May 12, 1964 E. L. IZZI ETAL 3,132,813

LUMINAIRE

Original Filed Feb. 13, 1959

Fig. 1.

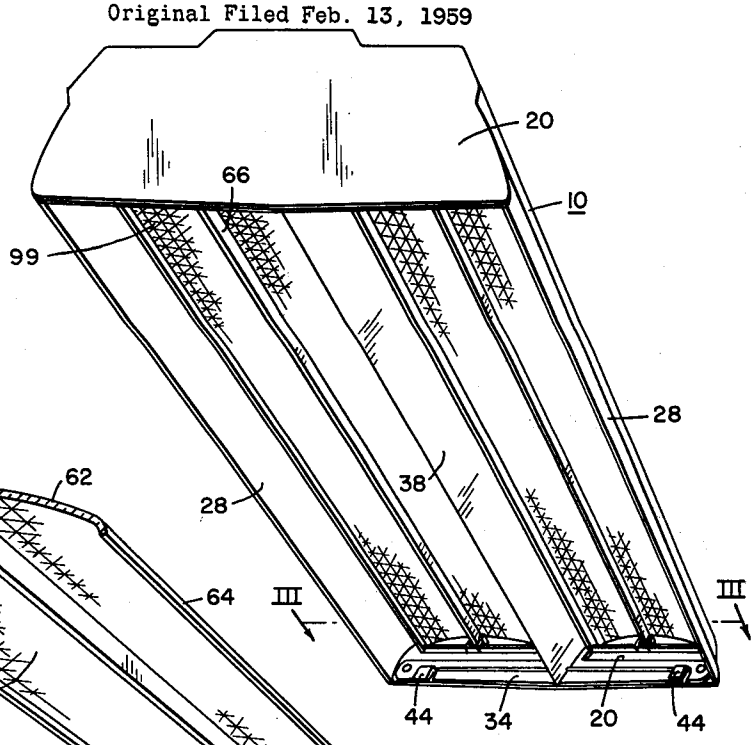


Fig. 2.

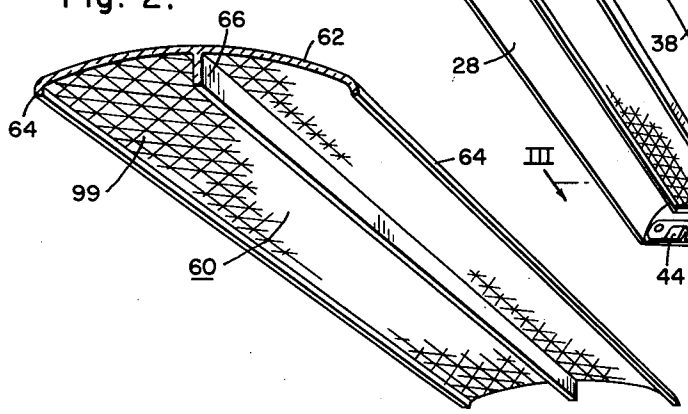
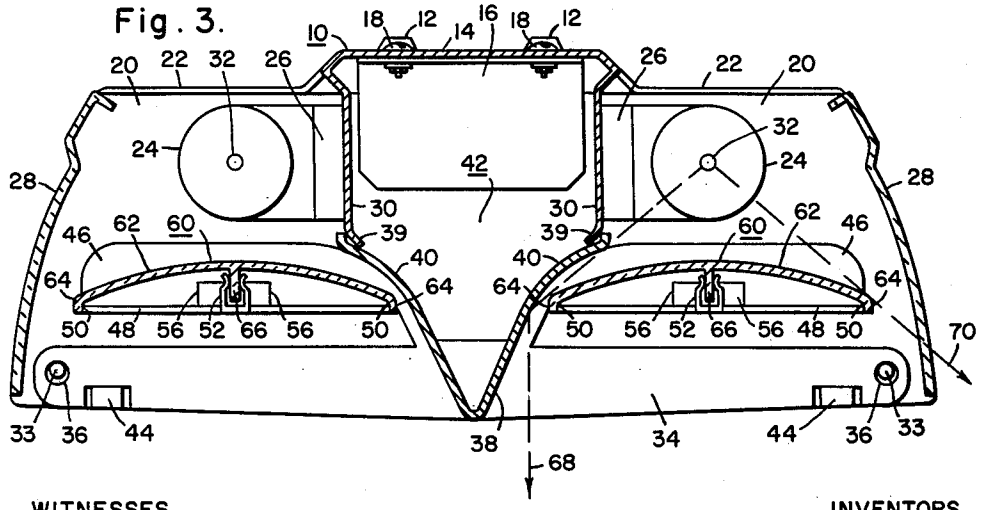


Fig. 3.



WITNESSES

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United States Patent Office 3,132,813 Patented May 12, 1964

3,132,813

LUMINAIRE

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Continuation of application Ser. No. 793,003, Feb. 13, 1959. This application Aug. 13, 1962, Ser. No. 219,358
12 Claims. (Cl. 240—51.11)

This invention relates to lighting fixtures and has a particular reference to a lighting fixture having a light emitting panel which is detachably mounted within the bottom opening of the luminaire and is so located therein as to transmit all direct and reflected light emitted from the bottom openings of the luminaire.

This is a continuing application of application Serial No. 793,003, filed February 13, 1959, by Edmund L. Izzi and Carle E. Rackley, entitled "Luminaire" and assigned to the same assignee as is the present application.

This invention primarily comprehends a lighting fixture having a bottom opening of the ceiling or pendant type adapted to receive elongated fluorescent light bulbs and which can be mounted as a single fixture or as one of a group of fixtures arranged in end-to-end abutting relation.

More particularly, the present invention is directed to a one piece light control or diffusing means having structural and optical qualities heretofore unknown in this type of luminaire. In addition, this particular light control means is readily detachable from the luminaire thus providing access to the interior of the fixture for replacing the fluorescent light bulbs, for repairing and cleaning the fixture when required, and the like.

An object of this invention is to provide a novel light control or diffusing means for use with fluorescent lamps.

Still another object of this invention is to provide a unitary light control means rotatably and detachably mounted within a light fixture.

A further object of this invention is to provide an elongated light control means having a curved cross section such that substantially all direct and reflected light from the light sources are transmitted or diffused through the light control means before being emitted from the bottom opening of the luminaire.

Still another object of this invention is to provide a translucent or a prismatic light control means which will distribute the light transmitted by the light control means in an effective manner pleasing to the eye.

Another object of this invention is to provide a lighting fixture having a light control means which provides air circulating passages to the interior of the luminaire to cool the ballast and lamps contained therein, thereby increasing their efficiency and operating life.

These and other objects of our invention will become more apparent upon consideration of the following detailed description of preferred embodiments thereof when taken in conjunction with the attached drawings, in which:

FIGURE 1 is a perspective view of the lighting fixture of this invention;

FIG. 2 is a partial perspective view of the light control means; and

FIG. 3 is a cross sectional view of the lighting fixture of FIG. 1 taken substantially along the reference line III—III thereof.

Referring more particularly to FIG. 3, the lighting fixture has an elongated, inverted, generally U-shaped channel member **10** extending the length of the luminaire. The U-shaped channel member **10** can be formed of a suitable structural material, such as sheet steel. Spaced, raised bosses **12** are located on the bight portion **14** at each end of the channel member **10** to serve as spacers

between the ceiling and the luminaire. As shown in FIG. 3, a ballast **16** is secured to the inner surface of the bight portion **14** of the U-shaped channel member **10** by nut and bolt assemblies **18**.

A generally flat end plate **20**, made of any suitable structural material such as sheet steel, is securely mounted at right angles to the longitudinal axis of the channel member **10** in any suitable manner to thereby form an end wall of the lighting fixture. A substantially right angle inwardly turned flange **22** extends along the upper surface of the end plate **20**. It is to be noted, that the inverted U-shaped channel member **10** in an actual application will have a definite length and will be formed in such a manner that the end plate **20** can be secured thereto so that the end plate **20** will be in a plane substantially perpendicular to the longitudinal axis of the inverted U-shaped channel member **10**. The end plate **20** can be secured to the inverted U-shaped channel member **10** by any of several known methods common in the art, such as, nuts and bolts, welding or by tabs on the inverted U-shaped channel member **10** engaging corresponding slits in the end plate **20**. Further, as shown in FIG. 1, there is a corresponding end plate **20** located and secured to the opposite end of the inverted U-shaped channel member **10** which in effect, provides the two end walls for the luminaire.

As shown in FIGS. 1 and 3, a side panel **28** is located on each side of the end plate **20**. Each side panel **28** can be formed from a transparent or translucent plastic material with or without optical control means or decorative configurations located thereon. For purposes of disclosing our inventon, each side panel **28**, extending between the oppositely disposed end plates **20** has the configuration shown and is considered to be made of the translucent plastic material. However, it is to be understood that each side panel **28** can be formed of an opaque material, such as sheet steel, without in any way changing the scope of our invention.

In the particular embodiment shown, there is located on each end plate **20** and extending outwardly from the downwardly extending legs **30**, a lamp support **26**. The lamp supports **26** shown in this particular embodiment are of the tombstone type suitable for mounting and supporting an elongated light source between each pair of oppositely disposed lampholders. In the embodiment shown, lamp support **26** is embossed inwardly from the same piece of material used in forming end plate **20**. When this occurs, flat cover plate **21** can be attached to the outside of the end plate **20** to cover the embossed portion thereof. It is understood, however, that lamp support **26** can also be a separate piece of material attached to the end plate **20** or extending from the channel legs **30** and accomplish the same function. In any of these or equivalent ways, lamp support **26** can be located on or adjacent the end plate **20**. In either case, the lamp support **26** is contiguous to the end plate **20**. On each lamp support **26**, there is schematically illustrated a light source **24** having a light center **32**.

It is to be understood that a plurality of lamp supports **26** can be secured to each end plate **20** thereby providing a plurality of light sources **24** located on each side of the downwardly extending legs **30**.

At each lower corner of the end plate **20**, as best shown in FIG. 3, there are located relatively short inwardly projecting lugs **33**.

Extending transversely of the longitudinal length of the inverted U-shaped channel member **10**, and located closely adjacent to the lower edge of the end plate **20**, there is located a thin, flat, structural member **34** which is made of a resilient material, such as spring steel, and has at its outer ends apertures **36**, which are of a suitable size to engage the lugs **33**. A V-shaped channel

member 38 is secured to the structural member 34 at substantially its midpoint. The V-shaped channel member 38 can be attached to the structural member 34 by any known and commonly used method such as welding. The upper inner surfaces 40 of the legs of the V-shaped channel member 38 engage the outer ends 39 of the downwardly extending legs 30 of the inverted U-shaped channel member 10 when the structural member 34 is located in its operative position on the lugs 33.

An inner chamber 42 is formed extending the length of the luminaire and is defined by the legs 30 and the bight portion 14 of the U-shaped channel member 10 and in addition by the inner surfaces of the V-shaped channel or trough 38 whose upper inner surfaces 40 engage the downwardly extending legs 30. As can easily be seen in FIG. 3, a ballast 16 can be readily mounted within chamber 42 and in addition the elongated chamber 42 provides a convenient wire way for electrical conductors associated with the luminaire. Located closely adjacent to each aperture 36 of the structural member 34 are pressed out thumb tabs 44 which can be used to disengage either or both ends of the structural member 34 from the lugs 33.

Also, as best shown in FIG. 3, there is formed integrally with the structural member 34 two upper arm members 46 symmetrically located on each side of the V-shaped channel member 38. Each of these arm members 46 are formed integrally with the structural member 34 and do not engage the end plate 20, but are spaced inwardly therefrom a short distance. Also, integrally formed with the upper arm 46 and at the lower surface thereof, there is formed an inwardly extending flange 48 having end portions 50. Midway each of the upper arm flanges 48 there is located a U-shaped clip 52, having its legs extending upwardly, which is fastened, for example by welding, to each of the upper arms 46 by its flange portions 56.

A light control shield means 60, shown in FIG. 2, is secured to each of the upper arm members 46 and has a sufficient longitudinal length to extend between oppositely disposed upper arm members 46 located adjacent oppositely disposed end plates 20 at each end of the luminaire. The light control means 60 has a curved cross section 62 with a relatively small downwardly extending longitudinal leg 64 at each end of the cross section 62. In addition, as shown in FIG. 2, the curved cross section 62 has a depending integrally molded longitudinal rib 66 extending the length of the light control means 60. If desired more than one longitudinal rib 66 can be located on said light control means 60 as determined by the width of the luminaire. For example, a light control means employing two such ribs is shown in a copending, coassigned application of Eugene Michel and Carle Rackley, entitled "Luminaire," Serial No. 63,827, filed October 20, 1960.

Referring to FIG. 3, it will be seen that the light control means 60 is shaped so that when its structural rib 66 is located in the U-shaped clip 52, the downwardly extending longitudinal legs 64 will engage the outer surface of the end portions 50 of the upper arm flange 48. Generally, the light control means 60 is substantially imperforate and is molded from a translucent or transparent plastic having a certain amount of resiliency so that the downwardly extending longitudinal legs 64 may be spread apart a small distance to engage the end portions 50 of the upper arm flange 48. The bottom surface of the light control means 60 has light diffusing prisms 99 molded integrally thereon to disperse the light emanating from the light sources 24. The light diffusing prisms 99 can have the contour of any prismatic surface; but, as shown in FIG. 2, they have a contour similar to that which is known in the art by the trade name "Opti-Kube" prismatic surface which is covered in the application of Frederic Winkler and Nick Stuffer, Serial No. 534,526, filed September 15, 1955, now U.S. Patent No. 3,001,062, and assigned to the same assignee.

In addition, it is to be noted, that the light control means 60 can be formed of a translucent plastic material to further diffuse the light if it is so desired.

It is to be noted, that one end of the structural member 34 having an aperture 36, may be disengaged from its associated lug 33 and rotated about the oppositely disposed lug 33. In this manner, the V-shaped channel member 38, the structural members 34, and the light control means 60 can be rotated about one longitudinal side of the luminaire in such a manner so as to expose the ballast 16, the longitudinal chamber 42, and the light sources 24 thereby providing easy access for maintenance and repair.

In addition, because the longitudinal rib 66 extends the length of the light control means 60, no additional structural frame work is required to support the light control means 60 within the luminaire and thus distortion of light transmitted through the light control means is minimized. Except for the U-shaped clips 52 and the upper arm flange 48 and the structural member 34, all of which are located closely adjacent to the end plates 20, there are no opaque members extending the length of the luminaire and associated with the side panel 28 or the light control means 60. The surfaces of the V-shaped channel member 38 are polished and act as a reflector.

Referring more particularly to FIG. 3, it will be seen that light rays 68 and 70 emanating from the light source 32 have been shown to be tangent to the outer ends of the curved cross section 62 of the light control means 60. It will readily be seen, then, that light ray 68 will be reflected off the surface of the V-shaped channel 38 before being emitted from the bottom opening of the luminaire. Similarily, light ray 70 is also drawn tangent to the other end of the curved cross section 62 of the light control means and as it is extended further it will intersect and be transmitted by the transparent or translucent side panel 28. It will readily be seen, therefore, that because the light control means 60 is recessed in the luminaire all light emanating from the light source 62 will be viewed as reflected or refracted light by the eye and will not appear as direct light.

In addition, it is readily apparent that the efficiency of a luminaire incorporating this particular light control means 60 will be greatly improved as there are no opaque members present to disrupt any light rays emanating from the light source 32.

Furthermore, a light control means of this type may be readily incorporated into a luminaire having only one bottom opening and it is to be understood that this is within the contemplated scope of the invention.

Since it is obvious that the invention may be embodied in other forms and constructions within the scope of the claims, we wish it to be understood that the particular form shown is but one of these forms and various modifications and changes being possible, we do not otherwise limit ourselves in any way with respect thereto.

We claim as our invention:

1. A luminaire comprising an elongated inverted U-shaped channel member, end plates transversely connected to opposite ends of said channel member and extending in a direction outwardly therefrom, structural members hingedly connected to each end plate, a V-shaped cover member mounted on said structural members and enclosing the open bottom of said channel member when in its operative closed position, side panels extending between opposite outer portions of said end plates, said side panels and said end plates and said cover member defining bottom openings of said luminaire, light source means attached to said luminaire between each respective side panel and the channel member, an elongated substantially imperforate light control means located beneath each of said light source means and extending between and being secured to oppositely disposed structural

members, the longitudinal edges of said light control means being spaced from each respective side panel and the adjacent side of said cover member so as to provide ventilation openings on each side of each light control means, said light control means in addition being totally recessed within the bottom openings for preventing escape of direct light therefrom.

2. A luminaire comprising an elongated inverted U-shaped channel member, end plates transversely connected to opposite ends of said channel member and extending in a direction outwardly therefrom, structural members hingedly connected to each end plate, a V-shaped cover member mounted on said structural members and enclosing the open bottom of said channel member when in its operative closed position, light transmitting side panels extending between opposite outer portions of said end plates, said light transmitting side panels and end plates and said cover member defining bottom openings of said luminaire, light source means attached to said luminaire between each respective side panel and the channel member, an elongated imperforate light control means located beneath each of said light source means and extending between and being secured to oppositely disposed structural members, the longitudinal edges of said light control means being spaced from each respective side panel and the adjacent side of said cover member so as to provide ventilation openings on each side of each light control means, said light control means in addition being totally recessed within the bottom openings for preventing the escape of direct light therefrom.

3. A luminaire comprising an elongated inverted U-shaped channel member, end plates transversely connected to opposite ends of said channel member and extending in a direction outwardly therefrom, structural members hingedly connected to each end plate, a V-shaped cover member mounted on said structural members and enclosing the open bottom of said channel member when in its operative closed position, light transmitting side panels extending between opposite outer portions of said end plates, said light transmitting side panels and said end plates and said cover member defining bottom openings of said luminaire, lamp supports secured to said luminaire between each side panel and the channel member and positioned contiguous to said end plates, elongated light sources mounted on said lamp supports and located between each respective side panel and the channel member, an elongated substantially imperforate light control means located beneath each of said light sources and extending the distance between said structural members, the longitudinal edges of said light control means being spaced from each respective side panel and the adjacent side of said cover member so as to provide ventilation openings on each side of each light control means, said light control means in addition being totally recessed within the bottom openings for preventing escape of direct light therefrom, each said light control means having an inwardly curved cross section and rib means extending the length thereof, and clip means fastened to said structural members for engaging said rib means to support said light control means so that said light control means and said cover member can be rotated together to open the bottom of said luminaire for access to the inner components thereof.

4. A luminaire comprising an elongated inverted U-shaped channel member, end plates located transverse to and adjacent the ends of said channel member and connected thereto, pin means located on said end plates and extending inwardly of said luminaire, plate like structural members including apertures adjacent each of their extremities engaging said pin means for providing a releasable hinged connection with said end plates, a V-shaped cover member mounted on said structural members and enclosing the open bottom of said channel member when in its operative closed position, light transmitting side panels extending between outer portions of said end plates, said light transmitting side panels and said end plates and said cover member defining bottom openings of said luminaire, light source means attached to said luminaire between each respective side panel and the channel member, an elongated substantially imperforate light control means located beneath each of said light source means and extending the distance between said structural members, the longitudinal edges of said light control means being spaced from each respective side panel and the adjacent side of said cover member so as to provide ventilation openings on each side of each light control means, said light control means in addition being totally recessed within the bottom openings for preventing escape of direct light therefrom, each said light control means having an inwardly curved cross section and rib means extending the length thereof, and means fastened to said structural members for engaging said rib means to support said light control means so that said light control means and said cover member can be rotated together about either extremity of said structural members to open the bottom of said luminaire for access to the inner components thereof.

5. A luminaire comprising an elongated inverted channel member having a separable trough shaped cover member over the bottom thereof, said cover member having a V-shaped portion, end plates transversely connected to opposite ends of said elongated channel member and extending in a direction outwardly therefrom, light transmitting elongated side panels extending between the outer portions of said oppositely disposed end plates and secured thereto, said light transmitting side panels and said end plates and said V-shaped cover member portions defining bottom openings of said luminaire, lamp supports secured to said luminaire between each side panel and the channel member and positioned contiguous to said end plates, elongated light sources mounted on said lamp supports and located within said bottom openings, elongated substantially imperforate light control means located beneath said light sources and totally recessed in each of said bottom openings and generally parallel thereto to intercept substantially all direct light, each said light control means being light transmitting and having rib means extending the length thereof, means secured to said end plates and engaging the ends of said rib means to support said light control means between said V-shaped cover member portion and said side panels and spaced therefrom, the longitudinal edges of said light control means spaced from each respective side panel and said V-shaped cover member to provide ventilation openings adjacent said longitudinal edges.

6. A luminaire comprising an elongated inverted central channel having side walls and an open bottom, a generally V-shaped cover member over said open bottom and hingedly secured to said luminaire, end plates transversely connected to opposite ends of said channel and extending in a direction outwardly therefrom, elongated side panels extending between corresponding outer portions of said end plates and secured thereto, each side panel and a respective side wall of said cover member defining a bottom opening of said luminaire, elongated light source means within each bottom opening and extending between said end plates, lamp holding means on said end plates supporting said light source means from said luminaire, an elongated substantially imperforate light control means totally recessed within each of said bottom openings generally parallel thereto and located below the light source means supported therewithin, each said light control means being light transmitting and having an inwardly curved cross section and rib means extending downwardly therefrom the length thereof, means on said end plates engaging said rib means to support said light control means between said V-shaped cover member and said side panels, the longitudinal edges of each light control means being in juxtaposition with its associated side panel and cover member side wall portions but being

spaced therefrom, said spacing being wide enough to provide ventilation openings for the interior of the luminaire but narrow enough to prevent escape of direct light from the bottom openings of the luminaire.

7. A luminaire comprising an elongated inverted U-shaped channel member, end plates located transverse to and adjacent the end of said channel member and connected thereto, pin means located on said end plates and extending inwardly of said luminaire, plate like structural members including apertures adjacent each of their extremities engaging said pin means for providing a releasable hinged connection with said end plates, a V-shaped cover member mounted on said structural members and enclosing the open bottom of said channel member when in its operative closed position, side panels extending between said end plates, said side panels and said end plates and said cover member defining bottom openings of said luminaire, elongated substantially imperforate light control means located within each bottom opening and extending the distance between said structural members, the longitudinal edges of said light control means being spaced from each respective side panel and the adjacent side of said cover member so as to provide ventilation openings on each longitudinal side of each light control means, said light control means in addition being totally recessed within the bottom openings for preventing escape of direct light therefrom, and means fastened to said structural members for supporting said light control means so that said light control means and said cover member can be rotated together by either extremity of said structural members to open the bottom of said luminaire for access to inner components thereof.

8. A luminaire comprising an elongated inverted U-shaped channel member, end plates located transverse to and adjacent the end of said channel member and connected thereto, pin means located on said end plates and extending inwardly of said luminaire, side panels extending between outer portions of said end plates, a generally V-shaped cover member covering the open bottom of said U-shaped channel member, said V-shaped cover member and said end plates and said side panels defining bottom openings of said luminaire, structural members having an upper pair of arms and a lower pairs of arms connected transversely to said cover member, said lower pair of arms having apertures proximate to each of the extremities thereof for engaging and bearing upon and pivoting about said pin means so that the closure assembly is releasably hinged, said upper pair of arms having means connected thereto for supporting substantially imperforate light control means within said bottom openings, said light control means being of such a width as to be spaced from said side walls and said cover member when said closure assembly is in its operative closed position, with such spacing being wide enough to provide ventilation openings for the interior of said luminaire but narrow enough to prevent escape of direct light from said bottom openings of the luminaire.

9. In a luminaire having at least one substantially rectangular bottom opening the combination comprising a substantially imperforate light control means having an inwardly curved cross section and rib means extending the length thereof, the longitudinal edges of said light control means having downwardly extending longitudinal legs, clip means and projections affixed to said luminaire, said clip means and said projections frictionally engaging said rib means and the inner surface of said longitudinal legs respectively to support said light control means within said bottom opening, said legs of said light control means spaced from each respective side of said bottom opening providing ventilation openings on each side thereof, said light control means being totally recessed within said bottom openings for preventing escape of direct light therefrom.

10. A closure assembly for a luminaire having end walls, side walls, and a centrally inverted channel member, said closure assembly comprising, lugs projecting from said end walls, structural members proximate to and paralleling said end walls, said structural members having an upper pair of arms and a lower pair of arms, said lower pair of arms being resilient and having apertures provided therein proximate to each of the extremities thereof, said lugs releasably engaged in the apertures provided in said lower pair of arms, a generally V-shaped cover member extending between and connected to said structural members and covering said channel member when said closure assembly is in operative closed position, said upper pair of arms having means connected thereto for supporting substantially imperforate light control means on either longitudinal side of said V-shaped cover member and spaced therefrom, said light control means also spaced from the side walls of said luminaire when said closure assembly is in operative closed position, the spacings provided adjacent the longitudinal edges of said light control means providing ventilation for the interior of said luminaire.

11. A luminaire comprising: end plates; side walls connected to and extending between said end plates; said end plates and said side walls defining a bottom opening; light source means supported within said luminaire and paralleling said side walls; substantially imperforate light control means totally recessed within said bottom opening; means supporting said light control means from said end plates; the longitudinal edges of said light control means slightly spaced from said side walls to provide ventilation openings adjacent said longitudinal edges of said light control means; said light source means positioned substantially over the longitudinal center-line of said light control means so that direct light emanated from said light source means and generally toward each of said ventilation openings, and which direct light is not intercepted by said light control means, will be intercepted by said side walls; whereby the escape of any direct light through said ventilation openings is prevented.

12. A luminaire comprising: a longitudinal downwardly open channel member; end plates; side walls extending between and connected to said end plates; a V-shaped cover member covering the opening of said channel member, paralleling said side walls, extending between said end plates, and positioned between said side walls; said end plates, said side walls and said V-shaped cover member defining two bottom openings; light source means supported within said luminaire and paralleling said side walls and said V-shaped cover member; substantially imperforate light control means totally recessed within each of said bottom openings; means supporting said light control means from said end plates; the longitudinal edges of said light control means slightly spaced from said side walls and said V-shaped cover member to provide ventilation openings adjacent said longitudinal edges of said light control means; and said light source means positioned substantially over the longitudinal center-line of said light control means and spaced close to said light control means so that direct light emanated from said light source means and generally toward each of said ventilation openings, and which direct light is not intercepted by said light control means, will be intercepted respectively by said side walls and said V-shaped cover member; whereby the escape of any direct light through said ventilation openings is prevented.

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