

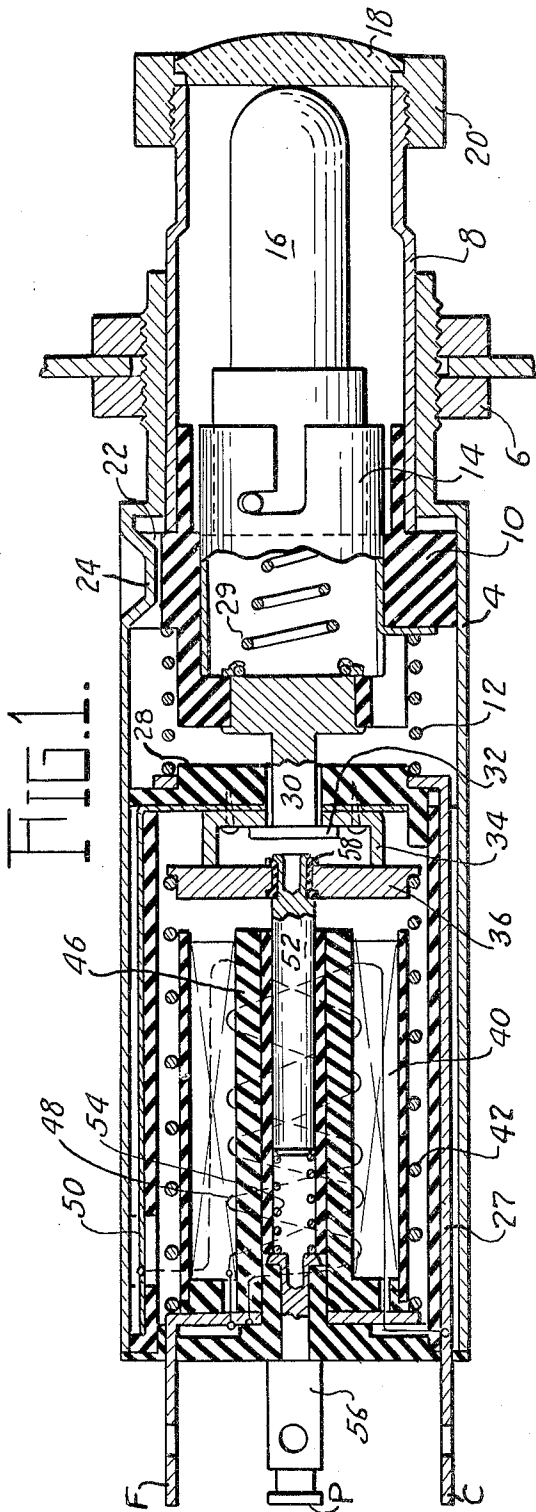
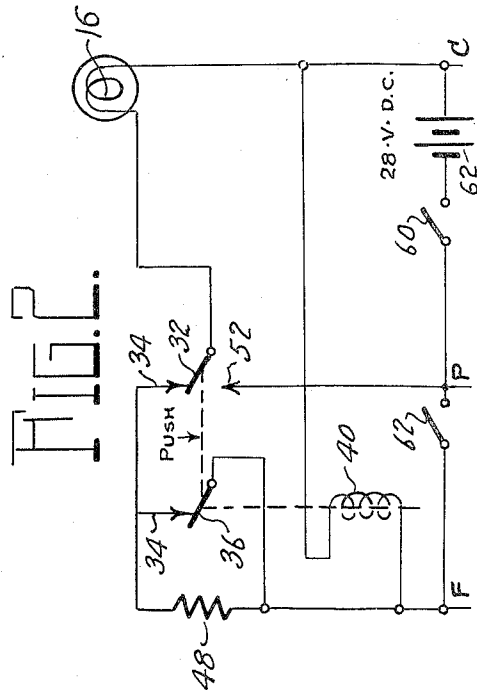
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AUTOMATIC RECYCLING WARNING LIGHT

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AUTOMATIC RECYCLING WARNING LIGHT

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This invention relates to warning devices and is particularly directed to warning lights of the type used in aircraft to indicate a malfunction or abnormality of a monitored apparatus.

Aircraft warning signals are preferably of the type that will give a bright signal when the electrical circuit thereto is first closed, which signal may be dimmed if the pilot finds it to be annoyingly bright. In many instances this dimming arrangement has taken the form of a polarized filter in front of the signal which is turned to adjust the display to the desired brilliance. These devices are satisfactory only if the pilot painstakingly resets all of his warning devices prior to take-off to assure that the first warning given will be by a bright light, otherwise the dim signal may not be sufficiently brighter than the ambient light to afford a satisfactory warning. If the pilot neglects to reset the warning devices of the prior art with which we are familiar, only the dim signal will be given. The primary object of the present invention is to provide a warning device which automatically resets itself, and further, which requires only a minimum of motion to adjust the intensity of the display.

Still another object of the invention is to provide a warning device in which the lamp itself may be tested for integrity at any time without the possibility of confusion by reason of the fact that the function circuit is broken during the testing operation.

Still another object of the invention is to provide a warning device which has a minimum of moving parts that are likely to get out of order, but which will accomplish its desired function without fail.

Other objects and advantages of the invention will become apparent from the following specification which describes a preferred embodiment thereof, reference being had to the accompanying drawings in which—

Fig. 1 is a central vertical sectional view of a warning light embodying the invention, certain of the connections being diagrammatically shown; and

Fig. 2 is a circuit diagram showing the connections of the warning light and its power source.

Briefly the present invention comprises a warning light energized upon closure of a "function" switch through two parallel circuits of different resistance so that the intensity of the light is dim if one circuit is closed and high if both circuits are closed. A solenoid is provided which is also energized upon closure of the function switch, being thus in parallel with the light. The armature of the solenoid is biased to stand away from its coil and is made a part of a normally closed switch in the low resistance lamp circuit. Upon closure of the solenoid circuit the energy thereof is insufficient to overcome the bias on the armature, but is sufficient to hold the armature in a switch-open position if moved close to the coil by a manual movement of the operator. Opening of the circuit of which the armature is a part establishes the higher resistance lamp circuit and dims the display. When the function switch reopens, or power to the device is cut off,

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the bias on the armature re-establishes its normal position and the unit will then give a bright display upon subsequent closure of the function circuit.

Referring to the drawings, the preferred form of the invention includes a housing 4 having any suitable form of attachment means 6 to enable the unit to be attached to a panel or bulkhead. A reciprocable housing member 8 is associated with the principal housing member 4 and is connected to an insulating lamp socket receiving member 10 which is biased outwardly by a spring 12. A metallic lamp socket 14 of conventional form is held in the insulating member 10 and receives a warning lamp 16 which may be removed and replaced through the open end of the reciprocable housing member. A lens cap 18 closes the open end and is held in position by a ring 20.

The reciprocable housing member is guided in its longitudinal movements in the main housing member by a slot or recess 22 in its periphery which engages with a depressed portion 24 of the main housing member. The spring 12 biases the entire assembly outwardly and in turn bears against an insulating partition 28 within the housing. The lamp socket 14 which engages the shell contact of the warning lamp is connected by the biasing spring 12 to a side contact member 27 which runs along the interior of the main housing member and extends therefrom in a contact marked C in the drawing.

The center lamp contact is connected through a small spring 29 to a plunger or contact member 30 which passes through the insulating partition 28 and which has an enlarged contact head 32 at its lower end. Normally, the contact head 32 bears against a stationary contact 34 which is fixed to the insulating partition 28 in any suitable manner and which is provided with a downturned peripheral flange. Thus in its normal position the contact 32 engages the central portion of the stationary contact 34, and a metallic armature and contact member 36 is engaged by the periphery of the stationary contact.

Also disposed within the main housing member is a solenoid having a coil diagrammatically indicated at 40 and associated with the armature 36. The armature 36 is biased away from the coil of the solenoid by a spring 42 and the coil is so dimensioned and wound as to be normally incapable of overcoming the bias of the spring 42 and drawing the armature 36 down when the coil is energized. Thus the biasing spring 42 normally urges the armature 36 against the periphery of the stationary contact 34. However, the size of the coil 40 is so chosen that if the armature is moved down to be linked by a greater portion of the flux emanating from the coil 40 it will be retained in its lowered position.

Coil 40 is connected at one side to contact F which extends beneath the base of the main housing member and its other side to contact C.

The solenoid coil 40 is wound around a hollow central form member 46 which also carries a second winding 48 consisting of only a few turns and which is interposed between the contact F and a side conductor 50 which is brought along the side of the interior of the housing, turned inwardly, and electrically connected to the stationary contact 34.

The hollow interior of the form over which the solenoid coil is wound is used to guide a stem 52 which is pressed upwardly by a spring 54 which serves also as an electrical connection between the stem 52 and a terminal 56 extending outwardly from the main housing of the unit. The armature 36 is mounted on the end of the stem 52 so that the latter may guide it in its movements but is electrically insulated therefrom by a grommet 58 so that the portion of the stem extending upwardly from the armature may serve as a contact independently of the armature it-

self. This portion serves as a test contact in cooperation with the plunger contact 32 as hereinafter described.

Turning now to the circuit diagram in Fig. 2, the warning lamp 16 is shown as connected between contact C and a movable contact forming the member of a double throw switch. The movable contact shown is a diagrammatic representation of the plunger contact 32 in Fig. 1. In its normal position the movable contact 32 is closed against a stationary upper contact which is a diagrammatic illustration of the center portion of contact 34 in Fig. 1. The lower contact of the double throw switch of which the movable contact 32 is a part, is a diagrammatic representation of the stem 52 in Fig. 1. It will be seen that this stem is connected to a contact P corresponding to terminal 56 and through a power switch 60 to a battery 62, the other side of the battery being connected to contact C. Thus, a test circuit is formed by which the integrity of the lamp 16 may be determined at any time, it being only necessary for the operator to depress the plunger contact 32 against the contact 52 to complete a circuit from the battery to the lamp.

In Fig. 2 the peripheral portion of the stationary contact 34 is shown diagrammatically as a contact closed against the armature or contact 36 and the latter is indicated as being coupled to the solenoid coil 40. It will be seen that the connection between the armature and contact F in Fig. 2 is a diagrammatic illustration of the biasing spring 42 which serves as the electrical contact in the physical device shown in Fig. 1.

The small coil constituted by winding 48 is shown in Fig. 2 as being electrically connected to the stationary contact 34 and to contact F.

A function switch 62 is shown in Fig. 2 as interposed between terminals P and F and is thus in series with the switch 60 to the power source. This switch may be any suitable device which is closed in response to a malfunction or an abnormality of a monitored condition. For example, it may be closed upon the overheating of a portion of a machine or it may be closed in response to increases or decreases in pressure above or below a predetermined value. The monitoring of various functions on aircraft is well known in the art and need not be particularly described.

In operation, assuming first that the power switch 60 is closed, the operator tests the lamp 16 by pushing in on the movable housing portion 8 which moves the plunger contact 32 away from stationary contact 34 and against the test contact 52. It will be seen that the "function circuit" hereinafter described is broken before the test circuit is established, by opening contacts 32, 34.

If the lamp is in operating condition, the contact 32 is permitted to return to its normal position against contact 34. There are then two parallel circuits which may be established immediately upon closure of the function switch 62 in response to the monitored condition. One of these is the low resistance circuit running through contact F, spring 42, armature 36, contact 34, contact 32, to the lamp and its return to contact C. The other parallel circuit is of higher resistance and runs from contact F through the resistance of winding 48 to contact 34, contact 32 and then follows the same path as the low resistance circuit just described.

Thus if the function switch 62 closes for any reason the lamp 16 will be energized through the low resistance circuit and will give a bright display calling the operator's attention quickly to the fact that something is wrong.

Upon closure of the function switch a circuit is established also through the solenoid 40 across terminals or contacts F and C. The coil however is, as above described, so wound that its magnetically related armature 36 will not be drawn away from its normal position in which it is held by spring 42. Should the operator note the display of the lamp and wish to dim it he does so by pushing in on the end of the movable housing part 8 so that the plunger 30 moves against the armature 36 and forces it against its

biasing spring to a position close to the coil 40. Once the armature is moved to this position it will stay there because the coil is sufficiently strong to hold it. The plunger contact then returns to its normal engagement with contact 34 while the armature remains out of contact with this member.

The movement just described opens the low resistance parallel circuit to the lamp by breaking the contact between armature 36 and contact 34. This leaves active, however, the higher resistance lamp circuit and the lamp will thereafter burn dim.

Should the function switch 62 be thereafter opened, the coil 40 will no longer have current flowing in it, and the armature will be released so that it can move back to its initial position under the biasing force of spring 42, and the unit is ready for a new cycle of operation.

It will also be seen that repositioning of the armature 36 will take place if power switch 60 is opened. Thus if at the end of a flight the warning lights have been burning dim and the succeeding operator neglects to test them, he will always be given a bright display and there is no chance of the dim lamp condition being held over as is the case with the usual polarized dimming arrangement.

While the present invention has been shown and described in conjunction with a specific form and disposition of the parts, it should be expressly understood that it is capable of numerous embodiments within the scope of the appended claims.

What we claim is:

1. An automatic recycling electrical warning device comprising, a power source, a warning lamp, a main power switch in series with said power source, a function switch responsive to a condition to be monitored in series with said main power switch, two parallel circuits of higher and lower resistance connecting said function switch and said lamp, manual means to open said lower resistance circuit to dim said lamp, a solenoid in parallel with said lamp across said function switch, an armature for said solenoid constituting a portion of said low resistance circuit and movable by said manual means and normally biased to circuit closing position, said solenoid being so magnetically related to said armature as to be capable of overcoming the biasing force thereon only when said armature is manually moved to circuit opening position and releasing said armature to said biasing force when either said main power switch or said function switch is opened.

2. An automatic recycling electrical warning device comprising, a power source, a warning lamp, a main power switch in series with said power source, a function switch responsive to a condition to be monitored in series with said main power switch, two parallel circuits of higher and lower resistance connecting said function switch and said lamp, a stationary contact in said lower resistance circuit, a solenoid in parallel with said lamp across said function switch, a movable armature biased away from said solenoid and normally standing against said stationary contact, a plunger contact connected to said lamp and normally standing against another portion of said stationary contact, means to move with said plunger away from said stationary contact and against said armature to move said armature into the effective magnetic field of said solenoid, whereby the connection between said armature and said stationary contact is broken and remains broken so long as current flows in said solenoid, and said lamp draws current only through said higher resistance parallel circuit.

3. An automatic recycling electrical warning device comprising, a power source, a warning lamp, a main power switch in series with said power source, a function switch responsive to a condition to be monitored in series with said main power switch, two parallel circuits of higher and lower resistance connecting said function switch and said lamp, a stationary contact in said lower resistance circuit, a solenoid in parallel with said lamp

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across said function switch, a movable armature biased away from said solenoid and normally standing against said stationary contact, a plunger contact connected to said lamp and normally standing against another portion of said stationary contact, a test contact connected between said function switch and said power source, means to move said plunger away from said stationary contact and against said test contact to close a circuit to said lamp and also to move said armature into the effective magnetic field of said solenoid, whereby the connection between

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said armature and said stationary contact is broken and remains broken so long as current flows in said solenoid, and said lamp draws current only through said higher resistance parallel circuit.

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