Aug. 11, 1931. L. A. GEBHARD 1,818,316

INDUCTANCE SYSTEM

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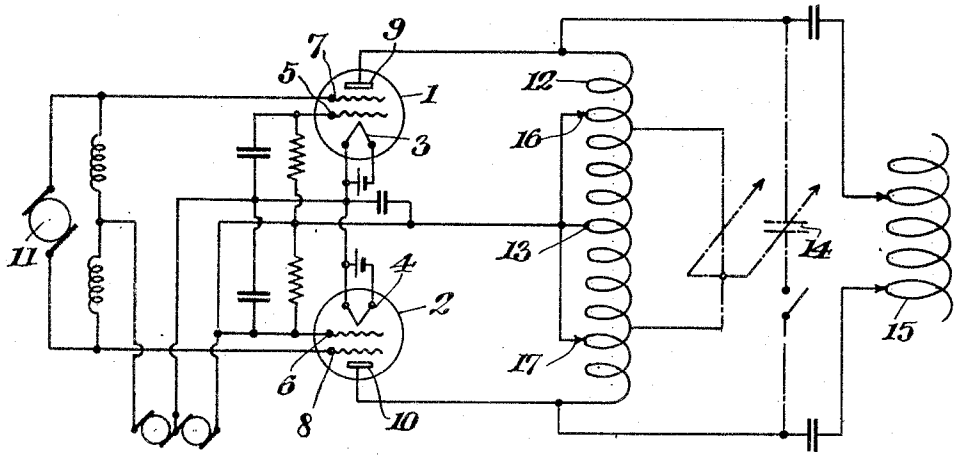


Fig. 1.

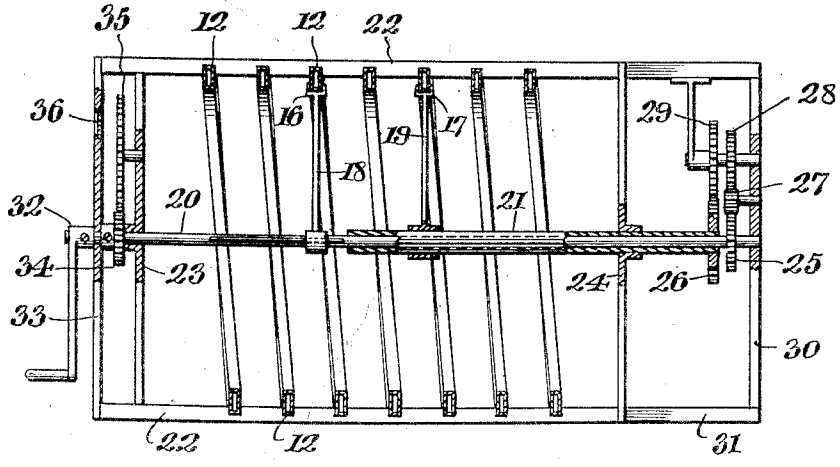


Fig. 2.

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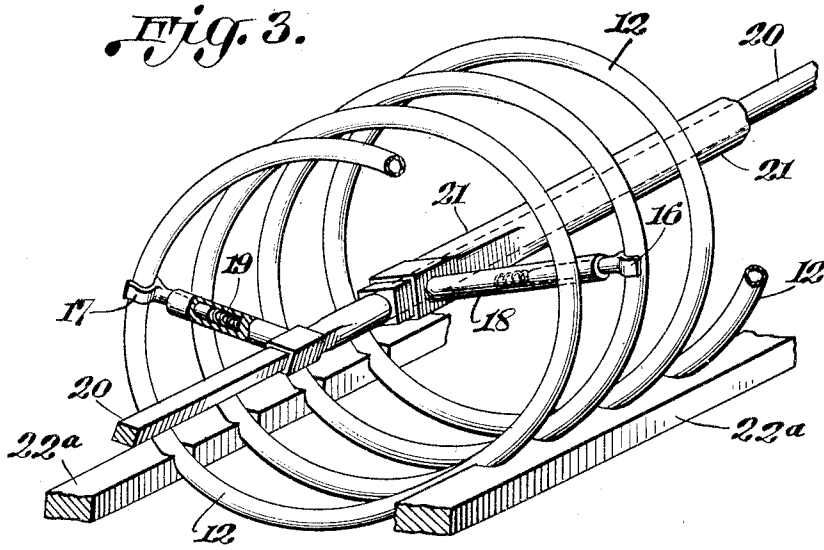
by Harold Dodd
his Attorney

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Fig. 3.



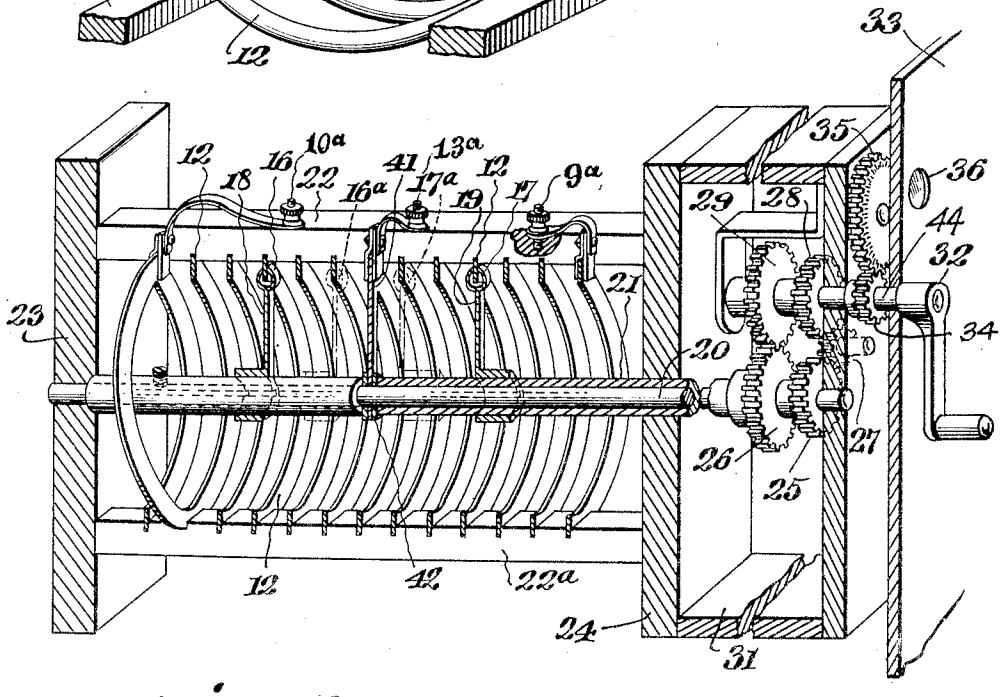


Fig. 4.

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UNITED STATES PATENT OFFICE

LOUIS A. GEBHARD, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO WIRED RADIO, INC., OF NEW YORK, N. Y., A CORPORATION OF DELAWARE

INDUCTANCE SYSTEM

Application filed December 22, 1928. Serial No. 327,984.

My invention relates to inductance systems in general and more specifically to inductances employed in high frequency transmitters.

An object of my invention is to provide an adjustable inductance whereby adjustments of the frequency characteristics may be easily and readily accomplished.

Another object of my invention is to provide an inductance particularly adapted to be employed in combination with balanced thermionic tube circuits.

Still another object of my invention is to provide an inductance system adapted to be employed in combination with balanced thermionic tube circuits whereby adjustments of the frequency characteristics do not destroy the symmetrical or balanced condition of the associated circuits.

Other and further objects of my invention reside in the structural features of the inductance system of my invention, a better understanding of which can be had from the specification following and by referring to the accompanying drawings wherein:

Figure 1 is a schematic circuit diagram showing the inductance system of my invention and Figs. 2, 3 and 4 are diagrammatic representations showing structural features of my invention.

In thermionic tube circuits wherein the several thermionic tubes are connected in electrically balanced arrangements it is essential that this balanced arrangement be maintained irrespective of adjustments in the frequency characteristics of the circuits. Fig. 1 is a schematic circuit diagram showing such a balanced circuit arrangement. Thermionic tubes 1 and 2 have cathodes 3 and 4, control electrodes 5 and 6, shielding anode electrodes 7 and 8 and anodes 9 and 10 respectively. Shielding anode electrodes 7 and 8 are connected with source of energy 11. Source of energy 11 may be connected with electrodes 5 and 6 as is ordinarily the practice when three electrode thermionic tubes are employed. The output circuits of thermionic tubes 1 and 2 comprise inductance 12, the common cathode connection from the tubes established at or near the electrical center 13 of inductance 12. A capacity 14 is usually connected in parallel with inductance 12 although the capacity of the respective turns comprising inductance 12 usually constitutes sufficient capacity. The capacity may be simultaneously varied with adjustments in the frequency characteristics of inductance 12. Inductance 12 may be in electrical relation with any suitable load circuit 15. Load circuit 15 may comprise thermionic tube amplifier circuits, a space radio radiating system or a wired radio system. Associated with and electrically connected to the electrical center connection 13, are provided contact members 16 and 17. These members may be adjustably positioned along the length of inductance 12 thereby shunting the necessary portion of the inductance to obtain the desired frequency characteristics.

Assuming that the frequency characteristics of thermionic tubes 1 and 2 correspond, connectors 16 and 17 would be spaced equidistant from electrical center connection 13. Adjustments to obtain other frequency characteristics would be obtained and the symmetry or balance retained by causing contact members 16 and 17 to be moved in opposite directions or away from contact 13. The method employed to accomplish this is better understood by referring to Figs. 2, 3 and 4.

Fig. 2 shows a side elevation and the structural features of the inductance system of my invention. The inductance proper, comprises suitable metallic ribbon or tubing 12 wound in the form of a helix, and supported by insulating members 22. Insulating members 22 are supported by end members 23 and 24. Contact members 16 and 17 are secured to metallic arms 18 and 19 respectively and bear against the turns of inductance 12. Arms 18 and 19 are associated with shafts 20 and 21 respectively. Shaft 21 comprises a length of tubing surrounding shaft 20 and movable in respect thereto. Shaft 20 is supported by a suitable bearing in end member 23. Shaft 21 is supported by a suitable bearing in end member 24. The ends of shafts 20 and 21 are provided with gears 25 and 26 respectively which are secured

thereto. Gear 25 meshes with gear 27 and the latter with gear 28. Gear 28 is positioned on a common shaft which also supports gear 29. Gear 29 meshes with gear 26. A suitable end plate 30 provided with the necessary bearings, may be integral with end member 24 or supported therefrom by suitable supporting members 31. A control member 32 is secured to one end of shaft 20. The panel 33 of the transmitter may be provided with a window 36 by means of which the operator may observe the indicated position of the contact members.

The relative length of the inductance shunted may be determined by observing the reading on dial 35. Dial 35 may be provided with suitable gear mechanism 34 and the latter mechanically connected for movement corresponding to the rotary movement of shaft 20. The rotation of control member 32 in a clockwise direction causes gear 25 to move in a clockwise direction, gear 27 to move in a counter-clockwise direction, gears 28 and 29 in a clockwise direction and gear 26 to move in a counter-clockwise direction. Since arms 18 and 19 are secured to shafts 20 and 21 respectively and must rotate therewith, contact members 16 and 17 are rotated around the turns of inductance 12 in opposite directions. Inductance 12, being wound in a helical manner causes contact members 16 and 17 to move away from each other. Contact members 16 and 17 are electrically connected and hence the separation therebetween constitutes the portion of the inductance shunted out of the circuit.

Fig. 3 of the accompanying drawings shows an end elevational view of the inductance system of my invention. The tubing or ribbon 12 is supported by members 22—22*a*. Contact members 16 and 17 may consist of spring metallic material. Arm members 18 and 19 are rotatable with shafts 20 and 21 respectively and movable horizontally along the lengths thereof. Fig. 4 shows a modification of the inductance system of my invention. Reference characters employed in this illustration correspond to those of Figs. 1, 2 and 3. Control member 32 is here shown secured to shaft 44. Contact members 16 and 17 are associated with metallic arm members 18 and 19 respectively. Metallic arm members 18 and 19 are mounted on shafts 20 and 21 respectively. Shafts 20 and 21 are common to contact washer 42 which is electrically connected to the electrical center of inductance 12 by connecting member 41.

Gear 25 is secured to shaft 20 and gear 26 is secured on shaft 21. Gear 25 engages with gear 27 and the latter engages with gear 28. Gear 26 engages with gear 29. Gears 28 and 29 are secured on a common shaft 44 controllable by control member 32. Gear 34 is secured to shaft 44 and is mechanically connected to indicating dial 35. Dial 35 may be suitably calibrated and positioned in such a manner as to be visible through window 36 inserted in panel 33.

In Fig. 4, assuming that a balanced thermionic tube system is connected with inductance 12 similar to the schematic circuit arrangement shown in Fig. 1, the anodes 9 and 10 of thermionic tubes 1 and 2 would be connected with terminals 9*a* and 10*a* of inductance 12. The electrical center of inductance 12 connected to terminal 13*a*, would be connected to the common cathode circuit of the thermionic tubes. Thus the portion of inductance 12 between terminals 13*a* and 9*a* would constitute the output circuit of thermionic tube 1. The portion of inductance 12 between terminals 13*a* and 10*a* would constitute the output circuit of thermionic tube 2. Since terminal 13*a* is electrically connected to shafts 20 and 21 by means of connecting members 41—42 and contact members 16 and 17 are electrically connected to shafts 20 and 21 respectively, it follows that the effective inductance in the output circuit associated with terminals 13*a*—9*a* comprises that portion of the inductance included between contact member 17 and terminal 9*a*. Likewise the effective inductance in the output circuit associated with terminals 13*a* and 10*a* comprises that portion of the inductance included between contact member 16 and terminal 10*a*.

A rotary motion transmitted to control member 32 causes contact members 16 and 17 to move toward or away from terminal 13*a* thereby causing the effective inductance included between terminals 13*a* and 9*a* to simultaneously increase or decrease with the increase or decrease of the effective inductance included between terminals 13*a* and 10*a*. A second position of contact members 16 and 17 is represented by dotted lines 16*a* and 17*a* respectively. It is obvious that a balanced circuit is obtained irrespective of changes in the frequency characteristics desired.

I realize that many modifications of the inductance system of my invention are possible without departing from the spirit of my invention. Many modifications of my invention include gear and mechanical arrangements other than those shown in the accompanying drawings. It is to be understood that my invention shall not be limited to the foregoing specification or to the accompanying drawings but only as defined in the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States of America is as follows:

1. An inductance system comprising in combination a helix, a plurality of contact elements associated with said helix, a connection from the electrical center of said helix to said contacts and means for simul-

taneously moving said contact elements in opposite directions and equi-distant from said electrical center.

2. In an inductance system the combination of a helix, contact members therefor, said members being electrically connected by a member having a substantially low inductance, rotatable means for shifting said brush contact members simultaneously along the lengths of said helix at substantially equal rates and in opposite directions with respect to a predetermined point in said helix.

3. An inductance system comprising in combination a helix, a plurality of contacts associated therewith and electrically connected by a low inductance member, rotatable means for driving said contacts simultaneously movable to positions along said helix in opposite directions and equi-distant from the original positions thereof.

4. An inductance system comprising in combination a helix, a plurality of movable contactors for said helix, an electrical connection from the electrical center of said helix to said contactors and means for simultaneously moving said contactors in opposite directions and equi-distant from said electrical center.

5. In an inductance system the combination of a helix, a connection to the electrical center of said helix and means for simultaneously short circuiting an equivalent number of turns from said electrical center toward the extremities of said helix.

6. An inductance system comprising in combination a helix adjustable connecting members engaging the turns of said helix for changing the effective inductance thereof, said connections being disposed on opposite sides of the electrical center of said inductance, and means for sliding said connections in opposite directions for simultaneously shunting equal values of inductance from said helix said slidable connections being connected to the electrical center of said helix, whereby the electrical equilibrium of said inductance system is maintained as said slidable connections are moved.

7. An inductance system comprising in combination a helix, a pair of slidable contactors on said helix disposed symmetrically with reference to the electrical center thereof, circuits connecting each of said contactors to the electrical center of said helix, and means for simultaneously moving each of said contactors the same distance along said helix but in opposite directions, whereby said contactors are at all times equidistant from the electrical center of said helix and the electrical equilibrium of said inductance system is maintained.

8. An inductance system comprising an inductance element, a pair of contactors disposed in said inductance element symmetrically with reference to the electrical center thereof, circuits connecting each of said contactors to the electrical center of said inductance element, and means for simultaneously moving each of said contactors the same distance along said inductance element but in opposite directions, whereby said contactors are at all times equidistant from the electrical center of said inductance element and the electrical equilibrium of said inductance system is maintained.

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