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D. E. HUSBY
STREETLIGHTING LUMINAIRE CONTAINING REPLACEABLE
SEALED OPTICAL SYSTEM

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2 Sheets-Sheet 1

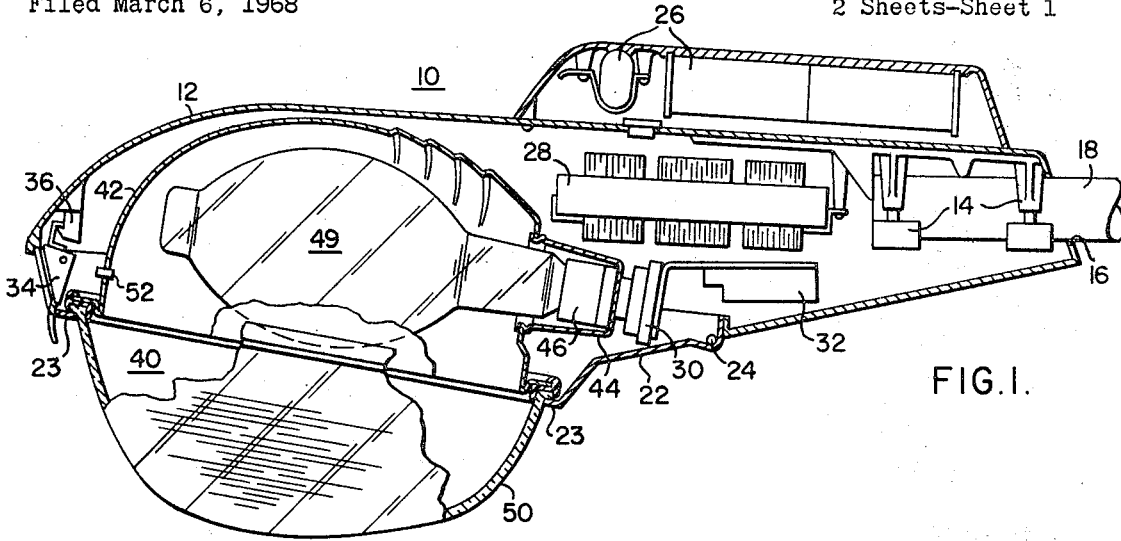


FIG. 1.

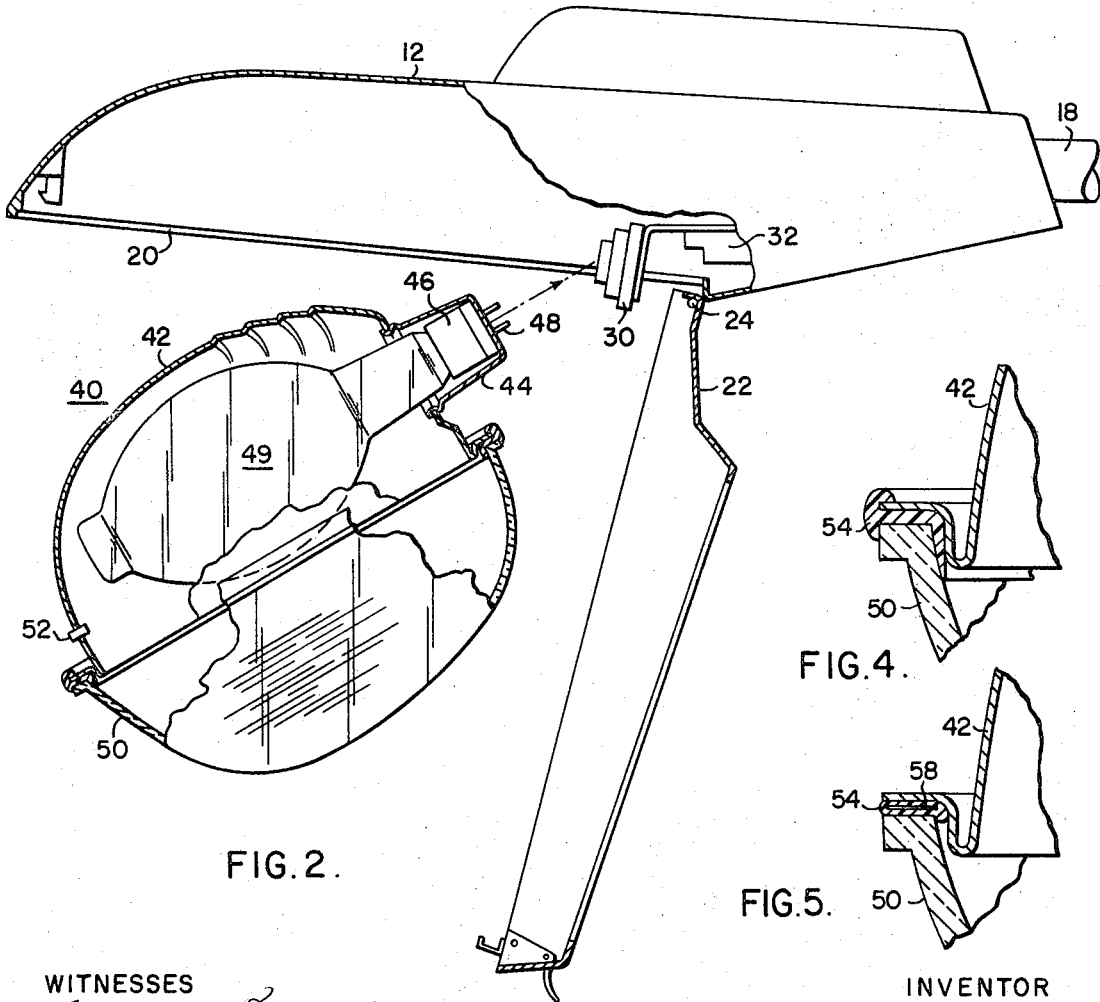
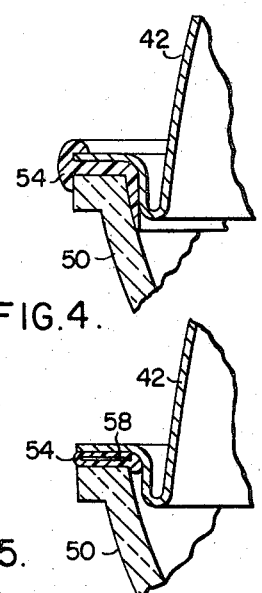


FIG. 2.

FIG. 4.

FIG. 5.



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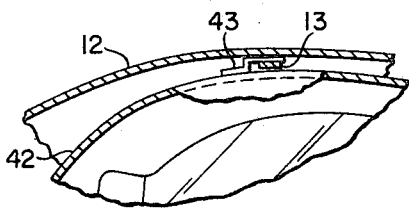


FIG. 3.

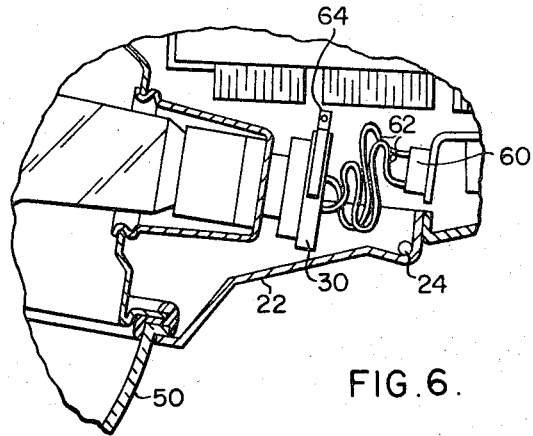


FIG. 6.

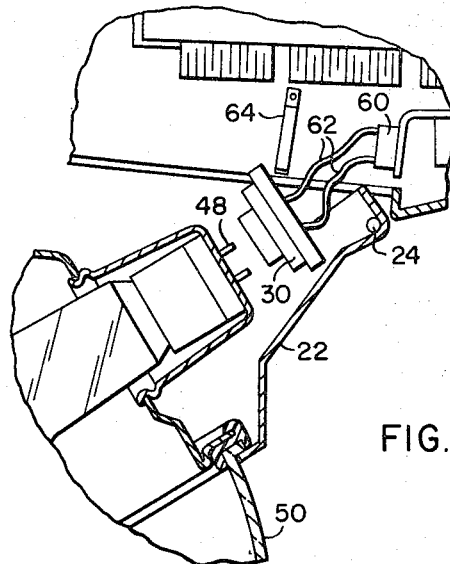


FIG. 7.

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**STREETLIGHTING LUMINAIRE CONTAINING
REPLACEABLE SEALED OPTICAL SYSTEM**

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10 Claims

ABSTRACT OF THE DISCLOSURE

A streetlighting luminaire employing a self-contained, replaceable, sealed optical system in which the reflector and refractor are sealed together to form a hermetically sealed container. Within the container is mounted a lamp socket having male electrical connector blades which extend externally of the sealed container to plug into a female electrical socket fixed with respect to the luminaire housing. A lamp is mounted in the socket and the interior of the container surrounding the lamp may be evacuated or may contain a gas fill with relamping of the luminaire being accomplished by replacing the entire sealed optical system.

BACKGROUND OF THE INVENTION

The necessity for periodically cleaning lighting fixtures used for lighting roadways and parking areas is a continuing maintenance expense for the municipality or other owner of the lighting fixtures. In the past it was sufficient to clean the optical parts of the fixture when the lamp in the fixture burned out and it was necessary to travel to the fixture site to replace the lamp. This of course was a condition which existed at a time when the life of the lamp was much shorter than present day lamps. With the advent of lamps that would last in excess of 4,000 hours it became necessary to periodically clean refractors and reflectors without changing the lamp in order to maintain the lumen output of the lighting fixture. A permanent sealed optical system was of course not practical because of the necessity for periodically relamping the fixture, at the termination of the lamp life. In order to maintain a cleaner interior within the lighting fixture, close fits between refractor and reflector which still permitted access to the interior for relamping were utilized. In these systems when the lamp is energized the air surrounding it will be heated and expand and the close fit will allow air to escape from the interior of the reflector-refractor optical system. When the lamp is then deenergized the reverse occurs and the optical chamber tends to suck in outside air to relieve the created partial vacuum and in doing so drags dust and dirt particles into the interior of the optical chamber which in time reduces significantly the lumen output of the fixture.

Efforts have been made in recent years to provide definite routes for this air motion in order that some filtering agent could be introduced. These fixtures have utilized such means as felt pads, wire and cloth screens, charcoal filters, and labyrinth type rubber gaskets in an attempt to filter out to some extent the dirt and dust which is pulled back into the optical system as the lamp cools down and a differential pressure between the ambient atmosphere and the interior of the optical chamber occurs.

Although this type of lamp "seal" has aided in keeping the optical system clean to some extent, the dramatic increase of lamp life for mercury vapor and fluorescent lamps in recent years require even these type luminaires to be cleaned periodically between lamp changes to assure some semblance of good lumen efficiency maintenance.

With the advent of the long life lamp and the ability

to significantly reduce through manufacturing processes the cost of refractor and reflector parts the totally sealed optical system of the present invention will provide a solution to the maintenance problem in streetlighting and area lighting luminaires.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a replaceable self-contained light generating and distributing assembly for use in streetlighting type luminaires.

Another object of the present invention is to provide a replaceable self-contained sealed optical system for use in a streetlighting type luminaire.

Yet another object of the present invention is to provide a replaceable self-contained light-generating and distributing assembly which includes a hermetically sealed unitized optical system.

Another object of the present invention is to provide a streetlighting luminaire which includes a self-contained sealed optical system wherein a high strength high bond seal connects the refractor and reflector of the optical system.

The above described problems have been solved and the foregoing objects accomplished in accordance with the present invention by providing in a streetlighting luminaire a replaceable self-contained light generating and distributing means which includes a lamp receiving socket having male electrical connector blades extending therefrom, reflector means mounted about the socket with the male electrical connector blades extending exteriorly thereof and refractor means which is sealed hermetically to the reflector means to define a sealed enclosure surrounding a light generating source mounted within the socket and which light generating and distributing assembly is adapted to be removably positioned within a luminaire housing.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing objects along with many of the attendant advantages of the present invention will become more readily apparent and better understood as the following detailed description is considered in connection with the accompanying drawing in which:

FIG. 1 is a sectional view of a streetlighting type luminaire containing the sealed optical system of the present invention;

FIG. 2 is an elevational view of a streetlighting type luminaire with the front portion partly broken away and the sealed optical system of the present invention partially removed;

FIG. 3 is a sectional view of one mechanism for supporting a sealed optical assembly within the luminaire;

FIG. 4 is a sectional view illustrating one form which the seal between the refractor and the reflector may take;

FIG. 5 is a sectional view illustrating yet another form which the seal between the reflector and the refractor may take;

FIG. 6 is a fragmentary sectional view of an alternative method of supporting a sealed optical system within a luminaire housing; and

FIG. 7 is a fragmentary sectional view similar to FIG. 6 with the sealed optical system partially removed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With the advent of the 16,000 hour mercury lamp and an ability to substantially reduce the cost of refractor and reflector parts a throw-away sealed optical system has now become practical. By eliminating the requirement for periodic cleaning of the refractor and reflector in streetlighting and industrial lighting type luminaires a substantial savings may be had by the number of mecha-

nized vehicles required to be owned by the municipality or industry in order to service their lighting fixtures. With a lamp life of 16,000 hours the sealed optical system of the present invention can be placed in a streetlighting fixture and remain untouched for about 4 years whereas with present day systems the reflector and refractor must be cleaned at least about every six months.

Referring now in detail to the drawings wherein like reference characters represent like parts throughout the several views, there is illustrated in FIG. 1 a sectional view of a streetlighting luminaire generally designated 10 which includes a housing 12. The housing 12 has at the rearwardmost end thereof a conventional slip fitter mechanism 14 adjacent an opening 16 for receiving a mast or mounting pole 18. The slip fitter mechanism 14 generally has the facility to both secure the luminaire 10 to the mast or mounting pole 18 and adjustably position or level the luminaire. At the other end of the luminaire housing 12 a light source receiving opening 20 is located which may be partially closed off by a luminaire door frame assembly 22 which is hinged to the remainder of the luminaire housing 12 by a hinge mechanism 24. Also located in the luminaire housing 12 are built-in ballast capacitors 26 and a transformer coil and core 28.

A female type electrical socket 30 may be fixedly positioned within the housing as illustrated at 32 in FIGS. 1 and 2 or may be releasably secured within the housing 12 as will be later described with respect to FIGS. 6 and 7. The luminaire housing 12 further has included therein a latch mechanism 34 attached to the door frame 22 which coacts with a latch member 36 on the housing 12 to securely hold the door frame 22 when the sealed optical system generally designated 40 is in position within the luminaire housing.

The sealed optical system 40 is in the form of a replaceable, self-contained, light generating and distributing assembly and includes a reflector member 42 of preferably generally semi-spherical form and constructed of aluminum. The reflector member 42 includes a neck portion 44 in which is mounted a lamp socket member 46 having male electrical connector blades 48 extending therefrom which are sealed through the end of reflector neck portion 44. A substantially semispherical refractor member 50 is hermetically sealed along its substantially ovate circumferential edge to a complementary circumferential edge of reflector member 42 to thereby define a sealed enclosure with the reflector member 42. Either or both of the reflector and refractor may be designed to produce a predetermined light distribution pattern. For example, the refractor 50 may include conventional flutes and prisms and/or the reflector 42 may have a specific parabolic-elliptical contour, as is known in the art. Prior to the sealing of the reflector member 50 to the reflector member 42 a light source 49 is mounted in electrical socket 46 and is preferably a high pressure mercury vapor lamp. A valve member 52 may be provided in the wall of the reflector member 42 in order to provide for the evacuation of the interior of the sealed enclosure or to permit the interior of the sealed enclosure to be filled with a preselected gaseous atmosphere. Alternatively, or additionally, a preselected pressure can be established either above or below atmospheric through the use of valve member 52.

Referring now in detail to FIGS. 4 and 5 there is illustrated the preferred mechanisms for sealing the refractor member 50 to the reflector member 42 as envisioned by the present invention. The seal between the refractor and the reflector must have a high bond strength, be unaffected by substantial temperature changes and be preferably unaffected by ultraviolet light and other potentially deleterious media. In accordance with the present invention the refractor 50 is sealed to the reflector 42 by means of a silicone rubber sealing composition 54 which is coated between the mating edges of the members in an uncured condition and vulcanized at temperatures of about 300 to 380° F. This vulcanized silicone rubber

seal will be hermetic and will have a seal strength of about 100 pounds per square inch. The silicone rubber composition 54 may alternatively, where the weight of the refractor 50 is not extreme, also comprise a RTV (Room Temperature Vulcanizable) silicone rubber material as, for example, a Silastic such as Dow Chemical #537. The RTV silicone rubber materials have a seal strength of about 40 pounds per square inch but have the advantage that the vulcanization of the refractor to the reflector can be accomplished without a heat treating step thus eliminating the need for a furnace in the assembly process.

An alternative seal is illustrated in FIG. 5 in which an uncured silicone rubber material 54 having fiberglass cloth (bias cut) reinforcement 58 is employed and the sealing compound is again vulcanized between the complementary circumferential edges of the reflector 42 and the refractor 50.

In accordance with the present invention when a luminaire is installed an entire sealed optical system including a refractor 50, reflector 42, lamp socket 46 and light source or discharge lamp 49 is mounted within the luminaire housing by means of male electrical connector blades 48 engaging female electrical socket 30.

Additional support may be provided for the sealed optical system within the luminaire housing in a number of different ways. For example as illustrated in FIG. 1 the door frame 22 may include a ring-like flange 23 which coacts with the flange surface on the circumference of the refractor 50 so that when latch mechanism 34 is connected to latch member 36, flange or ring 23 will help to support the sealed optical system. Alternatively as illustrated in FIG. 3 the top of reflector 42 may include an integrally formed finger 43 which slides into a dependent ring 13 on the underside of luminaire housing 12 as the male connector blades 48 are inserted into the female electrical socket 30.

The sealed optical system 40 may be alternatively mounted within the luminaire housing 12 in the manner illustrated in FIGS. 6 and 7. In the configuration of FIGS. 6 and 7 the female electrical receptacle is connected to a terminal block 60 by means of lengths of electrical wires 62 and there is provided on the interior surface of luminaire housing 12 a spring clip member 64 which is constructed and arranged to securely but releasably clamp the female electrical receptacle in a preselected position within the housing 12. With this construction the male electrical connector blades can be inserted into the female electrical receptacle while the receptacle is outside the housing 12, the entire assembly then placed within the housing 12 and the door frame 22 closed to provide the entire support of the sealed optical system within the luminaire housing by means of ring or flange 23. When it is desired to replace a sealed optical system the door latch 34 is then opened and as the door frame is revolved downwardly the sealed optical system while connected to the female electrical receptacle will swing down with the door frame and can be removed therefrom after the door frame is opened. The electrical disconnect is then made outside the housing and a new sealed optical system installed.

With the sealed optical system of the present invention a streetlighting luminaire can be erected and permitted to operate without cleaning of the optical parts for periods of more than 4 years without the requirement of periodic visitations in order to clean the optical system. Only after a trouble free 4 year period is it necessary to return to the luminaire site to replace the entire sealed optical system and look forward to another 4 years plus of luminaire life without added expense.

An additional feature of the sealed optical system of the present invention is that the entire sealed optical system may be returned to the factory at the conclusion of the lamp life, the sealed optical enclosure opened, the light source replaced with a new lamp, the optical system cleaned and resealed and the sealed optical system thus returned to service.

Since numerous changes may be made in the above described apparatus and different embodiments of the invention may be made without departing from the spirit thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawing, shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A streetlighting luminaire comprising:

an elongated housing having slipfitter means at one end thereof for mounting said luminaire to a luminaire support and a light source receiving opening at the other end thereof;

a female electrical receptacle and ballast means mounted within said housing intermediate said slipfitter means and said light source receiving opening; and

a replaceable, self-contained, light generating and distributing means having male electrical connector blades extending therefrom and connecting said replaceable self-contained light-generated and distributing means to said female electrical receptacle, said self-contained light-generating and distributing means comprising:

a lamp receiving socket having said male electrical connector blades extending therefrom;

reflector means having a substantially ovate peripheral edge mounted about said socket with said male electrical connector blades extending exteriorly thereof;

refractor means having a peripheral edge complementary to the peripheral edge of said reflector means; sealing means hermetically sealing the peripheral edge of said refractor means to said substantially ovate peripheral edge of said reflector means; and

a light generating source mounted within said socket, at least one of said reflector means and said refractor means causing the light from said light generating source to be distributed in a predetermined pattern.

2. A streetlighting luminaire according to claim 1 wherein said sealing means is a vulcanized silicone rubber composition.

3. A streetlighting luminaire according to claim 1 wherein said sealing means is a fiberglass cloth reinforced silicone rubber material.

4. A streetlighting luminaire according to claim 1 wherein said reflector means and said refractor means define a sealed enclosure which sealed enclosure contains a preselected atmosphere in addition to said light generating source.

5. A streetlighting luminaire comprising: housing means having mounting means at one end thereof for mounting said luminaire to a luminaire support and a light source receiving opening at the other end thereof;

electrical receptacle means and ballast means mounted within said housing intermediate said mounting means and said light source receiving opening;

self-contained light generating and distributing means having complementary electrical connector means extending therefrom for connection to said electrical receptacle means, said self-contained light generating and distributing means comprising:

reflector means having a peripheral edge therearound and a lamp socket means therewithin connected to said complementary electrical connector means;

refractor means having a peripheral edge complementary to the peripheral edge of said reflector means; sealing means hermetically sealing the peripheral edge of said refractor means to the peripheral edge of said reflector means; and

a light generating source removably mounted within said lamp socket.

6. A streetlighting luminaire according to claim 5 wherein said sealing means is a silicone rubber composition.

7. A streetlighting luminaire according to claim 5 wherein said sealing means is a silicone rubber composition which is fiberglass cloth reinforced.

8. A streetlighting luminaire according to claim 5 wherein said reflector means and said refractor means define a sealed enclosure which sealed enclosure contains a preselected atmosphere in addition to said light generating source.

9. A luminaire comprising:

elongated housing means having mounting means at one end thereof for affixing said luminaire to a luminaire support and an opening on the underside of said elongated housing means approximate the other end thereof;

closure means hinged to the underside of said housing means and adapted to be retained in its closed position within said opening, said closure means including an ovate opening bounded by a supporting rim;

electrical receptacle means mounted within said housing means intermediate its ends;

self-contained hermetically sealed light-generating and distributing means including a refractor portion and a reflector portion sealed together and surrounding a lamp socket and lamp;

electrical connector means on an end of said light generating and distributing means electrically connecting said lamp socket to said electrical receptacle means; and

a laterally projecting flange on the periphery of said light generating and distributing means, said supporting rim of said closure means constructed and arranged to underlie the projecting flange of said light generating and distributing means to thereby support said light generating and distributing means within said housing.

10. The luminaire as specified in claim 9, wherein the electrical connection between said electrical receptacle means and said electrical connector means is flexible to facilitate removal of said light-generating and distributing means.

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U.S. Cl. X.R.

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