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SECTOR ANTENNA SWITCHING

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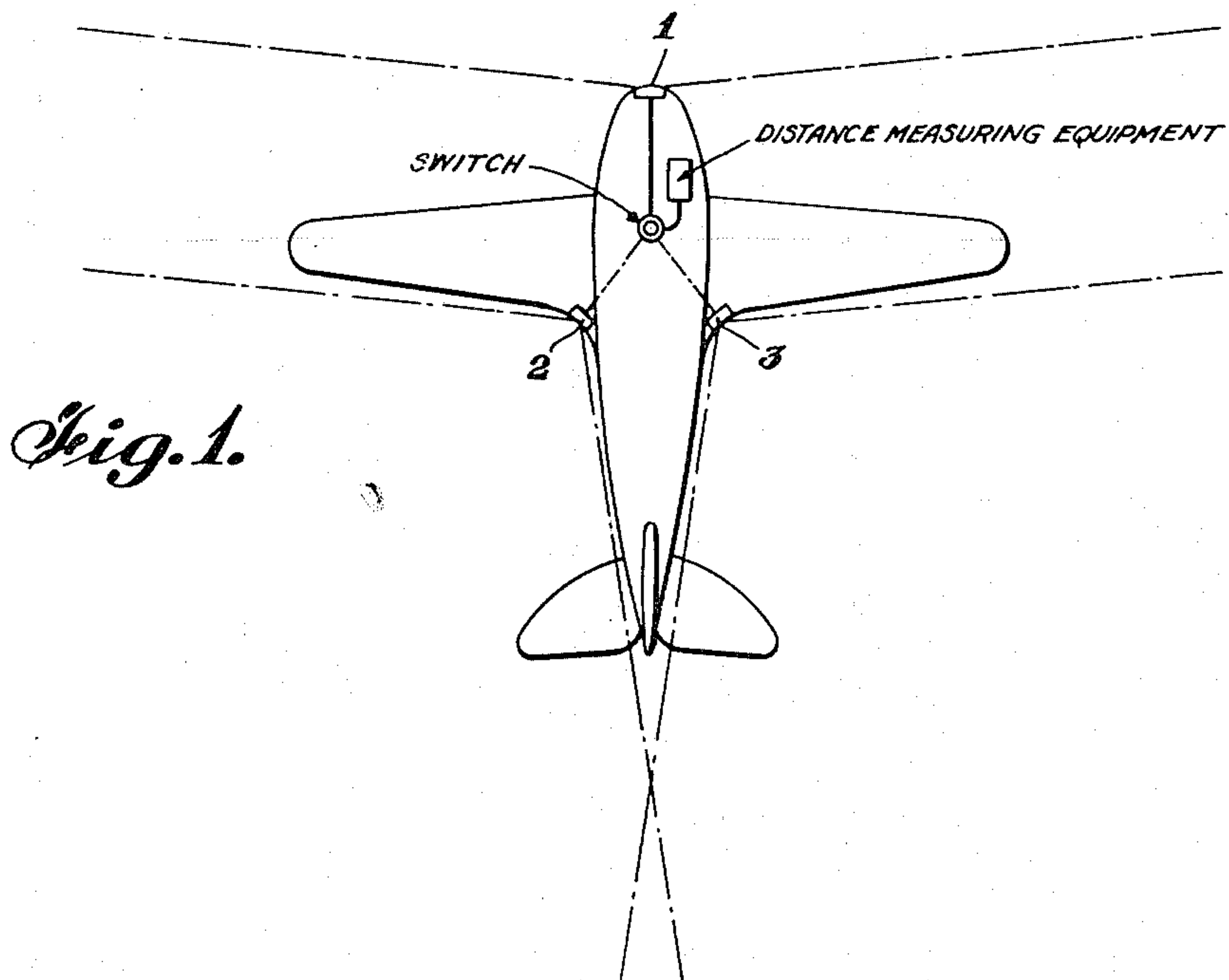
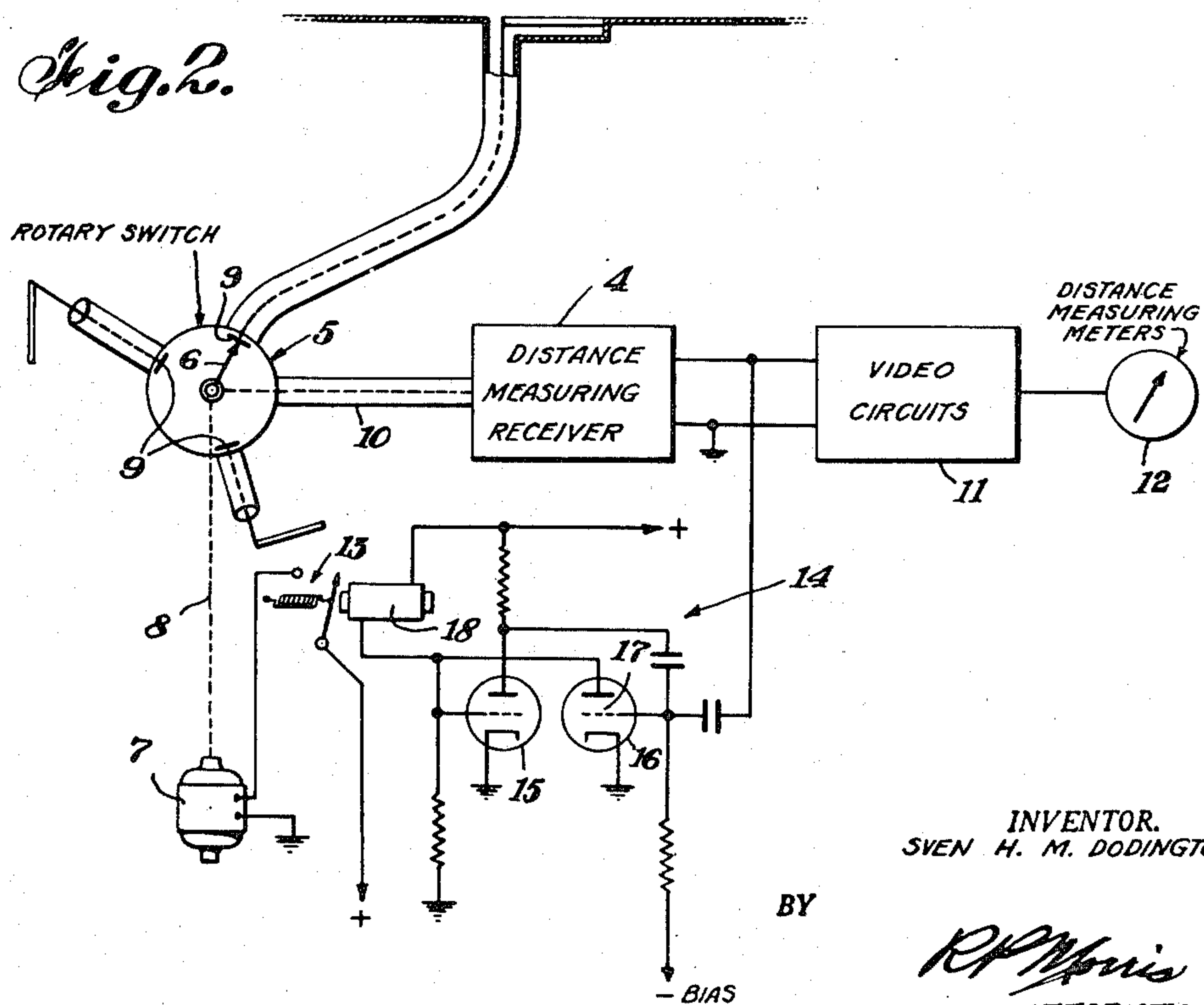


Fig. 2.



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SECTOR ANTENNA SWITCHING

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3 Claims. (Cl. 343—100)

1 This invention relates to antenna switching systems, and more particularly to switching systems especially useful where a plurality of sector antenna systems are provided.

One of the difficulties encountered in the installation of an antenna system for communication or navigation purposes aboard movable craft, such as aircraft, is the appearance of shadow effects upon the antenna system operational performance due to craft structure. This has been usually overcome by dividing the antenna system into units covering separate sectors spaced about the craft to minimize the shadow effects. While it is conceivable that a multiple sector antenna system could be set up without seriously overlapping patterns, it is probable that such an arrangement would only hold for one particular type of craft. Moreover the simultaneous use of all-sector antennas when usually the signal is strongest in one, represents a sizable loss of energy.

One of the objects of this invention is to provide a system for automatically selecting from a sector antenna system a sector providing adequate performance qualities.

In accordance with an embodiment of this invention, a switching system for craft, such as an aircraft provided with a plurality of sector antennas spaced about the craft, comprises a movable coupling unit which normally would successively couple each of the antenna sectors to a receiving means, but is, however, prevented from doing so whenever a certain desired amplitude appears at the receiving means.

The above mentioned and other features and objects of this invention will become more apparent, and the invention itself, though not necessarily defined by the said feature and objects, will be best understood by reference to the following description of an embodiment of the invention taken in connection with the accompanying drawings wherein:

Fig. 1 represents a craft provided with a sector antenna system.

Fig. 2 shows an automatic switching arrangement in accordance with the present invention.

Referring to Fig. 1 there is shown a craft provided with sector antennas, three in this case, located at 1, 2 and 3 for providing a 360° coverage for use with distance measuring equipment of the pulse type aboard the craft. As illustrated the three sectors provide adequate coverage, each giving roughly 120° coverage. To insure the use of an antenna sector providing adequate signal reception, the circuit shown in Fig. 2 is provided.

Sector antennas 1, 2 and 3 for Fig. 2 are pro-

2 vided for receiving distance measured signals of the pulse type. For coupling the antennas to the distance measuring receiver 4, a movable coupling unit such as the rotary switch 5 is provided. Switch 5 comprises a movable blade 6 driven by the motor 7 through a mechanical coupling 8 whereby the movable blade 6 successively engages the fixed contacts 9 associated with the different sector antennas 2, 3 and 1. The movable blade 6 is electrically coupled to the distance measuring receiver 4 by means of the coupling element 10, as shown, the sector antenna 2 is coupled by means of the movable blade 6 to the distance measuring receiver 4. The output of the receiver 4 comprises in the particular embodiment, positive going pulses which are applied through the video circuit 11 to the distance indicating meter 12. The motor 7 as shown is stationary since the relay switch 13 in the position shown, keeps the motor supply circuit open. It is assumed that the amplitude of the received signal are of a satisfactory level.

However, if the signals received by sector antenna 2 fall below a predetermined level, a control circuit 14 operates to close relay switch 13 and permit energization of the motor 7 whereby another antenna sector may be selected by means of the movable blade 6.

The control circuit 14 comprises a pair of electron discharge devices 15 and 16 arranged to operate as a trip multivibrator circuit. The electron discharge device 16 has an input grid electrode 17 biased negatively whereby only receiver output pulses above a preset level, determined by the amount of negative bias, will cause tube 16 to conduct heavily, resulting in current flow through the relay coil 18 coupled as an anode load of the tube 16. Current flow through coil 18 keeps the relay contact 13 open and hence prevents rotation of the motor 7. Thus as long as satisfactory signals are obtained from the sector antenna 2, the motor 7 will be deenergized. However, if the pulse signals from sector antenna 2 fall below a level, determined by the negative bias applied to grid electrode 17, the tube 16 will cut off, resulting in a deenergization of relay coil 18, and permitting relay contact 13 to close the voltage supply source to motor 7. Motor 7 thereupon turns, for example, at a slow rate of about 3 revolutions per minute, which results in moving the movable blade 6 to engage the next successive contact 9 associated with sector antenna 3, assuming clockwise rotation. If the output pulses passed through receiver 4 from antenna 3 are below the present level, relay

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coil 18 will remain deenergized and the motor will continue to rotate to couple with the next successive sector antenna 1. However, if the signals received from sector antenna 3 be above the present level, tube 16 will be energized as previously mentioned, permit opening of the relay contact 13, and hence retain the coupling of antenna 3 to the distance measuring receiver 4. Tube 15 operates in a normal multivibrator manner to provide feedback voltages at the proper polarity to enhance the signal applied to grid 17 from receiver 4. In order to prevent the movable blade from rotating during very short period fades of the incoming pulses, signals, a small time delay circuit may be provided, as for example, inherent in the circuit constants associated with the trip multivibrator.

While I have shown three sector antennas by way of example any desired number may be used. Moreover, other type of switching and coupling circuits than those illustrated will readily suggest themselves to those skilled in the art.

While I have described above the principles of my invention in connection with specific apparatus and particular modifications thereof, it is to be clearly understood that this description is made only by way of example and not as a limitation of the scope of my invention.

I claim:

1. A receiver system for predetermined signals comprising a plurality of receiving antennas each differently directionally responsive to said signals, a receiver, switching means for selectively coupling said receiver to one of said antennas, drive means for said switching means, control means for said drive means including a drive control relay and a multivibrator having an input circuit coupled to the output of said receiver and an input circuit coupled to said relay, said multivibrator responsive to the energy level of said received signals dropping below a predetermined level to operate said relay for energizing said drive means, whereby the antennas will be successively coupled to said receiver until a signal above said predetermined level is received.

2. A receiver system for use on a craft for distance indication purposes with respect to a given transmitter system, comprising a plurality of antennas mounted on said craft each directionally responsive in a given sector, a receiver, a distance indicating meter coupled to said receiver and responsive to signals above a given energy level received from said transmitter system, a switch means for selectively coupling said antennas to

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said receiver, a motor having a control circuit for driving said switching means, a relay for opening and closing said control circuit, two electron discharge devices each having an input and an output circuit, means coupling the input circuit of one of said devices and the output circuit of the other of said devices to the output of said receiver, means coupling the output circuit of said one device and the input circuit of the other device to said relay for maintaining said control circuit open in response to receipt of signals from said receiver above said given energy level, and for closing said control circuit if the signals drop below said level, whereby said motor will drive said switch for coupling to successive antennas until said signals are received above said given energy level.

3. A receiver system for use on a craft for distance indication purposes with respect to a transmitter of radiant energy pulses, comprising a plurality of antennas mounted on said craft each mounted for a given sector of reception of said pulses, a receiver, a distance indicating meter coupled to said receiver and responsive to received pulses above a given energy level, a rotatable switch means for successively coupling each of said antennas to said receiver, a motor for driving said switch means, an energizing circuit for said motor, a relay for opening and closing said energizing circuit, a multivibrator circuit coupled to the output of said receiver and to said relay for maintaining said control circuit open in response to receipt of signals from an antenna providing pulses above said given energy level, and for releasing said relay if the pulses drop below said level, whereby said motor will drive said switch for coupling to successive antennas until an antenna is coupled which provides pulses above said given energy level.

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