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3,228,288

INTERLOCKING CAP AND LENS FOR INDICATOR LIGHTS

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2 Sheets-Sheet 1

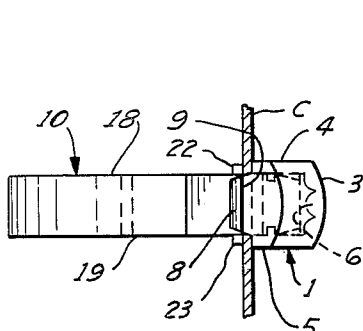


Fig. 3.

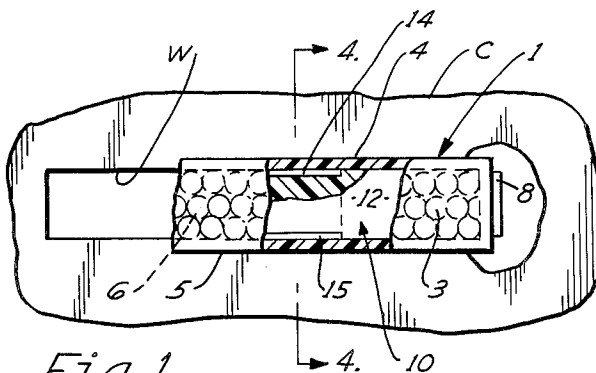


Fig. 1.

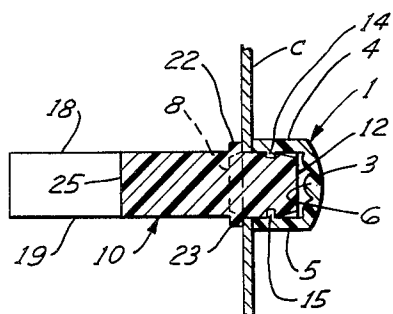


Fig. 4.

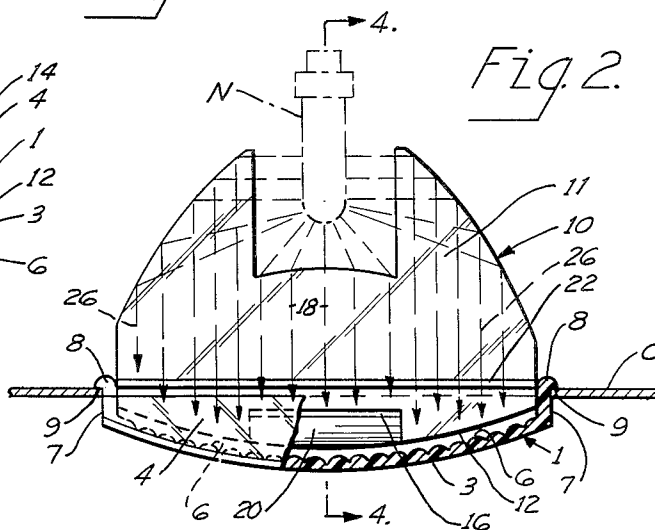


Fig. 2.

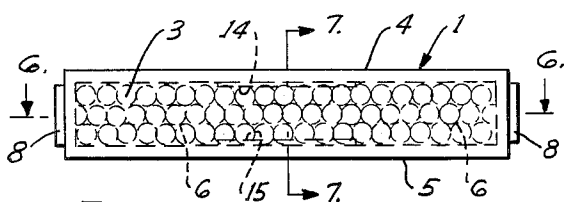


Fig. 5.

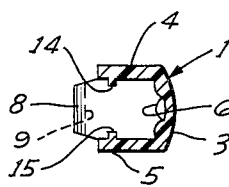


Fig. 7.

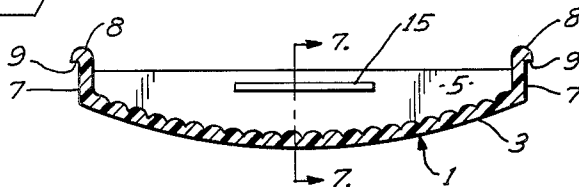


Fig. 6.

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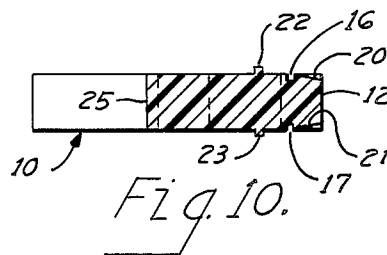
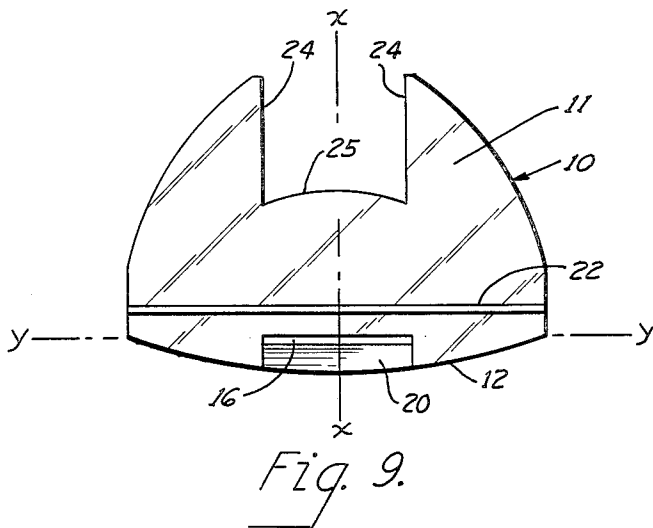
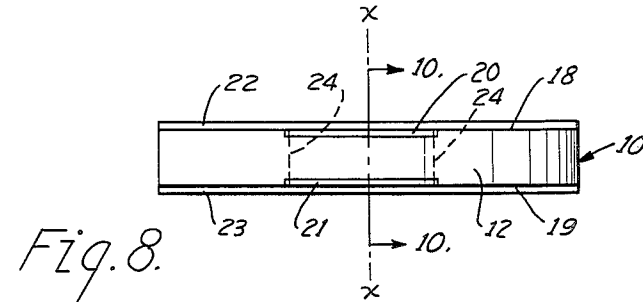
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INTERLOCKING CAP AND LENS FOR INDICATOR LIGHTS

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2 Sheets-Sheet 2



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INTERLOCKING CAP AND LENS FOR INDICATOR LIGHTS

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7 Claims. (Cl. 88-57)

This invention relates to pilot lights for enclosures for electrical equipment and the like and particularly to a cap for closure of a window opening through a wall of such an enclosure and to a lens cooperable with the cap.

In motor starter enclosures and the like, the cover of the enclosure is generally of sheet metal. In many instances it is provided with knockouts, any one of which, when removed, leaves a window opening through which the rays from a pilot light within the enclosure are visible from the exterior of the enclosure.

In general, such window openings are covered by suitable protective caps, and the caps usually are of transparent or translucent material.

In accordance with the present invention, the pilot light is located wholly within the enclosure, and its rays are refracted and reflected by a lens in such a manner that they are concentrated on the transparent, exteriorly exposed, forward face of the cap so as to provide highly effective illumination of the forward face with a bulb of limited overall lighting capacity.

The present invention is directed particularly to a cap and to a cap and lens combination for use in connection with such window openings.

More specifically the invention relates to a simple and effective lens and cap combination of which the cap can readily be installed in the window opening and the lens installed in the cap, whereby both can be installed and replaced readily after installation of the enclosure itself at the worksite.

Another object is to provide a cap and lens of readily moldable set synthetic organic plastic material and the like, which cap and lens are effective for providing an effective light pattern at the forward face of the cap from a neon bulb in the enclosure.

Various other objects and advantages will become apparent from the following description wherein reference is made to the drawings, in which:

FIG. 1 is a front elevation of a portion of the front cover of an enclosure having a window opening with the cap and lens combination of the present invention installed therein, part of the cap and lens being shown in section for clearness in illustration;

FIG. 2 is a top plan view of a structure illustrated in FIG. 1, part of the cap and cover of the enclosure being shown in section for clearness in illustration;

FIG. 3 is a left end elevation of the structure illustrated in FIG. 1;

FIG. 4 is a vertical cross sectional view, taken on the line 4-4 in FIGS. 1 and 2;

FIG. 5 is a front elevation of the cap of the present invention;

FIG. 6 is a longitudinal sectional view taken on the line 6-6 in FIG. 5;

FIG. 7 is a vertical cross sectional view of the cap and is taken on the line 7-7 in FIGS. 5 and 6;

FIG. 8 is a front elevation of a lens of the present invention;

FIG. 9 is a top plan view of a lens of the present invention; and

FIG. 10 is a vertical cross sectional view taken on the line 10-10 in FIG. 8.

Referring to the drawings, the cap and lens combination is shown in connection with a sheet metal front

cover C of a conventional closure. For purposes of the pilot light, the cover has a window opening W which is preferably rectangular and substantially coextensive in length with the cap. In the form shown, the cap, indicated at 1, is light transmitting and preferably of a suitable translucent or transparent synthetic organic plastic, such as clear or tinted polycarbonate.

The cap has a forward wall 3 which is convex forwardly and curvilinear about an upright axis. It has upper and lower side walls 4 and 5, respectively, which, in the form illustrated, are planar and parallel to each other. The outer forward face of the wall 3 is smooth, but the inner face is provided with integral light diffusing protuberances 6.

The cap has end walls 7 and lugs 8 are provided on the inner edges thereof and having forwardly facing shoulders 9. Due to the material of which the cap is made, it is resiliently yieldable and self-restoring. The shoulders 9 extend a short distance endwise outwardly from the end of the cap beyond the ends of the window opening which the cap is to fit. The shoulders 9 are so arranged that they can be flexed toward each other and, while so held, passed through the opening W from the outside of the cover. Upon their self-restoration, they engage the inner face of the cover C, and also the end edges of the metal, which define the opening W, with firm pressure. The lugs 8 are of substantially the same width as the opening W, and so terminate at their outer lateral limits substantially at the inner faces of the side walls 4 and 5. The inner or rear edges of the side walls 4 and 5 lie in engagement with the outer face of the cover C when the shoulders 9 are in engagement with the inner face. Thus the cap is held firmly in position and restrained from movement inwardly of the enclosure by the inner or rear edges of the side walls 4 and 5 and outwardly of the enclosure by the shoulders 9.

In the form illustrated, the lens, indicated generally at 10, is adapted to be secured to the cap by a snap fastening engagement and preferably is received a substantial distance within the cap. The lens 10, as illustrated, preferably comprises a body in the form of a flat plate 11 of clear acrylic resin, Lucite, or the like. The body is provided with a curvilinear forward face 12 which is generally parallel, in the installed position of the lens, to the front face of the forward wall 3 of the cap.

In order to effect this snap fastening engagement, between the cap and lens, the side walls 4 and 5 of the cap are provided at their inner faces with integral longitudinal ribs 14 and 15 which are parallel to each other and extend lengthwise of the cap, parallel to the rear edges of the walls 4 and 5. The lens is provided with grooves 16 and 17 so positioned that when the lens is installed in the cap with its forward face 12 foremost and moved to its final position, the ribs 14 and 15 will be received in the grooves 16 and 17.

In order to assist in this installation, the side walls 18 and 19 of the lens have central cam portions 20 and 21 which converge toward the forward face 12. Due to the resiliency of the side walls of the cap, as the lens is installed, the ribs 14 and 15 ride up the cam surfaces and are spread part, and snap into the grooves 20 and 21 when they become aligned therewith. Thus snap fastening means in the form of coacting interengaging shoulders are provided on the cap and lens for holding the lens in place.

The lens side walls 18 and 19 are provided with longitudinal shoulders 22 and 23, respectively, which are parallel to grooves 16 and 17 and to the inner edges of the side walls 4 and 5 of the cap, and are spaced rearwardly from the forward face of the lens when the lens is in installed position. The spacing is such that, when the

inner edges of the side walls 4 and 5 rest against the forward face of the cover C, the shoulders 22 and 23 rest against, or are close to, the inner face of the cover C.

As mentioned, it is desirable to supply the pilot light by means of a neon bulb, such as indicated at N. Rays from this light generally issue along the entire length of the bulb. To refract and direct them so as to concentrate them on the forward wall of the cap, the inner portion of the lens is given a special configuration. The lens is preferably formed of clear acrylic resin with the side walls 18 and 19 planar. The shapes herein discussed may be imparted by molding or grinding. The forward wall is convex forwardly and preferably curvilinear about an upright axis. The lateral edges of the plate 11 extend rearwardly from the ends of the forward edge or face 12, respectively, the major portion of the outer surface of each of the lateral edges is convex outwardly edgewise of the plate and preferably curvilinear about upright axes. Thus the outer surface of these edges is concave generally toward the forward edge or face 12. Each lateral edge of the plate 11 terminates rearwardly in spaced relation to the forward face 12 and lies within the rearwardly projected end limits of the forward face 12.

A rearwardly opening notch is provided in the plate 11 and has forwardly and rearwardly extending sides 24 which terminate in a notch bottom wall 25 which is spaced rearwardly from the forward face 12 of the plate 11. The bottom wall 25 is convex rearwardly and preferably curvilinear about an upright axis. All of these edges are preferably symmetrically arranged with respect to a reference plane indicated at X—X in FIGS. 8 and 9, which plane is midway between the ends of the forward face 12, normal to the planar side walls 18 and 19, and to the plane defined by the ends of the forward face 12, as indicated by the line y—y in FIG. 9.

As a result of this configuration, the rays of light passing from the neon bulb end, no matter where they strike the rear of the lens, are directed forwardly, as indicated by arrows 26 in FIG. 2, so that there is an even distribution of light along the entire length of the forward face 12 of the lens, and hence along the forward face 3 of the cap.

With the same configuration of lens, a conventional incandescent bulb also may be used because, though supplying only a point source of light, the source is more intense and the refractions and reflections provide effective distribution of light and substantially parallel rays from the forward face of the lens.

It is apparent from the foregoing description that the cap may be readily installed in the window opening of the closure C and the lens installed in and supported by the cap.

Having thus described by invention, I claim:

1. In combination with an enclosure wall of rigid sheet material and having a window opening therein, a cap having a light transmitting forward wall and a peripheral wall extending rearwardly therefrom, first shoulder means on the peripheral wall and engaging one face of the enclosure wall when the cap is in closing relation to the opening, snap fastening shoulder means on the peripheral wall engaging the opposite face of the enclosure wall when the cap is in said relation, said peripheral wall having resilient portions spaced peripherally of the cap from said snap fastening shoulder means, said portions being resiliently movable transversely of the window opening while the cap is in installed position, the first shoulder means and snap fastening means cooperating to hold the cap securely in position in said relation and restrain it from displacement from said position, said light transmitting forward wall being visible from, and disposed outwardly from said one face of the enclosure wall, a lens movable into an operating position within the cap wherein the lens constrains said portions from flexure inwardly transversely of the opening and projects lights rays onto the forward wall of the cap, interengageable snap fastening means, in addition to said

snap fastening shoulder means of the cap, on the lens and said resilient portions of the cap, respectively, and operable, by partial movement of the lens toward said operating position, to move said resilient portions apart from a starting position and there, upon movement of the lens to operating position, to release said resilient portions whereupon said portions return toward said starting position and said interengageable means inter-engage and retain the lens in said operating position.

2. The combination of claim 1 wherein the lens has shoulder means positioned for engagement with said opposite face when the lens is supported by the cap.

3. A cap and lens combination comprising a cap having a light transmitting forward wall and a peripheral wall extending rearwardly therefrom, snap-fastening means on the peripheral wall for connecting the cap in closing relation to an opening in a wall of rigid sheet material by engaging the sheet material adjacent the margin of the opening, said light transmitting forward wall being arranged relative to the snap-fastening means so as to be visible from, and disposed outwardly from, one face of the rigid sheet material when the cap is so connected in said opening, a lens movable into an operating position within the cap wherein the lens constrains said snap-fastening means from disconnection from said sheet material and projects light rays onto the forward wall of the cap, interengageable snap-fastening means, in addition to said snap-fastening means of the cap, on the lens and said resilient portions of the cap, respectively, and operable, by partial movement of the lens toward said operating position, to move said resilient portions apart from a starting position and then, upon movement of the lens to operating position, to release said resilient portions whereupon said portions return toward said starting position and said interengageable means interengage and retain the lens in said operating position.

4. The combination according to claim 3 wherein the peripheral wall of the cap is of resilient self-restoring material, and the snap fastening means on the cap comprise shoulders rigid with said peripheral wall and movable for snap fastening engagement by deflection and self-restoration of said peripheral wall.

5. A cap and lens combination including a lens having a forwardly convex light-projecting face and side walls extending rearwardly therefrom, a rearwardly open cap of resilient self-restoring material receivable on the lens from the forward face of the lens rearwardly and having a forward wall disposed in front of the forward face of the lens, and having side walls overlying the side walls of the lens, respectively, said cap being adapted to be received in a window opening in an enclosure wall, cap shoulders on the inner faces of the cap side walls, lens shoulders on the outer faces of the lens side walls, said shoulders of the cap being positioned for snap fastening inter-engagement with the shoulders of the lens, respectively, due to the resiliency of the cap side walls, when the lens is received in operating position in the cap, and said lens and cap shoulders being operative while inter-engaged to prevent removal of the lens from the cap rearwardly of the cap, rearwardly facing shoulder means on the cap side walls, respectively, adapted to engage the outer face of the enclosure wall when the cap is installed in the opening, end fastening shoulders on the ends of the cap, respectively, and spaced peripherally of the cap from the shoulder means and from said cap shoulders and facing forwardly of the cap, the end shoulders of the cap being spaced slightly farther rearwardly of the cap than the shoulder means, said cap shoulders being resiliently movable away from each other by the lens during installation of the lens while the cap is installed in the opening, and being self-restoring when the lens is installed in the cap.

6. A lens and cap combination comprising a lens member having a forward light-transmitting face and side walls extending rearwardly therefrom, a cap engaging a portion of the lens adjacent said forward face and overlying

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said face, and having side walls overlying said side walls of the lens, respectively, adjacent said face, said cap being resiliently expansible laterally and self-restoring, shoulders on the overlain side walls of the lens, cooperative shoulders on the inner surfaces of the overlying side walls of the cap end engaged in snap fastening relation with the shoulders on the lens by flexure and return of the side walls of the cap, forwardly facing shoulder means on the cap and spaced from each other endwise of the cap and movable relatively toward and away from each other resiliently, rearwardly facing shoulder means on the cap between and spaced from the forwardly facing shoulder means of the cap and disposed laterally of the cap outwardly beyond the lateral limits of the first mentioned shoulder means on the cap, and a cooperative shoulder means on the lens and positioned so as to lie in rearwardly spaced relation to the last mentioned shoulder means of the cap when the shoulders of the cap and lens are inter-engaged.

7. The lens and cap combination of claim 6 wherein

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said cap is transparent molded synthetic organic plastic and the lens is molded synthetic organic acrylic resin.

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