Feb. 4, 1930. H. CHIREIX 1,745,981

ELECTRIC SIGNALING SYSTEM

Filed Dec. 15, 1924

Fig. 1

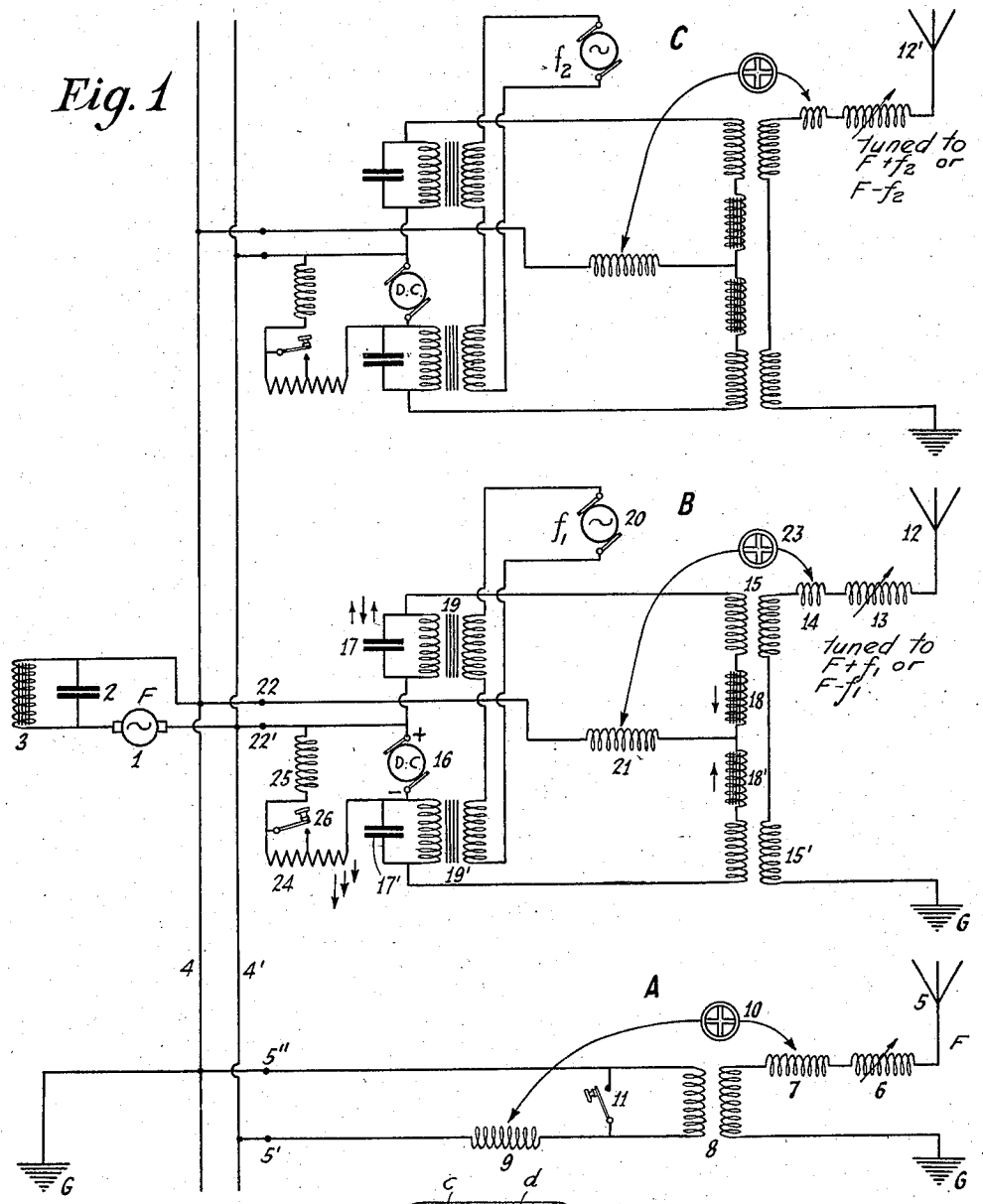


Fig. 1a

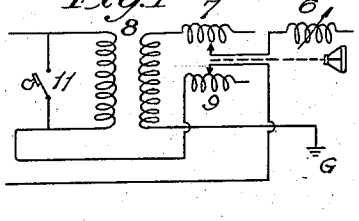
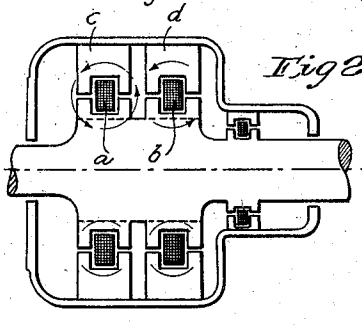


Fig 2



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ELECTRIC SIGNALING SYSTEM

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My invention relates to improvements in electrical signaling systems and methods. More specifically my invention relates to multiple transmission of radio signals.

One of the principal objects of my invention is the provision of a plurality of radiating antennæ energized by a smaller number of main alternators than there are antennæ resulting in the following advantages: (1) low no-load losses; (2) low installation cost; (3) low operating costs; (4) flexibility in the application of power to any one or more of said antennæ.

Other objects and advantages of my invention will be apparent from the following description taken in conjunction with the accompanying drawing in which:

Fig. 1 is a schematic diagram of a preferred radio transmitting system.

Fig. 1ª is a detailed construction of the power regulating means in Fig. 1, and

Fig. 2 is a schematic diagram of a preferred type of main alternator.

Referring to Fig. 1, a main alternator 1 of frequency F is connected to the distributing bus bars 4, 4′. The alternator is suitably compounded by a condenser 2 connected therewith. An iron core inductance coil 3 is connected across the condenser for permitting the passage of currents of the modulating frequency as will be more completely explained later. The bus bars 4, 4′, supply a plurality of transmitting devices A, B and C.

The transmitting device A comprises an antenna 5, a tuning coil 6, a coil 7 and the secondary coil of a coupling device 8 all connected in series and grounded at G as shown. The transmitting device A further comprises a coil 9 and the primary coil of the coupling device 8 both connected in series across the bus bars 4, 4′ by leads 5″, and 5′, the bus bar 4 being grounded at G as shown. The impedances of the coils 7 and 9 are simultaneously regulated by the common control device 10 in the manner indicated in Fig. 1ª. When the impedance of the coil 9 is varied to influence the amount of energy supplied to the antenna 5, the impedance of the coil 7 is simultaneously varied to preserve the tuning of the transmitting device A to the desired frequency. A keying mechanism 11 is schematically shown for energizing and de-energizing the antenna 5.

The transmitting device B comprises an antenna 12, a tuning coil 13, a coil 14, the secondary coil of a first coupling device 15 and the secondary coil of a second coupling device 15′ all connected in series and grounded at G as shown.

A loop circuit is connected across the + and − terminals of a direct current generator 16. Starting from the + terminal this circuit comprises a condenser 17, the primary coil of the first coupling device 15, coil 18 of a first iron core impedance device, coil 18′ of a second iron core impedance device, primary coil of the second coupling device 15′, and condenser 17′ to the − terminal of the generator 16.

Secondary coils of transformers 19 and 19′ are connected across condensers 17 and 17′ respectively. The primary coils of transformers 19 and 19′ are connected in series across the terminals of a modulating frequency generator 20 of frequency f_1.

A coil 21 is connected between bus bar 4 and the junction point of coils 18 and 18′ by the lead 22. Lead 22′ connects the positive terminal of generator 16 to bus bar 4′. The impedances of the coils 14 and 21 are simultaneously regulated by the control member 23 in the same manner and for the same reasons as set forth above in connection with the coils 7 and 9. A resistance 24 is connected in series with the shunt field 25 of generator 16. A portion of this resistance is arranged to be short circuited by a keying device 26.

The transmitting device C is similar to the transmitting device B with the exception that its modulation generator is arranged preferably to supply a different modulating frequency f_2 from that of the generator 20 of device B. A description of the transmitting device C is therefore thought to be unnecessary.

The system above described functions in the following manner. Antenna 5 is tuned to the frequency F of generator 1 and transmits on that frequency. By manipulation of

control member 10, all or a part of the power out-put of main generator 1 may be employed for transmission by the transmitting device A. Manipulation of control device 23 similarly effects the amount of power utilized by transmitting device B.

When the keying device 26 is open circuited the direct current generator 16 furnishes only sufficient current to effect very slight magnetization of the cores of impedances 18 and 18'. These impedance coils therefore offer large impedance to the passage of the main frequency and the modulating frequency. If any alternating current does pass thru, the induced electromotive forces in the antenna 12 will neutralize owing to passage of alternating currents in opposite directions thru the coupling devices 15 and 15'. Antenna 12 will therefore radiate no energy.

Assume now that keying device 26 is closed to short circuit a portion of resistance 24. The electromotitve force across the terminals of the generator 16 rises. This increases the degree of magnetization of the cores of impedances 18 and 18'. The cores are now magnetized to a point slightly beyond the knees of their respective saturation curves. The transformers 19 and 19' are so connected as to effect an addition of the modulating currents flowing in the lead 22. During a positive half of the modulating frequency wave one of the impedance coils say 18 offers a large impedance to the flow of current while the other one 18' offers practically zero impedance. During a negative half of the modulating frequency wave, impedance coil 18 offers practically zero impedance while coil 18' offers a large impedance. The electromotive force of the main generator is therefore shifted thru 180° in the antenna 12 as the modulating frequency wave changes from positive to negative. The antenna 12 may be tuned to the frequency of the main generator minus the modulating frequency $(F - f_1)$ or to the main generator frequency plus the modulating frequency $(F + f_1)$.

While it is preferable to have the modulating frequencies for the antennæ 12 and 12' different, it is possible to employ the same modulating frequency for each. In this event one of the antennæ is tuned to the sum of the main frequency and the modulating frequency $(F + f_1)$ while the other antenna is tuned to the difference between the main frequency and the modulating frequency $(F - f_1)$.

While a single phase system has been shown and described for reasons of simplicity of disclosure, a polyphase system for accomplishing the same results might be employed.

Fig. 2 is a diagrammatic showing of an alternator furnishing currents of absolutely constant frequency that may be employed in Fig. 1. This alternator by preference is an alternator comprising two toothed non-wound rotors and opposite them are two wound stators displaced with reference to one another by one fourth pole pitch. Associated with the stators are two windings, *a*, *b*, the former serving as the field or inductor of the first rotor and the first stator (magnetic circuit *c*), the second one *b*, serving as the field of the second rotor and the second stator (magnetic circuit *d*). If the two stator windings are connected in series, and if the two field windings are passed by two-phase currents due to or supplied from rectified beats of the same auxiliary alternator and an auxiliary socurce regulated to a frequency very slightly differing from that which the alternator would normally supply (preferably a valve outfit), it will be seen that there will be available at the two terminals of the stator a current having an absolutely identical frequency to the one furnished by said auxiliary source and therefore as constant as that supplied by the said auxiliary source.

While I have shown and described various preferred modifications of my invention, I do not limit myself to the same but may employ such other modifications as come within the spirit and scope of my invention.

Claims—

1. In a radio signalling system, the combination of a high frequency alternator, a plurality of radiating circuits adapted to be fed from said alternator, means in each of said circuits for controlling the amount of power supplied thereto from said alternator, and a plurality of modulating means associated with said radiating circuits, whereby different signal impulses may be radiated from said devices.

2. The combination with a source of power and a radiating device arranged to be energized thereby, a coil associated with said source of power, a coil associated with said radiating device and means mechanically interconnected for simultaneously adjusting said coils, whereby the amount of power taken by the radiating device may be varied without disturbing the tuning of said radiating device.

3. In combination a source of high frequency oscillations, a pair of bus-bars associated with said source, a radiating device adapted to be fed from said bus-bars and to radiate at the frequency of said source, a second radiating device adapted to be fed from said bus-bars and to radiate at a frequency substantially different from the frequency of said source, and means to proportion the power output of the source between said radiating devices.

4. In a radio signaling system, the combination of a main high frequency alternator, a plurality of radiating devices arranged in parallel and adapted to be fed from said alternator, modulating means associated with

each radiating device, means associated with one of said radiating devices for transmitting the sum of the frequencies of the main alternator and the corresponding modulating means, and means associated with the other of said radiating devices for transmitting the difference of the frequencies of the main alternator and the corresponding modulating device, and means to independently vary the power output in each of said radiating devices.

5. In a radio signaling system, the combination of a high frequency alternator, a pair of bus-bars associated with said alternator, a plurality of radiating devices adapted to be energized from said bus-bars, a modulating frequency generator associated with each of said radiating devices, and means included in each radiating device for selectively adding or subtracting the output of said alternator and the corresponding modulating generator.

6. In a radio signaling system, the combination of a high frequency alternator, a pair of bus-bars associated with the said alternator, a plurality of radiating devices each of which is adapted to be energized from said bus-bars, a modulating frequency generator associated with each of said radiating devices, means included in each radiating device for selectively adding or substracting the outputs of said alternator and the corresponding modulating generator, and means for controlling the amount of energy radiated from each of said radiating devices.

7. In combination a high frequency generator, a pair of bus-bars associated therewith, a plurality of radiating devices arranged in parallel and adapted to be fed from said bus-bars, independent modulating means for each radiating device, and means associated with each radiating device for regulating its power output and preserving at the same time the tuning thereof.

8. In a multiplex system of transmission, the combination with a high frequency generator, of a plurality of radiating devices adapted to be fed from said generator, one of said radiating devices being adapted to transmit the fundamental frequency of said generator, a modulating frequency generator associated with each of the remaining radiating devices, said radiating devices including means to transmit respectively the sum and difference of the frequencies of the high frequency generator and the corresponding modulating frequency generator, and separate means for regulating the power output of each radiating device at the same time preserving the tuning thereof.

9. In a radio signaling system, a high frequency alternator, a plurality of radiating devices arranged to be fed from said alternator, modulating means associated with each of said radiating devices, and means for tuning each of said devices to the sum or difference frequencies of the alternator and the corresponding modulating means.

10. In a radio signaling system, a high frequency alternator, a plurality of intermediate circuits associated with the output of said main alternator, a radiating circuit coupled to each of said intermediate circuits, independent modulating means for modulating the high frequency currents in each of said intermediate circuits, and simultaneously controlled means in each of the intermediate and radiating circuits for controlling the amount of energy radiated from the latter circuits without altering the tuning thereof.

11. In a radio signaling system, a high frequency alternator, a plurality of radiating circuits, a pair of bus bars fed by said alternator, coupling means between said bus bars and each of said radiating circuits, at least one of said coupling means comprising a circuit including a direct current generator in series with a plurality of transformer secondary windings, and a pair of iron core impedances, a pair of inductances coupled to inductances in series with one of said radiating circuits, a connection between the positive terminal of said direct current generator and one of said bus bars, an inductance connecting a point between said iron core impendances to the other bus bar, a modulating frequency generator connecting the primary windings of said transformers in series, and means for controlling the output of the direct current generator.

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