

Nov. 28, 1933.

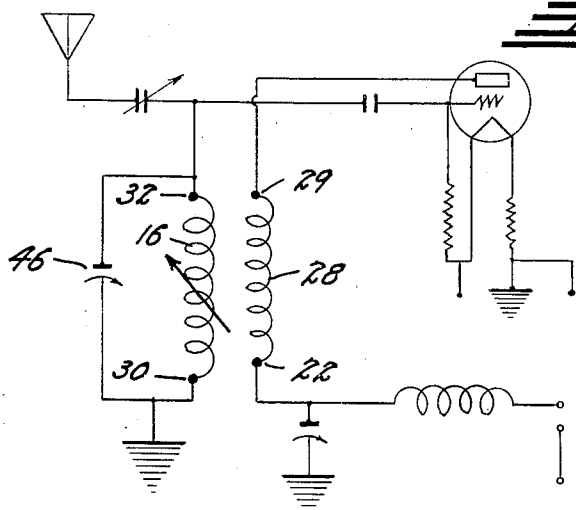
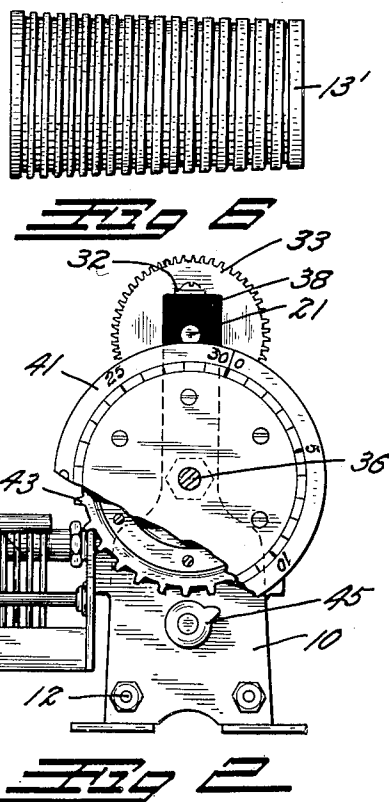
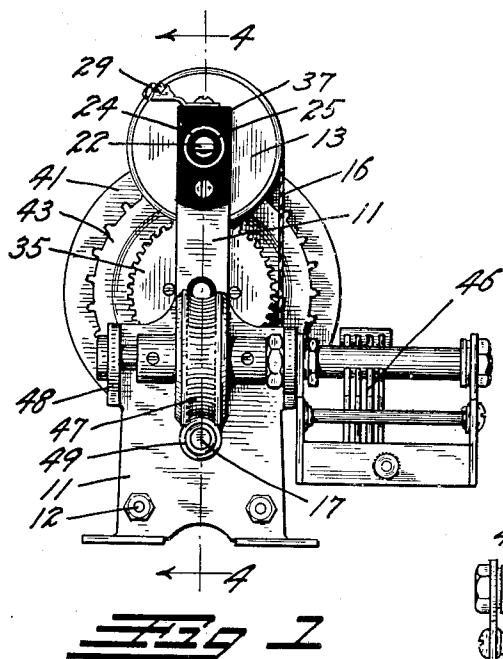
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1,936,671

SHORT WAVE TUNING DEVICE

Filed Jan. 3, 1931

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

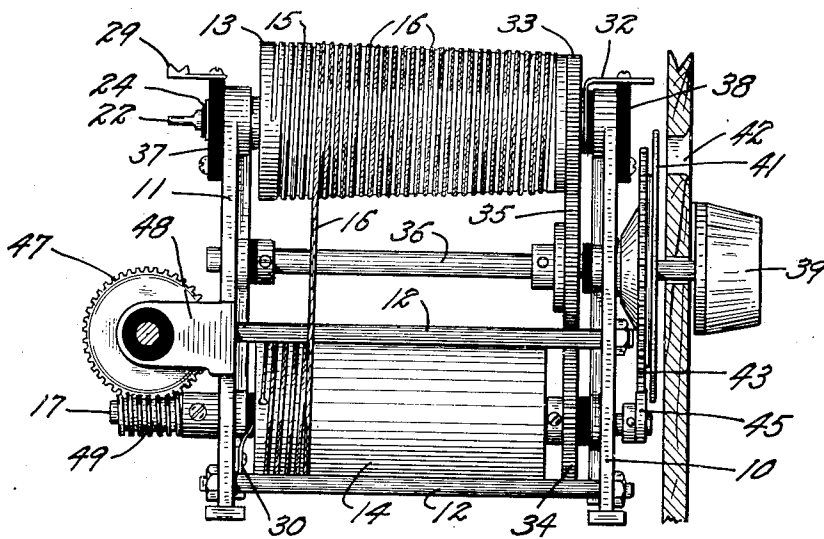


Fig. 3

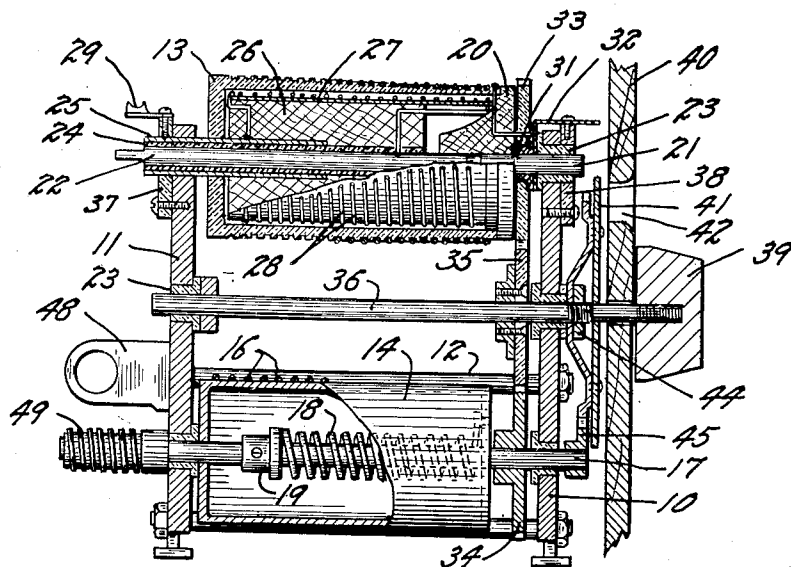


Fig. 4

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SHORT WAVE TUNING DEVICE

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3 Claims. (Cl. 171-242)

This invention relates to a variable inductance device more particularly designed for the reception of short Hertzian waves. Heretofore it has been attempted to tune a short wave receiving set by means of a variety of changeable coils of varying inductance. This has not been satisfactory as it is only an approximate method for only rarely do any of the coils provide the exact inductance for the desired wave length.

The principal object of this invention is to provide a tuning coil for short wave reception, the turns of which, can be added to or subtracted from so as to minutely adjust the inductance to the desired wave length.

Another object of the invention is to mechanically combine an adjustable-length tuning coil with a variable condenser so that the correct inductance-to-capacity ratio will be automatically maintained at all settings of the coil.

Still another object of the invention is to provide a tuning coil of adjustable length, the turns of which, will be shorter as the low inductance extremity is approached so as to provide means whereby a minute adjustment of the inductance can be obtained at very short wave lengths and a rapid adjustment at comparatively long wave lengths. This construction provides a greater number of coils adjacent the grid extremity so that it will oscillate at exceedingly high frequencies and so that it will eliminate bunching or crowding of the high frequency stations at the grid extremity.

A further object of the invention is to combine a feed back coil with a variable length grid or tuning coil so that the feed back effect will be automatically proportioned according to the length of the grid coil.

A further object of the invention is to so construct the variable inductance device that all of the active coils will be maintained in spaced relation from each other so as to maintain a perfect balance throughout the entire range of adjustment without coil turn contacts which would set up objectionable noises in the receiver.

A still further object is to build a tuning coil in which the turns will be more widely separated as the grid end is approached so as to give a wider separation at the crowded positions.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention reference is had to the accompanying drawings which form a part hereof. Like numerals refer to like parts in all views of the drawings and throughout the description.

In the drawings:

Fig. 1 is a rear end view of my improved vari-

able inductance coil combined with a condenser.

Fig. 2 is a front end view thereof.

Fig. 3 is a side elevation thereof, with the condenser eliminated.

Fig. 4 is a vertical, longitudinal section there-through taken on the line 4-4, Fig. 1.

Fig. 5 is a circuit diagram illustrating the incorporation of the variable inductance coil in a receiving circuit.

Fig. 6 is a detail view illustrating an alternate form of the insulated coil spool.

The invention comprises a front frame 10 and a rear frame 11 joined by means of spacer bolts 12. Between the frames 10 and 11 are journaled an upper insulated spool 13 and a lower metallic spool 14. The insulated spool is preferably slightly conical and is provided with a spiral external groove 15 adapted to receive the turns of coils of a bare flexible wire 16.

One extremity of the wire 16 is soldered or otherwise secured to one extremity of the metallic spool 14 so that it may coil thereabout. The metallic spool 14 is free to rotate about a lower shaft 17, but is constantly urged in one direction about the shaft 17 by means of a coil spring 18 so as to maintain the wire 16 taut at all times.

One extremity of the coil spring 18 may be secured to one extremity of the spool 14. The other extremity is secured to the shaft 17 by means of a collar 19 or other suitable fastening device. The insulated spool 13 is hollow and cup-shaped, the open end of the cup being closed by means of a plug 20 of insulating material. The insulated spool 13 is supported on two stub shafts 21 and 22. The shaft 21 is affixed in, and projects from, the plug 20 and rotates in a bearing bushing 23 in the front frame 10. The shaft 22 also projects into the plug 20 but the plug rotates thereabout so that the shaft 22 remains stationary. An insulated sleeve 24 surrounds the shaft 22 and is in turn surrounded by a relatively shorter metallic sleeve 25. All of these sleeves and the shaft 22 are rigidly carried in the rear frame 11.

A stationary core block 26 is carried by the shaft 22. The core block 26 supports an inner coil cylinder 27 upon which is wound a feed-back coil 28. One extremity of the feed-back coil 28 is connected to the metallic sleeve 25 so that the current is carried to the exterior and to a circuit connector 29. The other extremity of the feed-back coil 28 is connected to the shaft 22. Thus the extremity of the shaft 22 and the connector 29 form the terminals of the feed-back coil 28.

The terminals of the variable inductance coil formed by the flexible wire 16 lead from the device as follows: the lower extremity, as before noted, is connected to the metallic spool 14. Current from the cylinder 14 is conducted by means of a brush 30 which is insulated from the rear frame 11 and contacts with the rear end of the

spool 14. The other extremity of the wire 16 is connected to a metallic contact bushing 31 which in turn contacts with a bearing brush 32. Thus, the brush 30 and the bearing brush 32 form the terminals for the variable inductance coil. The connector 29 and the bearing brush 32 are carried upon insulating blocks 37 and 38 mounted upon the rear and front frames 11 and 10, respectively.

The cylinders 13 and 14 are caused to rotate in unison, and in the same direction, by means of an upper insulating gear 33 and a lower metallic gear 34, both of which mesh with an insulating drive gear 35. The drive gear 35 is fixed to a drive shaft 36 journaled in the front and rear frames 10 and 11. The drive shaft 36 may be rotated in any desired manner, such as by means of a tuning knob 39. On the drawings the knob 39 is shown as projecting on the front surface of a panel 40.

The journals for all of the shafts in the front and rear frames are provided with insulated bushings 23 as illustrated. The insulating gears 33 and 35 also prevent stray currents from flowing to the framework and drive mechanism.

It will be noted that as the drive shaft 36 is rotated the flexible wire 16 can be caused to either wind onto the insulating spool 13 or onto the metallic spool 14 so that the active length of the coil or the number of active turns on the spool 13 can be minutely adjusted. The turns upon the metal spool 14 do not cause inductance because they, being of bare wire, contact with the metal surface of the spool so as to eliminate any independent action of the turns.

In order that the operator may know the number of turns upon the insulated spool 13 at all times, an indicating disc 41 is provided, the upper portion of which is visible through a sight opening 42, in the panel 40. The disc 41 is carried on a sheet metal gear 43 which is free to rotate about the drive shaft 36 but is prevented from loose rotation thereon by means of a clamp nut 44. The gear 43 is rotated by means of a single tooth gear 45 which is secured on the extremity of the lower shaft 17. At each revolution of the shaft 17, the gear 43 will be turned one tooth space or one dial indication. Since the rotation of the shaft 45 corresponds to the rotation of the insulating spool 13 the operator can minutely determine the number of turns to a fraction thereof upon this spool.

In order to maintain the proper inductance-to-capacity ratio throughout all positions of the variable coil, a variable condenser 46 is employed. The condenser 46 is driven from a worm gear 47 which is journaled in brackets 48 projecting from the rear frame 11. The worm gear 47 is driven from a worm 49 secured on the rearward extremity of the lower shaft 17.

The condenser 46 can be of any desired, variable design. Its capacity, however, should be adjusted through adjustment of the worm gear 47 and the worm 49, so as to be in the proper ratio at a given setting of the coil. The worm gears are so designed that this ratio will be maintained during the various settings of the coil.

The device may be used in any desired hookup, a typical one being shown in Fig. 5 in which the leads to the condenser 46 are bridged across the extremities of the variable coil formed by the flexible wire 16. In other words the condenser leads are connected to the brush 30 and the bearing brush 32.

By forming the insulating spool 13 with a smaller diameter at the grid extremity as illustrated a greater number of coils are provided at this extremity for a given length of the wire 16. This allows oscillation at very high frequencies when but a comparatively short length of the wire 16 is inactive. It also allows a relatively coarser adjustment of the tuning at this extremity so as to provide a wider separation of the very high frequency stations.

To further assist in the latter separation it has been found desirable to cut the coil groove on the insulated spool 13 with a variable pitch, such as shown in the alternate form of spool illustrated in Fig. 6. This provides a relatively wider separation of the coil turns on the active coil as the grid or high frequency extremity is approached. The spiral grooves in the insulated cylinder also serve to prevent the wire from sliding down the incline of the tapered surface of the cylinder.

While a specific form of the improvement has been described and illustrated herein, it is desired to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:—

1. A spool construction for a variable inductance device comprising: a shaft; a hollow, cup-shaped spool filled concentrically about said shaft and provided with an open end; a plug fitted over said shaft and closing said open end; and a second spool fitted about said shaft and enclosed by said hollow spool and said plug, said plug being fixed to said hollow spool so as to cause the latter to rotate therewith; means for rotating said plug; and means for preventing rotation of said inner spool as said hollow spool rotates.

2. A spool construction for a variable inductance device comprising: a shaft; a hollow, cup-shaped spool filled concentrically about said shaft and provided with an open end; a plug fitted over said shaft and closing said open end; and a second spool fitted about said shaft and enclosed by said hollow spool and said plug, means for rotating said hollow spool; means for preventing said shaft from rotating therewith, said inner spool being secured to said shaft; a metallic sleeve surrounding said shaft but electrically insulated therefrom; and a coil surrounding said inner spool, the terminals of said coil being connected to said shaft and to said metallic sleeve.

3. A variable inductance device comprising: two frame members; a central shaft journaled in said frame members; means for rotating said central shaft; a stationary shaft secured in said frame members parallel to said central shaft; a fixed spool carried by said stationary shaft; a hollow spool arranged to rotate on said stationary shaft about said fixed spool; a rotatable shaft journaled in said frame members parallel to said central shaft; a rotatable spool secured to said rotatable shaft; a first gear secured to said hollow spool; a second gear secured to said rotatable shaft; a central gear secured to said central shaft and arranged to mesh with said first and second gears; a fixed coil on said fixed spool; and a flexible wire arranged to coil from said hollow spool to said rotatable spool.

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