

July 11, 1944.

G. MOTT, JR

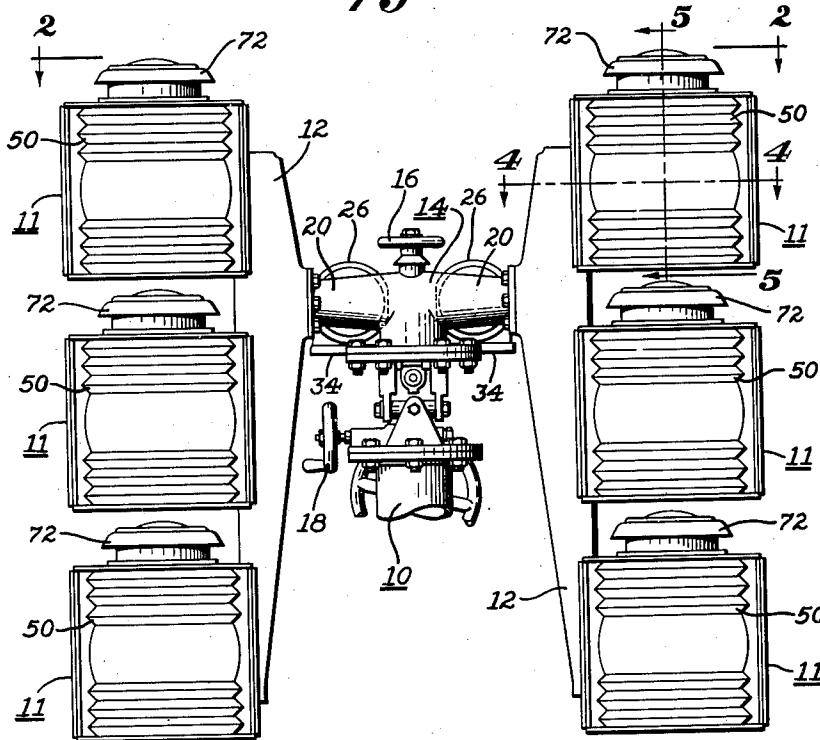
2,353,258

LIGHTING DEVICE

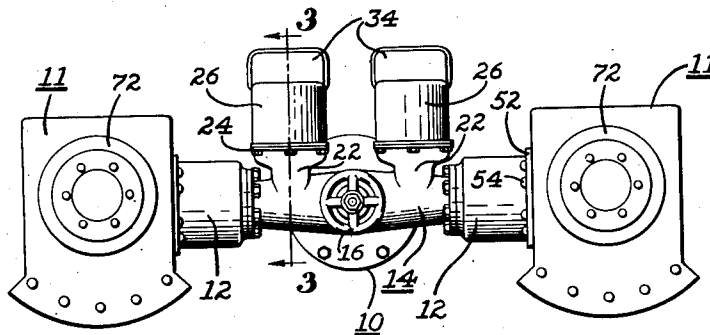
Filed Feb. 12, 1942

3 Sheets-Sheet 1

*Fig. 1.*



*Fig. 2.*



INVENTOR.  
*Garret Mott, Jr.*  
BY *Thomas C. Betts*  
*His Attorney*

July 11, 1944.

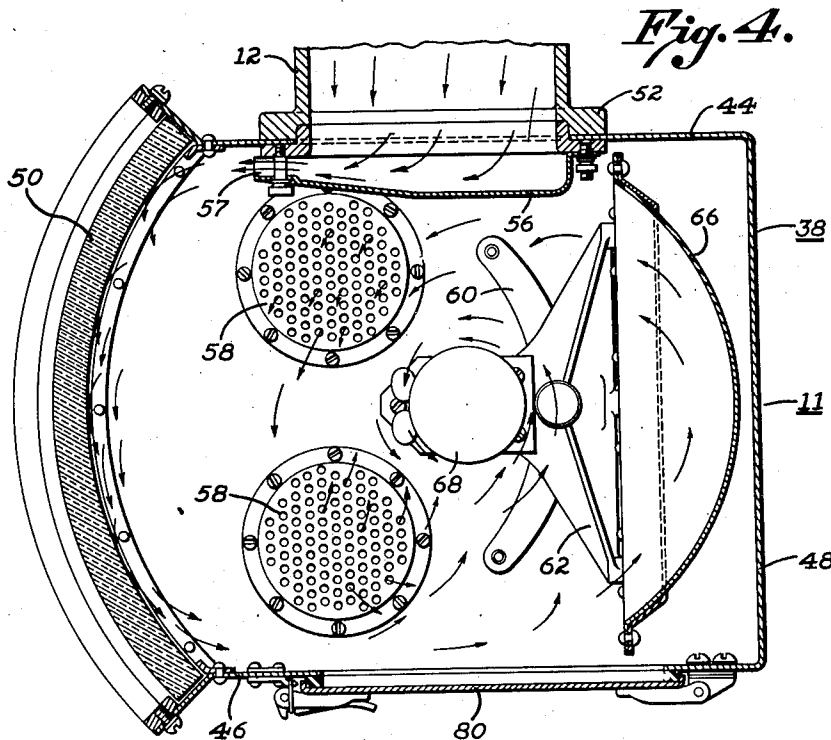
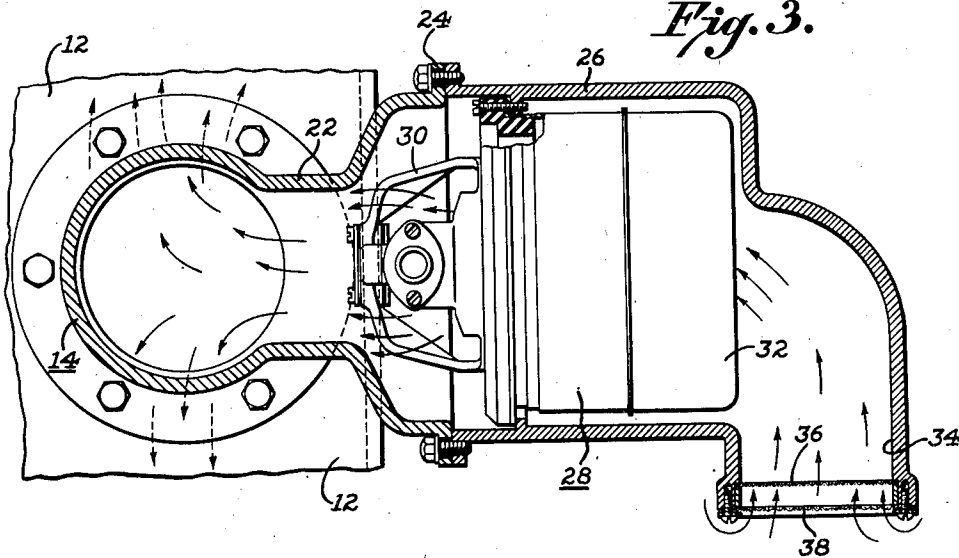
G. MOTT, JR

2,353,258

LIGHTING DEVICE

Filed Feb. 12, 1942

3 Sheets-Sheet 2



INVENTOR.

BY

*Garret Mott, Jr.*  
*Thomas C. Betts*  
*His Attorney*

July 11, 1944.

G. MOTT, JR

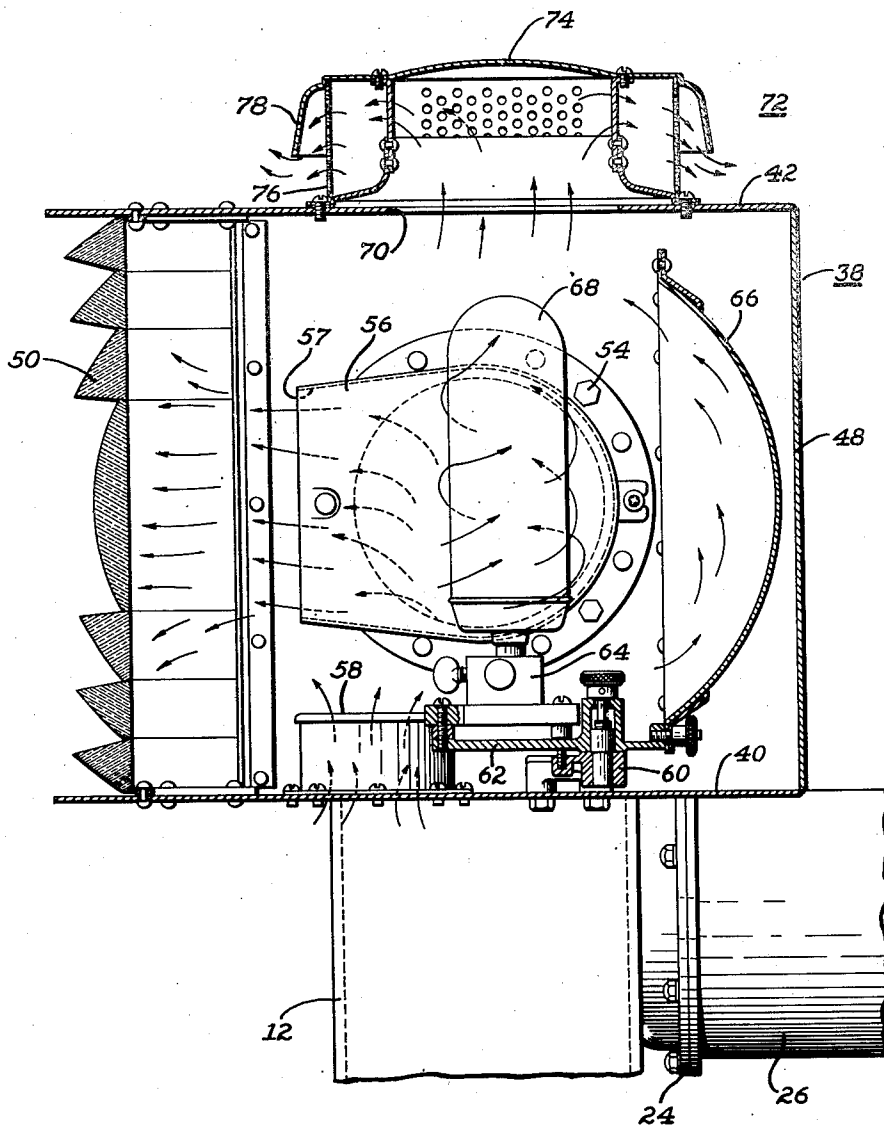
2,353,258

LIGHTING DEVICE

Filed Feb. 12, 1942

3 Sheets-Sheet 3

*Fig. 5.*



INVENTOR.

BY

*Garret Mott, Jr.*  
*Thomas C. Betts*  
*his attorney*

## UNITED STATES PATENT OFFICE

2,353,258

## LIGHTING DEVICE

Garret Mott, Jr., Scarsdale, N. Y., assignor to  
Electrolux Corporation, New York, N. Y., a corporation of Delaware

Application February 12, 1942, Serial No. 430,574

8 Claims. (Cl. 240—47)

The present invention relates to beacon lights and more particularly to means for cooling the lenses and lamps of such lights.

In order to provide light of sufficient intensities, the source of light, such as an incandescent bulb, generates so much heat at such a high temperature that it heats the lens to such a degree that, if the latter is suddenly cooled by rain, it is apt to crack due to the uneven contraction thereof. In accordance with this invention a current of cooling air is continuously circulated over the inner surface of the lens in efficient heat transfer relation therewith so as to maintain the latter at all times at a low enough temperature so that it will not be damaged by the sudden cooling caused by rain.

Furthermore, difficulty has been experienced in maintaining the lamp at a sufficiently low operating temperature, particularly when a spherical reflector is employed which reflects the light back through the source.

Further objects and advantages of the invention will be apparent from the following description considered in connection with the accompanying drawings which form a part of this specification, and of which:

Fig. 1 is a front view of a beacon in accordance with the invention;

Fig. 2 is a top view of the beacon shown in Fig. 1;

Fig. 3 is a cross-sectional view on an enlarged scale taken on the line 3—3 of Fig. 2;

Fig. 4 is a cross-sectional view on an enlarged scale taken on the line 4—4 of Fig. 1; and

Fig. 5 is a cross-sectional view on an enlarged scale taken on the line 5—5 of Fig. 1.

Referring to the figures, reference character 10 designates any suitable standard on which the beacon is mounted. As shown, the beacon includes six beacon lights 11 arranged in vertical rows of three on either side of the standard. The lights of each row are supported by hollow arms 12, each of which is secured to a T-shaped member 14. The latter is movably mounted on the upper end of the standard 10 and its position may be adjusted by means of hand wheels 16 and 18.

The horizontal arms 20 of the member 14 are hollow and each is provided with a hollow branch 22 formed with an enlarged and flanged end 24. Bolted to the flange 24 is a casing 26 within which is mounted a motor-fan unit 28 which comprises an electric motor 30 to the frame of which is secured a fan housing 32. Suitable

impellers are mounted on the end of the motor shaft within the housing 32 and serve to draw air through the inlet passage 34 of the housing 26. The lower end of this passage is open to the atmosphere through an opening located in a horizontal plane and provided with a dust filter including a fine mesh screen 36 and a screen 38 of somewhat coarser mesh. The air discharged from the fan passes through the motor 30 and through the hollow branch 22 into the hollow arm 20 of the T-shaped member 14. As appears from Figs. 1 and 2, two motor-fan units are provided, each communicating with the member 14. The two arms 20 preferably communicate with each other so that, should one of the motors fail, air from the other motor-fan unit will pass through both of the arms to each of the hollow members 12.

Each of the beacon lights 11 includes a casing 38 having a bottom wall 40, a top wall 42, side walls 44 and 46 and one end wall 48. The other end of the casing is closed by means of a Fresnel lens 50 the inner surface of which is cylindrical. Each beacon light is supported from the hollow arm 12 by having the side wall 44 secured to a flange 52 by means of suitable bolts 54. This wall is provided with an opening in alignment with an opening formed in the hollow arm. A deflector plate 56 is secured over this opening and is arranged so as to direct air entering the casing 38 against the cylindrical interior of the Fresnel lens. The plate 56 is formed so as to provide a nozzle-like opening 57 of substantially smaller cross-section than that of the passageway in the arm 12, whereby the air issues at a relatively high velocity.

The bottom wall 40 of the casing is provided with one or more openings covered by perforated plates 58. Mounted on the bottom wall is a bracket 60 which removably supports a base 62 carrying a lamp socket 64 and a spherical reflector 66. An incandescent lamp 68 is mounted in the socket 64 and is so located that the center of its filament is located substantially at the center of curvature of the reflector 66.

The top wall 42 of the casing 38 is provided with an opening 70 surrounded by a chimney 72. This chimney includes a closed top 74, a perforated cylindrical wall 76 and a skirt 78, the arrangement being such that air may flow outwardly through the chimney, as indicated by the arrows, but rain is substantially prevented from entering the light casing.

The wall 46 of the casing is provided with a door 80 through which access may be had to

the interior in order to replace the bulb or perform any necessary adjustments.

The lamps used in these beacon lights may be as high as 1500 watts and consequently a large amount of heat at a high temperature is generated. Thermocirculation through the casing is provided by the openings in the bottom wall 40 and the chimney-protected opening in the top wall 42. When one beacon light is placed above the other, as illustrated in Fig. 1, much of the air which enters through the bottom walls of other than the lowermost lights, has been heated by passage through lights therebeneath. The closed top 74 and the skirt 78 of the chimney serve to prevent the direct flow of heated air to the next higher light and results in the admixture of some fresh cool air, but still the air entering the next higher light is at a temperature substantially above atmospheric.

While the cooling possible as the result of this thermocirculation is usually sufficient to maintain the bulb 68 in the lowermost lights at a suitable operating temperature, it has been found that this temperature is apt to be exceeded in the upper lights, particularly when a spherical reflector is employed, inasmuch as all of the light striking the reflector is reflected back through the bulb. Moreover, it has further been found that the Fresnel lenses are heated to such a high temperature that they are very apt to crack if suddenly cooled, as is the case when a rain-storm starts while the lights are in operation.

In accordance with the present invention, the operating temperatures of both the bulbs and the lenses are maintained at a relatively low value of means of the forced circulation of air produced by the motor-fan units 28. The air discharged from the motor-fan unit passes through the hollow arms 20 into the hollow members 12 and thence from where it is distributed to each of the casings. The deflectors 56 cause this air to first pass in contact with the inner curved surface of the Fresnel lens, thus maintaining the lens at a low enough temperature so that sudden cooling by rain will not cause it to crack. The high velocity of the air issuing through the nozzle-like opening 57 causes this air to travel in a substantially horizontal curved path all the way across the lens, thus overcoming the tendency of the air to rise due to its increase in temperature. The nozzle also provides a relatively thin layer of air traveling at the high velocity, which is much more effective in removing heat from the lens than would be a thicker but slower moving current of air. Experiments with a smoke indicator show that the moving air closely hugs the interior surface of the lens. Consequently, a good rate of heat transfer is obtained between the lens and the air. After leaving the lens the air spirals upwardly around the bulb 68, as indicated by the arrows in Figs. 4 and 5 and finally passes out through the chimney 72.

Inasmuch as the lens 50 is naturally at a lower temperature than the lamp 68, the cooling air is directed to flow in heat-exchange relation with first the lens and then the lamp, thus in effect obtaining the benefits of counter-flow. Also, inasmuch as the lens is subject to sudden cooling by direct contact with rain, whereas the lamp is protected against such contact and cooling, it is more important to maintain the former at a low temperature than it is the latter.

It has been found from past experience that it is the central segment of the Fresnel lens

that is most apt to crack. This is believed to be due to the configuration and shape of the cross section of this segment which subjects it to greater stresses and strains. It may be noted further that the central segment is closest to the source of heat. Regardless of the cause of the greater probability of cracking of the central segment, it has in some instances been found desirable to shape the air inlet in such a manner as to cause the air to be restricted in its path substantially to the area of the central segment. Referring to Fig. 5, this has been done in the embodiment there shown by making the opening 57 of nearly the same height as the central segment, and further, by extending the nozzle sufficiently to prevent the air emerging therefrom from fanning out over a wide area. It is desirable to have the nozzle so shaped that the air travels in parallel stream as indicated by the arrows in the drawings. In the specific arrangement shown, the sides of the nozzle between the outlet opening and the inlet port lie in planes tangential with the surface of the cylinder forming the inlet port.

For similar reasons the nozzle outlet must be sufficiently far removed from the inlet to cause the air to flow smoothly against the inside wall of the casing so that it will hug the lens when it emerges instead of spreading out into the center of the casing.

If desired, additional outlet openings may be provided in the nozzle to direct air against other parts of the beacon which need to be cooled, for example the light bulb and the portions of the lens far removed from the nozzle.

Due to the fact that the cooling effect of the air entering through the openings in the bottom wall 40 is less in the upper lights than in the lower, as previously explained, the cross-sectional area of the passage through the hollow members 12 is so proportioned as to provide a greater supply of cooling air under forced circulation to the upper beacon lights than to the lower. Moreover, the two upper lights are located closer to the horizontal arms 20, than is the lowermost light. The result of this is a substantial equalization in the cooling of the various lights.

While there has been described one more or less specific embodiment of the invention, it is to be understood that this has been done for purposes of illustration only and that the scope of the invention is not to be limited thereby, but is to be determined from the appended claims.

What I claim is:

1. In a lighting device, a casing, a lens having a substantially cylindrical concave inner surface affixed in an opening in said casing, a high temperature source of light located in said casing, said casing being formed with a cooling air inlet in a wall adjacent to said lens, and with an outlet in the wall above said source of light, means to introduce a current of cooling air through said inlet, and means for directing said air to flow first in a path hugging the inner surface of said lens and subsequently in heat-exchange relation with said source of light, said outlet being substantially directly above said source of light and in unobstructed communication with the space immediately around the latter whereby air heated by said source of light may rise directly to and escape through said outlet.

2. In a lighting device, a casing, a lens having a substantially cylindrical concave inner surface positioned in an opening in said casing with the axis of the cylindrical surface extending vertical-

ly, said casing being formed with a cooling air inlet opening in a vertical wall adjacent to said lens, an incandescent lamp within said casing near the center thereof, a source of air under pressure connected to said inlet, and nozzle-like means disposed substantially entirely to one side of the lens in a radial direction therefrom for directing said air to flow in a substantially horizontal direction across the inner concave surface of said lens in heat-exchange relation therewith, said nozzle imparting sufficient velocity to the air to cause the latter to travel horizontally across the lens without rising substantially due to its increase in temperature.

3. In a lighting device, a casing, a lens having a substantially cylindrical concave inner surface positioned in an opening in said casing with the axis of the cylindrical surface extending vertically, said casing being formed with a cooling air inlet opening in a vertical wall adjacent to said lens, an incandescent lamp within said casing near the center thereof, a source of air under pressure connected to said inlet, and a flat nozzle disposed substantially entirely to one side of the lens in a radial direction therefrom for directing said air to flow in a substantially horizontal direction across the inner concave surface of said lens in heat-exchange relation therewith, the major dimension of said nozzle extending vertically whereby the air flows across the lens in a relatively thin layer at high velocity.

4. In a lighting device, a standard, a hollow member supported by said standard, a motor-fan unit having an exhaust passage connected to the interior of said hollow member, a plurality of casings supported by said member, each casing having an opening communicating with the interior of said member, a lens affixed in an opening in each of said casings, a high temperature source of light in each casing, and means for directing air introduced into said casings from said hollow member to flow in heat-exchange relation with the inner surfaces of said lenses.

5. In a lighting device, a standard, a hollow member supported by said standard, a motor-fan unit having an exhaust passage connected to the interior of said hollow member, a plurality of casings supported by said member at different heights, each casing having an opening communicating with the interior of said member, a lens secured in an opening in each of said casings, a high temperature source of light in each casing, and means for guiding air introduced into said casings from said hollow member to flow in heat exchange relation with the inner surfaces of said lenses, the cross sectional area of the passageway through said hollow member varying so as to supply air to said casings in amounts dependent

upon their height sufficient to maintain all of the lenses at substantially the same temperature.

6. In a lighting device, a standard, a hollow arm supported in a substantially horizontal position by said standard, a hollow member secured to either end of said arm, a plurality of casings supported by each of said members, each casing having an opening communicating with the interior of the supporting member, a lens affixed in an opening in each of said casings, a high temperature source of light in each casing, a plurality of motor-fan units each having an exhaust passage connected to the interior of said hollow arm, and means for directing air introduced into said casings from said hollow members to flow in heat-transfer relation with the inner surfaces of said lenses, the passageway through said arm being continuous from end to end whereby either of said motor-fan units may supply air to both said hollow members in the event the other motor-fan unit is inoperative.

7. A dyadic lighting device comprising a standard, lamp casings supported on either side of said standard forming a left side and a right side of said device, two blowers adapted to supply gaseous cooling medium in heat-exchange relation with the interior of said casings, ducts adapted to convey said medium to the casings on the left side of the device from one of said blowers, other ducts adapted to convey said medium to the casings on the right side of the device from the other of said blowers, and a connection between said ducts permitting said medium to flow to any of said casings from either of said blowers in case one of the blowers fails.

8. In a lighting device, a standard, an elongated hollow member supported by said standard, means for producing flow of air through said standard, a plurality of casings spaced along said member and supported thereby, each casing having an opening communicating with the interior of said member, a lens secured in an opening in each of said casings, a high temperature source of light in each casing, the different casings being subjected to different temperatures during operation of the lighting device, and means for guiding air introduced into said casings by said fan to flow in heat-exchange relation with the inner surfaces of said lenses, the passageway through said member from said casings to said fan being so dimensioned that the resistance to flow of air therethrough is such as to supply air to the respective casings in amounts, dependent upon the temperatures to which they are subject, sufficient to maintain all of the lenses at substantially the same temperature.

GARRET MOTT, JR.