

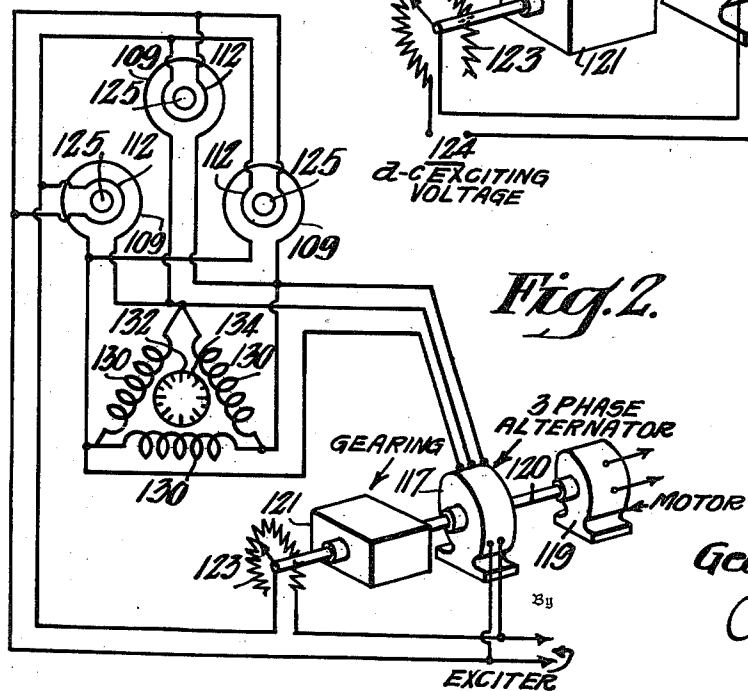
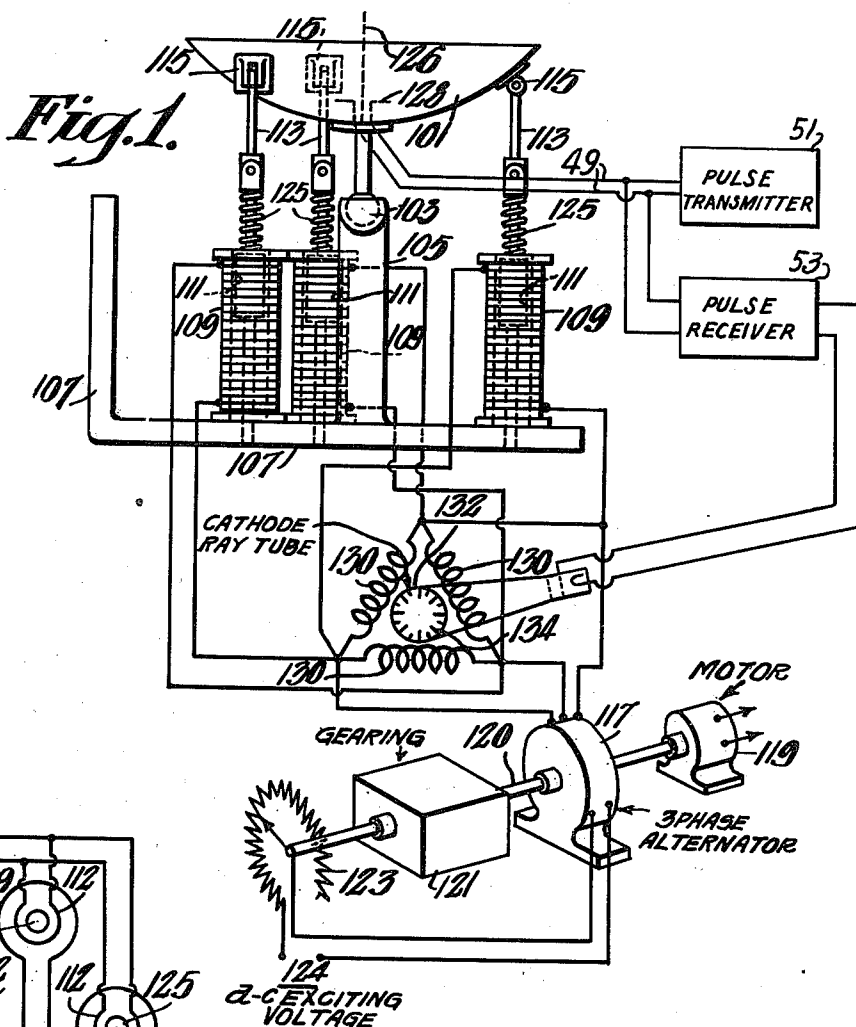
May 6, 1947.

G. W. LECK

2,419,999

ORIENTING MECHANISM FOR PULSE ECHO SYSTEMS

Original Filed June 14, 1941



Inventor
George W. Leck
CD Puska
 Attorney

UNITED STATES PATENT OFFICE

2,419,999

ORIENTING MECHANISM FOR PULSE ECHO SYSTEMS

George W. Leck, Princeton Junction, N. J., assignor to Radio Corporation of America, a corporation of Delaware

Original application June 14, 1941, Serial No. 398,057. Divided and this application July 27, 1942, Serial No. 452,392

4 Claims. (Cl. 250-1.72)

1

This application is a division of my copending application Serial No. 398,057, filed June 14, 1941, entitled "Orienting mechanisms for pulse echo systems."

This invention relates to scanning devices and particularly to improvements in devices for varying the direction of a beam of energy from a pulse echo system and for directing in synchronism therewith the scanning beam of a cathode ray indicator.

Pulse echo systems are used to detect objects and to indicate the direction and distance of the object. In such systems a directive antenna is generally used for the pulse transmission and a non-directive antenna may serve for reception or vice versa, or directive antennas may be used for both transmission and reception.

While separate antennas may be used, the instant invention is described by referring to a single directive antenna which may be used for both transmission and reception. Such an antenna system is described in the copending application Serial No. 184,354, filed January 11, 1938, by Wolff and Hershberger for Signaling system.

One of the objects of the instant invention is to provide improved means for scanning a region by a beam of pulse energy. Another object is to provide improved means for moving a beam of pulse energy and a cathode ray beam in synchronism. Another object is to provide means for directing a beam of pulses throughout a conical region and for synchronously directing a cathode ray beam in a helical pattern.

The invention will be described by referring to the accompanying drawing, of which Fig. 1 is a schematic diagram of one embodiment providing an electro-mechanical scanning, and Fig. 2 is a circuit diagram of a modification of Fig. 1.

Similar reference characters are applied to similar elements throughout the drawing.

In my co-pending application, of which this application is a division, there is described a mechanical system whereby a directive antenna is caused to traverse a conical region. The connections to the antenna from the pulse transmitting and receiving apparatus may be made as described in the copending application of Wolff and Hershberger mentioned heretofore. Fig. 1 provides an electro-mechanical drive for actuating the scanning mechanism of the directional antenna system. The directive antenna system 101 is mounted in a ball and socket or other universal joint 103 which is supported by a post 105 extending from the base member 107. Three solenoid

2

type motors 109 are preferably mounted at 120° intervals. The motors each include a polarized magnetic armature or movable member 111.

The movable members 111 are connected by suitable links 113 to bearings 115 on the outer portion of the antenna reflector or other antenna member. The field coils of the motors are energized by a three phase alternator 117, which is driven by a motor 119. The shaft 120 of the alternator, or the driving motor 119, is connected through suitable gearing 121 to a rheostat 123 in the generator exciter circuit 124. The generator output is thus varied according to any desired pattern so that the three phase output voltage follows, for example, a sawtooth pattern. The motors 109 are successively energized by the three phase currents so that the antenna system undergoes a circular rocking movement of an amplitude varying according to the generator output. The resulting antenna beam deflections follow a spiral pattern. That is, as the applied voltages increase, because of the sawtooth wave form of the generator exciting voltage, the motors 109 produce larger and larger movements and since the movements are preferably at 120° intervals in space and in time, the axis 126 of the antenna 128 traces a helical pattern and the beam of pulses from the antenna scan a conical or hemispherical region. The antenna system is connected by a transmission line 49 to a pulse transmitter 51 and to a pulse receiver 53. The output of the pulse receiver is applied to the control electrodes of the cathode ray tube 132 so that received signals may brighten or dim the cathode ray trace. The three phase currents may be applied to a three coil deflecting system 130 arranged around the cathode ray indicator 132 to rotate the cathode ray in synchronism with the rotations of the antenna, and the sawtooth voltages may be applied to produce radial movements. The cathode ray will trace a helical pattern on the fluorescent screen of the indicator, which may be provided with a suitable calibrated scale 134 to indicate the position of the reflecting object with respect to predetermined coordinates.

Instead of using polarized magnetic armatures in the solenoid motors 109 and applying sawtooth exciting voltages to the three phase generator, the movable motor members 111 may be consist of a second solenoid 112 to which the sawtooth voltages from the potentiometer 123 may be applied. Under these circumstances, the three phase currents are applied, as shown in Fig. 2 to the fixed windings and the direct currents are

applied to the movable windings, or vice versa, so that the antennas will be deflected by variable amounts so that its axis follows a helical path as before. In either arrangement the connecting rods may be provided with biasing springs 125 to maintain the zero or central position of the antenna, which has been omitted to avoid complicating the diagram.

Thus the invention has been described as an improved means for scanning a region by means of a beam of pulses. A cathode ray is moved in synchronism with the scanning beam. Received pulse echoes are applied to modulate or vary the cathode ray so that an object will be indicated according to predetermined coordinates on the cathode ray tube screen. In this manner the sky from the horizon upwardly may be continuously scanned and reflections from an aircraft or surface vessel coming over the horizon will indicate the azimuth and elevation of the craft.

I claim as my invention:

1. A pulse echo scanning device including, in combination, a directive antenna for radiating a beam of pulses and for receiving echo pulses from objects in said beam, a universal joint for supporting said antenna, three solenoid type motors each including a field winding and a movable member, means connecting said movable members to said antenna so that upon energizing said motors from a three phase source said antenna will follow a circular rocking movement, a radio receiver connected to said antenna and responsive to said echo pulses, a cathode ray indicator connected to said receiver for indicating said echo pulses, and means for deflecting said cathode ray in synchronism with said circular rocking movement.

2. A device according to claim 1 including means for varying the amount of energy applied to said motors so that the amplitude of said circular rocking movement is correspondingly varied.

3. A radio beam scanning device including an antenna system for establishing a sharply defined beam, a universal mounting for supporting said antenna system, three solenoid type motors each including a field winding and a movable member, means connecting said movable members to said antenna system, and means for energizing said motors from a three phase source so that said antenna will follow a circular rocking movement.

4. A device according to claim 3 including means for varying the amplitude of said circular rocking movement.

GEORGE W. LECK.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,231,929	Lyman	Feb. 18, 1941
1,654,067	Anderson	Dec. 27, 1927
2,003,661	Bassett et al.	June 4, 1935
503,602	Hunter	Aug. 22, 1893
2,151,549	Becker	Mar. 21, 1939
2,257,320	Williams	Sept. 30, 1941

FOREIGN PATENTS

Number	Country	Date
487,861	German	Oct. 2, 1928