Jan. 26, 1932. H. D. CURRIER 1,842,507

CONDENSER

Filed Dec. 15, 1924 2 Sheets-Sheet 1

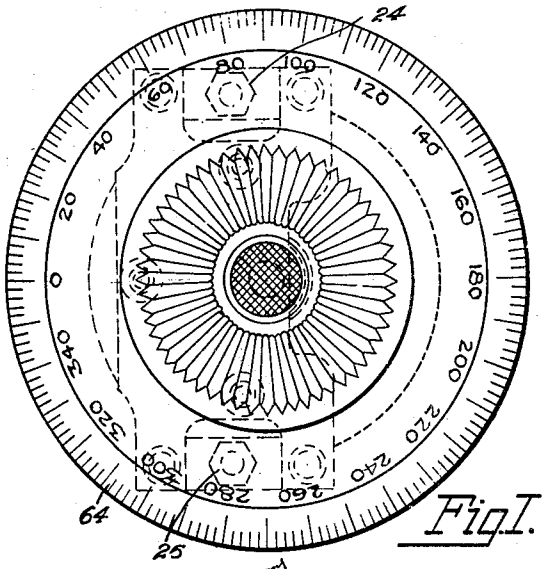

Fig. 1.

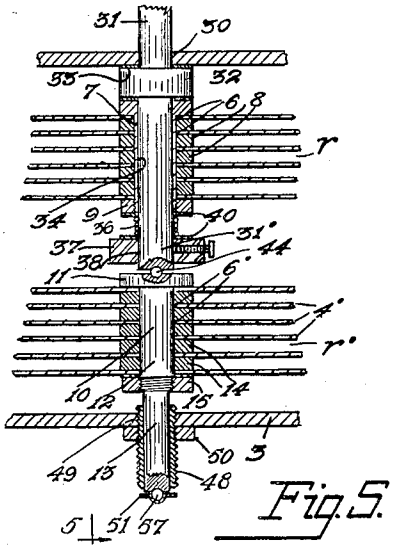

Fig. 5.

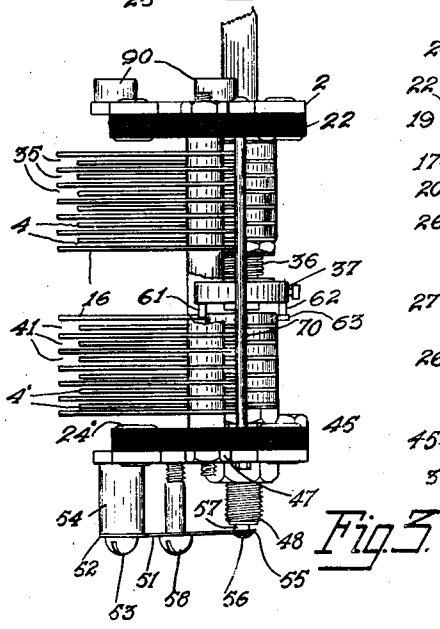

Fig. 3.

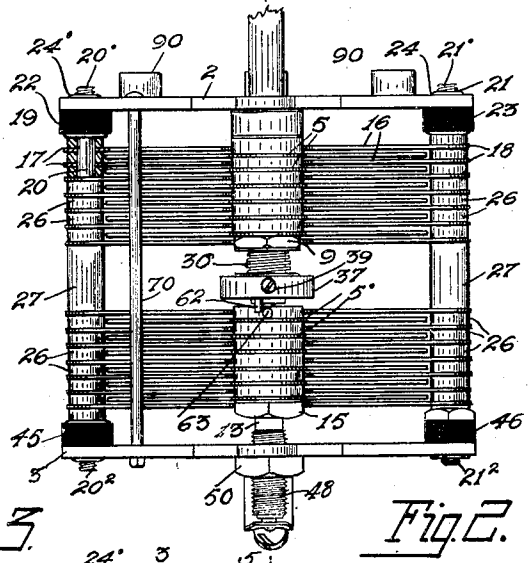

Fig. 2.

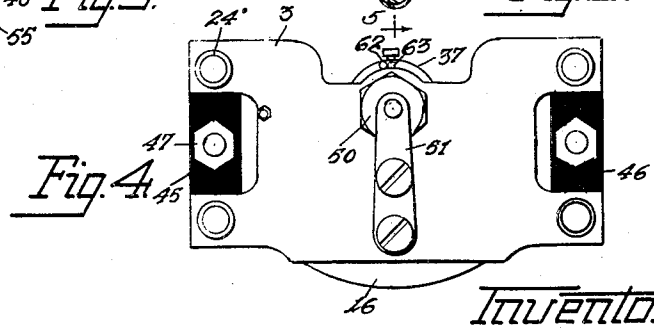

Fig. 4.

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CONDENSER

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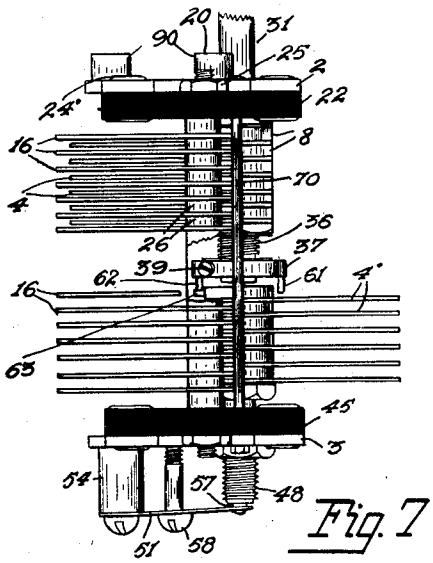


Fig. 7

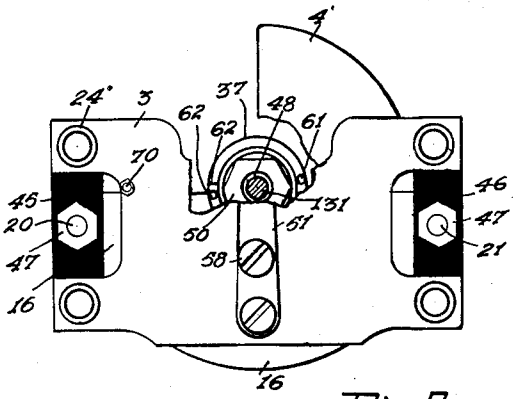
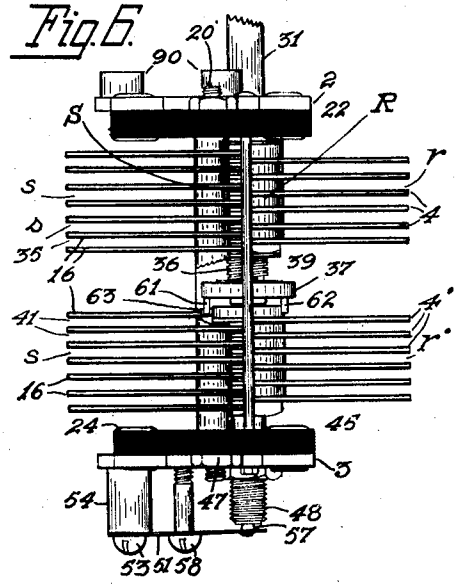


Fig. 8.

Fig. 6.



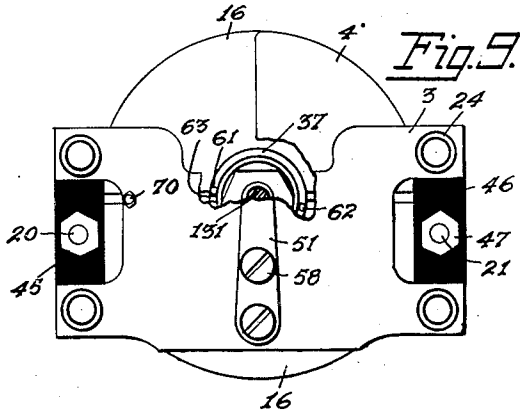


Fig. 9.

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UNITED STATES PATENT OFFICE

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CONDENSER

Application filed December 15, 1924. Serial No. 755,827.

My invention relates to condensers and has to do more particularly with variable condensers with an air dielectric, such as are in general use in wireless sets, and an object of my invention is the provision of an improved condenser of the variable type. My condenser is provided with structural features in combination with a novel rotor arrangement, and the combination produces an improved condenser of the above type, which is efficient in its operation and inexpensive to manufacture.

The form of condenser now commercially used is designed to permit the rotor element of the condenser to be moved through 180 degrees of rotation to adjust the condenser from a zero capacity to its rated maximum capacity, depending, of course, on the number of plates. It is also known that the popular wave band for broadcasting lies between 200 meters and 550 meters, and with the numerous broadcasting stations operating within this wave band, it is readily seen that a condenser of the 180 degree type when used for tuning purposes will have all the broadcasting stations within this wave band range in this 180 degrees of movement of the rotor element. With this outline, it is readily apparent that the stations will be closely grouped, due to the large number of stations operating, and that there is a liability of overlapping, especially in connection with stations that broadcast within a few meters wave lengths of each other.

To overcome the limitations of the present type of condenser, I have devised a condenser in which the rotor element of the condenser is adapted to move through 360 degrees of rotation without departing from the general form of condenser now in use. From this it will be seen that I have twice the movement of the herein above referred to condensers and thus have twice the spacing between stations. In other words the capacity of my condenser changes just half as fast as the present type of condensers. The stationary plates of the condenser of my invention are of the usual semi-circular type which are assembled in an aligned manner, supported between two end plates to form the stator element. The rotor element which also comprises a plurality of semi-circular plates and rotatably supported between two end plates is adapted to be rotated in the usual manner between the spaces formed by the separated stator plates for the usual capacity purposes, as is well known.

A feature of my invention is the provision of a stator element which comprises two units conductively united and which stator units are associated with a rotor element which comprises two units which are conductively united, and which units when assembled aggregate rated capacities, such as are commercially used in radio receiving sets.

Another feature is the provision of a divided rotor element which comprises two units each comprising a certain number of rotor plates which co-operate with the two stator units. The rotor element comprises an upper rotor unit and a lower rotor unit, and when the shaft of the rotor element is turned, through the agency of a suitable dial, the upper rotor unit is rotated through 180 degrees of rotation to increase the capacity of the condenser to a certain point, and means, associated with the upper rotor unit and lower rotor unit, now function to bring about the rotation of the lower rotor unit of the rotor element due to the continued rotation of the dial to cause this lower rotor unit to associate itself with the lower stator unit to still further increase the capacity of the condenser, and when it has been rotated through 180 degrees of rotation, the condenser will be at its maximum capacity.

Another feature of my invention is the novel construction of the rotor element units, and the means provided to permit the rotation of the upper rotor unit into association with the upper stator unit until its full 180 degrees of movement has been made before the lower rotor unit of the rotor element is brought into operation.

Still another feature of my invention is the construction of the two rotor units, and their association with the rotor shaft and their association with each other, to permit 360 degrees of rotation of the rotor unit, as a whole.

The above features as well as others, not

specifically mentioned, will be more fully pointed out in the ensuing specification and claims.

For a more complete understanding of my invention reference may be had to the accompanying drawings in which like reference characters in the several views denote like parts and in which

Fig. 1 is a plan view of the condenser of my invention with the dial in position.

Fg. 2 is a front elevation of the condenser;

Fig. 3 is a left side elevation of Fig. 2;

Fig. 4 is a bottom view of Fig. 2;

Fig. 5 is a sectional view on the line 5—5 of Fig. 2 which clearly illustrates the details of the rotor support;

Fig. 6 is a view similar to Fig. 3 but illustrating the rotor units of the condenser in their normal positions;

Fig. 7 is a view of the condenser illustrating the upper rotor unit in its operative position and the lower rotor unit of the rotor in its normal position;

Fig. 8 is a bottom view of the variable condenser with parts broken away to clearly illustrate the portion of the pins associated with the rotor shaft when the rotor element is in a partially operative position, with upper half of the rotor in its normal position;

Fig. 9 is a view similar to Fig. 8 with parts broken to illustrate the position of the pins associated with the rotor shaft when the rotor element is in another partially operated position.

Referring now more in detail to my invention as illustrated in the accompanying drawings the condenser of my invention comprises rotor element R which consist of two units r and r' and a stator element S, which consists of two stator units s and s' associated respectively with the rotor units r and r'. The rotor element R and stator element S are supported between a pair of end plates 2 and 3. I will first describe the construction and supporting means for the rotor element R. This element R consists of the rotor units r and r' and the rotor unit r comprises a plurality of semi-circular plates 4 of suitable material such as sheet aluminum or brass, each plate 4 being provided with a reduced semi-circular portion 5, which semi-circular portions 5, are provided with orifices 6 for receiving a supporting sleeve 7. The supporting sleeve 7 passes alternately through the orifices 6 in the portions 5 of the plates 4 and spacer washers 8, and when the requisite number of plates 4 and spacer washers 8 are slipped upon the sleeve 7 its end 7′ which is threaded receives a nut 9 which when turned down tightly clamps the plates 4 and spacer washers 8 upon the sleeve 7.

The rotor unit r' of the rotor elements R′ also comprises a plurality of semi-circular plates 4′, which are provided with reduced semi-circular portions 5′ and provided with orifices 6′ for receiving a supporting bolt or stud 10. The stud 10 is provided with a head 11 and an intermediate reduced portion 12 and a further reduced portion 13. The intermediate reduced portion 12 of the stud 10 passes alternately through the orifices 6′ in the plates 4′ and spacer washers 14 and when the requisite number of plates 4′ and spacer washers 14 have been slipped upon the intermediate portion 12 of stud 10 the protruding end of the intermediate portion 12 which is threaded receives a nut 15 which when turned down tightly clamps the plates 4′ and washers 14 upon the stud 10.

The fixed or stator plate element S which is built up of its stator units s and s' are associated respectively with the rotor units r and r' of the rotor element R and the stator unit s comprises a plurality of semi-circular plates 16 of suitable metal such as aluminum or brass. The plates 16 are each provided with a pair of ears 17 and 18 diametrically opposite, each ear 17 and 18 being provided with an orifice 19 of a size to receive rods 20 and 21. The rods 20 and 21 are provided with threaded ends 20′ and 21′, which ends 20′ and 21′ pass through suitable orifices in insulation strips 22 and 23 which are secured to the end plate 2 by means of suitable tubular rivets 24′. Nuts 24 and 25 are provided which have screw threaded engagement with the threaded ends 20′ and 21′ of the rods 20 and 21 to secure them to the insulation strips 22 and 23, which are secured to the end plate 2 as already described. The supported rods 20 and 21 are inserted alternately through the orifices 19 in the ears 17 and 18 of the plates 16, and spacer washers 26 until a requisite number of plates 16 and spacer washers 26 have been placed on the rods 20 and 21 for purposes as will presently be described. A spacer member or sleeve 27 is next slipped over the rods 20 and 21 and when in position, the rods 20 and 21 are again inserted alternately through orifices 19 in the ears 17 and 18 of the plates 16, and spacer washers 26 until a requisite number of plates 16 and washers 26 are placed on the rods 20 and 21. The first predetermined number or group of plates 16 on the rods 20 and 21 between the insulation strip supports 22 and 23 and the spacer sleeve 27 form the units s of the stator element S which is operatively associated with the rotor unit r and the predetermined number or group of plates 16 on the rods 20 and unit s below the spacer sleeve 27 is operatively associated with the rotor unit r' of the rotor element R. The spacer sleeve 27 separates the two units s and s' but they are conductively connected by the spacer sleeve 27 and the purpose of these two units s and s' in association with the two rotor units r and r' will be presently described.

The construction and assembly of the two stator units s and s' of the stator S and the

two rotor units r and r' of the rotor R having been described, I will now describe the assembly of the units s and s' and r and r' as a whole to form the complete variable condenser of my invention. The end plate 2 to which the insulation strips 22 and 23 are secured and which in turn support the rods 20 and 21 is provided with an orifice 30 of a size to permit the insertion of a rotor shaft 31 which is provided with an intermediate enlarged portion 32, the face 33 of which rests against a washer between the bottom face of the end plate 2 and the face 33. The sleeve 7, upon which the rotor plates 4 of the rotor unit r are supported, is provided with a central orifice 34 and with the rotor shaft 31 in position, the sleeve 7 and its supported plates 4 is slipped over the shaft 31 to place the plates 4 of this rotor unit r in position to register with the spaces 35 between the fixed or stator plates 16 of the stator units. When the sleeve 7 and its supported plates 4 are in position as just described on the shaft 31, a helical spring 36 is slipped over the protruding end 31′ of the shaft 31 and a collar 37 provided with a central orifice 38 is slipped over this protruding end 31′ of the shaft 31 below the helical spring 36 and adjustably secured on the shaft 31 by means of a set screw 39. Washers 40 are placed between the spring 36 the collar 37 and the nut 9 on the sleeve 7. The purpose of the collar 37 and the helical spring 36 will be more fully hereinafter described.

After the rotor unit r has been placed in operative association with its associated stator unit s as just described the rotor unit r' is now placed in position to permit its plates 4′ to register with the spaces 41 between the fixed or stator plates 16 of the stator unit s' of the stator S. The protruding end 31′ of the shaft 31 and the face of the head 11 of the stud 10 are countersunk and a ball bearing is placed between the end 31′ of the shaft 31 and the head 11 of the stud 10 and when in position rests in the countersinks in the end 31′ of the shaft 31 and the face of the stud 10 for purposes as will presently be described. After the rotor units r and r' have been positioned in operative relation with the stator units s and s', an end plate 3, similar to the end plate 2, and supporting a pair of insulation strips 45 and 46 is positioned to permit the threaded ends 20^2 and 21^2 of the rods 20 and 21 to pass through suitable orifices in the strips 45 and 46, and nuts 47 having screw threaded engagement with the protruding threaded ends 20^2 and 21^2 of the rods 20 and 21 clamp the stator plates 16 of the units s and s' between the two end plates 2 and 3. The reduced end portion 13 of the stud 10 which supports the plates 4′ of the rotor unit r' passes through a bearing sleeve 48 which has screw threaded engagement with a suitable tapped orifice 49 in the end plate 3, the said sleeve 48 serving as a bearing for the rotor unit r' and the bearing 48 is secured against movement in the threaded orifice 49 in the end plate 3 by means of a lock nut 50 which has screw threaded engagement with the threaded bearing sleeve 48. A combined thrust and friction leaf spring 51 is provided for the rotor units r and r' its one end 52 being secured to the end plate 3 by means of a screw 53 which passes through a suitable spacing sleeve 54. The free end 55 of the spring 51 is provided with a concave formed portion 56 which supports a ball bearing 57. An adjustable screw 58 passes through an orifice intermediate of the ends 52 and 55 of the spring 51 and has screw threaded engagement with a suitable tapped orifice in the end plate 3 which when turned adjusts the tension of the free end 55 of the spring causing the ball bearing 57 to engage the end of the stud 10 which is countersunk and in which the ball bearing 57 rests. The tension of the leaf spring 51 is such as to cause the ball bearing 57 which rests between the countersink in the end of the stud 10 and concave depression 56 in the free end 55 of the spring 51 to bear against the bottom of the stud 10 which supports the plates 4′ of the rotor unit r' and force the stud 10 and its supported plates 4′ as a whole upward, in relation to Fig. 2. Due to the fact that the ball bearing 44 rests between the head 11 of the stud 10 and the end 31′ of the shaft 31, this forced upward movement caused by the leaf spring 51 also causes the shaft 31 and its supported rotor r to be forced upward causing the face 33 of the intermediate enlarged portion 32 of the shaft 31 to bear against the washer between the face 33 of the portion 32 of the shaft 31 and force the washer against the bottom face of the end plate 2.

The collar 37 which is secured to the shaft 31 is provided with a pair of depending pin members 61 and 62 diametrically opposite which are operatively associated with a pin 63 secured in the peripheral face of the head 11 of the stud 10 for purposes as will presently be described. A suitable dial 64 is secured to the shaft 31 by suitable means to permit the ready manipulation of the rotor element R which comprises rotor units r and r'. To operate the rotor element R the dial 64 is grasped by the operator and rotated in a counter-clockwise direction with reference to Fig. 1. The helical spring 36 supported on the shaft 31 between the collar 37 and the washer 40 is placed under compression by means of the collar 37 which, when positioned on the shaft 31 and secured thereto by means of the set screw 39 causes the spring 36 to be compressed, and when the shaft 31 is rotated through the agency of the dial 64, the frictional engagement between the collar 37 secured on the shaft 31 and the washer 40 caused by the compressed spring 36, causes the sleeve 7 and its supported plates 4 which

as a whole form the rotor unit r to rotate with the shaft 31 and enter the spaces 35 between the plate 16 of the stator unit s. The instant the shaft 31 is rotated the pin 61 secured to the collar 37 disengages the pin 63 in the stud 10 of the rotor unit r', and continued rotation of the shaft 31 causes rotation of the rotor unit r. When the rotor unit r has been rotated through substantially 180 degrees of rotation the edges of the plates 4 will engage a stop rod 70 which is secured between the two end plates 2 and 3 in any suitable manner. This 180 degree of rotation of the shaft 31 and its frictionally supported rotor unit r places the pin 62 which is diametrically opposite the pin 61 into engagement with the pin 63 in the peripheral face of the stud 10. The orifice 30 in the end plate 2 serves as one bearing for the shaft 31, and the ball bearing 44 between the end of the shaft 31 and the head 11 of the stud 10 serves as the other bearing during the rotation of the shaft 31 and its frictionally supported rotor unit r. After the 180 degree rotation of the rotor unit r has been accomplished and further movement of the same has been arrested by the stop rod 70 the continued rotation of the shaft 31 through the agency of the dial 64 causes the pin 62 which is secured to the collar 37 on the shaft 31 to engage the pin 63 in the head of the stud 10 to cause the rotation of the rotor unit r' and this rotor unit r' is also rotated through substantially 180 degrees and at the end of its travel the edges of the plates 4' of the rotor unit r' engage the stop rod 70 and prevent further rotation of the shaft 31 which has now been rotated through 360 degrees or one complete turn. After the rotor unit r has been rotated through its 190 degree of rotation and arrested by the stop rod 70 due to the fact that it is loosely supported on the shaft 31 but frictionally connected to it through the agency of the helical spring 36, the continued rotation of the shaft 31 overcomes this frictional engagement between the shaft 31 and the sleeve 7 of the rotor unit r and the engagement of the pin 62 with the pin 63 now causes rotation of the rotor unit r' as just described. The ball bearings 44 and 57 in combination with the sleeve 48 serve as bearings for the rotor unit r' and the tension spring 51 in combination with the helical spring 36 maintains the rotor unit r in any of its adjusted positions and the tension spring 51 will also hold the rotor unit r' in any of its adjusted positions.

From the above description it is readily apparent that I have designed a condenser which can be constructed to measure up to any of the standard capacities that are popular and fit into the circuits of receiving sets now in use. The popular form of condenser now commercially used is designed to permit the rotor element of the condenser to be moved through 180 degrees of rotation in adjusting the same from a minimum capacity to a maximum capacity. It is also well known, as already stated, that the popular wave band of broadcasting lies between 200 meters and 550 meters, and that with the numerous broadcasting stations operating between this wave band, it is readily seen that for tuning purposes these various broadcasting stations will range between this 180 degree movement of the rotor element. With this arrangement the broadcasting stations will be more or less bunched and cause an overlapping when using the condenser for tuning the receiver for a certain station especially those stations which broadcast on wave lengths within a few meters of each other. With this point in view, I have designed a novel condenser arrangement in which I have divided the rotor element R of my condenser into two units r and r' which are conductively united, and have also divided the fixed or stator element S in two units s and s' which are conductively united and which are associated respectively with the two rotor units r and r'. To operate the condenser of my invention, the dial 64 which is secured to the rotor shaft 31 when rotated, causes the rotation of the rotor unit r independently of the rotor unit r' as previously described, through 180 degrees of rotation to increase the capacity of the condenser, and when this portion r of the rotor R has been moved through its 180 degrees of rotation to further increase the capacity of my condenser further rotation of the dial 64 will bring about the rotation of the other unit r' of the rotor R, as previously described. It will thus be apparent that the condenser of my invention is adapted to be rotated through 360 degrees of rotation, and when tuning the stations which are broadcasting and which lie between this popular wave band the tuning of different stations will be distributed through this 360 degrees of rotation of the rotor element R, thus increasing the spacing between stations as to the dial settings for tuning purposes depending upon the wave length on which they are broadcasting and especially those stations that broadcast on wave lengths just a few meters apart.

With the rotor units r and r' set, should the operator wish to decrease the capacity to properly tune in a station, the rotation of the dial 64 in the reverse direction will cause the pin 62 on the collar 37 which engages the pin 63 secured to the head of the stud 10 during the movement of the rotor unit r' through its 180 degrees of rotation to disengage the same and the spring will maintain the rotor unit r' in its adjusted position. The helical spring 36 about the shaft 31 will again function and effect the frictional engagement between the collar 37 secured to the shaft 31 and the sleeve 7 which supports the rotor plates 4 and cause movement of this rotor unit r for proper tuning. To restore the

condenser to its zero capacity, the dial 64 is rotated in a clockwise direction with relation to Fig. 1, causing the pin 62 on the collar 37 to disengage the pin 63 secured to the stud 10. The helical spring 36 about the shaft 31 will again function and the frictional engagement between the collar 37 and the sleeve 7 will again cause the rotor unit r to rotate with shaft 31 and when the unit r has been restored to its zero position, the edges of the plates 4 of the rotor unit r will engage the stop rod 70. This rotation of the rotor unit r does not affect the adjusted rotor unit r', as it is held in its adjusted position by the spring 51, as already described. When the rotor unit r has been restored, the pin 61 on the collar 37, due to the rotation of the collar 37, with the shaft 31, now engages the pin 63 of the stud 10, and the continued rotation of the dial 64 causes the pin 61 which has engaged the pin 63 of the stud to move the unit r' to its zero position in which position the edges of the plates 4′ of the rotor unit r' will engage the stop rod 70, to limit further movement of the shaft 31, thus placing both units r and r' in their zero positions.

To permit the condenser to be mounted upon a panel I provide studs 90 secured to the end plate 2 in any suitable manner. The studs are provided with tapped orifices which are adapted to receive screws which pass through aligned orifices in the panel to secure the condenser to the panel. The shaft 31 also extends through a suitable orifice in the panel, and a suitable dial, such as 64, is secured to this shaft end to permit ready manipulation of the condenser.

From the foregoing it will be seen that I have twice the movement of the dial for a given change in capacity that the 180° condenser has. The upper rotary unit of the condenser is the one that is operated unless it is resting against the stop member, in which event the lower unit of the condenser rotates when the dial is turned.

While I have described the variable condenser of my invention in its preferred form, it is to be understood that changes and modifications will readily suggest themselves to those skilled in the art, and I, therefore, desire to cover all such changes and modifications as come within the spirit and scope of the appended claims.

What I claim as new and desire to secure by United States Letters Patent, is:

1. A device of the character described including a stator element comprising two groups of plates conductively united, a rotor element comprising two groups of plates mounted on a common shaft and conductively united to form two rotor units, each of said groups adapted to be moved only independently of the other, and single control means associated with one of said rotor units for controlling the movement of said rotor element.

2. A device of the character described including a stator element comprising two units conductively united, supporting means for said element, a rotor element comprising two rotor units coaxially mounted and rotatably supported by said supporting means in operative relation with said stator units, each of said rotor units adapted to be rotated independently of the other unit, and single control means for controlling the movement of the rotor units.

3. A device of the character described including a stator element comprising two units conductively united, supporting means for said stator element, a rotor element comprising two rotor units mounted on a common shaft and rotatably supported by said supporting means, a rotor shaft for said rotor element, and means associated with said rotor shaft for rotating one of said rotor units a predetermined degree and thereafter causing rotation of said other rotor unit, each of said rotor units adapted to be rotated independently of the other rotor unit.

4. A device of the character described including a pair of stator units conductively united to form a stator element, a pair of rotor units conductively united to form a rotor element, a rotor shaft for said rotor element loosely supporting one of said rotor units, frictional means for connecting said rotor unit with said shaft to rotate the same with said shaft through a predetermined degree, and means associated with said shaft and said other rotor unit for thereafter rotating said other rotor unit, each of said rotor units adapted to be rotated independently of the other rotor unit.

5. In a device of the character described including a pair of stator units conductively united to form a stator element, a pair of rotor units conductively united to form a rotor element, supporting means for said stator element, said supporting means rotatably supporting the shaft of said rotor element to maintain said rotor element in operative relation with said stator element, a rotor shaft for said rotor element loosely supporting one of said rotor units, a spring on said shaft frictionally connecting said rotor unit with said shaft to permit rotation of said rotor unit through a predetermined degree, and means on said shaft and the other of said rotor units for thereafter causing rotation of the other of said rotor units through a like predetermined distance.

6. A device of the character described including a pair of stator units conductively united to form a stator element, a pair of rotor units conductively united to form a rotor element, supporting means for said stator element, said supporting means rotatably supporting the shaft of said rotor element to

maintain said rotor element in operative relation with said stator element, a rotor shaft for said rotor element loosely supporting one of said rotor units, a helical spring supported on said shaft frictionally connecting said rotor unit with said shaft to permit rotation of said rotor unit with said shaft through a predetermined number of degrees, a collar secured on said shaft, and a depending pin on said collar moved into engagement with means on the other of said rotor units to then rotate the other of said rotor units through a like predetermined distance.

7. A device of the character described including a stator element and a rotor element, each comprising a pair of units mounted on a common shaft, and a single control member for said rotor element adapted to rotate through an angle of substantially 360 degrees to move the rotor units independently of each other.

8. A device of the character described including a pair of stator elements and a pair of rotor elements, coaxially mounted, each of said pair of rotor elements adapted to be rotated independently of the other, each of said rotor elements remaining stationary while the other is being rotated and a single control member for said rotor elements.

9. A device of the character described including a pair of stator elements and a pair of rotor elements mounted on a common shaft, and a single control member for said rotor elements, means including a helical spring for connecting said control element to said rotor elements so that only one of said rotor elements is operating at a time irrespective of which element is operating.

10. A device of the character described including a pair of stator elements and a pair of rotor elements, a single control member for said rotor elements, said control member being adapted to separately rotate each of said rotor elements through an angle of substantially 180 degrees, only one of said pair of rotor elements adapted to rotate at a time.

11. A device of the character described including a plurality of stator elements and a plurality of independently movable rotor elements coaxially mounted, and a single control member for moving said rotor elements successively, only one of said rotor elements adapted to rotate at a time.

12. A device of the character described including a plurality of stator elements and a plurality of rotor elements mounted on a common shaft, and a single control member adapted to move through an angle of substantially 360 degrees, means controlled by said control member for successively bringing said rotor elements, operating one at a time, into operative relation with said control member.

13. A device of the character described including a pair of stator elements and a pair of rotor elements mounted on a common shaft, a single control member, means connecting said control member to one of said rotor elements so that it always moves with said control member for the first half of its excursion and for connecting said second rotor element to said control member so that it moves therewith during the second half of its movement, said first rotor element remaining quiescent when said second rotor element is operated and said second rotor element remaining quiescent when said first rotor element is operated.

14. A device of the character described including a pair of stator elements, a pair of rotor elements, a control member for moving one of said rotor elements and for then moving the other of said rotor elements when said control member is rotated in one direction and for then moving said first rotor element in a reverse direction when the control member is turned in a reverse direction, said second rotor element remaining quiescent while said first rotor element is rotating and said first rotor element remaining quiescent while said second rotor element is rotating.

15. A condenser including a stationary unit, a movable unit for cooperation therewith, said movable unit comprising a plurality of coaxially mounted sections, and a single control member for operating said sections, each of said sections adapted to remain stationary when another of said movable sections is operating.

16. A condenser including a stationary unit, a movable unit for cooperation therewith, said movable unit comprising a plurality of sections mounted on a common shaft, and a single control member for successively moving the sections of said movable unit one at a time.

17. A condenser including a stationary unit, a movable unit for cooperation therewith, said movable unit comprising a plurality of sections mounted on a common shaft, and a single control member for successively moving the sections of said movable unit one at a time by a continuous movement.

18. In an electrostatic condenser of the character described, the combination of a plurality of rotors, each rotor comprising a series of plates side by side in spaced relation and each rotor being mounted for movement independent of that of the other, a series of stator plates for each rotor, the stator plates of each series being side by side and spaced apart and positioned whereby each rotor may have an overlapping spaced-apart relation to its own series of stator plates, and unitary means for moving first one of the rotors through substantially one hundred and eighty degrees and then the other through substantially one hundred and eighty degrees into such overlapped relation with the respective series of stator plates, said last-men-

tioned means including a shaft common to the two rotors.

19. In an electrostatic condenser of the character described, the combination of a plurality of rotors, each rotor comprising a series of plates side by side in spaced relation and each rotor being mounted for movement independent of that of the other, a series of stator plates for each rotor, the stator plates of each series being side by side and spaced apart and positioned whereby each rotor may have an overlapping spaced-apart relation to its own series of stator plates, and unitary means for moving first one of the rotors independently of the other and then the other independently of the first into such overlapped relation with the respective series of stator plates, said last-mentioned means including a frame holding the stator and the rotors, hand-operable means, and friction means associated with the hand-operable means and said frame.

20. In an electrostatic condenser of the character described, the combination of a stator comprising a series of plates side by side and spaced apart, and a plurality of rotors, each rotor comprising a plurality of plates side by side and in spaced relation, each rotor being mounted for independent movement to bring its plates into overlapping and spaced relation with plates of the stator, with means including a shaft on which both rotors are mounted for moving the rotors sequentially into and sequentially out of overlapped relation with stator plates.

21. In an electrostatic condenser of the character described, the combination of a stator comprising a series of plates side by side and spaced apart, and two rotors, each rotor comprising a plurality of plates side by side and in spaced relation, each rotor being mounted for independent movement through substantially one hundred and eighty degrees into overlapping and spaced relation with plates of the stator, with means including a shaft on which both the rotors are mounted for moving first one rotor and then the other through subsantially one hundred and eighty degrees and with said shaft moving through substantially three hundred and sixty degrees, said first rotor remaining quiescent during the movement of the second rotor.

22. In an electrostatic condenser of the character described, the combination of a series of stator plates arranged side by side and in spaced-apart relation, two series of rotor plates mounted on a common axis adjacent to the stator plates, the rotor plates being spaced apart and adapted to have an intermeshing relation with the stator plates and in spaced relation thereto, the stator plates and the rotor plates being so formed and arranged that a rotative movement of substantially one hundred and eighty degrees is required to move either series of rotor plates into such overlapped relation with stator plates, and means operatively associated with each series of stator plates for moving first one series thereof substantially one hundred and eighty degrees into such overlapped relation and for then moving the other series thereof substantially one hundred and eighty degrees into such overlapped relation, each of said series of rotor plates remaining quiescent during the movement of another series of rotor plates.

23. In an electrostatic plate condenser of the character described, the combination of a stator, a plurality of rotors mounted for movement independent of that of the other to bring their respective plates into overlapping and spaced relation with plates of the stator, with means including a shaft on which all the rotors are mounted for moving the rotors sequentially and independently of other rotor movement into overlapped relation with stator plates through a shaft movement of substantially three hundred and sixty degrees.

Signed by me at Chicago, county of Cook, and State of Illinois, this 13th day of December, 1924.

HIRAM D. CURRIER.