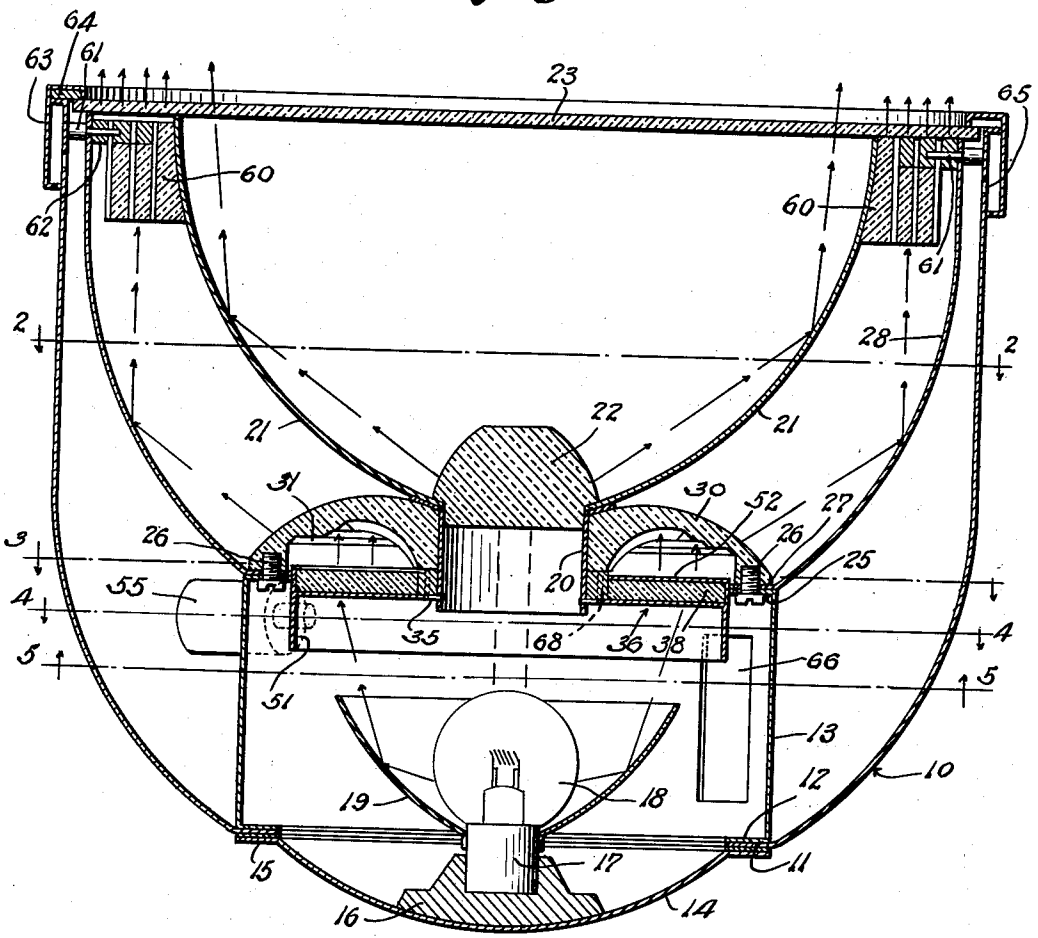
April 20, 1954 J. R. DILLON 2,676,312

CATADIOPTRIC SIGNAL LIGHT

Filed June 4, 1953

3 Sheets-Sheet 1

Fig. 1.



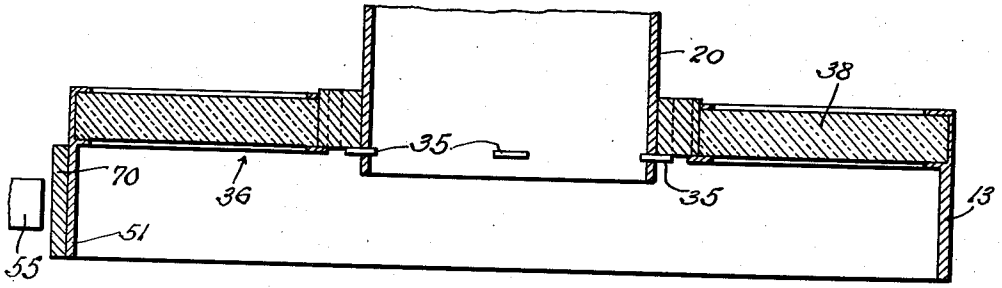


Fig. 6.

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Fig. 2.

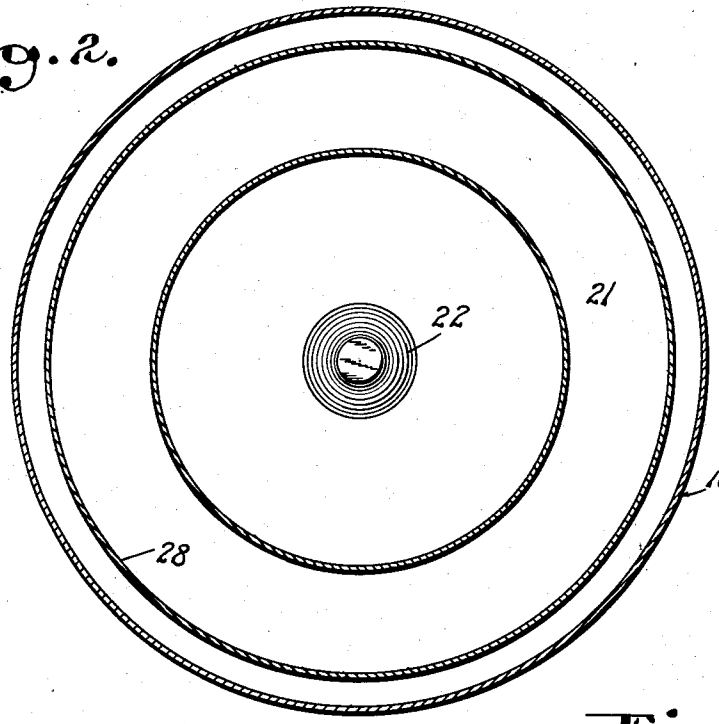

Fig. 3.

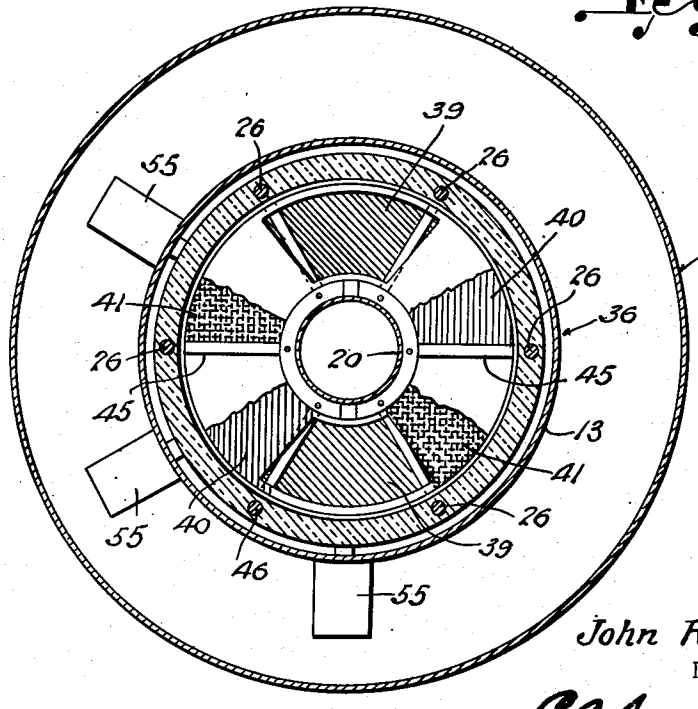

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Fig. 4.

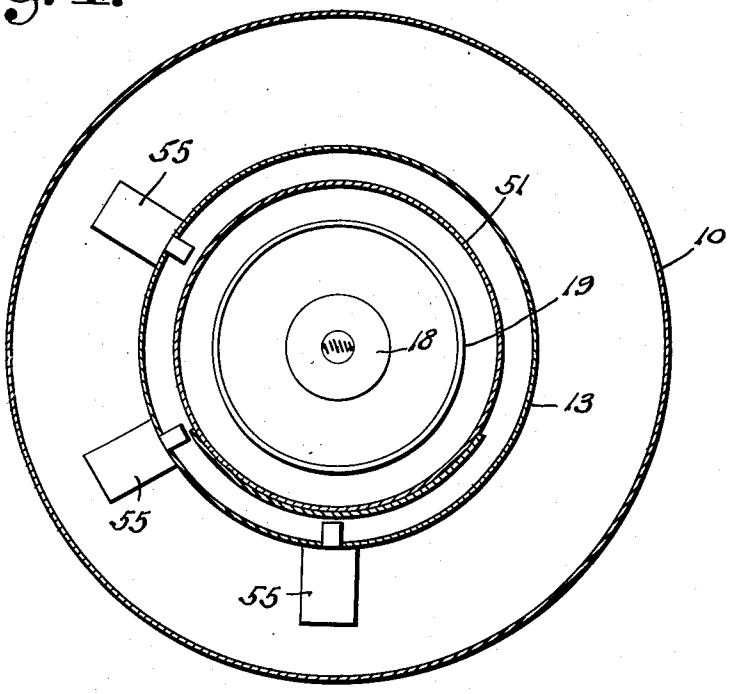
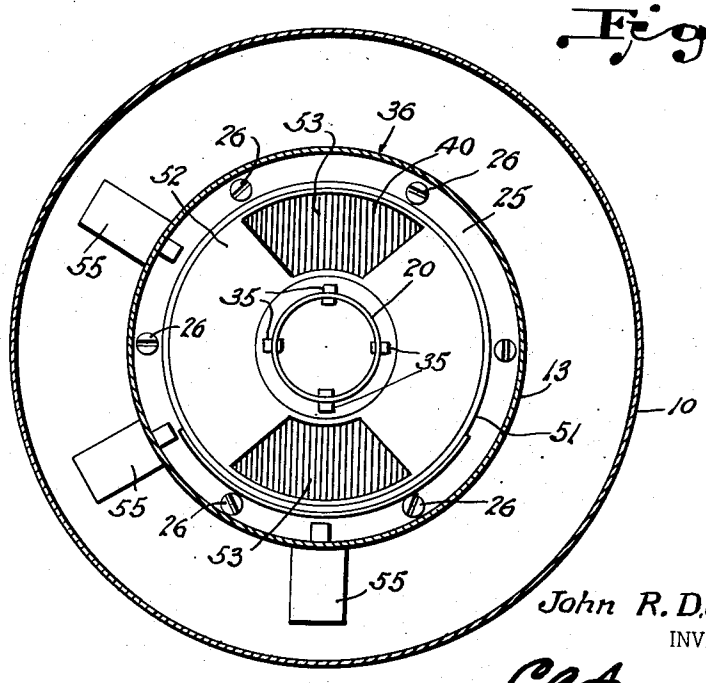


Fig. 5.



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UNITED STATES PATENT OFFICE

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CATADIOPTRIC SIGNAL LIGHT

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Application June 4, 1953, Serial No. 359,520

12 Claims. (Cl. 340—84)

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This invention relates to a catadioptric signal light, and has for its primary object the provision of a signal light such as a traffic light or the like which will be visible from the side at materially greater distances than those signal lights presently in use.

An additional object of the invention is the provision of a signal light composed of an inner beam of light or colorless light and an outer beam of colored light.

A further object of the invention is the provision of a means for projecting such a beam whereby the outer edges of the colored beam as seen in profile are sharply defined rather than diffused as is presently common to color light, thus rendering the signal more acutely visible.

Still another object of the invention is the provision of a means for projecting an annular ring or corona of colored light surrounding as a tubular sleeve an inner white or colorless beam.

An additional object of the invention is the provision of means whereby the color of the surrounding sleeve may be varied either manually or automatically as desired.

Still another object of the invention is the provision of a mechanism providing a suitable arrangement of color filters so that any one of the plural colors required as a signal may by automatic means such as a solenoid switch be projected from a single source of light instead of separate and distinct sources for each color.

An additional object of the invention is the provision of a signal light which may be readily adapted for such means as switch and semaphore railroad signals, airfield landing signals, coast and airline beacons, highway and street traffic signals, and emergency signals.

Still another object of the invention is the provision of a signal light which may be readily adapted to mobile units, such as motor vehicles or the like and particularly to emergency vehicles such as police cars, ambulances, fire engines, and similar automotive vehicles.

As conducive to a clearer understanding of this invention, it may here be pointed out that the perception of rays of light, particularly in darkness is due to the illumination of minute particles of matter suspended in the atmosphere. This atmospheric minutiae consists largely of water globules and silicon with other matter present according to locale and conditions. Normally the lumen value of a colored ray such as red is not of sufficient intensity to illuminate these minute particles to the degree of visibility. Therefore the solid beam of color is imperceptible.

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If a colored light beam is interposed between the observer and a colorless beam the color light will be visible due to the catadioptric effect of the more luminous colorless beam. It is an important object of this invention therefore to provide a means for interposing such a colorless light beam between a colored light beam and the observer in the form of a colorless beam surrounded by a concentric colored sleeve.

It may further be pointed out that an overlapping of the beams will neutralize the color by over brilliance if there is extreme imbalance in the lumen value of the beams. It is a further object of this invention therefore to provide a single source of light for both the colored and colorless beams whereby the lumen value of both will be substantially identical.

A further important object of the invention is the provision of an apparatus for the projection of such concentric beams which will be reliable and efficient in operation, and which will provide a light beam visible from the side at a maximum distance from the observer, in any one of a selected plurality of desired colors.

Still other objects reside in the combinations of elements, arrangements of parts, and features of construction, all as will be more fully pointed out hereinafter, and disclosed in the accompanying drawings wherein there is shown an illustrated embodiment of the instant invention.

In the drawings:

Figure 1 is a side sectional view taken substantially through the center line of one form of device embodying the instant invention.

Fig. 2 is a sectional view taken substantially along the line 2—2 of Fig. 1.

Fig. 3 is a sectional view taken substantially along the line 3—3 of Fig. 1.

Fig. 4 is a sectional view taken substantially along the line 4—4 of Fig. 1.

Fig. 5 is a sectional view taken substantially along the line 5—5 of Fig. 1 as viewed in the direction indicated by the arrows, and

Fig. 6 is an enlarged sectional view showing certain details of construction of the filter assembly of the device.

Similar reference characters refer to similar parts throughout the several views of the drawing.

Since the device of the instant invention produces what may be termed a solid central beam of light, surrounded by a sleeve or corona, it will be referred to hereinafter as a corona beam, in lieu of more descriptive terminology.

Having reference now to the drawings in detail there is generally indicated at 10 a lamp

housing or casing, of generally parabolic configuration. Casing 10 terminates at its lower extremity in a peripheral flange 11, surrounding a central aperture, upon which flange 11 is seated a second concentric flange 12 comprising the lower portion of a cylindrical lamp-containing housing 13. A concaved lower closure member 14 is also provided with an annular flange 15 which is suitably secured in any desired manner to the flange 11. Seated in the bottom of member 14 is a lamp socket base 16 containing a lamp socket 17 in which is mounted a lamp 18 surrounded by a parabolic reflector 19.

Light rays from lamp 18 pass through a central aperture in a tubular member 20, which comprises an extension of a parabolic reflector 21, through an axial lens 22 which lens diffuses the rays to the sides of parabolic reflectors 21 as indicated by the arrows, and thence outwardly through a colorless lens 23, to be more fully described hereinafter. By means of this assembly the central core or white or colorless beam of light is projected.

The upper extremity of lamp-containing housing 13 is also provided with a flange 25, to which is secured, as by means of screws 26 an annular flange 27 comprising the lowermost portion of a second upper parabolic reflector 28, the purpose of which will be more fully described hereinafter. Screws 26 also serve to secure to the assembly a colorless corona lens generally indicated at 30. Corona lens 30 is toroidal in shape, and generally concavo-convex in cross sectional configuration. The concave portion of lens 30 however is provided with prismoid irregularities 31 to increase the surface for the purpose of light absorption and equalize the distribution of light from prismatic lens 19.

The exterior periphery of extension 20 is provided with protruding lugs 35, which serve to support a filter assembly generally indicated at 36. Filter assembly 36 generally includes a retainer 37, concentric with a color filter preferably composed of Lucite, and including oppositely disposed segments of green 39—39, red 40—40 and yellow 41—41 (see Fig. 3).

The assembly or colored disc 38 is preferably composed of Lucite or similar non-conductive material, and is adapted to be carried by radial spokes 45 (see Fig. 3), the tips of which latter may be covered with graphite to provide lubrication when the device is rotated. The spokes 45 are seated in suitable recesses in the disc.

The entire disc assembly is carried by a carrier member generally indicated at 50, including a depending annular flange 51. The disc is also positioned for rotation between two opposed halves of a shutter member 52, the latter being provided with suitable apertures 53 adapted to expose opposed color segments of similar colors simultaneously. As best shown in Fig. 5 the red segments of the color disc are shown as exposed in the apertures 53, the yellow and green segments being covered by the solid portions thereof.

Solenoids 55 are provided at spaced intervals about the periphery of flange 51, and may be selectively energized to expose a suitable or desired color to the apertures in shutter member 52. These solenoids may be energized in any desired conventional manner, either by mechanical means or manually in accordance with the proposed use of the device. It will thus be seen that in accordance with the position of the color disc relative to the apertures in the shutter a certain color of light will be refracted between

parabolic members 21 and 28. Between these members there is positioned a diffusion preventing lens 60 which is preferably comprised of a device formed by bonding transparent colorless strips to like spacers to form a concentric unit. The wide parallel surfaces of the lens strips are dulled to prevent cross reflection. The lens 60 is adapted to be supported as by means of pins 61 and spacers 62. The lens 60 is immediately adjacent the previously mentioned cover plate 23, which is held in position as by means of a glass retaining rim 63, adapted to clamp against a bushing or similar annular ring 64. Suitable vent openings 65 are provided to allow dissemination of heat through the device.

Similarly vent openings 66 are provided in annular ring 13 to permit the escape of heat from the bulb 18.

It is to be noted that the ring 35 contains ports or vents 68 which function to admit light rays from bulb 18 to the inner section of the toroidal lens 30.

Ordinarily the concentration of color light in the inner area of lens 30 would be disproportionate to color in the outer area due to the depth of the inner section and to the lesser depth of the outer section. By the introduction of colorless light to the area of concentrated color there is uniform distribution of color throughout the lens with consequent lumen value of maximum brilliance.

From the foregoing the operation of the device should now be readily apparent.

Light from the bulb 18 is diffused by means of parabolic reflector 19 as indicated by the arrows partially through the axial lens 22, and thence from parabolic reflector 21 outwardly to face plate 23 to provide a substantially cylindrical beam of clear or white light.

An additional portion of the light from the bulb 18 is diffused through the color filter assembly 36, and thence through lens 30 between parabolic reflector 21 and off of parabolic reflector 28 through the lens 60, and thence outwardly as indicated by the arrows to the face plate 23. This light is colored in accordance with the relative position of the color filter therein, and provides a corona or sheath about the central core of white light, thus providing a colored light beam illuminated by a clear light beam to the rear thereof, relative to the observer.

In the above described illustration it will be seen that a plurality of colored beams may be provided, for use with traffic signals or the like.

However when it is desired to utilize this invention in connection with motor vehicles for example such as fire engines or the like wherein only one color as for example red is necessary, the color filter may be locked in position in any desired manner, in such manner that only the red beam is exposed. Correspondingly in use with private motor vehicles wherewith no colored lights are permitted a fog filter may be substituted for the color filter. Similarly in the use of emergency vehicles the fog filter and color filter may be utilized simultaneously. When utilized for changing signals the steel traction member 70 is actuated by means of the solenoid 55 to occasion rotation of the device relative to the apertures in the shield 52.

There is thus provided a corona beam, comprising an inner area of clear or white light and an outer area of selective colored light in the form of a corona or sleeve, which accomplishes all of the objects of this invention, and others,

including many advantages of great practical utility and commercial importance.

As many embodiments may be made of this inventive concept, and as many modifications may be made in the embodiment hereinbefore shown and described, it is to be understood that all matter herein is to be interpreted merely as illustrative and not in a limiting sense.

I claim:

1. In a device for projecting a catadioptric signal light in the form of a corona-beam, a source of light, a parabolic reflector coaxial with said source of light having a centrally disposed opening, an axial lens in said opening directing light rays towards said parabolic reflector to form a light beam, a toroidal lens surrounding said aperture, a second parabolic reflector concentric with said first parabolic reflector but exterior of the outer periphery of said toroidal lens, and a third parabolic reflector about said light source to direct a portion of said light through said toroidal lens between said first and second parabolic reflectors to form a corona-like light beam about said first mentioned beam.

2. In a device for projecting a catadioptric signal light in the form of a corona-beam, a source of light, a parabolic reflector coaxial with said source of light having a centrally disposed opening, an axial lens in said opening directing light rays towards said parabolic reflector to form a light beam, a toroidal lens surrounding said aperture, a second parabolic reflector concentric with said first parabolic reflector but exterior of the outer periphery of said toroidal lens, a third parabolic reflector about said light source to direct a portion of said light through said toroidal lens between said first and second parabolic reflectors to form a corona-like light beam about said first mentioned beam, and a color filter between said toroidal lens and said light source.

3. In a device for projecting a catadioptric signal light in the form of a corona-beam, a source of light, a parabolic reflector coaxial with said source of light having a centrally disposed opening, an axial lens in said opening directing light rays towards said parabolic reflector to form a light beam, a toroidal lens surrounding said aperture, a second parabolic reflector concentric with said first parabolic reflector but exterior of the outer periphery of said toroidal lens, and a third parabolic reflector about said light source to direct a portion of said light through said toroidal lens between said first and second parabolic reflectors to form a corona-like light beam about said first mentioned beam, said toroidal lens being concavo-convex in cross section.

4. In a device for projecting a catadioptric signal light in the form of a corona-beam, a source of light, a parabolic reflector coaxial with said source of light having a centrally disposed opening, an axial lens in said opening directing light rays towards said parabolic reflector to form a light beam, a toroidal lens surrounding said aperture, a second parabolic reflector concentric with said first parabolic reflector but exterior of the outer periphery of said toroidal lens, and a third parabolic reflector about said light source to direct a portion of said light through said toroidal lens between said first and second parabolic reflectors to form a corona-like light beam about said first mentioned beam, said toroidal lens being concavo-convex in cross section and having its concave surface provided with a plurality of prismoidal irregularities to increase the light absorbing surface.

5. In a device for projecting a catadioptric signal light in the form of a corona-beam, a source of light, a parabolic reflector coaxial with said source of light having a centrally disposed opening, an axial lens in said opening directing light rays towards said parabolic reflector to form a light beam, a toroidal lens surrounding said aperture, a second parabolic reflector concentric with said first parabolic reflector but exterior of the outer periphery of said toroidal lens, and a third parabolic reflector about said light source to direct a portion of said light through said toroidal lens between said first and second parabolic reflectors to form a corona-like light beam about said first mentioned beam, said toroidal lens being concavo-convex in cross section and having its concave surface provided with a plurality of radially disposed prismoidal irregularities to increase the light absorbing surface.

6. In a device for projecting a catadioptric signal light in the form of a corona-beam, a source of light, a parabolic reflector coaxial with said source of light having a centrally disposed opening, an axial lens in said opening directing light rays towards said parabolic reflector to form a light beam, a toroidal lens surrounding said aperture, a second parabolic reflector concentric with said first parabolic reflector but exterior of the outer periphery of said toroidal lens, a third parabolic reflector about said light source to direct a portion of said light through said toroidal lens between said first and second parabolic reflectors to form a corona-like light beam about said first mentioned beam, a color filter between said toroidal lens and said light source said color filter having a plurality of colors thereon, and a shutter for shielding all but a selected one of said colors.

7. In a device for projecting a catadioptric signal light in the form of a corona-beam, a source of light, a parabolic reflector coaxial with said source of light having a centrally disposed opening, an axial lens in said opening directing light rays towards said parabolic reflector to form a light beam, a toroidal lens surrounding said aperture, a second parabolic reflector concentric with said first parabolic reflector but exterior of the outer periphery of said toroidal lens, a third parabolic reflector about said light source to direct a portion of said light through said toroidal lens between said first and second parabolic reflectors to form a corona-like light beam about said first mentioned beam, a color filter between said toroidal lens and said light source said color filter having a plurality of colors thereon, a shutter for shielding all but a selected one of said colors, and means for rotating said color filter.

8. In a device for projecting a catadioptric signal light in the form of a corona-beam, a source of light, a parabolic reflector coaxial with said source of light having a centrally disposed opening, an axial lens in said opening directing light rays towards said parabolic reflector to form a light beam, a toroidal lens surrounding said aperture, a second parabolic reflector concentric with said first parabolic reflector but exterior of the outer periphery of said toroidal lens, a third parabolic reflector about said light source to direct a portion of said light through said toroidal lens between said first and second parabolic reflectors to form a corona-like light beam about said first mentioned beam, a color filter between said toroidal lens and said light source said color filter having a plurality of colors thereon, a shut-

ter for shielding all but a selected one of said colors, and solenoid means for rotating said color filter.

9. In a device for projecting a catadioptric signal light in the form of a corona-beam, a source of light, a parabolic reflector coaxial with said source of light having a centrally disposed opening, an axial lens in said opening directing light rays towards said parabolic reflector to form a light beam, a toroidal lens surrounding said aperture, a second parabolic reflector concentric with said first parabolic reflector but exterior of the outer periphery of said toroidal lens, a third parabolic reflector about said light source to direct a portion of said light through said toroidal lens between said first and second parabolic reflectors to form a corona-like light beam about said first mentioned beam, and a diffusion preventing lens between the outer peripheral edges of said first and second parabolic reflectors.

10. In a device for projecting a catadioptric signal light in the form of a corona-beam, a source of light, a parabolic reflector coaxial with said source of light having a centrally disposed opening, an axial lens in said opening directing light rays towards said parabolic reflector to form a light beam, a toroidal lens surrounding said aperture, a second parabolic reflector concentric with said first parabolic reflector but exterior of the outer periphery of said toroidal lens, a third parabolic reflector about said light source to direct a portion of said light through said toroidal lens between said first and second parabolic reflectors to form a corona-like light beam about said first mentioned beam, and a diffusion preventing lens between the outer peripheral edges of said first and second parabolic reflectors, said lens being formed of a plurality of transparent colorless strips and a plurality of transparent colorless spacers to form a concentric ring.

11. In a device for projecting a catadioptric signal light in the form of a corona-beam, a source of light, a parabolic reflector coaxial with said source of light having a centrally disposed opening, an axial lens in said opening directing light rays towards said parabolic reflector to form a light beam, a toroidal lens surrounding said aperture, a second parabolic reflector concentric with said first parabolic reflector but exterior of the outer periphery of said toroidal lens, a third parabolic reflector about said light source to direct a portion of said light through said toroidal lens between said first and second parabolic reflectors to form a corona-like light beam about said first mentioned beam, and a diffusion preventing lens between the outer peripheral edges of said first and second parabolic reflectors, said lens being formed of a plurality of transparent colorless strips and a plurality of transparent colorless spacers to form a concentric ring, the parallel surfaces of said strips being dulled to prevent cross reflection.

12. In a device for projecting a catadioptric signal light in the form of a corona-beam, a source of light, a parabolic reflector coaxial with said source of light having a centrally disposed opening, an axial lens in said opening directing light rays towards said parabolic reflector to form a light beam, a toroidal lens surrounding said aperture, a second parabolic reflector concentric with said first parabolic reflector but exterior of the outer periphery of said toroidal lens, a third parabolic reflector about said light source to direct a portion of said light through said toroidal lens between said first and second parabolic reflectors to form a corona-like light beam about said first mentioned beam, said toroidal lens being concavo-convex in cross section and having its concave surface provided with a plurality of radially disposed prismoidal irregularities to increase the light absorbing surface, a color filter between said toroidal lens and said light source, said color filter having a plurality of colors thereon, a shutter for shielding all but a selected one of said colors, solenoid means for rotating said color filter, and a diffusion preventing lens between the outer peripheral edges of said first and second parabolic reflectors, said lens being formed of a plurality of transparent colorless strips and a plurality of transparent colorless spacers to form a concentric ring, the parallel surfaces of said strips being dulled to prevent cross reflection.

No references cited.