ANTENNA ARRANGEMENT, ESPECIALLY FOR RADIO BEACONS

Filed April 21, 1938

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Fig. 2

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The invention concerns a new antenna arrangement for radio beacons which avoids disturbance of the radiation fields by the high frequency feeder and the key conductors.

In radio beacons having a continuously fed pair of vertical electrodes and two reflecting antennae which are keyed alternately in such a manner that they are alternately made effective and ineffective, there is the disadvantage that the directional characteristics become distorted by the feeder of the electrodes and the leading wires to the key relays and give rise to errors in determining the direction of the beacon signals. This is mainly due to the fact that when feeding in the current loop of the above mentioned electrodes, the radiation field is interfered with by the feeder and key-currents which have an absorbing or reflecting influence.

By means of this invention, the aforementioned disadvantage is overcome by feeding the electrodes through a reactance coil which has been non-inductively wound and which is located at the junction between the emitting part of the energy transmitter, namely, the pair of electrodes, and the non-emitting part or feeder thereof. By means of this reactance coil, currents in opposite phase relation may flow through without hindrance whilst waves of the same phase which are reflected by the antenna system are choked. This prevents the feeder itself from emitting energy whilst in addition, the feeding circuits are not influenced at all.

According to a further characteristic of the invention, the electrodes are fed at one end, for example, at the lower end. For this purpose, the electrodes consist of a tube or like a loop of a quarter of a wave length and a conductor which is positioned in this tube.

The disturbing influence of the key conductors is overcome by extending these conductors through the lower part of the electrodes which lower part is of tubular formation.

According to a further characteristic of this invention, the high frequency feeder is also adapted to be employed as a conductor for the low frequency key frequency current. For this purpose filters are provided for preventing the high frequency current from influencing the conductors of the key relays.

Referring to the drawings which form part of this specification:

Figs. 1, 2 and 3 are diagrammatic illustrations of two practical examples of radio beacon antenna arrangements in accordance with the invention.

The transmitting radiator of the arrangement shown in Fig. 1 consists of a tube or the like 1 as one electrode of the dipole and a conductor 2, which is located within said tube and extends beyond said tube to form the other electrode of said radiating dipole. The feeding of the electrodes is obtained by means of a coupling at the lower end of the electrodes, namely, at the points 3, 4 through a reactance coil 5 which has been wound non-inductively. The energy conductors 7 screened by a jacket 8 are connected to the transmitter 6.

The keying of the reflectors 9, 10 is obtained by a working relay 11 and a stationary relay 12. The key frequency is supplied to the relays 11, 12 by a special key conductor passed through the tubular part 1 of the electrodes.

According to the embodiment illustrated in Fig. 1, the high frequency feeders 7 and the tubular part 1 of the electrodes are also employed as conductors for the low frequency key frequency current. At the feeding point for this purpose coils 13, 14 are provided, the terminals 15, 16 of which are connected with the high frequency conductors 1 at the points 17, 18. These high frequency conductors are connected with an oscillating circuit containing the capacity 30 and the coil 31.

The conductors 28, 29 of the relays 11, 12 are connected to the terminals 19, 20 of the electrodes 1, 2. The reactance coils 21 to 28 are connected to these conductors 28, 29. Said coils 21 to 28 are wound bifilarly or unifilarly depending upon their position and type of connection. By means of these coils a horizontally polarised disturbing emission of the key conductor is avoided.

Sometimes it is important to make an outside connection of the centre point 27, for instance, to regulate the closing and opening times of the relays by the connection of resistances. This connection is made by a conductor 28' which also passes through the tubular part 1 of the electrodes and is chocked by a winding of the non-inductively wound reactance coil 5 itself or by a special reactance coil. The conductor 28' is connected for instance, to terminal 30' through the jack 8 of the feeders 7.

In the embodiment illustrated in Fig. 2, the feeder cable 1' consists of a conductor and a screening jacket both of which are used for the conduction of the high frequency current to the electrodes. The lower part 1 of the electrodes consists of portion of this screening jacket. The upper part 2 of the electrodes consists of an interior conductor projecting beyond the screening jacket for a quarter of a wave length.
The lower end of the electrodes 1, 2 formed by the high frequency cable is connected to the bi-
lar reactance coil 5 which is constructed simply
by coiling the feeding cable. By means of this
reactance coil, that part of the cable 1 which is
adapted to function as the electrodes, is separat-
ed from the other part of the cable acting as
a feeder. The key frequency is also conducted
to the cable 1.

In the transmitter 6, the high frequency cur-
rent is conducted to the covering of the cable 1'
at the terminal 17 and to the interior con-
ductor 2' of the cable at the terminal 18 through
the oscillating circuit 30, 31. The low frequency
key frequency current is conducted to the re-
actance coils 13, 14 from the terminals 15, 16.
The frequency passing through the terminals
19, 20 of the electrodes 1, 2 is connected to the
key relays 11, 12 of the reflectors 9, 10 by means
of the key conductors 28, 25. In order to check
a horizontally polarised emission of the conduc-
tors 28, 25, reactance coils 21 to 26 are connected
to the key relays.

A multi-core cable may also be used as a feed-
er as shown diagrammatically in Fig. 3. For ex-
ample, the metallic covering and one core of a
three core cable may be used as high frequency
cables and as transmitting electrodes whilst the
other two interior conductors may be used
as key conductors. In case there is one point,
for instance, the centre 27, to be connected to the
two key relays 11, 12 the feeder may contain one
more key conductor.

The bipolar reactance coil 5 and the other re-
actance coils may be improved by inserting there-
in a core of iron suitable for use at high fre-
quencies.

Having now described my invention what I
claim as new and desire to secure by Letters
Patent is:

1. A dipole antenna structure for producing symmetrical radiant action comprising, a tubular
conductor forming one electrode of said dipole, a second conductor in said tubular conductor
extending beyond one end of said tubular con-
ductor to form the other electrode of said dipole, means for energizing said dipole, comprising a
high frequency energy source, lead-in conductors
connecting said source to said tubular member
and said second conductor, and reactive means
between said lead-in conductors and said tubular
member and said second conductor for isolating
said dipole from said conductors to prevent dis-
tortion of the radiated pattern by said lead-in
conductors.

2. A dipole antenna structure according to
claim 1, in which said lead-in conductor com-
prises a coaxial transmission line forming a con-
tinuation of said tubular member and said con-
ductor, and said reactance means comprises a
coil made up of a portion of said coaxial trans-
mission line.

3. An antenna array for radio beacons com-
prising a radiating dipole comprising a tubular
conductor forming one electrode of said dipole,
a second conductor within said tubular conductor
and extending beyond one end of said tubular
conductor to form the other arm of said dipole,
two reflectors arranged in spaced relation on
either side of said dipole, means for alternately
keying said reflectors to produce intersecting
patterns, a source of radio frequency energy, con-
ductor leads from said source to the conductors
of said dipole for energizing said dipole, and re-
actance means between said dipole conductors
and said leads for isolating said dipole from said
leads.

4. An antenna array according to claim 3, in
which said keying means comprise relays, further
keying means for applying keying control
energy to said conductive leads, and a circuit be-
tween said tubular conductor, said second con-
ductor, and said relays for conveying said con-
trol energy to said relays.

5. An antenna array according to claim 3, in
which said conductor leads comprise a coaxial
transmission line forming a continuation of said tubular member and said second conductor, and
said reactance comprises a coil made by coiling
a portion of said coaxial line.

6. An arrangement according to claim 3, where-
in the dipole electrodes are fed at one end there-
by, and said keying means comprises relays, fur-
ther comprising additional conductors extending
through said tubular conductor for controlling said
relays.

7. An arrangement according to claim 3, fur-
ther comprising a feeder, wherein said feeder and
one part of the electrodes are employed as
conductors for operating said keying means, a
source of keying frequency connected to said
leads, key frequency leads connected to said
keying means, a plurality of filters included in
the key frequency conductors to prevent said high
frequency currents from reaching said keying
means.

8. An arrangement according to claim 3, fur-
ther comprising a feeder, said feeder and said
conductor leads comprising a multi-core cable
having a metallic covering, said conductor leads
and said dipole electrodes consisting of the meta-
llic covering and one core of said cable, and con-
nections to the remaining cores for conducting
control energy to said keying means.

9. An arrangement according to claim 3 where-
in the dipole electrodes are fed by a coupling at
one end of the electrodes, further comprising a
source of keying frequency, key frequency leads
connected to said keying means and to said di-
pole electrodes, said key frequency source being
connected to said high frequency leads whereby
said high frequency feeder and part of the dipole
electrode are employed as conductors for the key
frequency current, a plurality of filters included
in the key leads and high frequency conductor
leads to isolate the high frequency and low fre-
quency apparatus from each other, said reactance
means comprising a non-inductively wound re-
actance coil constructed by coiling said high fre-
quency conductor lead, a multi-core cable having
a metallic covering, said high frequency conduc-
tor lead and said dipole electrodes consisting of
the metallic coating and one core of said cable,
the remaining cores of said cable being connected
for conducting said key frequency current.

10. An arrangement according to claim 3
wherein said reactance means comprises a non-
ductively wound reactance coil, said iron cores
suitable for use at high frequency in said coil.

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