

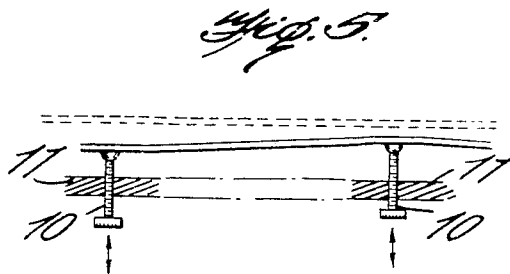
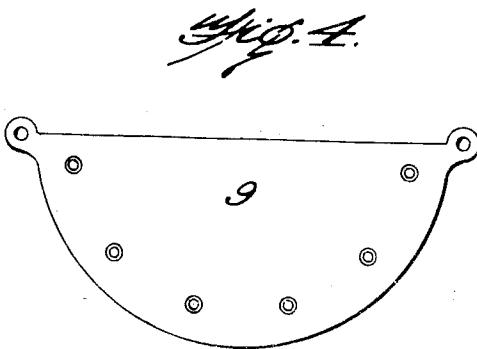
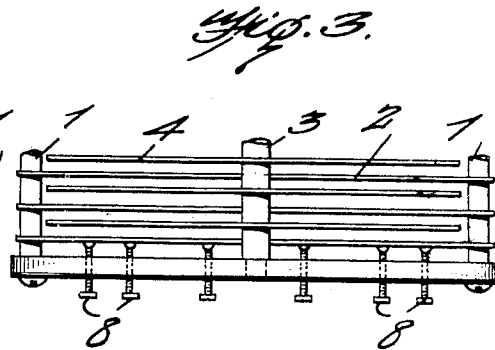
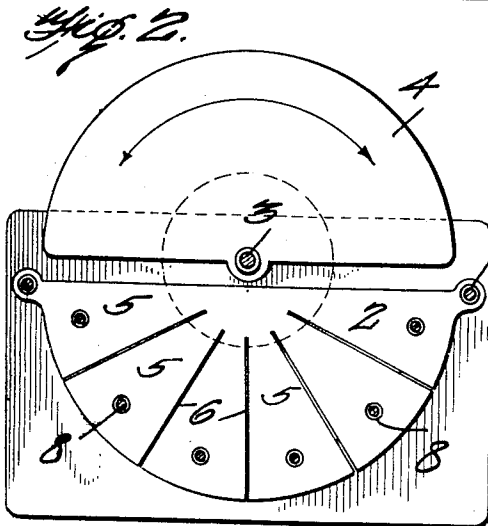
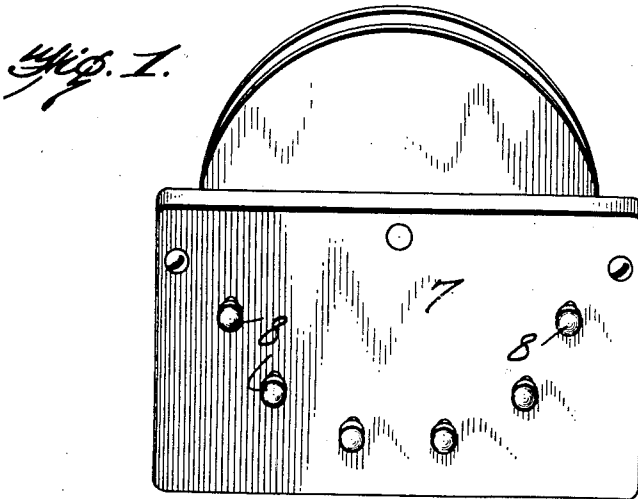
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2,052,316

VARIABLE CONDENSER

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## UNITED STATES PATENT OFFICE

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## VARIABLE CONDENSER

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22 Claims. (Cl. 175-41.5)

This invention relates to an improvement in variable condensers designed particularly for use in connection with radio sets and constructed to provide for independently adjusting the capacity of the condenser at various settings thereof.

In the modern radio receiving set the single dial control has proven of great popularity and of advantage to the user, and with such single dial control it is of course understood that all circuits are, generally through the governing of the variable condensers, to be balanced. For ideal reception these respective circuits must be phased to the same periodicity and experience has proven that notwithstanding the utmost known precision in manufacture certain well understood variable factors tend to unbalance the circuits.

It is customary in single dial control sets to adjust the circuits at the factory following the complete wiring of the set, and to thereafter make adjustments tending to as nearly a perfect balancing of the circuit as can be obtained. It may well be however, that the respective circuits balanced in one setting, will be unbalanced in another, and hence the factory adjustment while correcting the unbalanced relation of the circuits at a particular setting, will ordinarily fail to correct such unbalanced relation at other settings. As a result of these disadvantages the single dial control apparatus is much less effective for sharp tuning than is the apparatus where each circuit is independently controlled.

It is the object of the present invention to entirely avoid the difficulties incident to the balancing of the respective circuits in providing means whereby any or all of the circuits may be properly controlled at any and all settings for tuning by constructing the variable condenser so that its capacity may be varied at each setting to thereby insure that all circuits will be balanced or phased to the same periodicity at the particular setting. In this connection it has been heretofore proposed to adjust the capacity of the variable condenser to insure a balancing of the circuits, but this adjustment while effective for balancing the circuits in one setting may be ineffective for such result in another setting, and hence all tuning phases other than that for which the particular described adjustment is effective may still present unbalanced circuits.

The present invention therefore provides a variable condenser which is separable and independently adjustable for each setting with no particular adjustment affecting any other setting. Hence in the factory test each particular setting may, through the independent adjustment of the

condenser or condensers for that setting, insure and subsequently maintain absolute resonance of the circuits in that setting. Thus all settings may be arranged to take care of the variable uncertain factors which would otherwise tend to destroy the balance of the circuit in that setting so that the single dial control may be rendered just as effective in tuning the respective circuits as is the multiple dial control.

The invention is illustrated in the accompanying drawing, in which:

Fig. 1 is a perspective view of the variable condenser constructed in accordance with the present invention.

Fig. 2 is an elevation of the same with the back plate removed.

Fig. 3 is an edge view of the same.

Fig. 4 is a plan of the adjustable condenser plate showing a modified form.

Fig. 5 is an enlarged sectional detail showing the adjustment of the plate of the modified form.

Variable condensers of the type to which the present invention is applied are ordinarily constructed of a stator 1 made up of a series of relatively fixed plates 2 supported in a frame including backing plates, and a rotor 3 made up of a series of plates 4 adapted to be interleaved with the plates 2 to vary the capacity of the condenser.

In a single dial control the variable condensers form the adjusting element for the circuits, the periodicity of the circuits being governed by the variation in capacity of the condensers. Even if the condensers should be of identical construction so that in any one setting the variation in capacity of the respective circuits may be identical, yet the uncertain variable factors tending to otherwise unbalance the circuits would prevent that absolutely similar circuit condition tending to the maximum result. Furthermore, if as has been proposed, means are provided for adjusting the relative capacity of the condensers in any one setting, with the result to insure an absolute balance of the circuits at that setting, there is no certainty that a similar balance will be maintained for the other settings for the reason that the disturbing factors may be in evidence when at certain settings, and may effect one or more of the circuits in various settings. Hence it is highly desirable that the capacity of the condensers be adjustable for each setting in order that when tested and proper adjustments are made, a certainty of uniformity will be subsequently maintained.

To secure this result the outer plate 2 of the stator is divided into a number of independent

sections 5, preferably by slitting such plate at 6, along radial lines with such slittings opening through one edge and extending short of the other edge. The frame plate 7, here of insulating material, immediately adjacent the sectioned stator plate is provided with a series of adjusting screws 8 threaded through the plate 7 and each terminal secured to one of the sections 5 of the sectioned stator plate described. Thus by properly operating the appropriate set screw 8 any one of the sections 5 may be adjusted toward or from the cooperating rotor plate to thereby vary the capacity of the condenser. It is of course to be understood that the sections 5 are in such number as to permit practically all necessary adjustments of the condenser in the various settings, the illustration herein being merely indicative of the construction and not intending to determine the number of stator plate divisions.

In Figs. 4 and 5 there is shown a slightly modified form wherein the outer stator plate, here indicated at 9 is connected to a series of adjusting screws 10 threaded through the overlying frame plate 11. In this instance the stator plate is not sectioned or divided, and the adjustment afforded through the operation of the set screws is secured through the equivalent resiliency of the plate, as indicated more particularly in Fig. 5.

It is to be understood that the adjustment provided for by the present invention is primarily designed as a factory adjustment. That is to say, after the set is completely wired the usual testing of the circuits is carried out and for each setting the particular section 5 of the sectioned stator plate, or the particular adjusting screw 10 of the form shown in Fig. 5, is operated to vary the capacity of the condenser of any and all circuits until an absolute balance of the circuits is secured at that setting. The next setting is made and similar adjustments of any and all condensers as may be necessary to insure the balance at this setting is carried out, and so on throughout the various settings of the apparatus. Thus all circuits are brought into absolute balance, that is, phased for the same periodicity with respect to each other in each and every setting through an independent adjustment of the capacity of the variable condensers at that setting, and obviously this circuit relation having been adjusted in the face of the variable disturbing factors, will be maintained during the use of the apparatus so that in any position of the single dial control the circuits will be in absolute balance for maximum result.

The specific structure shown and described is designed as a simple embodiment of the underlying feature of the present invention which is the construction of a variable condenser to permit its independent adjustment at any one setting without affecting its adjustment at any previous or subsequent settings, and it is to be understood that all such mechanical structures tending to this result and falling within the scope of the appended claims are contemplated as within the spirit of the present invention.

What is claimed as new is:

1. A variable condenser comprising a fixed element and a rotary element movable to vary the capacity of the condenser, independent portions of the fixed element being mounted for adjustment with respect to the movable element whereby to vary the capacity of the condenser following any predetermined position of the elements.

2. A variable condenser comprising a fixed element and a rotary element movable to vary the capacity of the condenser, the fixed element having sections independently adjustable relative to the movable element for varying the capacity determined by the normal set of the elements.

3. A variable condenser comprising a fixed element and a rotary element movable to vary the capacity of the condenser, the fixed element having sections independently adjustable relative to the movable element for decreasing the capacity determined by the normal set of the elements.

4. A variable condenser comprising a fixed element and a rotary element movable to vary the capacity of the condenser, the fixed element having sections independently adjustable relative to the movable element for increasing the capacity determined by the normal set of the elements.

5. A variable condenser comprising a series of fixed sections and a series of movable sections adapted to be interleaved with the fixed sections to vary the capacity of the condenser, the fixed section being formed of independently movable parts, and means for independently adjusting said parts relative to the movable section.

6. A variable condenser having one of the plates thereof formed in radially disposed sections, and means whereby the sections may be independently adjusted.

7. A variable condenser comprising a fixed section made up of spaced plates and a movable section made up of spaced plates adapted to be interleaved with the plates of the fixed section to vary the capacity of the condenser, and means whereby a predetermined area of one of the plates of the fixed section may be adjusted toward and from the adjacent plate of the movable section to adjust the capacity of the condenser.

8. A variable condenser comprising a fixed section made up of spaced plates and a movable section made up of spaced plates adapted to be interleaved with the plates of the fixed section to vary the capacity of the condenser, one of the plates of the fixed section being formed to provide independently movable sections, and means cooperating with each section whereby it may be adjusted relative to the adjacent movable plate to adjust the capacity of the condenser.

9. In an electric condenser comprising a stator and a rotor capable of producing a certain capacity curve, including stator and rotor elements, an adjustable presetting plate capacitatively associated with one of the condenser elements for altering said curve automatically, said adjustment of the plate being obtained by moving the plate at more than two points.

10. In radio apparatus, a variable condenser including blades relatively movable into different overlapping relations to change the capacity of the condenser, one of said blades being changeable in shape to change the capacity of the condenser without changing the amount of overlap between the blades, and means included in said condenser for changing the shape of said blades.

11. In radio apparatus, a variable condenser including a blade, portions of which are adjustable relative to other portions thereof to change the capacity of the condenser, and a plurality of screw devices connected, respectively, with said

blade at spaced points thereon for adjusting portions of said blade relative to other portions thereof.

12. A condenser comprising in combination, a plate, a second plate variable in position in one direction relative to said first plate, and means for deforming one of said plates in another direction to effect minor variations of the capacity between said plates at any desired position in the setting thereof without affecting the capacity of said condenser at settings corresponding to less capacity.

13. A plate for an electrical condenser provided with narrow slots dividing said plate into a plurality of sectors, said slots being equal in length to a substantial fraction of the radius of said plate, whereby the bending of one of said sectors out of the plane of said plate will slightly vary the capacity of such condenser.

14. In a condenser, a stator leaf comprising a rigid central member and a series of segments attached thereto, and means whereby the distance between segments of said stator leaf and an adjacent rotor leaf may be varied.

15. In a condenser, a stator leaf comprising a rigid portion and a series of yielding portions, a rotor leaf and means whereby the distance between said yielding portions and the adjacent rotor leaf may be independently varied.

16. In radio apparatus, a variable condenser including blades relatively movable into different overlapping relations to change the capacity of the condenser, one of said blades being of such structural character as to permit relative displacement at different local portions thereof into stable capacity-varying settings to effect corresponding capacity adjustments of the condenser.

17. In radio apparatus, a variable condenser including blades relatively movable into different overlapping relations to change the capacity of the condenser, one of said blades having such flexible property as to permit bending thereof at a plurality of local portions of the blade to provide stable capacity-varying settings for effecting minor capacity adjustments of the condenser.

18. A condenser comprising, in combination, a

plate, and a second plate variable in position in one direction relative to said first plate, one of said plates being of such structural character as to permit relative displacement thereof in another direction at a plurality of local portions of said plate into corresponding stable capacity-varying settings which effect minor corrections of the capacity between said plates at a plurality of positions in the setting thereof.

19. A variable condenser comprising, in combination, relatively movable plates mutually spaced to include an interposed dielectric, one of said plates being of flexible material bendable transversely to the plane of said movement at a plurality of local portions of the plate into stable settings which vary the transverse dimensions of the dielectric at corresponding points to effect corrections of the capacity of the condenser at a plurality of positions in the settings thereof.

20. In a variable capacity condenser including relatively movable condenser elements comprising a stator and a rotor capable of producing a certain capacity curve, a presetting plate capacitatively associated with one of the condenser elements, said presetting plate being of such structural character as to permit displacement thereof at a plurality of local portions of said presetting plate into stable capacity-varying settings which effect corrections of said capacity curve.

21. In a condenser, a stator leaf comprising a rigid portion and a series of yielding portions, a rotor leaf, and adjustable screw means whereby the distance between said yielding portions and the adjacent rotor leaf may be independently varied.

22. In a condenser, a stator leaf comprising a rigid central portion and an outer portion slotted to provide a series of yielding portions, a rotor leaf, and means whereby the distance between said yielding portions and the adjacent rotor leaf may be independently varied, said means comprising a plate adjacent said stator leaf and a plurality of adjustable screws threaded through said plate to engage the yielding portions of said stator leaf.

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