

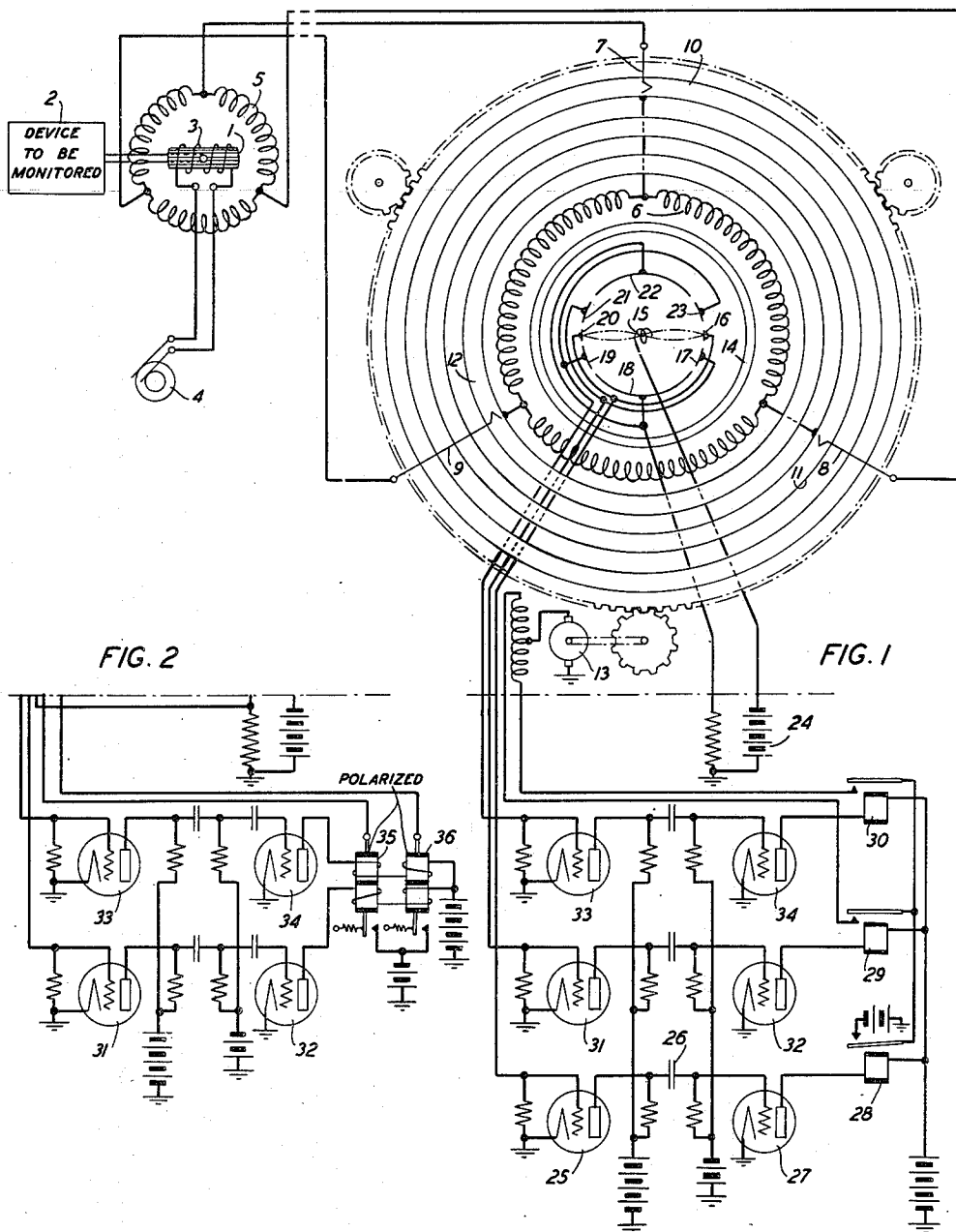
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SELF-SYNCHRONIZING DEVICE

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SELF-SYNCHRONIZING DEVICE

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This invention relates to telemetric devices and particularly to remote control indicating and controlling means.

The object of the invention is to provide a dead beat and inertialess element for indicating an angular movement which has taken place at a remote point for controlling a comparatively heavy duty corresponding and following movement by a local power source.

In accordance with this invention, the usual rotor of the indicating or controlling device is replaced by a radial beam tube which is made stationary. The usual stator is then mounted so as to be rotatable. When the controlling element at the distant point is moved, then the beam of the tube moves accordingly. When the beam moves away from a normal position, it controls means which causes a corresponding movement of the said stator which continues until the beam is again brought back to its normal position.

A feature of the invention is a radial beam tube having a centrally located and sharply defined cathode and a plurality of various sized anodes located in a circle about said cathode defined by a cross-section of said tube, the main structure of said tube being substantially cylindrical.

Another feature of the invention is a cathode ray beam acting as the remotely controlled movable member of a telemetric device, said cathode ray beam acting as a pilot to direct the following movement of a comparatively massive member under local power.

Another feature of the invention is a telemetric device in which the distant remotely controlled device comprises a rotatable cathode ray beam controlling a relay system, in turn controlling a motor and which in turn controls the said cathode ray beam.

Other features will appear hereinafter.

The drawing consists of a single sheet having two figures, as follows:

Fig. 1 is a diagram, partly circuit diagram and partly schematic, illustrating one embodiment of the invention. At the upper left-hand corner is a self-synchronizing transmitter. To the right of this is a schematic cross-sectional view of a movable three phase field structure within which is stationary radial beam tube. In the lower part of this figure, below the broken line, is a circuit diagram showing the controlling circuit arrangement.

Fig. 2 is an alternative controlling circuit arrangement which may be substituted for the equivalent part of Fig. 1.

The self-synchronizing device consists of an armature 1 adapted to be rotated to any desired position by a device to be monitored indicated by the rectangle 2. The armature 1 is energized by a coil 3 from a source of single phase alternating current 4, thus setting up alternating currents in the three phase stator coils 5 which may be transmitted to the stator coils 6 of the receiver and there set up a field similar to that of the armature 1. The "stator" of the receiver is actually rotatable, and the three phase connection thereto is made by brushes 7, 8 and 9 contacting with slip rings 10, 11 and 12 respectively. This device may be rotated in either direction by motor 13.

The circle 14 indicates the envelope of a radial beam tube, having a cathode 15 and a plurality of anodes 17 to 23 inclusive, concentrically arranged about the cathode. The beam is indicated by the broken line outline between anodes 16 and 20 and the cathode 15, and it will be noted that it extends in the same general direction as the armature 1 when the stator of the receiver is rotated as shown so that the two three phase fields are similarly placed.

For a full understanding of the theory and operation of a radial beam tube, reference may be had to Patent 2,217,774 granted October 15, 1940, to A. M. Skellett.

It will be noted that the anodes 16 and 20 are narrow, that anodes 17, 19, 21 and 23 are of greater dimensions, and that anodes 18 and 22 are of still greater dimensions. The circuit arrangement in the lower part of the figure will always adjust the field 6 to cause the beam to return to the position shown, that is, extending between the cathode 15 and the narrow centering anodes 16 and 20.

In this position, the pulsating negative potential derived from the alternating current source 4 which affects the field winding 6 in combination with the battery 24 is communicated over the beam through anodes 16 and 20 to tube 25 which is thereby periodically (at double the frequency of the source 4) rendered inactive or non-conducting. The consequent rise and fall of positive potential of the anode of this tube is translated by condenser 26 into a pulsating current at the output of tube 27 which results in the energization of relay 28. Relay 28 energized opens the battery supply which may be connected by the armatures of relays 29 and 30 to the motor 13.

Suppose the device 2 causes the armature 1 to rotate slightly in a clockwise direction. Immedi-

ately this shift results in a similar clockwise shift of the beam which may now extend from the cathode 15 to the anodes 17 and 21. Relay 28 is released and now through like action of tubes 31 and 32, the relay 29 is operated. A circuit is now established from battery armature of relay 28, armature and front contact of relay 29, upper portion of the field winding and the armature of motor 13 to ground. Motor 13 operates to move the field winding 6 in a counter-clockwise direction until the beam is brought back to anodes 16 and 20 as shown.

Similarly, if the device 2 had rotated the armature 1 in a counter-clockwise direction, the anodes 19 and 23 would have caused the operation of tubes 33 and 34 and the energization of relay 30 would have caused the motor 13 to move the field 6 in a clockwise direction.

If movement of the armature 1 is anticipated to be faster than the motor 13 may shift the field 6 and the follow-up gear controlled thereby, then the anodes to either side of the narrow centering anodes may be made wider.

If very fast operation is anticipated, the large anodes 18 and 22 may be divided and similarly connected to other tube and relay circuits which will place a higher potential battery on motor 13 to cause it to operate at high speeds.

The cathode 15 may be in filamentary form so as to make the beam as narrow as possible. Only half the anodes, covering 180 degrees about the cathode, may be employed to achieve the same result.

In the arrangement where Fig. 2 is substituted for the lower part of Fig. 1, tubes corresponding to tubes 25 and 27 and a relay corresponding to relay 28 are omitted. The neutral relays 29 and 30 are replaced by two polarized relays 35 and 36, respectively, each having a winding from the anode of both tubes 32 and 34. Since these windings are differentially arranged and the relays are sufficiently biased (mechanically as indicated) positive and fast operation will be had and the motor 13 will be operated as before. Thus when tube 32 is rendered active relay 35 will be operated, since the plate current from tube 32 will move the armature of relay 35 toward the right and tend to move the armature of relay 36 toward the left in the direction in which it is biased. When tube 34 is rendered active then the plate current from this tube will tend to move the armature of relay 35 toward the left in the direction in which it is biased and will move the armature of relay 36 toward the right and thus operate relay 36. Relays 35 and 36 perform the same functions as relays 29 and 30, respectively.

What is claimed is:

1. A telemetric device comprising means for setting up a magnetic field in any given direction, remotely controlled means for determining the direction of said field, an electronic tube in which a radial beam may be pointed in any direction from a centrally disposed axis controlled by said field, and a circuit arrangement controlled by said tube for further controlling said field.

2. A telemetric device comprising means for setting up a magnetic field in any given direction, remotely controlled means for determining the direction of said field, a cathode ray beam device controlled by said field, and a circuit arrangement controlled by said cathode ray beam device for moving said magnetic field means.

3. A telemetric device comprising means for setting up a magnetic field in any given direction, remotely controlled means for determining the direction of said field, a motor for moving said magnetic field, means for changing the direction of said field, a cathode ray beam controlled by said field and means controlled by said cathode ray beam for controlling said motor.

4. A telemetric device comprising means for setting up a magnetic field in any given direction, remotely controlled means for determining the direction of said field, a motor for moving said magnetic field, means for changing the direction of said field, a cathode ray beam device controlled by said field, said last device having a neutral position for the said beam, and means controlled by said device in any other than said neutral position of said beam for operating said motor until said beam is returned to its said neutral position.

5. A telemetric device comprising means for setting up a magnetic field in any given direction, remotely controlled means for determining the direction of said field, motor means for moving said magnetic field means for further changing the direction of said field, a cathode ray beam device controlled by said field, said last device comprising a centrally located cathode surrounded by a cylindrical array of anodes, one pair of said anodes located 180 degrees apart constituting a neutral beam position, means controlled by said beam when directed to other than said neutral position anodes for energizing said motor means.

6. A telemetric device comprising means for setting up a magnetic field in any given direction, remotely controlled means for determining the direction of said field about a given axis, motor means for rotating said magnetic field means about said axis to further change the direction of said field, a cathode ray beam device held stationary within said magnetic field means comprising a centrally located cathode positioned on the said axis surrounded by a cylindrical array of anodes, one pair of said anodes located 180 degrees apart constituting a neutral beam position and circuit means connected to others of said anodes for controlling the energization of said motor means.

7. A telemetric device comprising means for setting up a magnetic field in any given direction, remotely controlled means for determining the direction of said field about a given axis, motor means for rotating said magnetic field means about said axis to further change the direction of said field, a cathode ray beam device held stationary within said magnetic field means comprising a centrally located cathode positioned on the said axis surrounded by a cylindrical array of anodes, one pair of said anodes located 180 degrees apart constituting a neutral beam position, said neutral beam position anodes being comparatively narrow, the remaining anodes being graduated in dimensions and becoming progressively wider in proportion to their positions in relation to said neutral beam position anodes, others of said anodes contiguous to said neutral beam anodes being connected to means for energizing said motor means.

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