PATENT SPECIFICATION

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COMPLETE SPECIFICATION

An Electro-mechanical Frequency Compensating Device for Wireless Transmitting and Receiving Apparatus

We, SOCIETÀ ANONIMA FIMI, of Corso del Littorio 10, Milan, Italy, a body corporate organized under the laws of Italy, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to an electro-mechanical frequency compensating device for wireless transmitting and receiving apparatus combined in one unit, which allows the apparatus to be switched from transmitting to receiving and vice-versa without the necessity of varying the tuning members of the apparatus itself for the purpose of maintaining the working wave unaltered.

The device according to the present invention is intended to be utilized in combined wireless transmitting and receiving apparatus having one single tuning unit which is employed both for the transmission as well as for the reception. It is known that when a change from transmission to reception is made in wireless apparatus of this kind, the functions of the valves and generally also of the other elements constituting the apparatus are changed, so that with this change there occurs a change in the tuning conditions of the oscillating circuit or circuits owing to the fact that two portions of the apparatus are differently tuned. In any event whenever a change over is made from transmission to reception and vice-versa it is necessary to readjust the tuning conditions of the tuning unit and, when receiving, considerable searching is necessary for the answering station, by means of the variable tuning condenser or condensers. Inversely (when transmitting) it is necessary to set the condenser or condensers to another point on the scale corresponding to the wavelength of the previous transmission. These various operations, especially in the case of transmission and reception on short and very short wavelengths present drawbacks and difficulties, and various attempts have been made to eliminate them.

The present invention solves the problem in a satisfactory manner and permits a change from receiving to transmitting and vice-versa, after a check and comparison with the correspondent concerned, by simply depressing or releasing a small lever disposed within easy range of the operator. The compensating device which this operation renders operative is mechanical and acts directly upon the tuning member without altering the electrical connections.

According to the present invention there is disposed in series or in parallel with the condenser of one or more circuits, a compensating vernier condenser, driven simultaneously with the member effecting the change over from working as a transmitter to working as a receiver and vice-versa and adapted to compensate by electro-mechanical means and without altering the connections in any way, the variations in tuning which occur owing to the change over.

The invention will now be described with reference to the annexed drawing wherein:

Figure 1 is a wiring diagram of the apparatus according to the invention;

Figure 2 is a perspective view of the tuning condenser as modified according to the invention;

Figure 3 illustrates the same device in plan view, diagrammatically and partially broken away.

In Figure 1 the aerial coupling is indicated by the numerals 1 and 2, as the transmitting and receiving is effected on very short waves said aerial coupling consists of two single suitably spaced turns, if desired, constituting a variable coupling. The microphone 3 is interposed with its two terminals connected to the grids of the double triode valve 4 the internal arrangement of which is symmetrical, the anodes being connected one to each of the ends of the turn of wire located internally of the metallic tubular member 5, the extreme ends of the said member being connected one to each of the grids of the aforesaid valve. Between the extremities of the metallic tubular member 5 there is disposed the tuning condenser 6, 6^1, the construction of which

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constitutes one of the most important features of the present invention.

Said condenser is provided with two stators and two rotors in order to produce mechanical auto-compensation. The rotors are mounted on the same driving shaft and are earthed. In parallel with said condenser there are provided one or more fixed trimming plates 7, 7¹ which are electrically connected to the stators, and one or more movable trimming plates 8 which are connected electrically to the rotor. Having now fixed the electric connections from the point of view of a wiring diagram, an examination will now be made of Figures 2 and 3 of the drawing.

In these Figures identical reference numerals are used to indicate identical component parts.

Above the normal variable condenser plates there is provided a kind of vernier condenser 7, 7¹, 8 constituting the compensating device according to the present invention. The said vernier is driven from without by means of a small knob attached to a small spindle arranged internally of the main spindle driving the rotors.

Upon this spindle there is mounted at the opposite end a resiliently engaging small tube 9 which is integral with a small member 10 hinged to a plate 11 which may be displaced under the action of an actuating lever 12 hinged at a convenient point 13 and possessing a knob 14 extending outside the apparatus. A pull-off spring 15 is disposed between a small nut 16 of the lever and a fixed point of the chassis. It will be seen from the above description that the movable vanes of the compensating device may be set to the appropriate position by means of a small external knob without altering the position of the square lever 10, the resilient clamp of which will slide upon the spindle as the friction is not sufficient to overcome the tension of the pull-off spring 15, and that furthermore the said movable vanes may be displaced through a definite angle with respect to any chosen initial position by actuating the control lever 12.

The compensating vernier is constituted in the manner illustrated in Figure 3; the fixed vanes have approximately triangular shape and are symmetrical with respect to the axis and with respect to a plane passing through them, and the movable vanes are correspondingly constituted in such a manner as to cover an appropriate portion of the fixed vanes.

From the foregoing remarks it will be evident how, once a suitable initial position has been chosen for the movable vanes of the compensating vernier, the displacement of the control lever 12 is able to compensate a possible variation in the tuning, by varying the capacity in the appropriate direction.

When the vanes 7 and 7¹ are so covered that the movable vanes 8 of the compensating vernier possess an equivalent uncovered area, and the displacement effected by means of the lever 12 is equivalent to a rotation through 90°, the working of the entire device will be as follows:

Assuming it is desired to transmit and to receive without the necessity of altering the tuning at each transition, a station which for the sake of convenience may be called A is called by another station which for the same reason may be called B, the announcer indicating operation on the same receiving and transmitting wavelengths (iso-waves operation) for example, and for the sake of convenience to a graduation corresponding to an integer, for example 20°. On commencing operations the operators at both stations actuate the small knob of the small spindle of the compensating device and displace it in such a manner as to produce minimum capacity. The station A who is called then proceeds to change to reception whilst station B changes to transmission for a certain period, the tuning unit remaining in the same position as when the station was listening.

Station A must in order to receive station B, alter the tuning setting. Let it be assumed that for the purpose of receiving station B, station A must set the tuning condenser to 16°; having thus ascertained the amount of variation, station A rotates the tuning condenser in the direction of its initial setting but only for one quarter of the aforesaid variation, in the present case the condenser is therefore returned to 17° and the reception sharply tuned by rotating the small knob of the compensating device clockwise.

When this has been done station A switches from reception to transmission and station B from transmission to reception.

Let it be assumed that for the purpose of receiving station A, station B must readjust the tuning by 3°. The tuning condenser is subsequently rotated in the opposite direction not for a quarter of the variation but for half the amount thereof, that is to say 1.5°, fine tuning being then effected by means of the small knob of the compensating device. When this has been done, the two stations, may switch from transmission to reception without touching the tuning members by merely actuating, for the purpose of switching over, the lever 12 which will cause the compensating device to be displaced by a

well defined and pre-determined angle. As will be seen, the operation which is effected by actuating the small knob of the compensating device is merely a compensation of the variations which occur in the apparatus when a change is made from transmission to reception and vice-versa. It should be noted however that this compensating is effected by means of a practical and rapid and above all a positive drive. The lever 12 is retained in the appropriate extreme positions by means of suitable mechanical stops and during its displacement it may also cause the degree of aerial inductive coupling to be varied, if necessary and to the desired extent by means of a system of articulated levers, not shown, and/or act as a switch for connecting or disconnecting other electric contacts.

The device according to the present invention is naturally susceptible to innumerable constructional variants either for the purpose of adapting it to various types of circuit or in view of the various mechanical solutions of which it admits. Any such modification shall be understood to enter into the conception of the present invention.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A combined wireless transmitting and receiving apparatus having one or more tuned circuits, characterized in that there is disposed in series or in parallel with the condenser of one or more circuits, a compensating vernier condenser, driven simultaneously with the member effecting the change over from working as a transmitter to working as a receiver and vice-versa and adapted to compensate, by electro-mechanical means and without altering the connections in any way, the variations in tuning which occur owing to the said change over.

2. An apparatus according to claim 1, characterized in that the compensating vernier or verniers is/are adapted to be driven separately or conjointly and in a gradual manner from outside, being moreover provided with means also driven from outside and adapted to displace said compensating verniers through a predetermined angle starting from any position to which said verniers may have been set initially and to return said verniers to the initial positions, said means being adapted to act in unison with the "transmission-reception" commutator or independently thereof.

3. An apparatus as claimed in claim 1 or claim 2, characterized in that the movable vanes of the compensating verniers are disposed upon a thin spindle arranged axially concentric with and internally of the normal condenser spindle, from one end of which said thin spindle extends to the outside of the apparatus and is there adapted to be driven with a gradual movement, and from the other end of which it extends inwardly and is provided on the inner end with a resilient collar adapted to slide upon the spindle during the gradual rotary movement imparted thereto from without and to cause the said spindle to rotate through a pre-determined angle when by any desired means a rotary motion is imparted to said resilient collar.

4. An apparatus as claimed in claim 3, characterized in that the resilient collar disposed upon the thin spindle within the apparatus is integral with a small member connected to a small blade which in turn is hinged to a lever extending to the outside of the apparatus, the whole assembly being adapted to be displaced against the opposing tension of a spring and locked in the desired positions by suitable mechanical stops.

5. An apparatus as claimed in claim 4, characterized in that the control lever of the compensating device may be utilized to vary simultaneously the degree of aerial coupling by means of a system of articulated levers and/or to connect or disconnect simultaneously one or more electrical connections.

6. An apparatus as claimed in claim 1, characterized in that the variable tuning condenser or condensers are of the self-compensated type and possess two rotors and two stators, the vanes of the compensating device being double-ended and corresponding to each of the electrostatic systems.

7. A method of operation on the same receiving and transmitting wave-lengths (iso-waves operation) in combined transmitting and receiving wireless apparatus, characterized in that the operators at the two communicating stations each tunes the apparatus of the station to transmission and to reception of the other station, and having recorded the difference in the degrees of the scale between transmitting and receiving conditions, partially compensate said difference by displacing the tuning member, subsequently tuning in the other station by means of the compensating devices which were all initially in a pre-determined position, the angular displacement of the compensating devices, which has a certain well-defined value, being obtained subsequently by actuating a mechanical compensating device allowing a change over to be effected from

transmission to reception without altering the tuning members.

8. The improved electro-mechanical frequency compensating device for wireless transmitting and receiving apparatus substantially as hereinbefore described with reference to the accompanying drawings.

Dated this 20th day of January, 1939.

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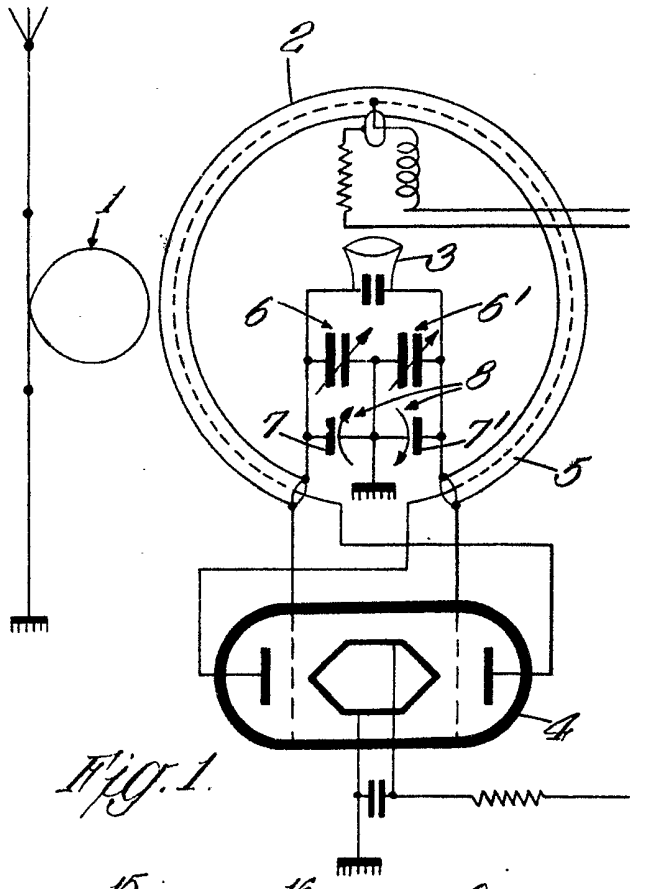

Fig. 1.

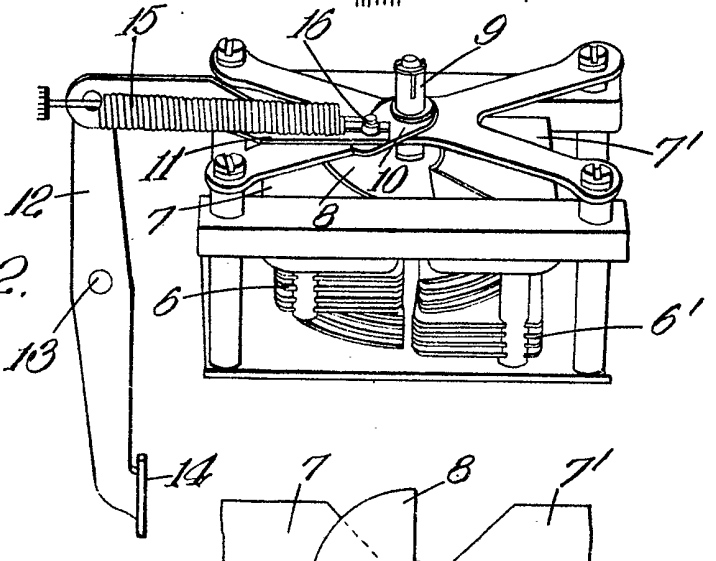

Fig. 2.

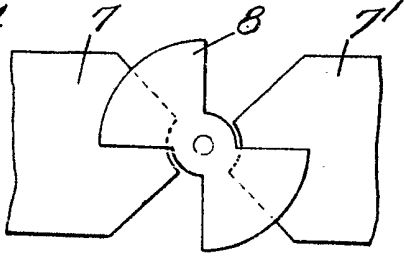

Fig. 3.

Malby & Sons, Photo-Lith