

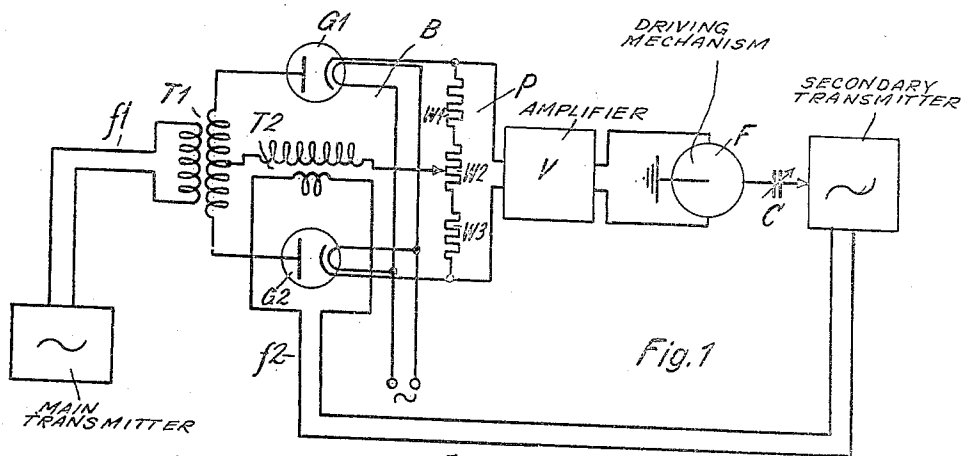
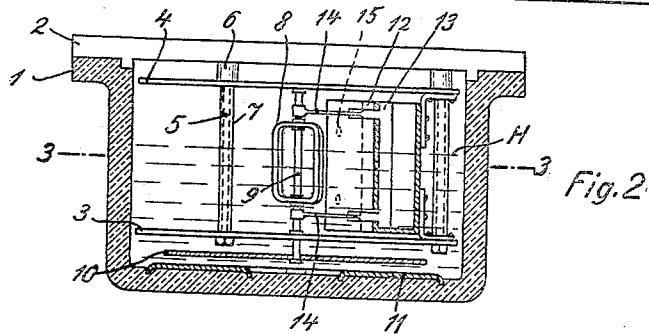
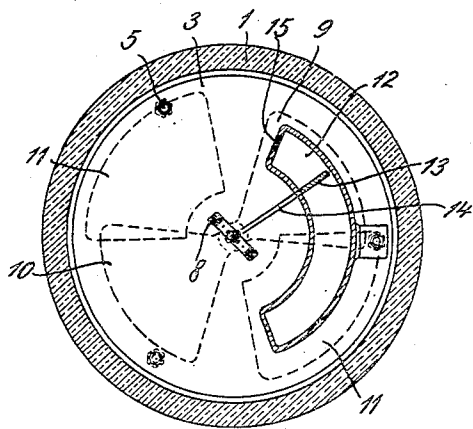
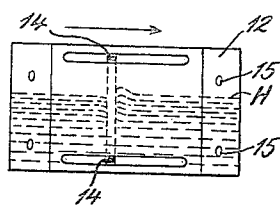
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COMMON WAVE RADIO TRANSMITTER SYSTEM

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COMMON WAVE RADIO TRANSMITTER
SYSTEM

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7 Claims. (Cl. 250—36)

The present application is a continuation in part of a copending application, Serial No. 84,436, filed June 10, 1936, in the names of Felix Gerth and Erich Schulze-Herringen, for "Common wave transmitter systems."

The present invention relates to common wave radio transmitter systems, and more specifically to improvements in the regulation means adapted to supervise the frequency conditions between the oscillations emitted by the main transmitter and the secondary transmitter or transmitters of such systems.

It is well known in common or single wave radio transmitting systems to replace directly controlled secondary transmitters by self-excited secondary transmitters and to provide frequency or phase dependent means for supervising the coincidence between these transmitters and the main transmitter. For this purpose a particular frequency is derived from the main transmitter and another frequency from the secondary transmitter or transmitters, these frequencies being applied to a regulating device which responds to changes with respect to the phase relation between these frequencies and which effects frequency regulation of the secondary transmitter or transmitters when the coincidence between these frequencies is unbalanced. A bridge circuit, for instance, may be used for the purpose of comparison between the frequencies, and the voltages or currents derived from this bridge may be utilized for actuating the secondary transmitter controlling device, e. g. by adjusting a variable condenser.

The regulating device according to the present invention is influenced by an additional highly non-aperiodic damping and operates without biasing force. The expression non-aperiodic damping relates in this case to a particular restoring force set up during the momentary presence of a regulating current. This force tends to restore the regulating device to some particular position when the regulating current decreases. However, when the regulating current persists over longer periods, the device remains in its end position. It has been found that common or single wave radio transmitter systems inevitably require such restoring force expedients if reliable operation is desired.

The invention will be more readily understood from the following description taken in conjunction with the accompanying drawing, in which

Fig. 1 is a wiring diagram of one embodiment according to the invention, Fig. 2 is a cross section through the regulating device indicated at

F in Fig. 1, Fig. 3 is a section on the line 3—3 of Fig. 2, while Fig. 4 illustrates the function of the device shown in Figs. 2 and 3.

The arrangement shown in Fig. 1 operates as follows: one frequency f_1 from the main transmitter and a further frequency f_2 from the secondary transmitter are both impressed upon a bridge circuit B. These frequencies may be high frequencies derived from the main and secondary transmitter frequencies by frequency multiplication or frequency division. The bridge circuit comprises the rectifying tubes G1 and G2 and three resistances W1, W2 and W3 constituting a potentiometer P. As long as the alternating voltages applied through the transformers T1 and T2 are 90 degrees out of phase, no voltage drop is set up across the potentiometer P, but as soon as this quadrature phase angle is changed in any way, a current is produced. This current is impressed upon an amplifier V, the output circuit of which is connected to a regulating device F which e. g. creates frequency regulation by adjusting a variable condenser C shunted across the quartz crystal of the secondary transmitter oscillatory stage or across the condenser of the oscillatory circuit so as to influence the frequency thereof.

One vertical and one horizontal cross section through the novel regulating device are shown in Figs. 2 and 3, respectively. A receptacle 1 which may consist of a ceramic material is closed by a cover 2 which carries the supporting structure for the various members of the frequency regulating device. The supporting structure comprises a base plate or disc 3, an upper plate or disc 4 and a number of rods 5 extending through said plates. Suitable spacing members 6 and 7, such as small tubes or the like, are placed between the cover 2 and the disc 4 and between this disc and the base plate 3, respectively. The regulating device itself consists of a rotary coil 8 in cooperation with a magnet (not shown). The coil is adapted to receive the current produced in the potentiometer P of Fig. 1. This coil is subjected to a rotational movement in response to said current in a similar manner as in connection with normal metering devices and the resulting movement of the coil is adapted to adjust a variable condenser C shown in Fig. 1. The equivalent of this condenser is shown in Figs. 2 and 3 and comprises the movable plates or vanes 10 fixedly attached to the spindle 9 of the coil 8, and the stationary plates 11 fixed in the bottom of the receptacle 1. The regulating motion between the movable and the fixed condenser plates introduces the capacity change utilized for the frequency adjustment.

The essential portion of this arrangement is the damping device which comprises an arcuate box-shaped container 12 fixed in any manner, e. g. on one of the rods 5. A vane 13 carried by two supporting rods 14 fixedly attached to the spindle 8 is adapted to be moved in the arcuate container 12. The receptacle 1 is filled with oil to a level shown at H. The end walls of the container 12 are provided with holes 15 so that the oil level is the same within this container as in the receptacle. This oil level is so chosen that the vane 13 is partially immersed in the oil while its upper end projects above the oil surface.

The operation of the device will be more readily understood in conjunction with the explanatory Fig. 4. Assuming that a current flow in the coil 8 tends to move this coil and hence, the vane 13 in a direction indicated by the arrow, the oil will be dammed up by the vane on the side toward which this movement is directed since merely a slow escape of the oil from the container is permitted through the holes 15. After a finished motion of regulation, that is, when the current flow through the coil 8 decays, the vane remains without biasing force so that the oil which is dammed up on this side of the vane exerts a certain force with the tendency to reset the regulating device by a slight amount where it comes to rest. This restoring force may be varied by a suitable choice of the height of the oil level within the receptacle. In cases of a slow movement of regulation there will be no or merely an inconsiderable restoring effect.

Investigations have proven that the above described device involves an extraordinarily reliable regulating effect with the result that a considerably improved frequency constancy can be obtained than heretofore possible by the aid of the known aperiodic regulating devices.

What is claimed is:

1. A common wave radio transmitter system comprising a main source of oscillations, a secondary source of oscillations, a phase sensitive equipment adapted to respond to differences in phase between the oscillations of said sources, a regulating device controlled by said phase sensitive equipment and adapted to control the frequency of said secondary source, said regulating device operating without biasing force and means for exerting upon said regulating device a restoring force with a highly non-aperiodic damping.

2. A common wave radio transmitter system comprising a main source of oscillations, a secondary source of oscillations, a phase sensitive equipment adapted to respond to differences in phase between the oscillations of said sources, a movable regulating device controlled by said phase sensitive equipment and adapted to control the frequency of said secondary source, a liquid-damping system connected to said device to modify the motion thereof and containing a fluid, and including means for causing said fluid to dam up during the regulation action and at the conclusion thereof to exert some restoring

force upon said device by virtue of its inherent tendency to recede so as to provide a highly non-aperiodic damping.

3. A common wave radio transmitter system as defined in claim 2, in which said regulating device comprises a current responsive meter mechanism having a rotatable portion, and in which said liquid-damping system comprises a partially oil-filled receptacle, an arcuate container provided with openings and arranged in said receptacle so as to dip in the oil therein, and a vane movably provided in said container and partially dipping into the oil in said container, said vane being fixedly attached to said rotatable portion of said meter mechanism.

4. A common wave radio transmitter system comprising a main source of oscillations, a secondary source of oscillations, a phase sensitive equipment adapted to respond to differences in phase between the oscillations of said sources, a current-responsive meter mechanism having a movable portion controlled by said phase sensitive equipment, a variable condenser directly connected to said movable portion for variation thereby, connections between said condenser and said secondary transmitter for varying the frequency of said secondary transmitter in response to variation in said condenser, and means for damping the movement of said movable portion and exerting a temporary restoring force in response to movement thereof.

5. A common wave radio transmitter system as defined in claim 1, in which said regulating device comprises a meter mechanism having a movable portion, a receptacle of ceramic material encompassing said mechanism, a plate fixedly mounted in the interior of said receptacle, and a movable plate carried by said movable portion adjacent said fixed plate to constitute therewith a variable condenser said condenser being adapted to control the frequency of said secondary source.

6. A common wave radio transmitter system as defined in claim 1, wherein said means for exerting a damping comprises a receptacle for containing a liquid at varying levels and movable means shaped and positioned to cooperate effectively with said liquid at any of said levels for exerting damping and restorational forces whose magnitude depends upon the level of said liquid.

7. A common wave transmitter system comprising a first source of oscillation, a second source of oscillation, phase sensitive means for producing a current responsive to a departure of the phase relation of the oscillations of said two sources from a predetermined phase angle, movable means for adjusting the frequency of said second source, said movable means being mechanically unbiased so as to be stable in any position, means for actuating said movable means in response to said current from said phase sensitive means, and non-aperiodic damping means for exerting a resetting force upon said movable means responsive to movement thereof.

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