Jan. 10, 1939. G. R. BAUMGARTNER 2,143,673

LIGHTING FIXTURE

Filed May 11, 1937

Fig. 1.

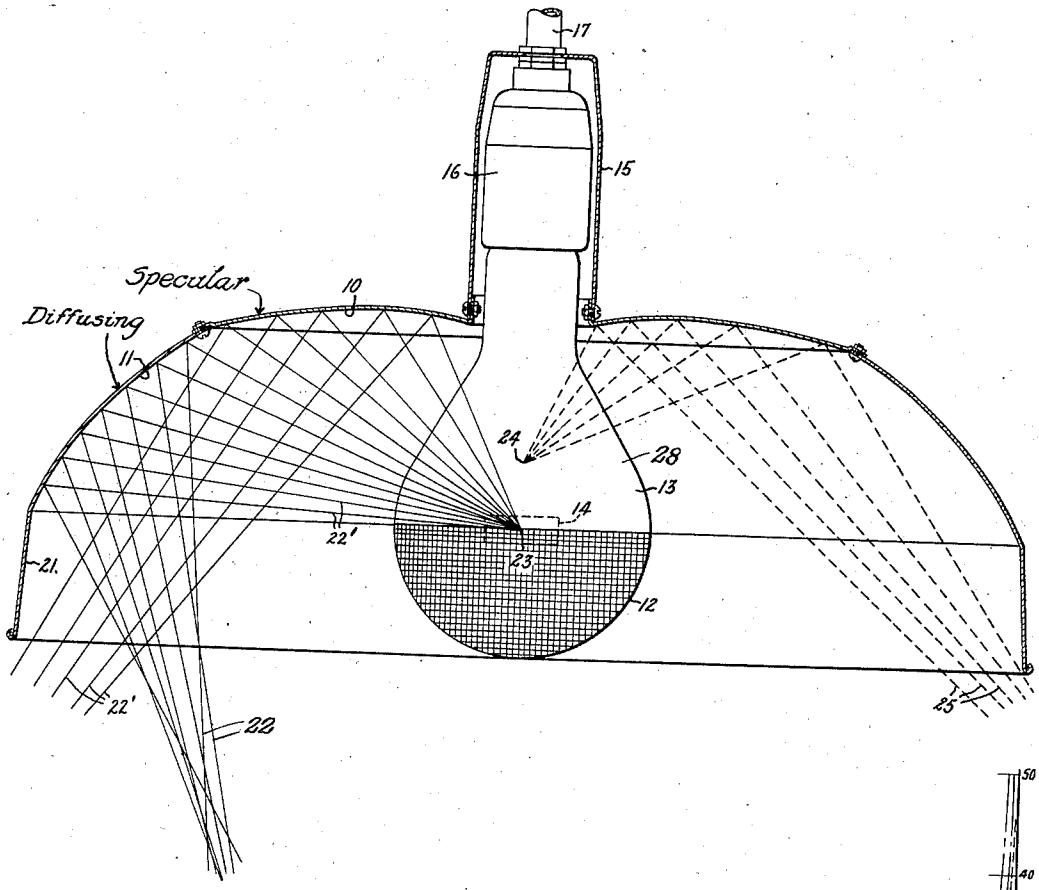
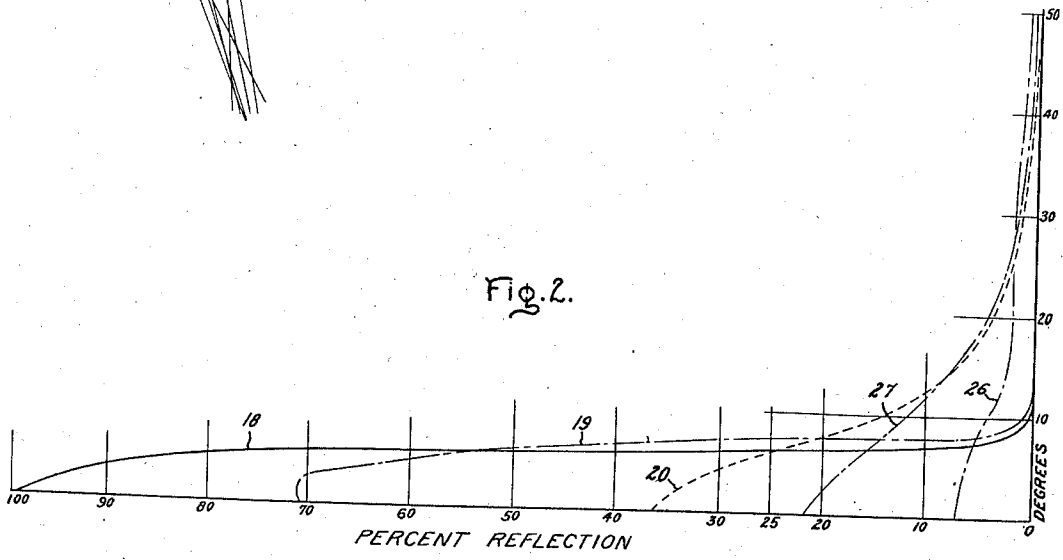


Fig. 2.



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LIGHTING FIXTURE

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4 Claims. (Cl. 240—78)

My invention relates to lighting fixtures and more particularly to a lighting fixture adapted to be used for industrial lighting wherein the fixture is mounted near the ceiling and the light is directed downward.

An object of my invention is to provide a lighting fixture capable of operating efficiently with the more powerful light sources and of effectively distributing the light. The higher powered light sources requires special lighting fixtures since the greater amount of light increases the brightness of the fixture and produces glare. Accordingly, lighting fixtures prior to my invention were made of considerable depth in order to shield the brighter portions of the light source and fixture from observers located to one side thereof and in position to see the reflector in the normal angles of vision. To reduce the glare from the fixture itself the reflecting surfaces thereof were made diffuse in character which caused the light to be repeatedly reflected within the fixture and reduced the efficiency thereof and the control over the direction of reflection therefrom.

According to my invention, the lighting fixture comprises three reflector sections, one of which is a specular or semi-specular reflecting surface located above the light source for directing downward and sideward at a relatively small angle from the vertical a large portion of the light projected upward from the light source. A second reflector section consists of a diffuse reflecting surface extending outward and downward from the edge of the first-mentioned reflector section for directing the remainder of the light emitted by the light source above horizontal to the area directly below the lighting fixture. A third section consists of a reflecting surface mounted below the light source for intercepting and redirecting the light projected downward from the light source back upward to the other reflector sections. The use of the specular or semi-specular reflector section permits making the lighting fixture shallow since it appears to be unlighted except when viewed from the area being illuminated by it. Because of the shallowness of the lighting fixture and the direct reflecting characteristic of the specular or semi-specular reflector section, the majority of the light passes from the fixture after being reflected by the upper portion thereof but once. This feature is largely responsible for the high efficiency of the lighting fixture. The distribution of light from the specular or semi-specular reflector is such that it never falls within the normal angles of vision and is not glare-producing. There is no possibility of glare from other portions of my fixture because no light can pass downward from the light source due to the reflector mounted therebelow and because the diffuse reflector section is so shaped and positioned as to direct the light to an area directly below the fixture. If a lamp is used which has the portion of its bulb above the light source frosted, a fourth section consisting of a downwardly extending rim is preferably added to the diffuse reflector section to prevent glare therefrom. Other features and advantages of my invention will be apparent from the description which follows of a species thereof and from the accompanying drawing.

In the drawing, Fig. 1 is a vertical section through a lighting fixture comprising my invention, and Fig. 2 is a graphical representation of the percentage and direction of reflections from different materials from which my lighting fixture may be made.

The lighting fixture shown in Fig. 1 is comprised of three reflector sections 10, 11 and 12, the first of which is located directly above the incandescent lamp 13, the second of which extends outward and downward from the edge of the first section, and the third of which is preferably in the form of a reflecting coating on the bowl of the lamp bulb below the center of the filament indicated at 14. In this particular case the first two reflector sections 10 and 11 are attached directly to each other and form a unit which is mounted on the husk 15 surrounding the socket 16 for the lamp 13. Both the husk 15 and the socket 16 are mounted on the usual downwardly extending conduit or pipe 17.

The first reflector section 10 which contributes greatly to the high efficiency of the fixture is either specular or has a slightly depolished semi-specular surface and directs substantially all of the light intercepted by it downward in the definite directions indicated by the lines 22. A depolished surface is preferred, since the reflection perceived by an observer looking upward into the surface is not so bright or pronounced. To establish the character of material suitable for the reflector section 10 and the degree of depolishing that is preferred, tests were made on several satisfactory surfaces, the results being indicated in the graph in Fig. 2. This graph indicates the percentage of reflection and the direction of the reflection in degrees. A very highly polished sample of a specular aluminum alloy marketed under the trade name "Alzak" by the Aluminum Company of America, gave the reflection indicated by the solid line 18, and a sample of a

particularly specular vitreous enamel produced by the Ferro Enamel Company of Cleveland, Ohio, gave the reflection shown by the dot-dash line 19. The depolished surface referred to above was produced by etching the aluminum alloy "Alzak" lightly with an acid and it reflected light as shown by the dotted line 20. Obviously various degrees of depolishing and various other materials having similar light reflecting properties may be used for the reflecting surface, and I wish to include within the scope of my invention any material for the reflector section 10 which reflects directly at least thirty per cent of the light intercepted by it. The shape of the said reflector section 10 is such as to redirect the radiation from the filament 14 downward and sideward just inside the rim 21 and illuminate an area thereabout. To illustrate the direction of the radiation the lines 22 are drawn from the midpoint 23 of the filament 14. In designing the curvature of this reflector section 10, a point 24 was taken above the actual location of the filament (actually about one and one-fourth inches thereabove) and the curvature was made such that the light directed from this point 24 and redirected by said section 10 cleared the rim 21 of the fixture as shown by the dotted lines 25. This point 24 was taken at a position intended to duplicate the most extreme condition possible to make sure that the light from all parts of the filament 14 and a substantial part of the light passing through a frosted neck portion of the lamp 13 strikes the reflector section 10 at such an angle as to cause it to pass directly out of the fixture therefrom.

The reflector section 11 is preferably of a diffusing character such as that produced by white vitreous enamel or by a more deeply etched surface of the aluminum alloy "Alzak." The reflection characteristics of these materials are shown by the lines 26 and 27 respectively in the graph shown in Fig. 2. The said reflector section 11 is shaped so that whatever direct reflection is given off by it is directed downward below the fixture, as shown by the rays 22', and cannot produce glare except to an observer located directly below the fixture and looking upward into it. For normal service this surface is preferably made of enamel or some other material giving very little direct radiation, but if the fixture is mounted some distance above the area to be illuminated a less diffuse material, such as the more deeply etched "Alzak," is preferred. A material giving less than twenty-five per cent direct reflection is preferred for this reflecting surface 11.

The reflector 12 may be either a silvered or other reflecting coating on the lamp bulb, as shown, or it may be a cap attached thereto and in either case functions both to prevent light from passing directly downward from the lamp and producing glare and to redirect light upward into the fixture to prevent loss thereof. I prefer to make the said reflector 12 spherical in shape so that the light redirected thereby strikes the fixture at substantially the same angle as the light from the filament 14.

If the fixture comprises simply the reflecting surfaces 10, 11 and 12, there is still possibility of glare from the upper portion 28 of the lamp bulb if it is frosted. To prevent this from occurring, the downwardly extending rim 21 is preferably attached to the reflecting surface 11 to shield said bulb neck from the view of an observer not directly below said fixture. This rim 21 is preferably coated with a white vitreous enamel or presents some other diffusing surface since it receives some light, particularly from the reflecting surface 11.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A lighting fixture comprising means for supporting an electric lamp, a comparatively shallow reflector surrounding said lamp and having a substantially horizontal slightly concave section located above said lamp with a surface which reflects directly at least about thirty per cent of the light intercepted by it, said section being shaped to direct light from said lamp downward and sideward directly out of the fixture, said reflector comprising a second section having a surface which diffuses at least about seventy-five per cent of the light intercepted by it, said second section being concave and extending downward from the edge of said first-mentioned section around said lamp so as to concentrate and direct the light reflected thereby directly below the fixture, said second section being so arranged as to be out of the path of light reflected from said first-mentioned section, and another reflector located below said lamp for directing the downwardly projected light from said lamp back toward said first-mentioned reflector.

2. A lighting fixture comprising means for supporting an electric lamp, a comparatively shallow reflector surrounding said lamp and having a substantially horizontal slightly concave section located above said lamp with a semi-specular reflecting surface, said section being shaped to direct light from said lamp downward and sideward directly out of the fixture, said reflector comprising a second section having a light-diffusing surface, said second section being concave and extending downward from the edge of said first-mentioned section around said lamp so as to concentrate and direct the light reflected thereby directly below the fixture, said second section being so arranged as to be out of the path of light reflected from said first-mentioned section, and another reflector located below said lamp for directing the downwardly projected light from said lamp back toward said first-mentioned reflector.

3. A lighting fixture comprising means for supporting an electric lamp, a comparatively shallow reflector surrounding said lamp and having a substantially horizontal slightly concave section located above said lamp with a semi-specular reflecting surface, said section being shaped to direct light from said lamp downward and sideward directly out of the fixture, said reflector comprising a second section having a light-diffusing surface, said second section being concave and extending downward from the edge of said first-mentioned section around said lamp so as to concentrate and direct the light reflected thereby directly below the fixture, said second section being so arranged as to be out of the path of light reflected from said first-mentioned section, and a substantially semi-spherical reflector located below said lamp with its center of curvature substantially at the center of the light source in said lamp for directing the downwardly projected light from said lamp back toward said first-mentioned reflector.

4. A lighting fixture comprising means for supporting an electric lamp, a comparatively shallow reflector surrounding said lamp and having a substantially horizontal slightly concave section located above said lamp with a semi-specular re-

flecting surface, said section being shaped to direct light from said lamp downward and sideward directly out of the fixture, said reflector comprising a second section having a light-diffusing surface, said second section being concave and extending downward from the edge of said first-mentioned section around said lamp substantially to the level of the light source therein so as to concentrate and direct the light reflected thereby directly below the fixture, said second section being so arranged as to be out of the path of light reflected from said first-mentioned section, a substantially cylindrical rim portion extending downward from the periphery of said second reflector section but terminating at its lower edge short of the path of the light reflected from said first-mentioned section, and another reflector located below said lamp for directing the downwardly projected light from said lamp back toward said first-mentioned reflector.

GEORGE R. BAUMGARTNER.