April 9, 1968 C. C. SANSOM 3,377,593

ANTENNA BEAM DIRECTION INDICATOR

Filed June 7, 1967

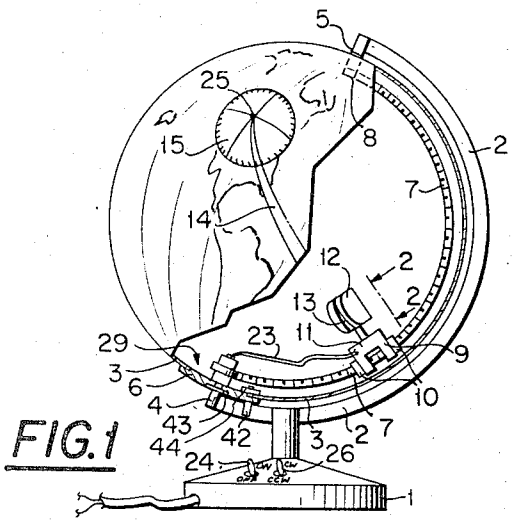

FIG. 1

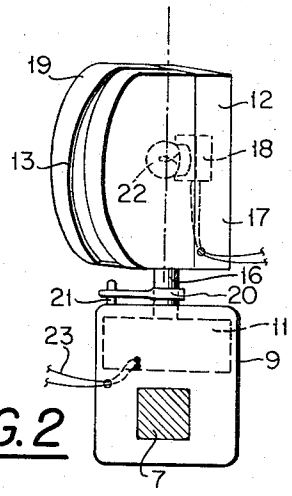

FIG. 2

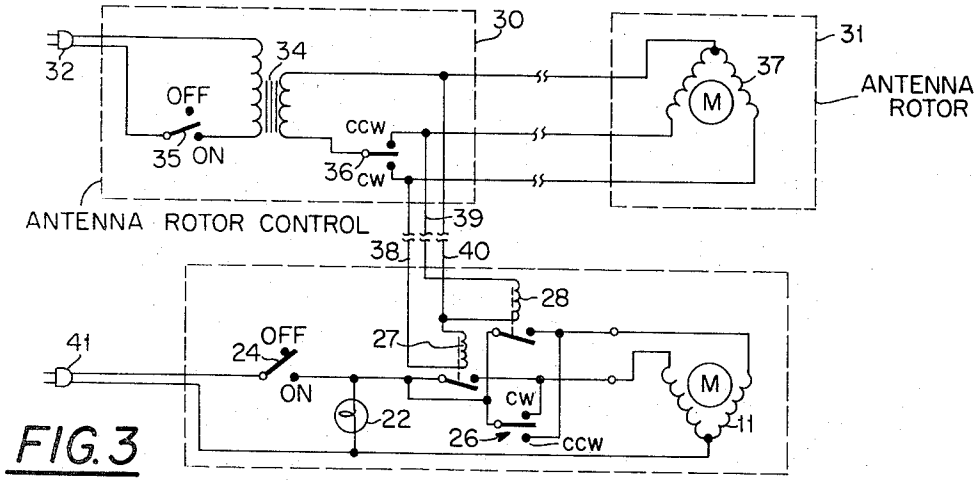

FIG. 3

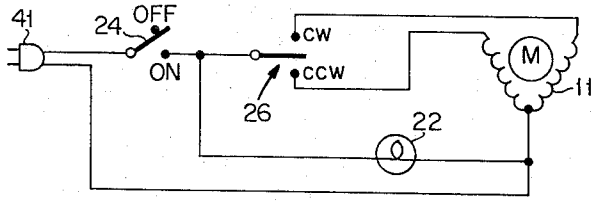

FIG. 4

INVENTOR

CLARENCE C. SANSOM

BY William M. McMillen

AGENT

United States Patent Office

3,377,593

Patented Apr. 9, 1968

3,377,593

ANTENNA BEAM DIRECTION INDICATOR

Clarence C. Sansom, 18961 Lynbrook Court, Saratoga, Calif. 95070

Filed June 7, 1967, Ser. No. 644,304
13 Claims. (Cl. 343—115)

ABSTRACT OF THE DISCLOSURE

A shaped light beam impinging on the interior of a translucent globe provides means for indicating to a radio station operator the great circle path of the center of the radiation pattern of the directional transmitting and receiving antenna as well as the optimum positioning for the antenna to facilitate radio contact with any geographical area on the surface of the earth.

Background of the invention

Directional antennas are in widespread use in the transmission and reception of radio signals. These antennas are constructed to have a greater gain in one direction than in other directions and are, therefore, designed to rotate and be controlled by the station operator. The radiation pattern of these antennas follows a great circle path about the surface of the earth. Therefore, to properly orient an antenna, it is necessary to determine the azimuth of the great circle passing through the transmitting station and the station to be contacted. Planar great circle charts are available for making such determinations for a small number of geographical locations, i.e., San Francisco, Calif.; Chicago, Ill.; and New York, N.Y. in the continental United States. In any other locality, the operator is forced to estimate the correct azimuth setting.

Summary of the invention

According to the invention, an improved antenna beam direction indicator comprises a hollow globe of translucent material imprinted with a representation of the earth's surface, a light source, a means projecting a narrow triangular-shaped light beam representing the front lobe of a directional radio antenna on the interior of the globe, a motor drive and controls for rotating the light beam about a point representing the radio station location, and a compass rose affixed to the globe exterior and centered on the aforesaid point.

To determine the proper azimuth setting for the directional antenna for establishing radio contact with a radio station located at some remote location, the triangular light beam is caused to rotate within the globe until the beam illuminates the remote location. The azimuth is then read from the compass rose.

Further, the invention provides an improved radio directional antenna positioning system when connected to a conventional antenna rotor. The indicator drive motor is caused to rotate in approximate synchronism with the antenna drive motor and indicates at all times the antenna direction.

Brief description of the drawings

FIGURE 1 is a front elevation of the antenna beam direction indicator, certain points being shown in section.

FIGURE 2 is a section taken on line 2—2 of FIGURE 1.

FIGURE 3 is a wiring schematic of the radio antenna positioning system.

FIGURE 4 is a wiring schematic of the invention used as a radio antenna position indicator.

Description of preferred embodiment

FIGURE 1 shows the structure of the invention contained in a modified terrestial globe of the conventional

illuminated variety. The conventional globe includes a base 1 supporting a yoke 2, which rotatably supports transparent or a translucent globe 3 on pivot pins 4 and 5. A large opening 29 is provided in the conventional illuminated globe for a removable lamp mounting which the inventor has replaced by a plate 6. Affixed to the plate 6 is a stop pin 42 which limits the rotation of the globe 3 to approximately 360° by striking the yoke 2. The interior end of the pin 42 is threaded to engage a clamp 44 and secure the plate 6 to the globe 3. A semicircular shaped sector bar 7, made from square bar stock and threaded, is mounted intraglobular at the upper globe pivot on the pin 5 and at the lower globe pivot on the pin 4 passing through the plate 6 and secured in position by a nut 43. A lamp carriage 9 is adjustably mounted on the threaded support bar 7 and positioned by two nuts 10. A motor 11 is mounted on the carriage 9 and rotates the opaque lamp housing 12 containing an isosceles triangular slit or aperture 13 and a lamp 22. Light through the slit 13 impinging on the interior of the globe illuminates a pattern 14 representing the antenna beam. An azimuth circle 15 is affixed on the globe exterior with the center situated on the geographical location 25 of the antenna.

In FIGURE 2, greater detail of the lamp carriage is shown. The motor 11 is a reversible AC motor with gear box and slip clutch. The output shaft 16 is geared to approximately the same rotational speed as the antenna rotor. The lamp housing 12 is attached to the motor shaft 16 and contains lamp box 17, lamp holder 18 and lamp box cover 19. The lamp holder 18 supports the lamp 22 with the filament in alignment with the axis of the shaft 16. The lamp housing 12 is positioned with the apex of slit 13 in alignment with the axis of the shaft 16. The lamp housing stop arm 20 and the stop pin 21 limit the lamp housing rotation to approximately 360°. The electrical cable 23 is a four conductor cable to the lamp 22 and the motor 11.

FIGURE 3 shows the indicator unit connected to a conventional antenna rotor 31 and control 30 to form an antenna direction indicating system. Electricity supplied when the switch 35 is in the ON position is stepped down through a transformer 34. The lower voltage is used to drive the reversible motor 37 in a clockwise or counterclockwise direction through the SPDT switch 36. Wires 38, 39 and 40 connect relays 27 and 28 in the indicator to the rotor control. The indicator is provided with electricity via the plug 41. A switch 24 turns on the lamp bulb 22 illuminating the pattern 14 on the globe. The switch 26 may be used to operate motor 11 to position the pattern 14 in agreement with the starting antenna position. Thereafter, operation of the switch 36 in the rotor control will cause rotation of the antenna, energize the appropriate relay 27 or 28, causing the motor 11 to rotate in synchronism with the antenna. These relays 27, 28 and the switches 24, 26 may be mounted in the base 1 or in a separate enclosure.

The embodiment chosen for illustration is designed to utilize a conventional antenna control without modification and obtain synchronism within acceptable limits. It is obvious that the controls for the indicator may be combined with the rotor controls by modification without departing from the spirit of the invention. Other means of synchronization including closed loop control, synchronous motors, stepping motors, and chopper drive of motor 11, are considered to be within the scope of this invention.

FIGURE 4 is a diagram for wiring the control switches to utilize the invention as a separate radio antenna position indicator of azimuth finder. The electrical plug 41 provides power to the indicator through the ON position of the switch 24 thereby lighting lamp 22. An SPDT

switch 26 connects power to the motor 11 for rotation of the light beam in the clockwise or counterclockwise direction.

The indicator is prepared for use at a particular geographical location by inserting the support bar 7, with the lamp carriage 9 attached, into the dismounted globe 3 and positioned with the hole 8 on pin 5. The support bar 7 is rotated and the carriage 9 adjusted to a position where the apex of the light pattern 14 centers the location 25. Thus, the location 25 on the surface of the globe, the apex of the triangular slit in the opaque light housing 12, the filament of the lamp 22 and the center of the motor shaft 16 are all on a diametral line. Therefore, the triangular light beam will appear to emanate from the antenna position 25 and to rotate about this position.

Stop arm 20 is adjusted to stop the lamp housing at North or some other convenient position. Cable 23 is inserted through pin 4. Plate 6 is placed over pin 4 and into opening 29 in the globe. Nut 43 is threaded onto pin 4 and tightened. Stop pin 42 is tightened, clamping plate 6 to globe 3. Pin 5 is removed, the globe placed in yoke 2 and pin 5 reinserted. Cable 23 is connected to the controls as shown in FIGURE 3 or FIGURE 4.

The invention claimed is:

1. A radio antenna positioning system including antenna rotor and control means wherein the improvement comprises:
a hollow terrestial globe of translucent material,
light pattern projecting means mounted internally of said hollow globe,
means for rotating said projecting means,
means for controlling said rotating means in synchronism with said antenna rotor.

2. A radio antenna positioning system as in claim 1, said light pattern projecting means comprising:
a lamp,
an opaque lamp housing encompassing said lamp and triangular aperture in said lamp housing.

3. A radio antenna positioning system as in claim 2, the filament of said lamp and the apex of said triangular aperture being in alignment with the axis of said rotating means.

4. A radio antenna positioning system as in claim 1, said rotating means comprising a reversible electrical motor.

5. A radio antenna positioning system as in claim 1, said controlling means including switching means operated by the application of a control voltage to the said antenna rotor.

6. A radio antenna positioning system as in claim 5, said switching means including relays.

7. A radio antenna position indicator comprising:
a hollow globe,
a lamp housing arranged internally of said globe and having a light transmitting triangular aperture therein,

a lamp located in said lamp housing behind said aperture,
said lamp housing being rotatable about a line passing through an apex of said triangular aperture, and
said lamp housing being located within said globe with said line passing through a selectable predetermined point on said globe.

8. A radio antenna position indicator as in claim 7, said hollow globe being of translucent material,
a sector bar arranged internally of said globe and pivotable about an axis thereof,
said lamp housing slidably arranged on said sector bar.

9. A radio antenna position indicator as in claim 8, said light transmitting triangular aperture being in the form of an isosceles triangle having the acute apex thereof in a diametral line through said globe,
said lamp housing also being arranged for rotation about said diametral line.

10. A radio antenna position indicator as in claim 9, said globe being rotatably mounted on a base.

11. A radio antenna position indicator as in claim 10, having electrical switching means controlling said lamp and said motor.

12. A radio antenna position indicator comprising:
a base,
a yoke supported on said base,
a hollow globe rotatably mounted on an axis of said globe supported by the extremities of said yoke,
an azimuth circle affixed exterior of said globe,
a semicircular sector bar adjustably mounted internally of said globe,
a carriage adjustably mounted on said bar,
a reversible electric motor affixed to said carriage,
said motor having a shaft,
an opaque lamp housing attached to said shaft,
a lamp mounted internally of said housing,
said lamp having a filament in alignment with the axis of said motor shaft,
a semicircular surface on said lamp housing,
a triangular opening in said semicircular surface with the apex aligned with the axis of said motor shaft,
first switch means controlling said lamp, and
second switch means controlling said motor.

13. A radio antenna position indicator as in claim 12, said hollow globe being of translucent material.

References Cited

UNITED STATES PATENTS

1,849,927	3/1932	Howe	343—115
3,003,257	10/1961	Madden	343—112 X
3,096,593	7/1963	Visser	35—46

RICHARD A. FARLEY, *Primary Examiner.*

R. E. BERGER, *Assistant Examiner.*