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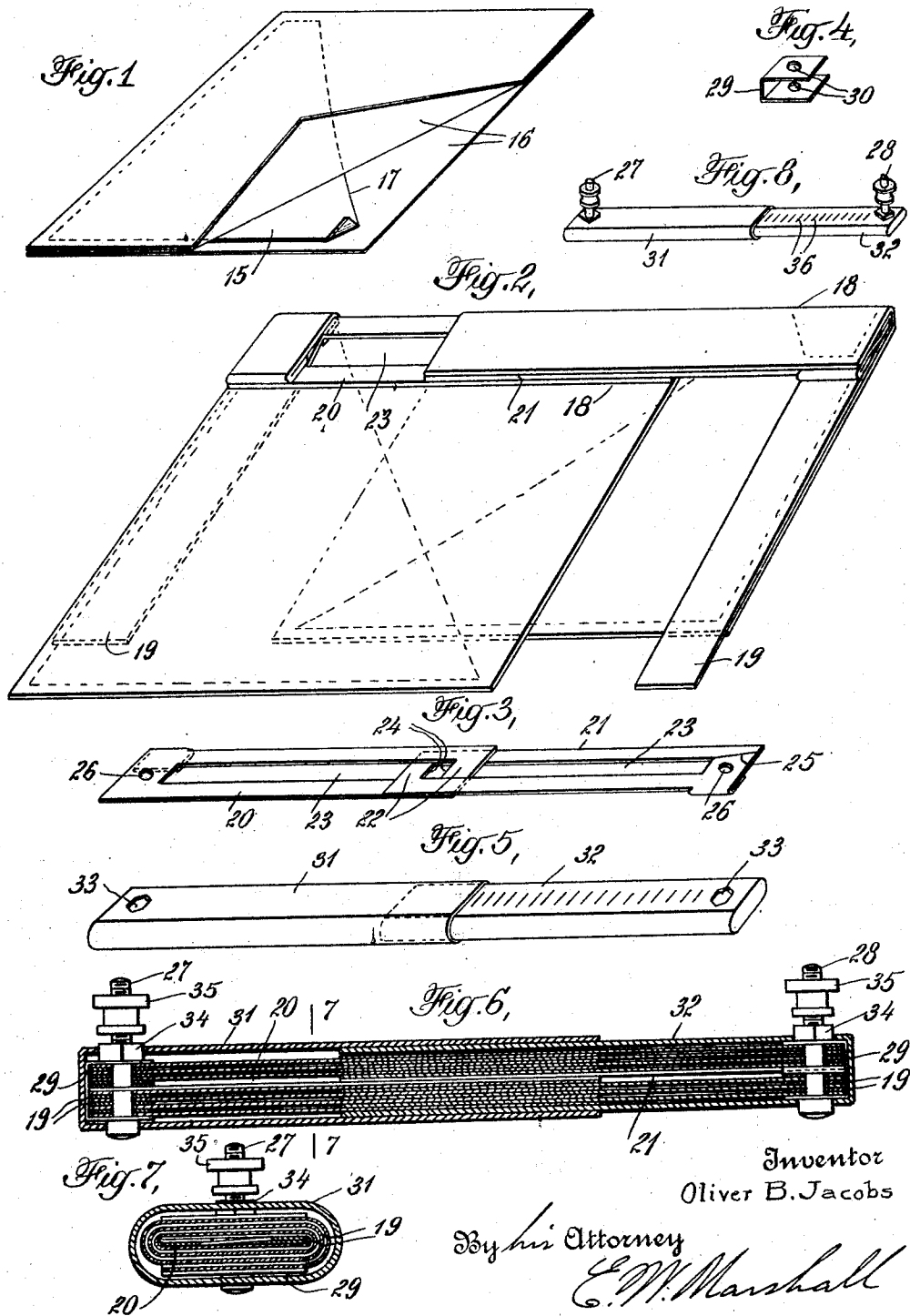
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O. B. JACOBS

VARIABLE CONDENSER

Filed March 24, 1922

2 Sheets-Sheet 1



Inventor
Oliver B. Jacobs

By his Attorney
E. W. Marshall

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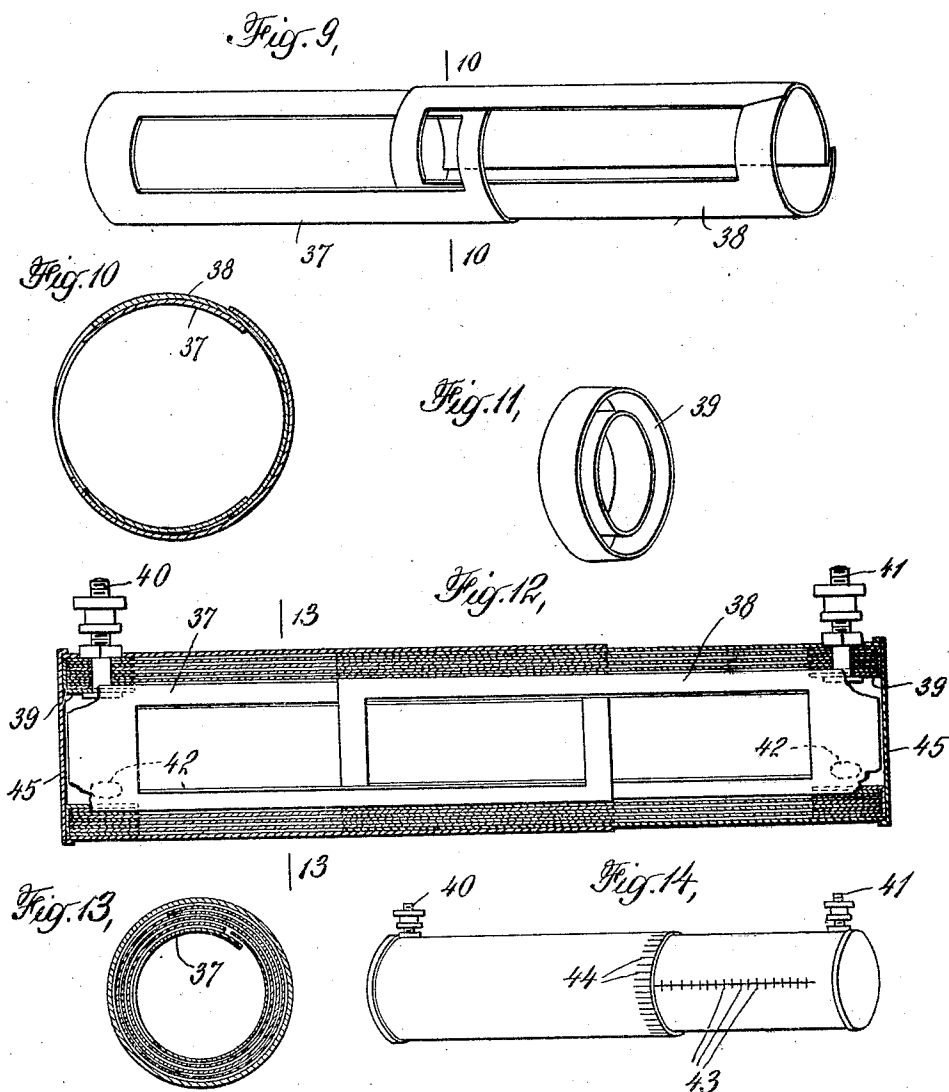
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UNITED STATES PATENT OFFICE.

OLIVER B. JACOBS, OF MORRIS PLAINS, NEW JERSEY.

VARIABLE CONDENSER.

Application filed March 24, 1922. Serial No. 546,339.

To all whom it may concern:

Be it known that I, OLIVER B. JACOBS, a citizen of the United States, and a resident of Morris Plains, Morris County, and State of New Jersey, have invented certain new and useful Improvements in Variable Condensers, of which the following is a specification.

My invention relates to condensers of variable capacity.

Some of the important objects of the invention are to provide a condenser of this character, which will be of particularly simple and inexpensive construction, and which will be capable of very fine adjustment throughout a considerable range of capacity.

Other and further objects are to provide a condenser which can be quickly and easily adjusted, which will retain its positions of adjustment and in which the degrees of adjustment will be of constant or substantially constant value.

Other objects and the special novel features of construction, combination and relation of parts which make possible the attainment of such objects, will appear as the specification proceeds.

In the drawings accompanying and forming part of this specification, I have illustrated the invention as embodied in but two of its simplest and most practical forms and wish it understood that the structure may be modified in various respects without departure from the true spirit and scope of the invention as hereinafter defined and claimed.

Figure 1 in the drawings referred to is a perspective view of one of the condenser elements, made up of a sheet of tinfoil or the like with layers of paper or other suitable dielectric directly attached thereto.

Figure 2 is a perspective view of the two cooperating condenser elements in partially folded condition.

Figure 3 is a perspective view of the interlocking core members which limit the movement of the condenser elements.

Figure 4 is a perspective view of one of the contact clips which bind the folds of the condenser elements together.

Figure 5 is a perspective view of the telescopic sections of the case.

Figure 6 is an enlarged longitudinal sectional view of the completely assembled device.

Figure 7 is a cross sectional view of the same.

Figure 8 is a perspective view of the complete condenser on a somewhat reduced scale.

Figure 9 is a perspective view of the telescopic core elements of a cylindrical form of the condenser.

Figure 10 is a cross sectional view of the same on substantially the plane of line 10—10 of Figure 9.

Figure 11 is a perspective view of the cylindrical form of contact clip used with this style of condenser.

Figure 12 is a longitudinal sectional view of the complete condenser.

Figure 13 is a cross sectional view of the same on substantially the plane of line 13—13 of Figure 12.

Figure 14 is a perspective view of the complete condenser.

In both forms of the invention herein shown the plates of the condenser are in the form of flexible sheets folded together into interleaved telescopic sliding relation with a flexible dielectric folded in between the layers of the condenser plates.

A preferred method of construction is to combine the dielectric with the plate material so that they can be handled and folded as a single sheet. One of these compound sheets is disclosed in Figure 1 as consisting of a layer 15 of flexible conducting material such as tinfoil, with layers 16 of waxed paper or other suitable dielectric secured to the opposite faces thereof, in this particular instance, for example, by simply applying heat and pressure to the waxed covering layers. In this view also I have shown how the dielectric is preferably extended beyond the edges of the plate and how the plate may be tapered in width from one end to the other, the taper edge 17 being indicated as cut on a logarithmic curve, for a purpose which will later appear.

In Figure 2 I have indicated one method by which these flexible condenser plates with the attached flexible dielectric may be assembled in interleaved relation by laying one over the other and then folding them together along the lines 18. This it will be seen brings a plurality of leaves of one plate between similar leaves of the other plate, the dielectric folding with the plate material and holding the same properly separated.

rated at all points. The sheets are preferably so arranged that the edges of one do not extend fully into the creases between the folds of the other so that they will not cut through the dielectric in the relative adjustment of the same.

The leaves of each sheet may be spaced apart so as to freely receive the leaves of the other sheet as by means of spacer strips such as indicated at 19 in Figure 2, which may be attached to the dielectric sheets or simply be folded in at the ends of the sheets when the parts are being assembled. The spacing effect of these strips will be observed particularly in Figure 6.

In this folded and properly spaced relation the condenser plates are guided so as to readily slide over each other, and permit of an easy telescopic action. The capacity, of course, will depend upon the area of the leaves exposed to each other and the proximity of the plates, and with these facts in mind it will be evident that the invention provides a means by which a relatively high capacity may be obtained in a most compact form, and further, that the capacity may be varied in very fine increments and decrements by slight in and out adjustments of the two elements.

The purpose of cutting the plates on logarithmic curves, as indicated, will now be apparent, it being seen that with the proper curves or angles of the two plates, the capacity may be increased or decreased to tune a circuit, including the condenser, to definite wave lengths by directly proportional movements of the two members. In other words, the tuning of the circuit can be made directly proportional to the adjustment of the condenser.

Complete separation of the interleaved plates is prevented and the extent of adjustment is controlled in the illustration by slidably related core members 20 and 21 (Figure 3) in the form of flat strips of insulating material linked together in sliding relation, and each having an end bar 22 operating in a slot 23 in the other and arranged by engagement with each other to limit the outward sliding movement and by engagement with the inner walls of the slots at 24, to limit the inward sliding movements. One of these core strips is shown slotted at 25 to permit of the linking together and both of them are shown as perforated at their outer ends at 26 to receive the combined securing screws and binding posts.

These binding posts are shown in the form of screws 27, 28, extending through the compacted outer ends of the folded plates and the centrally disposed core strips.

To insure good electrical contact between these screws and the condenser plates, I have shown the metallic U-clips 29 (Figures

4 and 6) engaged over the ends of the folded plates and perforated at 30 to admit the screws. In place of these clips, tubular rivets or equivalent fastenings may be employed.

To protect the folded plates from mechanical injury I preferably enclose the same within a casing consisting of the telescopically engaged sections 31, 32, which may be of suitable insulating material and perforated at their outer or closed ends at 33 for the passage of the screws. In the form illustrated the openings at the lower sides of these casing sections are shown as large enough to admit the heads of the screws into contact with the terminal clips and the openings at the upper sides are shown as of polygonal outline to admit the nuts 34 into contact with the other sides of the clips, and to hold the nuts against turning when the screws are tightened. Suitable binding nuts 35 may be provided on the ends of the screws for securing the wires or other conductors used for connecting the condenser in circuit.

As an aid to securing the desired adjustments, a suitable scale may be provided, as shown in Figure 8, wherein a series of graduations 36 are placed on one face of the inner casing section for registry with the end of the outer casing section.

The telescopic sections of the casing operate as external guiding means and the interlinked stop members operate in a guiding capacity at the center of the interleaved plates, relieving the plates of strain and causing them to slide in straight line movements over each other. The stop members also serve in the further capacity of a core or form about which the condenser sheets may be wrapped, as plainly indicated in Figure 2.

The flat-folded form of condenser thus far described is particularly advantageous because of its compactness, but where compactness is not so necessary and where it is desirable to get a certain further adjustment, the condenser may be made up in the cylindrical tubular form shown particularly in Figure 14. Except for the difference in form the structure is practically the same. The core elements 37, 38 (Figure 9) are of tubular slotted construction linked together in the same way as the flat core members previously described, this cylindrical construction allowing of a rotary as well as a straight telescopic adjustment, the extent of such rotary adjustment being determined by the width of the slots.

The flexible condenser plates are in this instance folded or rolled together about the cylindrical core, with interposed spacing strips at the ends as before and with U-clips 39 of cylindrical form engaged over and

secured to the ends of the plates by binding posts 40, 41. These clips, which are here actually in the form of doubled walled rings, may be further secured in place on the ends of the plate elements by through rivets, such as indicated at 42.

The two adjustments made possible in this construction are of special advantage in providing for instance, a first or primary adjustment by the in and out telescopic movement of the parts and then a finer or vernier adjustment by the relative rotation of the parts. The first of these adjustments is facilitated by the longitudinally extending scale 43 and the second by the peripherally extending scale 44.

After the parts have been assembled the ends of the tubular condenser elements may be closed by suitable caps 45 which may simply be held in place by the binding screws.

When the condenser elements are flattened, as in the form illustrated in Figures 2, and 6-8, their longitudinal folds at the edges materially stiffen the structure and this form also brings all of the plates into close proximity. This feature, with the core at the inside and the more or less stiff casing at the outside provides two practically rigid elements which can be readily adjusted as desired.

What I claim is:

1. A variable condenser comprising interleaved flexible condenser plates with interposed flexible dielectric interfolded along parallel lines and longitudinally adjustable with respect to each other.

2. In a variable condenser, cooperating relatively adjustable flat condenser elements including a flexible metallic sheet folded along a straight line over the other element into substantially parallel planes and carrying a flexible dielectric.

3. The structure of claim 2 with means for positively limiting the relative movements of said two elements.

4. The structure of claim 2 in which said elements are provided with interlinked relatively slidable cores of non-metallic material arranged to engage to limit the relative movement of the elements.

5. The structure of claim 2 in which the folds are held together by an embracing clip.

6. The structure of claim 2 in which the relative motion of the elements is limited by interlinked core members and in which said core members are secured to the condenser elements by through fastenings forming terminals.

7. In a variable condenser, a core consisting of slidingly related members interlinked to limit the separating movement thereof and condenser elements consisting of flexible conducting sheets with flexible dielectric

rolled about the core and secured each to one of the slidingly related interlinked core parts.

8. In a variable condenser, a core consisting of slidingly related members interlinked to limit the separating movement thereof and condenser elements consisting of flexible conducting sheets with flexible dielectric sheets rolled about the core and secured each to one of the slidingly related interlinked core parts by means of fastenings having exposed terminals providing binding posts for the respective condenser elements.

9. The structure of claim 7 in which the slidingly related condenser elements are encased in telescopically related covers.

10. The structure of claim 7 in which the slidingly related condenser elements are encased in telescopically related insulating covers and in which the fastenings for each condenser element secure together the folds of the condenser element, the core member and the casing section for such element.

11. The structure of claim 7 in which the condenser elements have a rotary as well as a longitudinally sliding adjustment.

12. The structure of claim 7 in which the condenser elements have a rotary as well as a longitudinally sliding adjustment and in which the core parts are interlinked by having slotted engagement with each other, the extent of such slots determining the amount of longitudinal and rotary adjustment of the elements.

13. The structure of claim 7 with metallic clips mechanically and electrically connecting the ends of the folded sheets.

14. In a variable condenser, flexible sheets of conducting material with flexible dielectric layers folded together into sliding interleaved relation.

15. The structure of claim 14 with spacing strips at the ends of the sheets to provide spacers between the folded leaves of each element for the free reception of the folded leaves of the other element.

16. The structure of claim 14 in which the dielectric material extends beyond the edges of the conducting material.

17. A variable condenser comprising laminated sheets of tinfoil and paper, folded together into sliding interleaved relation.

18. A variable condenser comprising laminated sheets of tinfoil and waxed paper affixed thereto, said sheets being folded together into sliding interleaved relation.

19. A variable condenser, the elements of which comprise two sheets of paper and an interposed sheet of tinfoil, said elements being folded together into sliding interleaved relation.

20. A variable condenser, the elements of which comprise two sheets of waxed paper and an interposed sheet of tinfoil, said sheets of paper and tinfoil being affixed to each

other, and said elements being folded together into sliding interleaved relation.

21. The structure of claim 20 in which the paper extends beyond the edge of the tin-
5 foil.

22. A variable condenser comprising elements composed of flexible metallic sheets and flexible dielectric sheets, folded along longitudinal lines to form a plurality of flat
10 interleaved portions.

23. A variable condenser comprising a pair of similar elements composed of flexible metallic sheets and flexible dielectric sheets, folded along longitudinal lines to form a
15 plurality of flat interleaved portions, the outer end of each element extending beyond the inner end of the other element.

24. In a variable condenser, cooperating relatively adjustable condenser elements including a flexible metallic sheet carrying a
20 flexible dielectric on both of its sides, said sheet and dielectric being folded on parallel lines into flat, overlapping portions, said elements being relatively movable in a di-
25 rection parallel with said lines.

25. In a variable condenser, cooperating

relatively adjustable condenser elements including flexible metallic sheets each carrying a flexible dielectric on each of its sides, said sheets and dielectrics being folded on paral- 30
lel lines into flat, overlapping portions, relatively movable in a direction parallel with said lines.

26. In a variable condenser, a plurality of flexible metallic plates separated by a flex- 35
ible dielectric, at least one of said plates being folded into flat portions which overlap another plate, said plates being free to move relatively in a direction parallel with the edge of the fold. 40

27. In a variable condenser, a plurality of flexible metallic plates separated by a flexible dielectric, said plates being folded into flat portions along parallel lines with the portions of one of the plates overlapping 45
the portions of another of the plates, said plates being free to move relatively in a direction parallel with the edges of the folds.

In witness whereof, I have hereunto set my hand this 22d day of March, 1922.

OLIVER B. JACOBS.