United States Patent [19]

Peterson et al.

[11] **3,883,732**

[45] **May 13, 1975**

[54] **CEILING LUMINAIRE**

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[22] Filed: **Dec. 6, 1973**

[21] Appl. No.: **422,271**

Related U.S. Application Data

[63] Continuation of Ser. No. 311,455, Dec. 4, 1972, abandoned.

[52] **U.S. Cl.** ..... **240/73 BC**

[51] **Int. Cl.** **F21v 21/04**

[58] **Field of Search** ..... 246/73 R, 73 BC, 73 LD, 246/78 R, 78 H, 78 HA, 78 LD

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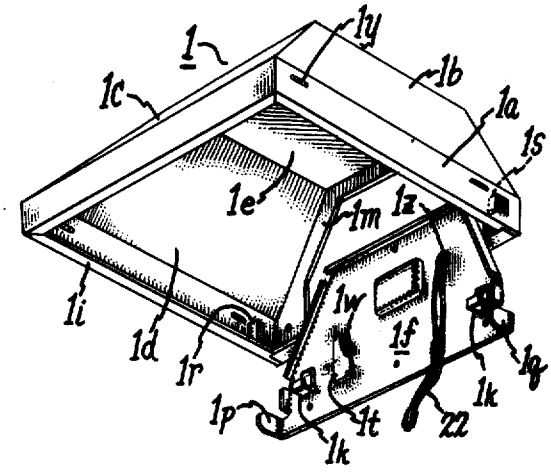
Primary Examiner—Joseph F. Peters, Jr.
Attorney, Agent, or Firm—Sidney Greenberg

[57] **ABSTRACT**

Luminaire adapted for mounting in suspended ceilings has modular construction to facilitate installation and assembly. The unit includes a rectangular open bottom housing adapted to rest on the ceiling support bars, a removable ballast supporting panel forming a wall of the housing, an optical assembly including lamp support, reflector and refractor, and a light transmitting cover for the housing bottom.

15 Claims, 11 Drawing Figures



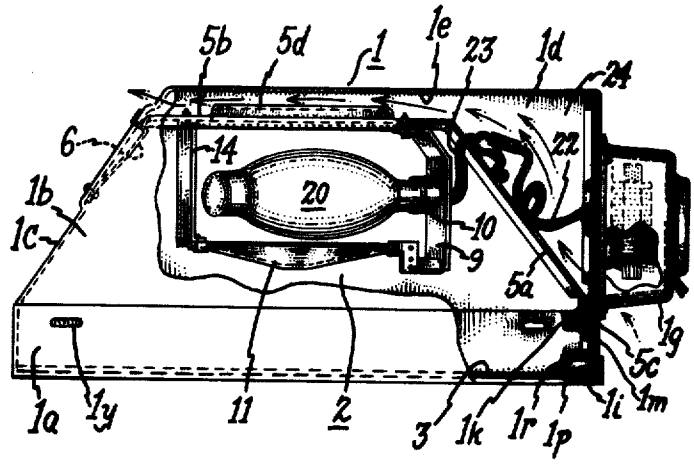


Fig. 1.

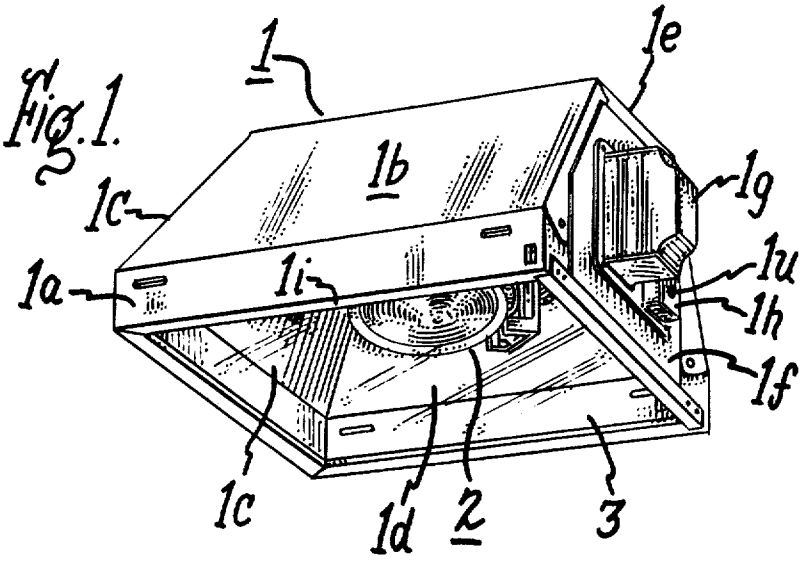

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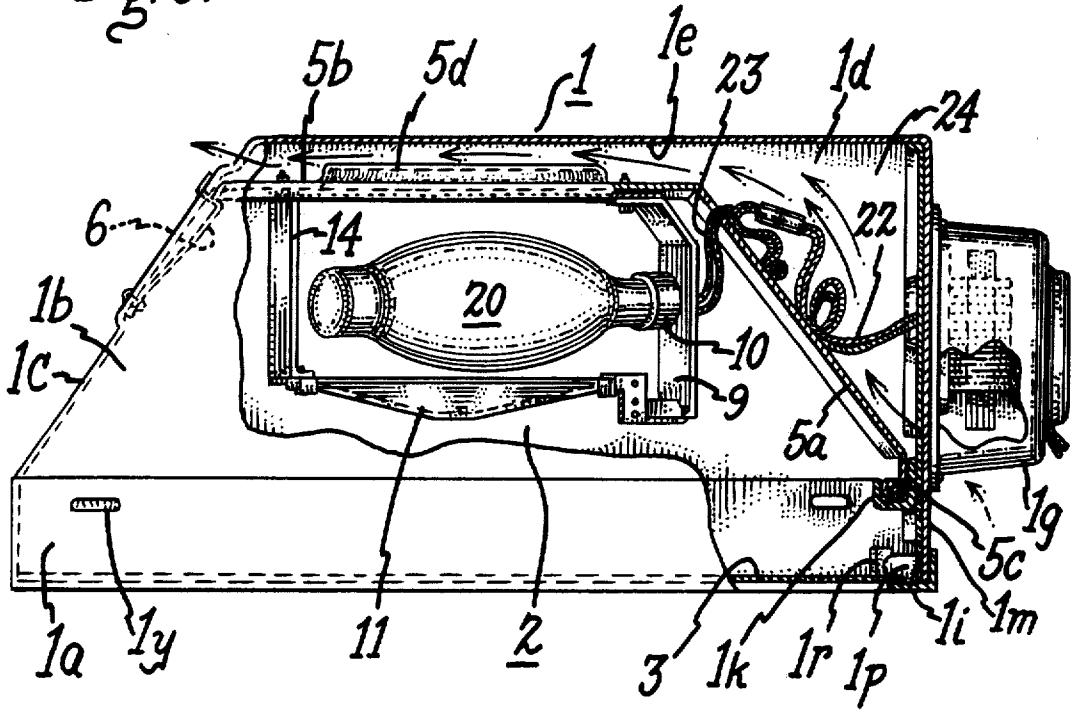
Fig. 5.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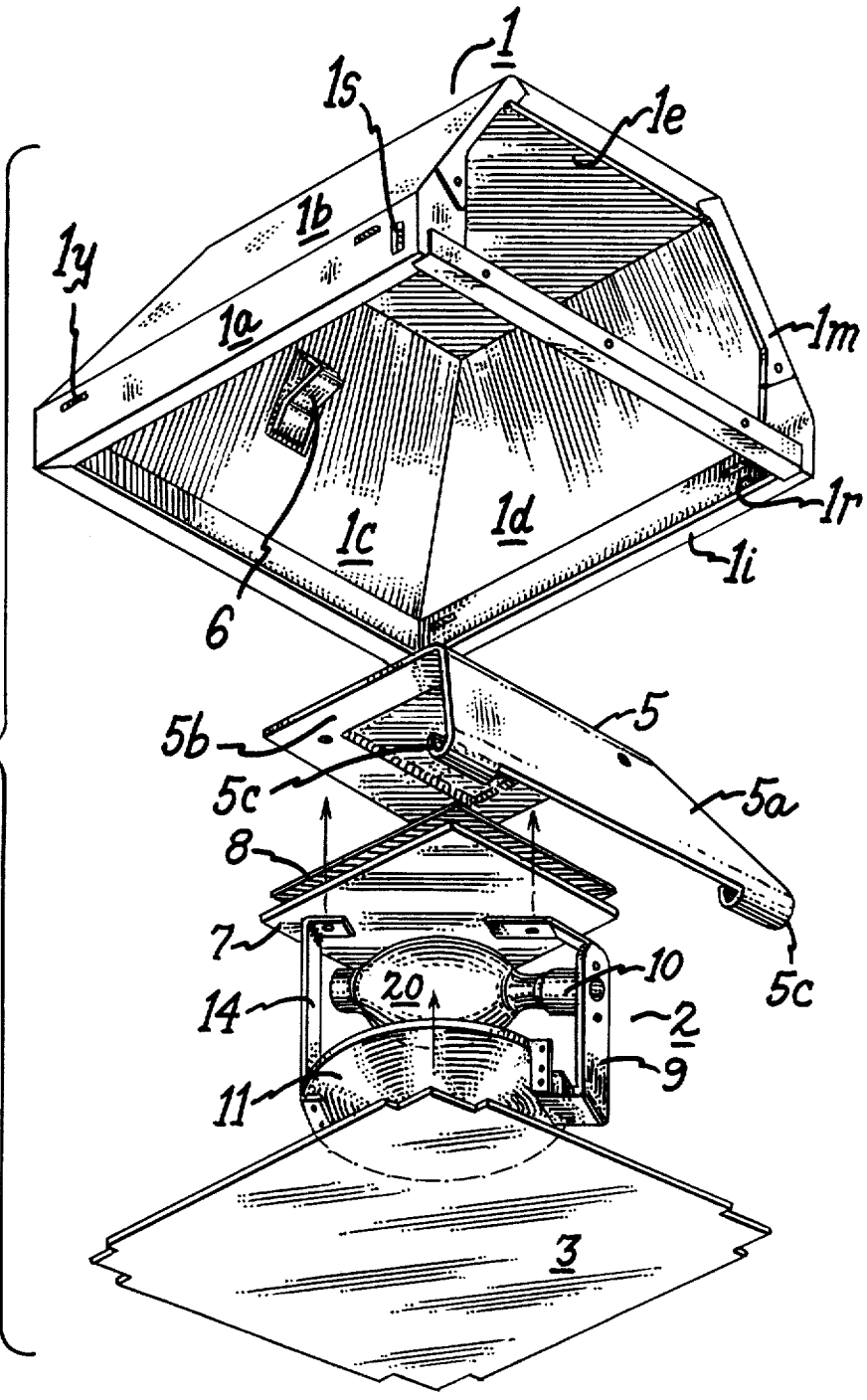

Fig. 2.

Fig. 3.

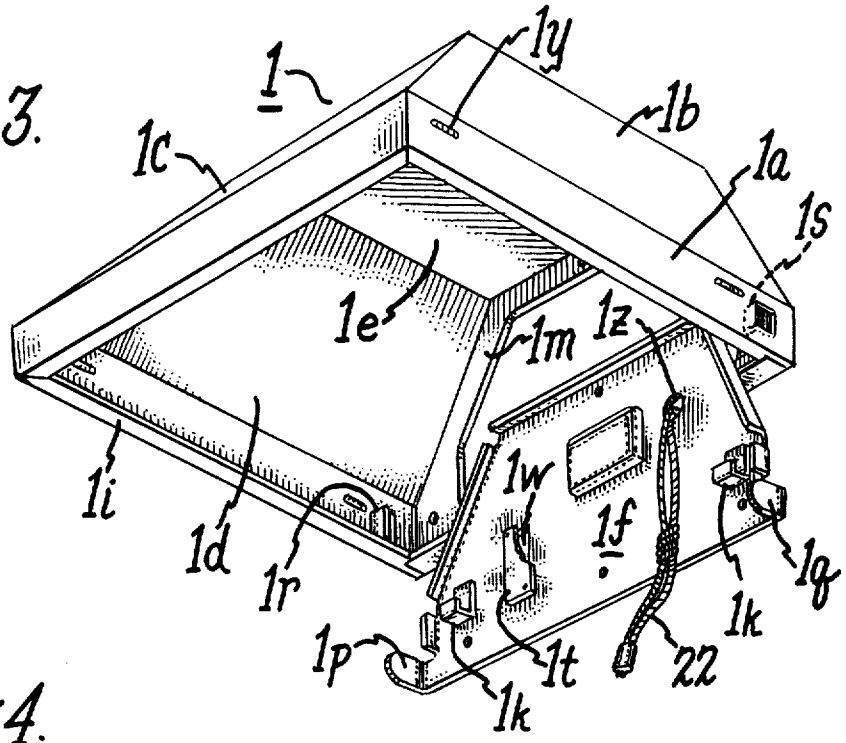
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Fig. 4.

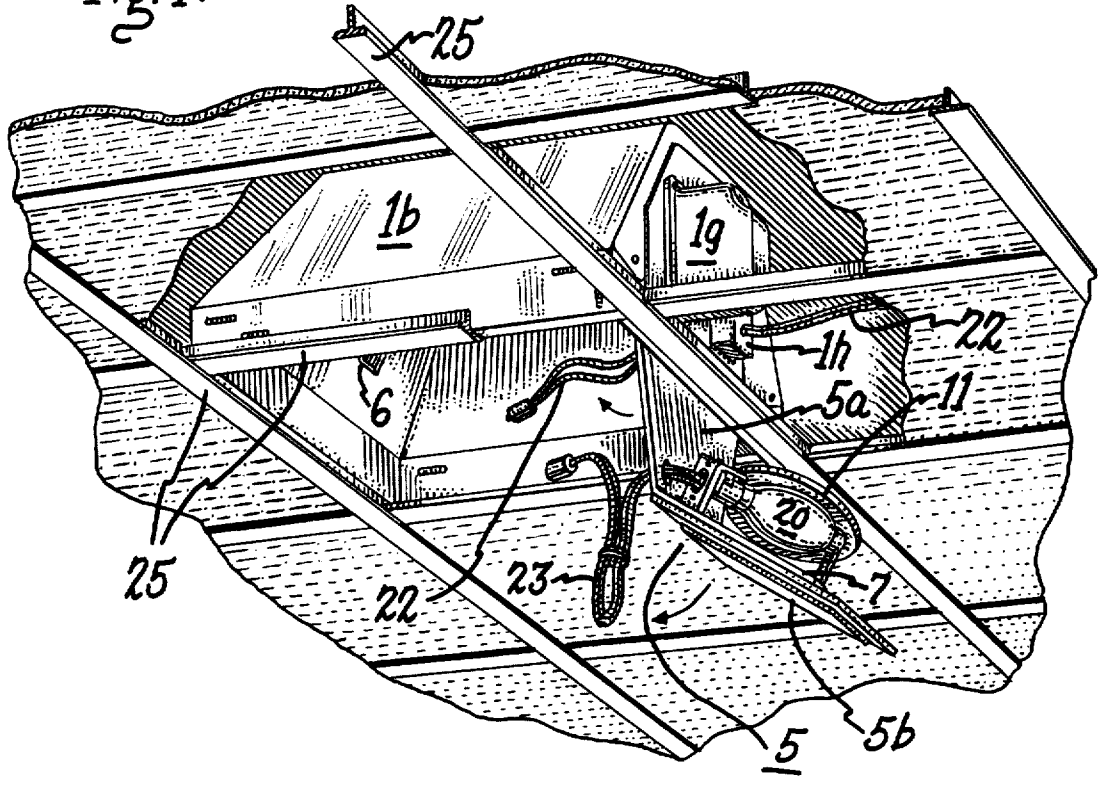
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Fig. 6.

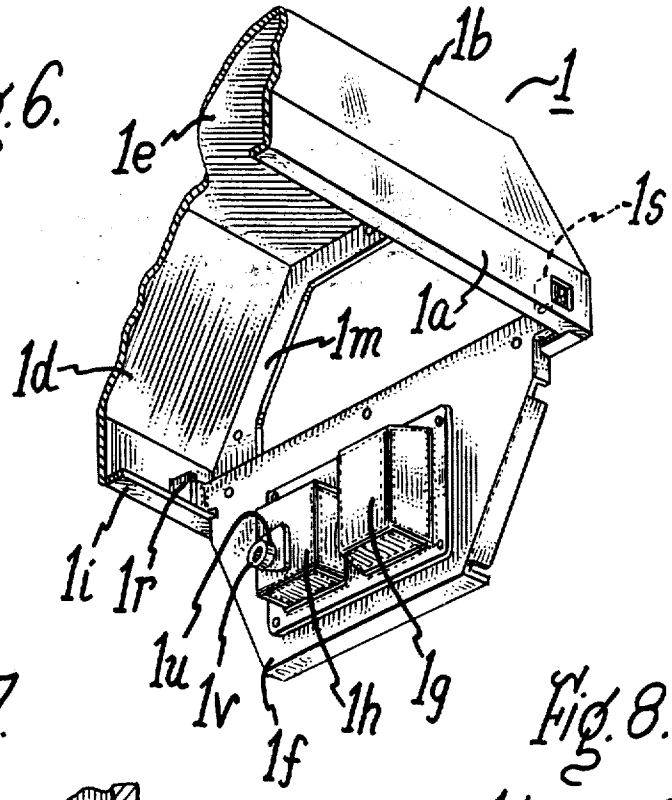


Fig. 7.

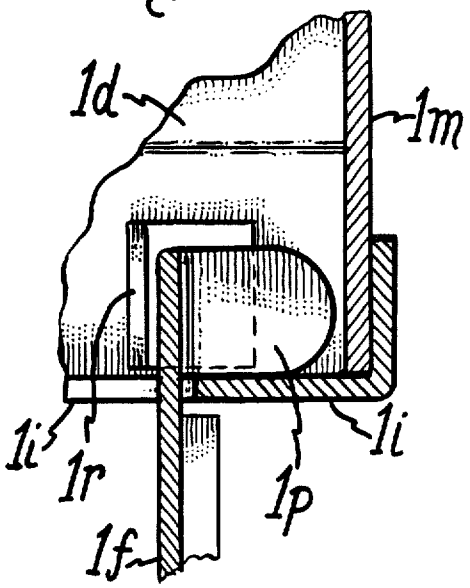


Fig. 8.

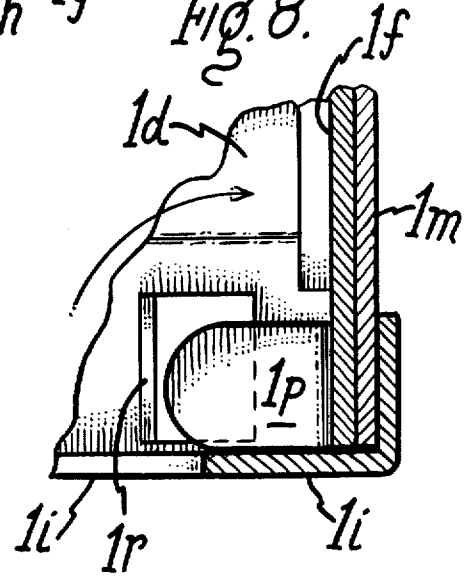


Fig. 9.

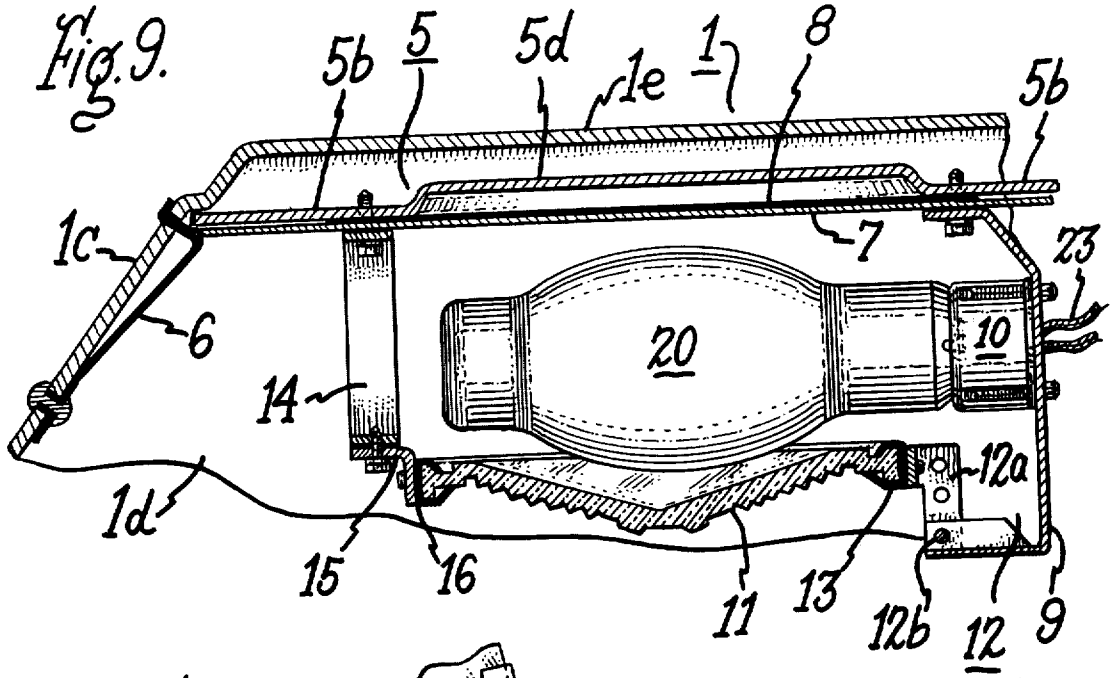


Fig. 10.

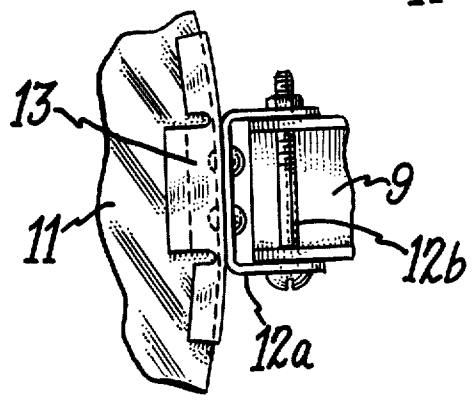
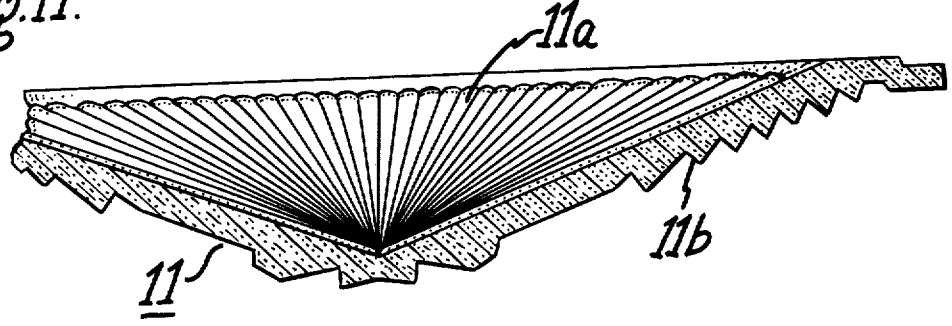


Fig. 11.



CEILING LUMINAIRE

This is a continuation of application Ser. No. 311,455 filed Dec. 4, 1972, now abandoned.

The present invention relates to luminaires, and more particularly concerns a luminaire employing a high intensity discharge lamp and adapted to be mounted on indoor ceilings, especially ceilings of suspended type.

It is an object of the invention to provide an improved luminaire, especially of the ceiling recessed type, having a construction which facilitates installation, assembly and maintenance of the fixture.

It is a particular object of the invention to provide a luminaire of the above type which has a modular construction comprising separable component assemblies which may be individually modified to meet particular functional needs.

Still another object of the invention is to provide a luminaire of the above type which affords relatively uniform, glare-free illumination, avoids excessive heat in the interior of the luminaire, and minimizes electrical hazards to installing and maintenance personnel.

Other objects and advantages will become apparent from the following description and the appended claims.

With the above objects in view, the present invention in one of its aspects relates to a luminaire comprising, in combination, a housing comprising a top, a plurality of side walls and an open bottom, one of the side walls being detachably mounted on the housing, electrical operating means mounted on the detachable side wall, an optical assembly in the housing comprising optical support means detachably secured to the housing, and lamp holder means secured to the support means, and light transmitting cover means removably closing the open bottom of the housing.

In a preferred embodiment of the invention, the detachable side wall and the optical support means are constructed so as to be capable of being initially hung from the housing prior to their capable of being initially hung from the housing prior to their assembly into operative position to enable the necessary wiring and other servicing operations to be carried out.

The invention will be better understood from the following description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of a ceiling luminaire constructed in accordance with the invention;

FIG. 2 is an exploded view of the parts of the FIG. 1 luminaire;

FIG. 3 is a perspective view of the interior of the luminaire housing assembly with the ballast supporting side wall shown displaced therefrom;

FIG. 4 shows the luminaire in recessed position in a suspended ceiling;

FIG. 5 is a side elevational view, partly broken away, of the luminaire;

FIG. 6 is a perspective view of a portion of the housing assembly showing the removable side wall in hanging position prior to being rotated into assembled position;

FIG. 7 is an enlarged detail view of the hinge portion of the removable side wall in the hanging position shown in FIG. 6;

FIG. 8 is a similar view of the side wall hinge in the assembled position of the side wall;

FIG. 9 is a cross-sectional detail view of the luminaire optical assembly in assembled position;

FIG. 10 is a plan view of the refractor hinge and associated clip device shown in the FIG. 9 optical assembly; and

FIG. 11 is a cross-sectional view of the refractor of the optical assembly.

Referring now to the drawings, and particularly to FIG. 1, there is shown a luminaire constructed in accordance with the invention and adapted to be installed in recessed position in a suspended ceiling. The luminaire comprises housing 1 having a lower portion 1*a* defining a square opening and three integral side walls 1*b*, 1*c*, 1*d* converging upwardly toward top wall 1*e*. Housing 1 may be formed of a sheet steel structure having one side open as shown. The fourth side wall 1*f* is detachably mounted on housing 1 covering the open side and serves as a removable supporting panel for electrical operating components, such as electrical ballast elements and associated wiring, enclosed by pods 1*g*, 1*h* on the outer side of 1*f*. Optical assembly 2, including a reflector, a lamp holder, a lamp and a refractor, is mounted in the interior of housing 1, and the bottom opening of housing 1 is closed by a light transmitting lens 3 such as a glass or plastic plate. The bottom of housing 1 has an inwardly directed flange 1*i* extending around the bottom opening on which the periphery of cover lens 3 is adapted to loosely rest in its assembled position.

As seen in FIG. 2, the optical assembly includes a reflector support 5 formed of a trapezoidal side portion 5*a* and a square top portion 5*b* which are arranged at an obtuse angle to one another. The bottom edge of side portion 5*a* of the reflector support 5 is rolled at opposite ends to form spaced hinges 5*c* which interfit with corresponding spaced hangers or seats 1*k* (see FIGS. 3 and 5) on the inner side of side panel 1*f* so as to be hingedly supported thereon. The opposite end of reflector support 5 is held in assembled position by spring detent 6 or the like secured to housing side wall 1*c* (see FIG. 9). Reflector member 7, such as a metal plate having a white enamel coating on its underside, is arranged below top portion 5*b* and is substantially coextensive therewith. A sheet of aluminum foil 8 or the like is preferably arranged between reflector plate 7 and top portion 5*b* to serve as a thermal radiation shield for preventing excessive transmission of heat through the top of the fixture.

Socket bracket 9 of the optical assembly is secured at its top to the superposed top support portion 5*b* and extends downwardly therefrom (see FIG. 9). At its lower end, bracket 9 is secured to the edge of dish-shaped conical refractor 11 at one side by a hinge connection 12 and clip device 13, while at its opposite side refractor 11 is secured to reflector support 5 by bracket 14 detachably secured at its lower end by captive screw 15 to clip device 16 similar to clip device 13. Brackets 9 and 14 are secured at their top ends by screws or the like to reflector support 5 with intervening reflector 7 and foil 8 as seen in FIG. 9.

Hinge connection 12 at the edge of refractor 11 comprises channel member 12*a* secured at its top to clip device 13 (see FIG. 10) and interfitting at its bottom with the channel-shaped bottom portion of bracket 9, with a hinge bolt 12*b* passing through and releasably holding the interfitting parts together in hinged relation.

Lamp holder or socket **10** is secured to socket bracket **9** intermediate its ends for holding lamp **20** between reflector plate **7** and refractor **11**. Lamp **20** is typically of a high intensity gaseous discharge type, such as a mercury vapor or sodium vapor lamp.

To provide for desired spacing of refractor **11** from lamp **20**, e.g., to obtain desired light distribution, there are preferably a number of vertically spaced holes formed in channel member **12***a* which may be selectively aligned with the holes in the channel at the bottom of bracket **9** for receiving hinge bolt **12***b*. As will be understood, a bracket **14** of suitable length will be selected to correspond to the particular spacing of refractor **11** below lamp **20**.

In accordance with a feature of the invention, the parts of the optical assembly including reflector support **5**, reflector plate **7**, aluminum foil **8**, lamp **20** and refractor **11**, are connected together as shown in FIG. **9** prior to insertion in the luminaire housing **1** so as to form a subassembly or module which is readily mounted as a unit in housing **1** after the latter is installed in the ceiling, as more fully described below.

As seen in FIGS. **2** and **9**, top portion **5***b* of reflector support **5** is formed with a dome **5***d* in its central area so as to provide a dead air space between reflector plate **7** and dome **5***d* which further contributes desirable thermal insulation between lamp **20** and the top of the fixture.

Light transmitting cover or lens **3** is slightly larger in dimension than the inner boundary of housing bottom flange **1***i* and is preferably cut away somewhat at the corners as shown in FIG. **2**, so that the lens may be readily inserted in tilted position through the bottom opening of the housing prior to laying it on top of flange **1***i* in installed position.

Ballast support panel **1***f* (see FIG. **3**) is of generally trapezoidal shape for covering the similarly shaped wall opening in housing **1** defined by flange **1***m* extending around the opening. Panel **1***f* is somewhat larger than the wall opening and in its installed position lies flat against the inner surface of flange **1***m*, being detachably secured thereto by captive screws or the like passing through aligned holes in panel **1***f* and flange **1***m*. Panel **1***f* is formed with inwardly projecting pivot ears **1***p*,**1***q* at opposite ends of its bottom edge. The spacing between pivot ears **1***p*,**1***q* is such that in the installed position they rest on flanges **1***i* at opposite sides of housing **1** adjacent flange **1***m*, as shown in FIG. **8**. Pivot ears **1***p*,**1***q* are retained in that position by tabs **1***r*,**1***s* struck inwardly from opposite sides of housing **1** (see FIG. **3**). In accordance with a feature of the invention, pivot ears **1***p*,**1***q* enable panel **1***f* carrying the heavy ballast components to be initially hung from bottom flange **1***i* in the position shown in FIG. **6**, with its pivot ears **1***p*,**1***q* arranged as seen in the detail view of FIG. **7**, to allow any necessary wiring operations involving the ballast components to be carried out, and panel **1***f* may then be rotated inwardly as indicated by the arrows in FIGS. **6** and **7** to the installed position shown in FIG. **8**, where it is then fastened by screws or other fastening means to flange **1***m* of housing **1**. During such rotation, pivot ears **1***p*,**1***q* pivotally seat on flange **1***i* while being confined between retaining tabs **1***r*,**1***s* and wall flange **1***m*. The width of detachable panel **1***f*, other than at its pivot ears **1***p*,**1***q* is less than the width of the bottom opening of the housing so that panel **1***f* freely passes through the bottom opening into installed position.

On its outer surface, as seen in FIG. **1**, panel **1***f* has attached thereto by screws or the like a housing or pod **1***g* for enclosing a ballast transformer and a pod **1***h* for enclosing a ballast capacitor. A hole **1***u* in capacitor pod **1***h* provides for passage of conduit wire leads into pod **1***h* and a conduit connector **1***v* (see FIG. **6**) is provided at hole **1***u* for securing a flexible supply conduit thereto. As seen in FIG. **3**, an elongated aperture **1***w* is formed in panel **1***f* communicating with the interior of capacitor pod **1***h* to provide access to the latter for connecting the conduit supply leads to the ballast wiring. A rectangular door **1***t* closing aperture **1***w* is removably attached to panel **1***f*. Circular aperture **1***z* which opens into ballast pod **1***g* allows passage of ballast leads **22** into the interior of housing **1** for connection to the lamp leads **23** (see FIG. **4**). If necessary or desirable, a thermally and electrically insulating sheet (not shown) may be placed between the outer surface of panel **1***f* and the ballast components in pods **1***g*,**1***h*.

As seen in FIG. **5**, when reflector support **5** is in operative installed position in housing **1**, a compartment **24** is formed between its angled side portion **5***a* and panel **1***f* wherein the connected wire leads **22**, **23** are contained. Side portion **5***a* thus serves to protect the wiring as well as the ballast components from the heat generated by lamp **20** during operation. Where necessary or desirable, suitable slots or vents (not shown) may be provided in the housing to allow flow of cooling air through the fixture, as indicated by the arrows in FIG. **5**.

Conical refractor **11** serves to control the brightness of lamp **20** and also to shield lens **3**, which may be of plastic material, from the heat of lamp **20**. In a typical form, as seen in FIG. **11**, refractor **11** is provided with radial flutes **11***a* on its interior surface for uniformly spreading the light laterally, and has annular concentric rows of prisms **11***b* on its outer surface for depressing the light rays passing therethrough, so that the light is spread evenly over lens **3** and uniformly distributed without substantial glare on the area to be illuminated. Cover lens **3** may be simply a plain transparent window, or it may be of light diffusing or refracting nature, as appropriate for the purposes desired.

The luminaire as described is readily installed on a ceiling either as a pre-assembled unit or in easily handled sub-assemblies, and such installation including any necessary wiring connections or any later maintenance or servicing operations may be carried out entirely from below the fixture and without necessitating disassembly or removal of the main housing shell.

In a typical procedure for installing the fixture in a suspended ceiling, housing **1** without ballast mounting panel **1***f* or other parts attached thereto is placed in the opening of a suspended ceiling, such as shown in FIG. **4**, with its bottom flange **1***i* resting on the inverted T-bars **25** forming a grid support for the suspended ceiling. Suitable clips (not shown) passing through slots **1***y* in housing **1** serve to hold the housing in position on the T-bar supports in known manner. Ballast panel **1***f* is then hung on housing **1** in the position shown in FIG. **6**, and the connection of the supply conduit (not shown) is made to connector **1***v* on the outside of ballast pod **1***h*. Panel **1***f* is then rotated in the direction of the arrow to its installed position on housing **1** and secured thereto as previously described. After the necessary wiring connections are made through access aperture **1***w* and with ballast lead wires **22** extending out of

aperture 1*z*, the optical assembly including reflector support 5 and the parts secured thereto is attached to panel 1*f* with the hinges 5*c* of side portion 5*a* engaging hangers 1*k* on panel 1*f*, so that reflector support 5 hangs downwardly therefrom in the position shown in FIG. 4. Leads 22 and 23 are then interconnected by the respective plug and socket connectors at their ends, and reflector support 5 is then rotated in the direction of the arrow into the housing interior until the free end thereof snaps over spring detent 6, which thereby holds the optical assembly in operative position, as shown in FIGS. 5 and 9. Finally, cover lens 3 is inserted in a suitably tilted position into the bottom of housing 1 and laid on the upper surfaces of flange 1*i*, on which it rests in installed position.

Instead of using a "tilt-in" type of cover lens as described, it will be understood that other forms of closures may be employed if desired, as, for example, a lens or refractor mounted in a frame hingedly attached or otherwise movably secured to the bottom of housing 1.

Although the luminaire has been described with reference to its use in a suspended ceiling, the invention is not limited to such application. The luminaire may be used, for example, as a pendent or surface fixture with the use of appropriate outside covers of shrouds to enhance its appearance, if desired.

While the present invention has been described with reference to particular embodiments thereof, it will be understood that numerous modifications may be made by those skilled in the art without actually departing from the scope of the invention. Therefore, the appended claims are intended to cover all such equivalent variations as come within the true spirit and scope of the invention.

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

1. A luminaire comprising, in combination, a housing comprising a top, a plurality of side walls and an open bottom, one of said side walls being detachably mounted on said housing, electrical operating means mounted on said detachable side wall, an optical assembly in said housing comprising optical support means detachably secured to said housing, and light transmitting cover means removably closing the open bottom of said housing, said detachable side wall having a bottom portion provided with hinge means turnably engaging said housing for swingable movement of said detachable side wall between an installed position forming a wall of said housing and a detached position away from said housing.

2. A luminaire comprising, in combination, a housing comprising a top, a plurality of side walls and an open bottom, one of said side walls being detachably mounted on said housing, electrical operating means mounted on said detachable side wall, an optical assembly in said housing comprising optical support means detachably secured to said housing and lamp holder means secured to said support means, and light transmitting cover means removably closing the open bottom of said housing, said electrical operating means being mounted on the outer side of said detachable side wall, said detachable side wall having hanger means on the inner side thereof, said optical support means comprising a side portion detachably engageable with said hanger means for swinging movement thereon of said support means between an inoperative hanging position and an operative installed position, said optical support means having a top portion spaced below the top of said housing in said operative position, a reflector on said top portion facing the open bottom of said housing, and latch means on said housing for holding said optical support means in operative position.

3. A luminaire as defined in claim 2, said side portion of said optical support means in said operative position being arranged at an angle to said detachable side wall for defining therewith a compartment therebetween for receiving wire means, said lamp holder means being arranged on the side of said side portion away from said compartment.

4. A luminaire as defined in claim 2, and thermal barrier means provided between said reflector and said top portion of said optical support means.

5. A luminaire as defined in claim 4, said thermal barrier means comprising an enclosed space defined by said reflector and said top portion of said optical support means.

6. A luminaire as defined in claim 5, said thermal barrier means additionally comprising heat-reflecting sheet means.

7. A luminaire comprising, in combination, a housing comprising a top, a plurality of side walls and an open bottom, one of said side walls being detachably mounted on said housing and turnably engaging said housing for movement between an installed position forming a side wall of said housing and a detached position away from said housing, electrical operating means mounted on said detachable side wall, an optical assembly in said housing comprising optical support means detachably secured to said housing, and light transmitting cover means removably closing the open bottom of said housing.

8. A luminaire as defined in claim 7, said optical assembly including light transmitting shield means secured to said optical support means and spaced above said cover means, and lamp holder means in said housing for holding a lamp spaced above said shield means.

9. A luminaire comprising, in combination, a housing comprising a top, a plurality of side walls and an open bottom, one of said side walls being detachably mounted on said housing, electrical operating means mounted on said detachable side wall, an optical assembly in said housing comprising optical support means detachably secured to said housing and lamp holder means secured to said support means, and light transmitting cover means removably closing the open bottom of said housing, said electrical operating means being mounted on the outer side of said detachable side wall, said detachable side wall having a bottom portion provided with hinge means turnably engaging said housing for swingable movement of said detachable side wall between an inverted hanging position projecting below said housing for providing access to said electrical operating means and an upright installed position forming a side of said housing with said electrical operating means on the outside thereof.

10. A luminaire as defined in claim 9, said housing being formed with first flange means defining the bottom opening thereof and a second flange means defining a wall opening closed by said detachable side wall, said hinge means during said swingable movement of said detachable side wall engaging said first flange means adjacent said second flange means.

11. A luminaire as defined in claim **10**, and projecting means on said housing for retaining said hinge means in position during said swingable movement.

12. A luminaire as defined in claim **9**, said detachable side wall having door means on the inner side thereof for providing access to said electrical operating means from the interior of said housing.

13. A luminaire comprising, in combination, a housing comprising a top, a plurality of side walls and an open bottom, one of said side walls being detachably mounted on said housing, electrical operating means mounted on said detachable side wall, an optical assembly in said housing comprising optical support means, and a reflector and lamp holder means secured to said optical support means, said optical support means being detachably secured to said housing for movement of said optical assembly as a unit selectively into and out of said housing through the open bottom thereof, and light transmitting cover means removably closing the open bottom of said housing.

14. A luminaire as defined in claim **13**, said optical assembly including refractor means secured to said optical support means for arrangement between a lamp adapted to be held by said lamp holder means and said light transmitting cover means.

15. A luminaire as defined in claim **14**, said refractor means being movably secured to said optical support means for movement away from the lamp to provide access thereto from the bottom of said housing.

* * * * *