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ARRANGEMENT FOR RADIO DIRECTION FINDING

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Fig. 1.

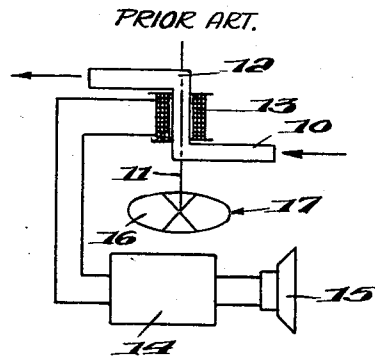
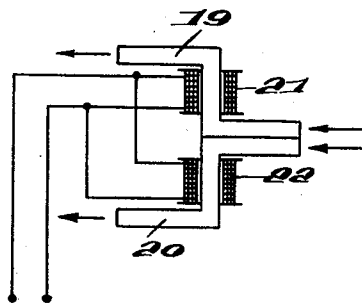


Fig. 2.



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ATTORNEYS

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ARRANGEMENT FOR RADIO DIRECTION FINDING

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2 Claims. (Cl. 343—788)

The traditional way of finding direction by radio is to use a strongly directed antenna system, for instance a frame antenna, which is either turned mechanically while observing the maximum or minimum voltage, or the turning of which is instead simulated by connecting a pair of mutually crossing antennas to a radio goniometer, the reading coil of which being turned in a corresponding way. Both of these arrangements, however, suffer from a disadvantage often observed. In turnable frame antennas, which are controlled by hand, it has been usual to limit the total turning angle of the frame to a little more than one turn. It has then been possible to connect the frame antenna with the receiver by means of a flexible conductor without slip contacts. However, it has proved, that such a small turning is very often insufficient for quick and easy handling, and by a specially expensive arrangement the total turning angle of the frame is increased up to two turns, but thereby an expensive and complicated stop device has been necessary, and the flexible conduits also become more complicated and expensive. Finally this arrangement means that part of the conductor has to hang down freely, whereby it has been sensitive to mechanical disturbances. Even the best ground mantled coaxial cables are to a certain degree sensitive to electro-magnetic disturbances, and the longer the conductor is, the stronger these disturbances will be. In direction finding with a radio goniometer one has always had to use slip rings for transferring the received signal voltage to the receiver, and the same has been the case in automatic direction finding, which requires well known, continuously rotating direction finding antennas. Slip ring contacts, however, always cause disturbances due to the weak currents to be transferred, the so-called contact noise.

In order to avoid the above disadvantages and to provide an arrangement of a direction finding antenna, in which neither flexible conductors, nor slip ring contacts are required, it is proposed to arrange the direction finding antenna for electro-magnetic waves in such a way, that it is influenced by the magnetic field. It contains for this purpose a turnable so-called Z-armature of a material with high conductive property for this field.

In induction compasses Z-armatures have already been used, but these have been kept in rotation with a very high speed, whereby they induced a voltage dependent upon the horizontal component of the earth-magnetical field. In this case, thus the magnetic field is unidirectional, and the Z-armature rotates in this field for creating an alternating voltage. Such an arrangement can be compared with a synchronous generator. In the arrangement according to the invention, on the other hand, a Z-armature is used in a way, which could better be compared with the arrangement in a transformer. The armature is normally not in rotation, but can of course be turned in two different positions, representing different directions of the input field. This, however, is an alternating field per se, and in the winding about

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the stem of the Z-armature therefore an electric voltage will be created the same way as the voltage in the secondary winding of a transformer, when the magnetic field in its armature or core is made the object of a periodical variation. The state of voltage thus occurring in the winding of the Z-armature then will form a measure of the direction of the input field, or in other words: The Z-armature can be used as an antenna with a strong directional action.

Tests have proved that the signal intensity achieved in this way is fully sufficient for direction finding purposes, and that this signal intensity in no way needs to be weaker than the field intensity in a normal frame antenna device, measured as the output voltage from the antenna. On the other hand, one has fully avoided slip ring contacts as well as long freely hanging conductors, and thereby also all of the disturbances occurring in all frame antenna systems, and therefore the received signal will be essentially more pure and easy to understand.

The said earlier known arrangement, however, is not perfect, because it is sensitive to input waves with horizontal polarization. It should be remembered, that the force lines of the input field are as a rule not only containing an horizontal component but also a distinct vertical component.

For avoiding the abovementioned disadvantages, two Z-armatures are combined by being applied in the form of a constructive unitary part one pole contacting the other, the one Z-armature thereby being turned as the image picture of the other one.

The invention will be further described below in connection with the attached drawing, which shows a form of execution of the invention. Thereby further advantages with the invention will also be mentioned. In the drawing Fig. 1 shows in strongly schematical form a complete system according to the known form of execution, partly in block diagram. Fig. 2 shows an arrangement according to the invention for improving the antenna, provided with Z-armature.

In Fig. 1 a Z-armature is indicated by 10, said armature being of the kind, which is known from the induction compass techniques. The armature 10 is turnable in about the same way as a normal frame antenna, about an axis 11, which is in this case coinciding with the centre line of the stem 12 of the Z-armature. This stem is surrounded by a winding 13, which is connected with the direction finding receiver 14, shown in block diagram, and thereby with the loudspeaker 15. On the shaft 11 a scale disc 16 with a reading mark 17 is provided. This can for instance be provided with all kinds of different means for improving the possibility of reading, known from usual direction finding systems with frame antenna, such as for instance a vernier for correcting the reading angle and so on. It should, however, be observed that even if here and in the following the arrangement has been described in connection with a system for manual direction finding, the invention is of course also possible to use in automatic direction finding, where it will even get its most essential advantages.

The arrangement according to Fig. 1 functions in the following way:

When the Z-armature is directed with its one leg onto the transmitting radio beacon and with its other leg in the exactly opposite direction, the armature will receive a magnetic field, which is conducted through the winding 13 with the same action as if a frame antenna had been arranged with its plane exactly perpendicular to the direction of the horizontal component of the input wave. In a corresponding way, the arrangement according to Fig. 1 acts when the legs of the Z-armature are directed perpendicularly to the direction of the horizontal com-

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ponent of the input wave in substantially the same way as if a frame antenna had been set with its level in the direction of the input wave. The characteristic will be almost the same as that for a frame antenna. One can consequently turn the Z-armature in the same way as one used to do in traditional systems with a frame antenna, and listen to the field intensity in the form of the sound intensity on an interference tone in the loudspeaker 15. Suitably the direction finding should be made on a minimum of received signal intensity in this case as in a frame antenna system.

An arrangement according to the invention for avoiding the disadvantages of the inclined field is shown in Fig. 2. In the arrangement according to this figure, two Z-armatures are combined into a constructive unit, the one armature 19 being placed as the image picture of the other armature 20. The two coils 21 and 22 are connected in such a direction, that the voltages created by the horizontal component add to each other, whereas the voltages created by the vertical component are extinguishing each other. In the shown example, the coils have been shown to be connected in parallel but they could equally well have been connected in series.

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Of course, this invention is not limited to the specific form of execution described above and shown in the drawing, but different modifications may occur within the frame of the invention.

What is claimed is:

1. An arrangement for radio direction finding including a magnetic antenna, said antenna having two magnetic cores each in the form of a Z-armature, each of said cores having a coil arranged about the stem of said armature, said cores being so arranged that one pole of each is in contact with a pole of the other, the engaging pole faces forming an imaginary plane, one of said cores being turned to form the image picture of the other of said cores in said imaginary plane.

2. An arrangement according to claim 1, wherein said coils are connected, whereby the voltages created by the magnetic horizontal components cooperate and the voltages created by the magnetic vertical components are extinguished.

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