Sept. 27, 1966 V. S. WINCE ETAL 3,275,822

FLUORESCENT LUMINAIRE

Filed Feb. 19, 1964 6 Sheets-Sheet 1

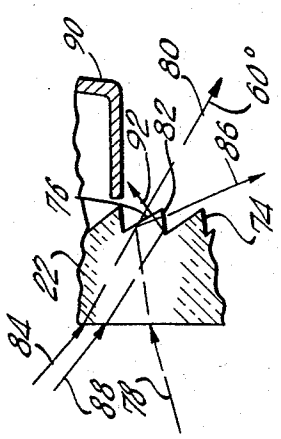

FIG. 3.

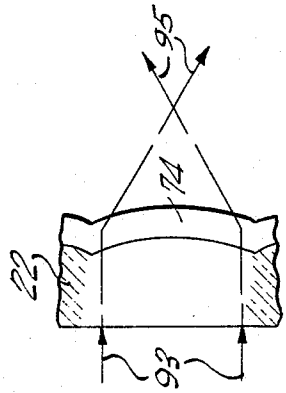

FIG. 4.

FIG. 1.

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FLUORESCENT LUMINAIRE

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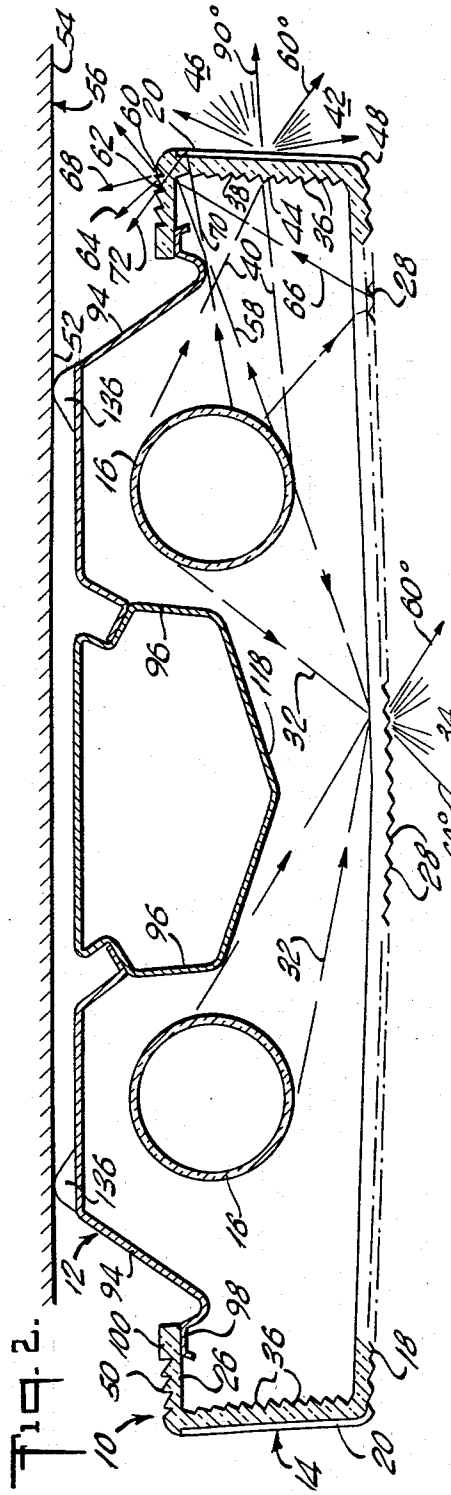

FIG. 2.

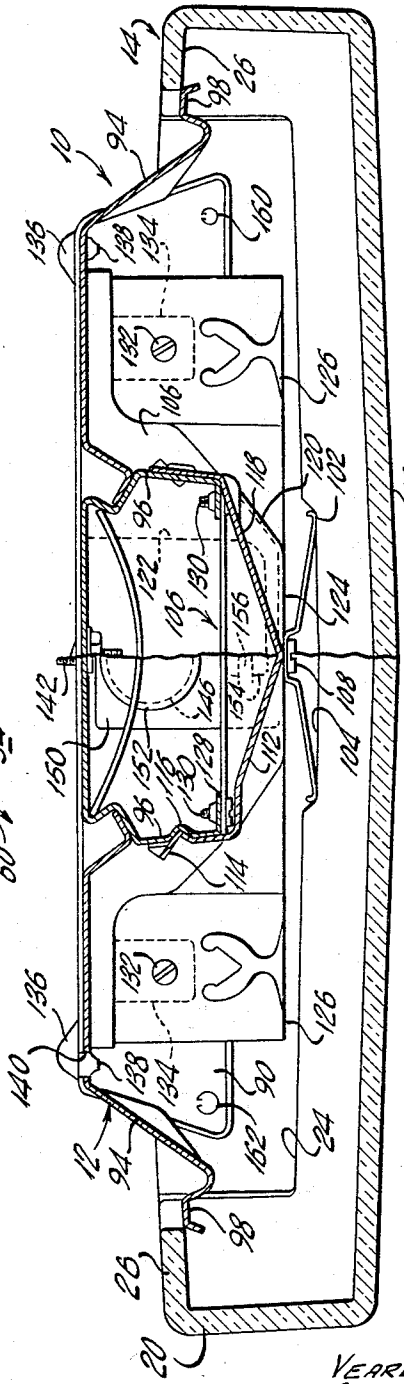

FIG. 5.

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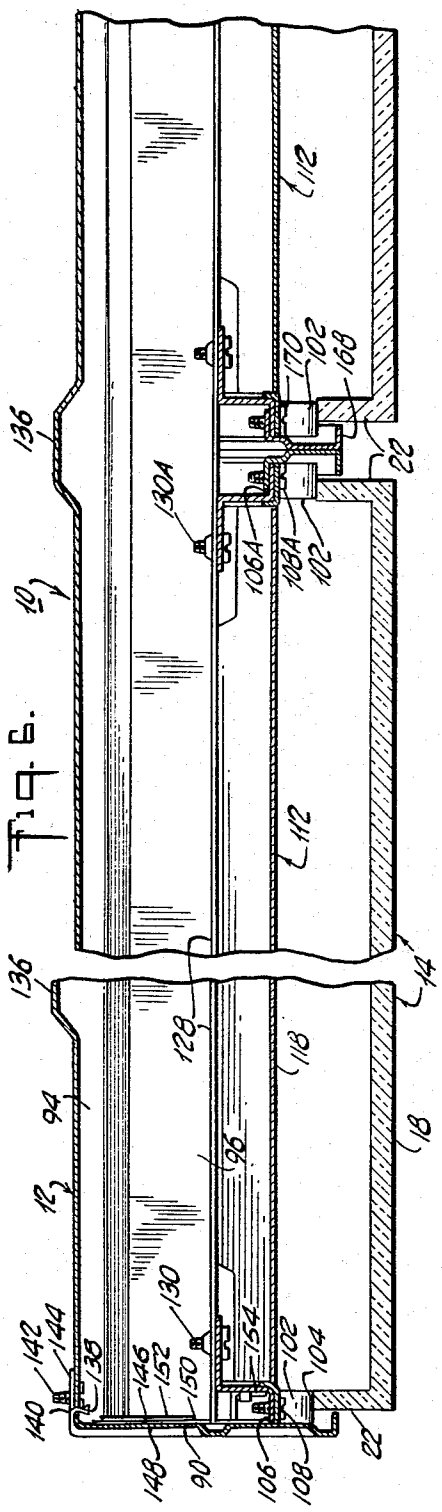

Fig. 6.

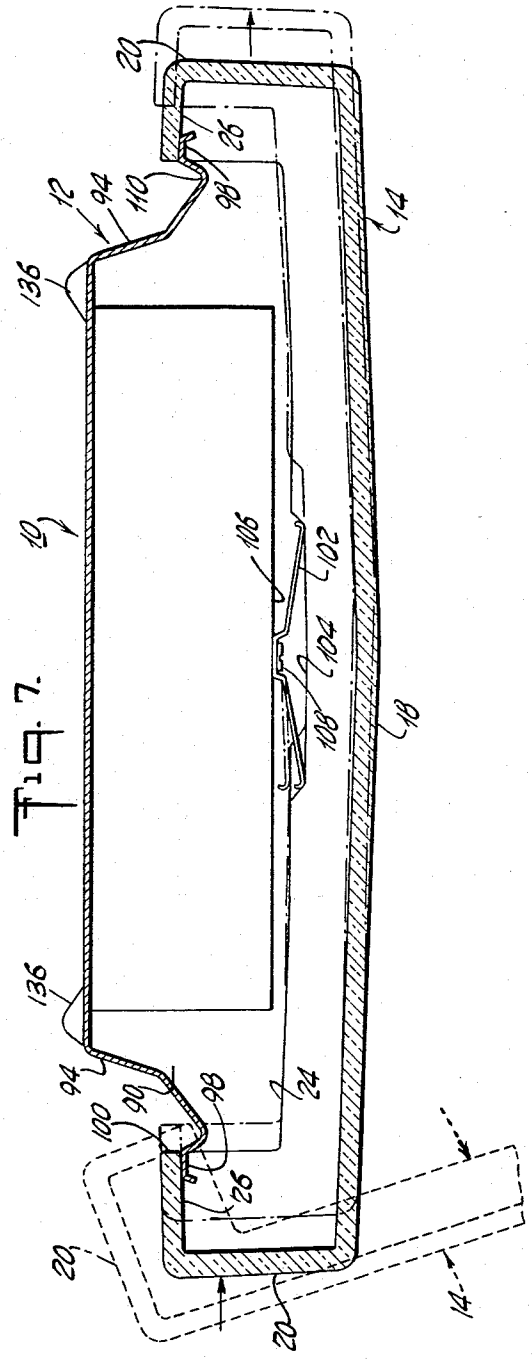

Fig. 7.

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Fig. 8.

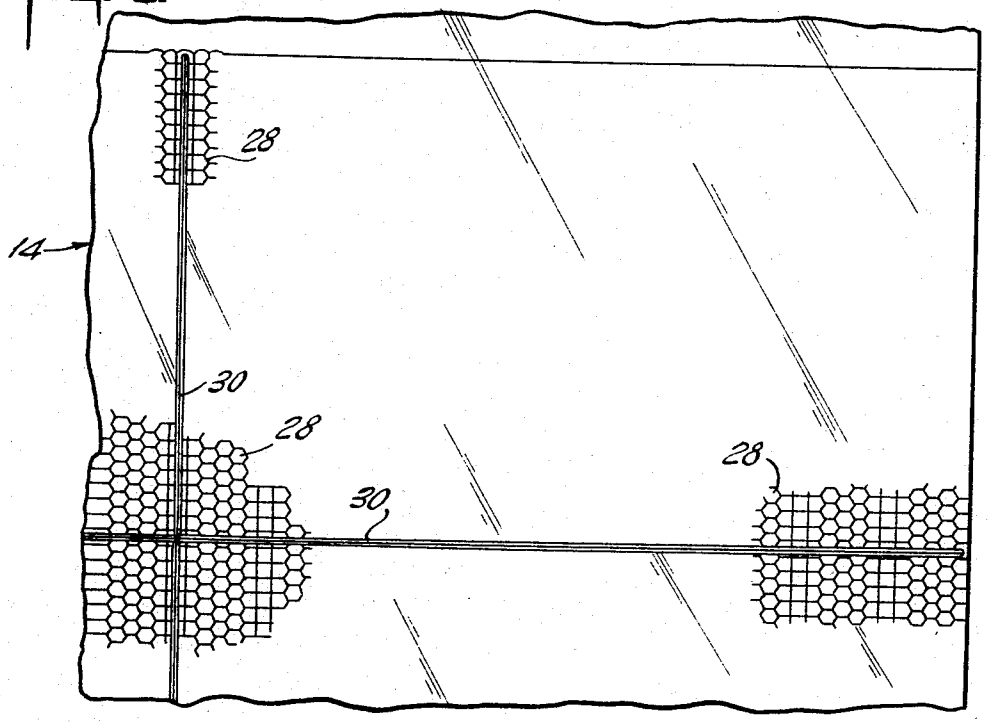

Fig. 14.

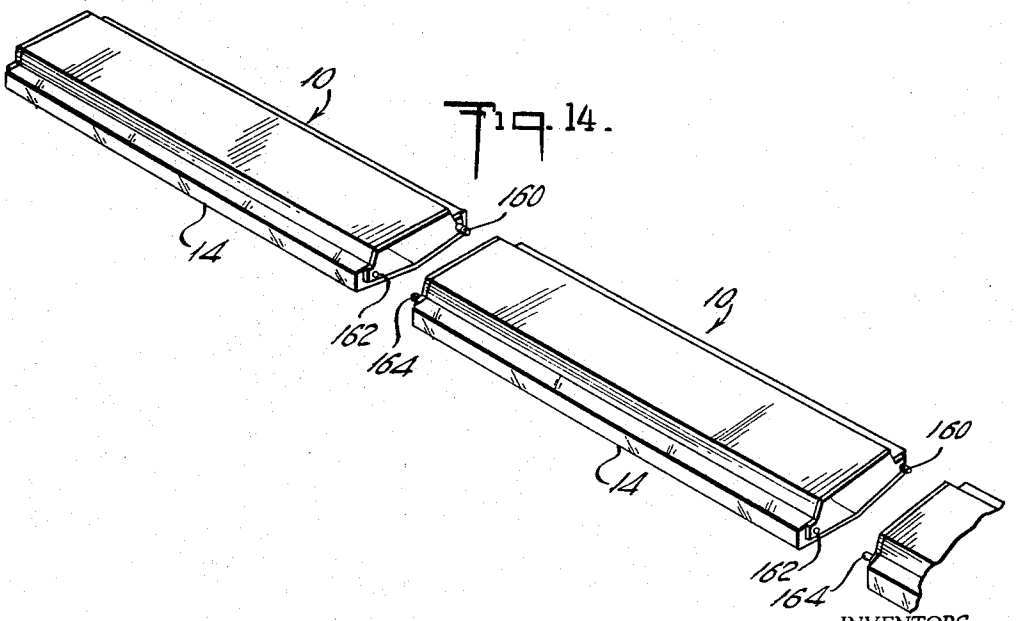

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Fig. 9.

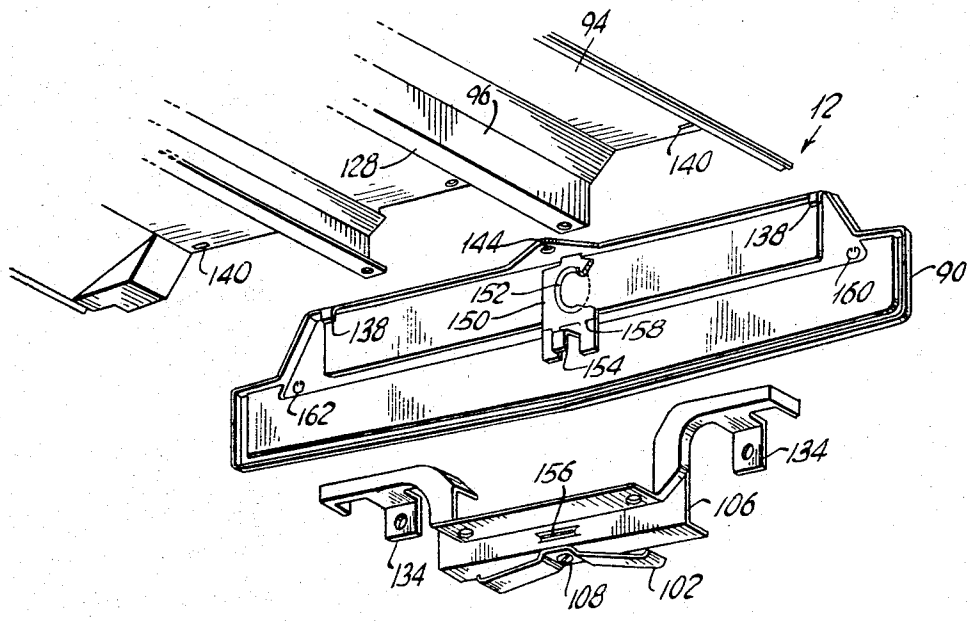

Fig. 10.

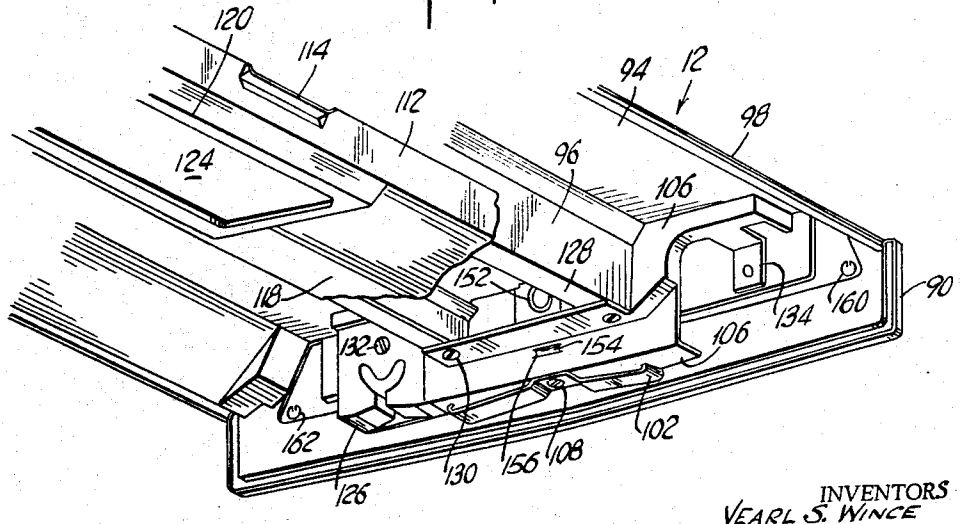

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Fig. 13.

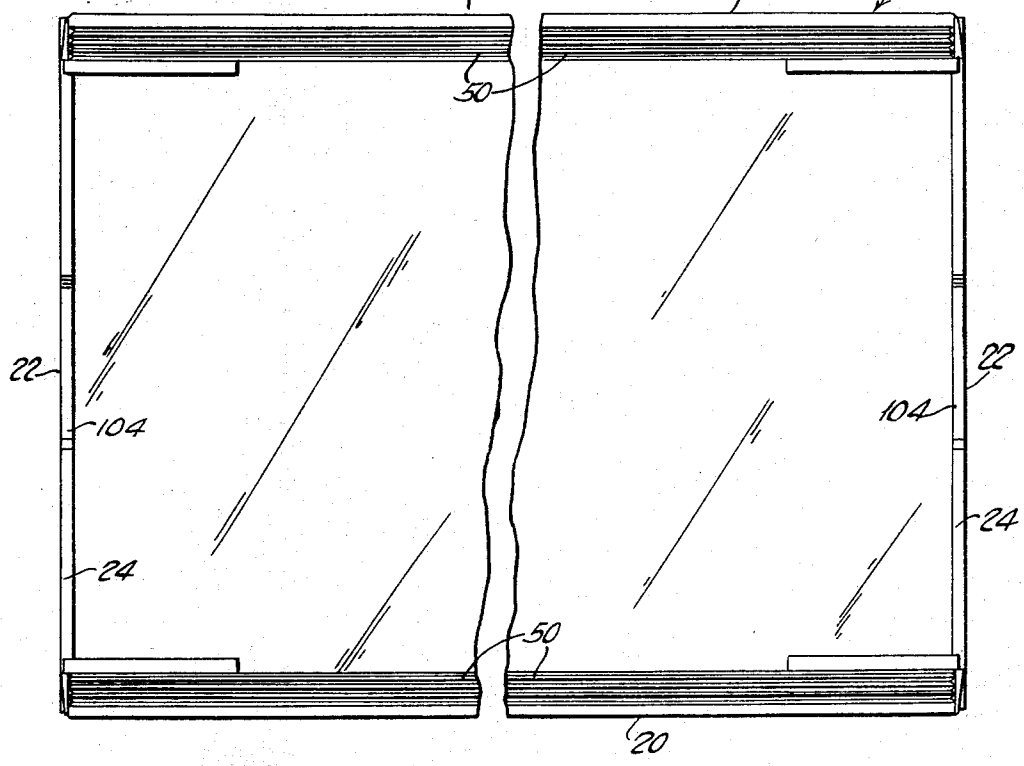


Fig. 11.

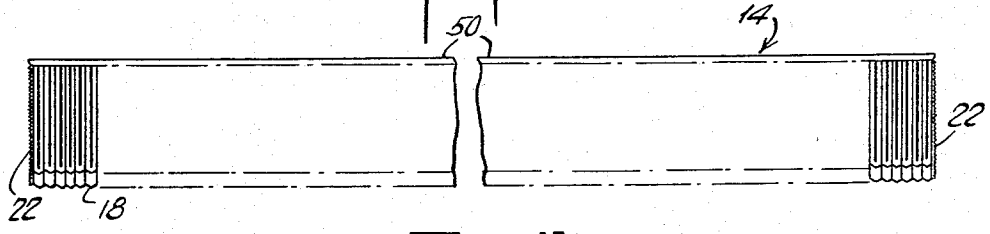
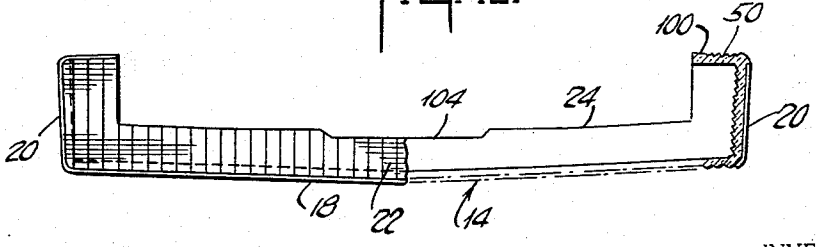


Fig. 12.



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United States Patent Office 3,275,822 Patented Sept. 27, 1966

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FLUORESCENT LUMINAIRE

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Filed Feb. 19, 1964, Ser. No. 345,894
4 Claims. (Cl. 240—51.11)

The present invention relates to direct lighting fluorescent luminaries for use in building interiors and in particular to such luminaires which provide both upward and endward components of lights for the purpose of relieving brightness contrast between the units and surrounding ceiling areas and between units.

Luminaires of the type described can be mounted close to the ceiling surface or suspended below the ceiling on stems. The refractors of such luminaires provide for the major portion of light emanating from the fluorescent lamps to be directed downwardly with a minimum amount of light being sent into glare zones, for instance, between 60 degrees and 90 degrees from nadir. A small part of the light from the lamps is directed upwardly to light the ceiling around the unit and to thereby relieve the brightness contrast between the unit and surrounding ceiling area.

However, dark areas usually occur directly above the luminaires.

It is an object of this invention to prevent dark areas from occurring directly above the luminaire and to such end, the refractor of the luminaire of the invention is provided with an upper generally horizontally disposed wall to direct light into these normally dark areas.

Another problem arises with luminaires of the type described in that the fixture chassis thereof is normally constructed in four foot and eight foot lengths whereas the refractor is usually made only in four foot lengths. It is common practice to install such luminaires in continuous rows with the refractors in each luminaire butted together or with opaque material separators between their ends. In such installations, it is practically impossible to make the ends of refractors align because of manufacturing tolerances and to make the ends of the fixtures align because of unevenness in most ceilings on which the units are mounted. Furthermore, the opaque metal parts between the refractors and at the ends of the fixtures are quite dark and unsightly in appearance.

It is an object of the present invention to overcome these difficulties by first, providing the fixture with embossed ends to give them thickness so that when the units are butted together the ends of the refractors are separated by sufficient distance to make it difficult to discern any normal misalignment.

Secondly, the fixture ends are constructed so that they are smaller in area than the refractor and the refractor is provided with end walls extending outwardly of the fixture ends both laterally and downwardly thereof.

The invention contemplates that the fixture ends cover mainly the non-luminous area at the end of the unit and the remaining area (in end elevation) is filled by the light directing end wall of the refractor, which is molded integrally with the refractor and, as previously stated, extends laterally and downwardly from the fixture end. In accordance with the invention, light to these walls is directed onto and illuminates the embossed edges of the ends of the fixtures.

As a result of the above considerations and objections of the invention, the refractor is provided with narrow horizontal segments on either side of the top thereof and the ends of these tops along with the ends of the side

walls and bottom of the refractor are integrally molded with the ends of the refractor. Therefore, it is also contemplated by this invention to utilize this structure, particularly the horizontal top segments in providing a hinge structure for ready access for maintenance of the interior portions of the luminaires.

In this respect it is an object of the invention to provide horizontal top segments for the refractor which not only direct light into desirable directions but also are used to support the refractor from the fixture.

The supporting arrangement is such that the unit can readily be opened by moving the refractor sideways a short distance towards either side thus providing clearance between one of the top horizontal segments and the fixture to allow the refractor to be swung open. From its open position it can readily be lifted off for cleaning.

For the purpose of positioning the refractor in the closed position, fixture springs depending from the fixture fit into notches in the refractor ends. It is a further object of the invention to provide various knock-out covered holes of different sizes in the ends of the fixture which will allow several methods of mounting and wiring with only the one standard fixture.

In manufacturing a refractor to be utilized in the luminaire to be described, there is required a rather complicated mold construction with interior parts which move to allow the formed refractor to be taken from the mold. These movable parts must slide along the inner faces of the end walls. This being so the end wall inner surface must be free of any configuration.

It is therefore an object of the invention to provide external prisms on end walls of the refractor which provide both diffusion and vertical light control.

Other and further objects of this invention will be apparent from the following description and claims and may be understood by reference to the accompanying drawings which by way of illustration show preferred embodiments of the invention and what is now considered to be the best mode of applying the principles thereof.

In the drawings:

FIG. 1 is a perspective view of a luminaire embodying the invention and is shown suspended from a ceiling;

FIG. 2 is a transverse sectional view of the luminaire in FIG. 1, detailing the optics of the refractor thereof;

FIG. 3 is a section taken along line 3—3 of FIG. 1;

FIG. 4 is a section taken along line 4—4 of FIG. 1;

FIG. 5 is a transverse sectional view of the luminaire through an end portion and center portion thereof;

FIG. 6 is a longitudinal cross section of a luminaire of the invention having two refractors within a single chassis;

FIG. 7 is a transverse sectional view illustrating diagrammatically the hinging action of the luminaire;

FIG. 8 is a plan view of a portion of the bottom of the refractor;

FIG. 9 is a partially exploded perspective view of the chassis, as seen from below;

FIG. 10 is a partially assembled perspective view of the chassis, as seen from below;

FIG. 11 is a side elevational view of the refractor;

FIG. 12 is a partial end elevational view and a partial transverse sectional view of the refractor;

FIG. 13 is a top plan view of the refractor, and

FIG. 14 is a perspective view illustrating a method of connecting a plurality of the luminaires.

Referring now more in detail to the drawings, wherein similar reference numerals identify corresponding parts throughout the several views, **10** represents a fluorescent luminaire, substantially as shown.

The luminaire **10** includes two major sections, a chassis **12** and a refractor **14**. The chassis supports the refractor and a pair of linear fluorescent lamps **16**, as will be explained more fully hereinbelow.

The refractor **14** will now be discussed in detail. In the embodiment shown the refractor is formed in the general shape of a rectangular box having an open top and a section cut out of the ends, the openings accommodating the chassis **12**. Refractor **14** includes an elongated generally rectangular bottom **18**, slightly V-shaped in cross section, sides **20** integrally formed with and extending along the length of bottom **18** and ends **22** integrally formed with the bottom and sides, and extending along the width of bottom **18**. Ends **22** include a cut-out area **24** into which a portion of the chassis is fitted, as described hereinbelow. Ledges **26** integrally formed with the upper edges of sides **20** extend inwardly a short distance as seen in FIG. 2.

The bottom **18** carries a plurality of cut-off cones **28** upon the lower or outer face thereof, arranged in the pattern shown in FIG. 8. Small cut-off linear prisms **30** extend through the cone pattern, as shown, and afford a decorative appearance. Referring to FIG. 2, cut-off cones **28** are designed to direct light rays **32**, emanating from lamps **16**, in generally downward directions and screen out light which would be emitted in the glare zone, that is from 60 to 90 degrees. Thus, rays **32** incident upon bottom **18** emerge as rays **34** in a direction 60 degrees or less, as measured from nadir.

A plurality of horizontally extending refracting prisms **36** are carried on the inner faces of sides **20**. As best understood, by reference to FIG. 2, the upper face **38** of prisms **36** is designed to direct light rays **40** incident thereon in a downward direction as indicated by emergent rays **42**. The lower face **44** directs the incident light rays in an upward direction as indicated by emergent rays **46**. As illustrated by the drawings a glare free zone is thereby created between 60 and 90 degrees. A plurality of vertically extending cut-off prisms **48**, carried by the outer face of sides **20** serve to control the lateral light in longitudinal directions.

A plurality of linear prisms **50** are disposed upon the top face of ledges **26**. Linear prisms **50** are designed to direct the light incident upon the inner face of the ledge such that the rays emerging from the ledge are contained in a zone approximately between points **52** and **54** (as shown in FIG. 2) upon ceiling **56**. Some of the light incident upon the inner face of ledge **26** reaches the face directly from lamps **16**, as shown by ray **58** and is reflected by face **60** through face **62**, where it emerges as ray **64**. Additional scattered light rays reflected from the cut-off cones **28** and cut-off prisms **48** are also transmitted through ledge **26**. Thus, ray **66** reflected off cones **28** emerges from ledge **26** as ray **68** and ray **70** reflected off prisms **48** emerges from ledge **26** as ray **72**.

As indicated previously, the manufacture of a refractor of the shape shown herein requires a rather complicated mold construction with interior parts which move to allow the formed refractor to be taken from the mold. These movable parts must be able to slide along the inner face of ends **22**, thus the inner face must be free from configuration, such as light controlling prisms. Therefore, prisms **74** on the outer face of ends **22** must provide both diffusion and vertical control of the light emitted therethrough.

Turning now to FIGS. 3 and 4, prisms **74** include an upper face **76** set at an angle to emit light incident thereon in angles below 60 degrees, as illustrated by incident ray **78** and emergent ray **80**, or is reflected downwardly and out through lower face **82** as illustrated by incident ray **84** and emergent ray **86**. Light incident on lower face **82** at angles similar to ray **88** are reflected upwardly and illuminate the edge of end plate **90** as illustrated by emergent ray **92**. Lateral diffusion is obtained by curving prisms **74** as shown more clearly in FIG. 4, wherein incident rays **93** emerge as rays **95**.

Turning now to a detailed description of chassis **12**, as best seen in FIGS. 5, 6, 9, and 10, upper lateral housing sections **94** are welded to central wiring channel **96**. Flanges **98** integral with and extending outwardly from sections **94** serve to support refractor **14**. The refractor is supported on chassis flanges **98** by refractor ledge flanges **100** at the corners. The ledge flanges rest upon the top face of the chassis flange when the refractor is in its operating position.

The refractor, when it is in its operating position is centered transversely by refractor centering spring **102** which engage notches **104** centrally positioned in ends **22**. Refractor centering springs **102** are bolted to socket saddles **106** by screws **108**. As seen in FIG. 7, to open the luminaire it is merely necessary to push or pull the refractor transversely to disengage springs **102** from notches **104** and move the refractor into the position shown by the dot-dash lines. In this position the refractor is supported along one side by refractor ledge flanges **100** engaging grooves **110** in housing section **94**. From this position the refractor can also be removed from the chassis for cleaning purposes. To install the refractor or return it to its operating position the above described sequence of operations is simply reversed.

Wiring channel **96** is enclosed by cover **112**. Cover **112** is held in place by friction projections **114** which engage depressions **116** in channel **96**. Throughout most of its length the lower face of cover **112** is V-shaped as shown at **118**, the most efficient shape found to reflect the light from laterally located lamps **16**. The shape of cover **112**, however, is modified as shown at **120** to accommodate the ballast assembly **122**, utilized in the luminaire. The recessed panel **124** contacts the lower face of the ballast assembly and thereby converts cover **112** into a conductor which serves to transfer heat from the ballast assembly **122**.

Socket saddles **106** also serve to support lamp holders **126**. Socket saddles **106** are connected to flanges **128** of channel **96** by screws **130**. Lamp holders **126** are secured by screws **132** which engage lugs **134** of socket saddles **106**. The saddle is formed to cover the wiring between the lamp holders and wiring channel **96**. Projections **136** serve to space the chassis below ceiling **56**, when mounted adjacent thereto, a distance sufficient to allow air circulation therebetween, thus dissipating some of the heat generated by the ballast assembly and lamps.

As best seen in FIG. 6, end plate **90** is fastened to the chassis by twist lugs **138** which extend through slots **140** in upper housing sections **94**, and by tapping screw **142** which screws into lug **144**. A flush conduit knockout **146** is provided for surface wiring or for running wires between adjacent luminaires. Knockout **146** is covered by a decorative cemented on foil cover **148**, cemented on to the exterior of indented panel **90A** and of end plate **90**. A metal insert **150** positioned inwardly of and adjacent knockout **146** is welded to the inner face of end plate **90**. Insert **150** includes a bushed-hole **152** which is positioned in line with knockout **146**. End plate **90** is also locked to chassis **12** by tab **154** welded to end plate **90** and which fits in slot **156** of saddle **106**.

When it is desired to mount the luminaires end to end, knockout **146** is removed. Bushed-hole **152**, in axial alignment with knockout **146**, now provides a bushed opening to run the necessary connecting electrical wires therethrough. If instead it is decided to attach the wires after knockout **146** is removed bushed-hole **152** would no longer be necessary, and furthermore would interfere with the conduit installation. In that case the insert **150** is removed by twisting until it breaks off at the partially sheared line **158**.

When the luminaires are fastened together, end to end, small screw holes **160** and **162**, closed by knockouts, are provided. Holes **160** are small enough to engage the threads of self tapping screws **164** while hole **162** allows the screw to slip through. Thus, as shown more clearly in FIG. 14, screws **164** are screwed into holes **160**. When the units are butted together, projecting screws **164** will extend through holes **162**. Nuts are then screwed onto the ends of screws **164** thereby locking the luminaires together.

The end plates **90** are embossed at **166**, as best seen in FIG. 1 to give the ends of the luminaires sufficient thickness to separate the refractors when the luminaires are butted together thereby making it difficult to discern any normal misalignment between the luminaires.

In installations where nominal eight foot long fixtures are used, lateral housings **94** and central wiring at channels **96** extend the complete length of the fixture while the wiring channel covers **112** and refractors **14** may be the same length as utilized in a nominal four foot unit, and as shown in FIG. 6, modified ends **168** depend from modified saddles **106A** via conventional means, and extend about the inner end peripheries of wiring channel covers **112** and about the sides of lateral housing **94** and central wiring channel **96**, adjacent the outer surface of end walls **22**. This construction, provided along the longitudinal center of the fixture simulates the appearance of two four-foot luminaires bolted together.

While various embodiments of the invention have been shown in detail to illustrate the application of the inventive principle, it should be understood that the invention may be embodied otherwise without departing from such principles.

What has been described is believed to be the best embodiments of the invention. However, it is not intended to confine the invention to the embodiments shown. What is desired to be covered by Letters Patent is set forth in the following claims.

What is claimed:

1. A luminaire, comprising a chassis, a plurality of linear fluorescent lamps mounted within said chassis, said chassis including flanges extending along the length of the chassis parallel to said lamps, and a refractor mounted on said chassis, said refractor including a bottom section, two spaced side sections extending parallel to the longitudinal axis of said lamps and connected to and extending upwardly from said bottom section, a ledge connected to the top of each side section and extending inwardly towards said lamps substantially parallel with said bottom section, and two spaced end sections connected to said bottom and side sections and extending transversely to the longitudinal axis of said lamps, said ledges being supported on said chassis flanges, the bottom section of said refractor including a plurality of light cut-off means for screening out light emitted by said lamps, from predetermined glare angles, said side sections including horizontally extending prism means on the inner face of said side sections for directing light, emitted by said lamps, in directions above and below the predetermined glare angles, said side sections also including vertically extending prism means on the outer face of said side sections for controlling light transmitted therethrough in longitudinal directions, said ledges including linear prism means on the outer face of said ledges for directing light transmitted therethrough directly above said luminaire, said end sections including prism means carried by the outer face of said end sections, for directing a portion of the light transmitted therethrough in a predetermined downward direction, and for directing another portion of light transmitted therethrough in an upward direction to illuminate end portions of said chassis, and for laterally diffusing the light transmitted therethrough.

2. A luminaire as in claim **1** wherein said chassis further includes channel means for enclosing and holding a ballast assembly and wiring therefor, spring means engaging said refractor for centering said refractor, and end plate means, said end plate means including means connecting next adjacent luminaires mounted end to end therewith.

3. A luminaire as in claim **2** including means for hinging said refractor on said chassis and said means comprises said ledges overlying said channel flanges, said refractor being movable laterally.

4. A luminaire, comprising a chassis, a refractor connected to said chassis, linear fluorescent lamp means connected to said chassis for providing a source of light, said refractor including a bottom section, two parallel spaced side sections extending the length of said bottom section and connected thereto, a ledge integrally connected to the top of each side section and extending inwardly, substantially parallel to said bottom section, linear prism means on the outer face of said ledge for directing light transmitted therethrough above the luminaire, said bottom section including a plurality of light cut-off means for screening out light emitted by said lamp means from a predetermined glare zone, said side section including horizontally extending prism means on the inner face of each side section for directing light emitted by said lamp means in direction outside of a predetermined glare zone and vertically extending prism means on the outer face of said side sections for controlling light transmitted therethrough in longitudinal directions, two parallel spaced end sections extending the width of said bottom sections and connected thereto, said end sections including prism means positioned on the outer face of the end sections for directing a portion of the light emitted by said lamp means in a predetermined downward direction and for directing another portion of light in an upward direction and for laterally diffusing the light transmitted through said prism means.

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