

Sept. 28, 1965

E. W. MICHEL ET AL

3,209,142

LUMINAIRE

Original Filed Oct. 20, 1960

2 Sheets-Sheet 1

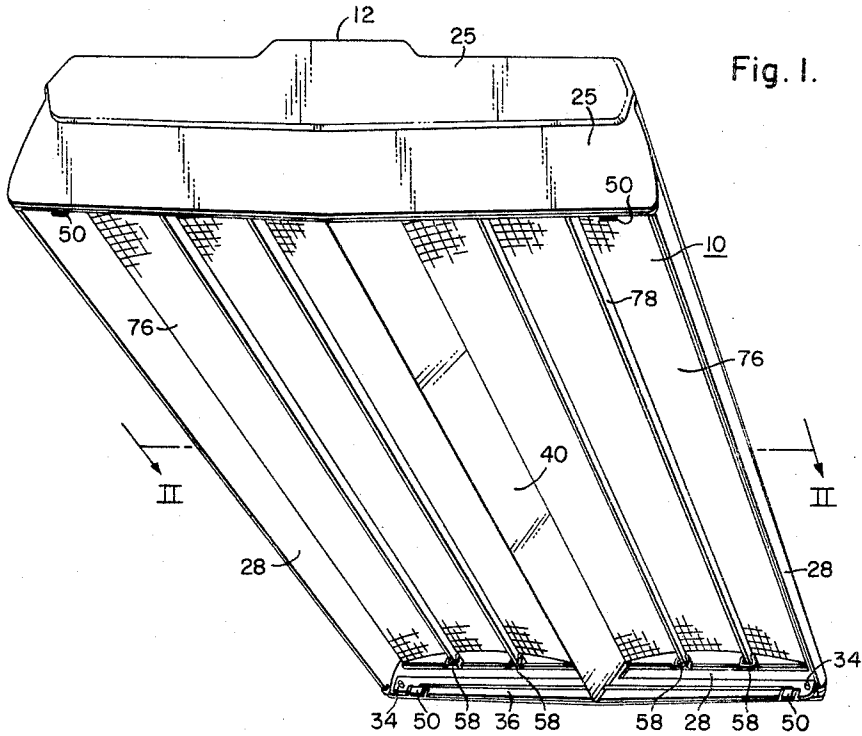


Fig. 1.

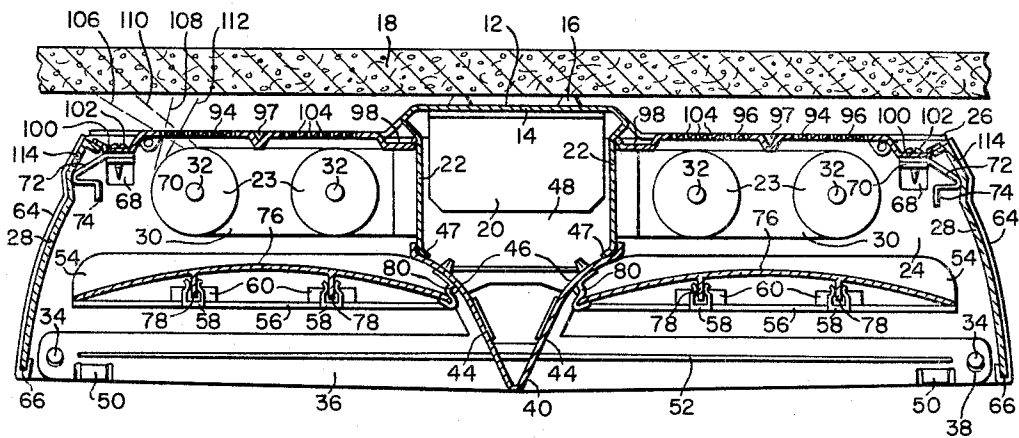


Fig. 2.

WITNESSES

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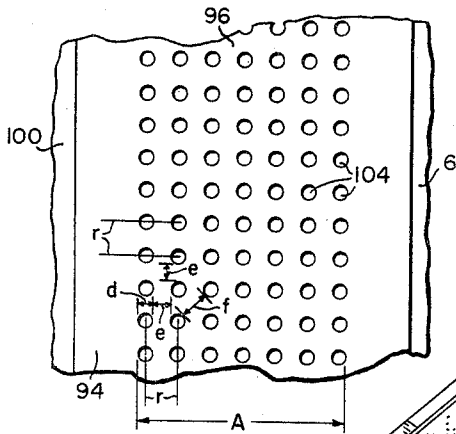


Fig. 6.

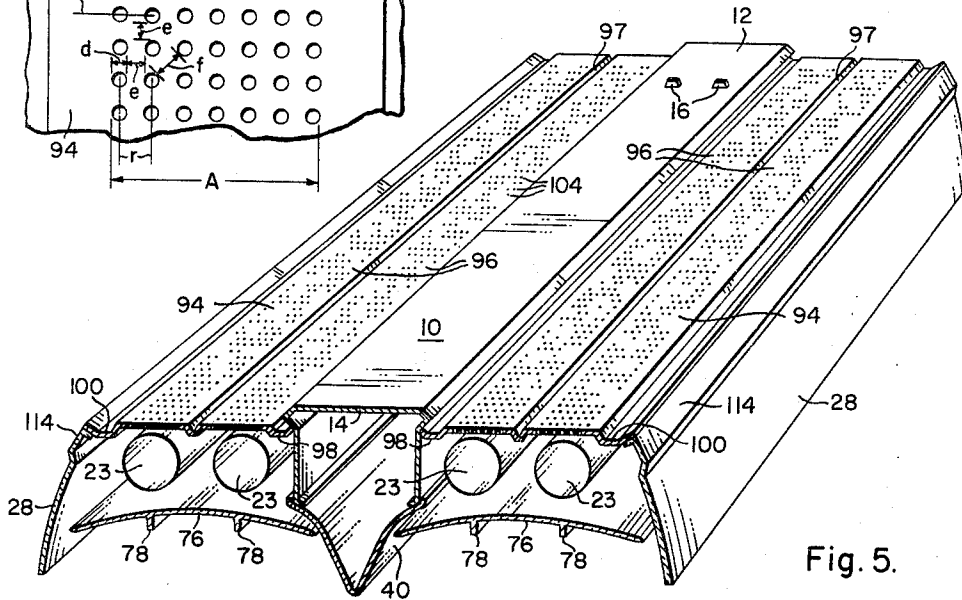


Fig. 5.

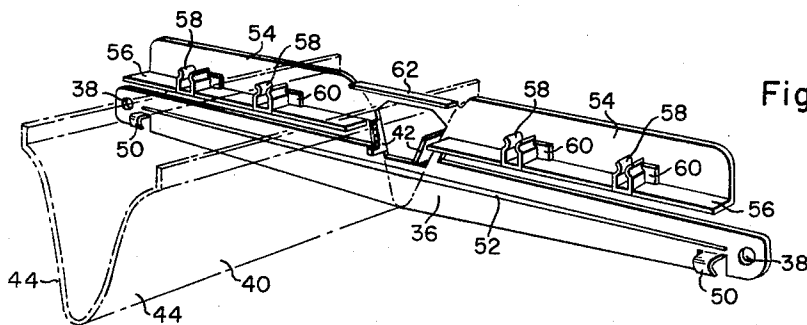


Fig. 3.

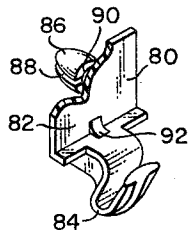


Fig. 4.

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3,209,142

LUMINAIRE

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Continuation of application Ser. No. 63,827, Oct. 20, 1960. This application Feb. 27, 1964, Ser. No. 353,014
3 Claims. (Cl. 240—51.11)

This application is a continuation of application Serial No. 63,827, filed October 20, 1960, now abandoned, and assigned to the same assignee as is the present application, which in turn was a continuation in part of application Serial No. 793,004, filed February 13, 1959, now abandoned, by Eugene W. Michel, entitled "Luminaire" and assigned to the same assignee as is the present application.

The present invention relates generally to a luminaire having a perforated reflector and relates more particularly to a perforated reflector of the type used on a luminaire which is mounted closely adjacent to the ceiling whereby the perforations not only serve as a ventilating means but also serve as a means for eliminating the dark area on the ceiling directly above the luminaire.

This invention primarily comprehends a lighting fixture of the ceiling type adapted to receive a lighting fluorescent light bulbs and which can be mounted in such a manner that the top of the luminaire housing is spaced a relatively short distance from the ceiling. In addition, the lighting fixture on which this invention may be practiced can be mounted as a single fixture or as one of a group of fixtures arranged in an end-to-end abutting relation. The fixture is provided with a bottom opening which is generally closed or covered by a light transmitting panel. The present invention is thus directed to a one-piece top panel housing member having structural and optical qualities heretofore unknown in this type of luminaire.

In view of the foregoing, an object of the present invention is the provision of a novel and efficient luminaire.

Another object of this invention is to provide a luminaire having a top panel member which is both a reflecting means and a means for illuminating a ceiling area directly thereabove.

Still another object of this invention is to provide a luminaire having a perforated reflector which provides ventilation for the electrical components thereof resulting in a longer life and more efficient operation of these electrical components.

A further object of this invention is to provide a reflector having a perforated surface with the perforations being of a size so that they can illuminate the area adjacent the non-reflective side of the reflector without substantially reducing its reflective characteristics.

A further object of this invention is to provide a top wall of a luminaire which performs the triple function of reflecting light, of substantially uniformly illuminating the ceiling area above the luminaire, and of providing ventilation for the electrical components in the luminaire.

A still further object of the present invention is to provide a luminaire having a central channel and opposite side walls which cooperate with light transmitting means so that a chimney effect is produced by means of air rushing in on each side of the light transmitting means and out through perforations in the wall of the luminaire.

Another object of this invention is to provide angularly disposed light transmitting portions on the side walls of a luminaire to provide illumination for an area of the ceiling not otherwise generally illuminated by said luminaire.

Still another object of the present invention is the provi-

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sion of resilient clip means in a central member of a luminaire adapted to support a free edge of a light transmitting means to prevent warping thereof.

These and other objects of the invention will be made more apparent upon consideration of the following detailed description of a preferred embodiment thereof when taken in conjunction with the attached drawings, in which:

FIGURE 1 is a bottom perspective view of a luminaire constructed in accordance with the present invention;

FIG. 2 is a transverse section of the luminaire of the present invention taken along the reference lines II—II of FIG. 1 and further includes a section of a ceiling member to which the luminaire is secured;

FIG. 3 is a perspective view of the structural support member employed in the luminaire of the present invention with a portion thereof broken away and with parts of the luminaire shown by broken lines;

FIG. 4 is a perspective view of the clip of this invention which is employed to support the free edge of the light transmitting cover member;

FIG. 5 is a partial top perspective view of the luminaire shown in FIG. 1 illustrating the perforations in the top panel of the luminaire; and,

FIG. 6 is a broken away portion of the perforated panel of FIG. 5 illustrating the relative proportions and sizes of the perforations with respect to a section of the top panel of the luminaire.

The present invention thus comprehends a luminaire having a perforated reflective top panel. The luminaire also includes a central channel member to house the electrical control means of the luminaire and readily releasable light-transmitting side panels including angular portions extending their lengths. Structural members are hingedly connected to the end walls of the luminaire and a cover member can be secured to the structural members to close the channel member. Light control shields can also be secured to the structural members to generally, but not entirely, cover the rest of the open bottom of the luminaire, and clip or hook members can be secured to the cover member to support the central edge portions of the shields when they are relatively long.

Referring more particularly to FIGS. 1 and 2, the luminaire 10 of the present invention has an elongated, inverted generally U-shaped channel member 12 extending the length of the luminaire 10. Spaced, raised bosses 16 are located on the bight portion 14 at each end of the channel member 12. Bolts or the like can extend through apertures or knockouts (not shown) generally located in the bight portion 14 preferably between the bosses 16 if it is desired to secure the channel member 12 directly to the ceiling 18. As will be described more fully later, the channel member 12 is the primary support for the luminaire 10 so that in mounting the inverted channel member 12 to the ceiling 18, the luminaire 10 will be securely fastened and positioned in place. A ballast 20 is located intermediate the downwardly extending legs 22 of the channel member 12 and is fastened by any suitable means such as bolts and the like to the bight portion 14 of the channel member 12.

A generally flat end plate 24 is secured substantially transversely adjacent each opposite end of the channel member 12. Each end plate 24 can be secured to the channel member 12 in any suitable manner such as by spot welding or by any other known fastening means.

If desired a decorative outer end piece 25 can be placed over the outside of an end plate 24 when that end of the luminaire is not to be placed in an abutting relationship with another luminaire. The end piece 25 includes an inwardly turned flange 26 which extends along the upper surface of the end plate 24, FIG. 2, and protrudes inwardly at substantially a right angle to the plane of the

end plate 24 to give a finished-off appearance. It is to be noted that the channel member 12, in a given situation, will have a definite length and will be preformed in such a manner that the end plates 24 can be easily mounted thereto. The oppositely disposed end plates 24 taken in conjunction with the channel member 12 will, in effect, generally determine the width and length of the luminaire 10.

As shown in FIGS. 1 and 2 a side panel 28 extends between each pair of adjacent side edges of the oppositely disposed end plates 24. It is to be noted that each side panel 28 is preferably light-transmitting and can be formed from a transparent or translucent plastic material or its equivalent with or without optical control or diffusing means or decorative configurations thereon, if desired. However it is to be understood that, if desired, each side panel 28 can be formed of an opaque material, such as sheet steel, without in any other way changing the principles of the present invention.

Located or formed on each end plate 24, and extending generally in a direction outwardly from the downwardly extending legs 22 of the channel member 12, is a lampholder support 30. Each lampholder support 30 can be actually drawn from the end plate 24, as shown, or can be a separate piece secured thereto by welding or the like. The lampholder support 30 has a substantially flat U-shaped configuration in cross section and when of the separate piece configuration would have its legs abutting against the end plate 24. Lampholders, not shown, can be located on each lampholder support 30 so that their electrical conductors can extend from the individual lampholders to the channel member 12. These lampholders located on or adjacent oppositely disposed end plates 24 support elongated light sources 23 which are generally of the vapor or fluorescent type lamp having a light center 32.

At each lower corner of the end plates 24 there are located relatively short, inwardly projecting lugs 34. Extending transversely to the longitudinal length of the channel member 12, and located closely adjacent to the lower edge of each end plate 24, there is located a structural member 36 made preferably of spring steel, which can be seen in FIGS. 1 and 2 but which is clearly shown by itself in FIG. 3. At the outer ends of structural member 36 are apertures 38 which are of a suitable size so as to be able to be readily engaged over the free ends of the lugs 34. It should be noted that each structural member 36 is located closely adjacent to each of the end plates 24 and that a V-shaped channel cover member 40 extends between the oppositely disposed structural members 36. The channel cover member 40 can be attached to the structural member 36 by means of tabs 42 of the structural member 36 being welded thereto, or by any other similar conventional means. The outer surfaces 44 of the sides of the channel cover member 40 are contoured so as to be evenly illuminated by the light from the light sources 23 rather than being left relatively dark as in the prior fixture. The surfaces 44 further serve as a guide means for flowing air as described in more detail later.

The upper inner surfaces 46 of the channel member 40 engage the lower outer portions 47 of the downwardly extending legs 22 of the channel member 10 when the structural member 36 is mounted on the lugs 34 in its closed operative position. In this manner, the inner closed chamber 48 is formed, extending the length of a luminaire, by the legs 22 and the bight portion 14 of the channel member 12, and by channel cover member 40. This elongated chamber 48 not only houses the ballast 20 but in addition provides a convenient wireway for the electrical conductors, not shown, of the luminaire 10.

Located closely adjacent to each aperture 38 are thumb tabs 50, as best seen in FIG. 3, which can be used to disengage either or both ends of the structural member 36 by lifting its outer ends, containing the apertures 38,

over the inwardly projecting lugs 34. This can be done because the structural member 36 is somewhat resilient and the outer ends can be pulled somewhat inwardly to disengage the projecting lugs 34. An optimal reinforcing raised rib 52 can be incorporated in the structural member 36 to prevent permanent bending of the member 36 when the outer ends thereof are pulled inwardly to disengage the projecting lugs 34.

There is formed integrally with the structural member 36 two outwardly extending upper arm members 54 adjacent to and extending in a direction outwardly from each outer surface 44 of the channel cover member 40. Upper arm members 54 do not engage the end plates 24 but are spaced therefrom a short distance so as to be freely movable with respect thereto. Also, integrally formed with the upper arm members 54 and at the lower surfaces thereof are inwardly extending flanges 56. Located on each of the upper arm flanges 56 are preformed U-shaped spring clips 58 having their legs extending upwardly. Each of the clips 58 are fastened, for example by welding, by their flange portions 60 to each of the upper arm members 54. Extending inwardly from the structural member 36 intermediate the oppositely disposed arm members 54 is a flange 62 which serves to keep the sides of the channel member 40 properly spread apart and firmly engaged with the structural member 36.

Each end plate 24 has at its outer edges an inwardly directed stubbed flange 64 having a return at the bottom thereof to act as a guide slot 66 for slidably receiving an outer edge of the side panel 28. A tab 70 is punched out of each upper corner of each end plate 24 in such a manner that it extends inwardly of the luminaire 10 in a horizontal direction leaving a punched out portion 68 in each end plate 24. Extending outwardly and to the side of the luminaire is a resilient holding clip 72 secured to the tab 70 and which serves to bias the end edge of the side panel 28 against the inner surface of the flange 64 to securely hold the side panel in position. The holding clip 72 is resilient so that it can be pushed backwardly away from the edge of the side panel 28 by thumb pressure against the edge 74 thereof to release the side panel 28 when desired.

Where a sheet metal side panel is substituted for the plastic or light-transmitting panel 28, the need for holding clips 72 can be eliminated in that the side panels can be permanently secured to the opposite end plates 24 by means of welding or the like.

A light control shield 76 is secured to each of the upper arm members 54 of the structural members 36 and generally extends the distance between the oppositely disposed structural members 36. The shield 76 is of a light-transmitting material and preferably has a curved or bowed cross-section. The shield 76 has generally parallel longitudinal ribs 78 extending the longitudinal length thereof. It will be seen that the shield 76 has a cross-sectional shape such that when its longitudinal ribs are located in the clips 58 the outer longitudinal edges thereof rest on the end portions of the flanges 56 of the upper arm 54.

In operation, one end of the structural member 36 having an aperture 38 can be disengaged from its associated lug 34 and rotated about the oppositely disposed lug 34. In this manner, the V-shaped channel member 40, the structural member 36 and the shield 76 can be rotated about one longitudinal side of the luminaire in such a manner as to expose the ballast 16 within the longitudinal chamber 48 as well as the light sources 23, thereby providing easy access for maintenance and repair. Of course, these elements can be optionally hinged about either longitudinal side of the luminaire 10 depending on which of the apertures 38 are disengaged from their corresponding lugs 34.

Because the shield 76 is supported by the longitudinal ribs 78, no additional structural framework is necessarily required to support the shield 76 within the luminaire

10. Thus, except for the clips 58 in the upper arm 54 and the structural member 36, all of which are located closely adjacent to the opposite end plates 24, there are no opaque members extending the length of the luminaire 10 except for the channel member 40 and, when not of light-transmitting material, the side panels 28. However, when the shield 76 is of a relatively great length, some bowing in of the center thereof may occur if some other support means is not included. Accordingly, if desired, a supporting clip or hook 80 (FIGS. 2 and 4) can be secured in the sides of the V-shaped channel cover member 40 at various locations therealong as is necessary. The supporting clip is preferably made with a back portion 82 adapted to lay flush against the outer surface 44 of the channel member 40 and has extending outwardly therefrom a resilient hook-shaped end portion 84 to releasably receive a longitudinal edge of the shield 76 and still permit the shield to be moved from its closed to open position and back again. A nipple 86 is employed to secure the supporting clip 80 to the channel cover member 40 by fitting through a properly sized aperture along the sides of the channel cover member 40. This nipple 86 is preferably of the kind having a slot 88 therein to allow compression of its component parts so that it may be simply thrust into the aperture and engaged by the groove portion 90 to lock the supporting clip 80 to the side of the channel cover member 40. A reinforcing wedge-like portion 92 between the back portion 82 and hook portion 84 can be used if desired. The supporting clip 80 is preferably of a light transmitting material having transmission characteristics similar to that employed for the shield 76 so that it does not present an unattractive opaque element in the luminaire. Again, it might be stated that the use of a supporting clip such as shown in FIG. 4 is optional and is often not necessary in the shorter luminaires. However, in longer luminaires its use can be quite advantageous in preventing bowing of the shield 76.

Located at the top of the luminaire 10, as can be seen in FIGS. 2, 5 and 6, is a generally flat upper panel structure 94 located on each side of the channel member 12. The panel structures 94 form the top wall of the luminaire 10 together with the bight portion 14 of the channel member 12. Each upper panel 94 is made of any suitable structural material, such as sheet steel and the like, and has a longitudinally V-shaped reinforcing rib 97 extending along its length to not only provide structural rigidity thereto, but also to divide each panel 94 into certain size areas for each fluorescent lamp 23. That is, each fluorescent lamp 23 will have a certain area or section 96 directly adjacent thereabove for permitting light to escape to the ceiling. Before going into more detail on the perforated top of the luminaire 10, it should be noted that the panels 94 are mounted so that the inner edge 98 thereof is bent slightly downwardly so as to rest upon one leg of the lampholder support 30 while the outer edge 100 thereof abuts on the horizontal tab 70 on top of the holding clip 72. The edge 100 of each panel 94 and holding clip 72 can be secured to the tab 70 by threaded screws 102. It is in this manner, that the upper panels 94 form the generally flat top wall of the luminaire 10.

A plurality of perforations 104 are located in the upper panels 94 in each section 96 thereof. Each perforation 104 can have any configuration such as a circle, as here illustrated, or a square but each must be of sufficient area so that light rays, for example rays 106, 108, 110, and 112 of FIG. 2 can pass through the perforations 104 to illuminate the surface of the ceiling located immediately above the luminaire 10. It is important that very small perforations, that are relatively close together, be used so as to substantially eliminate spots on the ceiling by diffusion of the light rays emitted through the perforations.

Shown in FIG. 6 is a broken away portion of one of

the sections 96 immediately above a standard fluorescent lamp and is an illustration in full scale size of a workable structure. It can be seen that the perforations are substantially less in total area than the remaining area of each section 96. It has been found that perforations of this relatively small size and of this relatively close spacing will generally eliminate spots on the ceiling and will serve to substantially evenly illuminate the area above the luminaire. In the specific embodiment shown in FIG. 6 the perforated area A is composed of circular perforations 104 of an approximate equal diameter d in substantially equally spaced parallel rows r . These rows r are so spaced from one another so that the distance e between the each perforation 104 in the direction of the rows r is approximately equal to the diameter d of each perforation. In this particular illustration the diagonal distance f between adjacent perforations is approximately twice the diameter d of each perforation. By this arrangement the relationship of the non-perforated portion of the area A to the perforated portion thereof is approximately three to one. This relationship, of course, can vary somewhat and still remain within the concept of this invention, such as a four to one ratio for example. However, to effectively diffuse the light illuminating the ceiling and yet substantially eliminate a spotted effect thereon, this approximate spacing and sizing of the perforations is generally needed. The unperforated portion of each section 96 outside of the area A, as well as the ribs 97, do not impede the generally even distribution of light upon the ceiling since some of the light rays emanating from the light sources 23 pass through perforations 104 at an angle, as will be described in more detail below with respect to FIG. 2, so as to overlap and illuminate the part of the ceiling directly above the unperforated portion of the section 96.

As illustrated in FIG. 2, the light rays 106 and 108 are emitted through one of the perforations 104 to illuminate the ceiling 18. Light rays 110 and 112 are emitted from an adjacent perforation 104 with light ray 110 overlapping light ray 112. Further light rays have been omitted from the drawing for the sake of clarity, but it can be readily seen that light rays emitted from other adjacent perforations 104 will overlap each other to thereby cause diffusion so as to generally uniformly illuminate adjacent portions of the ceiling 18. Those areas between adjacent rows of luminaires, especially where a plurality of lighting fixtures are employed in adjacent rows, are also illuminated by light emitted through the upper angularly displaced longitudinal portions 114 on each side panel 28.

Accordingly then, the entire ceiling 18 is generally illuminated uniformly by light rays passing through the main sides of the panels 28, through the angularly displaced portions 114, and through the perforations 104. This is even true if adjacent rows of luminaires are mounted closely together. Thus, when the luminaire 10 is viewed from the side and below, substantially no dark spots will appear on the ceiling 18 above that luminaire.

Desirably, the inner surface of the upper panels 94 is given a specular finish so that it will also act as a reflecting surface for all of the light rays not passing the perforations 104. These reflected light rays are directed downward and are transmitted primarily through the shield means 76 and partially through the sides of the panels 28. Since the perforations 104 are relatively small, the inner surface of the upper panels 94 reflects a much greater percentage of the light emanating from the light sources 23 than they allow to pass through the perforations 104. In addition, if the ceiling 18 has a highly reflective surface the light reflected from the surface thereof will have a much higher intensity and will blend more evenly with the light emanating from the light sources 23 to present a pleasing combination of indirect and diffused light from a luminaire.

The perforations 104 also serve as a means for circulating air through the luminaire 10 to transfer heat

generated from the light sources 23 and the electrical control means out of the luminaire with a resulting longer life and more efficient operation of the light source and electrical control components. Air passing into the luminaire 10 around the longitudinal edges of each shield 76 is guided towards the light sources 23 by each of the inside surfaces of the side panels 28 and the outside surfaces 44 of the V-shaped channel cover member 40 to give a chimney effect. The air carries the heat out the perforations 104 from the surfaces of the light sources 23 and the legs 22 of the channel member 12. The chimney formed by the component parts of the luminaire provides a draft effect to accelerate the passage of air therethrough with a resulting high rate of cooling. Thus, the perforations serve the dual function of eliminating dark spots on the ceiling above and adjacent the luminaire 10 and also provide for the ventilation of the luminaire 10 so as to remove the heat generated by the electrical components thereof in order to have a more efficient and longer lasting lighting fixture.

Since it is obvious that the invention can be embodied in other forms and constructions within the spirit and scope thereof, as would be apparent to one skilled in the art, it is to be understood that the particular form shown is but one of several such embodiment. Accordingly, with various modifications and changes being possible, the invention is not limited in any way with respect thereto. Moreover, it is to be understood that certain features of the invention can be employed without a corresponding use of other features thereof.

We claim as our invention:

1. A luminaire adapted to be mounted adjacent a ceiling, said luminaire comprising, an inverted generally U-shaped central channel member, perforated top members extending outwardly from each side of said channel member but being spaced from the ceiling, an end wall affixed to each end of said channel member, means affixed to said end walls and supporting said top members, light-transmitting side panels affixed to said end walls and extending downwardly from said top members, electrical control means mounted in said channel member, structural members affixed to said end walls, a generally V-shaped cover member having its upper ends located adjacent the lower ends of the legs of said channel member so as to substantially close the bottom opening thereof when said cover member is in its operative closed position, the outer surfaces of the legs of said cover member serving as a guide means for flowing air, and said cover member in supported engagement with said structural members, light sources mounted in said luminaire on both side of said channel member, a one-piece substantially light-transmitting shield mounted beneath said light sources and between each respective side panel and the cover member, the longitudinal edges of said shields being spaced from the adjacent surfaces of said cover member and of said side panels, said V-shaped member, channel member and side panels forming a chimney to accelerate air passing into said housing, flowing past said light sources and flowing out through said perforations, said air effectively cooling said luminaire when in its operative condition.

2. A luminaire adapted to be mounted closely adjacent a ceiling, said luminaire comprising an inverted U-shaped central channel member, electrical control means mounted

in said channel member, perforated top members extending outwardly from each side of said channel member, an end wall affixed to each end of said channel member, means affixed to said end walls supporting said top members, light-transmitting side panels extending downwardly from said top members, light sources mounted between each respective side panel and the channel member, structural members hingedly connected to the bottom of said luminaire, a V-shaped cover member mounted to said structural members and fitting over the open bottom of said channel member, light control means secured to said structural members so that pivoting of the hinged structural members from an operative to an inoperative position renders said electrical control means and light sources accessible for installation and maintenance, said light control means being spaced from the adjacent surfaces of said cover member and of said side panels, said cover member, channel member, and side panels forming a chimney to accelerate air passing into said housing, flowing past said light sources and flowing out through said perforations, said air effectively cooling said luminaire when in its operative condition.

3. A luminaire adapted to be mounted closely adjacent a ceiling, said luminaire comprising an inverted U-shaped central channel member, top members extending outwardly from each side of said channel member, end walls, means affixed to said end walls supporting said top members, a reflective surface on the bottom of said top members, light-transmitting side panels affixed to said end walls and extending angularly downwardly from said top members, a V-shaped cover member affixed to said luminaire proximate to said end walls with its upper ends located adjacent the lower ends of the legs of said channel member, said cover member closing the bottom of said channel member and serving as a guide means for flowing air, light sources and a relatively solid light control means mounted between each respective side panel and the channel member, said light control means being located below said light sources and being spaced from the adjacent surfaces of said cover member and of said side panels, some of said sources' rays of light being transmitted by said side panels, said top members including perforated means for allowing a portion of said sources' rays of light to pass therethrough in an overlapping manner to the extent that they provide for a substantially uniform distribution of light on the ceiling directly above the luminaire, said perforated means being disposed in such a manner that the rays passing therethrough overlap the rays passing through said side panels so that all areas of said ceiling adjacent said luminaire are substantially uniformly illuminated, said perforated means also allowing an accelerated flow of air out through said luminaire to dissipate the heat generated by said light sources.

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