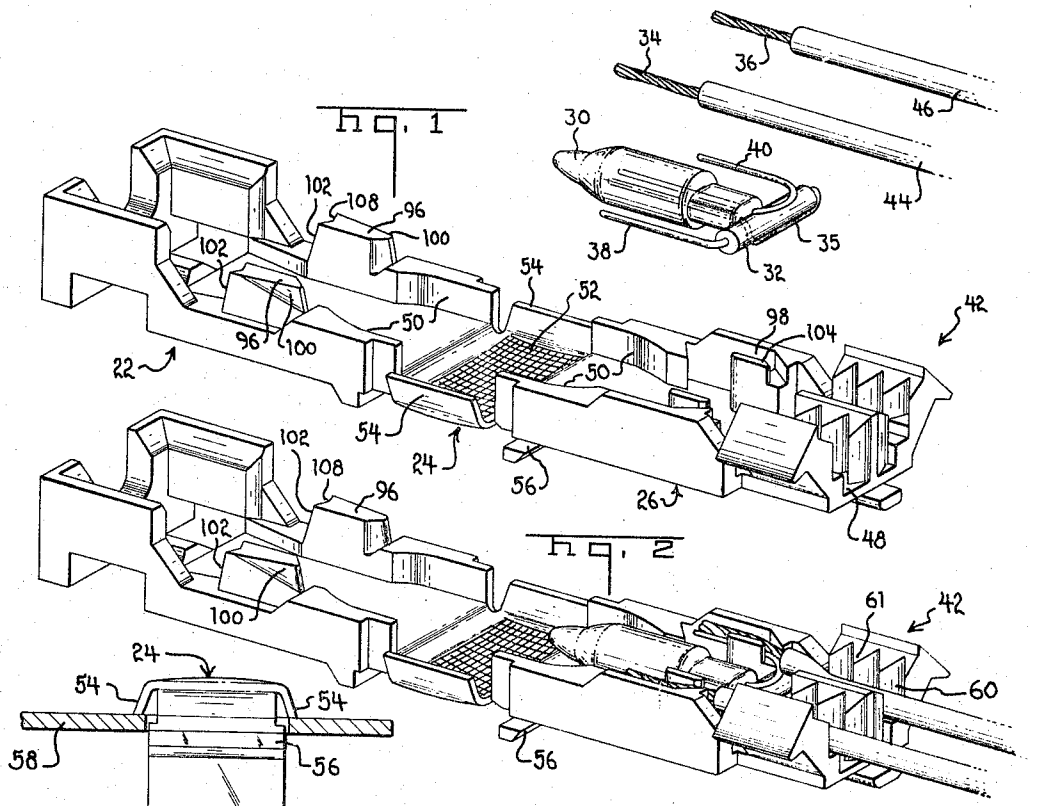
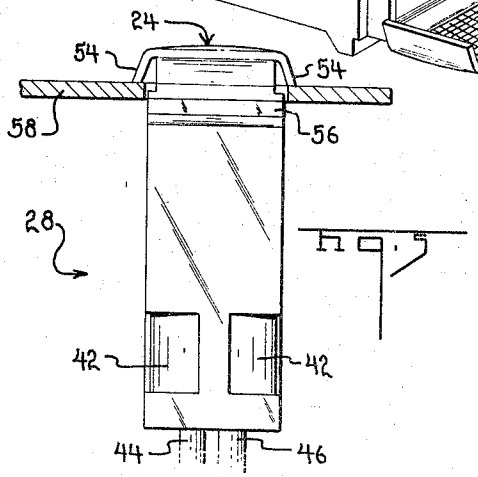
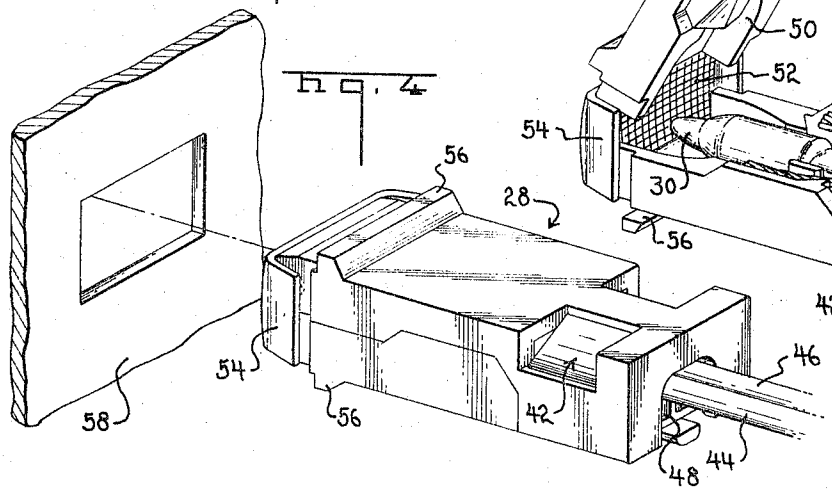
Nov. 21, 1967 H. RUEGER 3,354,454

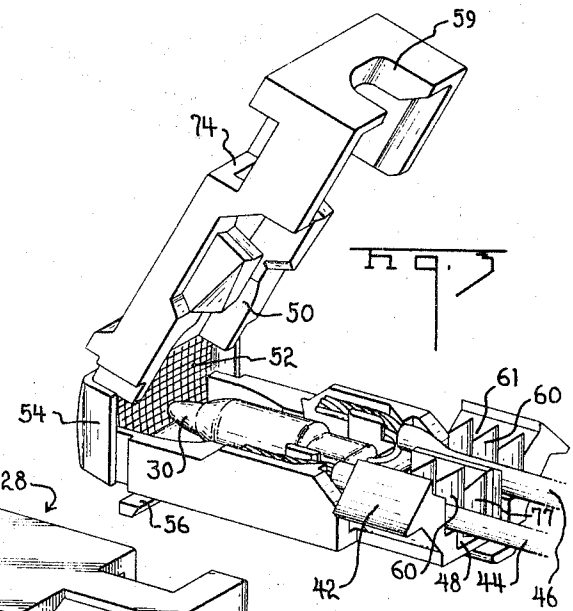
ONE-PIECE SIGNAL HOUSING

Original Filed Aug. 21, 1961 3 Sheets-Sheet 1









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ONE-PIECE SIGNAL HOUSING

Original Filed Aug. 21, 1961 3 Sheets-Sheet 2

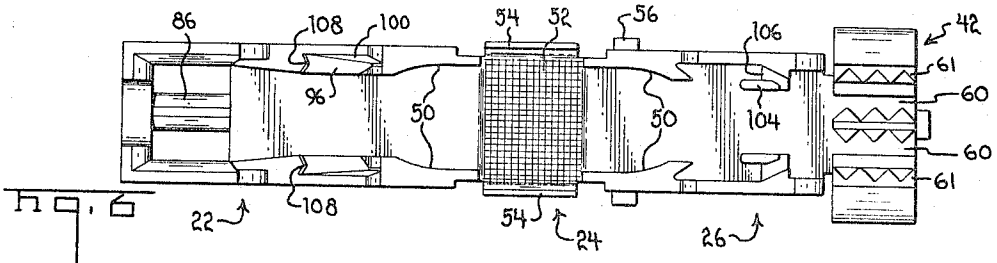

Fig. 6

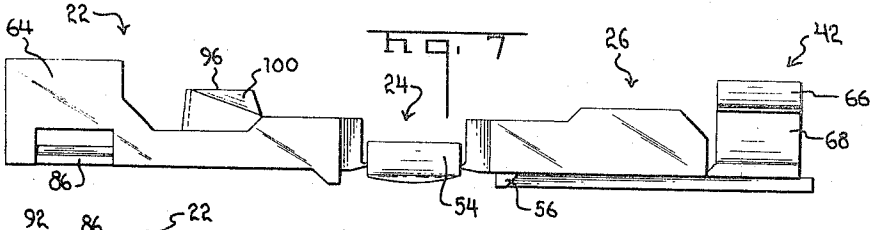

Fig. 7

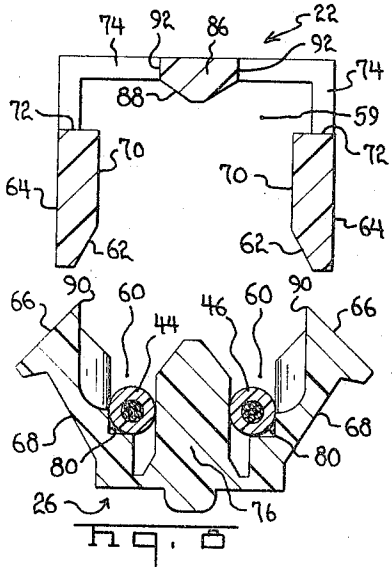

Fig. 8

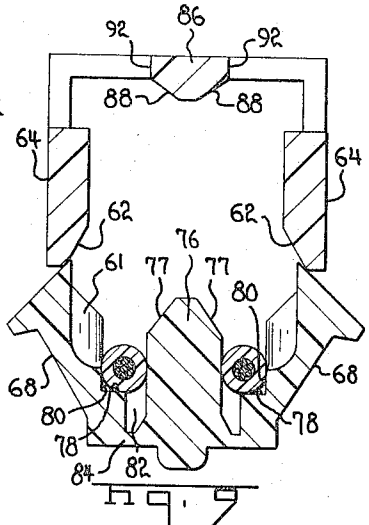

Fig. 9

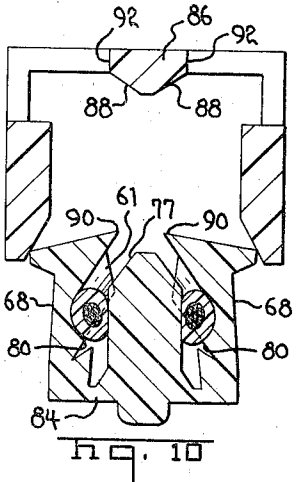

Fig. 10

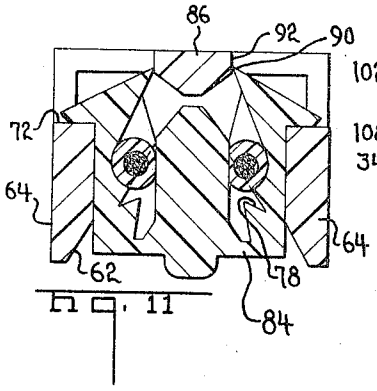

Fig. 11

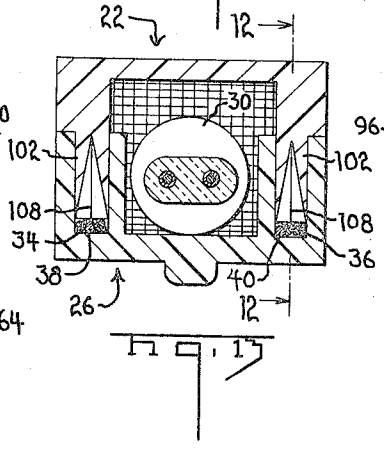

Fig. 13

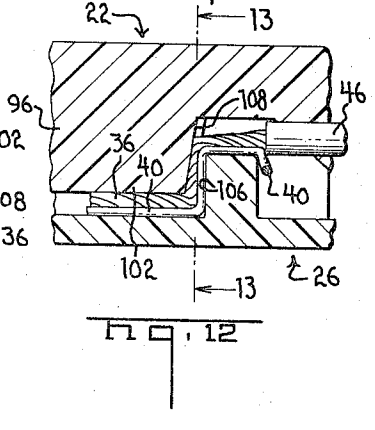

Fig. 12

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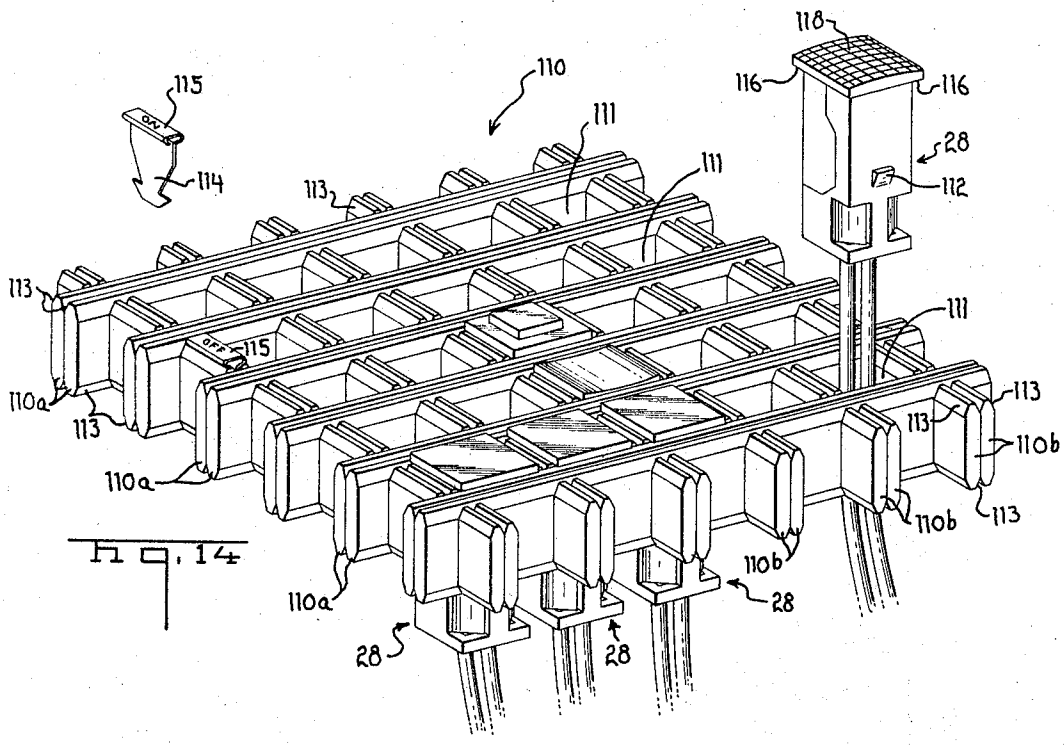

Fig. 14

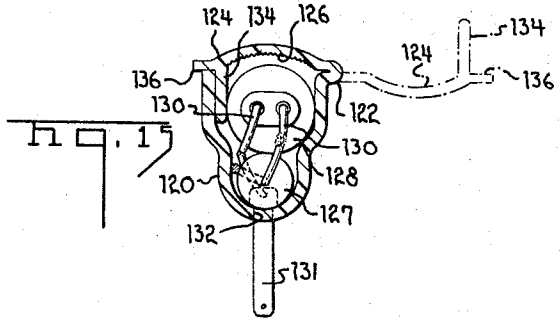

Fig. 15

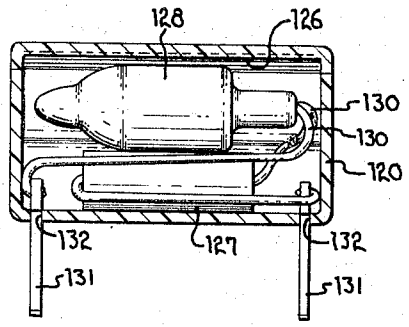

Fig. 16

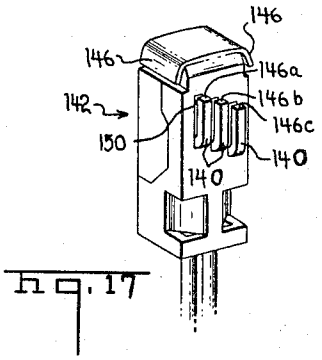

Fig. 17

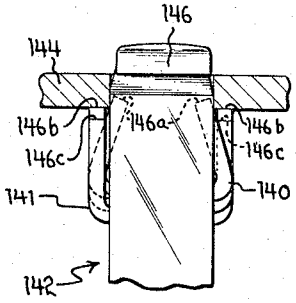

Fig. 18

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Patented Nov. 21, 1967

3,354,454

ONE-PIECE SIGNAL HOUSING

Herman Rueger, Lancaster, Pa., assignor to AMP Incorporated, Harrisburg, Pa.

Continuation of application Ser. No. 362,146, Apr. 23, 1964, which is a continuation of application Ser. No. 132,670, Aug. 21, 1961. This application Nov. 4, 1966, Ser. No. 592,234
16 Claims. (Cl. 340—381)

ABSTRACT OF THE DISCLOSURE

An integral one-piece housing having a lens section, body members having cavities therein and hingedly connected at one end to the lens section, and latch means at the other end of the body members latchably maintaining the body members in a closed position and thereby defining a hollow chamber to hold a light bulb and electrical units thereof with the light bulb being disposed adjacent the lens section.

This is a continuation of application Serial No. 362,146 filed April 23, 1964, now abandoned.

This invention relates to a signal and to the one-piece housing which contains the signaling elements.

The signal comprises an energy responsive device, its power conduit, and the one-piece housing. The energy responsive device may be a radiant energy emitter, a sound emitter, or the like. While the entire housing may serve as an energy passage means, the preferred embodiment includes an energy passage panel.

More particularly, this invention relates to a miniature signal in the form of an insulating plastic housing containing a miniature light bulb or glow lamp of the neon type and its resistor, the housing having a light passage panel or lens.

The housing is preferably molded in a predetermined form to provide complementary top and bottom members connected together by hinge means. The members in open position receive the electrical units and are then moved to the closed position to house the units. Strain relief means for the electrical lead is provided in the housing. The housing may be of colored plastic material, such as, nylon, or the like, and may be provided with a translucent or transparent light passage panel, the panel being in the form of a lens of specific characteristics, if desired.

The housing is designed to provide a latch means which is locked closed when the top and bottom member are moved to closed position. Complementary means are provided in the top and bottom members for squeezing the electrical leads into biased electrically conducting contact; the leads may also be connected in the usual manner, such as, soldering, if desired.

The signal of this invention is particularly adapted for use in control panels for electrical circuits, indicator lights on equipment including household appliances, and the like. As will be explained, the signal is designed for economical manufacture and can be constructed in a manner which prevents tampering. Preferably the signals are designed to be locked in a closed position so that no danger of electrical short circuits is present, and no unauthorized repair or disassembly can take place without destruction of the one-piece housing. The signal may be mass-produced at a cost which justifies replacement of the entire signal when the electrical units fail. The signal of this invention, therefore, provides important advantages of economics and safety.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a

reading of the following detailed description when taken in conjunction with the drawings in which there are shown and described illustrative embodiments of the invention; it is to be understood, however, that these embodiments are not intended to be exhaustive nor limiting of the invention but are given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify it in various forms, each as may be best suited to the conditions of a particular use.

In the drawings:

FIGURE 1 is a perspective view of the housing in open condition with the electrical units shown at locations above their housed positions in the housing;

FIGURE 2 is a view similar to FIGURE 1 with the electrical units in position in the housing;

FIGURE 3 is a view similar to FIGURE 2 with the top member pivoted about the hinge means toward its closed position;

FIGURE 4 is a perspective view similar to FIGURE 3 with the top and bottom members in closed position and the complete unit in position for movement into mounted position on a mounting plate;

FIGURE 5 is a side view of the signal mounted on the mounting plate;

FIGURE 6 is a top view of the housing shown in FIGURE 1;

FIGURE 7 is a side view of FIGURE 6;

FIGURE 8 is an end cross-sectional view of the latch means and strain release means as the top member approaches the bottom member;

FIGURES 9, 10 and 11 are views similar to FIGURE 8 showing the positions of the parts as the top member is moved to closed position on the bottom member;

FIGURE 12 is a longitudinal sectional view taken on line 12—12 of FIGURE 13 showing the means for establishing sound electrical contact between the leads;

FIGURE 13 is a cross-sectional view taken on a line 13—13 of FIGURE 12 across the housing;

FIGURE 14 is a perspective view of a signal in position for insertion into an egg crate type panel;

FIGURE 15 is a cross-sectional view of a modification of this invention showing a flange-like hinge means between the top and bottom members and wherein the signal emitting area is in one of the members;

FIGURE 16 is a sectional side view of the signal of FIGURE 15;

FIGURE 17 is a perspective view of the signal with a modified form of plate mounting means; and

FIGURE 18 is a fragmentary side view illustrating the mounting of the signal of FIGURE 17 on a plate.

Referring now to FIGURES 1 to 5, it will be seen that the preferred embodiment of this invention comprises a single-piece housing of moldable plastic material having a top half-shell member 22, hinge means 24, and a bottom half-shell member 26. The signal, generally designated as 28 in FIGURE 4, is constructed by placing a light bulb 30 of the glow lamp type in the bottom member 26 along with its electrically connected resistor 32, and placing the stripped main leads 34, 36 in the bottom member 26 in contact with the bare leads 38, 40 of the glow lamp 30 and its resistor 32. These leads may be previously joined together into an integrated electrical system or may be placed in the bottom member for squeezing action by the housing. In the illustrative embodiments, a resistor lead and a light bulb lead have been joined as lead 35 by welding. Resistor 32 serves to keep the welded lead 35 separated from the other leads. The signal is completed by merely moving the members 22 and 26 relative to each other whereby the hinge means 24 is moved to a position

at right angles or normal to the longitudinal attitude of the top and bottom members as shown in FIGURES 3 and 4, the top and bottom members being forced together to accomplish latching of the latch means **42** (FIGURE 4).

The light bulb **30** and its resistor **32**, if required, along with the necessary internal electrical leads, are contained within the enclosed light bulb chamber formed by the complementary top and bottom members **22**, **26** and the insulated electrical leads **44**, **46** pass out through the electrical passage **48** (FIGURE 4). As seen in FIGURE 3, the electrical passage **48** preferably is formed with strain relief means for gripping the insulated leads **44**, **46**. The front portions of the housing members **22**, **26** include complementary curved reflector surfaces **50** extending rearwardly from a generally rectangular, convex-surfaced lens **52**, which, in the illustrative embodiment, is advantageously formed as a part of hinge means **24** in the molding operation of the housing. In this connection, the lens **52** may take a variety of forms as suited to the conditions of a particular use, and further, when the plastic material for the housing, in general, is unsuited to pass the energy involved, hinge means **24** may be molded to leave an opening, not shown, into which a more suitable lens material may be fitted as will be apparent to those skilled in the art. It will also be apparent that lens **52** may be located elsewhere on the housing than as a part of hinge means **50**, as, for example, in the sidewall of one of members **22**, **26**.

Reflector surfaces **50** on adjacent sides of the members join when the housing is closed to form a reflector for the glow lamp which directs light rays through the lens. To improve the reflective characteristics of reflector **50**, its surfaces may be treated as by aluminizing or foil laminates as desired.

A pair of ears **54**, **54** extend transversely and rearwardly from the side edges of the lens **52** and when the housing is in closed position, these ears **54**, **54** extend outwardly from the housing for engagement with the front surface of a panel **58**, as shown in FIGURES 4 and 5. Transverse lugs **56**, **56** are formed on members **22**, **26** adjacent the hinge lines for abutting engagement with the back surface of the panel **58**. The ears **54** have sufficient flexibility to bias the lugs **56** toward the panel and thereby hold the signal in a firmly anchored condition.

As will be noted from FIGURES 3 and 4, the insulated main leads **44**, **46** extend through the lead passage **48** which is made up of the cover channel **59** and two separate channels **60**, **60** in the bottom member **26** having sidewalls formed with saw teeth **61**, **61** extending upwardly and transversely of the main leads. The strain relief feature at this location is shown more specifically in FIGURES 8 to 11. As the top member **22** moves downwardly from the position of FIGURE 8 to the position of FIGURE 9, the inner cam surfaces **62**, **62** of its rear end depending arms **64**, **64** engage the slanted surfaces **66**, **66** of the end wings **68**, **68** of the bottom member **26** causing them to swing inwardly towards each other, thereby crimping the insulated leads, as seen in FIGURE 10. When the uppermost portions of the cam surfaces **62**, **62** have reached the outermost edges of the wings **68**, **68**, the leads are in an over-crimped condition thereby causing a certain crimped set in the leads. The wings **68**, **68** then maintain this innermost crimping set position while the straight vertical inner surfaces **70**, **70** of the arms pass thereby, after which the inherent resilience of the wings, augmented by the tendency of the insulated leads to resume their uncrimped shape, causes the wings to spring outwardly over ledges **72**, **72** into the corner openings **74**, **74** in the top corners of the top member **22**. When the wings spring outwardly, they relieve some of the crimping stress on the insulated leads but retain a predetermined bias toward the leads to produce the necessary strain relief. The center bar **76** extending upwardly from the bottom member **26** is rigid and its vertical saw teeth **77**, **77** are staggered with respect to the saw teeth **61**, **61** on the wings to provide an interlocking or overlapping of the teeth, as shown in FIGURE 10, during the over-crimping stage of the closing operation. It will be noted in FIGURE 9 that each of the insulated leads **44** and **46** initially rests on a partial inwardly extending floor **78** and between the teeth on the center bar **76** on one side and a vertical wall **80** and the bottom portion of the teeth on its respective wing **68** on the other side. As seen in FIGURE 10, the vertical wall **80** is swung inwardly along with its wing **68** and the insulated lead assumes a crimped position above upwardly angled partial floor **78** and within the curved bottom portion of the teeth **61** on the wing. The partial floor **78** and its adjoining vertical wall **80** enclose substantially the outer lower quadrant of the lead in the initial position of FIGURE 9; a deep groove **82** is formed between the floor **78** and center bar **76** with a bottom resilient web **84** forming the bottom of the groove. The web **84** and the juncture of floor **78** and wall **80** provide resilient flexure zones for the movement of the wing **68**.

The preferred embodiment also includes a latch means **42** which provides for the orienting of all parts of the one-piece housing, as well as a sound structural lock to prevent inadvertent opening of the housing. The wings **68**, **68** which serve to crimp the leads and provide strain relief therefor also serve to latch the top member **22** to the bottom member **26** in a rigid manner. As seen in FIGURES 10 and 11, each wing flexes outwardly over its ledge **72** in the side of the top member. Central top strut **86** of the top member has divergent outwardly and upwardly slanted surfaces **88**, **88**, against which the inner pointed edges **90**, **90** of the wings slide as the wings **68**, **68** flex outwardly over the ledges **72**, **72**. Due to inherent resiliency, the pointed edges **90**, **90** continue to slide upwardly along the strut **86** into engagement with the vertical safety lock walls **92**, **92** of the strut **86**, thereby providing a double latching or locking effect. The double locking provides an indicator which is substantially tamper-proof in that it cannot be opened without the utilization of special tools or the partial destruction of the housing itself.

It will be understood that the necessary connection between the electrical units and the main leads can be accomplished in the usual fashion by soldering, or the like. In the embodiment shown specifically in FIGURES 1 to 14, electrical connection for certain leads is accomplished without solder by squeezing the bare leads together and maintaining them in a biased electrically contacting condition. This is accomplished by means of complementary squeeze means which force the electrical leads into electrically conducting contact when the top and bottom members are moved to closed position, the leads **38**, **40**, **34** and **36** having been properly placed in the bottom member **26** as shown in FIGURE 2. The top member **22** is provided at each side with a wedge **96** having a pilot portion **100** and a prong portion **102** positioned for engagement with a socket **98** having a guide portion **104** and an anvil portion **106**, respectively, at each side of the bottom member **26**. The pilot portion **100**, guided by portion **104**, enters the socket **98** as the two members **22**, **26** swing toward closed position to align the prong portion **102** with the anvil portion **106**. In the embodiment shown, the pilot portion **100** is tapered from a narrow front end to a wide rear end to provide a loose fit with the guide portion **104** at the initial engagement therewith. As the pilot portion **100** proceeds past guide portion **104** and into the socket **98**, the wider part of the pilot portion enters and completes the desired accurate alignment of the prong portion **102** with the anvil portion **106**. The front of the prong portion has a V-notch **108** along its vertical rear end wall which, as seen in FIGURES 12 and 13, slides into contiguous relationship with the forwardly facing vertical anvil portion **106** to accommodate the bare electrical leads in a biased electrically conducting condition. It will be recognized from FIGURE 12 that the prong portion **102** operatively engages and draws the leads downwardly over the anvil

portion **106** as the top and bottom members **22** and **26** are moved to a closed position.

Referring now to FIGURE 14, it will be seen that the signal **28** previoulsly described may be utilized in an egg crate-type panel **110** with indicia plate **115** being used to identify the item being monitored by the signal. In the exemplary embodiment, panel **110** is formed from a series of horizontal and vertical pairs of strips **110***a* and **110***b*, having conventional blind-halved lap joints at the cross-over points to define rows and columns of apertures **111** into which a plurality of signals **28** can be fitted. The four side corners **113** of each strip **110***a* and **110***b* are beveled to serve as a guide for inserting the retainer leg **114** of plate **115** into a frictional fit between the pair of strips as shown.

It will be noted in FIGURE 14 also that flexible latch elements **112** are provided in the sidewalls of the housing, which are disposed to snap behind and engage the bottom edges of the strips **110***a*, **110***b* as the lips **116** of lens **118** abut the top edges of the strips.

An embodiment of this invention showing flange side hinge means in a one-piece housing construction is shown in FIGURES 15 and 16. The bottom member **120** is hingedly connected by a flange hinge means **122** to a top member **124**, the top member including a lens **126**. Housed within the bottom and top members is a resistor **127**, a light bulb **128** and its associated electrical leads **130** connected together in this embodiment by welding. Leads **130** are connected, as by soldering, to sheet metal prongs **131** which project outwardly through openings **132** in the ends of the bottom member for connection with external lead wires. The top member **124** has a depending lug **134** which frictionally engages, and preferably is adhesively bonded to, the inner wall of the bottom member **120** for maintaining a closed position. The depending lug **134** and the wall of bottom member **120** are in a biased condition and provide a means for holding the light bulb **128** in a fixed position. The outer edge of the top member **124** includes an overlap flange **136**, which along with the flange hinge **122**, enables the mounting of the signal in a suitable panel board.

It can be appreciated from FIGURE 5 that the flexible nature of ears **54** will allow the signal to be firmly anchored to plates of different thicknesses within a limited rangefl Under some conditions of use, however, a wider range of plate thickness accommodation is desired than can be had by ears **54** alone. Accordingly, as shown in FIGURE 18, similar stops **140** and **141** are integrally formed on opposite sides of the body of signal **142**, which are arranged to abut the back surface of plate **144** in cooperation with the engagement of flexible ears **146** on the top of plate **144** to anchor the signal axially in the plate aperture.

Each stop, for example, stop **140** shown in FIGURE 17, includes a plurality of discrete stop elements **146***a*, *b* and *c*, which are axially spaced along the body of signal **142** in stepped differences relative to ears **146**, and each stop element is carried so as to be independently movable inwardly of the signal body, which is achieved in the illustrative embodiment by the stop elements being the end faces of a series of separate flexible arms **148** extending in spaced relation axially along the side of the signal body toward and in staggered spacing from ears **146**. Openings **150** in the signal sidewalls opposite the arms **148** allow the distal ends of the arms to be depressed to within the main body of the signal.

In operation, all the distal ends of the arms **148** are manually depressed as the lens end of the signal is inserted through the plate aperture. Upon the snap of ears **146** outwardly over the plate top surface, arms **148** are released and the signal pulled lightly backwardly against ears **146**. So many of arms **148** will then return to normal position as the thickness of the panel will allow to dispose the appropriate stop element **146***a*, *b* or *c* in position for engagement with the back surface of the plate. If the signal can be inserted from the top side of the plate, as indicated in FIGURE 14, arms **148** may be automatically cammed inwardly by the edges of the aperture to achieve the desired latching action. Under such circumstances, for easy camming action and to avoid enlarging the panel aperture beyond the cross-sectional dimensions of the signal body, the proximal ends of arms **148** may preferably be molded to emerge gradually from the body of the signal, and thus, to be depressible wholly within the signal body, as will be apparent to the skilled in the art. Further, to increase the compensating effect for variations in panel thickness of each stop element, the planar stop face **146** of arms **148** may be slightly declined outwardly from the edge of the aperture, as well as arranging arms **148** angularly of the signal body length as desired.

What is claimed is:

1. An integral one-piece plastic housing for containing a light bulb and its electrical leads comprising top and bottom members, hinge means connecting said members at spaced hinge lines for movement from an open position to a closed position, said hinge means including a light passage panel formed therein, said members having complementary portions defining a light bulb chamber and an electrical lead passage, said members having complementary strain relief means for gripping said electrical leads when the members are in closed position.

2. A housing for containing electrical units and for electrically connecting leads comprising top and bottom members, hinge means integrally connecting said members for movement between an open position and a closed position, said members having complementary squeeze means including a pilot portion and a prong portion extending from one of said members and a guide portion and an anvil portion extending from the other of said members, said pilot portion operatively coacting with said guide portion upon closing movement of said members to properly align said prong portion with said anvil portion, said prong portion operatively coacting with said anvil portion for forcing electrical leads into electrical contact when said members are in closed position.

3. A housing for containing electrical units and for electrically connecting leads comprising top and bottom members, hinge means integrally connecting said members for movement between an open position and a closed position, said members having complementary squeeze means including a wedge extending from one of said members and a socket formed in the other of said members, said wedge having a pilot portion and a prong portion, said socket having a guide portion for receiving said pilot portion upon closing movement of said members to accurately align said prong portion in said socket, said socket having an anvil portion operatively coacting with the aligned prong portion for forcing electrical leads into electrical contact when said members are in closed position.

4. A housing as defined in claim **3** and wherein said pilot portion is tapered to present initially a narrow, loose-fitting portion to said guide portion developing into a wide, tight-fitting portion upon moving said members to closed position, and wherein said prong portion has a V-notch along its end wall contiguous to the end wall of said anvil portion to accommodate the electrical leads in biased electrical contact.

5. A plastic housing for containing a light bulb and its electrical leads comprising top and bottom members, hinge means connecting said members at spaced hinge lines for movement from an open position to a closed position, said hinge means including a light passage panel formed therein, said members having complementary portions defining a light bulb chamber and an electrical lead passage, said members having complementary strain relief means for crimping and gripping said electrical lead including a flexible wing and a bar, opposed faces of said wing and said bar having complementary staggered saw teeth formed therein to enable overlapping of the teeth

as the members are moved to closed position to crimp the lead, said members being formed to bias said wing toward said bar as the members are closed.

6. A plastic housing as defined in claim 5 and wherein said members have complementary latch means including an outer side portion of said wing extending from one of said members and a complementary ledge formed in the other of said members at a position for latching engagement with said side portion when said members are in closed position.

7. A plastic housing as defined in claim 6 and wherein said latch means includes a pointed edge at the inner portion of said wing and a strut formed in said other of said members at a position for latching with said pointed edge when said members are in closed position.

8. For use in a signal structure containing a pilot lamp or the like having electrical leads, an integral one-piece housing of stiffly flexible insulating material comprising top and bottom members, hinge means connecting said members for movement between an open and closed position, said members having complementary cavities and forming when closed a chamber confining the pilot lamp in predetermined position, a wall section of said housing being translucent for transmitting the light of the lamp, means for supporting the housing in an aperture of a panel with said wall section in display position on one side of the panel, and latch means having complementary interengaging elements on the distal ends of said members for securing the housing in closed position.

9. An integral one-piece housing as set forth in claim 8 wherein said latch means includes a pair of arms on one member and camming surfaces on the other member for moving said arms toward one another upon closure of the housing, and a passageway for the leads of the pilot lamp extending between said arms, movement of said arms together closing said passageway thereby to grip the pilot lamp leads.

10. For use in a signal structure containing a pilot lamp, or the like, having electrical lead wires, an integral one-piece housing of stiffly flexible insulating material comprising a light transmitting panel, a pair of chamber-forming members connected to opposed sides of said panel by a thin-walled hinge section and movable toward each other to form a chamber confining the pilot lamp adjacent said panel, and latch means having complementary interengaging elements on the distal ends of said members for securing said members in chamber-forming position.

11. A one-piece housing of insulating material for containing electrical units and for electrically connecting leads comprising top and bottom shell members, hinge means integrally connecting said members for movement between an open position and a closed position, said members when closed forming a chamber for housing an electrical unit having electrical lead wires, aperture means in said members for admitting external lead wires into said chamber for engagement with the unit lead wires, and complementary interengaging clamping elements on said members for securing the unit and external lead wires in electrical engagement upon closure of said members, said clamping elements including a socket on one of said members for receiving in juxtaposed position an external lead wire and a lead wire of the electrical unit.

12. A housing according to claim 11 wherein said clamping elements include a wedge extending from one of said members and a socket formed in the other of said members, said wedge and socket being cooperable upon insertion of the electrical leads being disposed in said socket and closure thereof to press and secure the electrical leads in electrically conducting contact.

13. A housing for containing electrical units comprising top and bottom members, hinge means integrally connecting said members for movement between an open position and a closed position, said members having complementary portions defining an electrical unit chamber, said members defining when in said closed position an operating section adjacent which the operating portion of an electrical unit is to be disposed, and latch means on the distal ends of said members for securing the housing in said closed position.

14. An integral one-piece housing of stiffly flexible insulating material for containing an electrical unit having an inherent function, said housing comprising first and second members, hinge means connecting said members for movement between an open and closed position, said members having complementary cavities and forming when closed a chamber confining an electrical unit in predetermined position, said members when in said closed position defining an operating section through which the function of the electrical unit is attained, and latch means having complementary interengaging elements on said members for securing the housing in said closed position.

15. A housed component comprising a one-piece housing of stiffly flexible insulating material and an electrical unit having an end through which an inherent function of the unit is externally directed and an energizing lead wire, said housing including top and bottom shell members, hinge means integrally connecting said members for movement between an open and a closed position, said members when closed forming a chamber for housing the electrical unit and an aperture for passing the lead wire of the unit to external circuitry, complementary interengaging elements on said members for securing the unit in closed position, a wall section of said housing exposing said inherent function to the exterior thereof, said housing further including orienting elements to position said unit with said end adjacent to and directed towards said wall section.

16. A one-piece housing of stiffly flexible insulating material for containing an electrical unit having an energizing lead wire comprising a pair of shell members having an energizing lead wire comprising a pair of shell members having a fully-opened side-by-side natural condition, hinge means integrally connecting the adjacent sides of said members for movement between the open to a closed position, said members when closed forming a chamber and an aperture for housing the electrical unit and passing a conductor wire into the chamber, respectively, and complementary interengaging latch elements on the distal sides of said members for securing the unit in closed position, said elements including cam surfaces terminating in transverse shoulders on the outside of the sidewalls of one member which sidewalls interfit within the sidewalls of the other member, said other member having openings in the sidewalls thereof to provide a transverse ledge aligned and cooperating with said transverse shoulders to secure said members in closed position.

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