Nov. 24, 1964 V. S. WINCE 3,158,329

RECESSED CEILING LIGHTING FIXTURE

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Fig. 1.

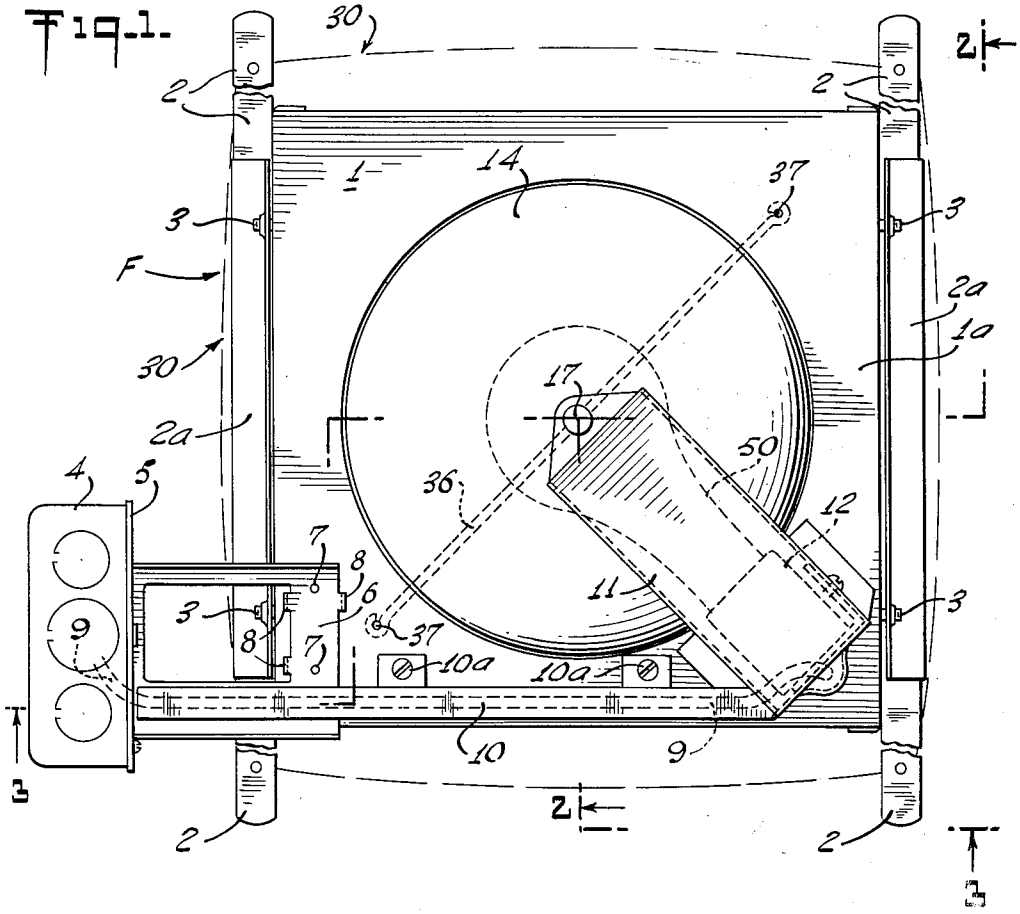
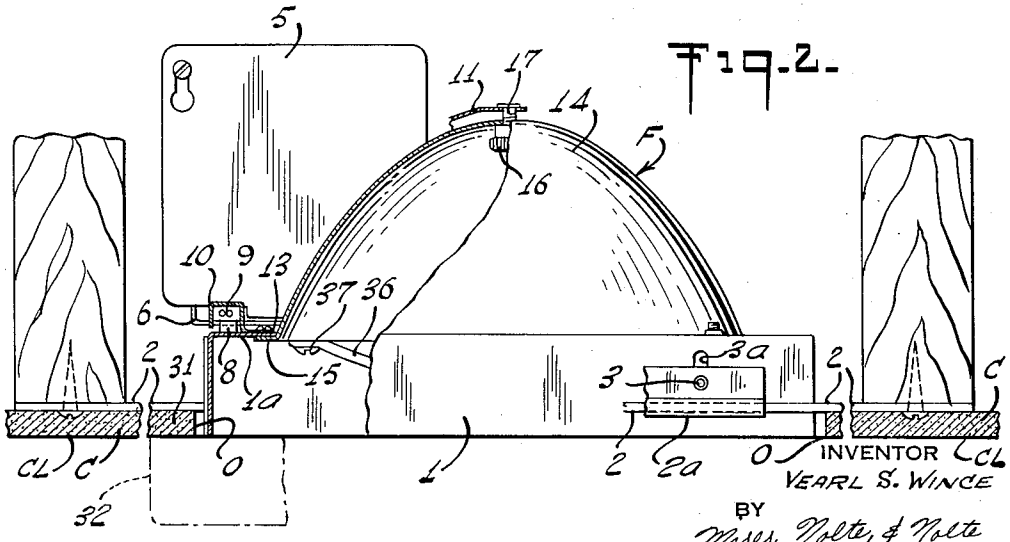


Fig. 2.



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Fig. 3.

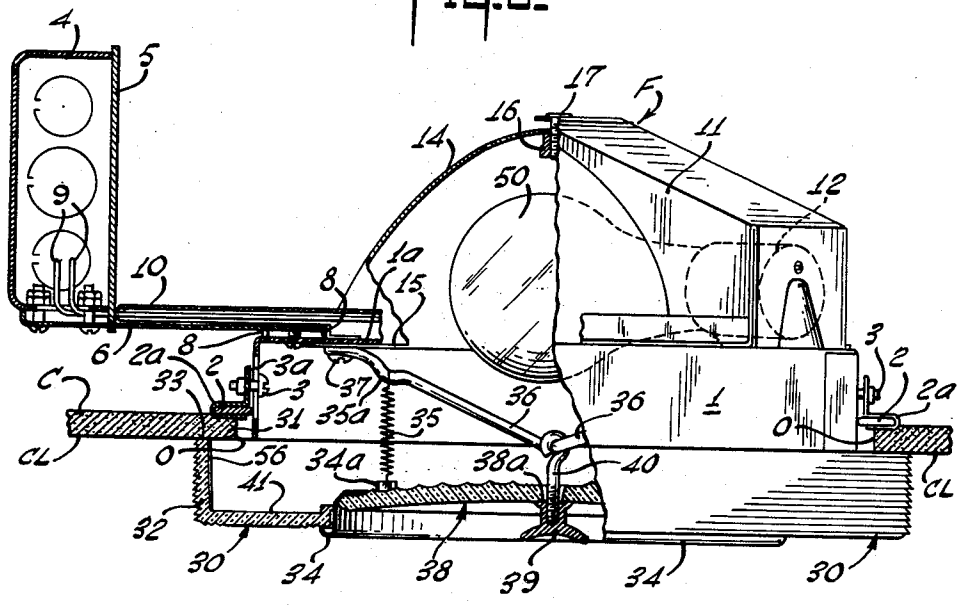


Fig. 7.

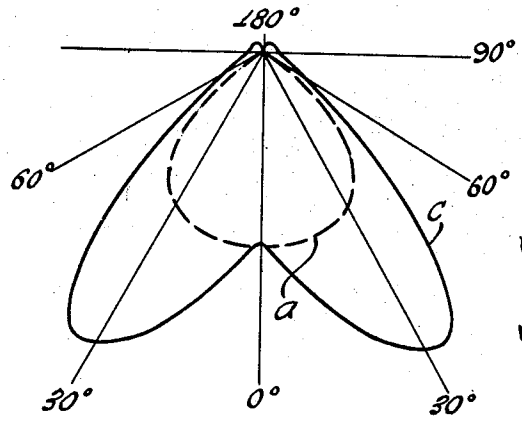
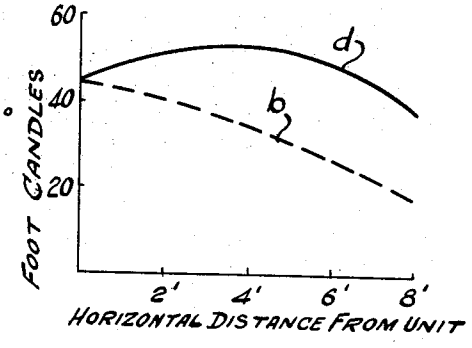


Fig. 8.



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FIG. 4.

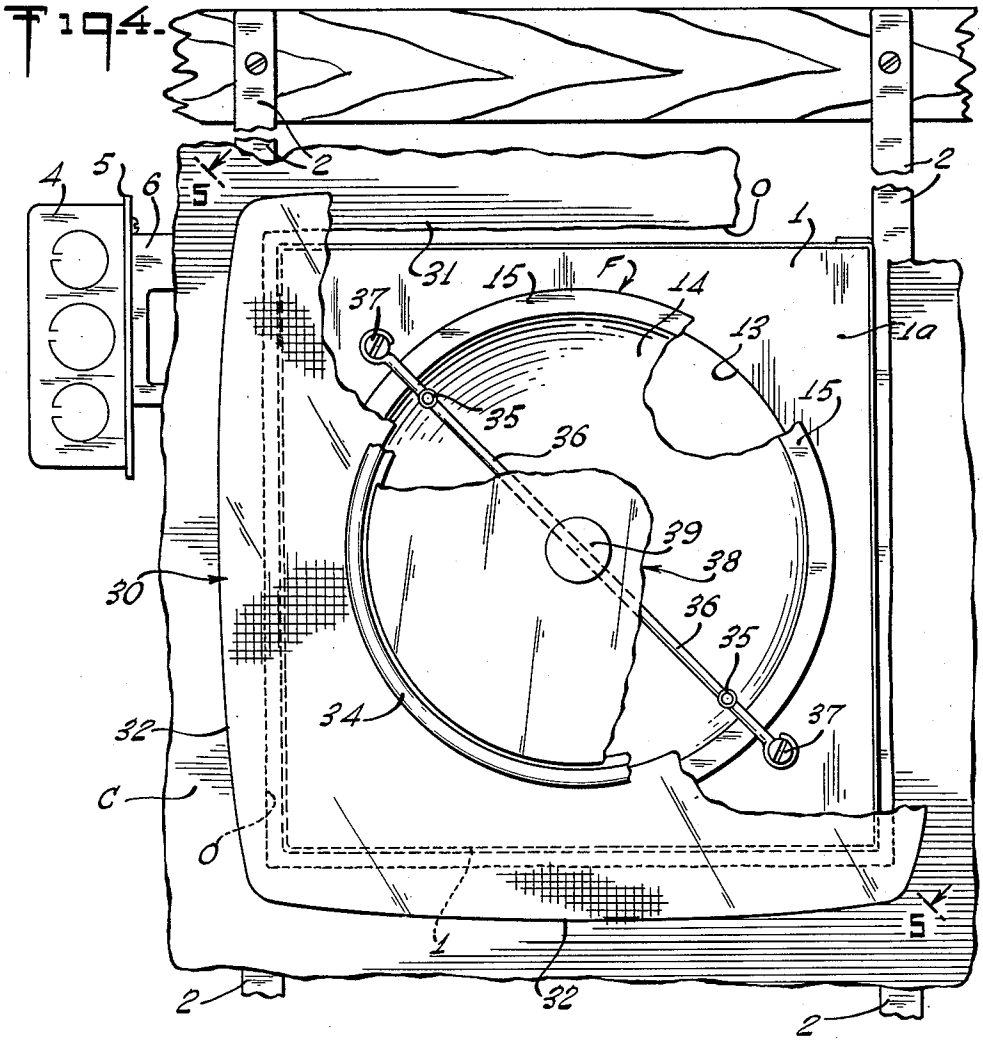
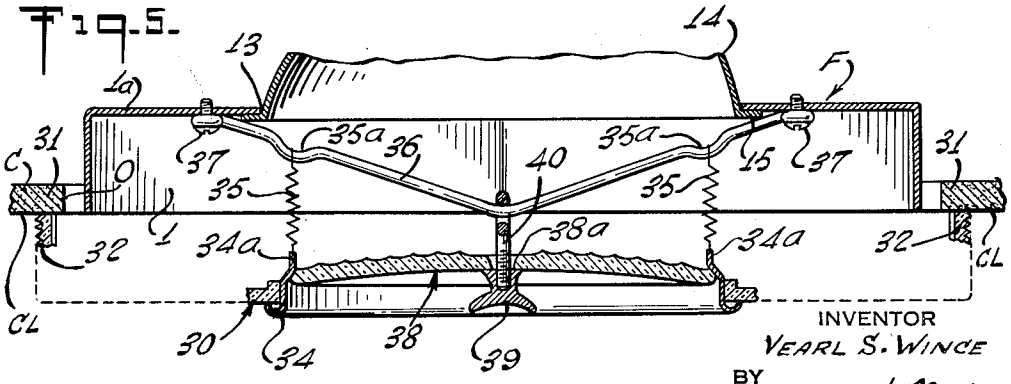


FIG. 5.



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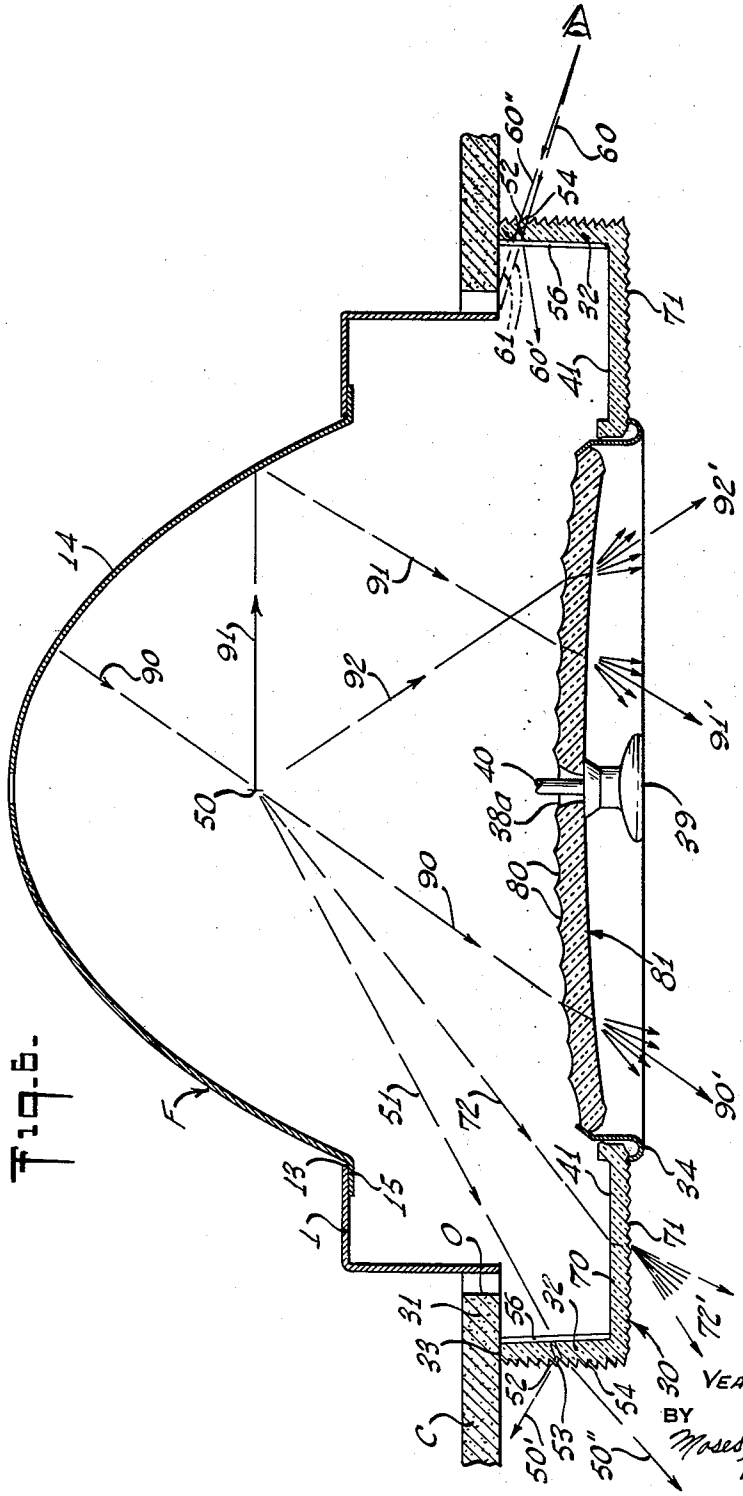


Fig. 6.

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United States Patent Office 3,158,329 Patented Nov. 24, 1964

3,158,329

RECESSED CEILING LIGHTING FIXTURE

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Filed Dec. 8, 1960, Ser. No. 74,723
6 Claims. (Cl. 240—78)

The present invention relates to recessed lighting fixtures for ceilings and is more particularly concerned with providing fixtures with light-transmitting members suspended below the ceiling.

Recessed lighting fixtures for ceilings are customarily provided with a metal finishing trim at the lower, or outer end to underlie the ceiling area immediately adjacent the recessed lamp box. In this way a pleasing finished effect is given to the installation, and at the same time the trim may be utilized to mount the lens or light-transmitting member or to carry a lens frame which in turn carries the light-transmitting member. In installations where existing ceilings have to be cut to accommodate the fixtures, trim members are of the utmost importance to cover rough, irregular aperture edges adjacent the fixture.

The basic drawback of such commercially available recessed light structures is that a good deal of illumination is lost because of the obvious requirement that the light be recessed, and even the reflectors backing the light source in such units cannot accommodate the best distribution of light. Extending light-transmitting members below the ceiling to increase the fixture's efficiency poses a great many problems, including the baring to view of the ceiling aperture which detracts from the beauty, and therefore, the real commercial value of the fixture.

It is a principal object of the invention to provide a novel recessed lighting fixture which will operate at extremely efficient levels of illumination without detracting from the desirable attractiveness of such fixtures derived from their recessed position in the ceiling.

Another object of the invention is to provide such a lighting fixture, the construction of which is compatible with a much greater delivery of illumination than that of comparable units and yet readily combines the feature of low heat conduction with highly uniform light distribution.

Still another object of the invention is to provide such a lighting fixture which utilizes the best structures of standard and other commercially available units without detracting from their advantages, such as ready accessibility to internal structures for light source replacement and for inspection, repair and splicing operations.

Further objects of the invention include the provision of such a lighting fixture which is very attractive to the eye, is easily installed and lends itself to facile manufacturing processes.

In a preferred embodiment of the invention, to be detailed herein, a light-transmitting member is utilized as the finishing trim of the recessed fixture and is adapted to frame the usual fixture lens. The optical performance of the trim is espeically designed to operate the fixture at peak illuminating efficiency and is so disposed relative to the fixture light source, reflector and lens as to receive a minimum of the radiant energy distribution in the fixture,and consequently a minimum of heat. This latter feature permits the use of thermo-plastic materials in the fabrication of the light-transmitting finishing trim; a distinct advantage in manufacturing costs, shipping charges based on weight and in installation where mishandling will not inevitably result in breakage.

Ease of installation, and accessibility of recessed structures after installation is facilitated in the structures of the preferred embodiment of the invention by mounting the optical trim on the lens rather than vice versa and

removably supporting the lens-trim structure from the internal parts of the fixture.

Further objects and advantages of the invention will be readily appreciated as the same becomes better understood by reference to the following detailed description, when considered with the accompanying drawings, wherein

FIG. 1 is a top plan view of the lighting fixture;

FIG. 2 is a side view, partly in section, taken along line 2—2 of FIG. 1, with parts omitted;

FIG. 3 is another side view, partly in section, taken along line 3—3 of FIG. 1;

FIG. 4 is an inverted plan view of the fixture with parts broken away;

FIG. 5 is a fragmentary section on the lines 5—5 of FIG. 4;

FIG. 6 is a schematic sectional side view, similar to that of FIG. 3, showing the optical performance of the device;

FIG. 7 illustrates the light distribution curves of the fixture as against a similar fixture not incorporating the invention; and

FIG. 8 is an illumination diagram of the lighting fixtures, the light distribution curves of which are shown in FIG. 7.

FIGS. 1–6 show a recessed lighting fixture construction similar to the structures shown in FIGS. 6 and 7 of U.S. Patent No. 2,863,990. The advantages of this unit, such as the installation and accessibility of the recessed parts, e.g., the outlet box, are considered very desirable in fixtures of this type. The present invention readily adapts itself for utilization in these desirable units, detracting nothing from their installation and accessibility features.

As seen in the figures, the fixture F includes a rectangular lamp box 1 supported at the upper surface of ceiling C by a pair of mounting strips 2, one on either side of the lamp box 1, and extending in parallel paths past the fixture opening O at either end of the fixture F. The strips 2 may be nailed at their ends to ceiling support beams as shown in FIG. 2. Each strip 2 is carried by an elongated strip bracket 2*a* adjacent the opposing sides of the box 1; they are secured to the box sides via nut and bolt connectors 3 which are conveniently received in vertical slots 3*a* provided in the box sides so that the lowermost edge of the box 1 may be readily adjusted vertically for flush horizontal alignment with the ceiling line CL during installation of the fixture F.

An outlet box 4, provided with a cover 5, is secured to a support bracket 6 which in turn is secured to the lamp box 1 at its horizontal upper portion 1*a* via screws 7 (FIG. 1). The attaching end of the bracket 6 is provided with bent-down pads 8 adjacent its connection to the lamp box 1 so that there is only edge contact between the two elements to minimize the heat transfer surfaces between them. House wiring, not shown, is connected in a conventional manner to the outlet box 4 to supply the slow-burning fixture wires 9 which pass from the outlet box 4 through a channel member 10 extending from the box to the socket housing 11 of the fixture F and secured to the lamp box upper portion by screws 10*a*, as shown in FIG. 1. The wires 9 extend through the socket housing 11 where they are attached to the socket 12. An incandescent lamp, identified by the numeral 50 in FIGS. 1 and 3, is threadedly engaged in the socket 12 in normal fashion.

The upper horizontal portion 1*a* of the lamp box 1 is provided with a large circular opening 13 (FIGS. 2 and 6) through which ready access to the outlet box 4 for making wire splices or for inspection, and the like, is accommodated. A reflector 14, provided with an annular, radially outwardly extending flange 15 (FIGS. 2 and 3) at its lower circular edge is utilized as a closure mem-

ber to close the opening 13 in the lamp box 1 where it is held in underlying relation with the lamp box upper portion 1*a* by a nut 16 and bolt 17 arrangement at the upper end of the reflector 14 and which secures the reflector 14 adjacent the inwardly extending end of the socket housing 11.

A centrally, downwardly bent yoke member 36 (FIGS. 3–5) extends diagonally across the lower portions of the fixture F and is supported at its ends via screws 37 adjacent the lower surface of the reflector flange 15 below the horizontal upper portion 1*a* of the lamp box 1. A vertical yoke extension 40 depends from the central bowed portion of the yoke 36 and is threaded at its lower end to receive a nut 39. A circular lens, or light-transmitting member 38 is provided with a central aperture 38*a* through which the yoke extension 40 extends and is supported adjacent the aperture 38*a* by the nut 39.

The lens 38 supports the fixture trim 30 via a ring 34 dimensioned at its inner, upper edge to overlie the lens 38 adjacent the outer circular edge thereof. The ring 34 is outwardly flanged at its lower end and supports the finishing trim 30 upon the flanged portion adjacent the inner edge of the centrally apertured floor 41 of the trim 30. Horizontal stability is given the lens 38, ring 34, and trim assembly by the turning of nut 39 to raise the lens 38 and ring 34 supported thereon. This acts to press the outer edges of the upwardly extending vertical wall 32 of the trim 30 against the ceiling C as shown at 33 (FIG. 6).

For purposes of relamping the fixture F, the lens 38 is readily removed by removal of the nut 39. The light source 50 may then be removed passed the yoke member 36 which is disposed sufficiently below the source 50 to accommodate its entry and removal. When the lens 38 is removed, the optical trim 30 is restrained in its position against the ceiling C by operation of a pair of springs 35, each depending from a swing support 35*a* formed at opposite ends of the yoke member 36 and connected at their lower ends to upstanding tabs 34*a* of the ring 34. When it is desired to remove the trim 30 for access to the recessed portions of the fixture, the upper ends of the springs 35 are lifted off of the swing supports 35*a*. Quick access to the outlet box 4 is then accomplished by removal of the yoke 36 by taking out the screws 37 and by removing the nut 16 and permitting the reflector 14 downward vertical removal.

It is seen that the trim 30, lens 38, yoke 36 and springs 35 are readily adapted for use as a component in new unit installations and also may be utilized as an assembly package for existing installations where drilled holes to accommodate the yoke screws 37 will be easily supplied. Alternately, different supports and connectors between the lens and trim elements and the fixture or ceiling may be desirable.

According to the invention, the finishing trim 30 comprises a transparent optical or light-transmitting member. It is noted that the vertical wall 32 of the trim 30 extends below the ceiling opening O and is in position, as is the horizontal floor portion 41 of the trim 30, to receive and to diffuse light rays from the incandescent lamp or light source 50 (shown schematically in FIG. 6).

With reference to FIG. 6, which shows the optical performance of the fixture F, it is seen that the outer surface of the optical trim 30 is provided with a series of vertically spaced and longitudinally extending prisms 53, each of which provides an upper face 52 and a lower face 54. The trim 30 is disposed to receive and transmit only direct rays from the light source 50, such as ray 51, which are intercepted at the vertical wall 32 and are transmitted in both downward and upward directions as they strike the upper faces 52 and lower faces 54, respectively, as shown by the refracted beams 50′ and 50″. The inner surface of the vertical wall 32 is provided with a series of longitudinally spaced vertical flutes 56 which act to diffuse the light from the source 50 in a lateral direction.

Beside acting to refract and diffuse rays of light in useful directions, the prisms 53 are also instrumental in hiding the ceiling opening O within the area of the optical trim 30. When observing the lighting fixture F from normal angles of view, i.e., from below, a line of sight 60 (FIG. 6) intercepted by the lower faces 54 of the prisms 53 is bent upwardly and is reflected off the inner face of the trim vertical wall 32 in an upward and outward direction. The line of sight 60″ intercepted by the upper faces 52 of the prisms 53 is bent downwardly and continues in the generally downward direction as shown at 60′. Broken lines 61, on the right side of FIG. 6, indicate undeviated lines of vision from lines 60, 60″ which would occur at the ceiling-trim area, if the optical trim member 30 was not provided with prism formations 53, and which would result in the permissive viewing of the ceiling opening O.

The outer surface of the horizontal wall of the optical trim 30 is formed with cut-off cones 71 distributed over the entire surface thereof. These cones 71 act to distribute light rays from the source 50, such as ray 72, in downward and outward directions such as indicated at 72′.

The lens 38 is disposed directly beneath the light source 50 to receive and transmit light directly from the source 50 as well as all of the light rays reflected by reflector 14. In FIG. 6, typical rays 90 and 92, emitted from the light source 50 are diffused by the lens 38 by means of the flutes 80 formed on the inner surface of the lens 38. The light is diffused outwardly and downwardly as indicated by the path of diffused rays 90′ and 92′. Similarly, reflected rays, such as 90 and 91, directed at the reflector 14 and then reflected downwardly are diffused by the lens 38 in downward and outward directions as indicated by the diffused rays 90′ and 91′.

As most clearly shown in FIG. 6, the major portion of emitted light from the source 50 and from the reflector 14 is intercepted by the lens 38. This advantageous positioning of the lens 38 and optical trim 30 relative to the source 50 and reflector 14, results in a relatively small portion of the radiant energy developed in the fixture F being intercepted by the optical trim 30. Consequently, temperature rise on the trim 30 will be substantially less than that on lens 38. This relationship permits the use of an optical trim made of a thermoplastic material, such as one based on polymerized methyl methacrylate resin, and without the danger of the material softening in use because of subjection to too high a temperature. As previously pointed out, the use of plastic for the trim member 30 results in many advantages both for the manufacturer and the shipper, as well as for the installer and the user.

It is noted too that the positioning of the lens 38, trim 30 and light source 50 of the arrangement shown results in the trim 30 receiving direct light from the source 50 and from the lens 38 to light the trim clear through, giving it a luminous glow, adding to the fixture's attractiveness. The efficiency of the fixture of the invention as against recessed fixtures which are not made in accordance with the invention is depicted in FIGS. 7 and 8. FIG. 7 shows a pair of curves *a* and *c* representing the light distribution of a typical recessed unit and a unit embodying the present invention, respectively. A very quick analysis of the curves *a* and *c* indicate that within 60° vertical angles on either side of the fixtures tested, the light distribution curve *c* of a unit incorporating the invention is much more extensive, particularly in the circumferential regions at the lower portions of the curve indications on either side of the unit center line 0°–180°. Light intensity in the regions usually drops below recommended values as is the case with curve *a* representing the distribution of light from a typical recessed unit.

FIG. 8 is an illumination diagram obtained from the unit tested for the FIG. 7 graph and indicates the efficiency of either unit in terms of distance in feet from the unit compared to illumination received in foot can-

dles. A comparison of curve *d*, representing illumination delivery from the unit incorporating the invention as compared with curve *b* derived from testing the typical unit, indicates a rise in efficiency in the former unit at initial distance removals to about 4 feet from the source where a decline in foot candle illumination is detected and which recedes to about 40 foot candles at 8 feet. The curve *b* of the typical unit immediately decreases in efficiency as distance from the source is begun and decreases to approximately 20 foot candles at 8 feet, just about one-half the efficiency of a unit incorporating the present invention.

Now it will be seen that the present invention provides a very efficient recessed lighting fixture which is most attractive to the eye and which utilizes an optical trim member extending below the ceiling opening of the uiit and which operates to assist in directing light rays from the source into useful directions and patterns. It readily performs the function of the trims of previous units by not only covering the ceiling opening which receives the recessed portions of the unit but is optically operative to deflect a line of vision from the edges of the ceiling opening, which in many instances in general building construction, will be irregular and rough where installation is made in existing ceilings. The various supporting structures of the lens and optical trim are also hidden from view behind the members themselves and are readily operative to permit easy access to the inner portions of the unit, thereby making repair and inspection a simple matter.

It is understood that the foregoing description of a specific embodiment of the invention is not intended to limit the spirit and scope of the invention which will now be defined in the following claims.

What is claimed is:

1. A lighting fixture comprising a reflector, a light source in front of said reflector, means for mounting said source and said reflector inwardly of a surface in an opening therein, a glass lens, means for supporting said lens spaced from said source and said reflector outwardly of the surface, a synthetic thermoplastic resinous light transmitting trim member framing said lens, the major portion of reflected and direct light being incident upon said lens, a minor portion of light direct from said source passing between the peripheries of said reflector and said lens and being incident upon said trim member, said trim member extending radially outwardly from said lens and including walls extending upwardly from the outer periphery thereof, said walls extending to the surface and around the outer periphery of the opening, said walls including prisms directing light from said light source and intercepting lines of sight directed from below and toward said opening and directing said lines of sight upwardly away from said opening and downwardly away from said opening depending upon which faces of said prisms intercept said lines of sight, whereby the edges of the opening are obscured.

2. In the lighting fixture of claim 1 wherein said trim member is supported upon said lens.

3. In the lighting fixture of claim 1 wherein said means for supporting said lens includes a yoke member secured within the fixture, said lens is provided with an aperture, attaching means extend from said yoke through said aperture for removably securing said lens to said yoke member adjacent the edges of said lens aperture at the bottom surface thereof, and said trim member is supported upon said lens.

4. In the lighting fixture of claim 3 wherein a trim mount is seated around the periphery of said lens, said mount including an outwardly extending flange, said trim member being supported upon said flange and means connecting said yoke and said mount for supporting said mount independently of said lens when said lens is removed.

5. In the lighting fixture of claim 4 wherein said means connecting said yoke and said trim mount include resilient means, and said resilient means are biased toward said yoke member for restraining said walls extending upwardly from the outer periphery of said trim member against the surface when the lens is removed.

6. In the lighting fixture of claim 1 wherein the radially outwardly extending portion of said trim member provides light directing means for directing light from the light source into downward and outward directions, said light directing means comprises prismatic cones with the apices thereof facing downwardly and formed on the light emergent surface of the radially outwardly extending portion of said trim.

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