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Riley et al.

[11] **3,780,282**

[45] **Dec. 18, 1973**

[54] **WATERPROOF TAIL AND CLEARANCE LIGHT**

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[52] **U.S. Cl.** **240/8.3,** 240/26, 240/41.5

[51] **Int. Cl.** **B60q 1/30**

[58] **Field of Search** 240/8.3, 41.5, 7.5, 240/26, 2.1

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Assistant Examiner—E. M. Bero

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[57] **ABSTRACT**

A waterproof tail or clearance light assembly comprising: a base member having internal and external surfaces; a lamp assembly secured to the base member internal surface; the lamp assembly including electrical leads extending through the base member to the base external surface; a cap member having a lens, the cap member cooperating with said base member to form a closed receptacle; one of the members including a shoulder portion and a circular sealing portion projecting from the shoulder portion in endwise fashion, the sealing portion having its diameter at the shoulder greater than its diameter at the free end thereof; the sealing portion being provided with O-ring retaining means and an O-ring positioned in the retaining means around the sealing portion; the other of the members being provided with an annular mating portion having an annular rim, the mating portion cooperating with the sealing portion to fit telescopically around the sealing portion and the rim abutting the shoulder portion; and means for securing the cap member to the base member; whereby when the cap member is secured to the base member, the sealing portion cooperates with the mating portion to compress the O-ring thereby rendering the receptacle formed by the base and cap members water tight.

13 Claims, 21 Drawing Figures

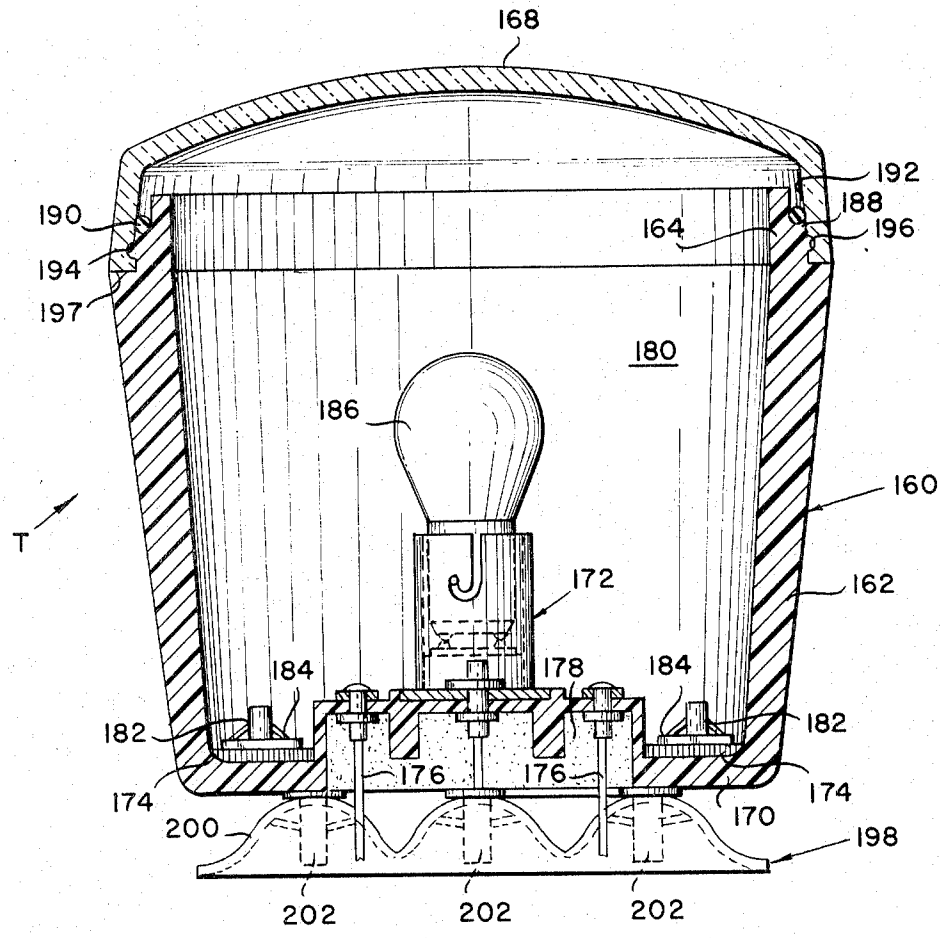


Fig. 1

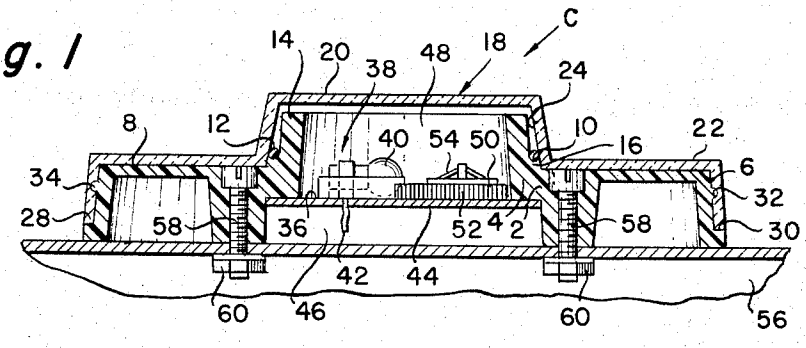


Fig. 2

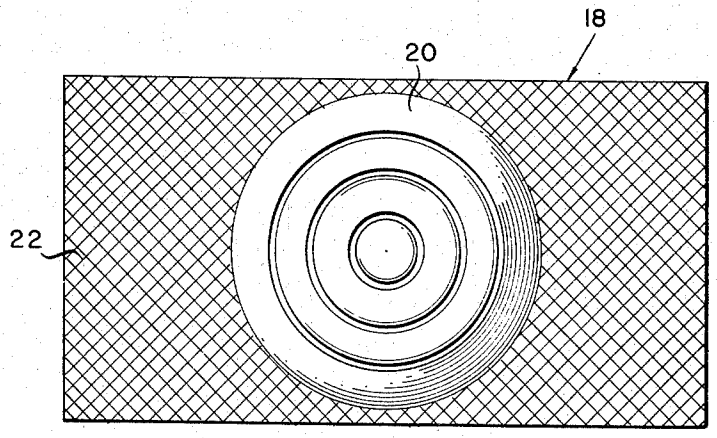
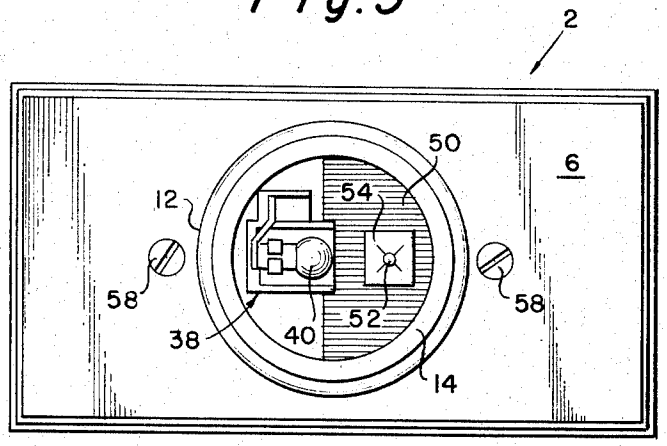


Fig. 3



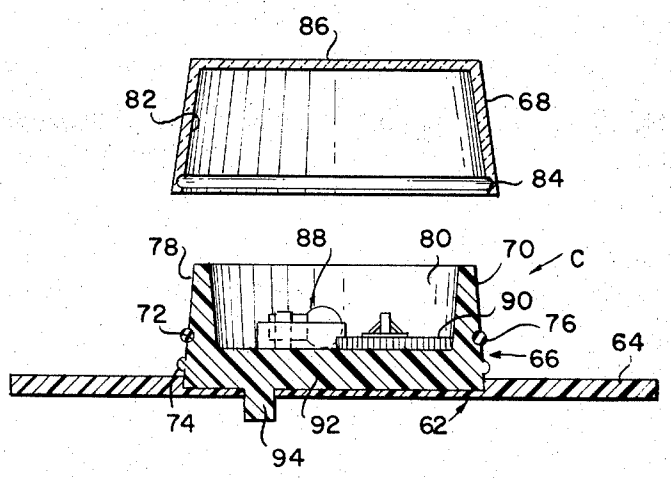


Fig. 4

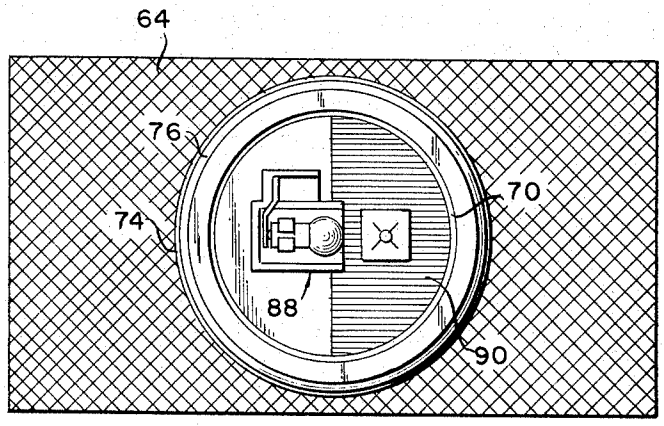


Fig. 4A

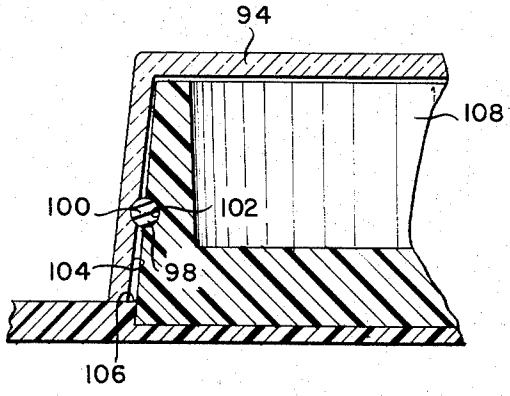


Fig. 5

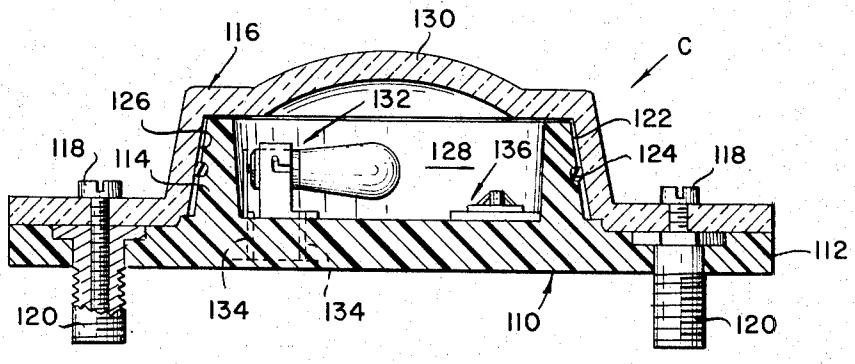

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Fig. 6

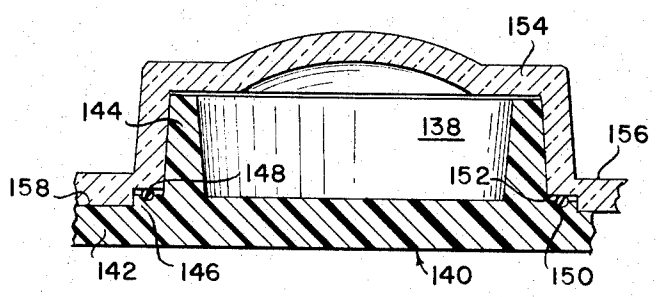

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Fig. 7

Fig. 8

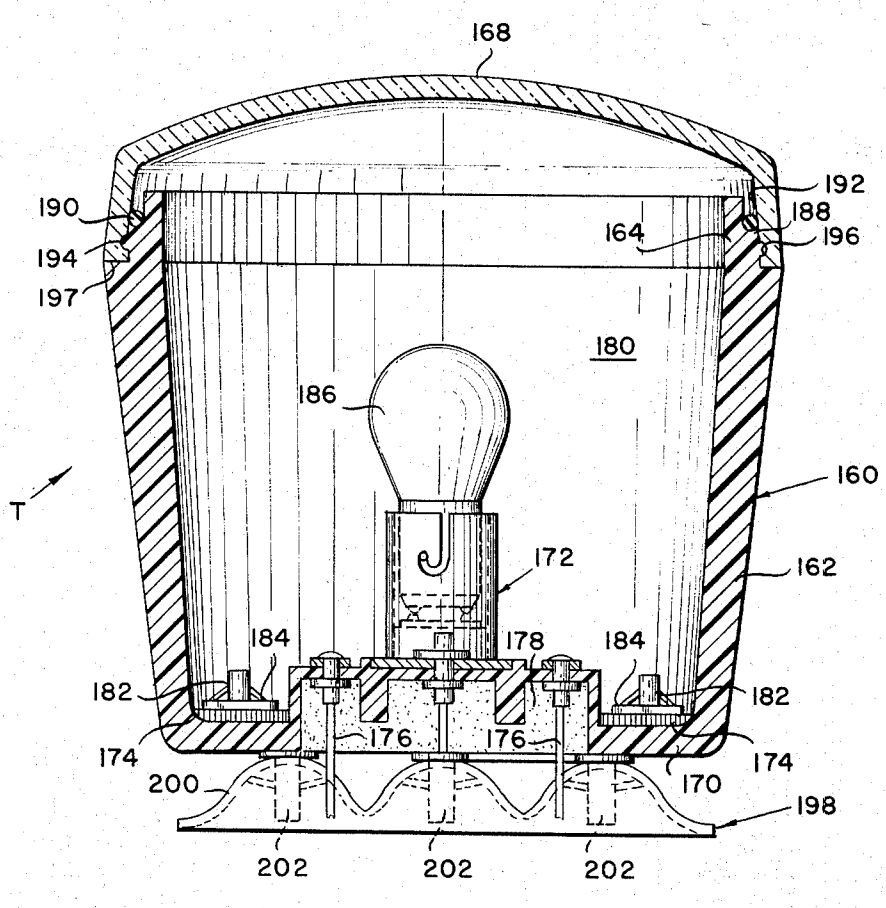
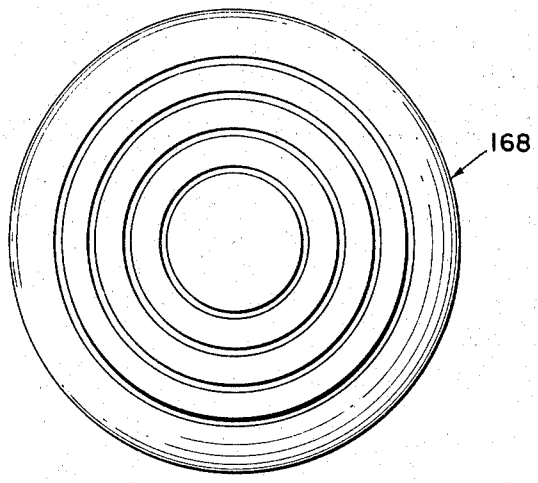

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Fig. 9



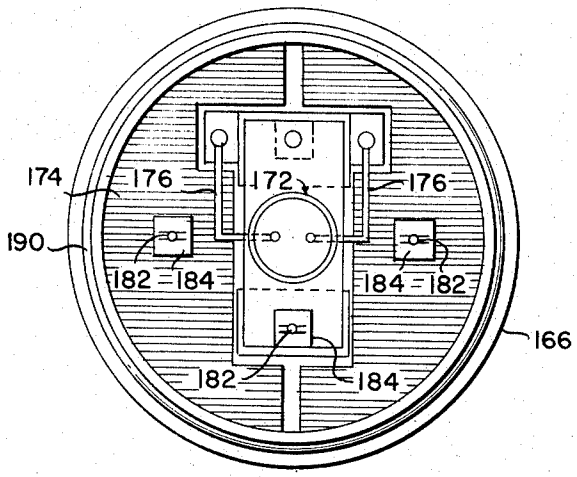


Fig. 10

Fig. 11

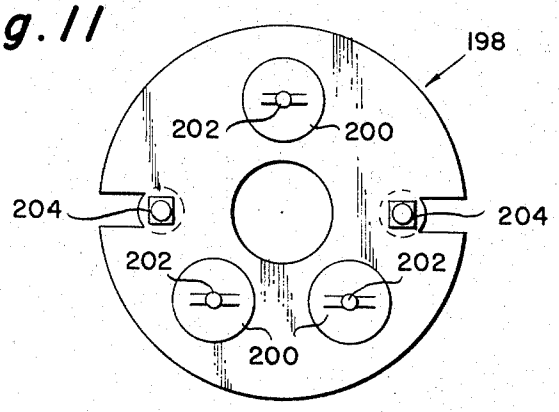


Fig. 12

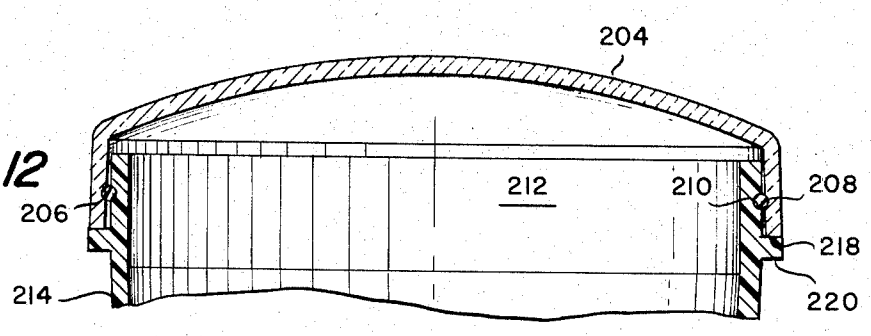


Fig. 13

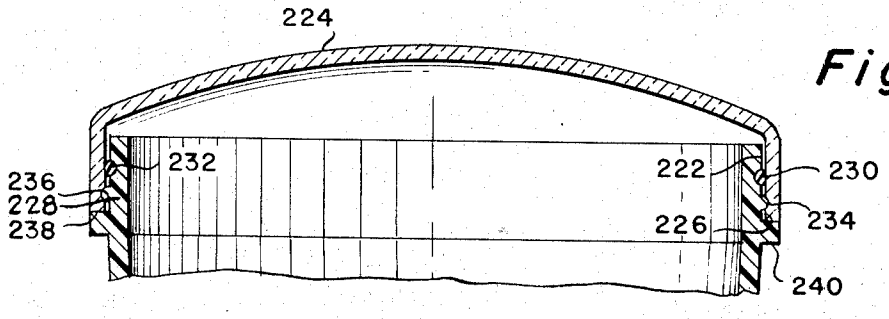


Fig. 13A

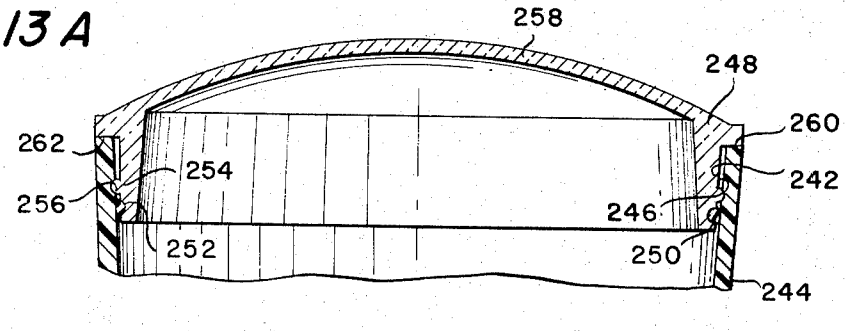
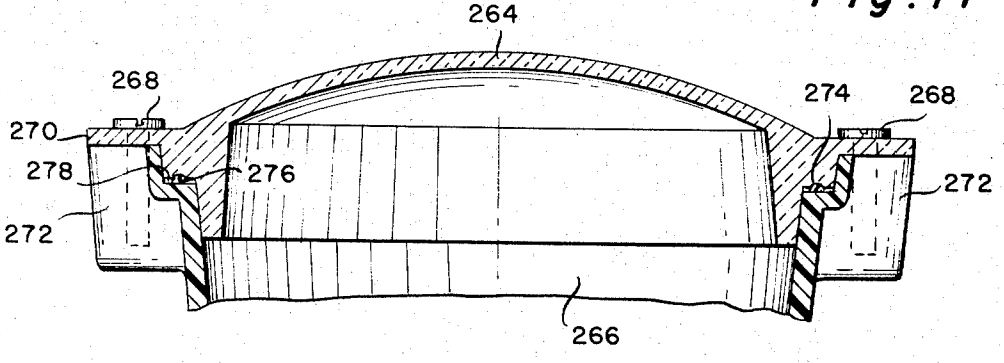


Fig. 14



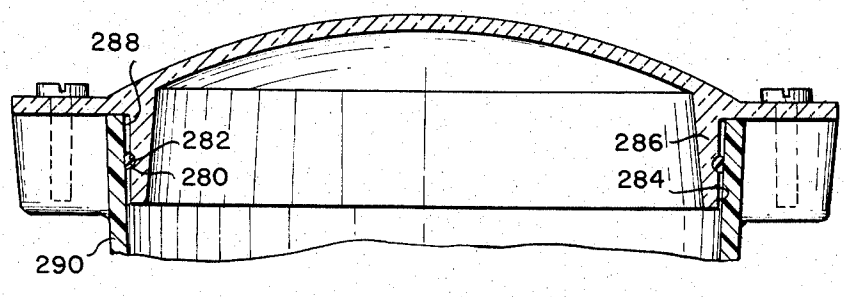

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Fig. 15

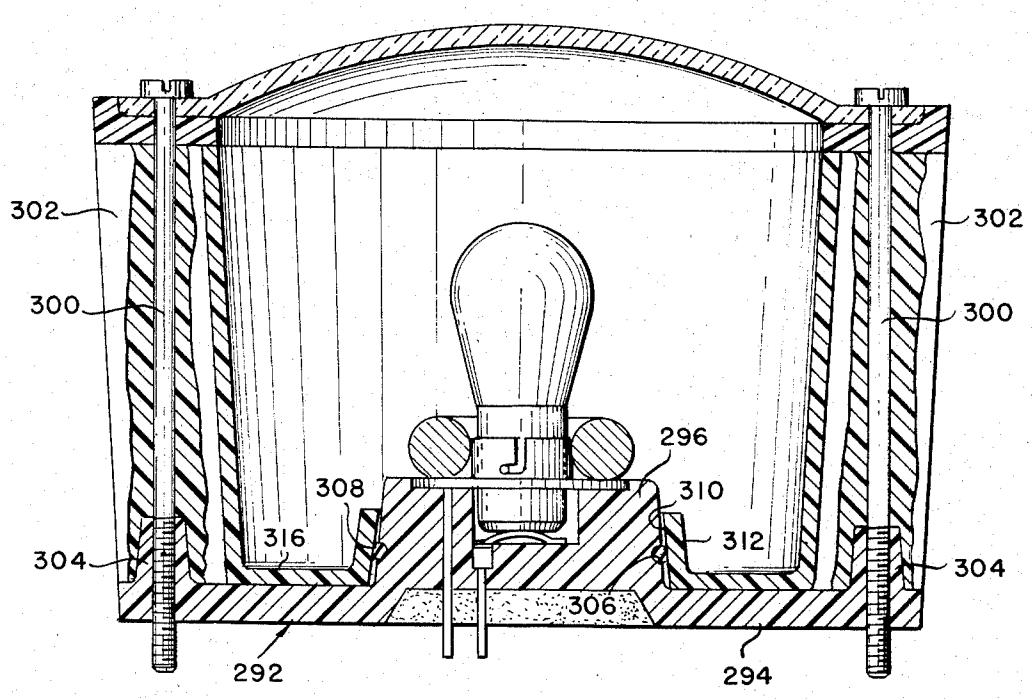

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Fig. 16

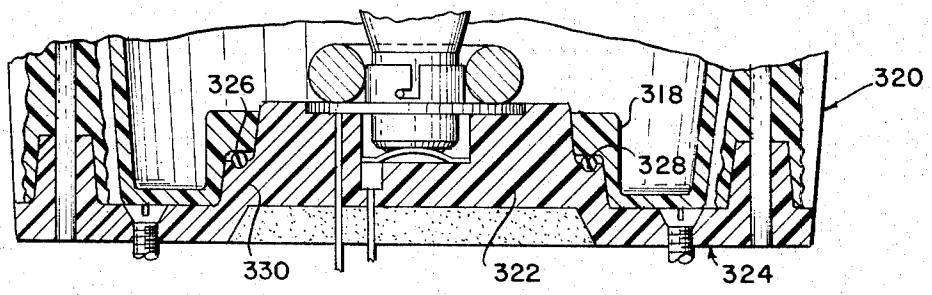


Fig. 17

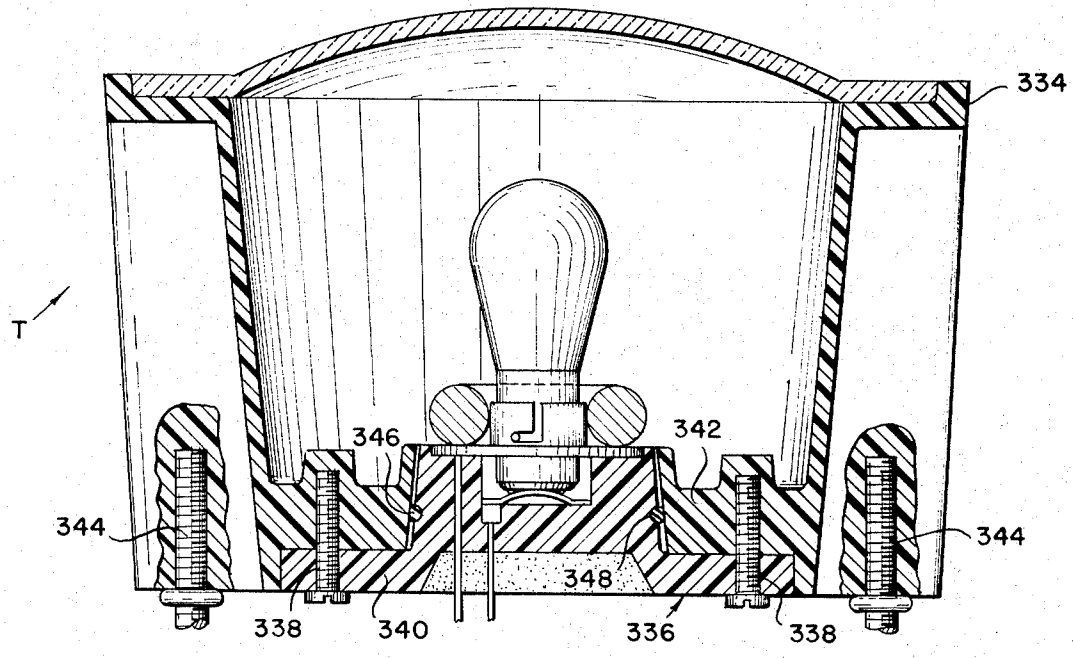
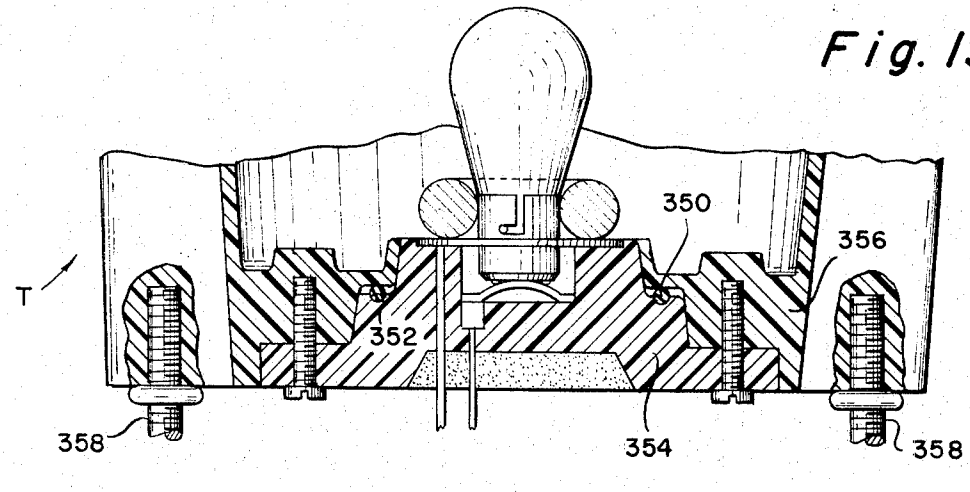


Fig. 18

Fig. 19



WATERPROOF TAIL AND CLEARANCE LIGHT

SUMMARY OF THE INVENTION

This invention relates to an improved waterproof light fixture of the type generally utilized as a tail or clearance light for boat trailers, trucks, etc. The unique construction of this fixture permits its use in extremely moist environments or in instances where complete submersion may occur.

HISTORICAL BACKGROUND AND OBJECTS

When launching a boat from a conventional trailer hitched to an automobile, it is customary practice to back the trailer and boat into the water until the trailer is nearly submerged and the boat is free to float on the surface of the water. Such submersion of the trailer presents a serious problem since the tail and clearance lights of the trailer are necessarily submerged also. It has been found that when vehicle lights have been exposed to an undue amount of moisture or submerged, water may leak inside the housing thereby causing rusting and corrosion or possibly short circuiting of the lamp circuit. Such conditions may easily render the trailer unsafe for towing on public highways.

It is therefore, an object of this invention to provide a tail or clearance light assembly which is waterproof and capable of submersion without the leakage of water to the interior thereof.

Another object of this invention is to provide a tail or clearance light assembly in which easy access to the lamp assembly may be had.

It is a further object of this invention to provide a tail or clearance light in which a desiccant is enclosed with the fixture thereby precluding fogging of the lens should a small amount of moisture be present therein.

A still further object of this invention is to provide a tail or clearance light assembly which is simple in design and easy to manufacture.

Still another object of this invention is to provide a tail or clearance light assembly wherein the interior of the fixture is sealed by an O-ring compressed between mating portions of the assembly.

Yet another object of the invention is to provide a tail or clearance light assembly having tapered mating surfaces thereby resulting in uniform 360° compression of the O-ring seal.

A further object of this invention is to provide a tail or clearance light assembly having a lens and reflector combination which is inexpensive to manufacture and easy to assemble.

A further object of the invention is to provide an O-ring sealed lamp assembly in which undue distortion of the O-ring is eliminated.

A still further object of this invention is to provide a tail or clearance light assembly which is easy to attach to the vehicle body.

These and other objects of this invention will be apparent from the following description and claims.

In the accompanying drawings which illustrate by way of example various embodiments of this invention:

FIG. 1 is an elevation in section of one embodiment of this invention;

FIG. 2 is a top view of the light assembly shown in FIG. 1;

FIG. 3 is a top view of the light assembly shown in FIG. 1 where the lens and reflector has been removed;

FIG. 4 is a partially exploded side elevational view in section of a further modification of this invention;

FIG. 4A is a top view of the light assembly shown in FIG. 4 where the lens has been removed;

FIG. 5 is a fragmentary side elevational view in section of another embodiment of this invention;

FIG. 6 is a side elevational view in section of still another embodiment of this invention;

FIG. 7 is a fragmentary side elevational view in section of a further embodiment of this invention;

FIG. 8 is an elevational view in section of yet another embodiment of this invention;

FIG. 9 is a top view of the light assembly shown in FIG. 8;

FIG. 10 is a top view of the light assembly shown in FIG. 8 where the lens has been removed;

FIG. 11 is a plan view of an attaching base for securing the light assembly shown in FIG. 8 to a planar surface;

FIGS. 12 through 15 are fragmentary elevational views in section of various further embodiments of this invention;

FIGS. 16 and 18 are elevational views in section of still further embodiments of this invention;

FIGS. 17 and 19 are fragmentary elevational views in section of yet further embodiments of this invention.

As shown in the drawings:

FIGS. 1 THROUGH 3

Clearance light C includes a base member 2 which is preferably of one-piece construction and made of a material which can be easily molded such as a suitable plastic or the like. It would not be outside the scope of this invention, however, to use metal or any other material possessing desirable characteristics. Base 2 comprises generally a sealing portion 4 and a flange 6. Sealing portion 4 is annular as shown in FIG. 3 and forms a shoulder 8 with flange 6. Sealing portion 4 is further provided with a circumferential step 10 the upper surface of which may be slightly concave so as to more effectively seat resilient O-ring 12 which is disposed thereon. Both the upper portion 14 of the sealing annulus 4 and that portion 16 which is immediately beneath step 10 tapers slightly inward so as to provide a more effective seal as will be described later.

Cooperating with base 4 is a cap member 18. Cap member 18 is preferably composed of a moldable plastic and includes a lens portion 20 and a reflector portion 22 integral therewith. The lens portion 20 should be transparent or translucent and of a color complying with the legal requirements for signal lights on vehicles. Reflector portion 22 may be made of the same material as lens 20 but treated in a manner so that it will effectively reflect visible light. Cap member 18 fits telescopically over base member 4 and the inner wall 24 of lens 20 cooperates with the outer surfaces of portions 14 and 16 of sealing portion 4 so as to compress resilient O-ring 12 therebetween. The inner surface 24 of lens 20 and the outer surfaces of portions 14 and 16 are tapered to insure that O-ring 12 is compressed uniformly about its periphery when the cap member is inserted on the base 2. A further advantage of the tapered structure of sealing portion 4 is that O-ring 12 is engaged by the inner wall 24 of lens 20 for only a short distance of the travel of lens 20 over sealing portion 4 before sufficient compression of O-ring 12 is accomplished and the cap member 18 is properly seated on base 2. In this manner

any twisting or distortion of O-ring **12** due to the tangential frictional forces created by inner wall **24** sliding over the outer surface of O-ring **12** is maintained at a minimum. Downward movement of cap member **18** onto base **2** is terminated when reflector **22** and rim **28** abut shoulders **8** and **30**, respectively. Cap **18** is retained on base **2** by means of an annular ridge or rib **32** on base **2** cooperating with a recess **34** in cap **18**. As an alternative to the single ridge **32** which encompasses base **2** and the corresponding mating recess **34** in cap **18**, a plurality of spaced protuberances (not shown) on base member **2** may cooperate with a plurality of spaced indentations (not shown) on cap member **18**.

Secured to the inner surface **36** of base member **2** is a standard lamp assembly **38** including a light bulb **40** and leads **42** the latter extending through floor **44** into recess **46**. Leads **42** may be potted with epoxy resin or the like to insure a water tight seal between the closed receptacle **48** formed by the cooperation of cap **18** and sealing portion **4** and recess **46**. Also secured to the floor **44** is a desiccant **50** which may be made of a sheet-like material and retained by an integral stud boss **52**, and a cooperating Tinnerman nut **54**. Desiccant **50** serves to eliminate any sweating of the interior walls of lens **20** and sealing portion **4** caused by the presence of a small amount of moisture within receptacle **48**. The elimination of such sweating substantially decreases the possibility that the lamp assembly may be shorted out or that lens **20** may fail to transmit sufficient light due to the condensed moisture therein. It should be added that while the use of a sheet-like desiccant is preferred in the type of light assembly shown in FIG. **1**, other desiccants such as containerized deactivated clay, $CaCl_2$, Drynite, etc., may be used.

Clearance light C is secured to vehicle body **56** by means of bolts **58** countersunk in flange **6** and cooperating with nuts **60** on the opposite side of vehicle body **56**.

FIGS. 4 THROUGH 7

FIG. **4** illustrates a modified version of the clearance light C shown in FIG. **1**. Clearance light C comprises generally a base member **62** including flange **64** and sealing portion **66**, and a cap member **68**. Sealing portion **66** includes an annular upper portion **70**, a circumferential recess **72** and a circumferential ridge **74**. Disposed within recess **72** is a resilient O-ring **76** which extends slightly beyond the outer surface **78** of sealing portion **66**. The interior **80** of sealing portion **66** is sealed and made water tight by the cooperation of the inner surface **82** of cap member **68** cooperating with the outer surface **78** of sealing portion **66** to compress O-ring **72** therebetween. As was the case in the clearance light shown in FIG. **1**, both the outer surface **78** of sealing portion **66** and the inner surface **82** of the cap member **68** are tapered so as to provide a uniform seal and maintain the distortion of O-ring **72** at a minimum. Cap member **68** is secured to sealing portion **66** by means of ridge **74** cooperating with recess **84** in snap acting fashion.

Cap member **68** is preferably made of a plastic having resilient characteristics to permit recess **84** to engage ridge **74**. Furthermore, the upper portion **86** of cap member **68** should be translucent so as to permitt the transmission of light of the desired wave length. Portion **86** may further be grooved or shaped so as to refract the light which passes therethrough.

Flange **64** may be manufactured separately from sealing portion **66** and preferably made so that it will reflect visible light.

Disposed within the interior **80** of sealing portion **66** are the lamp assembly **88** and desiccant **90** as described in conjunction with FIG. **1**. The clearance light shown in FIG. **4** may be secured to a vehicle body (not shown) by any number of means such as a bolt (not shown) passing from the interior **80** of sealing portion **66** through floor **92** and reflector **64**. Index stud **94** may cooperate with an appropriate aperture in the vehicle body (not shown) to properly position clearance light C thereon.

FIG. **5** illustrates a structural modification of the clearance light shown in FIG. **4** whereby the cap member **94** is secured to sealing portion **96** by means of O-ring **98**. In this modification, the ridge **74** employed in the embodiment shown in FIG. **4** to retain cap member **68** has been eliminated and cap member **94** has been provided with a recess **100** at a position opposite recess **102** when rim **104** abuts shoulder **106**. O-ring **102** is compressed slightly between the surfaces of recesses **100** and **102** to seal the interior **108** of sealing portion **96** from the ambient as in the previous examples. O-ring **98**, however, serves a second purpose in that it frictionally retains cap **94** in sealing position by contact with the surface of recess **100**.

In FIG. **6**, clearance light C comprises a base member **110** including a flange **112** and a sealing portion **114** extending therefrom and a cap member **116** telescopically fitting over sealing portion **114** and secured to base **110** by means of bolts **118** threadedly engaging the internal threads of bolts **120**. Bolts **120** are countersunk in flange **112** and serve to fasten the entire assembly to a vehicle body (not shown).

Sealing portion **14** is annular and the outer surfaces **122** thereof are generally frusto-conical in shape. The outer surface **122** of sealing portion **114** has a circumferential recess **124** therein and a resilient O-ring **126** is positioned in recess **124** and cooperates with the inner surface **126** of cap **116** to seal the closed receptacle **128** from the ambient as previously described.

As was the case with the light assembly shown in the previous figures, the upper portion **130** of cap member **116** should be translucent and is preferably shaped to function as a lens. Lamp assembly **132**, leads **134** and desiccant assembly **136** are of the type previously described.

FIG. **7** illustrates another way of sealing closed receptacle **138** from the ambient. Base **140** comprises a flange **142** and a circular sealing portion **144** extending therefrom and having a circumferential step **146** therein. Step **146** may have a recess **148** therein to retain O-ring **150**. The surface of recess **148** cooperates with surface **152** of cap **154** to compress O-ring **150** therebetween and rim portion **156** of cap **154** abuts shoulder **158**.

FIGS. 8 THROUGH 11

The light assembly shown in FIG. **8** is of a design most suitable for use as a tail light. Tail light T comprises a base member **160** including a reflecting receptacle **162** and a sealing portion **164** extending therefrom forming shoulder **166**, and a cap member **168** made of translucent material.

Receptacle **162** includes floor **170** to which lamp assembly **172** and desiccant **174** are attached. Electrical

leads 176 pass through floor 170 into recess 178 and are potted by means of epoxy resin or the like to provide sealing of the interior 180 of receptacle 162. Desiccant 174 is preferably made of sheet-like material and secured to floor 170 by means of studs 182 and Tinnerman nuts 184 as previously described. Receptacle 162 is preferably flared so as to best reflect the light generated by bulb 186 through translucent cap member or lens 168.

Sealing the interior 180 of receptacle 162 at the cap-receptacle joint is achieved in a manner similar to that as described in conjunction with FIG. 1. Sealing portion 164 has a circumferential step 188 therein which supports O-ring 190. The outer surface of sealing portion 164 cooperates with the inner wall 192 of cap member 168 to compress O-ring 190 therebetween. Both the outer surface of sealing portion 164 and the inner wall 192 of cap 168 are tapered inward slightly so as to assure a good seal. Ridge 194 cooperates with recess 196 in snap-acting fashion to retain cap 168 on base 160. Cap rim 197 cooperates with shoulder 166 to limit the downward motion of cap 168 on sealing portion 164 thereby preventing ridge 194 from breaking should cap 168 sustain undue downward force.

Tail light T may be attached to a vehicle body (not shown) by means of metal base 198 secured to base 160 by means of integral Tinnerman nut 200, formed by stamping or the like, cooperating with stud bosses 202 which may be integral with floor 170. Base 198 may then be secured to the vehicle body (not shown) by means of bolts 204.

FIGS. 12 THROUGH 15

FIGS. 12 through 15 show various methods for both sealing a tail light assembly of the type shown in FIG. 8 and retaining the cap member to the base member.

In FIG. 12, cap or lens 204 has a recess 206 therein which cooperates with O-ring 208 seated in recess 210 to both seal the interior 212 of receptacle 214 and secure cap 204 to sealing portion 216. As previously described, the surfaces of recess 206 and 210 compress and frictionally engage the outer surface of O-ring 208. Rim 218 abuts shoulder 220 thereby limiting downward motion of cap 204 onto receptacle 214.

In FIG. 13, the inner surface 222 of cap 224 cooperates with the outer surface 226 of sealing portion 228 to compress O-ring 230 which is seated in recess 232. Ridge 234 cooperates with recess 236 in snap-acting fashion to retain cap 224 about sealing portion 228. Rim 238 abuts shoulder 240 to limit the downward motion of cap 224 which may cause ridge 234 to break.

FIG. 13A illustrates a design which is essentially the converse of that shown in FIG. 13. Inner surface 242 of receptacle 244 cooperates with the outer surface 246 of sealing portion 248 to compress O-ring 250 which is seated in recess 252. Ridge 254 on sealing portion 248 cooperates in snap-acting fashion with recess 256 in receptacle 244 to retain cap 258 on receptacle 244. Rim 260 cooperates with shoulder 262 to prevent cap 258 from being forced within receptacle 244 should it sustain undue downward force. An obvious modification of the assembly shown in FIG. 13A would be to provide surfaces 242 and 246 with matching recesses as in FIG. 13 thereby eliminating the need for ridge 254.

In FIG. 14, lens or cap 264 is secured to receptacle 266 by means of bolts 268 passing through ears 270 and threadedly engaging receptacle ears 272. O-ring 274, which is seated in recess 276, is compressed between the surfaces of recess 276 and shoulder 278.

The light assembly shown in FIG. 15 is similar to that shown in FIG. 14 with the exception that O-ring 280 is retained in recess 282 on the tapered surface 284 of sealing portion 286. Tapered inner surface 288 of receptacle 290 cooperates with the surface of recess 282 to compress O-ring 280.

It should be noted that the sealing portion outer surfaces and receptacle inner surfaces which cooperate to compress the O-ring in the embodiments of FIGS. 12, 13, 13A and 15 are tapered so as to achieve a uniform compression of the O-ring and prevent any unnecessary distortion thereof.

In the embodiments shown in FIGS. 1, 4, 5, 6, 8, 12, 13, 13A, 15, 16 and 18, it is preferable that the sealing portion outer surfaces taper more gradually than the corresponding mating portion inner surfaces so that the O-ring does not reach maximum compression until the cap member is fully seated. Such a disparity in taper is illustrated in the appropriate drawings.

FIGS. 16 THROUGH 19

In FIG. 16, tail light T comprises a base 292 including a flange 294 and a frusto-conical sealing portion 296 extending therefrom, and a cap member 298 secured to base 294 by means of bolts 300 passing through ears 302 and threadedly secured to internally threaded studs 304. Sealing portion 296 has a circumferential recess 306 which retains a resilient O-ring 308. The inner surface 310 of annular mating portion 312 cooperates with the surface of recess 306 to compress O-ring 308 therebetween. Both inner surface 310 and the outer surface 314 of sealing portion 296 are preferably tapered with sealing portion 296 tapering more gradually than mating portion 312 so that O-ring 308 reaches maximum compression when rim 316 abuts flange 294 and the cap is properly seated.

The embodiment shown in FIG. 17 is similar to that shown in FIG. 16 except for the interface between mating portion 318 of cap 320 and sealing portion 322 of base 324. In this instance, O-ring 326 is seated in a recess 328 in step 330 and compressed between lower surface 332 of mating portion 318 and the concave surface of recess 328.

FIG. 18 illustrates a tail light assembly basically similar to those shown in FIGS. 16 and 17 but where cap 334 is secured to base 336 by means of bolts 338 passing through flange 340 and threadedly secured within mating portion 342. The entire assembly T is secured to a vehicle (not shown) by means of double threaded bolts 344. As was the case in the embodiments shown in FIG. 16, O-ring 346 is retained in recess 348 and is compressed by mating portion 342.

The embodiment illustrated in FIG. 19 is basically similar to that shown in FIG. 17 with O-ring 350 retained in recess 352 and compressed between sealing portion 354 and mating portion 357. Double threaded bolts 358 provide means for securing the assembly T to a vehicle body (not shown) as described in conjunction with FIG. 18.

While this invention has been described with particular reference to specific embodiments, it will be understood that it is capable of further modifications. This application is, therefore, intended to cover any variations, uses, or adaptations of this invention following in

general the principles of this invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains, and as may be applied to the essential features hereinbefore set forth and as fall within the scope of this invention or the limits of the appended claims.

What is claimed is:

1. A waterproof tail or clearance light assembly comprising:

a. a base having internal and external surfaces,

b. a lamp assembly secured to said base internal surface, said lamp assembly including electrical leads extending through said base to said base external surface,

c. a cup-like cap cooperating with said base to form a closed receptacle,

d. said base including a shoulder having an upper surface and further including an annular skirt projecting upwardly from said shoulder,

e. said base skirt having an external surface and a free end opposite said shoulder,

f. said base skirt external surface being provided with an annular rib circumscribing said base skirt and being spaced a short distance from said shoulder,

g. said base skirt external surface being further provided with an annular recess circumscribing said base skirt and being spaced from said rib at a position intermediate between said rib and said free end, and

h. an O-ring positioned in said recess,

i. said cap comprising a lens portion and an annular skirt extending from said lens portion and being in mating cooperation with said base skirt,

j. said lens skirt being at least equal in height to the height of said base skirt,

k. said lens skirt having an internal surface being slightly flared outwardly, an edge opposite said lens and an annular recess in said lens skirt internal surface adapted to engage said rib,

l. a portion of said O-ring projecting outwardly from said base skirt and being in sealing contact with said lens skirt internal surface,

m. said lens skirt edge abutting said shoulder upper surface,

n. whereby when said cap is secured to said base, said lens skirt internal surface cooperates with said base skirt external surface to compress said O-ring and render said receptacle formed by said cap and said base watertight.

2. A light assembly as in claim **1** and wherein:

a said base skirt includes an annular shoulder circumscribing said skirt,

b said recess is positioned on said last mentioned shoulder,

3. A light assembly as in claim **1** and wherein said base includes a light reflective flange.

4. A light assembly as in claim **1** and wherein said base skirt external surface is tapered.

5. A light assembly as in claim **1** and wherein:

a said lamp assembly is disposed within said base skirt.

6. A light assembly as in claim **1** and including:

a attachment means for securing said light assembly to a planar surface.

7. A light assembly as in claim **6** and wherein said attachment means includes:

a studs extending from said base external surface, and

b nut means for frictionally engaging said studs.

8. A light assembly as in claim **1** and including:

a a desiccant material secured to said base internal surface and disposed within said receptacle.

9. A light assembly as in claim **8** and wherein:

a said desiccant material is sheet-like.

10. A light assembly as in claim **9** and wherein:

a said desiccant material is secured to said base by means of studs projecting from said base internal surface.

11. A light assembly as in claim **1** and wherein:

a said base member includes a wall forming a cup shaped reflecting receptacle.

12. A light assembly as in claim **11** and wherein:

a said wall is flared.

13. A light assembly as in claim **1** and wherein:

a said base external surface is provided with a recess.

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