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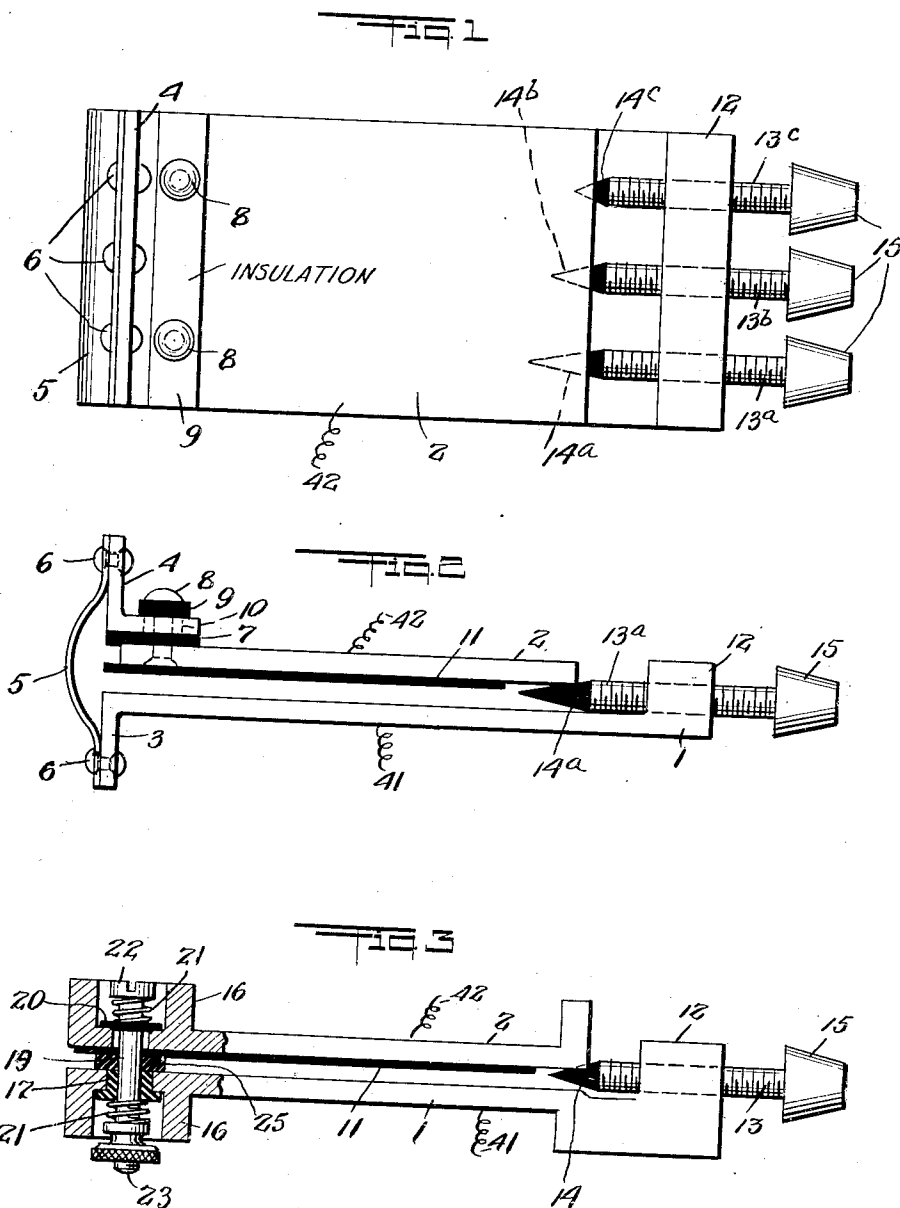
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1,735,532

VARIABLE CONDENSER

Filed Sept. 3, 1924

2 Sheets-Sheet 1



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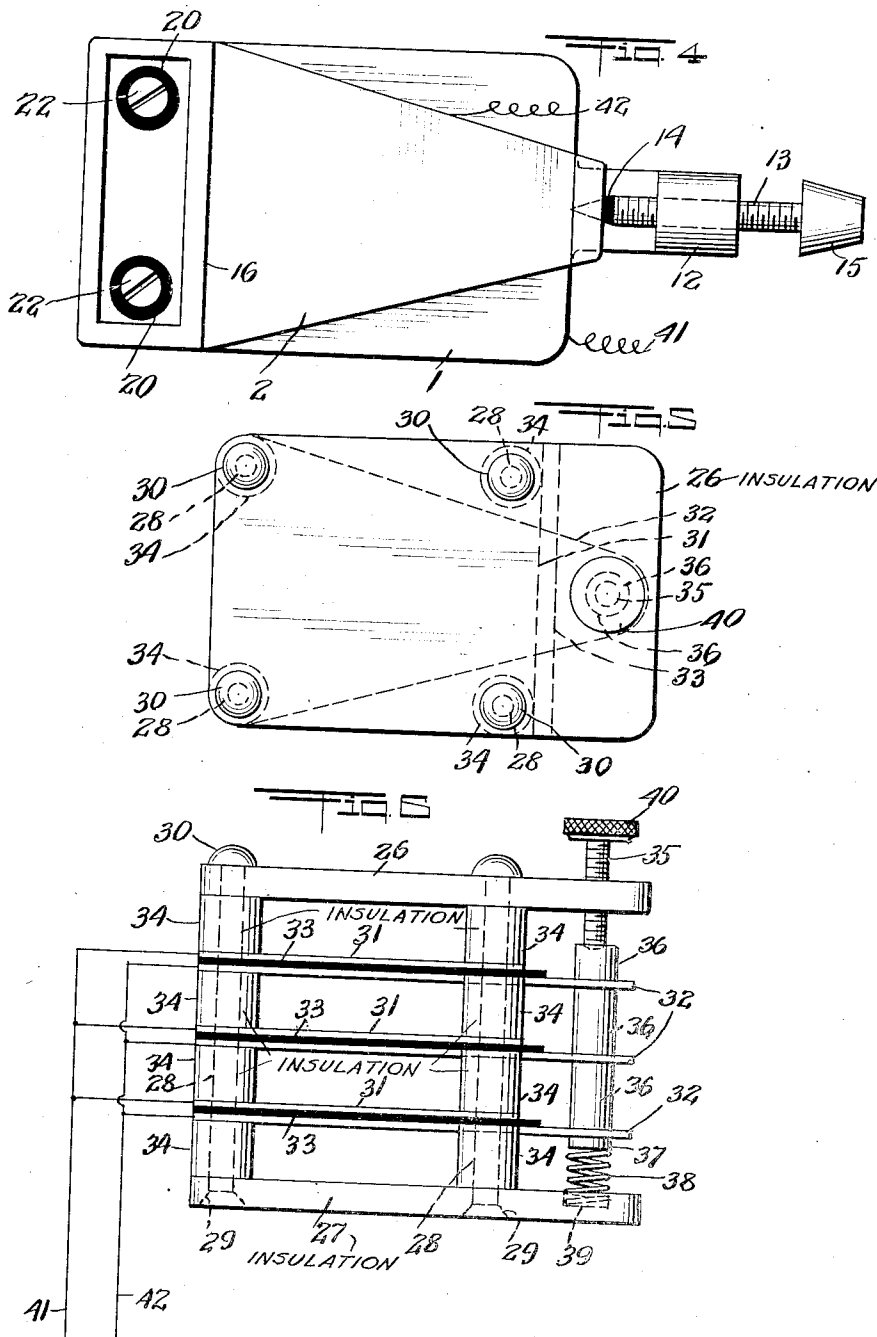
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VARIABLE CONDENSER

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2 Sheets-Sheet 2



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VARIABLE CONDENSER

Application filed September 3, 1924. Serial No. 735,563.

This invention relates to improvements in electrical condensers, particularly condensers of variable capacity.

An object of the invention is to provide an electrical condenser of such construction that precise adjustment can be obtained according to conditions in the circuit with which the condenser is connected; and a further object of the invention is to provide a condenser adapted especially for use with radio apparatus and comprising fixed and movable electrically conductive elements, so mounted that when adjusted to alter the capacity in accordance with a change in the wave length, the degree of relative movement of said elements will be proportionate to variations in the wave lengths with which the apparatus is set to operate.

The above and further objects and advantages of this invention will appear from the following description, taken with the accompanying drawings which illustrate several forms in which the principle of my invention is embodied; and I, of course, reserve the right to make changes in details; particularly, as to shape, size and arrangement of the various parts; within the scope and spirit of the invention as indicated by the broad and general meanings of the terms in which the appended claims are expressed.

On the drawings,

Figure 1 is a top plan of a condenser according to my invention;

Figure 2 is a side view thereof;

Figure 3 is a side view partly in section of another type of condenser according to my invention;

Figure 4 is a top plan thereof;

Figure 5 is a top view of another modification; and Figure 6 is a side view of what is shown in Figure 5.

The same numerals identify the same parts throughout.

In Figures 1 and 2 I show a plate or element 1 of electrically conductive material associated with a similar plate 2; the plate 1 having a transverse rib or offset 3 at one end and the adjacent end of the plate 2 being secured to a transversely disposed angle bar 4; this rib 3 and bar 4 being joined by resilient

means such as a spring 5 secured to the rib and the bar by rivets 6. Between the plate 2 and the bar 4 is a piece of insulation 7, and the plate 2 and bar 4 are attached together by means of rivets 8 passing through the plate, the insulation and the bar, and interposed between the upper heads of the rivets 8 and the bar 4 is an insulating washer 9, the holes for the rivets through the bar being larger than the rivets, as indicated at 10 in Figure 2, so that the rivets do not make contact with the bar 4, and the plates 1 and 2 are always electrically separated from each other. On the face of the plate 2 presented to the plate 1 is a sheet of insulation such as mica 11 held fast by an adhesive or any other suitable means.

The plate 1 is provided with an extension 12 having threaded bearing openings to receive a plurality of parts such as screws 13^a, 13^b and 13^c, the ends of these screws being tapered in varying degrees as indicated by the characters 14^a, 14^b and 14^c. These tapered ends or points of the screws project between the adjacent edges of the plates 1 and 2 and each screw has a knob 15 to enable it to be turned. With the screw 13^c, the two plates will be separated by a greater amount for the same degree of rotation of the screw, than by the rotation of the screw 13^b; and with the screw 13^a, the point of which is longest, all these screws being of the same diameter, a still finer adjustment can be obtained. Hence, in practice, the condenser can be set first with the screw 13^c, and then successively of the screws 13^b and 13^a; thus the capacity of the condenser can be varied with the full degree of precision desired.

In Figures 3 and 4, the plate 1 and plate 2 with the insulation 11 secured to the face of the plate 2 as before, are secured together along one end by means different from the spring 5. The ends of the two plates remote from the bearing 12 are each provided with a hollow projection or rectangular rim 16 and in the bottoms of these projections are holes which give passage to suitable binding screws; the holes, for example, in the plate 1, are provided with insulating bushings or

linings 17, the holes in the other plate being of about the same size, and screws 19 are passed through the bushings 17 and holes 18, these screws being insulated from the plate 1 by the lining 17, and being small enough to be out of contact with the edges of the holes 18 in the plate 2. Surrounding these screws and bearing against the bottoms of the projections 16 in the plate 2 are insulating washers 20, and surrounding the screws at both ends are compression springs 21, bearing against the linings 17 and washers 20. The head 22 of each screw is provided with a kerf to enable it to be engaged by a tool and this head and washer 20 confine one of the springs of each screw 21 between them; while the other end of each screw is threaded and receives a binding nut 23 to press the other spring 21 against the lining 17. Hence, by turning the nuts 23, the degree of compression of the springs 21 can be altered. The binding screws 19 can be caused to draw the adjacent ends of the plates 1 and 2 together to such an extent that the plate 1 will make contact with the insulating sheet 11; if nothing else is between the plates 1 and 2; or if desired, I can interpose between the plates 1 and 2 a spring or cushion or other resilient spacing element which can be compressed to draw the adjacent ends of the plates 1 and 2 together, as the springs 21 are compressed by turning up the nuts 23, as indicated in Figure 3 at 25.

The plate 1 may be substantially rectangular in shape and it has a central projection 12 at the end opposite the end carrying the lining 17, with a threaded bore to receive a single adjusting part or screw 13 with a tapering point 14 to project between the adjacent ends of the plates 1 and 2 and carrying on its opposite extremity a knob 15. The shape of the upper plate 2 may be as indicated in Figure 4. It will be widest at the end where it is engaged by the screws 19, and its sides will converge towards the opposite end which is forced away from the plate 1 and allowed to approach this plate according to the position of the tapered end 14 of the screw 13. The portion of the upper plate 2 which always moves through the greatest distance when this type of condenser is adjusted, is the small or narrow end, and the portions of the plate 2 at successive points between the narrow end and the larger or rear end will move to a less and less extent, and the rear edge where this plate is broadest hardly moves at all, but remains stationary practically to the same extent as if it were hinged to the plate 1. Thus a sufficiently good and fine adjustment can be obtained by turning the screw 13 and owing to the tapering outline of the upper plate 2, the degree of movement of the plate 2 will be proportional to changes in the wave length when the capacity of the condenser is to be altered for variation in wave lengths upon

which the apparatus for which the condenser is intended is operated; that is to say, with the condenser plates 1 and 2 set to give the desired capacity for a corresponding wave length, the amount of displacement which the plates 1 and 2 must receive for a change in capacity corresponding to another wave length will always be proportional to the wave lengths in question.

Of course, in the form shown in Figures 1, 2, 3 and 4 the screws having the heads 15 must not short circuit the plates 1 and 2. For this purpose the screws should be of insulation or at least the cone shaped points thereof should be of some non-conductive material.

Figures 5 and 6 show another condenser comprising a top 26 and a bottom 27 of insulation secured together by rods 28 having heads 29 at one end countersunk in the bottom 27 and riveted over at the opposite extremities 30 to engage the top and thus hold the top and bottom together. Between the top and bottom are several pairs of plates 31 and 32, the former having substantially the same shape as the plate 1 of Figures 3 and 4 and the latter, substantially the same shape as the plate 2 of the form shown in Figures 3 and 4, the plates of each pair being separated one from another by intervening insulation or dielectric 33. All of the rods 28 pass through the elements 31; while the elements 32 are engaged by only two of the rods adjacent one end of the condenser; that is to say, only by the two rods 28 which pass through the ends of its longer side; each pair of elements 31 and 32 with the dielectric 33 between them being spaced from the other pairs by insulating sleeves 34 encircling all four rods 28. These sleeves 34 on the two rods 28 at the left, with reference to Figures 5 and 6, may be separated by the plates 31 and 32 and the insulation 33; while the sleeves 34 on the other two rods 28 may be separated from one another by only the thickness of the plates 31 and the thickness of the insulation 33; if the plates of insulation or dielectric 33 are wide enough to spread over and cover the lower face of the plate 31. If, however, these plates 31 are intended to be associated and to be of substantially the same outline as the plates 32, then the sleeves 34 on these two other rods 28 will be separated from one another at their ends by only the plates 31. Normally, the plates 32 will lie flat against the insulation 33 and even press it upon the lower surfaces of the plates 31. The free or narrow ends of the plates 32 between the two posts 28 through which the narrow portions of the plates 32 extend are controlled by means of a screw 35 passing through a threaded opening in the top 26 and upon the narrow ends of the plates 32 below this screw are disposed and secured projections 36 of some insulating material

held in place upon these plates in any suitable manner, the projections 36 being all in alinement, and the projections 36 of all of these plates 32, except possibly the upper plate 32 being long enough to contact with the lower surface of the plate 32 immediately above in each instance, so that when the screw 35 is turned down it can be made to depress all of the plates 32 in unison. Upon the bottom of the lower-most plate 32 is a projection 37 to engage a spring 38 received in a recess 39 in the bottom 27, this spring tending to force upward all of the plates 32 to hold them against the insulating plates 33 and to keep these insulating plates against the lower surfaces of the plates 31. I prefer to make these plates 33 of such a shape that they are similar in outline to the plates 31 and are engaged by all four of the posts 28, that is, these insulating plates 33 as well as the plates 31 will extend between the ends of the sleeves 34 on all of the posts 28. Hence, only the plates 32 will be movable and the spring 38 as stated, will normally tend to force the plates 32 upward so as to hold the plates 32 as close to the plates 31 as the intervening plates of dielectric 33 will permit. The screw 35 will have an operating head or knob 40.

In operation, the turning of the screw 35 so as to force down the ends of the plates 32 will lower the capacity of the condenser, the plates 32 being flexible will bend downward at their ends beneath the screw 35 and these ends will be moved the farthest towards and from the plates 31, the intermediate portions between the wide ends and narrow ends of the plates 32 moving to a less extent, and with this form of condenser a sufficiently fine adjustment can be obtained as before, and the degree of movement of the plates 32 will likewise always be proportionate to changes in the wave lengths for which variations in capacity are required.

In all of the forms of condensers described herein, the conductive elements or plates are held together in effect at one end, and the adjustment is produced by causing the plates to separate or approach at their opposite ends.

All of the condensers above described can, of course, be enclosed in a suitable container or mounted upon a switchboard or panel with the knobs in accessible position and conductors leading to the plates 1 and 2 or the plates 31 and 32 in any suitable manner. Such conductors are indicated diagrammatically in the several views by the numerals 41 and 42.

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. A condenser comprising a top and bottom, elements of conductive material between said top and bottom and electrically separated from each other, each alternate one

of said elements having a projecting end, and a screw mounted in said top to cause pressure to be exerted upon said projecting ends to bend said alternate elements and vary their distances from the other elements to change the capacity of the condenser. 70

2. A condenser comprising a top and a bottom, rods for securing said top and bottom together, a plurality of pairs of plates between said top and bottom, insulation between the plates of each pair, said plates and said insulation being mounted by means of said rods and spaced apart by insulating sleeves encircling said rods, one plate of each pair having a free end with a projection thereon, said projections being in alinement, a spring tending to move said plates into close relation with respect to the remaining plates, and a screw engaging the top to enable pressure to be exerted upon said ends, in opposition to the spring, and thus effect separation of the plates of each pair to a greater or less extent to vary the capacity of the condenser. 80 85

In testimony whereof I affix my signature.
WILLIAM DUBILIER.