

March 10, 1964

O. W. SCHOTZ
PORTABLE LAMP

3,124,306

Filed Sept. 28, 1960

3 Sheets-Sheet 1

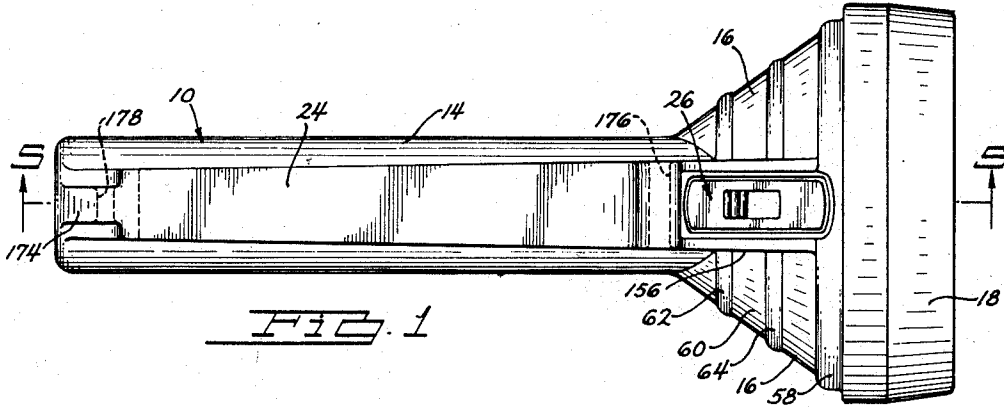


FIG. 1

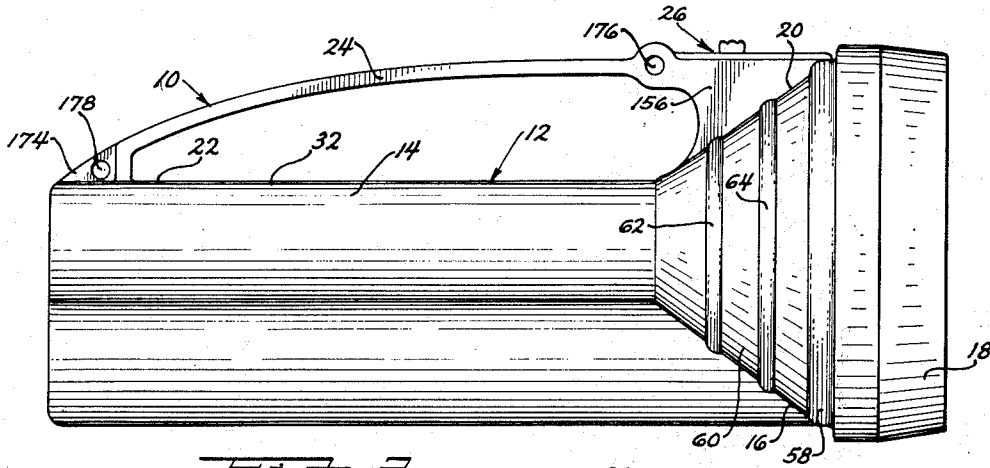


FIG. 2

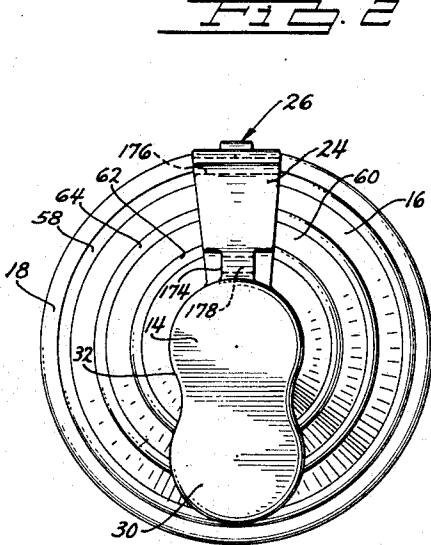


FIG. 3

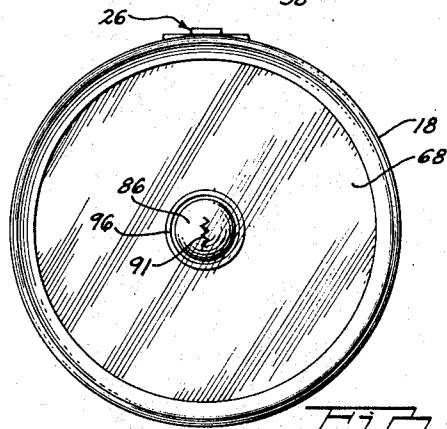


FIG. 4

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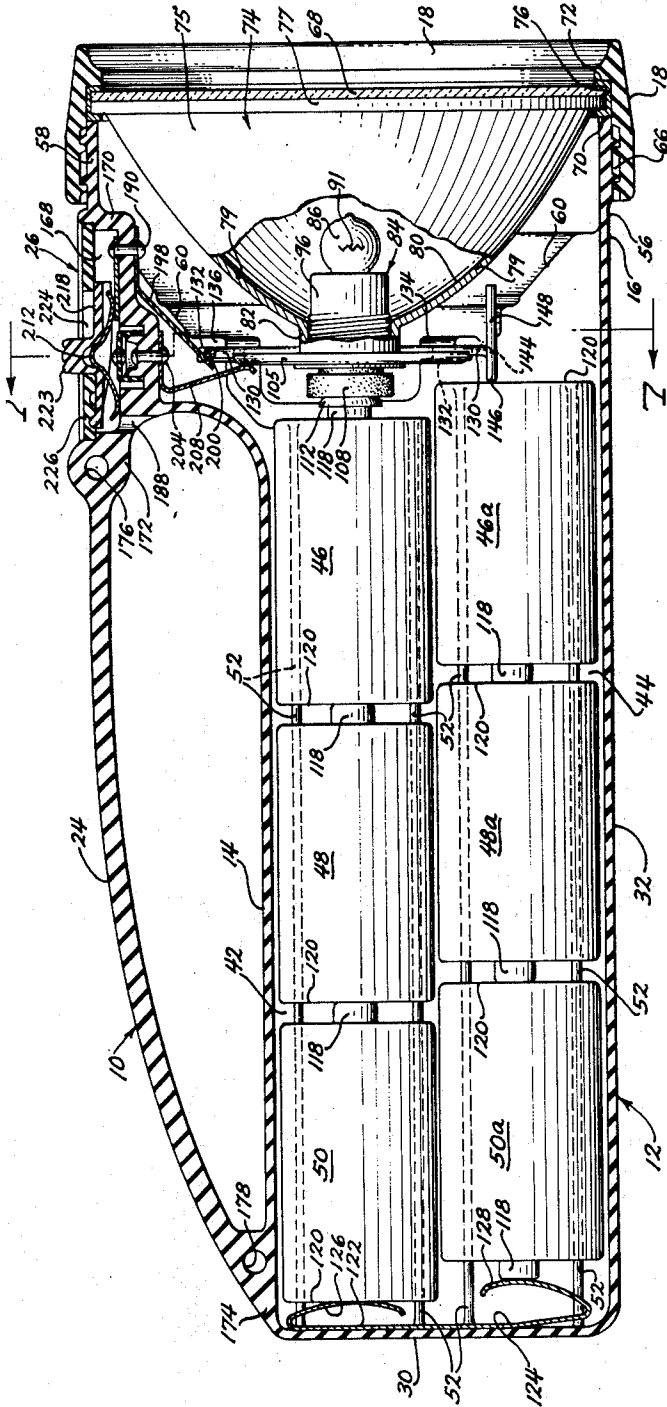
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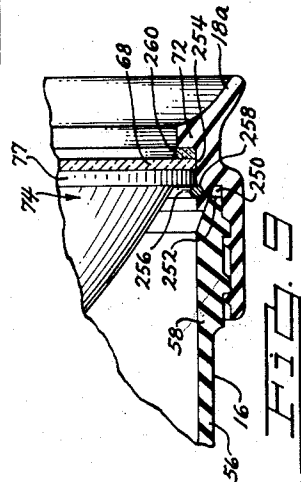
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HIG. 5



HIG. 6

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3,124,306

Filed Sept. 28, 1960

3 Sheets-Sheet 3

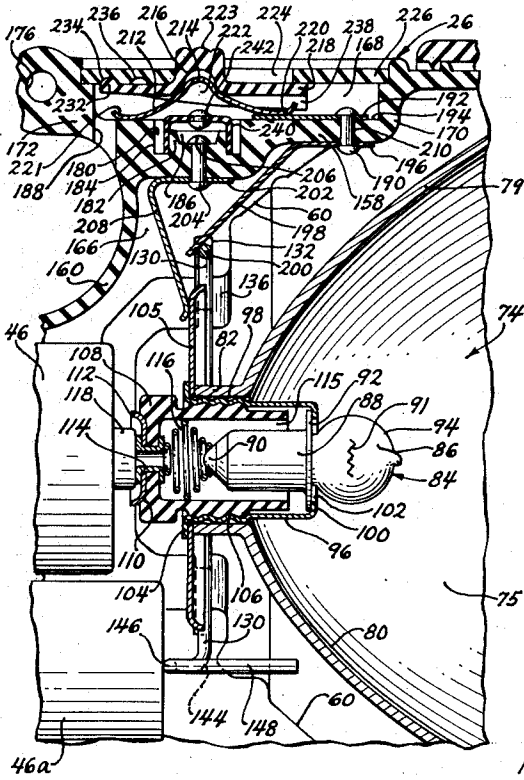


FIG. 6

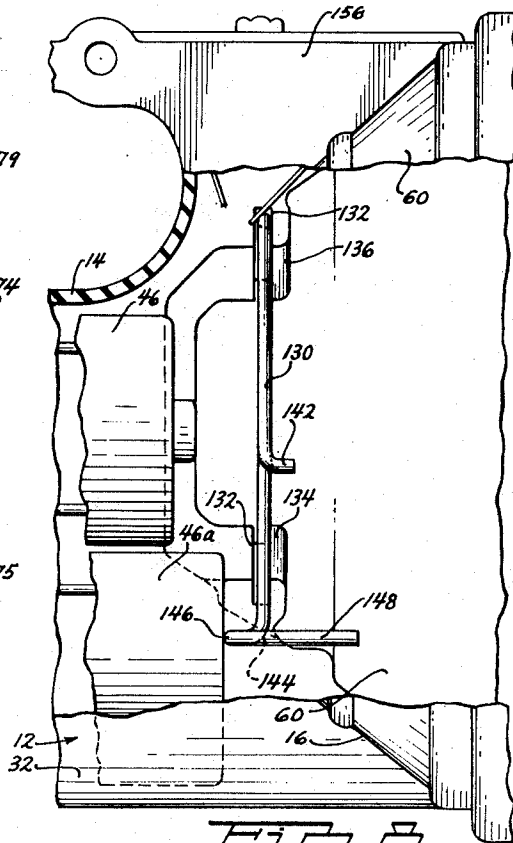


FIG. 8

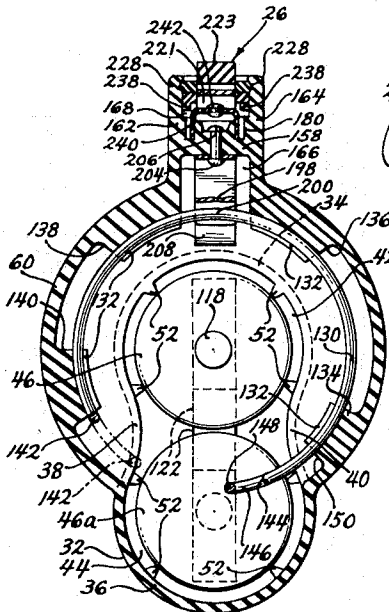


FIG. 7

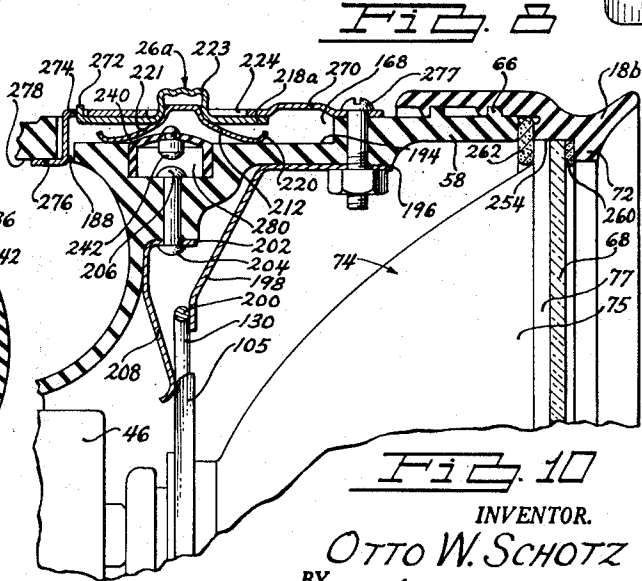


FIG. 10

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3,124,306

PORTABLE LAMP

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Filed Sept. 28, 1960, Ser. No. 58,989

18 Claims. (Cl. 240—10.63)

This invention relates to a battery-type hand lamp of the kind in which a small incandescent electric bulb and a plurality of batteries are mounted in a casing together with a suitable switch mechanism for controlling the flow of current from the batteries through the bulb. It is especially concerned with a portable lamp of this character usable by skin divers and the like for underwater operations.

An object of the invention is to provide a portable hand lamp operable under water at substantial depths without taking in water.

Another object is to provide a hand lamp as in the preceding object in which the casing is comprised of a resilient, shock resistant, electrically non-conductive synthetic plastic material having sufficiently rigidity without the use of built-in stiffeners to inhibit collapsing when subjected to substantial external water pressures.

Still another object is to provide a hand lamp as in the preceding objects wherein the batteries are so arranged as to provide a rigid core for the casing during use to further resist collapse of the wall portion thereof.

A particular object is to provide a portable hand lamp comprising a casing including a hollow elongated shank portion and an outwardly flaring integrally connecting hollow head portion, said shank portion being closed at its end remote from said head portion and composed of intersecting wall sections of generally circular contour simulating in section the external contour of a figure 8 and defining a pair of parallel elongated battery receiving wells for receiving columns of batteries, and said head portion being open at its end remote from said shank portion and composed of a threaded cylindrical wall section for receiving a lens and reflector retaining ring and a generally conical wall section connecting the cylindrical wall section with the wall of the shank portion, the longitudinal axis of said head portion being substantially co-axial with the axis of one of said wells.

Another object is to provide a portable lamp comprising a casing including twin longitudinally extending battery wells, one of which terminates in an enlarged head portion for supporting a lens, reflector and bulb assembly, a carrying handle connecting said head portion of said casing and the opposite end of said casing and switch mechanism in said head portion adjacent said connecting portion.

An additional object is to provide a portable lamp comprising a casing of plastic insulation material, a bulb assembly including a bulb and first and second contact members in circuit with the filament of said bulb, said first contact member being engageable with one pole of a battery circuit, a battery retaining ring releasably mounted in said casing and having first and second electrical contact portions, said first ring contact portion being engageable with the other pole of a battery circuit and switch means for controlling closing of the battery circuit through said filament comprising a first resilient contact means fixed to said casing and in releaseable electrical contact with said second contact member, a second resilient contact means fixed to said casing and in releaseable electrical contact with said second contact portion of said ring, a movable circuit maker, and a circuit maker link, said circuit maker being in electrical circuit with said second contact means and operable upon said link to establish electrical contact between said first contact means and this circuit maker to thereby establish an electrical circuit through said filament.

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A specific object is to provide a portable lamp as in the preceding object wherein said switch circuit making link is mounted on a flexible cap of resilient insulation material.

A further specific object is to provide a portable lamp casing mounted switch mechanism comprising first and second casing mounted contact means in part within said casing and adapted to establish a bulb filament circuit, a resiliently slidable circuit maker in circuit with said first contact means during all positions of this circuit maker, and a resiliently supported movable circuit link member operable by said slidable circuit maker to establish a circuit between this maker and said second contact means.

An additional object is to provide a portable lamp including a casing having twin battery wells for receiving parallel columns of batteries, a resilient circuit member bridging the batteries of said wells for circuit connecting the columns of batteries, a removable spring ring arranged transversely and circumferentially of said casing and supported at a plurality of points circumferentially thereof on the wall of said casing, one end of said ring arranged to abut against one of said columns of batteries and a switch mechanism comprising a fixed contact member resiliently in contact with another portion of said spring ring.

Still another object is to provide a portable flashlight comprising a casing having a battery-receiving well, a resilient ring-like member mounted in the wall of said casing adjacent one end of said battery well and movable circumferentially of said casing, said member having an open sector and one end of said ring-like member being offset from the general plane thereof, said ring-like member being movable to position said offset end thereof over said well and in abutment with a battery in said well and being movable to position said open sector over said well and said offset end clear of said well whereby a battery may be removed from said well past said ring-like member without removing said member from said casing.

A still further object is to provide a switch mechanism comprising a casing, first and second contact means secured to a wall of said casing, a slidable circuit maker having opposite resilient fingers arranged in an inverted V relationship, one of said fingers being in circuit with said first contact means in all positions of said circuit maker, an operator for said circuit maker slidable therewith, a guide member holding said circuit maker and operator in resilient biasing relationship with said wall of said casing and facilitating movement of said operator both normal to and longitudinally of said wall of said casing, and a resiliently mounted circuit maker link movable substantially normal to said wall of said casing into circuit with said second contact means by said circuit maker, said operator having an off, on and an intermediate flash position, said operator in said off position, positioning said contact maker to have its said fingers straddling and out of contact with said circuit maker link and said operator being operable in this position in a direction normal to said casing wall without causing said circuit maker to move said link into circuit making relationship with said second contact means, said operator in said "on" position thereof conditioning the other of said contact maker fingers to hold said link in circuit making relationship with said second contact means and said operator in said "flash" position conditioning said circuit maker with its said other contact finger in closer proximity to said link but spaced therefrom and being operable in this position in a direction toward said casing wall to resiliently bias said other finger into abutment with said link and the latter into circuit making relationship with said second contact means.

Other objects and advantages of the invention will be apparent from the following description and from the drawings wherein:

FIGURE 1 is a plan view of the exterior of the portable

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lamp of the invention showing the novel relationship of carrying member and switch mechanism in relation to the head and shank of the lamp;

FIGURE 2 is a side elevational view of the lamp of FIGURE 1;

FIGURE 3 is an elevational view looking at the left end of the lamp of FIGURE 2;

FIGURE 4 is an elevational view looking at the right or head end of the lamp of FIGURE 2 and showing the bulb centrally thereof;

FIGURE 5 is a sectional elevational view of the invention taken at 5—5 of FIGURE 1;

FIGURE 6 is an enlarged sectional elevational view of the bulb assembly and switch mechanism of FIGURE 5;

FIGURE 7 is a transverse sectional elevational view of the lamp structure of FIGURES 5 and 6 taken at 7—7 of FIGURE 5;

FIGURE 8 is an elevational view of the head end of the lamp of FIGURES 2 and 6 with portions broken away and the reflector and bulb assembly omitted to show the novel battery retaining and circuit making spring ring arrangement of the invention;

FIGURE 9 is a sectional elevation of a portion of the head end of the lamp of FIGURE 5 showing a modification of the lens and reflector retaining ring structure of FIGURE 5; and

FIGURE 10 is an enlarged sectional elevation of a portion of the structure of FIGURES 5 and 7 showing a modification of the switch mechanism of FIGURE 5.

Referring now to the various figures of the accompanying drawings especially FIGURES 1 to 7 wherein similar numerals are used to identify corresponding parts of the structure, the numeral 10 generally indicates a portable underwater lamp structure made in accordance with the invention and which broadly includes an elongated hollow casing 12 of electricity insulating and waterproof material which casing comprises an elongated shank portion 14, and an enlarged head portion 16 to which is secured a releasable ring 18. Preferably integrally connecting a top portion 20 of the head portion of the casing and a top portion 22 of the rearward end of the shank of the casing is a carrying handle or strap generally indicated by the numeral 24, and positioned in the interconnecting portions of the casing and strap is a switch mechanism generally designated by the numeral 26.

Since the lamp is particularly intended for underwater use for instance by skin divers, it is essential that the casing not only avoid electrical shorting but be capable of withstanding substantial external water pressure and shock tending to collapse the casing inwardly against the inherent rigidity of the casing material as supported by such internal pressure usually atmospheric pressure within the casing. It has been discovered that a rigid type polyethylene synthetic plastic, also known as a linear polyethylene plastic, is especially suited for this purpose and in fact suitable for making an integral molding of the entire casing and carrying handle.

As best seen in FIGURES 2, 3, 5, and 7, the shank portion 14 of the casing 12 is formed by a rearward or end wall 30 and a body or enclosing wall 32 whose transverse external contour generally simulates that of the outline of a pair of intersecting circles or a figure 8 and producing an oblong section composed of a top circular wall portion 34, a bottom circular wall portion 36 and inturned curved side wall portions 38, 40, these defining a pair of generally parallel elongated interconnecting top and bottom wells 42, 44, each adapted to receive a column or tandem arrangement of conventional dry cells 46, 48, 50, and 46a, 48a, 50a respectively, it being understood that while these columns have been illustrated to comprise three cells each, they may each be constituted of a single or plurality of cells of different number.

In order to provide for some air circulation space around the cells and to keep the columns of cells in separated relation, the walls of each of the wells 42, 44

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are provided with inwardly projecting narrow circumferentially spaced ribs or protuberances 52 preferably extending the full depth of the shank portion 14 of the casing 12 to facilitate molding.

The head portion 16 of the casing 12 is formed by a wall generally indicated by the numeral 56 and which is composed, as best seen in FIGURES 1, 2, 5, and 8 of connected cylindrical and conical sections 58 and 60 respectively which are also substantially coaxial with the top well 42, the conical portion 58 converging to meet with the oblong sectioned shank wall 32 of the wells 42, 44 to form an integral structure therewith. Reinforcing generally circular ribs, 62, 64 are provided externally on the conical section 60.

The cylindrical section 58 and ring 18 are threaded with mating threads as at 66 whereby the ring or lens cap can be screwed in position to clamp a window or lens 68 of transparent glass or plastic against the end face or rim 70 of the casing section 58 by means of the shoulder 72 of the cap. The lens cap also holds in place a suitable bulb and reflector assembly generally referred to by the numeral 74 by clamping the reflector 75 against the casing. A U sectioned ring 76 of elastomeric material preferably straddles the peripheral rim portion of the lens 68 and flange 77 of the reflector 75. It provides a water seal and resilient mount for these elements between the casing and cap 18. If desired, separate washers or O-rings can be used to provide a seal.

The reflector 75 comprises a forward parabolic section 79 to provide a light reflecting face 80, and a rearwardly extending cylindrical neck portion 82. The reflector is preferably made of metal but may be of silvered plastic since it in no way provides part of the electrical circuitry. The neck portion 82 supports a bulb assembly generally designated by the numeral 84. It incorporates a bulb 86 of the type provided with a base 88 having a central metallic terminal 90 connected electrically to one side of the filament 91 and having a metallic locating flange 92 intermediate the base 88 and globe portion 94 which connects with the other side of the filament 91.

The bulb assembly 84 also includes a metallic ferrule 96 tightly pressed into the bore 98 of the neck portion 82 of the reflector. The ferrule has an inturned flange 100 at its forward end which serves as an abutment for the flange 92 of the bulb and defines an opening 102 large enough to pass the globe portion 94 of the bulb 86. The rearward end of the ferrule has an outturned flange 104 which tightly holds a forwardly dished circuit forming metallic disc 105 against the rearward end of the neck 82 of the reflector. The ferrule 96 is formed with a rolled internal thread 106 adjacent its flange end 104 to threadedly receive a cup-shaped threaded electrical insulation bushing 108. The base of the bushing is recessed on its outer face at 110 to receive a rearwardly dished metallic circuit forming washer 112. The washer is secured to the bushing by a central metallic eyelet rivet 114.

The bushing may be unscrewed from the ferrule 96 in order to insert a bulb 86, the base portion of which as seen, projects into the internal bore 115 of the bushing. A metallic coil spring 116 preferably wound conically at both ends and with the last turn of each end in a loop, is located between the eyelet 114 and terminal 90 of the bulb and serves not only as a current conducting path but also to resiliently bias the flange 92 of the bulb against the flange 100 of the ferrule to properly locate the bulb filament 91 within the reflector.

The eyelet 114 is adapted to make electrical contact with the positive metal capped central pole 118 of battery 46 which as best seen in FIGURE 6 is received within the dished washer 112. Urging the battery 46 into contact with the eyelet 114 are the batteries 48 and 50 arranged electrically in series with battery 46, the pole 118 of one battery being in contact with the metal base or casing 120 forming the negative pole of the next suc-

ceeding battery. Furnishing spring bias for the batteries 46, 48, and 50 in the well 42 and for the series arranged batteries 46a, 48a, and 50a in well 44, the latter group facing in the opposite direction from the group in well 42, is a metallic spring member 122 (see FIGURES 5 and 7). This member is freely located in the bottom of the wells 42, 44 and includes a base portion 124 abutting the casing wall 30 and inturned ends forming spring fingers 126, 128 the former in electrical contact with the casing 120 of battery 50 and applying bias thereto and the latter being in electrical contact with pole 118 of battery 50a and urging that battery forwardly. The spring member 122 also serves as a jumper or terminal bar connecting the columns of batteries in series electrically.

Providing an electrical stop abutment for the casing 120 of battery 46a of the spring biased column in well 44 is a generally circular-shaped open or split spring ring 130 (see FIGURES 5 to 8 incl. and 10) which is spring mounted in substantially coplanar inwardly opening recesses 132 provided in circumferentially positioned pads or bosses 134, 136, 138, 140 projecting radially inwardly of the conical wall section 60 of the wall 56 defining the head portion 16 of the casing 12.

The split spring ring 130 is preferably made of round sectioned wire. One end of the ring is bent with a forwardly projecting short lug 142 at right angle to the plane of the ring while the opposite end is formed with a loop or hairpin-shaped portion comprising a short leg 144 extending rearwardly at right angle to the ring and which connects by a U-shaped loop 146 with a long leg 148 also at right angle to the ring, the latter extending forwardly beyond the plane of the ring to provide an elongated finger which may be gripped by the fingers of the operator's hand.

The ring 130 is rotatable relative to the casing in the plane of the ring by sliding in the recesses 132 and may be readily removed from the casing following removal of the lens and bulb assembly 74 by pressing the ends inwardly to release the spring ring from the recesses. Normally, however, once the ring is positioned in the recesses 132 there is no need to remove the same.

It will be observed that the loop 146 of the ring 130 forms an electrical abutment for the spring biased column of batteries 46a, 48a, 50a in the well 44. Also that the open sector formed between the opposite ends of the ring is of a size which is greater in width than the diameter of a battery, and that the distance in FIGURE 7 between the battery 46a and the nearest wall 150 of the pad 134 is greater than the width of the loop 146 between the legs 144 and 148 thereof. Hence by rotating or sliding the ring 130 counterclockwise in the recesses 132 until the leg 144 abuts the wall 150 of pad 134, the loop 146 may be moved clear of the battery 46a and the batteries 46a, 48a, and 50a may easily be removed for replacement or testing without removing the ring 130. Obviously the batteries 46, 48, and 50 may be removed once the lens and bulb assembly 74 is released from the casing by unscrewing the ring 18. When the batteries are in place with ring 130 in position with loop 146 contacting the casing 120 of battery 46a, a circuit will be established between one side of the filament 91 through bulb terminal 90, spring 116, eyelet 114, batteries 46, 48, 50, spring 122, batteries 50a, 48a, 46a and ring 130.

The switch mechanism 26 will now be described, controls completion of the electrical circuit to the opposite side of filament 91 by electrically bridging the ring 130 and the dished circuit forming disc 105 which electrically connects with the opposite side of the filament through the ferrule 96 and flange 100 of the bulb 86. Thus as seen in FIGURES 5, 6, and 7, the casing 12 is formed with an outwardly projecting hollow boss 156 on the top side of the conical section 60 of the head portion 16 of the casing 12 and coaxial with the head and shank

portions of the casing, as seen in FIGURE 1. The boss 156 is of generally H section comprising a horizontal wall portion 158 extending rearwardly from the conical section and connecting by a downwardly and rearwardly curving wall portion 160 with the wall 32 of the shank portion 14 of the casing side walls 162, 164 which extend above and below the horizontal wall 158 forming therewith and with the curved wall 60 an inner pocket 166 opening into the interior of head 16 and a rectangular outer pocket 168 with end walls 170, 172. The end wall 172 is somewhat bulbous in section and connects by the strap 24 with a projecting boss 174 adjacent the rearward end of shank 14 of the casing 12. The wall 172 and boss 174 are provided with cross openings 176, 178 adapted for connecting a shoulder strap or other supplemental device not shown. The rearward portion of the horizontal wall 158 is somewhat thicker than the forward part to provide a cylindrical-shaped recess 180 opening into the pocket 168 and which recess is defined by an upstanding cylindrical boss 182 and an outer cylindrical wall 184. The boss 182 has a circular depression 186. A hole 188 in wall 158 provides for drainage of water from pocket 168.

Secured by one or more rivets 190 (one being shown) to the horizontal wall 158 is a flat electrically conducting metal bearing plate 192 seated on the floor 194 of the pocket 168 and a metallic contact member 196 positioned against the underside of the wall 158 and having a downwardly and rearwardly directed flexible finger 198 that resiliently bears against the rearward side of a portion 200 of the battery retaining and circuit ring 130. With the finger 198 thus located, the spring ring 130 may be rotated in or removed from the casing at will without interference. A second metallic contact member 202 is secured against the underside of wall 158 by a metal rivet 204 located coaxial with the boss 182 and having its upper head 206 in the depression 186. A downwardly and forwardly projecting spring portion 208 of the member 202 is resiliently biased in contact with the circuit disc 105. Each of the rivets 190 and 204 are tightly fitted in undersized holes 210 in the dielectric wall 158 to produce a water tight seal therebetween.

The contact plate 192 extends rearwardly to adjacent the recess 184 and is in constant electrical contact with a resilient slidable metallic switch circuit making element 212 having a central top portion 214 received in a recess 216 of a rigid polyethylene operator 218. A forward resilient portion 220 contacts the plate 192 and a similar resilient rearward portion 221 bears against the floor 194 of the pocket 168. The portions 220, 221 sweep upwardly from the surfaces they contact to connect with top 214 and form a recess 222 between them. The operator 218 has a knob operating portion 223 projecting through and operable in an elongated slot 224 of a rigid plastic or metal plate 226 which covers the pocket 168 and is retained in position by resilient undercut portions 228 of the walls 162, 164 (see FIGURE 7), the side edges of the plate 226 being shaped to fit the undercuts. The plate 226 may be snapped into position by spreading the wall portions containing the undercuts 228 apart. The operator 218 includes portions extending forwardly and rearwardly of the knob 223 by which it is resiliently held against the underside of cover plate 226 by the slidable circuit maker 212, movement of which the operator controls. The rearward portion of the operator has a detent projection 232 which is selectively engageable in grooves 234, 236 in the underside of cover plate 226. Operator 218 also has depending side walls 238 of triangular shape which serve as fulcrum guides and stops for the operator 218 as will hereinafter be evident. A cylindrical cap 240 of resilient polyethylene tightly fits the upstanding boss 182 and forms a cover over head 206 of rivet 204. A circuit making link 242 in the form of a rivet is secured in the top of the cap 240 and is normally spaced from the head 206 of rivet 204. The cap 240 forms a water tight

fit with boss 182 and may if desired be cemented to the boss 182 by an epoxy cement, i.e. if the cap is made of a cementable plastic such as a vinyl resin or synthetic rubber.

The switch mechanism 26 has three selective positions, an "off" position such as shown in FIGURE 6 wherein the filament circuit is open because there is no circuit established between the contact members 196 and 202, a "flash" position wherein the operator 218 is moved to the right to engage the detent 232 in the recess 236 of plate 226 and to position the rearward portion or finger 221 of the circuit making element 212 in proximity to the contact link 242 of resilient cap 240 but without effecting contact of link 242 with rivet 206, this only occurring when the operator 218 is pressed downwardly by applying pressure against the control knob 223, and the "on" position where the operator 218 is moved to the extreme right, i.e. forwardly during which movement the link 242 is brought into contact with rivet 206 and remains in this condition until the operator 218 is moved to one of the other two positions.

The pressure applied to knob 223 in the "flash" position is transmitted through the finger 221 to the link 242 which, by reason of the flexible head to which it is secured, is moved downwardly to contact the rivet 206 without releasing the water tight engagement of cap 240 with boss 182. Since at this time the rearward finger 220 of circuit making element 212 is in contact with plate 192 a circuit is completed between contact members 196 and 202 thus closing the circuit through the batteries and the filament 91 and causing the bulb to light up. Release of the pressure on knob 223 again opens the filament circuit and causes the bulb to go out. In moving the operator 218 to the "on" position the finger 221 is moved over the link 242 in contact therewith. Since detent 232 is also cammed downwardly out of recess 236 at this time and the side wings 238 of operator 218 rest on floor 194 of depression 168 and serve as a fulcrum for the operator, the operator 218 is caused to apply a downward force against the finger 221 which is transmitted to link 242 both moving downwardly until the link 242 makes contact with rivet head 206 which is then maintained by the resiliency of finger 221.

Thus a switch mechanism 26 is provided that may be slidably operated to any selective position under water by a positive operable control knob and without causing water to enter the interior of the casing or causing a short and this even though water will fill the pocket 168. Obviously when the lamp is removed from the water any accumulation in the pocket may be drained out through the drain hole 188. Moreover, it will be noted that the switch mechanism 26 is easily operable by the thumb of the hand holding the carrying strap 24 thus making the lamp easily maneuverable by one hand.

FIGURE 9 illustrates a modified head structure wherein the lens ring 18a is formed with a wedge-like sectioned circumferential recess 250 adjacent the mating threads 66 which recess may receive the chamfered or complementary tapered lip 252 of the head portion of the cylindrical section 58 of the wall 56 forming the head 16 of the casing to form a water tight connection. Moreover, instead of being clamped between the ring 18 and casing head 16 as in FIGURE 5, the lens 68 and reflector assembly 74 are carried in the ring 18a in the bore 254 thereof being held endwise against the shoulder 72 of the ring 18a by a snap ring 256 resiliently held in a recess 258 in the ring 18a. A suitable gasket 260 is provided between lens 68 and shoulder 72 to make a water tight mounting at this point.

FIGURE 10 shows a further modification of the mode of mounting the lens and reflector and bulb assembly to the casing; also a modified form of switch mechanism. Here the lens 68 and reflector flange 77 are as in FIGURE 9 received in the bore 254 and seated against

a resilient gasket 260 between the lens 68 and shoulder 72 of the ring 18b but instead of being retained in place by a spring ring are here held by a ring 262 which is clamped between the ring 18b and the head. In this arrangement the bore 254 is relatively shallow and of less depth than the combined thickness of the gasket 260, lens 68 and reflector flange 77 to permit their being resiliently clamped between the shoulder 72 and ring 262 and effect a water tight joint.

The switch mechanism 26a in FIGURE 10 differs from that of FIGURE 6 in that here the operator 218a is of metal and has a common "off" and "flash" position and a separate "on" position to which it is movable. As in FIGURE 6 the operator is resiliently held against a cover plate 270 for the depression 168 by the resilient circuit making member 212 which has a forward finger 220 and a rearward finger 221. As before, the knob 223 of the operator projects through a slot 224 in the cover plate and it has a detent here in the form of an upwardly bent tab 272 which is received in a recess 274. The cover plate 270 has a hook-like end projection 276 which hooks through the drain hole 188 and against the inner side 278 of the casing. The opposite end of the cover plate 270 is secured to the casing by a bolt 277 which also mounts the contact member 196 to the casing and thereby places the contact member 196 electrically in series with the cover plate 270, the operator 218a and the circuit maker 212, all of which are metallic members. The circuit making link 242 is again secured to a cap-like resilient member 240 which here, however, is tightly fitted and/or cemented in place in a recess 280.

It will be observed that the position of the circuit maker 212 in FIGURE 10 corresponds to the "flash" position thereof in FIGURE 6, the finger 221 of the circuit maker 212 being in proximity to the link 242 but not in contact therewith. Moreover, the fingers 220 and 221 of the circuit maker 212 are in contact with the floor 194 of the depression 168 and not with a metal plate as in FIGURE 6. Thus in the combined "off" and "flash" position of FIGURE 10 the filament circuit can be completed only by depressing the operator 218a to cause the finger 221 of the circuit maker to contact the circuit link 242 and depress the latter by its flexible mounting into contact with the circuit rivet 206 whereupon the bulb will light and remain illuminated until the pressure on the operator is released. When the permanent "on" position is desired the operator will first be depressed to release the detent 272 from the cover recess 274 and slid to the right in FIGURE 10 until the knob 223 strikes the end of the slot 224 of the cover. In moving to this position the end of finger 221 will ride upon the circuit link 242 camming it downwardly into electrical contact with the circuit rivet 206 to complete the filament circuit. The resiliency in the finger 221 will hold the link 242 in contact even if the operator's finger is removed from the knob 223.

From the foregoing description it will be apparent that a novel portable lamp structure for under water application has been presented including novel switch mechanisms, casing structure, and combined battery retaining and circuit making means.

It will be understood that various changes and modifications may be made by those skilled in the art employing the above teachings and without departing from the spirit and intent of the invention set forth above. Accordingly, all changes and modifications coming within the purview of the appended claims are intended to be covered.

I claim:

1. A portable hand lamp comprising a casing including a hollow elongated battery receiving shank portion and an outwardly flaring integrally connecting hollow head portions housing a lens and bulb assembly, said shank portion being closed at its end remote from said

head portion and said shank portion being defined by two longitudinally extending and longitudinally connected wall sections of generally circular contour and less than a full circle together simulating in cross-section the general form of a figure 8, forming two substantially parallel battery receiving wells, said head portion being substantially coaxial with the axis of one of said wells and comprising a cylindrical wall section, a generally conical wall section integrally connecting the cylindrical section with the wall sections of said shank portion and an upstanding wall portion of the H section projecting outwardly of said conical section on the side of said casing opposite the other of said wells defining a contact mounting pocket internally of said head and defining an external switch mechanism receiving pocket opposite said internal pocket.

2. A portable hand lamp as claimed in claim 1 including a carrying strap integral with said casing and connecting the closed end of said shank portion of said casing with the near end of said upstanding wall portion of said head portion of said casing.

3. A portable hand lamp as claimed in claim 1 wherein the wall sections defining said battery wells each have a plurality of circumferentially spaced inwardly projecting longitudinal battery locating and air pocket forming ribs extending the depth of said wells.

4. A portable hand lamp as claimed in claim 1 wherein said casing comprises a linear polyethylene molding.

5. A portable hand lamp comprising a casing including a hollow elongated shank portion and an outwardly flaring integrally connecting hollow head portion, said shank being closed at its end opposite said head portion, said shank portion defining a pair of generally parallel wells for receiving the batteries for powering said lamp, said head portion being substantially coaxial with the axis of one of said wells, a split spring ring in said head portion, means in said head portion mounting said rings as to be slidable therein concentric with said axis of said one well and movable to overlie the other of said battery wells, said split ring having an open section, said ring also having a portion thereof offset from the plane of said ring adjacent said open section defining a battery contacting finger for making contact with the terminal end of a battery received in said other well and having a portion thereof within said casing adjacent said open section defining a manipulating finger for facilitating sliding of said ring from a position wherein said battery contacting portion is in contact with the terminal end of a battery in said other well to a second position wherein the said open section of said ring straddles said terminal end of said battery, said open section being sufficient in width to pass said battery from said well for removing the same from said lamp.

6. A portable hand lamp comprising a casing including a hollow elongated shank portion and an outwardly flaring integrally connecting hollow head portion, said shank portion being closed at its end opposite its head portion, said shank portion defining a pair of generally parallel wells for receiving the batteries for powering said lamp, said head portion being substantially coaxial with the axis of one of said wells and having a plurality of inwardly projecting wall portions arranged around said axis but spaced from the other of said pair of wells, a recess in each of said projecting wall portions facing inwardly of said head portion, a split spring ring mounted in said recesses and slidable therein concentric to said one well, said spring ring having an open section between its ends, one end of said ring being formed with a U loop extending generally normal to said ring in a direction away from said head for overlying and contacting the terminal end of a battery received in said other well and one of the legs of said loop extending generally normal to said ring in a direction away from said shank for forming a ring manipulating projection, the other end of said ring being formed with a lateral projection to provide a limit stop for

sliding movement of said ring, said ring being movable from a position wherein said loop is in contact with the said terminal end of a battery in said other well to a position wherein said loop portion is clear of the said battery and with the latter positioned relative to the ring with its body within the open section between the ends of said ring whereby to pass the same for removing said battery from said lamp.

7. A portable hand lamp comprising a casing including a hollow elongated shank portion and an outwardly flaring integrally connected head portion, said shank portion being closed at its end opposite its head portion, said shank portion defining a pair of generally parallel wells for receiving the batteries for powering said lamp, and said head portion being substantially coaxial with the axis of one of said wells, a battery retaining and contact making split spring ring in said head portion, means mounting said ring in said head portion to be slidable therein concentric with said axis of said one well, said ring having an open section and having a contact portion movable to a first position wherein it will overlie said other battery well and make contact with the forward terminal end of a battery therein and to a second position wherein said open section straddles said terminal end of said battery and said contact portion is no longer in contact with said terminal end of said battery, said open section having a width sufficient to pass said battery for removing it from said lamp; switch mechanism mounted on said head portion, a bulb assembly mounted in said head portion having a central contact for making contact with the forward terminal end of a battery in said one well, and having a disc-like contact member, said switch mechanism including a pair of resilient contact elements, one operable to contact with said spring ring the other with said disc and means for electrically connecting the rearward terminal ends of the batteries in said wells.

8. In a portable hand lamp including a casing for receiving battery means for supplying electric current to a bulb carried thereby; switch mechanism for making and breaking an electric circuit connecting said battery means and said bulb comprising a switch housing defined by a depressed wall portion of said casing on the exterior thereof, a cover for said housing secured to said casing, said cover having a longitudinally extending slot, a slidable control member in said housing and having a knob portion projecting outwardly of said housing through said slot and slidable therein, a slidable circuit making element interconnecting with said control member and movable therewith, said element being interposed between said control member and the floor of said housing and having a pair of spring fingers serving to bias said control member against said cover, first and second contact members to be connected in series circuit, said contact members being secured to said casing on the interior thereof, means electrically connecting one of said spring fingers with said first contact member during all operations of said switch mechanism, a third contact member connecting said second contact member with the interior of said housing through said wall portion, a movable circuit making link member in said housing adjacent the underside of said circuit making element and over said third contact member but spaced from both thereof, a resilient support for said link member mounted on said wall portion and facilitating movement of said link member into releasable contact with said third contact member, said control member having a "flash" position in which it is operator depressible to urge said link member into contact with said third contact member through said other spring finger for establishing a circuit between said first and second contact members which is maintainable while said control member is held depressed by the operator and said control member and circuit making link being movable from said "flash" position to a permanent "on" position and during said movement urging said other spring finger to cam said link member into contact with said third contact member to

establish said circuit between said first and second contact members.

9. A switch mechanism as claimed in claim 8 wherein said cover, control member and circuit making element are all of metal and wherein there is means electrically connecting said cover and said first contact member together.

10. A switch mechanism as claimed in claim 8 wherein said control member is of electrical insulation material and wherein means on the floor of said housing electrically connects said one spring finger in electrical circuit with said first contact member in all operations of said switch mechanism.

11. A switch mechanism as claimed in claim 8 wherein said resilient support for said circuit making link member comprises a cap-like member having a peripheral portion tightly secured to said wall portion defining said housing.

12. A switch mechanism as claimed in claim 8 wherein said housing has a water passage in the wall portion of the casing defining the same, the said passage connecting the interior of said housing with the exterior of said casing.

13. A switch mechanism as claimed in claim 8 wherein said cover and control element are of metal, wherein said control element has a tab engaged in a recess in said cover and wherein said cover has an L-shaped tab at one end projecting through said housing and wall portion defining the same and having its opposite end connected by fastening means with said first contact member.

14. In a portable lamp including a casing of dielectric material for receiving battery means for supplying electric current to a bulb carried thereby, switch mechanism for making and breaking an electric circuit connecting said battery means and said bulb comprising, a casing mounted plate defining an exterior chamber with a pocket in a wall portion of said casing, said plate having a longitudinal slot therein, a slideable control member in said chamber having an operator operable extension projecting through said slot and movable therein to position said member in a plurality of circuit determining positions, means interengageable with said control member for establishing at least some of said positions, circuit establishing link means operably positioned by said wall portion of said casing and movable in a direction normal to said slideable control member, a resilient link actuating means in said chamber operable by said control member and positioned operably intermediate said control member and link means and biasing said control member against said plate, and a pair of circuit establishing contact means carried by said casing and projecting interiorly thereof, at least one in constant connection with said link actuating means and the other functioning with said link means upon movement of the latter by said link actuating means in response to positioning of said control member in a circuit determining position to establish a circuit between said battery means and lamp through this pair of contact means, said actuating means including a resilient finger having three positions, a first position spaced from said link means and inoperable by said control member to actuate said link means to make said electric circuit, a second position in juxtaposition to said link means and operable in response to depression of said operator extension to actuate said link means to engage with said contact means to make said circuit and a third position in which it has actuated said link means to engage with said contact means to make said circuit.

15. In a portable hand lamp including a casing of electrical insulation material having a wall portion thereof forming an external pocket, a cover member for said pocket defining therewith a switch mechanism housing, said cover member also defining a slideway, and first and second contact means within said casing and extending through said wall portion into said pocket said contact means constituting the terminals of the circuit of said lamp, switch mechanism in said housing comprising a slideable control member underlying said cover member and selectively operable in said slideway between a switch

"off," switch "flash," and switch "permanent light" positions, said control member having a portion thereof interengageable with portions of said cover member in said switch "off" and switch "flash" positions of said control member to define the same, a metallic circuit making element in said housing underlying and interengaged with said control member and operable with said control member from said switch "off" to said switch "flash" and switch "permanent light" positions and a movable metallic circuit making link member underlying said circuit making element and resiliently mounted to said casing wall portion in said pocket in spaced relation to and non-circuit forming relationship with said circuit making element and said contact means in said switch "off" position of said control member and circuit making element, said circuit making element having a pair of flexible contact fingers bearing upon the floor of said pocket and resiliently biasing said control member against said cover and being depressible under urging of said control member, one of said fingers being in electrical contact with said first contact means in all of said positions of said circuit making element corresponding to said selective positions of said control member and said second finger of said circuit making element being in proximity to but spaced from said link member in said position of said circuit making element corresponding to said switch "flash" position of said control member and being adapted to contact said link member and move the latter into contact with said second contact means upon depression of said circuit making element by said control member to establish a "flash" circuit between said contact members through said link member and flexible fingers so long as said control member is held depressed and said second finger being operable to establish a "permanent light" circuit between said contact means through said link member when said circuit making element is moved into its position corresponding to said switch "permanent light" position of said control member and during which said link member is moved by said second finger into electrical contact with said second contact means.

16. In a portable hand lamp including a casing of electrical insulation material for receiving battery means for supplying electric current to a bulb carried by said lamp, said casing having an external pocket and having a removable cover thereon providing with said pocket a chamber for a switch mechanism, said cover having a longitudinal slot therein, first and second metallic spring contact means secured to said casing and constituting a pair of terminals of the circuit of said lamp, said contact means extending within said casing opposite said pocket and having retaining means extending through said casing into said chamber and connected with switch mechanism in said chamber, said switch mechanism comprising a slideable control member in said chamber having an operator operable extension projecting through the slot of said cover and movable therein to position said member in a circuit determining position, means cooperating with said control member for establishing said position, a circuit establishing link means operably positioned in said chamber by said casing and movable in a direction normal to said slideable control member, a resilient link actuating means in said chamber operable by said control member and positioned operably intermediate said control member and link means, said actuating means biasing said control member against said cover, and third and fourth contact means for establishing electrical contact with said battery means and lamp respectively, said first contact means being in operable contact with one of said third and fourth contact means and said second contact means being operable together with the other of said third and fourth contact means to establish a circuit between said battery means and lamp through said first and second contact means upon movement of said link means by said actuating means in response to positioning of said control member in said circuit establishing position.

17. A portable hand lamp as claimed in claim 16 wherein said casing pocket is provided with a seating face for said cover and with a resilient integral retaining lip for said cover which may be sprung back by said cover in positioning the same on said casing and which lip will spring back over said cover to retain the same when the latter is firmly seated.

18. In a portable hand lamp, a casing having a forward end and a rearward end, said forward end being open and having outer and inner surface portions extending rearwardly therefrom determining an annular wall, said wall being externally threaded and a portion of said wall being graduated in thickness between said surface portions from a point back from said forward end of said casing to said forward end to provide an annular tapered lip, and a window bezel ring assembled over the open end of said casing with one of its ends overlapping said casing wall, said ring having a threaded portion internally thereof extending back from its said end which threaded portion is engaged with said externally threaded wall of said casing, said threaded portion of said ring terminating in an

annular shoulder and there being an annular tapered recess in said shoulder substantially complementary in shape to said tapered lip and in which said lip is engaged in a water tight relationship.

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