May 27, 1924. 1,495,511

R. J. FITZGERALD

CONDENSER

Filed May 12, 1920

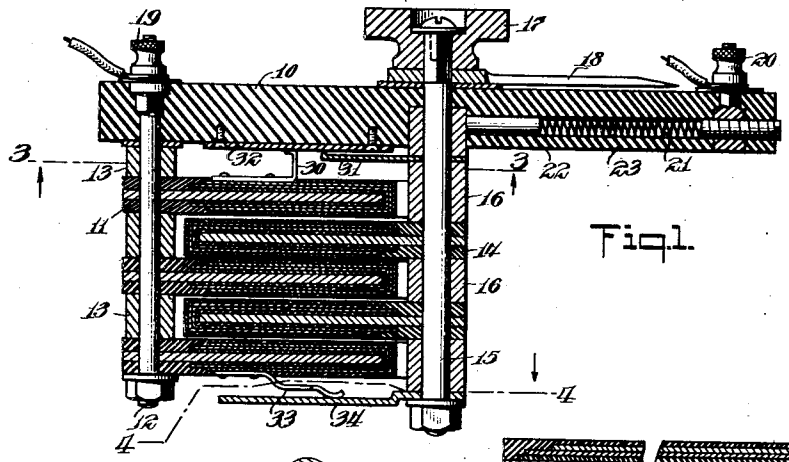


Fig. 1.

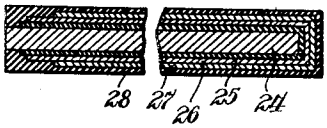


Fig. 5.

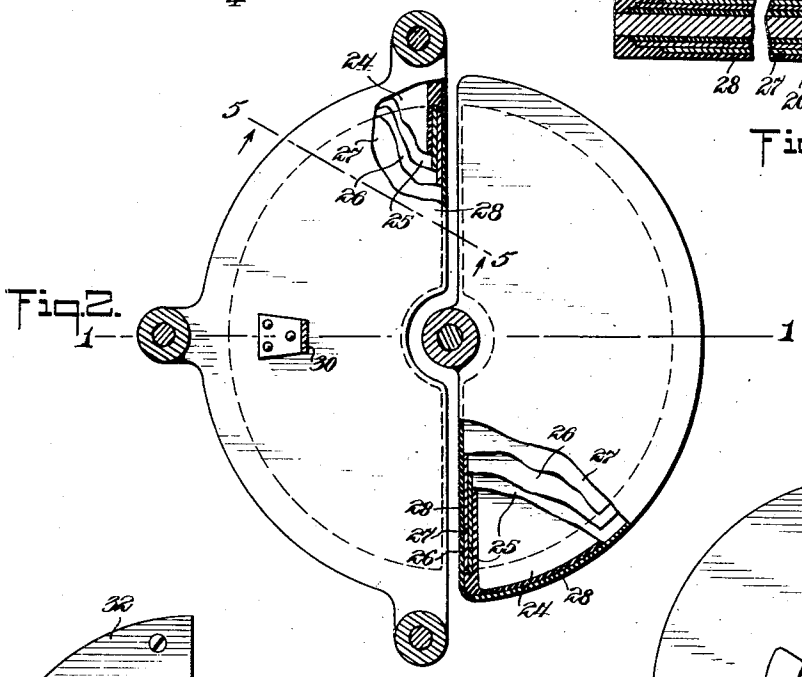


Fig. 2.

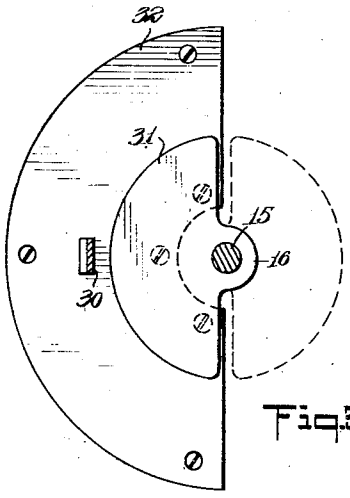


Fig. 3.

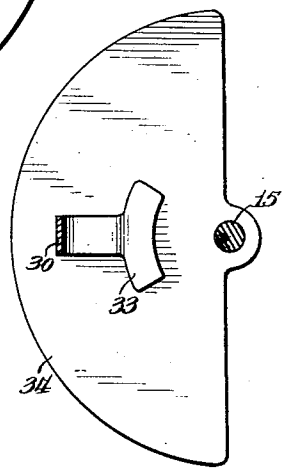


Fig. 4.

Inventor

Robert J. Fitzgerald

By his Attorney

C. F. Fairbank

Patented May 27, 1924. 1,495,511

UNITED STATES PATENT OFFICE.

ROBERT J. FITZGERALD, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO J. ARTHUR FISCHER, OF NEW YORK, N. Y.

CONDENSER.

Application filed May 12, 1920. Serial No. 380,730.

To all whom it may concern:

Be it known that I, ROBERT J. FITZGERALD, a citizen of the United States, and resident of New York city, borough of Manhattan, in the county of New York and State of New York, have invented certain new and useful Improvements in Condensers, of which the following is a specification.

This invention is an improvement in variable capacity condensers of the general type disclosed and claimed in my prior Patent 1,337,549 issued April 20th, 1920. Although in its preferred embodiment my present invention constitutes an improvement on the specific form shown in said patent, my present invention might be applied to condensers of other forms and independent of the invention of my said prior patent. In my present invention I secure the effect of a condenser of variable capacity having connected in parallel with it a series condenser also of variable capacity. Both condensers are varied simultaneously as a single condenser. In this way, I am able to secure a very much higher capacity for a given size of condenser than has heretofore been secured.

As an important feature of my invention I employ a series of stationary plates and a second series of plates movable in respect to the first series to vary the capacity as in my prior patent, but I provide each of the plates with additional plates insulated therefrom and constituting a series condenser.

In the accompanying drawings I have illustrated merely one embodiment of my invention and have illustrated this on a very greatly enlarged scale, so far as the thickness of certain of the parts is concerned, in order to facilitate clear illustration.

In these drawings:

Figure 1 is a central longitudinal section taken for instance on the line 1—1 of Figure 2, the plates being in position for maximum capacity;

Figure 2 is a section on the line 3—3 of Figure 1 looking down, the movable plates having been rotated through 180°;

Figure 3 is a section on the line 3—3 of Figure 1 looking up;

Figure 4 is a section on the line 4—4 of Figure 1; and

Figure 5 is an enlarged view of one of the plates in section.

In the form illustrated, the condenser is shown as mounted on a slab 10 of suitable non-conducting material, as for instance a slate panel. Rigidly secured to this slab is a series of condenser elements or plates 11 substantially semi-circular in form and rigidly secured by connecting bolts 12 or other suitable means. The several plates are held in rigid spaced relationship on the bolts by spacing collars or strips 13 which may be of insulating material. A second series of substantially semi-circular plates 14 are mounted on a single rod 15 which is rotatably mounted in the slab 10. These plates are held in rigid spaced relationship by spacing collars 16. The rotatable bolt is connected to each of the plates 14 intermediate of the straight edge or diameter thereof and the bolt is positioned intermediate of the ends of the straight edge of the stationary plates, as is clearly indicated in Figure 2. All of the plates lie in parallel planes and are so spaced and positioned that by rotating the shaft or rod 15 the removable plates may be brought into or out of position between the stationary plates. The shaft or rod 15 is shown as provided with a knob or handle 17 for facilitating this rotation and adjacent to the knob there is shown a pointer 18, by means of which the operator on the side of the slab opposite to the condenser plates may determine the relative positions of the plates. The opposite terminals from the source of electrical energy may be secured to binding posts 19 and 20. The binding post 19 is shown as formed of the upper or outer end of one of the stationary rods 12, and the binding post 20 is shown as connected through a coil conducting spring 21 to a brush 22 bearing on a metallic collar 23 on the rotatable shaft or rod 15. Each plate is made up of a plurality of layers of material and the construction of these plates together with their connections embodies the main feature of my invention.

In the specific form shown, each of the stationary and movable plates or units includes a main conducting body portion 24 preferably of zinc. This is encased in or coated with a layer of insulating material completely covering it except where it engages with the supporting or operating rods. This insulating coating 25 may be of various different kinds of material which may be applied in very thin impervious form or dried or baked on. I may employ bakelite,

enamel, molten or dissolved rubber composition or the like. The two opposite sides of the plates are then given a coating of graphite 26. This does not extend around the outer edges of the plates and is preferably of slightly less area than that of the main or inner zinc plate 24. The plate or unit is then electro-plated or otherwise given coatings of copper 27 upon opposite sides and of substantially the same area as the graphite layers. After the copper coating, the entire plate is given an outer coating 28 of insulating material which may be similar to or the same as the first mentioned insulating coating.

From the foregoing it will be seen that each plate has a center zinc body and separate copper plates upon each side thereof and insulated from the zinc but connected to each other around the straight or diameter edge of the plate and the entire unit is coated with insulation. Although I do not wish to be limited to any specific dimensions, the following dimensions may be given as a general approximation and to avoid confusion due to the illustrating of these layers of very much greater thickness in the drawing. The thickness of the layers measured in inches may be as follows: zinc plate .01, inner insulation .001 to .002, copper electroplating .002 to .003, outer insulation .002. This makes the thickness of the units somewhere in the neighborhood of .024.

As previously indicated all of the stationary zinc plates are connected to the terminal 19 and all of the movable zinc plates are connected to the terminal 20. The copper coatings of the plates do not extend to, or directly connect with, the metallic connecting or operating rods 12 and 15. The upper plate, which is preferably a stationary one, has a copper strip 30 projecting through the outer insulation and connected to the copper 27 and the shaft or rod 15 has a semi-circular copper strip or brush 31, both of which engage with a semi-circular copper plate 32 secured to the rear surface of the slab 10 so that the terminal 20 is thus connected to the stationary copper strip 30 in all adjusted positions. The lower stationary plate has a copper brush 33 connected to the lower copper layer 27 through the insulation 28 and this engages with a semi-circular copper plate 34 secured to and electrically connected with the lower end of the shaft 15.

The copper plates of each unit are not electrically connected to their zinc plates, but are to each other, and function by electro-static induction. The two copper plates 32 and 34 are electrically connected to the movable zinc plates by the rod 15. No copper surfaces are in electrical connection with the stationary zinc plates. The stationary zinc plates are not connected to any part of the movable plates, neither copper nor zinc, and constitute one element of the condenser. The effect of the combination is a condenser of variable capacity and a series condenser of variable capacity connected in parallel with it, the capacity of both condensers being varied simultaneously as though a single condenser.

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

1. An electrical condenser, including a plurality of stationary units and a plurality of interposed movable units connected together and movable into and out of position between said stationary units, each unit having a metallic body portion and metallic plates upon the opposite sides thereof and insulated therefrom.

2. An electrical condenser having a stationary unit and a movable unit, each unit including a metallic conducting element, a coating of insulating material upon opposite sides thereof and a metallic coating upon opposite sides of the unit and outside of said insulating coating.

3. An electrical condenser having a stationary unit and a movable unit, each unit including a metallic conducting element, a coating of insulating material upon opposite sides thereof a metallic coating upon opposite sides of the unit and outside of said insulating coating, and a further insulating coating covering said metallic coating.

4. An electrical condenser having a stationary unit and a movable unit, each unit including a body portion, a coating of insulating material, and a deposit by electro plating upon opposite sides of the unit and outside of said coating.

5. An electrical condenser having a stationary unit and a movable unit, each unit including a metallic conducting element, a coating of insulating material, and a metallic coating upon opposite sides of the unit and outside of said insulating coating, said metallic coating covering less than the total area of each surface of said conducting element.

6. An electrical condenser having a plurality of stationary units and a plurality of interposed units movable in their own planes into and out of position between said stationary units, each unit including a metallic conducting element, an insulating coating therefor upon opposite sides, a metallic coating on said insulating coating and a second insulating coating on said metallic coating, all of said metallic conducting elements of said movable units being connected together and all of the metallic conducting elements of said stationary elements being separately connected together.

7. The process of making a unit for electrical condensers consisting in coating a zinc plate with insulating material, applying a graphite coating to opposite sides of the insulating coating, depositing copper by electro-plating on said graphite and applying an insulating coating to the outer surface of said copper.

8. The process of making a unit for electrical condensers, consisting in coating opposite surfaces of a metal plate with insulating material, depositing a metal coating by electro-plating upon opposite sides of said insulating coating, and applying a second insulating coating to the outer surface of said metal coating.

Signed at New York in the county of New York and State of New York this first day of May A. D. 1920.

ROBERT J. FITZGERALD.