Feb. 8, 1927. 1,616,832

R. C. SPRAGUE

CONDENSER

Filed Sept. 18, 1925

Fig. 4.

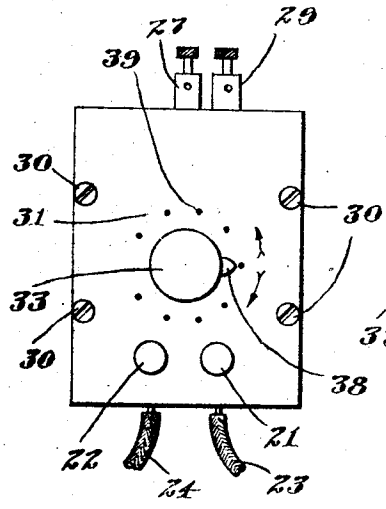


Fig. 5.

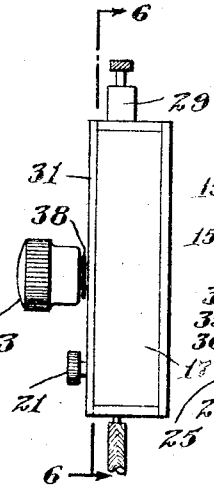


Fig. 6.

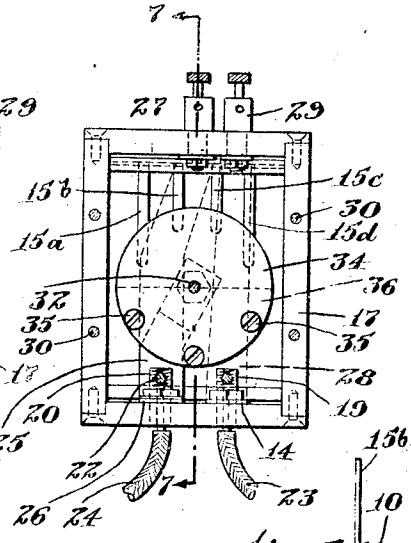


Fig. 1.

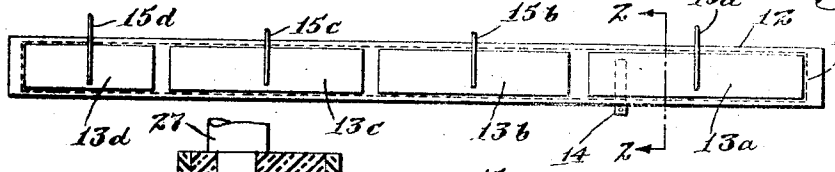


Fig. 2.

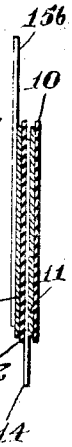


Fig. 7.

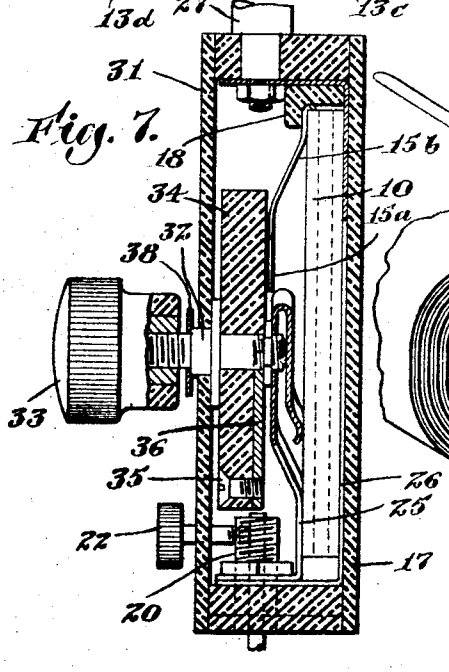
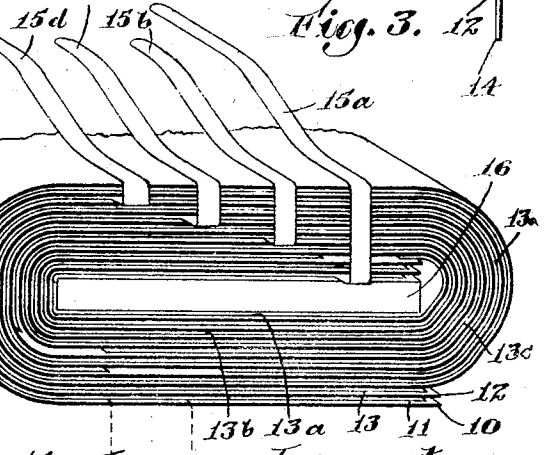


Fig. 3.



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UNITED STATES PATENT OFFICE.

ROBERT C. SPRAGUE, OF QUINCY, MASSACHUSETTS.

CONDENSER.

Application filed September 18, 1925. Serial No. 57,110.

My present invention relates to condensers, and more particularly to an improved condenser of variable capacity.

In variable condensers as heretofore constructed, it is customary to utilize plates of metal, such plates being arranged in groups or series and each group or series movable relatively to another group or series. It has not, however, as far as I am aware, been possible to construct a condenser of small cubic displacement and relatively large capacity by utilizing metal plates as the armatures. Again, heretofore it has not been considered possible to manufacture a condenser of the variable type with tin foil as the armature material.

In my present invention I have obviated the objectionable features of prior devices of this character and have produced a condenser of the variable type, utilizing tin foil as the armatures thereof and which condenser, while variable and of relatively large capacity, is of relatively small cubic displacement.

The principal object of my invention, therefore, is an improved condenser.

Another object of my invention is an improved condenser of the variable type.

A further object of my invention is an improved variable condenser utilizing tin foil as the armatures.

In the accompanying drawings illustrating the preferred embodiment of my invention,

Fig. 1 is a developed plan view of the condenser;

Fig. 2 is an enlarged sectional side elevation taken on the line 2—2 of Fig. 1;

Fig. 3 is a perspective view of a portion of the condenser structure showing the manner in which the lead out connectors are arranged;

Fig. 4 is a front elevation of an enclosing case in which the condenser structure shown in Figs. 1, 2, and 3 may be placed, and further showing the means mounted on the enclosing casing for varying the capacity of the condenser at will;

Fig. 5 is a side elevation of Fig. 4;

Fig. 6 is a front elevation with the cover plate removed, and therefore taken on the line 6—6 of Fig. 5, and

Fig. 7 is a sectional side elevation on the line 7—7 of Fig. 6.

Referring to the drawings, and particularly to Figs. 1 and 2, it will be noted that the condenser is made up of alternate layers of paper and a thin sheet metal, as tin foil. There is shown a layer of paper 10, then a layer of thin sheet metal 11, as foil, then a second layer of paper 12, and finally a layer of thin sheet metal 13, as foil. Each layer 10 and 12 of paper or other suitable dielectric is preferably made up of two sheets and each layer 10 is continuous from one end of the condenser to the other, as indicated in Fig. 1. The layers 10 and 12 are of suitable width and are also of any suitable length, the length depending, of course, on the capacity of the condenser it is desired to construct. Between the layers 10 and 12 of paper is placed the layer 11, preferably of tin foil, although any other suitable material may be employed. This layer is one continuous length and the length is such that it is slightly shorter than the overall length of the layers 10 and 12, and also the width thereof is less than the width of the layers 10 and 12, all as clearly indicated in Fig. 1 where such layer 11 is shown by the dotted lines. Connected to the layer 11 and extending laterally outward therefrom is a strip 14 of copper or other suitable material and which is used as a connecting strip for connecting the plate 11 in a circuit. Resting on the top layer 12 of paper is a layer 13 of tin foil, this layer being made up of a plurality of sections 13^a, 13^b, 13^c, 13^d, etc., the sections being arranged end to end with a space between them. This plate 13 formed of the sections 13^a, 13^b, 13^c, and 13^d, forms the second plate or armature of the condenser. To each of the sections 13^a, 13^b, 13^c, and 13^d is connected a thin strip of sheet material 15^a, 15^b, 15^c, and 15^d respectively, these strips being formed preferably of spring copper or spring phosphor bronze. These strips extend laterally outward from the sections 13^a, 13^b, 13^c, and 13^d respectively, and the disposition of such strips will be hereinafter described. To assemble the condenser, a block 16 of insulating material and of suitable length and width is utilized and on which the elements 10, 11, 12, and 13 are rolled, the finished condenser having the shape or form shown in perspective in Fig. 3. Referring to this Fig. 3, it will be noted that the connecting strips 15^a, 15^b, 15^c, and 15^d are of varying lengths, this difference in length being utilized in a manner to be hereinafter described.

The condenser structure shown in Fig. 3 is preferably mounted in a box or case 17 of insulating material, a bracket 18 being util-

ized to hold the condenser structure in position adjacent to the bottom of the box. When thus positioned, and referring to Fig. 6, it will be noted that the ends of the connecting strips 15^a, 15^b, 15^c, and 15^d lie in the circumference of a circle of which the geometrical center of the bottom of the box 17 is the center. One end of the box 17 is provided with terminals 19 and 20 and to the terminal 19 is electrically connected the terminal plate 14 attached to the condenser plate or armature 11. The terminals 19 and 20 are provided with thumb screws 21 and 22 respectively, and by means of which terminal wires, as those indicated by the numerals 23 and 24 respectively may be connected. Secured to the terminal 20 is a terminal plate 25 which extends inwardly on top of the condenser structure within the box and forms a spring contact plate for a purpose to be hereinafter described. Also secured to the contact 20 and extending along the bottom of the box 17 is a contact plate or strip 26 which is connected to a terminal 27 at the other end of the box 17. Secured to the contact 19, to which is attached the contact strip 14, is a contact plate or strip 28, this contact strip or plate passing along the bottom of the box 17 and being connected to a terminal 29 at the other end of such box. Fitting on the top of the box and secured thereto in any suitable manner, as by screws 30, is a cover plate 31, this cover plate being provided with perforations through which may pass thumb screws 21 and 22 leading to the terminals 19 and 20 respectively. Centrally located on the cover plate 31 so as to be rotatable therein is a shaft 32 threaded at its outer end to receive a knurled thumb nut 33 and having secured to its inner end a circular plate 34 of insulating material. Secured to the inner face of the plate 34 in any suitable manner, as by screws 35, is a semi-circular plate 36 of conducting material such, for example, as copper. This plate 36 is adapted to engage with the inwardly extending ends of the connecting strips 15^a, 15^b, 15^c, and 15^d, it being apparent that one or any number of the connecting strips may be in engagement with the disc 36 or that none of such connecting strips may be in engagement therewith. Further, the disc 36 is in electrical engagement with the shaft 32 and, as the end of this shaft 32 engages with the conducting plate 25, it is obvious that either of the connecting strips 15^a, 15^b, 15^c, and 15^d, or any or all of them may be brought into electrical connection with the strip 25, and therefore with any conducting element, as 24, that may be connected to the terminal 20. The shaft 32 is rotatable in either direction, and such shaft has attached thereto above the cover plate 31 a hand or pointer 38 that may be brought into registry with any one of a plurality of indicating points 39 formed in the base of the cover plate 31.

By making the length of the sections 13^a, 13^b, 13^c, and 13^d different from each other, it is obvious that the surface area of each of the said sections will be different and I utilize this fact to provide in my improved condenser the ability to obtain a condenser of a greater number of different capacities than the number of sections utilized. For example, it is well known that the capacity of a condenser made up of plate 11 and section 13^a is proportional to the area of the section 13^a. If the sections 13^a and 13^b should be connected together, then the capacity would be increased in the ratio of

$$\frac{13^a+13^b}{13^a}.$$

The capacity of the condenser could be further increased by adding sections 13^c and 13^d in succession. The ability to do this is rendered possible by rotating the shaft 32 to the right, as indicated in Figs. 4 and 6, thus bringing the disc 36 into engagement with the contact plates 15^a, 15^b, 15^c, and 15^d in succession, thus placing a variable capacity across the terminals 19 and 20, also the terminals 27 and 29. This arrangement has the additional advantage that a possibility of seven variations can be obtained with only the four sections 13^a, 13^b, 13^c, and 13^d shown thus. If we assume that the lengths of the sections 13^a, 13^b, 13^c, and 13^d is such that each separately with the plate 11 has a capacity of 7, 6, 6, and 4 respectively, then it is obvious that, if the shaft 32 is turned to the left, as viewed in Figs. 4 and 6, we get successive capacities of 4, 10, 16 and 23 while, if the shaft is turned to the right, as viewed in Figs. 4 and 6, we will get capacities of 7, 13, 19, and 23. Therefore it is possible to obtain seven different capacities: 4, 7, 10, 13, 16, 19, and 23, obtained with only four sections, this being accomplished by giving the sections the proper lengths in relation to each other. The above is merely a typical example as any desired combination of capacities may be obtained by properly proportioning the area of the sections 13^a, 13^b, 13^c, and 13^d.

While I have necessarily shown and described the preferred embodiment of my invention somewhat in detail, it is to be understood that I may vary the size, shape, and arrangement of parts within wide limits without departing from the spirit of the invention.

Having thus described my invention, what I claim as new is:

1. An improved condenser comprising a pair of armatures, one of said armatures being composed of a plurality of sections of various lengths arranged end to end and electrically insulated from each other, and

means for bringing said sections into electrical engagement with each other in any desired order.

2. An improved condenser comprising a pair of armatures, one of said armatures being composed of a plurality of sections of various lengths placed end to end and arranged in series and electrically insulated from each other, a contact arm for each of said sections, a rotatably mounted wiper associated with said contact arms, and means for rotating said wiper in either direction about its axis whereby a plurality of combinations of electrical value for the condenser are obtained greater than the number of sections employed.

In testimony whereof, I have signed my name to this specification.

ROBERT C. SPRAGUE.