VEILING GLARE CONTROL WITH LUMINAIRES

Inventor: Vern S. Wince, Newark, Ohio
Assignee: Holophane Company, Inc., New York, N.Y.
Filed: Dec. 11, 1969
Appl. No.: 884,280

Related U.S. Application Data

U.S. Cl. 240/93, 240/51.11, 240/106
Int. Cl. F21v 13/04
Field of Search 240/93, 25, 106, 51.11

References Cited

UNITED STATES PATENTS
1,941,079 12/1933 Exelmans..................................................240/106

2,394,992 2/1946 Franck..................................................240/93
3,258,590 6/1966 Goodbar..................................................240/106

Primary Examiner—Samuel S. Matthews
Assistant Examiner—Richard L. Moses
Attorney—Nolte and Nolte

ABSTRACT
A lighting system for eliminating specular reflection from work areas from impinging upon the eyes of persons in a workroom, such as a classroom and including a luminaire having a light source and a reflector having prisms which act to redirect longitudinal and transverse direct light from the source into lateral angles eliminating both longitudinal and transverse components of downlight on either side of a longitudinal plane through the light source. A work area receiving beams of longitudinal and transverse light at only lateral angles will not reflect light in the longitudinal directions at angles of "veiling glare." The refractor also provides sides having prisms redirecting light in the beam direction and upwardly to illuminate portions of the ceiling. Finally, a reflector is included which includes portions facing away from a light source so as to reflect as little light as possible upon the refractor.

16 Claims, 18 Drawing Figures
VEILING GLARE CONTROL WITH LUMINARES

This application is a continuation-in-part application of pending application Ser. No. 788,669, filed Oct. 22, 1968 about to become abandoned, which in turn was a continuation of application Ser. No. 664,890, filed Aug. 31, 1967, now abandoned. When this application Ser. No. 453,709, filed May 6, 1965, now abandoned, which in turn was a continuation-in-part application of application Ser. No. 249,747, filed Jan. 7, 1963, now abandoned.

This invention relates to illumination and has specific reference to the solution of a very common type of problem involved in the proper seeing of written or printed matter. It has particular reference to provision of illumination to permit the special performance of specific tasks.

A familiar type of desk work involves the viewing of paper on a horizontal surface such as the desk for the purpose of reading what is written or printed thereon and also writing on such horizontally supported paper. It is known that the significance and ease of reading of matter on paper surfaces depends upon the contrast of one portion of the paper to another as it is viewed. The object of illumination is to provide the greatest contrast possible between portions which are intended to be dark and portions which are intended to be light. This is accomplished by the viewer in so arranging his work with respect to the available illumination that he as far as possible sees by means of light which is diffused from the surface of the paper rather than by light which is reflected from the surface of the paper in a manner analogous to reflection from a mirror or a specular surface. This is difficult to accomplish with the type of illumination now prevailing in the work spaces such as classrooms, drafting rooms, offices and the like. The reason for this is that light sources available today pass most of the light in the direction of nadir or not much more than 45° therefrom. If such a light is placed in a position where it casts the correct amount of light on the task being performed, a certain amount of light from the source is reflected to the eye of the observer much as if the paper were a mirror. This mirrorlike reflection results in what is commonly known as veiling glare and is always present if the light source is within a certain area overhead from the point at which the paper is being viewed. The present invention is intended to eliminate to a substantial degree this deficiency in illumination.

It is therefore a primary object of the present invention to give illumination to a horizontally disposed piece of paper or the like for most advantageous viewing by a person in a position ordinarily assumed in viewing such material.

It is a further object of the present invention to provide adequate illumination which is substantially free from glare with respect to the position of the person with respect to the source of illumination, but only requiring a specific orientation with respect to the orientation of the illumination source.

Other objects and advantages will become apparent, as this description proceeds, which may be best understood with reference to the appended drawings in which:

FIG. 1 is a perspective view, showing in diagrammatic form the eye of a person seated at a desk engaged in a task requiring the perusal of a sheet of paper or the like lying thereon;
FIG. 2 is a light distribution diagram of a present commonly utilized illumination for spaces to be illuminated for reading and the like;
FIG. 3 is a polar diagram illustrating reflection from a spot on a piece of paper resulting from illumination by a single ray of light;
FIG. 4 is a diagram similar to FIG. 3 illustrating the same kind of reflection from a spot on a piece of paper having a greater reflectivity than that illustrated in FIG. 3, that is, a lighter area of the same piece of paper;
FIG. 5 is a section of a luminaire having a first preferred embodiment in accordance with the present invention, which luminaire provides illumination of the nature contemplated;
FIG. 5A is a partial view of the luminaire shown in FIG. 5 illustrating an alternative form;
FIG. 6 is a partial longitudinal section of the luminaire shown in FIG. 5 taken on line 6--6 of FIG. 5;
FIG. 7 is a light distribution diagram illustrating the transverse distribution of light from the luminaire shown in FIG. 5 and FIG. 6;
FIG. 8 is a similar diagram showing the longitudinal distribution of the light through a lobe of light shown in FIG. 7 along a central longitudinal plane thereof denoted by the dotted line of FIG. 7;
FIG. 9 is a diagram of the room shown in FIG. 1, taken as a sectional view on the plane 9--9--9 of FIG. 1;
FIG. 10 is an elevational cross sectional view of a luminaire having a second preferred embodiment in accordance with the present invention;
FIG. 11 is a longitudinal section of the luminaire refractor shown in FIG. 10 taken on line 11--11 of FIG. 10;
FIG. 12 is a horizontal section of the luminaire refractor shown in FIG. 10 taken from axis 12--12 of FIG. 10;
FIG. 13 is a diagrammatic perspective view showing the relationship between the luminaire of FIGS. 11--12 and the oblong light patterns which it projects on the working surface;
FIG. 14 is a horizontal section similar to that of FIG. 12 through a refractor having a third preferred embodiment in accordance with the present invention;
FIG. 15 is a diagrammatic perspective view showing the relationship between a luminaire with the refractor of FIG. 14 and the light patterns which it projects on the working surface;
FIG. 16 is a light distribution diagram illustrating the transverse distribution of light from the luminaire shown in FIGS. 10, 11 and 12; and
FIG. 17 is a similar diagram showing the longitudinal distribution of the light through a lobe of light shown in FIG. 16 along a central longitudinal plane thereof denoted by the dotted line of FIG. 16.

In order to make clear the factors in the present invention, attention is invited to the showing in FIG. 1. Point E represents the eye of an observer engaged in work upon a sheet of paper 10 laid upon a desk. Let us imagine that the paper 10 is replaced by a mirror. It is readily apparent that in looking in the mirror the observer will see the ceiling in the rectangle defined by the points 11, 12, 13, and 14. Consequently, if there is a source of illumination anywhere within the rectangle 11--14 the illumination would be seen by the observer at Point E reflected in the mirror on the desk surface. Continuation of the lines between the corners of the ceiling rectangle and the corners of the mirror meet at an imaginary point V which is beneath the mirror and on the line extending perpendicularly from the point E through the mirror a distance below the mirror equal to the vertical height the point E is above the mirror. Thus any illumination which is cast toward the point V is seen by the eye of the observer at E. If now the imaginary mirror is replaced by a piece of paper bearing writing or printing, a somewhat similar phenomenon takes place. Although the observer does not now see a mirror image of illumination used in the ceiling within the rectangle 11 to 14, he will see areas of more intense light on the paper which correspond to the mirror images of the light sources in the ceiling.

In these more intensely illuminated areas the ability to distinguish between different tones in the paper is greatly reduced. The reason for this may be readily understood by reference to FIGS. 3 and 4. These figures are reflection diagrams of small areas of a piece of paper illuminated by a single light ray 1 in FIG. 3 and a corresponding ray l' in FIG. 4. The ordinarily diffused reflection which is generated by paper whether printed upon or plain is distributed in intensity in such a manner that the reflected candle power may be roughly represented as a sphere. From these considerations it can be seen that in the figures if the eye were placed directly overhead, the maximum illumination contrast would be observable between the spot of light shown in FIG. 3, which represents a dark portion of the paper, and the spot shown in FIG. 4, which represents a light portion of the paper. The diagrams are from.
an actual piece of paper with printing thereon and represent a viewing contrast about 4 to 1. This diffused reflection is generated by light passing into and between the fibers of the substance of the paper and by multiple reflections between the fibers before the light emerges. Dark areas, or printed spots, naturally result in lesser diffuse reflection as the ink absorbs the light during its passage through the material and upon its reflection from fiber to fiber.

The difference in length between the vertical arrow in FIG. 3 and that in FIG. 4 is a representation of this. As we saw before, this difference is what makes a piece of printing readable. In addition to this however, there is another type of reflection from practically all substances which may be written or printed upon which is attributable only to reflections from the surface first struck. This reflection is specular in nature, results in a sharp increase in apparent brightness of the paper being viewed. If the eye is placed at a position which would correspond to a point to which the incident ray I or I' would be reflected if the paper were a mirror, this phenomenon becomes apparent. Thus if the eye were placed at a point along lines 20 or 21 in FIGS. 3 and 4, there would be plenty of illumination but the viewing contrast between the dark spots shown in FIG. 3 and the light spot shown in FIG. 4 falls to a value of about 1.5 to 1, this ratio, of course, being graphically represented by the length of the arrows pointing in the direction 20 and 21. This loss in contrast renders the task of reading by light which is reflected in this quasi-specular manner difficult.

This type of illumination and resulting viewing glare have been present in the places which are illuminated by conventional types of luminaires for such places. The reason for this can be seen in FIG. 2. FIG. 2 is a polar diagram illustrating the candle power distribution from an ordinary luminaire. It can be seen that practically all the light falls within the zone of 45° from nadir on each side thereof. If such a luminaire is to give adequate illumination it must of course be placed in a position such that the light does not fall at a higher angle than 45° from nadir on the object being viewed. Referring to FIG. 1, this means that such a luminaire if placed in the room to properly illuminate the workpiece 10, must be placed within the rectangle 11, 12, 13 and 14, with the result, as above explained, that viewing glare would be present. It might be possible, in a room such as that illustrated, to place the luminaire in such a position that such glare does not occur, with a particular location of the work piece, but general overhead illumination permitting a number of work positions must inevitably produce glare at a least some positions.

What is proposed is to provide a luminaire which can be placed anywhere in the room with relation to the observer without causing such viewing glare. This is accomplished by the provision of the luminaire which has a light distribution of such a nature that it casts practically no illumination directly downward, its illumination being concentrated as closely as possible in planes at a definite lateral angle from nadir (FIGS. 13 and 15). In FIG. 7 there is shown a candle distribution curve taken in a transverse direction of an elongated luminaire in accordance with the present invention. From what has been said before it can be seen that if such a luminaire were suspended directly overhead practically no light from it would reach the paper under it which is in direct contrast to the conventional luminaire the distribution curve of which is shown in FIG. 2. In that construction, the maximum amount of both lateral and longitudinal light possible is cast within say 45° of nadir, as was said before. Of course a luminaire of the invention, with the distribution of FIG. 7, within the rectangle 11 to 14 of FIG. 1, does not illuminate tasks being performed by the observer whose eye is at E but it does illuminate other parts of the room. For the purpose of illuminating task 10, it would be necessary to provide a luminaire of the nature set forth above of a rectangular in cross section, at which point because of the lateral angles of light distribution of both the lateral and longitudinal components of light, it will cause no viewing glare. It is thus necessary only to place and space luminaires in the ceiling so that they provide illumination on whatever work areas are to be covered with the assurance that even though the entire room be illuminated there will be no reflected glare anywhere provided the observer is faced in the right direction. This last fact will be evident from FIG. 9. Consequently, from the geometry shown, if a luminaire is provided with negligible light emission within the angle "α" , as shown for luminaires 25 and 26, the luminaire can be placed anywhere and will not emit longitudinally directed light at glare angles which would cause viewing glare. The angle α is of course, the same angle as that defined by points 30, V, and 31.

It will be noted that the emission curve shown in FIG. 7, is similar to that shown in FIG. 2, in that they both direct little light at high angles, particularly in the zone from 60° to 90° from nadir. This is important to prevent direct glare in the observer's eyes when the observer is looking in the near horizontal directions.

The difference in approach between the luminaire of the present invention and the conventional luminaire can be stated to be that the conventional luminaire is designed to cast light straight down and in such a manner that the greatest candle power is distributed over the surface to be illuminated. This of course means that inasmuch as the shortest distance from the luminaire to the work is along nadir, the largest amount of light is concentrated at that point and spread as widely as possible from nadir to cover the maximum area most efficiently. The principal involved in the present invention is the concentration of light emission at lateral angles high enough from nadir to prevent specular reflection from a horizontal surface to the observer's eye.

The details of a luminaire having a first preferred embodiment with which this is accomplished are shown in FIGS. 5, 5A and 6 which are, respectively, transverse and partial longitudinal sections of the luminaire. The luminaire is composed of a metallic housing 40 supporting a reflector 41, a ballast mechanism 42 and a fluorescent tube 43. The reflector 44, which may be of glass or plastic, is secured to the metallic structure by means of end plates 45. These luminaires are provided in conventional lengths. It is intended that they are to be installed in the space to be illuminated in the manner shown in FIG. 9, that is, with the length of the luminaire axis lying parallel to the direction in which the user faces. The reflector may have on the outer face of its horizontal surface portion prisms 46, which refract direct light from the source 43 to emerge in the direction of the ray 48. A series of prisms 49 in the inner face of the inclined bottom portions also serve to refract light to emerge as typically shown by the ray 51. Cutoff prisms 50 limit the vertical angle of emission of longitudinally traveling rays.

Optionally the horizontal surface portion of the bottom portion of the reflector may have prisms 46' on the light incident surface with the cutoff prisms 50' extending laterally completely across the light emergent surface (FIG. 5A).

Before proceeding further, from what has been said up to now, it can be seen that the bottom of the reflector emits very little light having a transverse component within the angle α of FIG. 9 because of the direction of ray 56. Refraction of the light towards 56 is directed upwardly to illuminate the ceiling as indicated by ray 56. This effect is obtained by so proportioning the prisms that an upper surface 57, thereof directs light downwardly while the lower surface thereof 58 directs light upwardly as along
It will be appreciated that the external shape chosen for the sides of the luminaire is dictated, to some extent, by the ratios desired for the widths of the upper surfaces 57, to those of the lower surfaces 58, while at the same time having emergent rays take the proper direction.

A reflector 41 is provided, having preferably a diffused white finish giving a reflection distribution as shown by the three polar diagrams on the three different surfaces thereof. As can be seen, the reflector has a central lower reflecting portion 60, on each side of which there is an upwardly and outwardly sloping surface 61 and finally a horizontally extending portion 62 on each side of the reflector. The light from portion 60 of the reflector, in general, behaves in a manner similar to the light coming directly from the fluorescent tube 43. Because of the inclination on the surface 61, relatively little light reaches that portion and a relatively small amount is reflected therefrom as indicated by the small polar curve 63. As a result the light which reaches the bottom of the reflector from surface 61, is kept at a minimum. Thus the typical ray 65 coming from surface 61, and refracted to emerge as 67, is not of great intensity.

The longitudinal distribution of candlepower from the luminaire is that shown in FIG. 8. This distribution is obtained by means of external "cutoff" prisms 68 in a manner well known in the art. This distribution it will be noted distributes relatively little light between 60° and 90° of nadir for the purpose which is well understood, of preventing direct glare as the observer looks at the light at low angles.

The second and third preferred embodiments are illustrated in FIGS. 10 through 12 and 14. Referring to FIGS. 10 through 13, this luminaire consists of a reflector 70, a specular reflector 71 and a housing 72 which allows space for housing the ballast equipment (not shown) for operating the lamp 74. The light source 82 in the second and third preferred embodiments is a concentrated source of light i.e., a small intense source such as a mercury or other metallic vapor lamp. The vertical sidewalls of the reflector element of these second and third embodiements include vertically extending reflecting prisms 75 on the light incident surface thereof. As can be seen in the detail shown in FIG. 12 these interior reflecting prisms 75 control the lateral direction of the light emerging from the reflector 70. The desired light direction pattern for the first and second preferred embodiments is illustrated diagrammatically in FIG. 13. To achieve this desired light distribution with the second preferred embodiment, whereby the individual will have glare free illumination if he faces in any direction, as 32°-32', the light emitted by the luminaire must not be directed by the reflector only in varying lateral directions (sidewall prism structure 75) but must also be directed to varying vertical angles. This vertical control is effected by horizontally extending prisms 76 on the light emergent surface of the sidewalls of the reflector 70. As can be seen from the detail in FIG. 10, a part of the light incident thereon (ray 87) is reflected by these horizontally extending calodiptic prisms 76 to emerge upwardly (ray 87') to illuminate the ceiling and part of the direct light (ray 88) is refracted to emerge in a downward direction as exemplified by ray 88'. The ratio of the light to be so reflected upwardly to that which is to be reflected downwardly is dependent upon the relative effective widths of the upper and lower surfaces 89, 90. The external shape chosen for the size of the luminaire is therefore dictated to some extent by the ratio desired.

The bottom portion of the reflector of the second preferred embodiment is illustrated in FIGS. 10 and 12 in which the bottom section of the reflector has a substantially circular shape and has a panel extending substantially longitudinally (axis 2-2') thereacross. This panel extends transversely from the center thereof in both directions to the point where the light from the light source 82 incident on the bottom reflector portion is emitted in beam direction with no deviation as shown by ray 79—79' in FIG. 10. On the light incident surface of this panel there are longitudinal parallel elongated light spreading prisms 77 and corresponding parallel light depressing prisms 78 are situated transversely to the light depressing prisms on the light emergent surface. The circular segments on the bottom section of the reflector established by the panel extending thereacross are comprised of radial prisms 81 on the light incident surface for providing lateral control of the incident light and concentric prisms 80 (FIG. 10) for depressing the light incident thereon on the light emergent surface thereof.

It can be seen that the bottom of the reflector emits very little light having a transverse component within the angle a of FIG. 9 because the active surfaces of prisms 77 and 80 redirect all longitudinal as well as transverse light from the source substantially entirely into lateral planes. To achieve the desired light distribution pattern as illustrated in FIG. 15, which enables observers to have glarefree illumination while facing either axis 33°-33' or 32°-32', the third preferred embodiment is to be utilized. As compared to the vertical light incident prismatic structure 75 on the sidewalks of the reflector 70 in the second preferred embodiment whereby incident light is laterally directed in two directions, the vertical light incident prismatic structure 75' as illustrated in FIG. 14 would laterally direct light in four lateral directions as shown by the typical rays emergent therefrom. The horizontal prisms 76' on the outer surface would control the light vertically in the same manner as prisms 76 on reflector 70. On the bottom panel, a central portion is comprised of concentric prisms 77' on the light incident surface thereof to control the light vertically and radial prisms 78' on the light emergent surface to provide for lateral control. The prism structure outside of this circular portion is comprised of radial prisms 81' on the light incident surface giving lateral control and concentric prisms 80' on the light emergent surface for achieving vertical control of the light.

Radial prisms 81 align with the planes in which the light rays in the radiant emission of light from the concentrated source are directed in the same manner as the longitudinal prisms 49 of the luminaire of FIG. 5 aligns with the planes in which the longitudinal components of light from the linear source 43 are directed and act to redirect the light onto work areas W, X, Y and Z (FIG. 15). Prisms 81' lying generally along and on either side of axes 32°-32' and 33°-33' act to lift the longitudinal components of light from the source onto the work areas on either side of each axis to eliminate glare along the axes and ceiling glare from the work surfaces in accordance with the object of the invention.

It can be appreciated that only uniformly illuminate the entire work surface, the luminaires of the present invention would have to have the sizes of the individual luminaires so designed that by a proper placement of a plurality of these luminaires all light would be incident so as to provide glarefree viewing and at the same time total uniform illumination of a complete work surface would be achieved.

To obtain even illumination of the floor surface it is obvious from an examination of FIG. 15 that the adjacent luminaire shown in FIG. 14 should be spaced apart approximately one-half the mounting height above the work plane in both directions 32°-32' and 33°-33'. The luminaire shown in FIGS. 10, 11 and 12 should be spaced apart in the direction 32°-32' approximately the distance of the mounting height while at right angles to this directtion they must be spaced apart one-half the mounting height.

The operation of the luminaire should now be clear. It can best be visualized by considering that the primary function of the reflector and refractor is to cause emergent light, not so much to strike a particular region in relation to the lamp, but to strike the surface to be viewed at a particular angle. If the viewer is faced in the direction, the light from the source will be received by the individual he finds that light light from the portion of the luminaire forward of him (within the ceiling rectangle mentioned), reaches the surface he is viewing. Illumination must, therefore, come from luminaires elsewhere in the ceiling. These luminaires, of course, cannot cause glare because of their position.

A typical glare producing ray has a component in a longitudinal direction toward the viewer, and a component from
3,647,148

6. A lighting system for illuminating a plurality of laterally and longitudinally spaced work areas spaced from ground level and to be viewed in the longitudinal direction, said system comprising a plurality of longitudinally extending luminaires, some of which are disposed directly above respective ones of said work areas and constituting means for substantially distributing longitudinal and transverse components of light at only lateral angles for illuminating work areas spaced laterally of said respective work areas, said luminaires further constituting means for substantially eliminating transverse components of light including rays extending longitudinally along a longitudinal center plane through the luminaire and within a range of from 0° to approximately 30° on either side thereof, said last-named means also constituting means for reducing indirect veiling glare from said work areas in predetermined longitudinal directions; each of said luminaires including preferably one linear light source having an axis extending parallel to the longitudinal direction, and also including an elongated refractor having linear prisms extending beneath and parallel to said axis and having active surfaces constituting means for receiving incident light from the linear light source and for redirecting light rays emitted by said linear light source and incident upon said active surfaces substantially entirely into relatively narrow angular ranges on opposite sides of and remote from a vertical plane through and parallel to the axis of the linear light source and further constituting means for directing the emitted light onto said work surface at such lateral and longitudinal angles for preventing reflection from the horizontally disposed work surface into the person's eye, said refractor further including prismatic cutoff means for limiting the vertical angle of light emission.

7. The combination according to claim 4, in which said reflector includes surface means for diffusing light incident thereon whereby the light reflected to said refractor bottom panel is diffused light.

8. A lighting system for illuminating a plurality of laterally and longitudinally spaced work areas spaced from ground level and to be viewed in the longitudinal direction, said system comprising a plurality of longitudinally extending luminaires, some of which are disposed directly above respective ones of said work areas and constituting means for substantially distributing longitudinal and transverse components of light at only lateral angles for illuminating work areas spaced laterally of said respective work areas, said luminaires further constituting means for substantially eliminating transverse components of light including rays extending longitudinally along a longitudinal center plane through the luminaire and within a range of from 0° to approximately 30° on either side thereof, said last-named means also constituting means for reducing indirect veiling glare from said work areas in predetermined longitudinal directions; each of said luminaires including preferably one linear light source having an axis extending parallel to the longitudinal direction, and also including an elongated refractor having linear prisms extending beneath and parallel to said axis and having active surfaces constituting means for receiving incident light from the linear light source and for redirecting light rays emitted by said linear light source and incident upon said active surfaces substantially entirely away from a vertical plane through and parallel to the axis of the linear light source into an angular range from 30° to 60° from said vertical plane on opposite sides thereof and onto the horizontal surfaces at angles for preventing reflection therefrom to viewers looking at the surfaces in longitudinal directions, said side panels respectively having linear prisms extending parallel to said linear light source, said second linear prisms having surface means disposed for redirecting substantially all longitudinal and substantially all lateral light rays emitted by said linear light source and incident thereon substantially parallel to the light emergent from that part of the bottom panel which is adjacent to the respective side panel, said refractor including prismatic cutoff means along said bottom panel for limiting the vertical angle of emission of longitudinally travelling rays.

3. A luminaire according to claim 1, wherein said prismatic cutoff means are provided on the outside of the refractor and constitute transversely extending prisms for limiting the emission of light below approximately 60° from nadir in the longitudinal direction of the refractor.

4. A luminaire according to claim 2, which includes a reflector arranged above said light source and having a horizontal center portion, inclined portions respectively connected to opposite sides of said center portion, and side portions respectively connected to said inclined portions, said inclined portions generally facing away from said light source and such that only a relatively small amount of light from said light source is reflected by said inclined portions to said first and second linear prisms.

5. A luminaire according to claim 2, in which the second linear prisms have further surfaces constituting means for redirecting light from said light source, and incident thereupon, upwardly for illuminating a surface above the luminaire.

11. The combination as defined in claim 10, wherein said refractor includes side portions extending upwardly from said bottom portion and said side portions include prismatic means for distributing the light from said source into four spaced work surfaces, and said first mentioned prismatic means also comprising means for distributing the light into said four spaced work surfaces, which are disposed directly above respectively disposed.
refractor, said refractor having light incident and light emergent surfaces, said light incident surface having continuous prisms extending below the light source and for extending in planes laterally of the horizontal surface, and having active surfaces constituting means for receiving incident light rays from the light source and for redirecting substantially all light rays emitted longitudinally and transversely relative to the active surfaces substantially entirely into lateral planes within a relatively narrow angular range on opposite side of an remote from a vertical plane through the light source and for directing the emitted light onto the work surface at such relative lateral and longitudinal angles thereto for preventing reflection from the horizontally disposed work surface into the person's eye, said refractor including prismatic means for effecting a predetermined vertical angle of emission of the light directed by said first mentioned prisms.

13. The combination according to claim 12, wherein said light source is a linear light source having an axis extending parallel to said horizontal surface, said refractor being elongated, said prisms on the light incident surface of said refractor being linear and extending parallel to the axis of said light source and wherein said center plane extends in a direction parallel to the axis of the light source.

14. In combination: a substantially horizontally disposed work surface to be viewed by a person facing the same, and a luminaire arranged above and laterally of said work surface said luminaire including a light source and a refractor, said refractor having light incident and emergent surfaces, said incident surface having continuous prisms extending below said light source and in planes laterally of said horizontal surface, and having active surfaces constituting means for receiving light from the light source and for redirecting substantially all longitudinal and transverse light rays emitted by said light source and incident upon said active surfaces substantially entirely into lateral planes within a relatively narrow angular range on opposite sides of and remote from a vertical plane through the light source and parallel to the direction in which said surface is to be viewed and for redirecting the emitted light onto said work surface at such lateral and longitudinal angles for preventing reflection from the horizontally disposed work surface into the person's eye, said refractor including prismatic means for effecting a predetermined vertical angle of emission of the light redirected by said first-mentioned prisms.

15. The combination according to claim 14, wherein said light source is a linear light source having an axis extending parallel to said horizontal surface, said refractor being elongated, said prisms on the light incident surface of said refractor being linear and extending parallel to the axis of said light source and wherein said center plane extends in a direction parallel to the axis of the light source.

16. In combination: a substantially horizontally disposed work surface to be viewed by a person facing the same, and a luminaire arranged above and laterally of said work surface, said luminaire including a concentrated light source and a refractor, said refractor having a bottom portion below said light source and including on its light incident surface prismatic means for receiving light from said light source and for redirecting substantially all light rays emitted by said light source and incident thereon into lateral planes within a relatively narrow angular range on opposite sides of and remote from a vertical plane through said light source and parallel to the direction in which said work surface is to be viewed and for directing the emitted light onto said work surface at such lateral and longitudinal angles for preventing reflection from the horizontally disposed work surface into the person's eyes, said refractor including side portions extending upwardly from said bottom portion and said side portions including on their light incident surfaces prismatic means for distributing the light from said light source into four spaced work surfaces, said first mentioned prismatic means also comprising means for distributing the light into said four spaced work surfaces, said bottom portion further including a ring shaped portion surrounding a circular portion and having radial prismatic means on the light incident surface for laterally controlling the incident light and concentric prismatic means on said light emergent surface for vertically controlling said light, said last mentioned radial and concentric prismatic means also constituting means for distributing light onto said four work surfaces.