May 6, 1941. M. C. HARLEY 2,241,128

ILLUMINATING DEVICE FOR AIRCRAFT

Original Filed Dec. 12, 1934 2 Sheets-Sheet 1

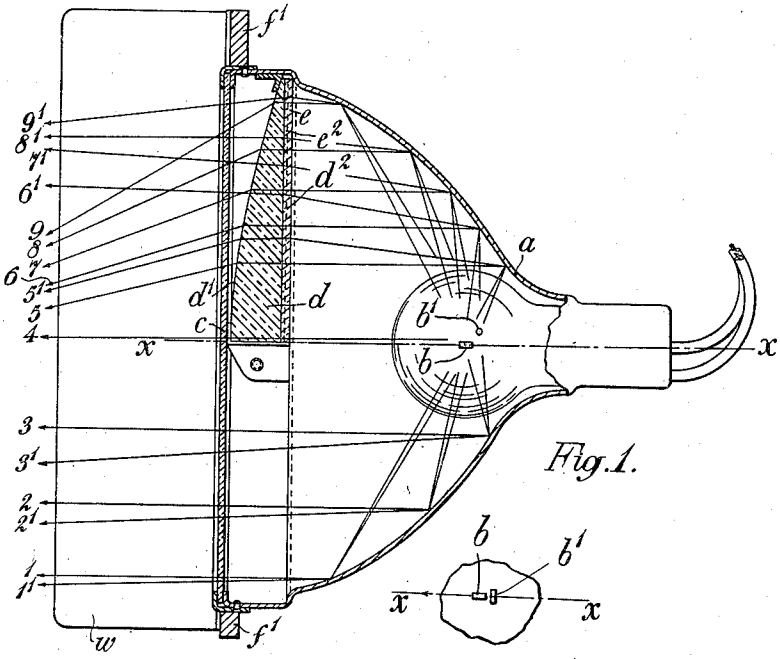


Fig. 1.

Fig. 4.

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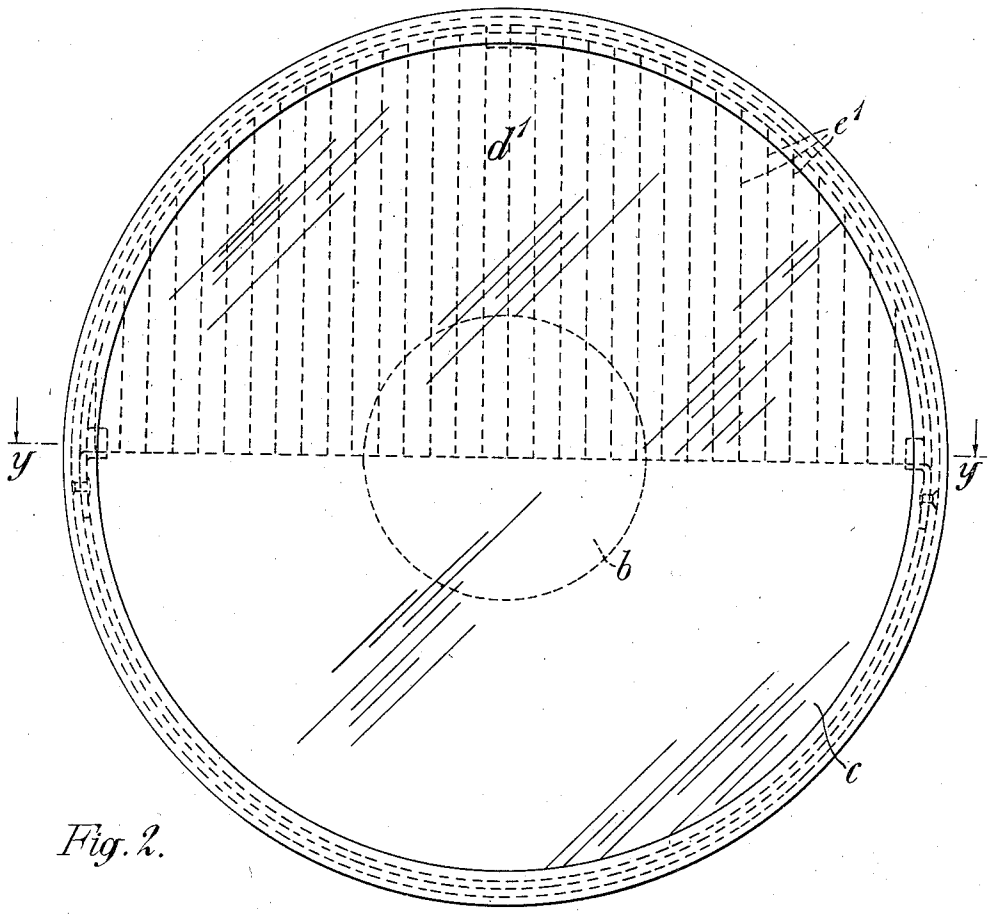


Fig. 2.

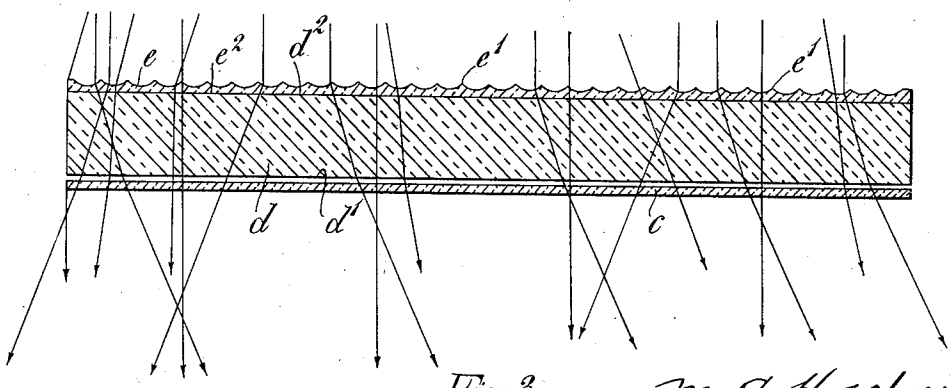


Fig. 3

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UNITED STATES PATENT OFFICE

2,241,128

ILLUMINATING DEVICE FOR AIRCRAFT

Maldon Cavendish Harley, Harlington, Hayes, England

Original application December 12, 1934, Serial No. 757,226. Divided and this application June 17, 1937, Serial No. 148,812. In France December 10, 1934

3 Claims. (Cl. 240—7.7)

This invention relates to and has for its object improvements in illuminating devices for use with aircraft, for assisting night flying and such purposes.

In particular, the invention of the present application, which is a division of my application Serial Number 757,226 filed December 12, 1934, and which has matured into Patent No. 2,099,362, aims at providing highly effective illumination of the ground at the time of landing and taking off in order that near objects, e. g. substantially below, and objects some distance ahead of the craft, may be illuminated in such a way as facilitates the safe performance of these operations.

This, I have found, renders very desirable both the use of a lamp having characteristics differing from those of an ordinary lamp (e. g one producing a substantially parallel beam of light into which a more or less fortuitous dispersion of light may be introduced) and also provision against more or less serious effects of a lamp being put out of action by failure of a lamp filament.

The invention consists in an aircraft illuminating device comprising a reflector and a light source in the focus thereof co-operating to produce a substantially parallel reflected beam, means operative to deflect a portion of said beam from the reflector axis and a second or emergency light source located in proximity to the first in such relationship thereto and to the reflector that the departure of reflected rays generally from parallelism when the second source is in operation and due to separation of that source from the focus, is partially compensated and reduced in that portion of the reflected beam affected by said deflecting means.

The invention also comprises other features hereinafter more fully described and set out in the appended claims.

Referring to the accompanying drawings:

Figure 1 is a vertical section of one convenient form of an aircraft lamp in accordance with the invention;

Figures 2 and 3 are respectively a front elevation of a preferred lamp construction and a sectional plan of a lens front system productive of desirable beam characteristics; the paths of light rays being indicated in Figure 1.

Figure 4 is a fragmental plan illustrating the relationship between two lamp filaments as included in the lamp shown in the other figures.

A preferred construction of lamp is shown in Figures 1 to 3 of the drawings and affords the characteristics found to be of special utility. According to this construction light rays **4**, **5**, **6**, **7**, **8** and **9** comprising part of a substantially parallel projected beam from the focal source *b* and substantially parabolic reflector *a* and disposed in the half of said beam to one side of a plane *y*, *y* containing the axis *x*, *x* of said beam, are subjected by refractive means both to deflection in relation to said plane and to dispersion laterally thereof, while the rays **1**, **2**, **3** of the remaining half of the beam are substantially unrefracted from their approximate parallelism.

The deflection referred to is produced by a special prismatic construction comprising two elements *d* and *e* each of which is of semicircular elevation, and lies to the upper side of the diameter *y*, *y*. The element *d* acts as a plano-cylindrical astigmatic lens of long focus, its surfaces d', d^2 converging away from the line *y*, *y* to a region on the circumference of the lamp casing or rim of the reflector centrally above the axis *x*, *x*. The element *e* which acts as a diffuser comprises a piece of glass having one face e^2 adjacent the inner flat face d^2 of the element *d* and its other face shaped to form a number of parallel ribs e', e' which are defined by substantially cylindrical depressions or curves providing inclined facets running normally to the line *y*, *y*. The face e^2 of the diffuser is flat and adapted to contact with the flat surface of the deflector *d*, and these surfaces may be cemented or otherwise secured together. Alternatively, the two elements can be integral. Under the action of the prismatic elements *d* and *e* rays such as **4**, **5**, **6**, **7**, **8** and **9** are deflected downwardly as shown in Figure 1 so as to pass through the plane containing the axis *x*, *x* and the diameter *y*, *y* and these rays are also refracted or diffused laterally.

The emerging light beam thus comprises a parallel or substantially unrefracted beam from the lower half which serves for distant illumination and is crossed by a beam from the upper half, which second beam provides a large area flood light for immediate surroundings. Further, the two beams are contiguous and graduate into one another obviating non-illuminated areas within the range of the lamp.

The construction specifically described may, of course, be differed from provided a beam of characteristics similar to those above indicated is obtainable.

A lamp so constructed is mounted on the aircraft in some such way as that shown whereby preferably the said plane *y*, *y* when the lamp is in an operative position extends horizontally or

substantially so and it can be moved so that the axis *x*, *x* of the lamp points ahead of the aircraft and more or less parallel with the ground the latter effect being produced by swivelling the lamp about a hinge or other transverse axis to the extent required having regard to the changes of angle of the aircraft in approaching or leaving the ground. The mounting, and combination thereof with a lamp such as the above, forms the subject of my aforementioned application Serial No. 757,226 from which the present application is divided, and accordingly is not claimed herein.

The spread of the portion of the light beam composed of rays such as **4**, **5**, **6**, **7** and **8** produces a wide area of illumination of the ground below and extending in front of the aircraft to merge into the distance beam as explained in my said copending application, the area thus illuminated not being so noticeably altered in position or configuration in relation to the aircraft by the raising or lowering of the nose of the latter (such as takes place in negotiating a landing or a take-off) as to be objectionable.

In the construction shown, the lamp is mounted on a perforated flap *f'* having a hinge, e. g. so as to rise and fall from a position under an aerofoil or wing with its axis *x*, *x* more or less horizontal to a position in which its front *c* or the flap *f'* to which the latter is secured lies flush with the underside of such wing, the lamp body being then concealed in a recess within the thickness of the wing. The movement of the lamp in such construction between different positions is effected by a quadrantal member attached by bracket means, as explained in my copending application already referred to, and this convenient form of mounting provides a very smooth acting means of swinging the lamp and generally adjusting its position.

Preferably a shadow bar *w* or the like is provided, say at one side of the lamp and movable therewith as in Figure 1, below the wing or adjacent part to shield the light beam, as desirable, from the body or other part of the machine which it is not desired to illuminate.

Referring again to the drawings, in addition to the filament *b* at the focal point of the parabolic reflector a second filament *b'* is provided, to provide an emergency light in the event of failure of the principal filament, a serious matter in night flying. One cannot practically provide two filaments to contain the focal point: therefore the position of the filament *b'* is of importance and it should be so related to both the filament *b* and the reflector surface as to obviate material departure of the characteristics of the emergency beam from those of the normal beam.

The preferred position for the emergency filament *b'* is as shown (see Figures 1 and 4), viz. somewhat above the plane *y*, *y* containing the axis *x*, *x* and behind the main filament (about 3/16" each way in the case of an 8" lamp), it having been found that the inevitable alterations in the beam characteristic when the emergency light is in action are a general lateral spreading of the entire beam, a slight vertical dipping of the beam emerging from the lower half of the lamp front (see Figure 1, rays **1'**, **2'**, **3'**) and a slight upward scattering of the other half of the beam (see rays **5'** to **9'**), which latter, however, is largely combated or compensated for by the action of the cylindrical face *d'* of the deflecting element *d*.

It will be noted that in a single bulb coiled filaments are indicated, the centre of length of the emergency filament *b'* lying in the same plane as the longitudinal axis of the main filament, that is in the vertical plane containing the lamp axis *x*, *x*.

I claim:

1. An aircraft illuminating device comprising a reflector and a light source in the focus thereof co-operating therewith to produce a substantially parallel reflected beam, means operative to deflect a portion of said reflected beam from the reflector axis and a second or emergency light source distinct from and located in proximity to the first in such relationship thereto and to the reflector that the departure of reflected rays generally from parallelism when the second source is in operation and due to separation of that source from the focus, is substantially compensated and reduced in that portion of the reflected beam affected by said deflecting means.

2. The combination in an aircraft lamp, of a parabolic reflector, a prismatic front capable of dispersing laterally and deflecting across the axis of said reflector a portion of a substantially parallel light beam from said reflector to one side of a diametral axial plane of the lamp and a double-filament electric bulb one of the filaments of which being in the reflector focus while the other is situated between the reflector surface and said focus and disposed to the said side of said plane.

3. Illuminating devices according to claim 1 comprising two like electric filaments having corresponding axes arranged at right angles to one another, the non-focal filament being situated equally behind the focal filament and to one side of a diametral plane of the lamp, the deflecting means being a plano-cylindrical lens located to cover the reflector front at the same side of said plane as the non-focal filament.

MALDON CAVENDISH HARLEY.