Dec. 2, 1941. C. ADLER, JR 2,265,095

AIRPLANE LIGHT

Filed Aug. 26, 1941

Fig. 1.

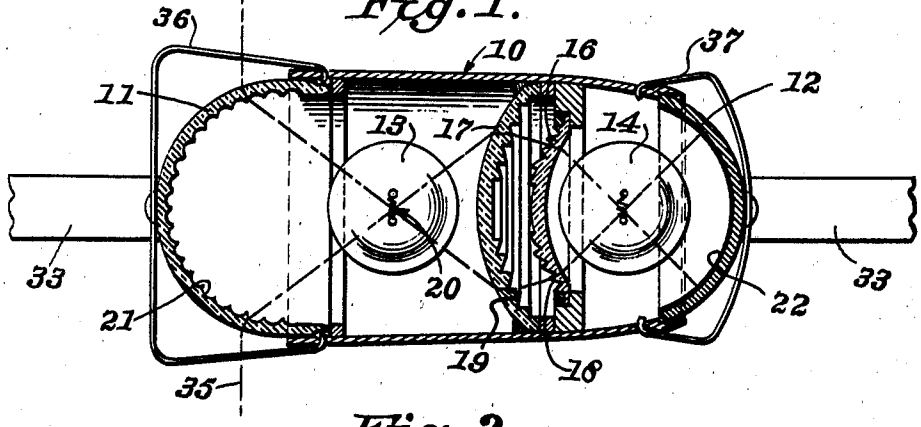


Fig. 2.

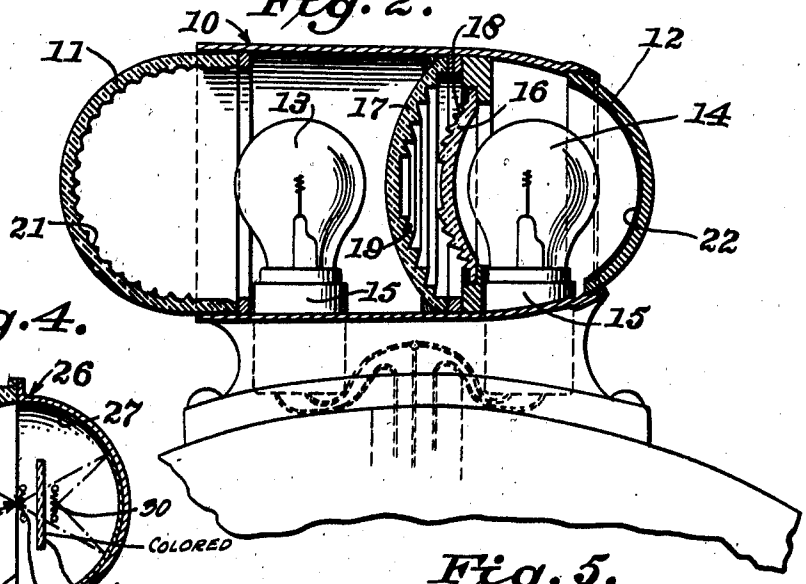


Fig. 4.

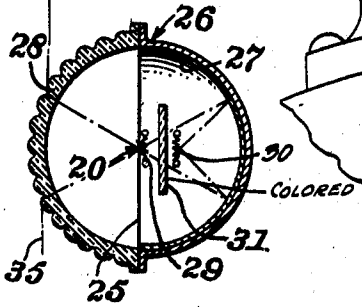


Fig. 5.

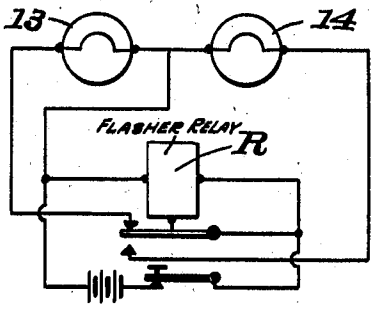
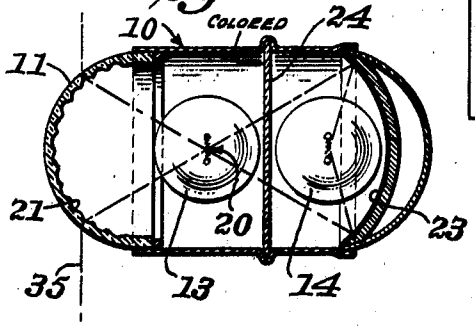


Fig. 3.



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UNITED STATES PATENT OFFICE

2,265,095

AIRPLANE LIGHT

Charles Adler, Jr., Baltimore, Md.

Application August 26, 1941, Serial No. 408,393

4 Claims. (Cl. 177—337)

This invention relates to running or position lights and is particularly useful in connection with airplanes where it is adapted to be attached, for example, to the rudder as a tail light.

The object of the invention is to provide a light of this character in which there is continuously projected alternately from a single visible area, namely, a cover glass, rapidly consecutive contrasting colored light indications of substantially equal intensity and distribution with a short dark interval between each light indication whereby a highly distinctive and arrestive form of indication is produced having the particular advantage that there is no increase in drag or appreciable adding of weight.

It is generally admitted that the conventional steady white or clear tail light lacks distinction and is readily confused with lights on the ground. A flashing white light, while an improvement, still as actual tests show, may be confused with lights of moving vehicles on the ground such as automobiles passing under trees or moving past telegraph poles. The lamp of the present invention flashes alternately white or clear and another color such as red or green with a predetermined dark interval between each flash and includes two independent light sources with means for alternately energizing the same in a continuously repeated cycle for predetermined time intervals with a lag between each energization and an optical system having means for causing rays of light from one source to converge at the other source and pass through this other source as rays which are colored and coincident with the paths which rays from said other source follow when the latter is energized. The entire unit is streamlined in accordance with aerodynamic principles and both colors are projected from a single opening or cover glass through angles ranging from 140° to 180° horizontally as well as vertically, the light sources being disposed in longitudinal alignment with each other substantially on the axes of the members of the optical system. The light unit has no moving parts and a flasher relay is preferably employed which is located remote from the light inside the airplane where it will not be subject to freezing.

In the accompanying drawing, I have illustrated several embodiments of the invention and the invention is subject to modification within the scope of the appended claims.

Referring to the drawing:

Figure 1 is a horizontal sectional plan view;

Figure 2 is a vertical sectional plan view;

Figure 3 is a horizontal sectional plan view of a modification;

Figure 4 is a horizontal sectional plan view of a further modification; and

Figure 5 is a diagrammatic view of one form of electric system including a flasher relay for alternately energizing the light sources.

Referring to Figure 1, the numeral 10 indicates a housing or casing which is made of metal or plastic and which is substantially tubular in cross section. At one end of the housing there is detachably secured a suitable cover glass 11 which forms a single visible signal area and at the opposite end of the casing, there is a detachable opaque end 12. The cover glass 11, body 10 and end 12 are streamlined in accordance with aerodynamic principles.

In a preferred form of the invention, two light sources in the form of incandescent electric lamps 13 and 14 of suitable candlepower are disposed in longitudinal alignment with each other and with the cover glass 11 in the casing 10, the lamps being held firmly in position in the usual bayonet sockets 15.

Disposed in advance of the light source 14 is a convex lens 16 and preferably a doublet lens arrangement consisting of the lens 16, and a convex lens 17 spaced as shown in Figure 1 is provided. While I have illustrated the convex lens 16 as smaller in diameter than the lens 17, both lenses may be of the same size. It has been found, however, to be good practice, to have the lens 16 of smaller diameter and also to have the lens 16 with its prismatic steps 18 on the convex side and the lens 17 with its prismatic steps 19 on the concave side. The filaments of the lamps are longitudinally aligned substantially on the axes of the lens 16 or lenses 16—17, the cover glass 11 and a reflector where the latter is employed, as will be later described.

The important consideration as regards the optical system is so to focus the light sources and lens or lenses that rays of light from the source 14 are refracted by the lens or lenses so that the rays converge at the filament of the light source 13 as shown at 20 and pass through this other source as colored rays which are coincident with the paths of the rays from the light source 13 when the latter is selectively energized.

This construction is advantageous because it permits the light sources to be disposed in longitudinal alignment with each other and on the axes of the lens or lenses and the cover glass and reflector when the latter is used, so that a small compact structure is provided which does not

create drag, and assures that the intensity and distribution of both the white or clear light and the red or green light will be substantially the same when alternately presented at the signal area 11.

The lamp 14 may be suitably colored or one or the other of the lenses 16 or 17 may be colored. The cover glass 11, of course, is clear.

When the lamp 14 is illuminated, a red beam is visible through the cover glass and when the lamp 14 is de-energized there is presented a dark interval of predetermined length by the cover glass whereupon the lamp 13 is energized, and a white or clear beam is visible. When the lamp 13 is de-energized, the sequence described of dark interval followed by the red indication continues. The cover glass is of any suitable construction which will give a wide light distribution, e. g., from 140° to 180° and in the present instance, I have shown it as having a prismatic structure at 21.

In some cases, although it is not usually necessary, a suitable reflector 22 may be employed to utilize the rays which may be directed rearwardly from the lens as shown in Figures 1 and 2.

Referring to Figure 3, I have shown a modification in which a spherical reflector 23 is employed. With this construction, the rays from the light source 14, directed upon the reflector 23, are reflected thereby as shown to also converge upon the filament of the lamp 13 in the manner previously described. The lens or lenses 16 or 16—17 are omitted in this construction and instead thereof I will either use a colored lamp 14 or an ordinary lamp with a suitably colored roundel 24. In this construction, the filaments are longitudinally aligned on the axes of the reflector and cover glass and the roundel where used and a light weight structure in which drag is substantially eliminated, is produced.

While I have illustrated the casing and housing with two independent light sources, e. g. incandescent lamps, it is to be understood that the housing itself may be a sealed bulb or casing in which are disposed two filaments and the preferred and modified constructions may be incorporated in the same or preferably a reflecting surface is employed and a red transparent screen is interposed between the filaments after the manner of Figure 3. Referring to Figure 4, I have illustrated a construction of this character in which the streamlined body 26 is of suitable material such as glass or plastic and formed into an integral sealed bulb which may be made cylindrical and which is either gas filled or evacuated. At one end and on the exterior or interior thereof, the bulb is suitably silvered to provide a mirror surface 27 in the form of a substantially spherical structure. At its opposite or light visible end 28, the glass has a prismatic contour. Preferably the end 28 is attached to the mirrored portion of the body by fusing to make a sealed container in the well known manner as shown at 25. Within the bulb are supported a pair of light sources 29 and 30 and between these sources is supported a transparent screen 31 which is suitably colored red, green or any color desired. In this construction, the filaments are longitudinally aligned on the axes of the screen and reflector and cover glass, and the optical system and the filaments are so positioned and focused as with all of the other constructions described herein that rays of light from the light source 30 converge at the other source 29 and pass through the same as rays which are colored and in paths coincident with the rays from the source 29. The structure eliminates any increase in drag and the weight of the light is not appreciable.

In Figure 5, I have illustrated a conventional flasher relay circuit in which the relay R may be disposed remote from the light. This circuit is of any suitable character for continuously operating to first energize and de-energize one lamp, break contact for a predetermined brief interval to render the cover glass dark and then energize and de-energize the other lamp so as to give a distinctive and arresting flashing signal. In this connection, a conventional motor driven flasher such as is now commercially available or an air actuated flasher relay may be employed to give this flasher indication as described in my co-pending application Serial No. 406,037, filed August 8, 1941.

Referring to Figure 2, I have illustrated in Figures 1, 3 and 4 diagrammatically the path of rays from the lamp 14 and the filament 30 and in all cases the filaments or light sources and the members of the optical system are so positioned and focused that these rays converge at the filament of the lamp 13 or the filament 29, as shown at 20, as colored rays and pass through these filaments to the cover glass 11 from which they are projected outwardly through angles of substantially 140° to 180° as shown at 35. The paths of these colored rays between the filament of the lamp 13 or the filament 29 and the cover glass are coincident with the paths which rays given off from said filaments follow when the same are energized, so that the alternate light indications from the cover glass 11 are of substantially equal intensity and distribution.

The numerals 36 and 37 indicate narrow gauge wire fastening means for detachably connecting the cover glass and opaque end of the casing to the body thereof. Other suitable connecting or holding means may, of course, be used.

It has been found that a flashing indication of the character described, namely, one which flashes red or some other color for a predetermined interval, then remains dark for a predetermined interval, then flashes white or another color for a predetermined interval and then remains dark for a predetermined interval, and continuously repeats the sequence described, provides an arrestive signal which solves the problem of running lights for airplanes, as has been demonstrated by actual tests. The relay employed, as stated, may be of any suitable conventional character, provided it is regulable to give predetermined periods of energization to the lamps with a predetermined period of de-energization between each flash of any filament. Preferably, the de-energization interval is less than the energization period of any filament, but, of course, it may be equal to and in some cases greater than such periods. The discovery which I have made is that the objectionable obscurity characteristic of airplane lights is remedied and a clear, sharp arrestive signal given by a flashing indication using contrasting colors presented from a single cover glass and in which a dark interval is presented between each flash.

The term "light projecting devices" as used in the appended claims, is intended to cover any combination of light source and color producing means so as to comprehend the clear lamps 13 and the construction for producing a contrasting color wherein the lamp 14 either has its bulb surface colored or is associated with any suitable

type of color producing means such as a colored lens, a colored roundel, or a colored screen. In other words, the expression "light projecting devices" is intended to cover the means by which beams differently colored from and contrasting from each other are produced.

This application includes related subject-matter of my co-pending applications Serial Nos. 405,867 and 409,876.

I claim:

1. An airplane position signal comprising a plurality of light projecting devices, each producing a beam differently colored from and contrasting from each other, means for distributing the light from said devices through an angle of at least substantially 140° horizontally and vertically, and means for energizing and de-energizing each of said light projecting devices in sequence and for maintaining all of the same deenergized for a predetermined time period after the illumination of one of said light projecting devices whereby the signal continuously presents alternately contrasting illuminated colored indications and a dark indication after an illuminated indication.

2. An airplane position signal comprising a plurality of light projecting devices, each producing a beam differently colored from and contrasting from each other, cover glass means for distributing the light from said devices through an angle of at least substantially 140° horizontally and vertically, and means for energizing and deenergizing each of said light projecting devices in sequence and for maintaining all of the same deenergized for a predetermined time period after the illumination of one of said light projecting devices whereby the signal continuously presents alternately contrasting illuminated colored indications and a dark indication after an illuminated indication.

3. An airplane position signal comprising a single casing having therein a plurality of light projecting devices, each producing a beam differently colored from and contrasting from each other, means for distributing the light from said devices through an angle of at least substantially 140° horizontally and vertically, and means for energizing and deenergizing each of said light projecting devices in sequence and for maintaining all of the same deenergized for a predetermined time period after the illumination of one of said light projecting devices whereby the signal continuously presents alternately contrasting illuminated colored indications and a dark indication after an illuminated indication.

4. An airplane position signal comprising a single casing having therein a plurality of light projecting devices, each producing a beam differently colored from and contrasting from each other, cover glass means for distributing the light from said devices through an angle of at least substantially 140° horizontally and vertically, and means for energizing and deenergizing each of said light projecting devices in sequence and for maintaining all of the same deenergized for a predetermined time period after the illumination of one of said light projecting devices whereby the signal continuously presents alternately contrasting illuminated colored indications and a dark indication after an illuminated indication.

CHARLES ADLER, JR.