March 28, 1944. B. CRAMER 2,345,382

ILLUMINATING APPARATUS

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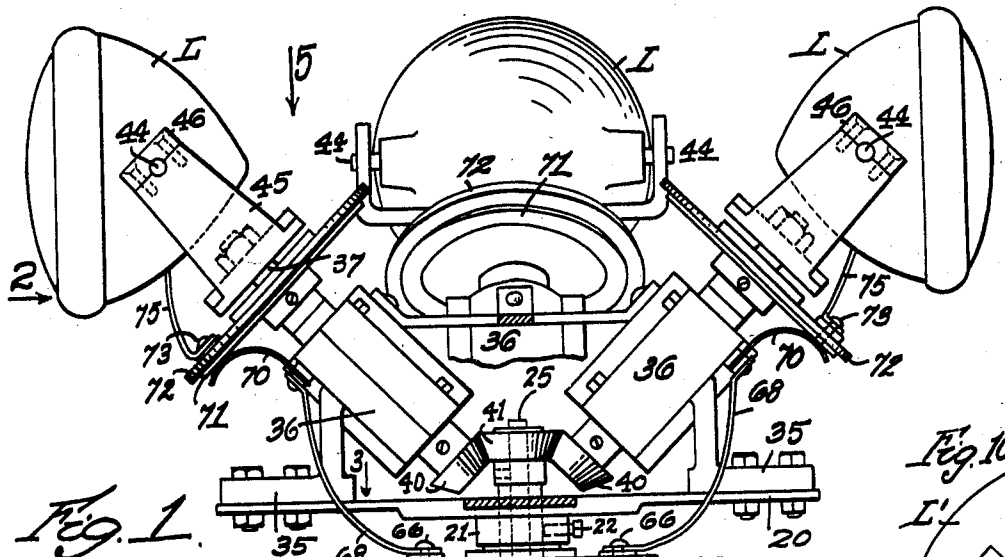


Fig. 1.

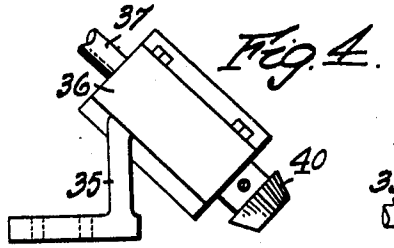


Fig. 4.

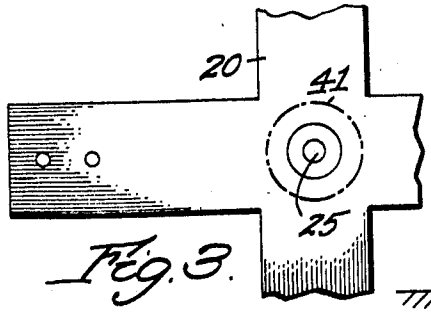


Fig. 3.

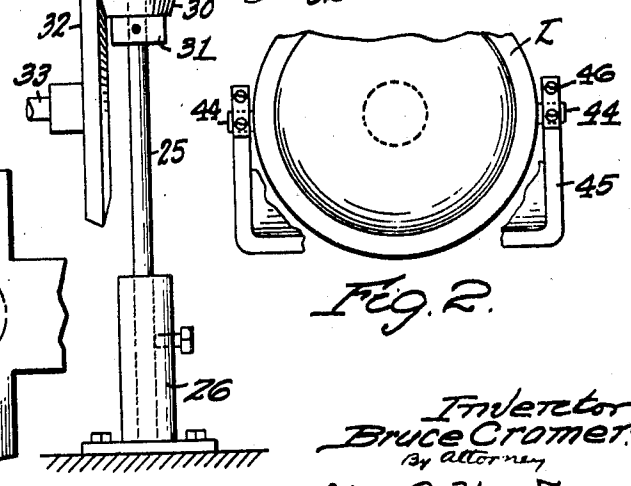


Fig. 2.

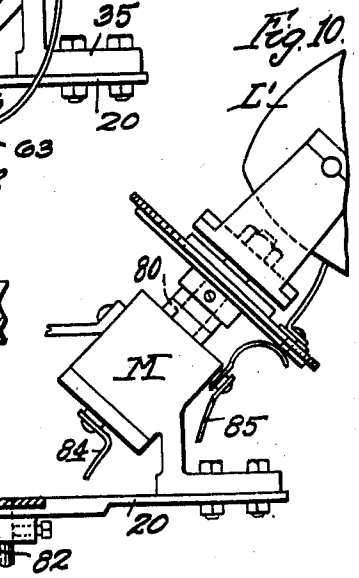


Fig. 10.

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Fig. 5.

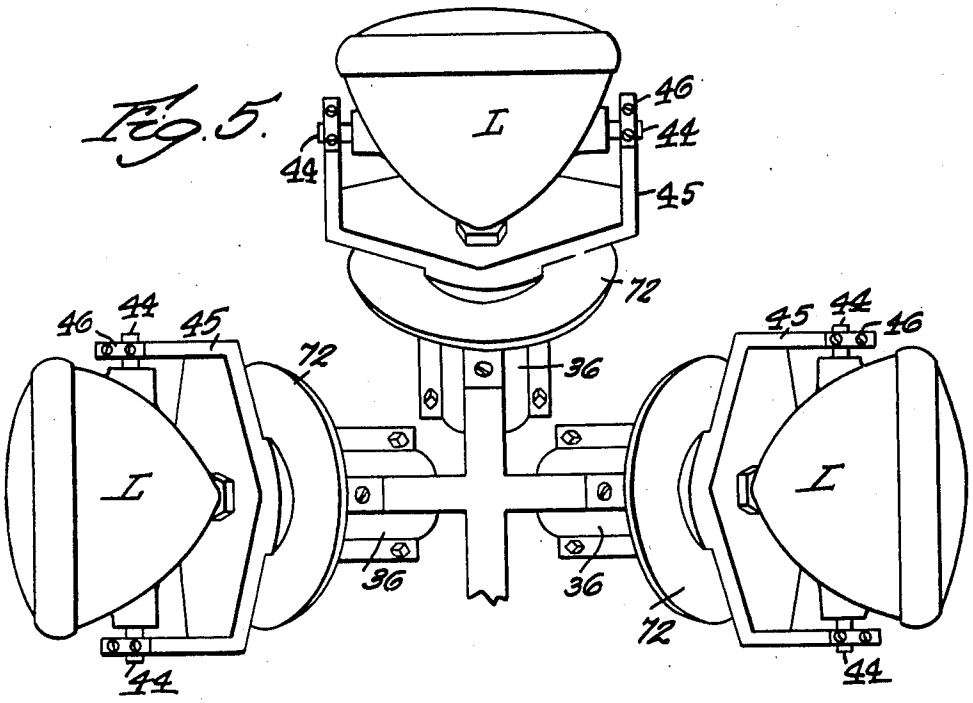


Fig. 6.

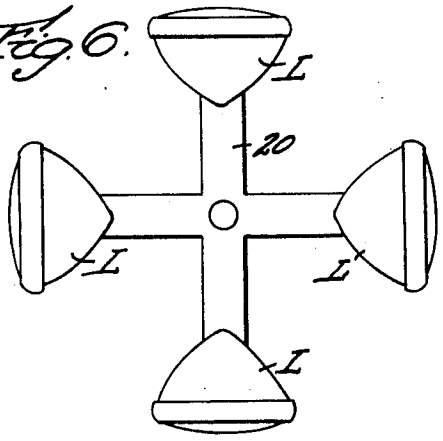
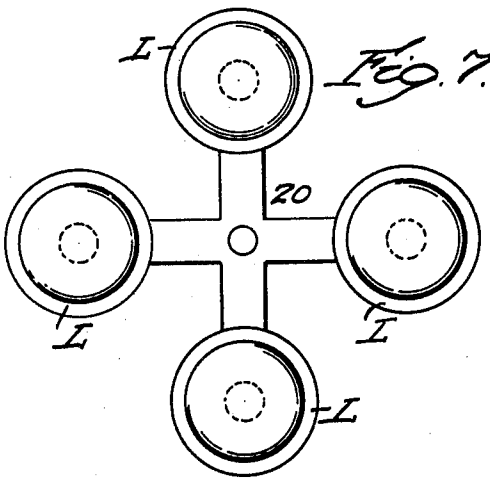


Fig. 7.



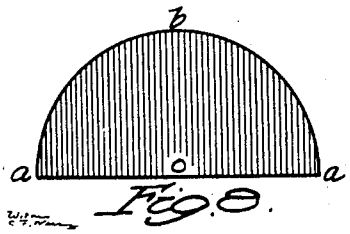


Fig. 8.

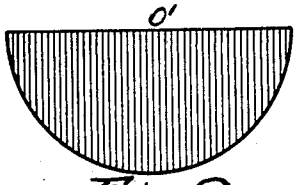


Fig. 9.

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ILLUMINATING APPARATUS

Bruce Cramer, Tolland, Conn.

Application February 1, 1943, Serial No. 474,235

2 Claims. (Cl. 240—49)

This invention relates to widespread surface illumination and more particularly to apparatus for effecting a uniform and satisfactory distribution of light over an extended surface area.

It is the general object of my invention to produce the general effect of a very powerful fixed flood light by mixing or intermingling the beams of a plurality of relatively small and rapidly moving search-lights.

More specifically, I provide means for collectively rotating all of a group of the search-lights about a common axis and also for rotating each search-light about its own additional and separate axis.

My invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

A preferred form of the invention is shown in the drawings, in which

Fig. 1 is a front elevation, partly in section, of my improved illuminating apparatus;

Fig. 2 is a side elevation of a light and its support, looking in the direction of the arrow 2 in Fig. 1;

Fig. 3 is a detail partial plan view of a supporting cross plate, looking in the direction of the arrow 3 in Fig. 1;

Fig. 4 is a front elevation of a shaft and bearing;

Fig. 5 is a partial plan view of the apparatus, looking in the direction of the arrow 5 in Fig. 1;

Fig. 6 is a diagrammatic plan view showing a group of four search-lights in horizontal position;

Fig. 7 is a view similar to Fig. 6 but showing the search-lights in vertical position;

Figs. 8 and 9 are diagrammatic views, showing the illumination which can be attained by use of my improved apparatus; and

Fig. 10 is a partial front elevation of a modified and motor-driven construction.

Referring to Figs. 1 to 5, my improved illuminating apparatus comprises a cross plate 20 (Figs. 1 and 3) having a hub 21 secured by a set-screw 22 to the upper end of a sleeve 23. The sleeve 23 is freely rotatable on an upright shaft 25 held from rotation in a fixed stand 26.

A bevel pinion 30 is secured to the lower end of the sleeve 23, and the sleeve and pinion are vertically positioned by a collar 31 on the fixed shaft 25. A bevel gear 32 engages and rotates the pinion 30 and sleeve 23 and is mounted on a shaft 33 which may be continuously rotated from any suitable source of power and at any desired speed.

Each arm of the cross plate 20 supports a bracket 35 (Fig. 4) and bearing 36 for a light-supporting shaft 37. The bearings 36 are angularly disposed with respect to the cross plate 20 and are shown in the drawings as being at 45° to the plane of the plate.

Each shaft 37 has a bevel pinion 40 at its lower end, and all of the pinions 40 engage a stationary bevel gear 41 secured to the upper end of the fixed shaft 25. As the sleeve 23 and cross plate 20 are rotated about the shaft 25, the bearings 36 and shafts 37 will also be rotated in a horizontal plane. Furthermore, each bevel pinion 40 will roll around the fixed bevel gear 41 and will thus rotate each light-supporting shaft 37 about its own axis.

Each lamp L is preferably mounted on trunnions 44 in a forked bearing bracket 45, which bracket in turn is secured to the upper end of the associated inclined shaft 37. Each lamp L may be angularly adjusted in its bracket 45 and may be securely held in adjusted position by tightening the clamping blocks 46 against its trunnions 44.

In Figs. 1 and 6, it is assumed that the four lights L have been positioned with their axes all in the same horizontal plane. It is also assumed that the shafts 37 are all inclined at 45° to the plane of the cross plate 20.

If the spindles 37 are simultaneously rotated on their own axes, the lamps L will be swung simultaneously from the positions shown in Fig. 6 to the positions shown in Fig. 7, in which latter position all of the beams are directed vertically upward. Between these two positions, it will be evident that the beams from the lights L will sweep around in a cone-shaped path and that each beam would trace a circle if directed against an internal semi-spherical enclosing surface.

Referring to Fig. 8, the lights L, if placed in the position *o* and adjusted as shown in Fig. 6, would direct their beams outward from the center *o* along perpendicular horizontal lines, as *o*—*a* in Fig. 8. When rotated to the position shown in Fig. 7, the beams would all be directed upward substantially along the line *o*—*b*. Between these two positions, the beams would sweep upward or downward along a curved path between *a* and *b*.

It should be remembered, however, that the lamps L are not only rotating about their own axes and thus producing illuminated conical surfaces, but that they are also rapidly and bodily rotating about a vertical axis. The combined

effect of these two movements is to produce a substantially uniform illumination over the entire surface of a hollow semisphere having its center at *o* in Fig. 8.

If the apparatus shown in Fig. 1 is inverted, as it might be for flood-light or air-craft landing purposes, the distribution of light will then be inverted as indicated diagrammatically in Fig. 9, the apparatus being located at *o'*.

By properly correlating the speed of rotation of the cross plate **20** and the speed of rotation of each spindle **37**, the beams of light may be so intermingled that the separate cones of light cannot be distinguished, and so that a substantially uniform illumination is secured over the entire surface area to be lighted.

In order to conduct current to the separate lights L, I connect a line wire **60** (Fig. 1) to a brush or sliding contact **61** which engages a contact ring **62** secured to the under side of a fibre plate **63**. The plate **63** is clamped by its hub **64** to the rotating sleeve **23**.

Studs **66** are mounted in the disc **63** and are connected to the contact ring **62** and are also connected by wires or flexible members **68** to additional brushes or sliding contacts **70**, one for each bearing **36** and shaft **37**.

Each brush **70** engages a contact ring **71** on the under side of a fibre disc **72** mounted on and rotatable with its associated shaft **37** and clamping bracket **45**. A stud **73** in each disc **72** connects the contact ring **71** through a wire **75** to one of the associated lamp terminals, the other terminal being preferably grounded on the apparatus and thus providing a return circuit.

With these connections, electric current may be continuously supplied from the wire **60** to each of the lamps L, regardless of the rotation of the cross plate **20** and regardless of the additional individual rotation of each shaft **37** and its associated light.

Both the actual and relative speeds of rotation may be widely varied to suit different operating conditions and to secure different desired results. One effective illustrative combination is produced by rotating the sleeve **23** and cross plate **20** at 500 R. P. M. and by simultaneously rotating each shaft **37** and its associated light L about its own axis at 750 R. P. M. Other desired speed ratios may be secured by changing the ratio of the bevel gears **40** and **41**.

While I have shown the lights set so that they simultaneously reach horizontal positions and vertical positions, they may be set at any desired angles in the bearing brackets **45**, as for instance with alternate lights horizontally and vertically disposed respectively. Furthermore, the axis of each lamp L may be swung nearer to its supporting shaft, in which event an illuminated band of more or less width would be produced, instead of a complete illuminated hemisphere. Obviously, also, the angles of the bearings **36** and shafts **37** with respect to the plane of the cross plate **20** may be increased or decreased, with additional variations in the illuminating effects produced.

In Fig. 10, I have shown a modified construction in which each light L' is mounted directly on the armature shaft **80** of a separate motor M, which in turn is supported on the cross plate **20** previously described. In this case, the cross plate **20** may be mounted directly on a driven shaft **82**, and the fixed shaft **25**, bevel pinions **40** and fixed gear **41** may all be omitted. This modified construction has the advantage that the motors M may be controlled through a suitable rheostat to vary the relative rotation of the lights with reference to the speed of rotation of the cross plate **20** without stopping the apparatus or changing gear connections, as is necessary in the construction shown in Fig. 1. Current for the motor M and for the light L' may be supplied to wires **84** and **85** through suitable sliding contacts and contact rings, all as previously described.

From the foregoing description, it will be seen that I have provided means for uniformly illuminating an extended area by the use of a plurality of relatively small search-lights, each throwing a concentrated beam of light which sweeps about a vertical axis and which also provides a conical illuminated surface concentric to or parallel with its own axis. By this combination of movements, the light beams are effectively mixed and uniformly intermingled, and furthermore the objectionable glare of a beam of light projected from a fixed focus is completely avoided. The power required to drive the apparatus is much less than the saving of current in using several small lights instead of one extremely powerful floodlight. Any desired number of small lights may be used.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:

1. Illuminating apparatus comprising a plurality of separate searchlights, a rotatable support for said lights, means to move said lights bodily with said support in a plane circular path, means to simultaneously rotate each light individually about a separate and additional axis which is disposed at a substantial acute angle with respect to the plane of said circular path, and means to mount each searchlight with its axis disposed at a substantial acute angle to the axis of its separate and additional shaft, rotation of said lights with said support effecting simultaneous swinging movements of each searchlight beam between a position substantially parallel to the axis of the rotatable support and a position substantially perpendicular thereto.

2. Illuminating apparatus comprising a plurality of separate searchlights, a rotatable support for all of said lights, means to rotate said support about a fixed vertical axis, means to simultaneously rotate each light about a separate and additional axis which is disposed at 45° to the plane of rotation of said support, and means to mount each light with its axis at 45° to the axis of its separate and additional shaft, said light being bodily rotated in a horizontal plane and the beam of each light being simultaneously shifted from horizontal to vertical and vice-versa as the support and lights are rotated.

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