Oct. 16, 1951 J. H. ANDRESEN, JR 2,571,810

ROTARY ELECTRICAL TRANSMITTER

Filed Jan. 12, 1950 2 SHEETS—SHEET 1

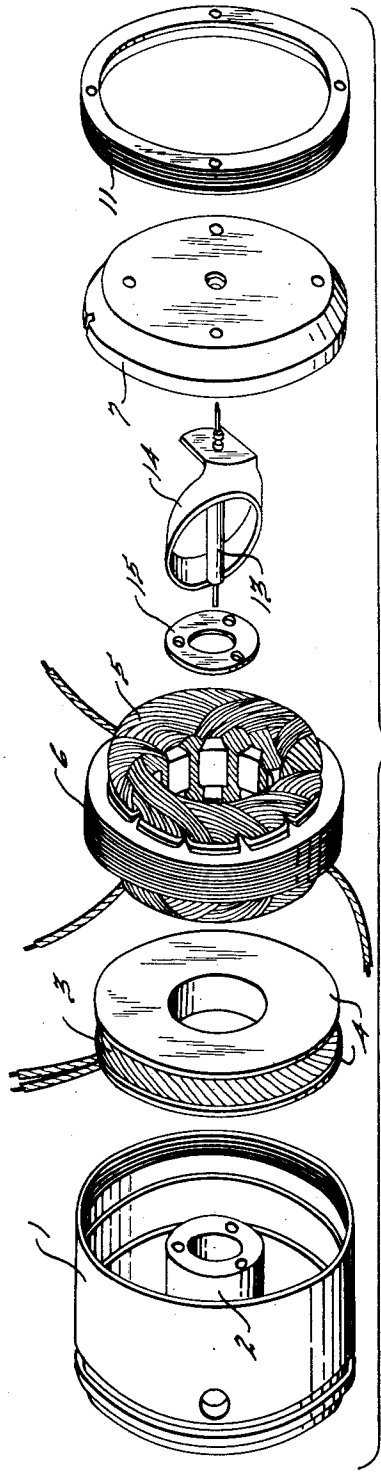


FIG. 1.

INVENTOR.
John H. Andresen, Jr.
BY Myron J. Seibold
ATTORNEY.

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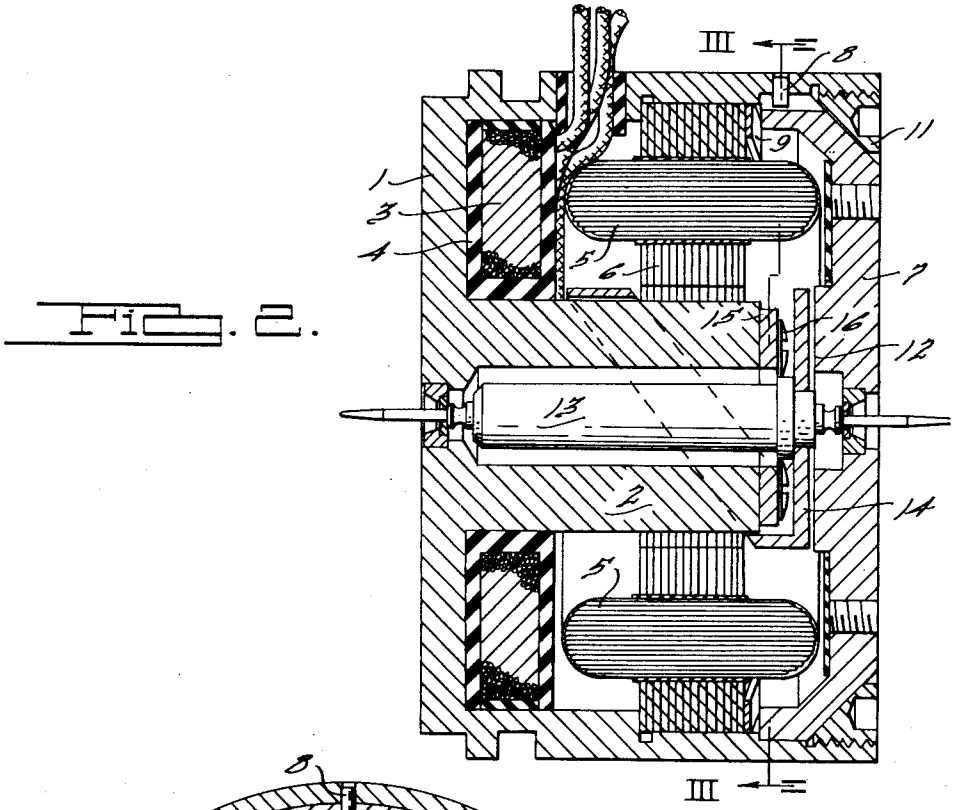


Fig. 2.

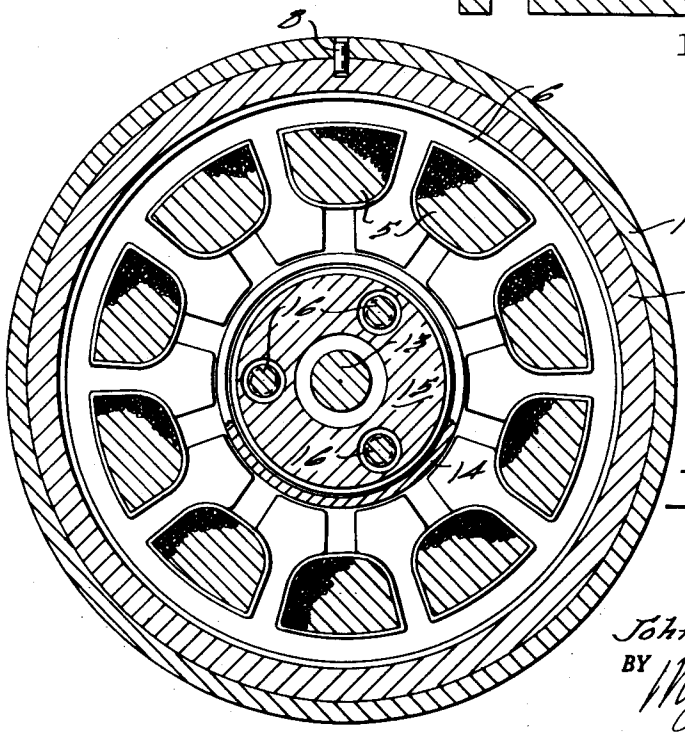


Fig. 3.

INVENTOR.
John H. Andresen, Jr.
BY Myron J. Seibold
ATTORNEY.

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ROTARY ELECTRICAL TRANSMITTER

John H. Andresen, Jr., Greenwood Lake, N. Y., assignor, by mesne assignments, to Kollsman Instrument Corporation, Elmhurst, N. Y., a corporation of New York

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5 Claims. (Cl. 171—252)

1

This invention relates to a device for the correction of irregularities in the flux paths of a synchro signal generator or receiver mechanism, and more particularly to a means for varying the effective air gap within a rotary device to encourage the proper flow of the flux within the device.

Errors in devices of this type are caused by mechanical eccentricity of the stationary rotor core and by dissymetries in the stator core and windings and their effect on the flux paths within the device. The object of the present invention is to provide an easily adjustable means whereby the effect of the mechanical irregularities upon the flux path may be compensated and effectively minimized.

A further object of this invention is to provide a means for directing the flux through the air gap of a rotary device to equalize the magnetic reluctance along all radial paths.

Another object of the present invention is to provide a compensating disc of magnetizable material within the flux path of a rotating field device which may be positioned to correct the flux path through the air gap in the device.

A further object of the present invention is to provide a means for improving the accuracy of a rotary position transmitting or receiving device by minimizing the null voltage by reducing the amount of the component of the transversely produced flux which flows axially within the device.

Further objects and features of the invention will be readily apparent to those skilled in the art from the specification and appended drawing illustrating certain preferred embodiments in which:

Figure 1 is an exploded, perspective view showing the components of the synchro device according to the present invention.

Figure 2 is a longitudinal sectional view of the device.

Figure 3 is a transversal sectional view along the line III—III of Figure 2.

The device in which the present invention is specifically illustrated consists of a cup-shaped outer casing 1 of magnetic material having a hollow central core 2. Within the outer casing 1 and surrounding the central core 2 is provided a stationary "rotor" (in effect) winding 3 suitably insulated from the casing 1 by insulating strips 4, and a stationary multiphase stator winding 5 wound on laminated pole pieces 6. A cover plate 7 keyed at 8 and a spring washer 9 are provided to secure the laminated pole pieces 6 with the stationary stator winding 5 in place within the

2

casing 1. A threaded annular ring 11 is provided to secure the cover plate 7 in place.

Within the hollow portion of the central core 2 and rotatably mounted in both the outer casing 1 and the cover plate 7 is disposed a shaft 13 carrying a skewed rotor 14. Surrounding the shaft and mounted on the end face of the central core 2 is a magnetizable compensator disc 15, which is of magnetizable material, secured by three adjustment screws 16.

When the stator winding 5 is energized, the magnetic flux produced should flow from stator pole to stator pole transversely only of the core 2. This flux will induce a voltage in the rotor 14 which will be determined by the angular position of the rotor. The current induced in the rotor 14, which is of electrically conductive material, will produce a component of flux longitudinally of the core 2 and about the casing which will link the winding 3 to induce a voltage therein. The voltage induced in winding 3 and the flux threading this winding should be produced solely by the current induced in the rotor 14. Due to mechanical irregularities in the flux path, all of the flux produced by stator winding 5 does not pass transversely of the core 2 but a proportion thereof will pass longitudinally of the core and will link the winding 3 to produce a voltage therein giving rise to an erroneous signal. The compensating disc 15 is provided to be adjusted universally transversely of the core 2 to minimize these irregularities and reduce the axial component of the stator flux.

The adjustment of the compensating disc 15 is as follows:

With the cover plate 7 and the movable rotor 14 removed, and with the stator windings 5 energized from a source of alternating voltage which thereby produces a flux rotating in the device and with the stationary "rotor" windings 3 connected to some form of indicating device, the screws 16 holding the compensating disc 15 are loosened and the disc is moved until by trial and error a position is found where the voltage induced in the stationary "rotor" winding 3 is a minimum. It is understood that with the device energized, as described, the voltage induced in the winding 3 will be due only to flux from the stator energization which flows axially through the core 2 and that when the disc 15 is adjusted to reduce the indication of the indicating device attached to the windings 3 to a minimum, it is thereby reducing the amount of flux from the stator winding 5 flowing axially within the central core 2. This correction both minimizes the residual or null

voltages in the device and increases the angular accuracy of the rotor position. The device will, of course, be reassembled after adjustment before use.

While the device herein has been referred to in the specification and appended claims as a synchro or a rotary electrical transmitter, it will be understood the invention is applicable generally to, and that these terms are to be construed to cover, control transformers, inductive pick-offs, receivers, signal generators, and similar devices.

While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto, as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

What is claimed is:

1. In a rotary electrical transmitter, a central cylindrical magnetic core, a multiphase magnetic stator surrounding said core and having pole faces adjacent thereto, a multiphase winding for energizing said stator to produce a magnetic flux extending from said pole faces and radially of said core, a skewed conducting rotor disposed between said pole faces and said core so as to link the flux therebetween, a single phase winding surrounding said core to be energized by the flux produced by the current induced in said rotor, and a magnetic wafer, adjustably mounted on said core, for minimizing irregularities in the flux paths between said pole faces and core so as to minimize the component of stator flux flowing longitudinally of the core.

2. In a rotary electrical transmitter, a central cylindrical magnetic core, a multiphase magnetic stator surrounding said core and having pole faces adjacent thereto, a multiphase winding for energizing said stator to produce a magnetic flux extending from said pole faces and radially of said core, a skewed conducting rotor disposed between said pole faces and said core so as to link the flux therebetween, a single phase winding surrounding said core to be energized by the flux produced by the current induced in said rotor, and a substantially flat magnetizable element which is adjustably mounted on said core to vary the magnetic reluctance of the flux path between said pole faces and core so as to minimize the component of stator flux flowing longitudinally of the core.

3. In a rotary electrical transmitter, a central cylindrical magnetic core, a multiphase magnetic stator surrounding said core and having pole faces adjacent thereto, a multiphase winding for

energizing said stator to produce a magnetic flux extending from said pole faces and radially of said core, a skewed conducting rotor disposed between said pole faces and said core so as to link the flux therebetween, a single phase winding surrounding said core to be energized by the flux produced by the current induced in said rotor, and magnetic means comprising a disc-shaped member, said disc-shaped member being mounted on said core and adjustable transversely of said core in all directions to minimize variation in the reluctance of the air gaps between the pole faces and core.

4. In a rotary electrical transmitter, a central cylindrical magnetic core, a multiphase magnetic stator surrounding said core and having pole faces adjacent thereto, a multiphase winding for energizing said stator to produce a magnetic flux extending from said pole faces and radially of said core, a skewed conducting rotor disposed between said pole faces and said core so as to link the flux therebetween, a single phase winding surrounding said core to be energized by the flux produced by the current induced in said rotor, and a magnetic disc mounted on said core and adjustably movable eccentrically thereof to correct irregularities in the flux paths between the pole faces and the core so as to minimize the longitudinal component of stator flux.

5. In a rotary electrical transmitter, a central cylindrical magnetic core, a multiphase magnetic stator surrounding said core and having pole faces adjacent thereto, a multiphase winding for energizing said stator to produce a magnetic flux extending from said pole faces and radially of said core, a skewed conducting rotor disposed between said pole faces and said core so as to link the flux therebetween, a single phase winding surrounding said core to be energized by the flux provided by the current induced in said rotor, a transverse face on said magnetic core adjacent to said stator, and a magnetic disc adjustably mounted on said face so as to be universally movable transversly thereof to minimize irregularities in the air gap between the stator poles and the core.

JOHN H. ANDRESEN, JR.

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