Sept. 6, 1927. 1,641,687

H. J. NOLTE

VACUUM CONDENSER

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Fig. 1.

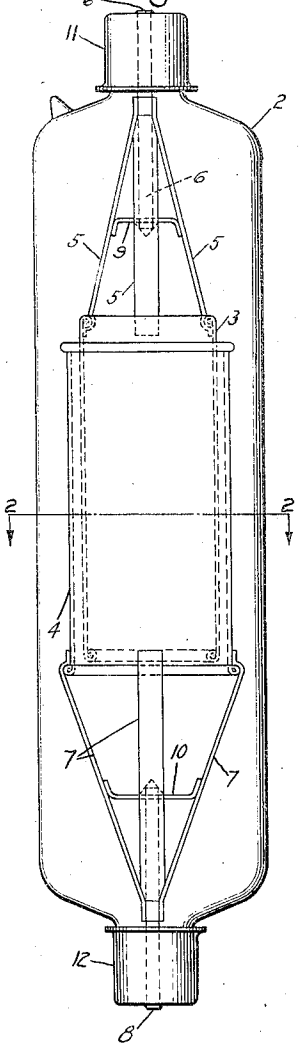


Fig. 3.

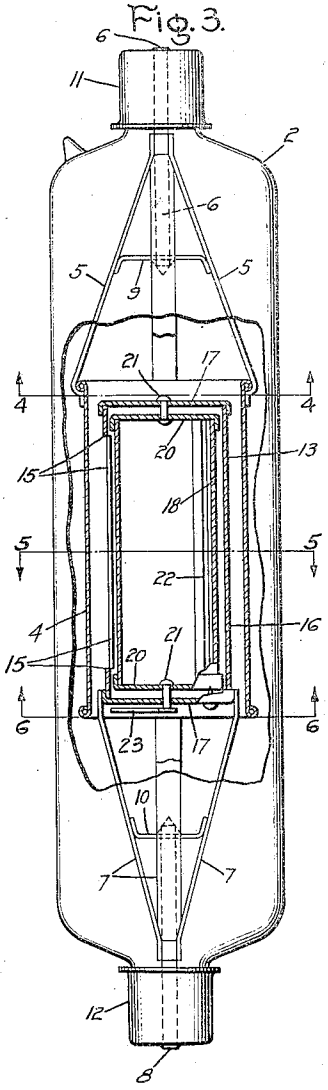


Fig. 4.

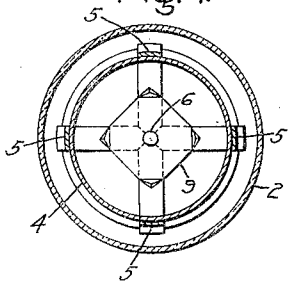


Fig. 5.

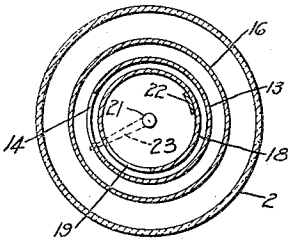


Fig. 6.

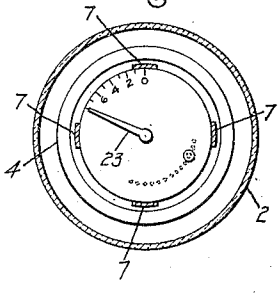
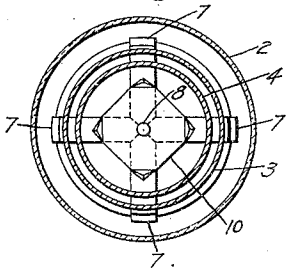


Fig. 2.



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Fig. 7.

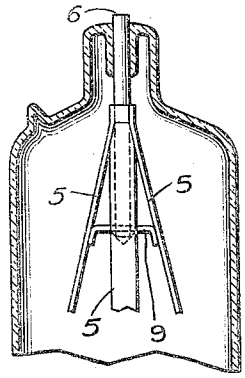


Fig. 8.

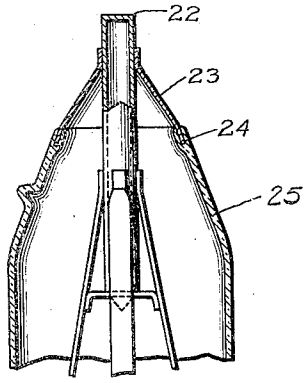


Fig. 9.

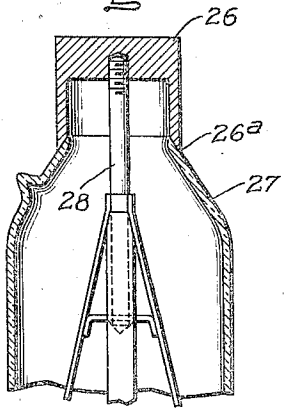


Fig. 10.

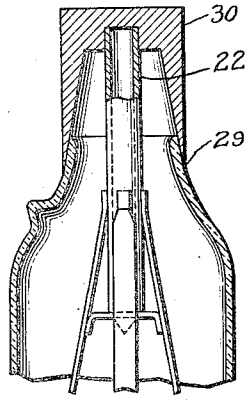


Fig. 11.

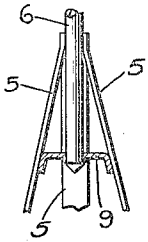
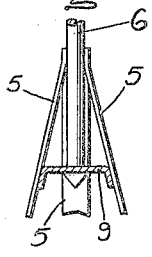


Fig. 12.



Inventor:
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His Attorney.

Patented Sept. 6, 1927. 1,641,687

UNITED STATES PATENT OFFICE.

HENRY J. NOLTE, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

VACUUM CONDENSER.

Application filed October 8, 1925. Serial No. 61,366.

My invention relates to condensers, and more particularly to condensers of the type in which the electrodes are located within a vacuum container.

It is an object of my invention to provide a vacuum condenser in which the electrodes are supported in a novel and effective manner and which may be simply constructed at comparatively low cost.

It is also an object of my invention to provide a condenser of the foregoing type in which the elements are adjustable with respect to each other and located within a vacuum container.

The means by which the foregoing ends are accomplished are hereinafter more fully set forth and claimed, reference being had to the accompanying drawings in which Fig. 1 shows the device of my invention in elevation; Fig. 2 shows a section of the same device taken on line 2—2, Fig. 1; Fig. 3 shows a form of the device in which the electrodes are adjustable with respect to each other for varying the capacity of the device; Figs. 4, 5 and 6 show sections of the condenser taken on lines 4—4, 5—5, 6—6, Fig. 3; and Figs. 7, 8, 9, 10, 11 and 12 show details of construction.

Referring more in detail to the drawings, and in particular to Fig. 1, it will be seen that the device as shown in this figure comprises an exhausted glass container 2. The glass for the container may be of any suitable kind adapted for the purpose, such as lead glass or such as hard glass.

Within the container are mounted the electrodes 3 and 4, which in the form shown in this figure, are tubular and are so supported that one electrode 3 is located within the other 4. These electrodes are separate from each other and the degree of vacuum of the intervening space determines the dielectric strength of such space. I find that the condenser may be effectively operated when the dielectric strength of this space is in the neighborhood of 8000 volts per mm. Referring in particular to the electrode 3, it will be seen that it is held in place by supporting spider arms 5. These arms are disposed about, and supported in turn by, the lead wire 6. It will be seen that the lead 6 passes through the wall of the container 2, the lead being hermetically sealed into the glass. In the construction of the device different metals may be used for the lead, but I find that tungsten or dumet metal are especially well adapted for the purpose. Referring in turn to the electrode 4, it will be seen that this electrode is similarly supported by the spider arms 7, which are in turn secured by the lead 8. It will be understood, of course, that the construction of the device is the same at both ends. For the purpose of insuring a more substantial and rigid support for the electrodes 3 and 4, the arms 5 and 7 are reinforced by plates 9 and 10 respectively. It will be seen that the corners of these plates are folded over. The object of this arrangement is to make it more convenient to attach the arms to the plates as, for example, by spot welding.

Referring to Figs. 11 and 12, it will be seen that the structure may be reinforced by having the lead 6 support the member 9. As indicated in Fig. 11, the lead 6 may extend thru the member 9 for this purpose or it may be secured in any suitable manner to the member 9; for example, the lead 6 may be extended until its strikes the member 9, as indicated in Fig. 12, and in this position the two elements 6 and 9 may be spot welded to one another.

The container is provided also with a pair of base terminals 11 and 12 and these are connected respectively to the leads 6 and 8.

It will be seen, therefore, that the device as thus constructed constitutes a vacuum condenser in which the elements 3 and 4 are arranged one within the other, and supported by a construction which is simple and rigid which may be carried out at a comparatively low cost.

Referring in turn to the form of condenser shown in Fig. 3, it will be seen that the supporting elements and terminal arrangement are the same as in Fig. 1. However, there is a difference in the construction of the inner electrode. The outer electrode is

the same as in Fig. 1, but the inner electrode 13 is provided with an opening 14, see Fig. 5, three of the sides 15 of which are indicated in Fig. 3. This opening may be of any suitable dimensions, for example, the angular width may be 45°, more or less. The longitudinal dimension may be as much as 90% of the total length of the electrode. Another feature of the electrode 13 is that it is provided with heads 17. These heads serve to support a similar cylinder 18 within the cylinder 13. The inner cylinder is also provided with an opening 19 similar to the opening 14 and of similar dimensions. The heads 20 of this inner cylinder serve to hold the pins 21 to which heads they are tightly secured. These pins serve as bearings for the cylinder 18 and rotate within suitable openings in the heads 17. Therefore, the cylinder 18 is adapted to rotate within the cylinder 13, the axes of both of which cylinders coincide. On one side the cylinder 18 may be provided with a weight 22 serving to accentuate the unbalanced condition of the cylinder caused by the opening therein.

The object in having the cylinder unbalanced is to enable the device as a whole to be rotated about the pins 21 while the cylinder 18 remains stationary, thus making it possible to vary the capacity of the condenser by moving the opening 14 with respect to the opening 19. As an indicator I provide a pointer 23 secured to the pin 21, Fig. 6, which indicates the relative positions of the two cylinders 13 and 18.

While in Fig. 7 the lead 6 is indicated as solid, in Fig. 8 the lead 22 is shown as larger in size and may be hollow. When the lead is thus constructed I find that it may conveniently consist of nickel or copper. About the element 22 there is soldered an element 23 in the form of a sleeve. The metal of this sleeve may be invar metal. The invar metal may be soldered to the nickel or copper element 22 by any suitable means such as silver solder. The lower rim 24 of the sleeve 23 should be sharp in order that the metal and the glass envelope 25 may be sealed effectively. I find that when this type of construction is used, lead glass is preferable.

Another form of construction is shown in Fig. 9, in which case a chrome iron base 26 is used, the lower rim 26^a of which is chamfered and brought to a sharp edge as indicated. The chamfered edge is allowed to fit over the outside of the glass envelope 27 and both elements 26 and 27 are sealed together. Lead glass is preferably used here also. With this construction the lead 28 may be threaded as indicated and screwed to the inside of the base 26. In place of chrome iron for the base 26 copper may be used, in which case the form of the base is preferably that shown in Fig. 10, and the flange 29 of the base 30 is made rather sharp. In this construction either hard glass or lead glass may be used.

It will be understood that in the construction of the condenser the glass envelope is cut in two sections somewhere along the middle as, for example, along lines 2—2 or 5—5, Figs. 1 and 3. The electrodes and base are first mounted in place and after the sealing operation between the glass and the elements the two sections of the envelope are fused or welded together to form a unit as indicated in Figs. 1 and 3 and evacuated.

It will be seen, therefore, that I provide a vacuum condenser the elements of which are supported in a novel and effective manner and in which the electrodes are adjustable with respect to each other.

It will be understood that while I have illustrated my invention in connection with specific embodiments, I do not wish to be limited to such specific construction, inasmuch as in view of the disclosure, variations may readily be made without departing from the spirit of the invention or the scope of the claims herein.

What I claim as new and desire to secure by Letters Patent of the United States is:—

1. In a condenser, in combination, a vacuum container, a pair of electrodes within the container, a lead piercing the wall of the container at one point only and supported by the container at said point only, one of said electrodes being entirely supported within the container by said lead.

2. In combination, in a condenser, a vacuum container, a pair of electrodes within the container, one of said electrodes comprising two sections, one of said sections being adjustable with respect to the other for varying the capacitance of the condenser.

3. In combination, in a condenser, a vacuum container, a pair of electrodes within the container, one of said electrodes comprising two sections, one of said sections being adjustable with respect to the other for varying the capacitance of the condenser, an index for indicating such a variation in the capacitance of the condenser.

4. In combination, in a condenser, a vacuum container, a pair of electrodes within the container, one of said electrodes comprising two sections, one of said sections being adjustable with respect to the other for varying the capacitance of the condenser, an index for indicating variation in the capacitance of the condenser, a pair of leads each piercing the wall of the container, one of said electrodes supported entirely by one of said leads and the other of said electrodes supported entirely by the other of said leads.

5. A condenser comprising a pair of electrodes, a vacuum container for said electrodes, two leading-in conductors piercing

the wall of the container, each of said electrodes being entirely supported by a separate one of said conductors, and sustaining arms for each electrode disposed about the axis of the supporting conductor, and a reinforcing member tying together the arms about each conductor for increasing the rigidity of the supporting structure, said lead being also in supporting engagement with the corresponding reinforcing member.

In witness whereof, I have hereunto set my hand and seal this 7th day of October 1925.

HENRY J. NOLTE.