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W. A. PENNOW

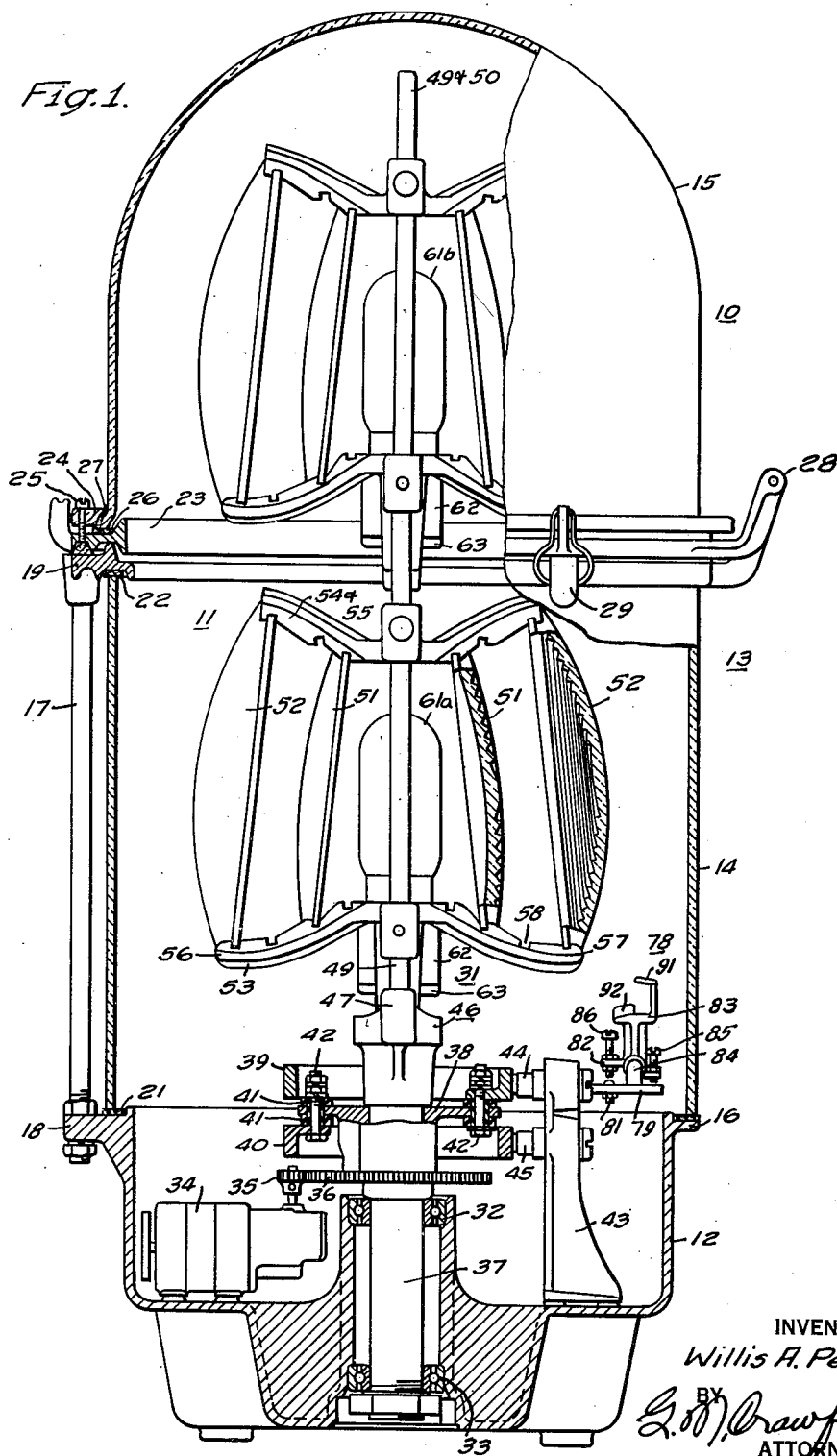
2,586,375

ROTATING BEACON HAVING DUPLICATE LAMP SYSTEMS ONE OF WHICH
IS AUTOMATICALLY ENERGIZED UPON FAILURE OF THE OTHER

Filed July 31, 1947

2 SHEETS—SHEET 1

Fig. 1.



INVENTOR
Willis A. Pennow.

BY *G. M. Crawford*
ATTORNEY

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2 SHEETS—SHEET 2

Fig. 2.

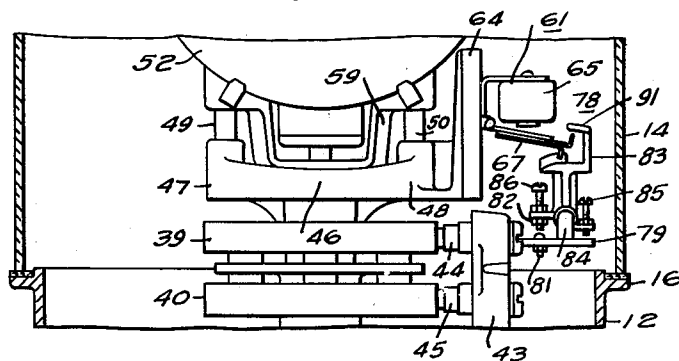


Fig. 4.

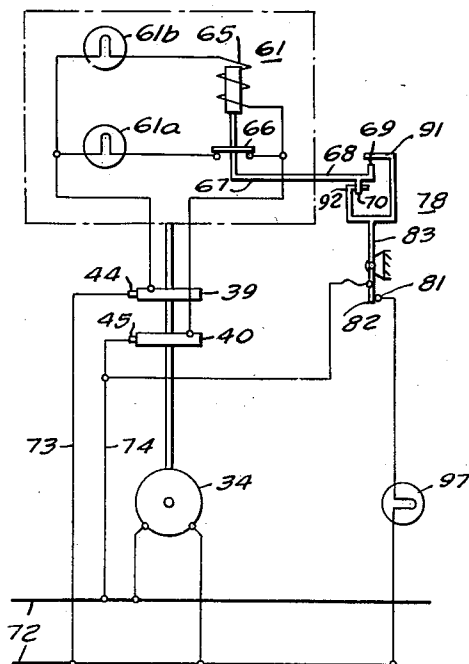
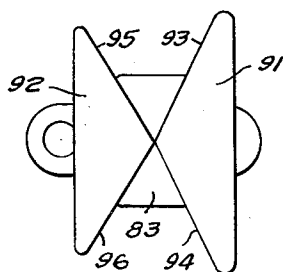


Fig. 3.



WITNESSES:

E. A. M. Blakey
Wm. L. Groove

INVENTOR

Willis A. Pennow.

BY *E. M. Crawford*
ATTORNEY

UNITED STATES PATENT OFFICE

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ROTATING BEACON HAVING DUPLICATE
LAMP SYSTEMS ONE OF WHICH IS AU-
TOMATICALLY ENERGIZED UPON FAIL-
URE OF THE OTHERWillis A. Pennow, Cleveland, Ohio, assignor to
Westinghouse Electric Corporation, East Pitts-
burgh, Pa., a corporation of Pennsylvania

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My invention relates, generally, to lighting equipment for use at airports and the like, and more particularly, to a rotating beacon of the type which produces a rotating light beam or beams which are particularly adapted for use at airports for identification purposes.

At the present time, high-powered rotating beacons are commonly used at large or commercial airports to identify the port and to meet certain Government regulations. These beacons are expensive and, therefore, not suitable for use at small privately or community-owned airports. For the most part, beacon lights now in common use are of the rotating drum type and produce either a single beam or two opposed beams. Beacons of this type, in addition to being expensive, have another disadvantage which is more important from the standpoint of a safe operation of aircraft. This is the inherent characteristic of such beacons of blacking out or going dark during some period of their operating cycle. This characteristic creates the danger of the pilot losing the beacon, whereas, if it were visible to him at all times, he could readily retain a fix on its position once it is seen.

Accordingly, it is an object of my invention, generally stated, to provide an improved type of rotating beacon which shall be of simple and economical construction and suitable for use on small privately or community-owned airports, and which shall be so constructed as to function mechanically under all weather conditions and be visible to a pilot throughout its entire operating cycle.

A more specific object of my invention is to provide a rotating beacon of the character described, wherein the light beam or beams are produced by substantially identical lens systems mounted on a rotatable support within a transparent enclosure.

Another object of my invention is to provide a beacon of this type wherein the rotatable support, as well as the lens mountings or supports, are of a skeleton nature so that the lighted beacon is visible from all directions of normal observation.

A further object of my invention is to provide a rotating beacon of the character described wherein the lamp circuits of the two lens systems are selectively controlled by a relay mounted on the rotatable support so that the lamp of one lens system is normally energized, and the other lamp energized in the event of the failure of the first lamp.

Another object is to provide for utilizing the

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position of the armature of the control relay to selectively determine the position of a trigger switch mounted on a stationary part of the beacon within the enclosure for controlling an indicator circuit to indicate at a remote point the failure of the main or normally energized lamp.

These and other important objects of my invention become more apparent from the following detailed description when considered in conjunction with the drawings.

Figure 1 is an elevational view, partly in section, showing a rotating beacon embodying the principal features of my invention.

Fig. 2 is a partial elevational view of the beacon of Fig. 1 showing the rotatable support assembly rotated through an angle of 90° from the position as in Fig. 1.

Fig. 3 is a top view of a portion of the trigger switch shown in Fig. 1; and

Fig. 4 is a diagrammatic view of the wiring connections of the beacon.

In practicing my invention in its preferred form, there is provided an elongated enclosure, a major portion of which is made of light emitting or transmitting material and in which is mounted a motor-driven support assembly carrying a pair of semaphore lens systems, one above the other, and associated lamp sockets. The rotating support assembly carries slip rings, and co-operating brushes are mounted on a stationary support within the enclosure. A control relay carried by the rotatable support assembly and rotatable therewith is utilized to control the lamps of the lens systems in such manner as to normally close one lamp circuit if the lamp is intact and open the circuit to the other lamp. Upon failure of the first or preferred lamp, this relay operates to connect the other lamp to the circuit. A trigger switch is stationarily mounted within the enclosure and may be used for controlling the operation of an indicating device on the outside of the enclosure for the purpose of indicating a failure of the preferred lamp. The trigger switch is disposed to be actuated from open to closed position by finger-extensions on the armature of the control relay which engage the trigger switch in one way or another depending upon its position and the position of the relay armature. The enclosure is comprised of upper and lower sections hinged together in such manner as to be readily openable to give access to the interior thereof. All of the working or moving parts of the beacon are completely enclosed and protected by this weatherproof enclosure.

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Referring to the drawings, there is shown a practical and commercial embodiment of my invention in the form of a rotating beacon which is so constructed as to be visible to an observer from all points of observation above the horizontal plane of the beacon.

In order to effect this visibility result, the beacon is comprised, generally, of an elongated enclosure or housing 10, a major portion of which is composed of a light emitting material, such as glass, and a rotatable light producing and directing assembly 11 mounted within the enclosure as shown in Fig. 1.

The enclosure 10 is preferably made up of a cup-shaped base portion 12 of metal, or other suitable opaque material, and a relatively deep cup-shaped cover portion or assembly 13 comprising a lower cylinder 14 of glass, or other light-emitting material, and an upper dome 15 of the same material. These glass portions 14 and 15 are preferably comprised of heat-resisting glass.

The cover assembly 13 is of two-part construction primarily for use in servicing the beacon. The lower cylinder 14 is held in position on the rim 16 of the base by means of a plurality of tie-rods 17 engaging spaced ears 18 on the base and a holding ring 19 engaging the upper end of the cylinder. Suitable gaskets 21 and 22 are positioned at the ends of the cylinder and act as cushions and seals at these joints. The upper dome 15 is mounted on a support ring 23 being secured thereto by a retaining ring 24 secured at spaced points to the support ring by screws 25. Suitable gaskets 26 and 27 are interposed at the joint between the support retaining ring and the rim of the dome to seal and cushion this joint.

In this instance, the support ring 23 is hinged to the retaining ring 19 at 28 so as to provide an openable enclosure. The two rings are detachably secured or held together in the closed position by latches 29, only one of which is shown in this view, spaced about the periphery of the enclosure.

The light producing and directing assembly 11 is preferably comprised of a support assembly 31 rotatably mounted on bearings 32 and 33 mounted in the base 12 and driven by a gear motor 34 through gears 35 and 36, all mounted within the enclosure as shown.

The support assembly 31 comprises a main shaft 37, which may be tubular if desired, vertically supported by the bearings 32 and 33 from the bottom of the base 12. The gear 36 is attached to this shaft. At the upper end of the shaft 37, there is attached a spider 38 carrying a pair of slip rings 39 and 40 which are insulated from the spider by suitable insulation 41. These slip rings may be secured to the spider by a plurality of bolts 42. A pedestal 43 mounted on the bottom of the base carries a pair of brushes 44 and 45 which cooperate with the slip rings 39 and 40 in connecting the circuits of the beacon to an outside source as will be explained more fully in connection with Fig. 4.

The rotatable support assembly 31 further comprises a yoke member 46 attached to the upper end of the main shaft 37, the arms 47 and 48 of the yoke member having openings therein to receive the ends of a pair of support rods 49 and 50. These rods function as spaced vertical supports for the lens systems and their associated lamps and lamp sockets.

Each lens system, of which there are four arranged in two, that is, upper and lower groups,

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preferably comprise inner and outer lens 51 and 52 as shown in Fig. 1. If desired, a single bull's-eye type of lens may be used instead, but it is preferred to use the arrangement shown. In this instance, the lens of each group are preferably supported by a lens support 53 and a pair of lens holders 54 and 55 mounted on the support rods 49 and 50. As viewed in Fig. 1, the lens supports and lens holders are seen from the side. As shown, each of the lens supports is provided with a double pair of oppositely-disposed arms 56 and 57 which are provided with suitable notches 58 to receive the rims of the lens. As shown in Fig. 2, these pairs of oppositely-disposed arms 56 and 57 are connected together by means of a saddle portion 59 making this lens support 53 of a one-piece construction.

The lens are held in position on the lens support by means of the lens holders 54 and 55 of which there are two, one mounted on each of the rods 49 and 50. It will be apparent that this arrangement provides for rigidly and accurately supporting the lenses with an open space between the lens systems for receiving the lamps. Lamps 61a and 61b are mounted between the inner lenses of the pairs of lens systems. Each lamp is supported in a vertical position by means of a suitable socket 62 mounted on a socket holder 63 which, in turn, is mounted within a suitable opening, not shown, in the saddle portion 59 of the lens support.

This arrangement provides a support for the lamps and their associated lens systems of such nature that the light source is visible at all times throughout the entire operating cycle of the beacon. By operating cycle, it is meant the entire rotation of the lens systems about their vertical axis of rotation.

The lenses 51 and 52 may be clear or colored, as desired. Color may be imparted to the light beams projected by the beacon in several ways. The inner or outer lenses may be colored or a color filter, not shown, may be inserted in the path of the light between the lamp and the lenses. If all of the beams are to be colored, a color hood may be placed over the lamp or a colored lamp used.

In order to provide for utilizing one of the lamps as a preferred lamp and automatically connecting the other or auxiliary lamp into the circuit upon failure of the preferred lamp, a control relay, shown generally at 61 in Fig. 2, is utilized. This control relay 61 is mounted on an arm or extension 64 of the yoke 47 and accordingly rotates with the rotatable support assembly 31.

As shown in Fig. 4, the control relay 61 is provided with an operating coil 65 and normally closed contact members 66. The armature 67 is provided with an extension 68 having oppositely-disposed finger-portions 69 and 70 which will be referred to hereinafter. The lamps 61a and 61b are connected to the supply source 72 through conductors 73 and 74 and the slip rings 39 and 40 with their cooperating brushes 44 and 45.

One side of the supply line is common to both lamps and lamp 61a is connected to the other side of the supply line through the normally closed contact member 66. The other lamp 61b is connected thereto through the operating coil 65 of the control relay.

It will be understood that by means of this connection, if the preferred lamp 61b is intact and operative, the control relay 61 will be energized and operated so that its contact members

66 are open. This opens the connection of the auxiliary lamp 61a to the source. If, for any reason, the preferred lamp 61b fails, the energizing circuit for the control relay is interrupted and it automatically closes its contact members 66 to connect the auxiliary lamp 61a to the supply circuit.

In this instance, the control relay 61 is utilized for another purpose, namely, to provide for operating a remote indicator for indicating the failure of the preferred lamp. This is accomplished by means of a trigger switch 78 mounted within the enclosure on an extension 79 of the pedestal 43.

This trigger switch is comprised of a stationary contact member 81, a movable contact member 82 and an actuating arm 83 therefor. The actuating arm and movable contact member are preferably in one piece and are mounted for a limited amount of rotation about a horizontal axis 84. The degree of rotation is determined by the adjustment of the screws 85 and 86 carried by the arm 83.

In order to provide for automatically controlling the position of the trigger switch 78 in accordance with the condition of the preferred and auxiliary lamps, the upper end of the arm 83 is so shaped and positioned with respect to the extension 68 and finger portions 69 and 70 of the armature of the control relay 61 as to be selectively actuated thereby, depending upon the position of the control relay.

As shown best in Fig. 3, the upper ends of the arm 83 of the trigger switch are composed of opposed cam elements 91 and 92. The upper cam element 91, as viewed in Figs. 1 and 3, is provided with two sloping or cam surfaces 93 and 94 which intersect the same point of intersection as the cam surfaces 95 and 96 on the lower cam element of the arm. These cam elements, as shown in Fig. 2, are disposed in the path of movement of the fingers 69 and 70 of the control relay in such manner that if the control relay is energized, as results when the lamp 61b is burning, the armature 67 is raised and the finger 69 will engage the cam element 91 on the first rotation of the support assembly 31. This moves the arm 83 of the trigger switch to the right-hand position, as shown in Fig. 1, thereby opening contact members 81 and 82 in the circuit of the indicator device or lamp 97, as shown in Fig. 4. In the event that the preferred lamp has burned out or its circuits become opened and the control relay 61 has been released, its finger 70 is then lowered to such position as to engage the cam element 92 of the trigger switch. This actuates the trigger switch to its closed position to energize the indicating lamp 97.

It will be apparent that by means of this arrangement of a control relay mounted on the rotating structure of the beacon and a cooperating trigger switch mounted within the enclosure on a stationary portion thereof, a positive and non-tamperable indicating arrangement is provided. The trigger switch is actuated or may be actuated once for each revolution of the support assembly. That is, if the trigger switch is not in the correct position as determined by the condition of the lamps, it will be actuated to the correct position during the next rotation of the support assembly.

In view of the foregoing detailed description of a preferred embodiment of my invention, it will be apparent that I have provided a small, low-

cost rotating beacon for airports not requiring large beacons, but which do need a beacon of the type that can be distinguished from those which are used at large commercial airports.

My invention provides further a rotating beacon of a type which may be readily serviced and which is so constructed that it is clearly visible from all points of observation. Its construction is also of such a nature that all of the moving or operating parts thereof are entirely enclosed by a weatherproof enclosure, the major portion of which is of a light-transmitting nature.

While a preferred embodiment of my invention has been disclosed and described in detail herein, it is to be understood that the principles of my invention may be readily embodied in equivalent structures.

I claim as my invention:

1. A rotating beacon for use at airports and the like comprising, a stationary base, a relatively deep inverted cup-shaped light emitting enclosure of transparent material mounted on the base, said enclosure being divided into upper and lower sections joined together to permit opening, a support rotatably mounted on the base for rotation about a vertical axis, a pair of lens systems rigidly mounted on the support one above the other, said lens systems being adapted to project light beams in opposite directions in a generally horizontal plane, a socket mounted on the support adjacent each lens system for supporting a lamp within the lens system, circuit means including a relay mounted on the support for selectively controlling the energization of the lamps to normally effect the energization of one lamp and to automatically effect the energization of the other lamp in the event of failure of the said one lamp, and means including a motor mounted on the base for rotating the support means within the closure.

2. A rotating beacon light for use at airports and the like comprising, a generally cup-shaped base, a cylindrical transparent lens mounted on the upper rim portion of the base, a ring member positioned on the upper end of said lens, a plurality of spaced tie members connecting the ring member to the base, a second ring member mounted on said first ring member and hinged thereto, a dome-shaped transparent lens attached to the second ring member, a support rotatably mounted on the base within the enclosure formed by the lenses in a vertical position, means mounted in the base for rotating the support, a pair of duplicate semaphore lens systems including associated lamp sockets mounted on the support one above the other in the upper and lower portions of the enclosure, and circuit means including a control relay mounted on the support for selectively controlling the energization of the circuit means of the beacon light to normally close the circuit to the lamp associated with one lens system while opening the circuit to the other and to close the circuit to the other lamp in response to the failure of the first lamp, said relay having outwardly extending fingers which are held in different positions depending upon the energized or deenergized condition of the relay, and a trigger switch mounted on the base disposed to be selectively actuated by said fingers in accordance with the position thereof for controlling indicating means to indicate failure of said first lamp.

3. A rotating beacon light for use at airports and the like comprising, a stationary base, a relatively deep dome-shaped light emitting enclosure

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of transparent material mounted on the base, a support rotatably mounted on the base in a vertical position within the closure, a pair of lens systems mounted on the support one above the other, a socket associated with each lens system for supporting and conducting electric current to a lamp positioned within the lens system, drive means mounted on the base for rotating the support, and circuit means including a relay mounted on the rotatable support and rotatable therewith for selectively controlling the energization of said lamp sockets, said relay being operable to normally effect the energization of one socket and the lamp supported thereby and to automatically effect the energization of the other socket and its associated lamp in response to the discontinuance of current flow through said one socket and its associated lamp, whereby upon failure of the normally energized lamp the other lamp is energized and lighted.

4. A rotating beacon light for use at airports and the like comprising, a base, a relatively deep cup-shaped light emitting enclosure of transparent material mounted on the base, a support mounted on the base within the enclosure for rotation about a vertical axis, a pair of lens systems mounted on the support one above the other, a lamp socket mounted on the support with each lens system for supporting and conducting electric current to a lamp, means mounted on the base operable to rotate the support, a pair of slip rings mounted on the support, a pair of cooperating brushes supported from the base and adapted to be connected to a current source, circuit means connecting the sockets to the slip rings, and a relay mounted on the rotatable support for selectively controlling the connection of the sockets to the slip rings, said relay having an operating coil connected in circuit relation with one of said sockets and normally closed contact members connected in circuit relation with the other of said sockets, whereby the circuit through said other socket is automatically closed in response to the opening of the circuit through said one socket.

5. A rotating beacon for airports and the like comprising, an elongated dome-shaped enclosure adapted for vertical mounting, said enclosure being of a light emitting nature at its top end and throughout a major portion of its length, a rotatable support assembly mounted within the enclosure, a pair of lens systems mounted on the support assembly one above the other within the light emitting portion of the enclosure, a lamp socket carried by the support assembly individual to each lens system for supporting a lamp therein, circuit means including a pair of slip rings carried by the support assembly and cooperating brush members stationarily mounted in the enclosure for connecting said lamp sockets to a source of current, and a relay carried by the support assembly and rotatable therewith for selectively controlling the energization of said sockets and the lamps carried thereby, said relay being normally effective when both lamps are intact to connect a predetermined lamp socket to the source and operable in response to the failure of the lamp carried by the preferred socket to establish the circuit to the other socket.

6. A rotating beacon for airports and the like comprising, an elongated dome-shaped enclosure adapted for vertical mounting, said enclosure being of a light emitting nature at its top end and throughout a major portion of its length, a rotatable support assembly mounted within the

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enclosure, a pair of lens systems mounted on the support assembly one above the other within the light emitting portion of the enclosure, a lamp socket carried by the support assembly individual to each lens system for supporting a lamp therein, circuit means including a pair of slip rings carried by the support assembly and cooperating brush members stationarily mounted in the enclosure for connecting said lamp sockets to a source of current, a relay carried by the support assembly and rotatable therewith for selectively controlling the energization of said sockets and the lamps carried thereby, said relay being normally effective when both lamps are intact to connect a predetermined lamp socket to the source and operable in response to the failure of the lamp carried by the preferred socket to establish the circuit to the other socket, and switch means stationarily mounted within the enclosure disposed to be mechanically actuated by the control relay dependent upon its operated and non-operated positions for controlling indicating means located outside the enclosure to indicate the failure of the preferred lamp.

7. A rotating light beacon for producing directed light beams comprising, a cup-shaped base member, a relatively deep dome-shaped light emitting enclosure member of transparent material mounted on the base member, said base member and enclosure member forming a weatherproof enclosure, a support mounted on the base member for rotation about a vertical axis within the enclosure, a pair of semaphore lens systems mounted on the support one above the other for rotation therewith within the enclosure member, sockets carried by the support member for mounting a lamp in each lens system, means including a motor mounted in the base member for driving the rotatable support member, circuit means including a relay mounted on the support member for selectively controlling the energization of the lamp sockets, said relay having an armature which is actuated to one position when the relay is energized and to a different position when deenergized, and a trigger switch stationarily mounted within the enclosure in predetermined relation to the path of movement of the relay, said trigger switch being actuable to different positions by engagement with the armature and having control contact members operable to closed and opened positions in accordance with the position of the trigger switch for controlling indicating means to indicate which one of said sockets is connected to be energized.

8. A rotating light beacon comprising, a base member, a relatively deep dome-shaped light emitting cover member of transparent material for the base member, said base member having a centrally disposed boss portion therein with a vertical bore, a shaft member rotatably mounted in the bore of said boss portion, a spider member attached to the shaft member, a pair of slip rings carried by the spider member in spaced concentric relation to the shaft member, a pedestal member mounted on the base member, a pair of brushes carried by the pedestal in contact making relation with the slip rings, a fork-shaped bracket member attached to the shaft member above the spider member, a pair of vertically disposed support rods carried by said bracket in spaced relation, a pair of semaphore lens systems carried by said support rods one above the other, lamp sockets carried by the support rods for mounting lamps within the lens

systems, means including a motor mounted in the base member for driving the shaft member to rotate the lens systems, and circuit means including a relay carried by the spider member for selectively controlling the energization of the sockets, said relay and sockets being connected to a current source outside the enclosure formed by the base member and cover member through the stationary brushes and slip rings.

9. A beacon comprising, a stationary base, a stationary enclosure mounted on the base and being substantially entirely of a transparent material, a support in said enclosure mounted on the base for rotation about a vertical axis, spaced superposed lamps supported in said enclosure substantially on said vertical axis, superposed transparent lens means mounted on said support and located adjacent said lamps, respectively, and between the lamps and a part of said enclosure, said lamps being substantially entirely exposed to all other parts of said enclosure, circuit means for said lamps including a relay mounted within said enclosure for selectively controlling the energization of the lamps to normally effect the energization of one lamp and to automatically effect the energization of the other lamp in the event of failure of the said one lamp, and means for rotating the support means within the enclosure.

10. A beacon comprising, a stationary base, a stationary enclosure mounted on the base and being substantially entirely of a transparent material, a support in said enclosure mounted on the base for rotation about a vertical axis, spaced superposed lamps supported in said enclosure substantially on said vertical axis, superposed transparent lens means mounted on said support and located adjacent said lamps, respectively, and between the lamps and a part of said enclosure, each of said lens means comprising a pair of transparent lens structures disposed at opposite sides of said lamp, and said lamps being substantially entirely exposed to all other parts of said enclosure.

11. A beacon comprising, a stationary base, a vertically extending stationary enclosure secured to said base and being substantially entirely of a transparent material, vertically extending support means in said enclosure mounted on the base for rotation about a vertical axis, spaced superposed lamps supported in said enclosure substantially on said vertical axis, at least one transparent lens member for each lamp, means for supporting each lens member at a location between its lamp and a part of said enclosure comprising a pair of substantially radially extending support elements for each lens member

secured on said support means in vertically spaced relation for engaging top and bottom edges of a lens member to hold the lens member therebetween, and said lamps being substantially entirely exposed to all other parts of said enclosure.

12. A beacon comprising, a stationary base, a stationary enclosure mounted on the base and being substantially entirely of a transparent material, a support in said enclosure mounted on the base for rotation about a vertical axis, a lamp supported in said enclosure substantially on said vertical axis, lens means mounted on said support and located adjacent said lamp at least at one side thereof between said lamp and a part of said enclosure, and said lamp being substantially entirely directly exposed to all other parts of said enclosure.

13. A beacon comprising, a stationary base, a vertically extending stationary enclosure secured to said base and being substantially entirely of a transparent material, vertically extending support means in said enclosure mounted on the base for rotation about a vertical axis, a lamp supported in said enclosure substantially on said vertical axis, at least one transparent lens member for said lamp, means for supporting said lens member at a location between said lamp and a part of said enclosure comprising a pair of substantially radially extending support elements for said lens member secured on said support means in vertically spaced relation for engaging top and bottom edges of said lens member to hold the lens member therebetween, and said lamp being substantially entirely exposed to all other parts of said enclosure.

WILLIS A. PENNOW.

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