

Dec. 7, 1926.

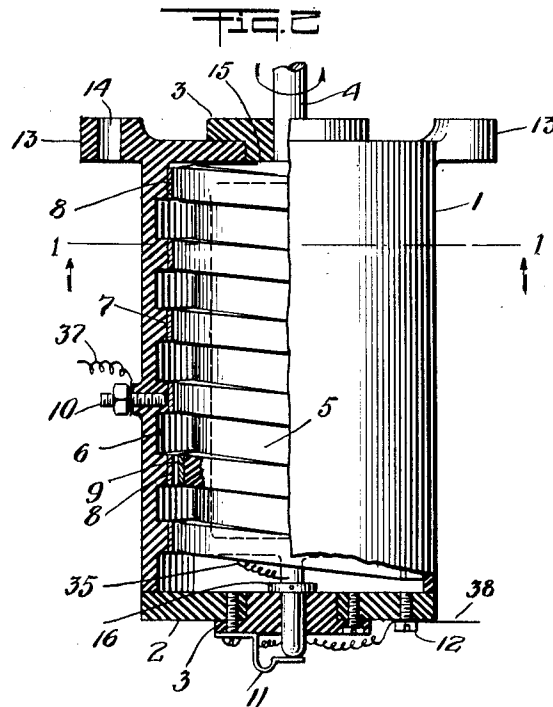
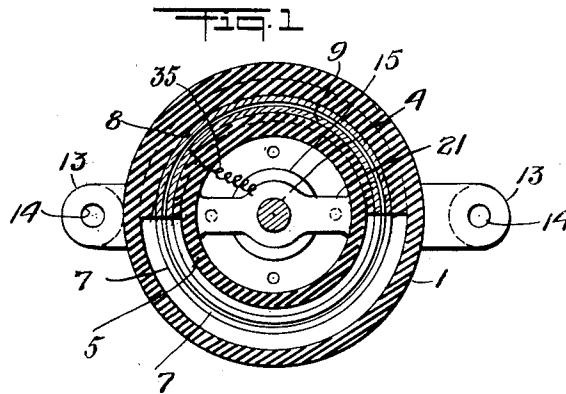
1,610,122

L. EDENBURG

ADJUSTABLE CONDENSER

Filed June 10, 1924

2 Sheets-Sheet 1



INVENTOR
LOUIS EDENBURG

BY
H. Van Dventer
ATTORNEY

Dec. 7, 1926.

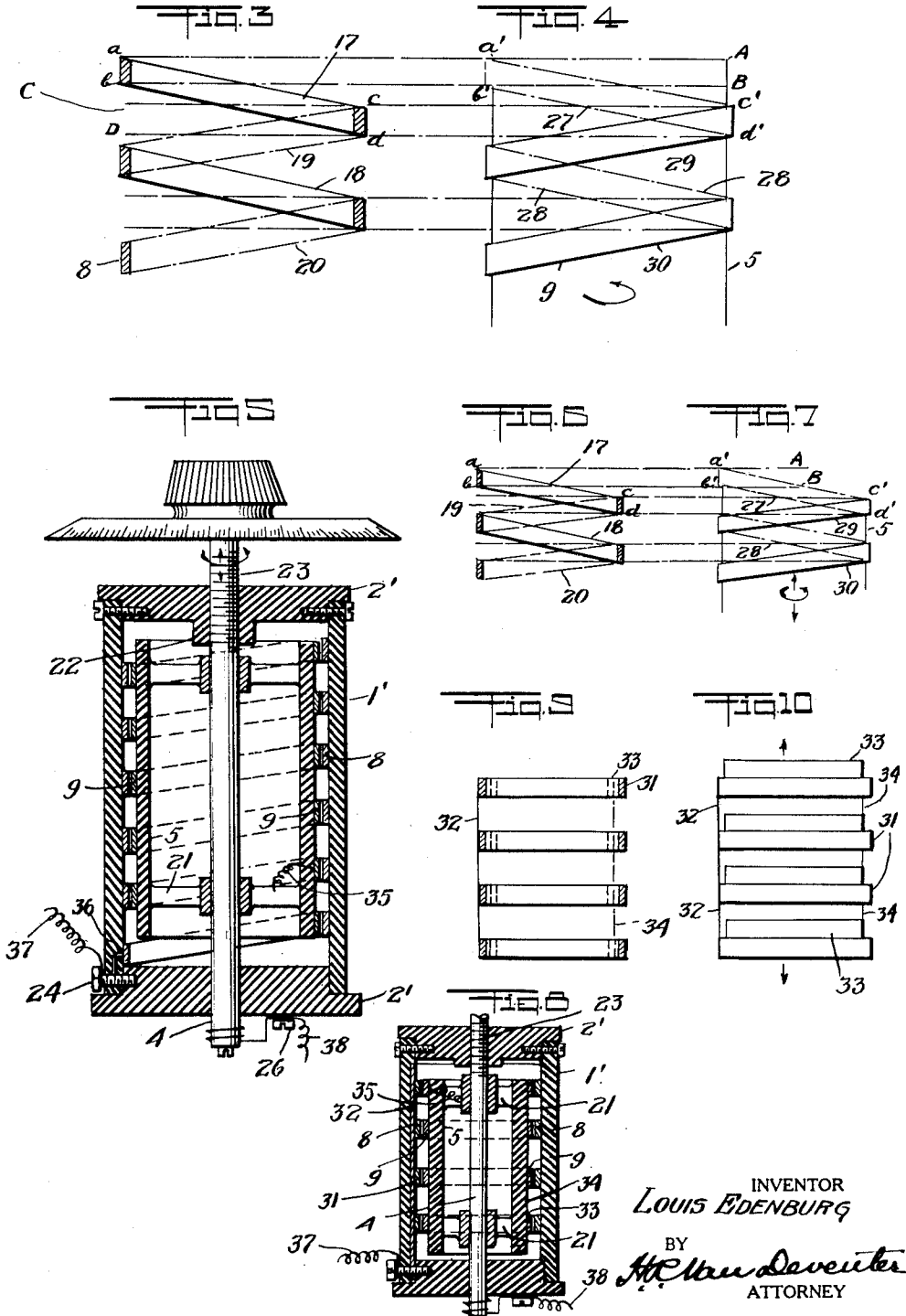
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE.

LOUIS EDENBURG, OF BROOKLYN, NEW YORK, ASSIGNOR TO DUBILIER CONDENSER & RADIO CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

ADJUSTABLE CONDENSER.

Application filed June 10, 1924. Serial No. 719,113.

This invention relates to improvements in electrical condensers; especially condensers designed to afford variation of capacity when connected in circuit.

5 The condenser according to my invention is of simple construction and easily operated; being capable of giving any desired variation in capacity whether large or small; and the nature and objects of the invention are fully set forth in the following description, taken with the drawings, which show several forms in which my invention is embodied; but I, of course, do not wish to limit myself to the exact structure shown, and I reserve the right to make any changes that are embraced within the scope and spirit of the invention as defined in the appended claims.

On the drawings—

20 Figure 1 is a cross-section on the line 1—1 of Figure 2;

Figure 2 is a side view partly in longitudinal section of a condenser according to my invention;

25 Figures 3 and 4 are diagrammatic views indicating the relative positions of the electrically conductive parts of the condenser, and showing the manner in which the relative positions of these parts can be changed to vary the capacity of the condenser;

30 Figure 5 is a longitudinal section of another form of my condenser;

Figures 6 and 7 are views similar to Figures 3 and 4 respectively, showing how the condenser of Figure 5 can be operated;

35 Figure 8 is a longitudinal sectional view of another type of condenser according to my invention; and

40 Figures 9 and 10 are views similar to Figures 3 and 4 respectively, showing how this form of condenser can be adjusted.

The same numerals identify the same parts throughout.

45 Referring first to Figures 1, 2 and 3, I show at 1 a casing which may be tubular or cylindrical in form, permanently closed at one end and having a removable cap or closure 2 at the other, the cap and the closed end of this casing having apertures to receive bearings 3. The casing, cap and bearings can all be of some insulating material and inside this casing mounted upon journals on a shaft 4, which is supported in the bearings 3, is a movable member 5 affixed to the shaft 4, and capable of turning in the

casing 1. The inside of the casing has a spiral groove 6 and a spiral rib or thread 7 of considerable width and substantially square cross-section; and upon the face of this thread is affixed a strip 8 of copper, 60 which has the form of a helix and extends along the face of the thread 7 from one end to the other.

Upon the outside surface of the member 5, which is also cylindrical, is a similar 65 groove 6, and a similar thread upon the outer face of which is a strip of copper or other conductive material 9 extending over the entire length of the thread. These two strips 8 and 9 form the conductive elements or plates of the condenser, being separated by a small air space, and in practice, one of the bands or strips will be joined to one terminal of an electric circuit, and the other band to the opposite terminal of the same circuit. The casing 1 carries a binding post 10 joined to the strip 8, to enable a circuit conductor to be united to this strip, and upon the closure 2 or bearing 3 thereon is affixed a spring 11 resting upon the adjacent end of the shaft 4. This spring may be joined to a screw 12 and in practice, the shaft 4 is preferably of metal joined to one end of the metallic strip 9. Hence, when one terminal of the circuit is fastened to the screw 12, the metallic strip 9 will be in circuit through the screw 12, the spring 11 and the shaft 4. Adjacent the closed end of the casing may be lugs 13 having openings 14 for screws or bolts, to enable the condenser to be mounted, and the shaft may have a shoulder 15 adjacent one end and be encircled by a collar 16 adjacent the other end of the member 4 to mount the member 5 snugly in the casing 1 and prevent any axial 95 play of this member in the casing 1.

Obviously, when the condenser is in circuit and the shaft 4 is turned to bring the surfaces of the metallic strips 8 and 9 directly opposite each other as shown in Figure 2, the capacity of the condenser will be greatest. If, however, the member 5 is turned by means of a knob attached to one end of the shaft 4, the metallic strips or threads 8 and 9 can be separated to a greater or less extent, and the capacity thus varied.

This effect is shown diagrammatically in Figures 3 and 4; Figure 3 presenting helical strip 8 in longitudinal section; that is, shown as if the half of this helically wound strip 110

on the side towards the observer were removed; while the rear half remains. Hence, the rear half of each complete turn of the strip is indicated by the numerals 17, 18 etc., while the forward half of each turn, which is shown as cut away, is indicated by the numerals 19, 20, etc.

Figure 4 presents the member 5 as seen from the side, the halves of the separate turn of the strip 9 on the side away from the observer being shown in broken lines, and indicated by the numerals 27 and 28; while the halves of the turns on the side turned towards the observer, are indicated by the numerals 29 and 30. Of course, the capacity will be greatest if the halves 27 and 28 of each turn of the strip 9 occupy the same positions as the halves 17 and 18 of the strip 8, and the remaining halves 29 and 30 of the turns of the strip 9 are directly opposite the remaining halves 19 and 20 of the strip 8 in the casing 1. In such positions, the points indicated at a' and b' at one end of the semi-circular half 27, will be in close proximity to the points a and b at the corresponding end of the half 17, and the points c' and d' at the other end of the half 27 will be closely adjacent to the points c and d at the other end of the half 17. Consequently, the two strips will be as close together as they can be moved, but if the member 5 be turned through 180 degrees from right to left on the side towards the observer in Figure 4, the point a' at one end of the half 27 will swing from left to right along a level indicated by the line a, a', A , and the point b' will likewise move to the right along a level indicated by the line b, b', B ; while the points c' and d' will move over to the left without changing their level until they come into position adjacent the points marked by the letters C and D , below the letters a and b . In other words, the portion 27 of the strip 9 will now be towards the observer, and the half turn 29 will be turned away from the observer and will be midway in position between the half turns 17 and 18 of the strip 8; while the half turn 27 of the strip 9 will be parallel to the half turn 19 of the strip 8, but one space above it.

The same relative positions will be occupied by all the other parts of the two helically wound strips 8 and 9, and these two strips will now be their greatest distance apart, thus making the capacity of the condenser much smaller; and for smaller changes in capacity, the member 5 is, of course, rotated through less than half a revolution.

The member 5 may be solid or it may be hollow and affixed to the shaft 4 by means of bridge bars 21. I have shown only two complete turns of the strips 8 and 9 in Figures 3 and 4, but, obviously there may be as many such turns as is desired, and the action of the

two halves of each turn will be the same as described.

In the modification shown in Figures 5, 6 and 7, the hollow cylindrical casing 1' has open ends which are closed by removable caps 2', and through apertures in these caps passes the shaft 4 which supports the member 5. The inside of the casing and the outside face of the member 5 carry helically wound strips 8 and 9 as before, and one of the caps 2' has a boss 22 with internal threads in the aperture leading there-through, to be engaged by threads 23 on the shaft or stem 4. A binding screw 24 secures the end of a conductor to the casing 1', and this screw is attached to the strip 8, the conductor forming one terminal of an electric circuit; the other extremity of said circuit may be joined to a screw 26 united by a coil of flexible wire to one projecting end of the shaft 4, and this shaft will be made metallic and be joined to the strip 9 in any suitable way. The operation of this form of condenser is the same as before except that the member 5 besides being rotatable can be caused to shift somewhat along the axis of the shaft 4 because of the threads 23 on this shaft meshing with the threads in the adjacent cap 2', having the boss 22. With this construction, the turning of the shaft 4 through a relatively smaller arc than in the case of the condenser shown in Figures 1, 2, 3 and 4 suffices to separate the strips 8 and 9 a maximum distance.

In the type of condenser shown in Figures 8, 9 and 10, a casing 1 has a number of separate circular bands 31 on its interior, all these bands being joined by a conductive strip 32 to the binding screw 24, and the member 4 has a corresponding number of separated circular bands 33 on its exterior, all joined by a strip 34, so that these bands 33 can be joined through the bridge bars 21 to the shaft 4; the bands 31 and 33 and the strips 32 and 34, together with the bars 21 and shaft 4 being, of course, of some conductive material, such as metal. In this construction, the adjustment is effected solely by the axial movement of the member 5 in the casing 1, when the shaft 4 is turned, this axial movement being due to the threads on the shaft engaging threads in one of the caps 2'.

The shaft 4 may be connected to the strip 9 on the member 5 through the bridge bars 21 in any suitable way, as indicated by the numeral 35 in Figures 1, 2, 5 and 8, and a conductor 36 is shown in Figure 5 to indicate diagrammatically how the screw 24 makes connection with the strip 8; 37 being the conductor which joins this binding screw and the binding post 10 in circuit, the other conductor at the opposite extremity of the circuit leading to the shaft 4, being indicated by the numeral 38.

For the sake of clearance, circular arrows have been added to Figures 2 and 4 to indicate that adjustment of capacity is obtained simply by turning the member 5, and both circular arrows and vertical arrows have been applied to Figures 5 and 7 to show that in the construction illustrated in these views, the member 5 not only turns, but moves up and down also. In Figure 7, the points A and B are shown closer to the points *a'* and *b'* than in Figure 4, to indicate that the member 5 in the construction shown in Figure 5 does not have to be turned through a full half circle to carry the turns of the band or strip 9 away from the turns of the band 8 and into position opposite the spaces between the turns of the band 8, to make the distance between the bands 8 and 9 as great as possible.

Figures 8 and 10 show vertical arrows only, to indicate that the adjustment is effected primarily by the vertical movement of the member 5 to carry the bands 33 as close as possible to the bands 31, and away from these bands into position opposite the spaces between the bands 31, as shown in Figure 10; although the member 5 is rotated also. This rotation, however, does not change the relative positions of the bands 31 and 33, as their position is regulated entirely by the threads 23 shifting the bands 33 up or down.

Having described my invention, what I believe to be new and desire to secure and protect by Letters Patent of the United States is:—

1. An electrical condenser comprising a casing, a band of electrically conductive material on the inside face of said casing, a

movable member in said casing, and a band of electrically conductive material on the outside face of said movable member in proximity to the first band, the movement of said member adjusting the relative position of said bands to vary the capacity of the condenser, the width of said bands being parallel to the axis of movement of the movable member.

2. A condenser comprising a casing having a strip of electrically conductive material wound helically over its interior surface from one end to the other, and a rotatable member in said casing, said member having a strip of electrically conductive material wound helically over the outside thereof to co-operate with the first strip, said member being held against axial movement in said casing, but being rotatable to vary the relative positions of said strips, and thus adjust the capacity of the condenser, the width of said strips being parallel to the axis of rotation of said member.

3. A condenser comprising a casing having a strip of electrically conductive material wound helically over its interior surface from one end to the other, and a rotatable member in said casing having a strip of electrically conductive material wound helically over the outside thereof, to co-operate with the first strip, said member being rotatable to vary the relative positions of said strips and thus adjust the capacity of the condensers, the width of said strips being parallel to the axis of movement of said member.

In testimony whereof I affix my signature.

LOUIS EDENBURG.