Feb. 9, 1932. L. J. BUTTOLPH 1,844,839

DIAL CONTROL

Filed Nov. 27, 1926

Fig. 1

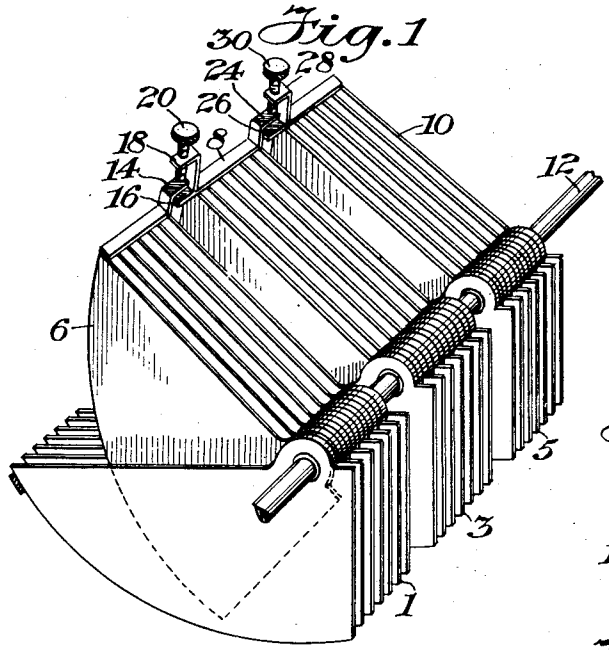


Fig. 4

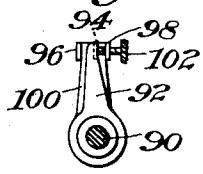


Fig. 2

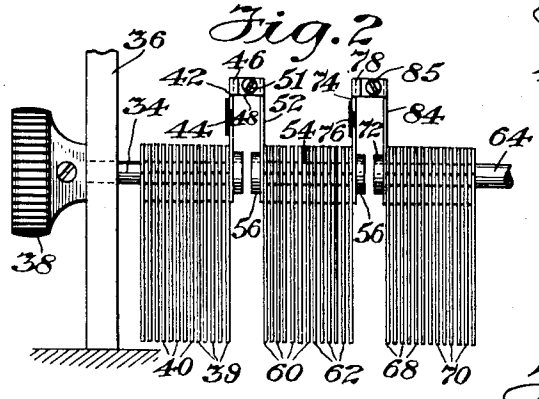


Fig. 3

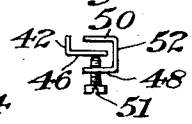


Fig. 5

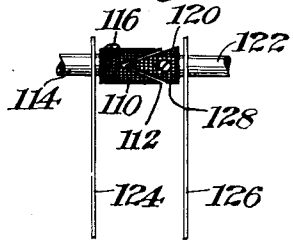
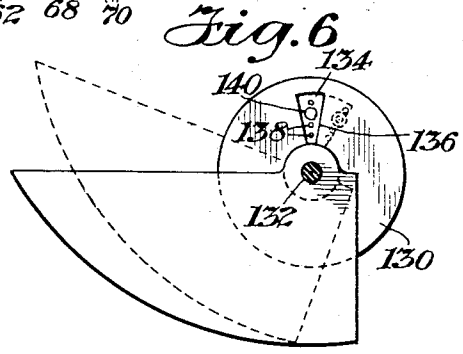


Fig. 6



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UNITED STATES PATENT OFFICE

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DIAL CONTROL

Application filed November 27, 1926. Serial No. 151,212.

The present invention relates to control means for tuned electrical circuits such for example as radio receiving circuits and for tuned circuits not shown and to other similar apparatus. More particularly the invention is applied to the art of controlling tuned circuits in which two or more variable and adjustable elements such as coupling coils and condensers are adjusted and varied simultaneously by a single control element. The invention relates more particularly to means by which two or more variable parts can be moved generally together over wide ranges of variation by a single control means and can also be individually adjusted and varied more accurately by the same control element.

Various objects and advantages of the invention will be obvious from the following particular description of forms of apparatus embodying the invention or from an inspection of the accompanying drawings; and the invention also consists in certain new and useful features of construction and combinations of parts hereinafter set forth and claimed.

In the accompanying drawings there is shown for purposes of illustration the somewhat diagrammatic views of one form of apparatus with certain modifications thereof embodying the invention, in which

Fig. 1 is a perspective view of a plurality of variable condensers having control means for the operation thereof in the manner of the invention.

Fig. 2 is a longitudinal elevation view of an alternative embodiment of the invention,

Fig. 3 is a plan view of details of a coupling member in the device of Figure 2,

Fig. 4 is an elevation view showing details of parts of mechanical coupling elements according to the invention,

Fig. 5 is a longitudinal elevation view of coupling elements for use in a combination of parts involving the invention, and

Fig. 6 is an end elevation view of another alternate form.

In Fig. 1 of the drawings three variable condensers comprising respectively the sets of stator plates 1, 3 and 5 and the sets of rotor plates 6, 8 and 10 are mounted by a suitable means with the centers of rotation of the rotors on a common axis. A shaft 12 supported on suitable bearings not shown passes through each of the rotor plates, the rotor set 6 being fixed with respect to the shaft and the sets 8 and 10 being free to rotate thereon. The rotor set 6 carries a member 14 extending toward said set 8 and the rotor set 8 carries two projections 16 and 18 one on either side of and spaced apart from said member 14 and in position with respect thereto whereby rotational movement of said set 6 in one direction or the other will carry said member 14 against either member 16 or member 18 for the rotational movement of said set 8. The distance between members 16 and 18 is such as to give an effective variation in the condenser comprising stator 1 and rotor 6 through movement thereof between limiting positions determined by said member 14 and said members 16 and 18. An adjustable screw 20 extending through said member 18 toward said member 14 serves to adjustably vary the distance of movement of said member 14 between said members 16 and 18. Said rotor 8 carries a member 24 similar to said member 16 and said rotor 10 carries a set of members 26, 28 and 30 corresponding to said members 16, 18 and 20 on said rotor 8.

Referring to Figs. 2 and 3 a shaft 34 extends through a switch-board panel 36 with a knob control 38 on the outer end thereof. Said shaft 34 carries on its inner end a set of condenser rotor plates 39 which are interleaved with the condenser stator plates 40 in a manner well known in the variable condenser art. A radial arm 42 having an insulating section 44 therein is rigidly fixed to said shaft 34 at its inner end and extends radially therefrom. This arm 42 carries an arm 46 which extends between the spaced apart arms 48 and 50. An adjustable screw 51 extending through said arm 48 serves to adjust the distance of relative movement of said arm 46 between said arms 48 and 50. Said arms 48 and 50 are spaced apart and are carried by an arm 52 which is fixed to the shaft 54 supported by the bearings 56,

56 and which carries the condenser rotor plates 60 which are interleaved with the stator plates 62, said shaft 54 being axially aligned with said shaft 34. Another axially aligned shaft 64 carries the rotor plates 68 which are interleaved with the stator plates 70. Said shaft 64 is supported by a bearing 72 and another bearing not shown. Said shaft 54 carries an arm 74 having an insulated part 76 similar respectively to said arm 42 and part 44 on said shaft 34. An arm 78 on said arm 74 extends between two spaced apart arms 80 and 82 carried by an arm 84 fixedly mounted to said shaft 64. An adjustable screw 85 extending through said arm 80 serves to adjust the distance of relative motion of said arm 78 between said arms 80 and 82.

In Fig. 4 is shown an alternate form of rotor coupling which is similar to those of Figures 2 and 3 except that no insulating part such as parts 44 and 76 are used. In this figure a shaft 90 carries a radial arm 92 having an angular arm 94 thereon which extends between the spaced apart arms 96 and 98 carried by another radial arm 100 which is fixedly mounted to another shaft axially aligned with respect to said shaft 90 but not shown. The screw 102 serves to adjust the distance of relative movement of said arm 94 between said arms 96 and 98. The insulated coupling of Figures 2 and 3 is suitable for use in apparatus in which the condensers are completely insulated from each other and the coupling of Figure 4 is suitable for use in apparatus where one side of each condenser is grounded.

In Fig. 5 is illustrated another form of coupling comprising a member 110 having a V slot 112 therein and mounted for axial adjustment on a condenser or coupling coil shaft 114 by means of set screw 116. A V shaped member 120 mounted in said V slot 112 and adjustably movable toward and from said member 112 is mounted to the shaft 122 which is axially aligned with said shaft 114. The members 124 and 126 serve as support and bearing members for said shafts 120 and 122 respectively and the screw 128 serves to fix said member 120 on said shaft 122. A circuit tuning part such as a loose coupling coil or a condenser rotor is mounted to each of said shafts 114 and 122 in a manner well known in the art.

In Fig. 6 is illustrated another form of loose mechanical coupling comprising a disc 130 mounted to the shaft 132 and another disc 134 mounted parallel to said disc 130 and carried by a shaft not shown which is axially aligned with said shaft 132. Said disk 130 has a V shaped radial slot 136 therein and said disc 134 has a number of holes 138 therein which are at various radial distances from the center of the disc and which are within the limits of the radial boundaries of said slot 136. A pin 140 extending through said slot 136 and mounted in one of said holes 138 serves to loosely couple mechanically said disc 130 with said disc 134. By varying the position of said pin 140 radially into different ones of said holes 138 various limits of relative radial movement of said discs with respect to each other can be secured. In the drawings the parts to be tuned are shown and illustrated as a plurality of variable condensers, but it is clear that without departing from the spirit of the invention, a plurality of coupling coils can be mounted in the same way, or a combination of one or more each of a variable condenser and a coupling coil can be mounted for simultaneous movement for adjustable movement between comparatively small limits in the manner of the invention and to suit needs and conditions well known in the art.

By means of the loose mechanical coupling of any one of the illustrated and described forms or any equivalent form, a tuned radio transformer receiving set using two or three or more variable condensers or tuning coils and having these parts variable by a single control element or dial, the loose mechanical coupling serving to attain a more accurate degree of tuning than is possible in the designing and building of the parts so as to approach identity of angular movement of the parts when varying the parts to bring the set in resonance with any particular sending set. By the use of loose mechanical connection of the invention the small auxiliary condensers and choke coils heretofore used for tuning the different parts with respect to each other can be dispensed with. In the use of apparatus involving the loose mechanical connection of the invention it is clear that approximate tuning or adjustment of the two or more parts controlled by the single means can be first brought to an approximately correct position and a higher degree of adjustment of each of the separate parts is attained through separate adjustments thereof within limits of movement permitted by the several loose mechanical connections. For example in the use of the coupling of the invention for controlling three condensers in tuned radio frequency stages by a single control with the critical positions of the three condensers with respect to an indicating dial being for example at the dial readings 49, 51 and 47 respectively, beginning with the condenser fixed to the control and for the other two successively, the tuning is done by turning the control clockwise to the dial position 47, then counter clockwise to the dial position 51, and then again clockwise to position 49. In this manner of movement the loose movement allowed by the coupling of the invention leaves the variable parts at dial positions in the order first named.

For indicating the position of each part

after tuning or at any other time a pointer is provided fixed to the shaft that has a condenser or coupler fixedly mounted thereto and a succession of other pointers which are loosely mounted about the shaft and have loose mechanical connection with the pointer on each side of them in the manner of the loose connection of the corresponding movable condenser or inductance coil part.

While I have shown and described and have pointed out in the annexed claims certain novel features of the invention, it will be understood that various omissions, substitutions and changes in the parts and details of the devices illustrated and in their operation may be made by those skilled in the art without departing from the spirit of the invention.

I claim:

1. In combination a plurality of tuned electrical devices such as variable condensers each having a movable part mounted on a common shaft for effecting the variation of the electrical characteristics of said devices and a single means for actuating said movable parts both in tandem and independently through a given extent of lost motion between said movable parts and means for controlling the extent of such lost motion.

2. In combination, a plurality of variable condensers of the stator and rotor type mounted in axial alignment, means for moving the rotor plates of one of said condensers, and a loose connection comprising a bracket between the aforesaid rotor plates and the rotor plates of an adjacent condenser, whereby said moving means is free to move the first mentioned rotor plates both in tandem with the rotor plates of said adjacent condenser and independently thereof through the extent of the lost motion permitted by the aforesaid loose connection.

3. In combination, a plurality of variable condensers of the stator and rotor plate type mounted in axial alignment, an actuating means for one of said rotors, and an adjustable bracket forming a loose connection between said rotor and an adjacent rotor, said bracket allowing a given loss of motion between said rotors, whereby said actuating means is free to move said rotors in tandem by continued movement in either direction and then to actuate one of said rotors independently of the other within the angle determined by the extent of said lost motion by movement in the reverse direction.

Signed at Hoboken in the county of Hudson and State of New Jersey this 26th day of November, A. D. 1926.

LEROY J. BUTTOLPH.