Jan. 21, 1958 K. C. MATHEWS 2,820,915

MAGNETIC SIGNAL GENERATOR

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FIG. 1

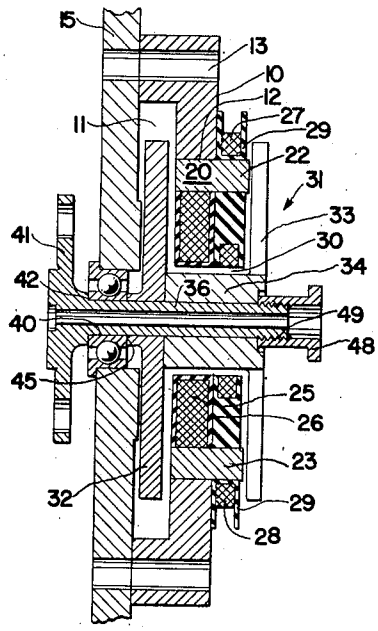
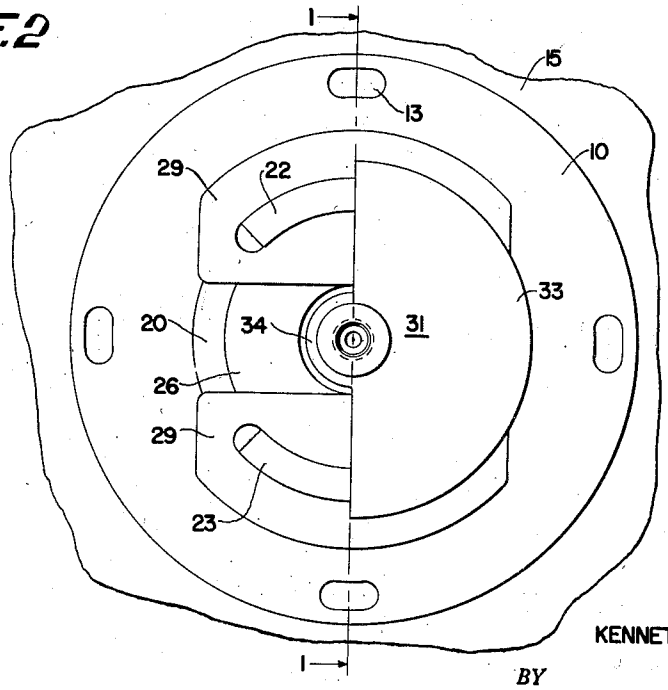


FIG. 2



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FIG. 3

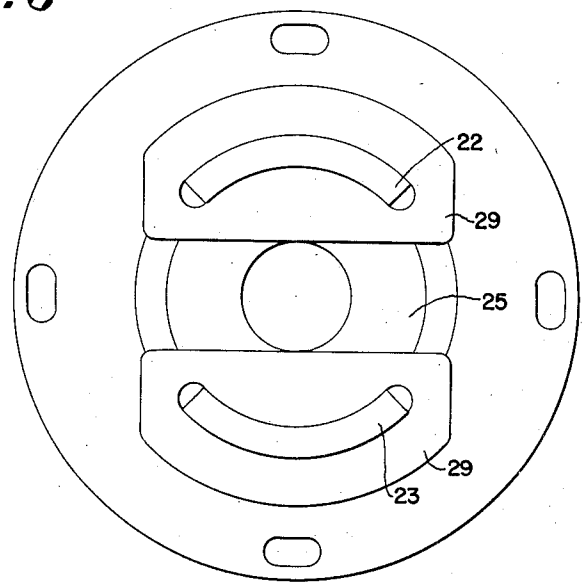


FIG. 4

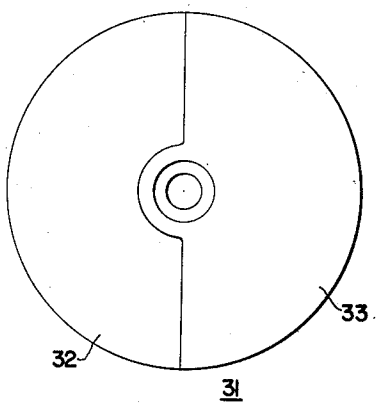
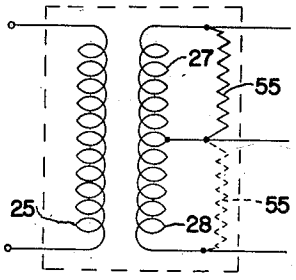


FIG. 5



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2,820,915

MAGNETIC SIGNAL GENERATOR

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Application November 15, 1956, Serial No. 622,366

7 Claims. (Cl. 310—168)

My invention relates to magnetic signalling devices and more particularly to improved magnetic signal generator or magnetic pickup.

Devices of this type are well known in the art and incorporate various physical magnetic and electrical configurations. The present invention is directed to an improved magnetic signal generating device which utilizes a simplified magnetic structure incorporating preformed electrical coils with a minimum of parts to produce an arrangement which is economical to manufacture and maintain and yet provides a highly accurate compact device which may be readily incorporated onto associated equipment. It is therefore the objects of this invention to provide a simplified magnetic structure in an improved magnetic signal generating device which is compact in design and economical to manufacture and maintain and yet provides a high degree of accuracy. These and other objects of this invention will become apparent from the reading of the attached description together with the drawings in which:

Figure 1 is a sectional view of an improved magnetic signal generating device,

Figure 2 is a top view of the entire device,

Figure 3 is a top view of the core assembly for the device, and

Figure 4 is a top view of the rotor assembly for the device,

Figure 5 is a schematic diagram of the windings in the generator of Figures 1 and 2.

As will be seen in Figures 1 and 2, the improved magnetic signal generating device is comprised of a plate member **10** which is annular in form and has a recess portion **11** and a centrally located aperture **12** together with suitable mounting holes **13** therein. This circular plate as will be seen in Figure 1 is adapted to be mounted on a base member **15** through a suitable means such as screws not shown. Positioned within the cylindrical base is a core member **20** which is cylindrical in form having an annular periphery at one extremity and a pair of pole projections **22, 23** at the other extremity which pole projections as will be seen in Figure 3 are shown as substantially 90° segments of an annulus and are uniformly spaced apart. It has been found, however, that the angular size of this pair of poles may be reduced from this figure. The core member **20** is adapted to be fitted in the aperture **12** in core **10** and suitably secured therein such as by press fitting or other external means.

Mounted within the cylindrical core **20** is an energizing winding **25** which is wound on the bobbin **26** and which is fitted into the cylindrical core member **20** and suitably held therein such as by press fitting or other means. The winding **25** is positioned adjacent the annular periphery or extremity of the core member **20** as will be seen in Figure 1. Mounted on the pole extensions **22** of the core member are a pair of preformed windings **27, 28** which are wound on preformed bobbins **29** and fitted over the pole extensions and adjacent the energizing winding **25** and a portion of the circular plate **10**. The preformed

windings are also adapted to be secured to the pole extensions **22, 23** through suitable means such as glue or other adhesive, or the entire core assembly may be impregnated after incorporation of all the parts to provide a rigid assembly. The positioning of the primary energizing coil **25** and the secondary coils **27, 28** on the core structure defines an aperture indicated at **30** within which is positioned a composite rotor structure indicated at **31**. The composite rotor structure member includes a circular flange like member **32** adapted to be positioned at one extremity of the core structure or member **20** adjacent to and overlying or extending beyond the peripheral rim of one extremity in the annular core structure **20**. The composite structure **31** also includes a semi-circular shaped flange portion **33** integral with a cylindrical connecting portion **34**, the semi-circular flange portion **33** being adjacent to and positioned over the opposite extremity of the core member **20** at which the pole members **22, 23** are located. The parts of the composite core structure **31**, namely the flanges **32, 33** and connecting portion **34**, are adapted to be mounted on a shaft indicated at **36** which is journaled on the base **15** through suitable bearing means **40**. Shaft **36** has a flanged extremity **41** with a shoulder indicated at **42** thereon against which is positioned the inner race of the bearing **40**, the outer race being press fitted into or otherwise suitably secured to the base **15**. Engaging the inner race of the bearing is a shoulder portion **45** on the circular rotor flange which spaces the flange within the recess **11** formed between the base plate **10** and the base **15**. The connecting portion **34**, integral with the semi-circular flange **33**, rests against the surface of the circular plate **32** and the entire arrangement is secured on the shaft by means of a suitable screw type connection means **48** fitted onto a tapped portion of the shaft **36** indicated at **49**. Thus it will be seen that rotative movement imparted to the shaft **36** through the flanged extremity **41** will cause rotation of the flange portions **32, 33** relative to the core member **20**. The circular flange **32** will rotate adjacent the exposed annular periphery of one extremity of the circular core member **20** and the semi-circular flange portion **33** will rotate adjacent the pole extensions **22, 23** of the core member.

The positioning of the energizing winding **25** within the core member **20** will upon energization direct flux through the connecting portion **34** of the rotor element and through the flange sections to the pole extremities **22, 23** of the core member. The flux lines so directed to the core member **20** will thread the secondary windings **22, 23** and depending upon the relative positioning of the semi-circular flange portions **33** relative to the poles more or less of the flux will be directed through the respective poles and windings mounted thereon. The secondary windings as indicated in Figure 5 are adapted to be connected in a series opposition relationship such as the current being generated therein will be of an opposite sense and will subtract to give an overall output across the terminals connecting the extremities of the two windings which varies in magnitude and phase depending upon the relative position of the rotor with respect to the pole members **22, 23**. A resistor element **55** may be connected across one or the other of the windings **27, 28** for balancing purposes in a conventional manner to minimize the quadrature of the exciting voltage.

In operation, an input movement to the shaft will rotate the composite rotor structure **31** relative to the core member **20** to vary the flux directed through the pole extensions **22, 23** of the core member **20** and hence the current generated through the pickup windings **27, 28**. The positioning of the semi-circular flange differentially with respect to the poles varies the magnetic reluctance of the magnetic circuit defined by the composite rotor struc-

ture and the core member 20 to vary the flux flow through the respective pole extensions and hence the flux flow into the respective pickup windings 27, 28 mounted thereon. By reversing the polarity of the coils 27, 28 and connecting the same in opposition, a differential of the inducted voltage in the coils is obtained to give a voltage signal which is variable in magnitude and reversible in phase with an alternating current energization of the primary winding 25 depending upon the position of the rotor 33 with respect to the core 20.

The subject magnetic signal generating device utilizes a simplified magnetic core structure with compact dimensions which cuts down on the overall physical length of the apparatus through use of simple bobbin wound coils to facilitate production of the same. A very simple and minimum number of parts provide a compact yet rugged arrangement which is highly accurate and economical to build. Further, the arrangement permits the corporation of the device onto other units such as gyroscopes without any substantial increase in dimensional requirements of main components. It will be recognized that the apparatus may be made in somewhat modified form such as utilizing radial as opposed to axial air gaps and consequently I wish to be limited only by my appended claims.

I claim as my invention:

1. A magnetic signal generating device comprising, a circular plate having an opening therein, a cylindrical core with sector like pole extensions at one extremity thereof, said cylindrical core being mounted in the opening in said circular plate, a composite rotor including a circular rotor plate positioned at one extremity of said cylindrical core and a semi-circular plate positioned at the other extremity of said cylindrical core adjacent said pole extensions with a connecting section extending through the aperture in the cylindrical core, a shaft supporting said rotor, means mounted on said plate for journaling said shaft, a primary energizing winding positioned with said core and encircling the connection section of said composite rotor, and secondary windings encircling the pole extensions of said cylindrical core and being mounted thereon.

2. A magnetic signal generating device comprising, a base, a cylindrical core mounted on said base and having a plurality of pole extensions at one extremity thereof, a rotor member having a circular flange at one extremity and a sector like flange at the other extremity, said rotor member being positioned within said cylindrical core member such that the circular flange at one extremity is positioned adjacent one extremity of said cylindrical core and the sector like flange at the other extremity is positioned adjacent pole extensions of extremities of said cylindrical core overlying the same, shaft means journaled in said base and mounting said rotor member for rotation into said cylindrical core, an energizing winding mounted on said cylindrical core encircling said rotor member between said flange portions, and secondary windings positioned on pole extensions of said cylindrical core.

3. A magnetic signal generating device comprising, a base, a cylindrical core mounted on said base and having a pair of arcuate pole extensions at one extremity thereof, a rotor member having a cylindrical flange at one extremity overlying the one extremity of said cylindrical core and semi-circular flange at the other extremity overlying the pair of poles with said rotor positioned within said cylindrical core, means mounting said rotor for rotating movement on said base relative to said core, an energizing winding mounted on said cylindrical core encircling said rotor member between said flange portions, and a pair of secondary windings mounted on said pole extensions of said core.

4. A magnetic signal generating device comprising, a base, a cylindrical core mounted on said base and having a pair of pole extensions at one extremity thereof, said pole extensions being approximately 90° sectors and spaced equal distance from one another, a rotor member having a circular flange at one extremity and a semi-circular flange at the other extremity, said rotor member being positioned within said cylindrical core with the circular flange positioned adjacent one extremity of said cylindrical core and the semi-circular flange being positioned adjacent pole extensions, shaft means journaled in said base and mounting said rotor member for rotation relative to said cylindrical core, an energizing winding mounted on said cylindrical core encircling said rotor member between said flange portions, and a pair of secondary windings positioned on pole extensions of said cylindrical core.

5. A magnetic signal generating device comprising, a base, a cylindrical core mounted on said base and having a pair of arcuate pole extensions at one extremity thereof, a rotor member having a cylindrical portion at one extremity positioned adjacent to one extremity of said cylindrical core and a semi-circular flange at the other extremity positioned adjacent to the pair of pole extensions, means mounting said rotor for rotating movement on said base relative to said core, an energizing winding mounted on said cylindrical core encircling said rotor member between its extremities, and a pair of secondary windings mounted on pole extensions of said core, and means mounted on said shaft for rotating said shaft.

6. A magnetic signal generating device comprising, a base member, a core member mounted on said base member and having an annular periphery at one extremity thereof and a plurality of pole extensions at the other extremity thereof covering substantially one-half of the peripheral surface at this extremity and being uniformly spaced, a rotor adapted to be positioned through said core member having a circular flange at one extremity and a sector like flange at the other extremity which are normally positioned such that the flanges are disposed adjacent the peripheral extremities of said core, means mounting said rotor member on said base for movement relative to said core member, a plurality of pickup windings positioned on said pole extensions, and means for generating a magnetic field which will flow through said core member and said rotor member including said flange portions.

7. A magnetic signal generating device comprising, a base member, a core member mounted on said base member and having an annular periphery at one extremity thereof and a pair of pole extensions at the other extremity thereof covering substantially one-half of the peripheral surface at this extremity and being uniformly spaced, a rotor adapted to be positioned through said core member having a circular flange at one extremity and a sector like flange at the other extremity which are normally positioned such that the flanges are disposed adjacent the peripheral extremities of said core, means mounting said rotor member on said base for movement relative to said core member, a plurality of pickup windings positioned on said pole extensions, and means for generating a magnetic field which will flow through said core member and said rotor member including said flange portions.

No references cited.