

Sept. 9, 1958

D. K. HAUSEN

2,851,620

STEP-BY-STEP MOTOR FOR POSITIONING TELEVISION ANTENNAE

Filed Aug. 4, 1955

FIG-1

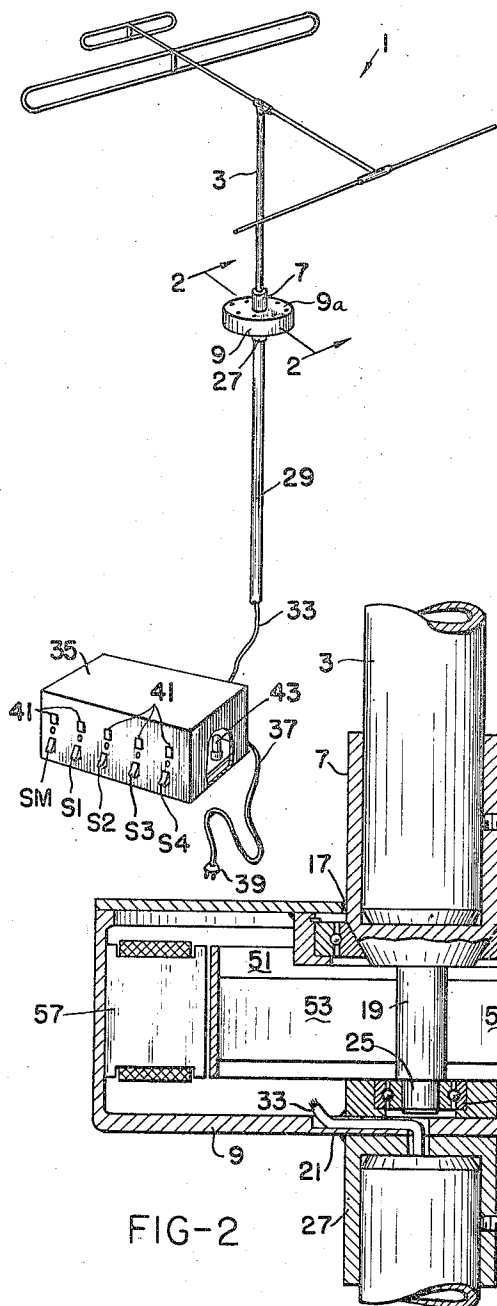


FIG-2

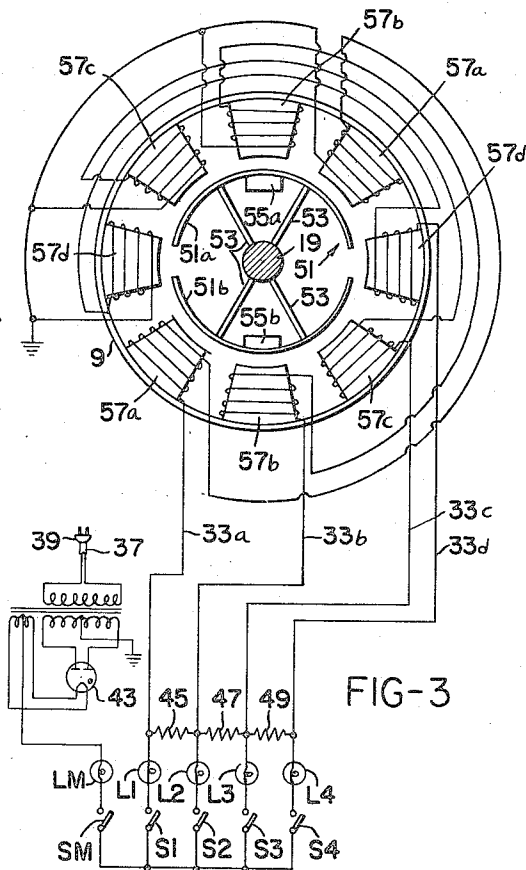


FIG-3

INVENTOR.

DIETRICH K. HAUSEN
BY *Toulmin & Toulmin*
ATTORNEYS

1

2,851,620

STEP-BY-STEP MOTOR FOR POSITIONING TELEVISION ANTENNAE

Dietrich K. Hausen, Dayton, Ohio, assignor to The Commonwealth Engineering Company of Ohio, Dayton, Ohio, a corporation of Ohio

Application August 4, 1955, Serial No. 526,365

3 Claims. (Cl. 310—49)

This invention relates to improvements in motor units intended primarily for actuating and orienting a directional device such as a directional receiving antenna wherein the antenna is given a predetermined movement to align it appropriately with a transmitting station.

The principal object of the invention is to provide a simple and efficient device which may be constructed and operated at small cost, and which will operate without objectionable noise.

More particularly the invention comprises a rotatable mechanism including a magnetizable body adapted to be moved by magnetic field flux such that the magnetizable body assumes a predetermined position in response to energization. Most suitably the magnetizable body is mechanically associated in fixed relation with a device, such as an antenna, which is to be oriented.

The invention will be more fully understood by reference to the following detailed description and accompanying drawings wherein:

Figure 1 is a perspective view schematically illustrating one embodiment of the invention as applied to a television antenna of directional characteristics;

Figure 2 is a sectional view taken on line 2—2 of Figure 1; and

Figure 3 is a view schematically illustrating the electrical connections for the embodiment of Figures 1 and 2.

In the drawings corresponding parts, insofar as practicable, are indicated by corresponding legends.

Referring first to Figure 1, the numeral 1 generally indicates an in-line antenna having directional characteristics. The antenna is supported securely on a vertically extending rod 3, the lower end of which is secured by set screw 5 in a sleeve 7 and is retained against rotation relative to the sleeve by the set screw (Figure 2).

Sleeve 7 is rotatably mounted (Figure 2) in steel housing 9 by bearing assembly 11 which is itself supported from the cover 9a of the housing by an integral inwardly depending circular flange portion 13. The cover 9a is suitably secured to the main housing 9 by screws as at 15. The interior of the housing is sealed from the atmosphere by a resilient rubber gasket 17, which is supported from the cover 9a in engagement with the sleeve 7.

Sleeve 7 at its lower end portion is suitably conically shaped for mounting in the bearing as shown in Figure 2 and a short shaft 19 depends therefrom and is supported thereby. If desired the sleeve 7 and shaft 19 may be integral.

A bearing block 21 is supported from the base 9b of the housing 9 inwardly, and bearing means 23 receive and rotatably support the lower, reduced end 25 of shaft 19.

A lower boss 27 of the housing 9 receives therein at the upper end thereof a protective conduit 29 which is retained against rotation with respect to the boss by set screw 31; conduit 29 may be supported in any suitable manner.

As shown in Figure 1 most clearly a cable 33 carrying a plurality of suitably insulated electrical conductors, 33a,

2

33b, 33c and 33d, to be described more particularly hereinafter, passes upwardly through the conduits 29 from casing 35.

The casing 35 constitutes a control box and is provided with a plurality of manually operable station selector switches indicated at SM, S1, S2, S3 and S4 and also shown in Figure 3. A cable 37 has one end thereof terminating at the control box and the other end is provided at 39 with the usual plug for connection to a source of power (not shown). The control box is also provided with a plurality of windows 41, one corresponding to each switch.

The lower portion of the schematic illustration of Figure 3 indicates the contents of the control box or casing 35. These include a rectifier 43; on-off indicating lamps LM, L1, L2, and L3; and resistors 45, 47, 49. The rectifier is provided to convert the usual 60 cycle alternating current to direct current and is suitably a full wave rectifier of the gas filled tube type, although other rectifiers may suitably be employed.

The on-off indicating lamps are utilized to indicate whether the switch of corresponding subscript is in the on or off position.

The resistors 45, 47, 49 are utilized to devide the current to the electrical conductors 33a, 33b, 33c and 33d in accordance with the position of switches S1, S2, S3 and S4. Suitably each of these resistors may have a value of 1 to 10 kilohms.

Referring now particularly to Figures 2 and 3 the shaft 19 has secured thereto for rotation therewith a collector-rotor 51; the rotor is split into two substantially semi-cylindrical portions 51a and 51b and spokes 53 extending from shaft 19 support the portions.

Each rotor portion 51a and 51b is provided respectively with a mass of block soft iron 55a and 55b. These masses are suitably of equal size and are large relatively to their supporting cylindrical portions 51a and 51b.

Disposed around the interior of the casing 9 in spaced relation with the rotor are four pairs of poles, the poles of each pair being oppositely disposed; the pairs are indicated at 57a, 57b, 57c and 57d. Each pole as seen in plan view tapers inwardly toward the axis of the housing as illustrated in Figure 3.

Each of the electrical conductors is wound about a pair of poles to provide a magnetic field across the housing 9, and across the rotor 51. Thus conductor 33a is wound about (Figure 3) the lower left hand pole (57a) and the upper right hand pole (58a) and terminates in a ground connection to complete an electrical circuit with the supply. Similarly conductors 33b, 33c and 33d are each associated with a pair of oppositely disposed poles indicated respectively at 57b, 57c and 57d and each conductor terminates in ground.

To rotate the antenna to a selected station direction, with power on the unit, it is merely necessary to close the switch SM and the proper station selector switch. Under such conditions magnetic fields will be created at each of the pairs of poles and the fields will vary in intensity, the stronger field being that associated with the conductor which contains the closed selector switch. Thus with power on, the rotor 51 and the blocks 55a, 55b would assume the position shown in Figure 3 if switches SM and S2 were closed. The blocks 55a, 55b line up with the stronger magnetic field and in attaining this alignment the antenna is carried by rotation of the sleeve 7 with the rotor 51 to provide the antenna in a desired direction.

Each pair of poles is initially associated with a given station direction and antenna direction and accordingly a desired station is readily selected.

To change from one station to another the selector

switch of the desired station is closed with all others (except SM) being in an open position. With the four pair of poles eight station directions are attainable since the rotor and the antenna each travel through a complete 360°. By way of illustration the position of blocks 55a, 55b may be altered 180° by successively closing switches S3, S4, S1 and S2 with each of the other selector switches being open; that is only one selector switch is closed at any one time.

It will be noted that current need only be drawn when energizing the rotor to position it. Thus the operating cost is low, the primary losses being due to the conversion of A. C. to D. C. The utilization to D. C. is desirable to avoid oscillation of the rotor and fading of the signal strength due to fringing.

The resistors 45, 47, 49 are in parallel with the main supply and the extent of the voltage drops across these resistors control the intensity of the fields and hence the differential strength between the fields. The fields with any given selector switch closed are of stepped intensity and the rotor will be successively energized by the stepped fields until the blocks align with the field of greatest intensity.

The blocks themselves because of their relatively large magnetizable mass move under the influence of the energized fields to alignment with an intersecting magnetic field of greater intensity even from a position 90° away. Further the relatively large mass tends to prevent overriding. The portions 51a and 51b may be of the same material as the blocks 55a and 55b but should be of a lesser mass; if desired a light iron coating which is magnetizable may be carried on any suitable base to serve as the portions 51a and 51b.

The power unit thus described is useful with other devices than antennae; for example, the direction and rotation of advertising signs may be similarly controlled. However the device is particularly adapted to antennae in which service the operation is generally intermittent and auxiliary apparatus such as timing mechanism is not required.

It will be understood that this invention is susceptible to modification in order to adopt it to different usages and conditions and accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

I claim:

1. In a motor unit, a magnetizable body member, an assembly for magnetizing said body member, the body member and assembly being mounted for relative rotation, a plurality of pole pieces on said assembly disposed in pairs, the pole pieces of each pair being in opposed relation on opposite sides of the body member, a coil on each pole piece, a conductor connecting the coils of each

pair of pole pieces in series, one end of each series connected pair of coils being connected to a common power terminal, a separate switch for each of said pairs of coils adapted to selectively connect the other end of each of said pairs to the opposite power terminal, and electrical resistors bridging said other ends, whereby selective closing of any switch connects all the pairs of coils in parallel across said terminals.

2. In combination, in an antenna motor unit, a rotor, a shaft supporting said rotor, means for supporting an antenna on said shaft, magnetizable bodies oppositely disposed on the rotor, and means for providing a plurality of magnetic fields of graduated intensity across the rotor, said means comprising a stator surrounding the rotor having inwardly disposed pole pieces extending substantially radially toward the rotor, the pole pieces being diametrically opposed in pairs, an electrical conductor connecting each pair of pole pieces in series, one end of each series connected pair of coils being connected to a common power terminal, a separate switch for each of said pairs of coils adapted to selectively connect the other end of each of said pairs to the opposite power terminal, and electrical resistors bridging said other ends, whereby selective closing of any switch connects all the pairs of coils in parallel across said terminals.

3. In apparatus for orienting an antenna having directional characteristics, means for rotatably mounting an antenna, said means including a shaft, a rotor on the shaft at a point remote from the antenna, said rotor having magnetizable masses, one disposed on each of the opposite ends of a diameter of the rotor, a stator surrounding the rotor, said stator having a plurality of wound pole pieces disposed in opposed relation at opposite ends of diameters of the stator, a plurality of conductors, each conductor including the windings of a pair of oppositely disposed pole pieces, one end of each conductor being connected to a common terminal, a selector switch in series with each conductor, means including a common conductor for connecting the selector switches to a source of power, and electrical resistors bridging the pole windings between the windings and the switches.

References Cited in the file of this patent

UNITED STATES PATENTS

608,246	Arlt	Aug. 2, 1898
1,058,545	Caldwell	Apr. 8, 1913
1,306,410	Dawson et al.	June 10, 1919
1,653,946	Clausen	Dec. 27, 1927
1,756,823	Harris	Apr. 29, 1930
2,286,406	Green et al.	June 16, 1942
2,424,843	Owsley	July 29, 1947
2,611,799	Ackerman	Sept. 23, 1952