

Nov. 30, 1926.

1,608,526

E. F. POTTER

CONDENSER

Filed Oct. 23, 1922

2 Sheets-Sheet 1

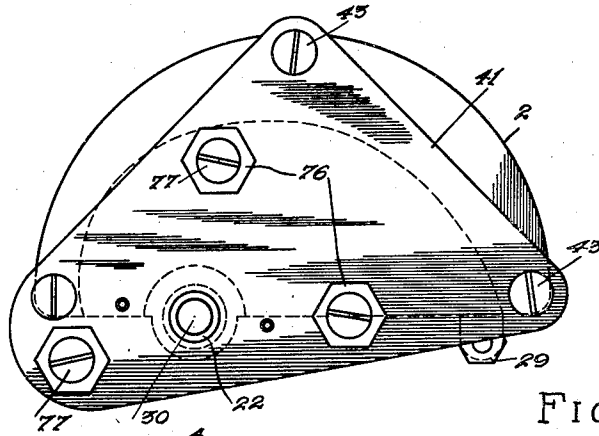


FIG. 2.

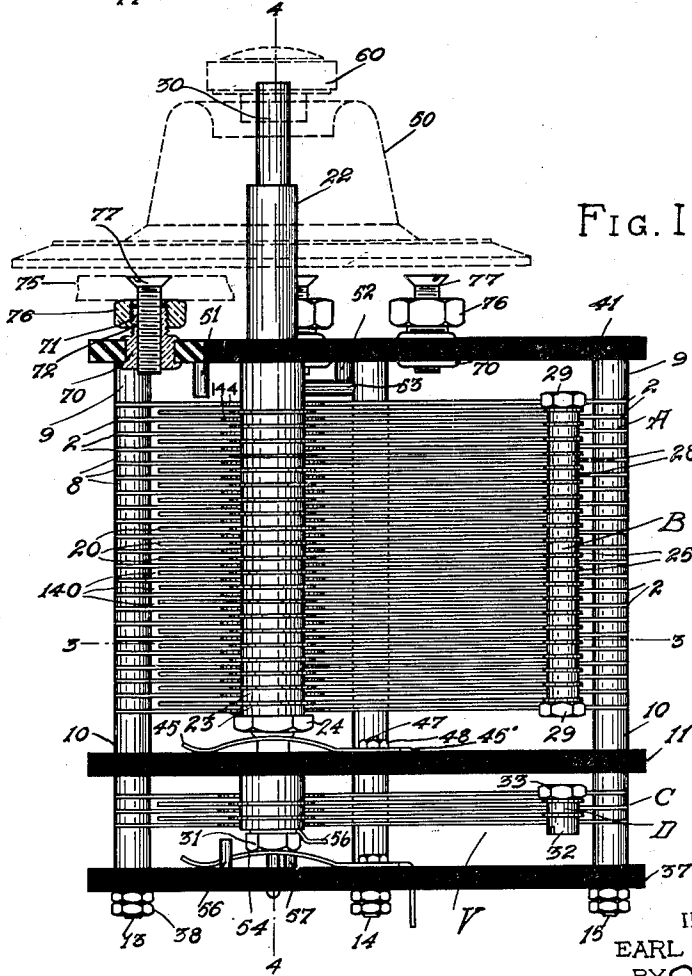


FIG. 1.

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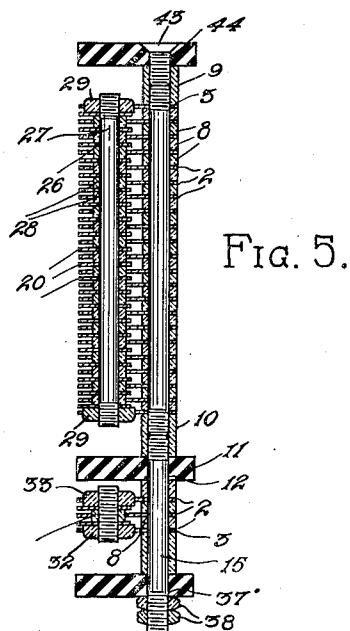
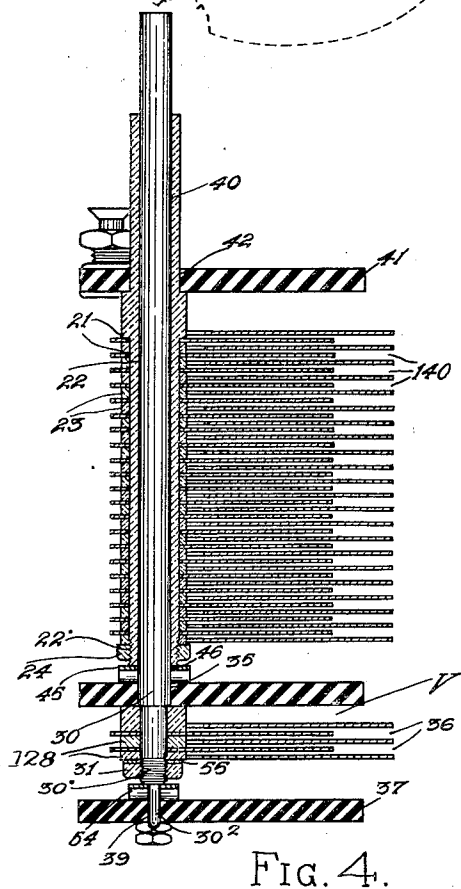
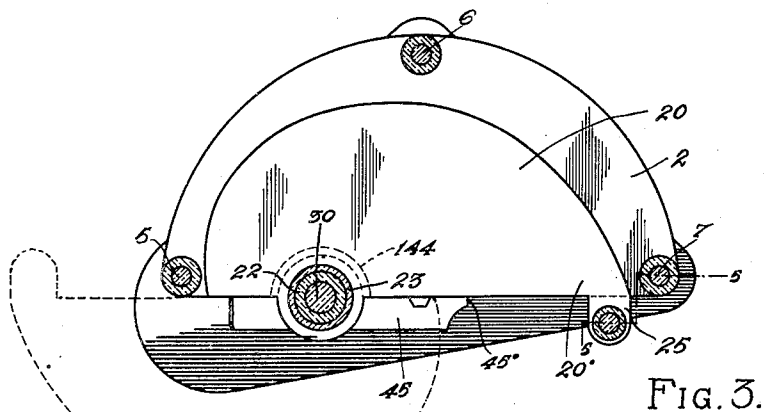
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CONDENSER

Filed Oct. 23, 1922

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

EARL F. POTTER, OF GLENCOE, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

CONDENSER.

Application filed October 23, 1922. Serial No. 596,211.

My invention relates to condensers and has to do more particularly with variable condensers with an air dielectric, such as are now in general use in wireless sets, and an object of my invention is the provision of an improved condenser of the variable type, which is provided with structural features which will facilitate assembly of a condenser of this type and at the same time provide an improved condenser structure which will permit the efficient operation of the same.

The condenser of my invention is of the decimeter type, in which the rotating plate element and its supporting shaft as a whole is eccentrically located in relation to the circular fixed plates so that the capacity of the condenser may be made to vary as the square of the angle of rotation of the rotatable element, which, of course, is well known in the art.

One of the features of my invention is the provision of a simple but efficient adjustable mounting means for permitting the condenser of my invention, when used in association with a panel type mounting to be universally adaptable for panels of different thicknesses. Another feature of my invention is the provision of a combined spring frictional and thrust means for holding the rotatable plate element in any of its adjustable positions, and for also preventing movement of the rotatable plate element in a direction parallel to its axis, should undue pressure be applied upon the dial during the manipulation of the rotatable plate element so as to prevent touching of the plates and bring about the discharge of the condenser.

Still another feature of my invention is the association of a vernier adjustment element with the variable condenser element for finer tuning purposes and its association with the variable condenser rotary or movable element. These and other features of my invention will be more apparent by a reading of the specification.

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 front elevation of the condenser of my invention;

Fig. 2 is a plan view of Fig. 1;

Fig. 3 is a sectional view along the line 3—3 of Fig. 1 to more clearly illustrate the shape of the fixed and rotary condenser plates;

Fig. 4 is a sectional view along the line 4—4 of Fig. 1 to clearly illustrate the rotary plate shaft assembly and the actuating means of the vernier element in association with the rotatable plate element; and

Fig. 5 is a sectional view along the line 5—5 of Fig. 3.

Referring now more in detail to my invention as illustrated in the accompanying drawings, the condenser comprises a fixed plate element A, a rotatable plate element B operatively associated with the fixed plate element A. I also provide a fixed plate vernier element C independent of the element A and its associated rotatable plate element D, which may be moved independently of the rotatable element B.

The fixed plate element A comprises a plurality of semi-circular plates 2 of suitable metal such as aluminum, each being provided with orifices 3 which are of a size to receive rods 5, 6 and 7. The rods 5, 6, and 7 are inserted alternately through the orifices 3 of the plates 2, and spacer washers 8 and their ends, which are threaded, have screw-threaded engagement with studs 9 and 10 which are provided with suitable tapped orifices to clamp the plates 2 in position upon the rods 5, 6 and 7. The fixed vernier element C also comprises a group of semi-circular plates 2, three in number, and which are also provided with orifices 3. An intermediate base 11 of suitable insulation material, such as bakelite, is provided, and orifices 12 in said base 11 in alignment with the orifices 3 of the plates 2, are adapted to receive rods 13, 14 and 15 which pass through said openings 12, their threaded ends having screw-threaded engagement with the tapped orifices in the studs 10. Spacer washers 8 are also provided, and the rods 13, 14 and 15 alternately pass through said washers 8 and the orifices 3 in the plates 2.

The rotatable plate element B comprises a plurality of suitably formed plates 20 designed according to the decimeter equation for developing the boundary curve of this type of rotatable plate. The plates 20 are provided with openings 21 of a size to per-

mit the passage of the shaft 22 of the rotatable element B associated with the fixed plate portion A of the condenser. The shaft 22 passes alternately through the openings 21 of plates 20 and spacer washers 23, and when the requisite number are slipped upon the shaft 22 its end 22' which is threaded receives a nut 24, which tightly clamps them upon the shaft 22. The plates 20 are also provided with ears 25 integrally formed therewith, and provided with openings 26 of a size to receive a rod 27, which passes alternately through said openings 26 and spacer washers 28. The ends of the rod 27 are threaded and are adapted to receive nuts 29 which clamp the free ends 20' of the plates 20 in the proper spaced relation to each other, and at the same time hold the plates 20 in alignment with each other upon the shaft 22.

The rotatable plate element D of the vernier portion V of the condenser comprises a pair of plates 20 and a shaft 30 upon which the plates 20 are mounted, the plates 20 also being suitably spaced from each other by means of spacer washers 28 and clamped upon the shaft 30 by means of a nut 31 which has screw-threaded engagement with threaded end portion 30' of the shaft 30. The free ends 20' of the plates 20 are also kept in proper spaced relation with each other by means of suitable spacer washers 28 and a screw 32 which passes through the spacer washers 28 and the openings 26 and a nut 33 which has screw-threaded engagement with the screw 32. The screw 32 and washers 28, in addition to holding the plates 20 in fixed spaced relation with each other, hold the plates 20 in alignment with each other on the shaft 30.

The construction and assembly of the fixed plate elements A and C and the rotatable plate elements B and D having been described, I will now describe the assembly of the elements A, B, C and D as a whole to form the completed condenser of my invention.

The intermediate base 11 is provided with an orifice 35 of a size to permit the insertion of the shaft 30, and with the plates 20 in position as illustrated in dotted lines in Fig. 3, the shaft 30 may be moved in position so as to place the plate 20 in position to register with the spaces 36 between the fixed plates 2 of the element C of the vernier portion V of the condenser. When the rotatable plate element D is in this position, a base plate 37 provided with orifices 37' of a size to receive the threaded end portions of rods 13, 14 and 15 is placed in position. The protruding threaded ends of rods 13, 14 and 15 receive nuts 38 which clamp the fixed plate element C in position between the base 11 and plate 37. The shaft 30 which is also provided with a reduced portion 30'

rests in an orifice 39 which forms a bearing for one end of the shaft 30, and the opening 35 in the base 11 forming an intermediate bearing for the shaft 30. The shaft 22 of the rotatable plate element B is provided with a central orifice 40 extending its length and is of a size to permit it being slipped over the shaft 30 of the rotatable plate element D of the vernier portion V of the condenser, and with the plates 20 of the rotatable element B in the position shown in dotted lines in Fig. 3, the said rotatable plate element B is slipped over the shaft 30. When the plates 20 of the rotatable element B register with their respective spaces 140 between the plates 2 of the fixed plate element A, a top plate 41 having an orifice 42 permits the shaft 22 to extend therethrough and screws 43 pass through suitable orifices 44 in the plate 41 and have screw-threaded engagement with the studs 9. To provide clearance for the shafts 22 and 30 of the rotatable elements B and D, a circular area is cut from the fixed plates 2 at the point 144 eccentrically displaced with relation to the center of the fixed plate 2. The shaft 30 of the rotatable element D of the vernier portion V of the condenser extends through the orifice 40 in the shaft 22 which serves as a bearing for the said shaft 30.

A combined thrust and frictional leaf spring 45 is provided for the rotatable plate element B which is provided with an orifice 46 through which the shaft 30 extends. The spring 45 is arcuate in shape and is secured to the base 11 by means of a suitable screw 47 and nut 48, its one end being provided with an angular extending tongue 45' which rests in a suitable orifice in the base 11 and prevents rotation of the said spring 45. The tension of the spring 45 is such as to bear against the bottom face of the shaft 22 to place its face in frictional engagement with the bottom face of the shaft 22 so that as the rotatable element B is rotated for tuning purposes it will remain in any position it is set due to this frictional engagement. The spring 45 also acts as a thrust means as the tension of the spring 45 is such as to force the shaft 22 and its parts as a whole upward in relation to Fig. 1, and if any downward pressure is exerted upon the shaft 22 the tension of the spring 45 is such as to prevent the shaft from being forced downward and cause the rotatable plates 20 to engage the fixed plates 2 to discharge the condenser when in use. A suitable dial 50 shown in dotted lines is secured to the shaft 22 by suitable means to permit the ready manipulation of the rotatable element B and a pair of pin stops 51 and 52 are provided which are secured to the plate 41 and are associated with the pin 53 secured to the shaft 22 and the engagement of the pin 53 with the pins 51 and 52 limits the movement

of the rotatable element B through a certain degree of rotation for the usual tuning purposes.

A combined thrust and friction spring 54 is also provided for the shaft 30 of the rotatable element D of the vernier portion V of the condenser and serves as a friction spring and a thrust spring as described in connection with the spring 45 of the rotatable element B, and a further description is now thought unnecessary. An arm 55 is clamped upon the shaft 30 by means of the nut 31 and is operatively associated with the stop pins 56 and 57 to limit the movement of the rotatable element D of the vernier portion V through a certain degree of rotation. The spring 54 also serves as a terminal for the rotatable elements B and D to connect them with the external circuit with which the condenser is connected. The rotatable element D of the vernier portion V is rotatable independent of the rotatable element B, and a knob 60 shown in dotted lines in Fig. 1 when grasped by the operator, may be turned, the said shaft 30 turning in the bearing in the shaft 22 formed by the orifice 40 in the said shaft 22. From the above description, it may be seen that when the dial 50 is turned the rotatable element B is rotated independent of the shaft 30 of the rotatable element D, and when the proper tuning is accomplished through the medium of the rotatable element B in association with the fixed element A the said element B is held in position by means of the spring 45. If a further finer tuning is desired to clarify, the knob 60 is grasped and the rotatable element D is rotated until the desired result is obtained. The spring 54 is of such tension as to hold the rotatable element D at normal while the rotatable element B is rotated, and also overcomes any friction that may be set up between the shaft 30 and the orifice 40 in the shaft 22 when it is turned.

Panels of bakelite or vulcanized rubber are used upon which variable condensers and other apparatus are mounted when used in connection with radio instruments, and are of varying thicknesses, and to permit the condenser of my invention to be used in connection with panels of varying thicknesses, I provide studs 70 staked to the top plate 41. The stud 70 is provided with a threaded extension 71 and a tapped orifice 72 and nuts 76 are provided which have screw threaded engagement with the extension 71 of the studs 70. By referring to Fig. 1 of the drawing, I illustrate one of the adjustable securing means in section, and as there are three of these that are provided similar in construction, a detailed description of one will suffice. As illustrated, I show the securing means adjusted for a maximum thickness of panel 75 in which the adjustable nut 76 is in its uppermost adjusted position, and

in which position the panel rests against the face of the nut 76. A screw 77 passes through a suitable opening in the panel and has screw-threaded engagement with the tapped orifice 72 in the stud 70 to secure the condenser as a whole to the panel. Now, if a panel whose thickness is less than that illustrated at 75 is to be used, the nut 76 is turned down to adapt the thickness of panel to be used, and when so adjusted the screw 77 is tightened to secure the condenser to the panel against movement.

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 by those skilled in the art, and I desire to cover all such changes and modifications as come within the spirit and scope of the appended claims.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a device of the character described comprising a pair of fixed elements and a pair of rotatable elements, mounting plates for supporting said elements in fixed relation, studs secured to one of said plates provided with threaded extensions and nuts having screw-threaded engagement with said threaded extensions, adjustable upon said extensions to permit said device to be secured to varying thicknesses of mounting panel.
2. In a device of the character described including a pair of fixed plate elements and a pair of rotatable plate elements, mounting plates for supporting said first and rotatable plate elements in fixed relation with each other, studs secured to one of said plates provided with threaded extensions, nuts having screw-threaded engagement with said threaded extensions, and adjustable upon said extensions to permit said device to be mounted upon varying thicknesses of mounting panel and screws having threaded engagement with said studs for securing said device on said mounting panel.

3. In a device of the character described a pair of rotatable elements, rotatable shafts for said elements, one of said shafts extending through the other of said shafts and rotatable independently of said other shaft, and individual spring means for each of said shafts, said individual spring means engaging its associated shaft to hold said associated shaft in any of its rotatable positions and also to prevent longitudinal movement of said associated shaft.

4. In a device of the class described, a pair of rotatable elements, a pair of stationary elements, an individual shaft for each of said rotatable elements and associated to permit said rotatable elements to be rotated independently of each other, a spring member for preventing longitudinal movement

- of the shaft of one of said rotatable elements and to also hold the same in any of its rotatable positions, a mounting plate for said elements, means formed integrally with said spring member adapted to engage said mounting plate to prevent rotary movement of said spring member relative to the shaft of said one element.
5. A device of the class described including mounting members, a pair of rotatable elements, an individual shaft for each of said rotatable elements adapted to engage each other and to rotatably support said rotatable elements in said mounting members so that said elements are rotatable independently of each other, an individual spring member for each of said shafts secured to said mounting members and adapted to engage their associated shafts to prevent longitudinal movement of said associated shafts and to also hold said associated shafts in their rotatable position, and a terminal integrally formed with one of said spring members to receive an external conductor.
6. A device of the class described including a pair of rotatable elements, an individual shaft for said rotatable elements, one of said shafts extending through the other of said shafts but arranged to permit said shafts to be rotated independently of each other, a spring member for engaging one of said shafts and a spring member for engaging the other of said shafts, said spring members adapted to prevent endwise movement of said shafts and to also hold said shafts and said rotatable elements in any of their rotatable positions, and means formed integrally with one of said spring members for receiving an external conductor to close a circuit through said shafts and said rotatable elements.
7. A device of the class described including a pair of stationary elements, a pair of rotatably adjustable elements, an individual shaft for each of said adjustable elements for adjusting said adjustable elements relative to said stationary elements, said shafts having contactual engagement with each other to connect said adjustable elements in circuit with each other but adapted to rotate independently of each other, and an individual spring member for each of said shafts adapted to engage the end of the shaft to prevent endwise movement of the shaft and to hold the shaft and its associated rotatably adjustable element in any of their adjustable positions.
8. A device of the class described including a pair of stationary elements, a pair of rotatably adjustable elements, an individual shaft for each of said adjustable elements for adjusting said adjustable elements relative to said stationary elements, said shafts having contactual engagement with each other to connect said adjustable elements in circuit with each other but adapted to rotate independently of each other, an individual spring member for each of said shafts adapted to engage the end of the shaft to prevent endwise movement of the shaft and to hold the shaft and its associated rotatably adjustable element in any of their adjustable positions, and means formed integrally with one of said spring members adapted to receive an external conductor to close a circuit through said shafts and said rotatable adjustable elements.
9. A device of the character described including a pair of supporting plates, fixed and movable condenser plates between said supporting plates, a third supporting plate, fixed and movable condenser plates between said third supporting plate and one of said first supporting plates, concentric shafts for moving said movable condenser plates, and spring means for maintaining said movable condenser plates in any of their rotatable positions.
10. A device comprising three supporting plates, fixed and movable condenser plates between said supporting plates, a pair of controls for operating said movable condenser plates, and spring means for maintaining said movable condenser plates in any of their rotatable positions.
11. A device comprising three supporting plates, fixed and movable condenser plates between said supporting plates, connector shafts for operating said movable condenser plates, and spring means for maintaining said movable condenser plates in any of their rotatable positions.
- Signed by me at Chicago in the county of Cook and State of Illinois, this 19th day of October, 1922.
- EARL F. POTTER.