Aug. 4, 1936. R. D. MERSHON 2,050,062

ELECTROLYTIC CONDENSER

Original Filed Nov. 14, 1929 3 Sheets-Sheet 1

FIG.1.

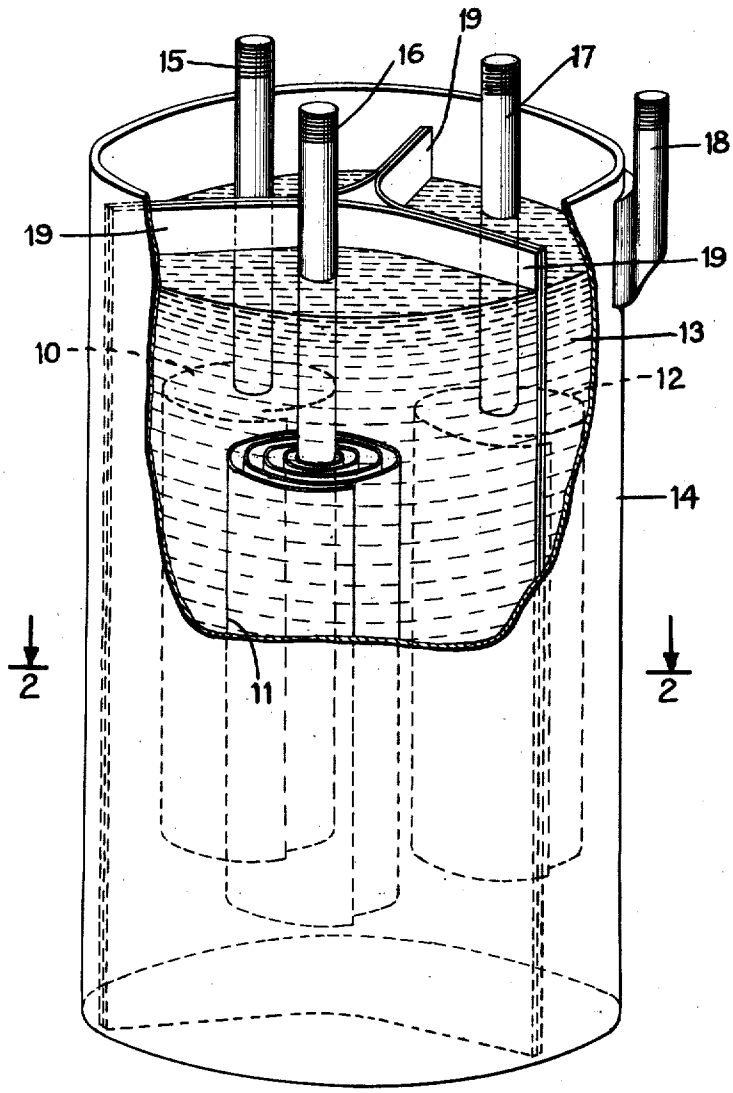

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FIG.2.

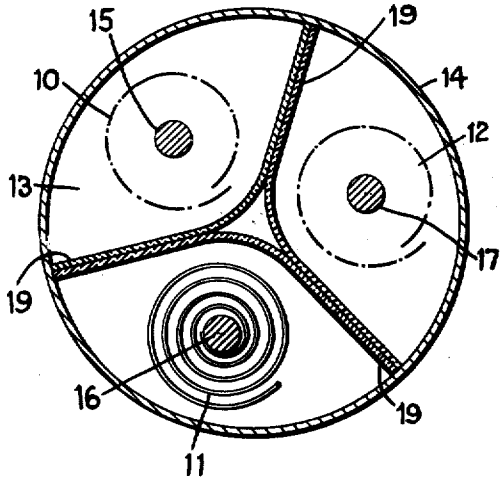

FIG.3.

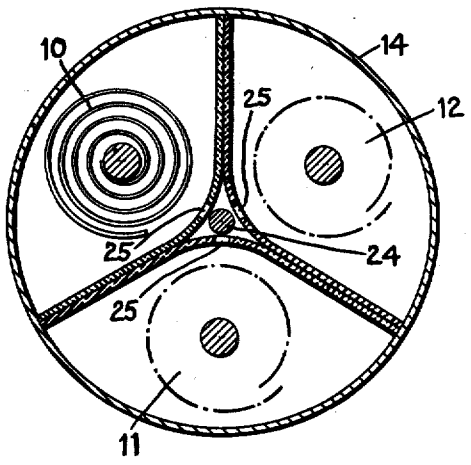

FIG.4.

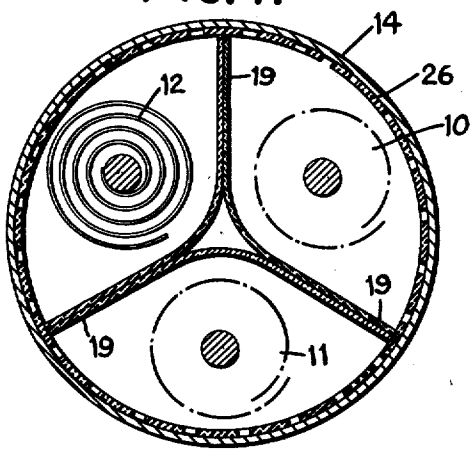

FIG.5.

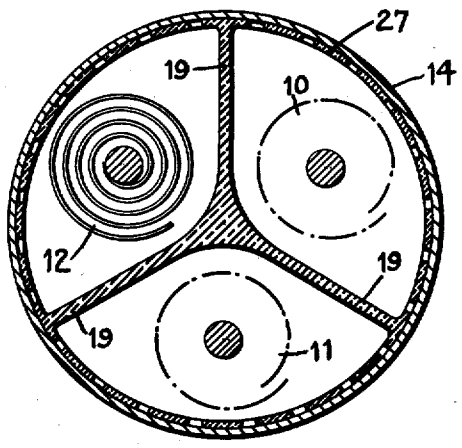

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FIG.6.

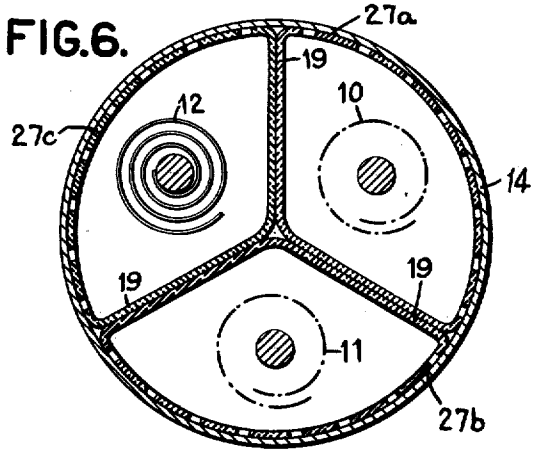


FIG.7.

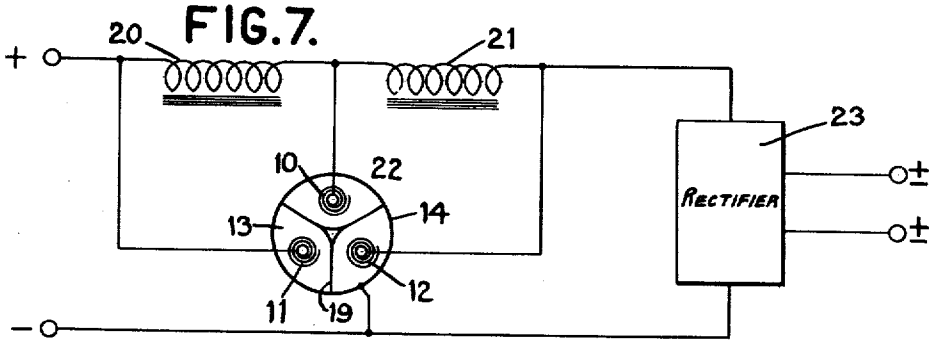
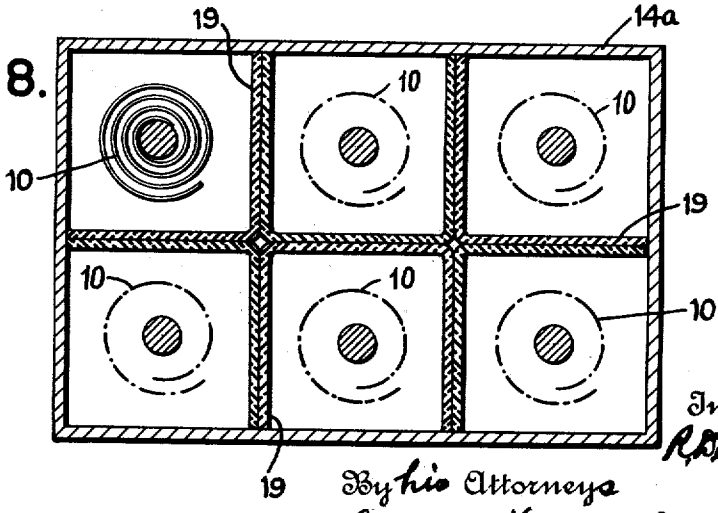


FIG.8.



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Patented Aug. 4, 1936 2,050,062

UNITED STATES PATENT OFFICE

2,050,062

ELECTROLYTIC CONDENSER

Ralph D. Mershon, New York, N. Y.

Application November 14, 1929, Serial No. 407,023
Renewed January 20, 1932

16 Claims. (Cl. 175—315)

In a type of electrolytic condenser in wide use in filter circuits for smoothing out or reducing the alternating component or "ripple" of unidirectional current obtained by rectification of alternating current, it is common practice to use the same electrolyte for two or more condensers. That is, two or more filmed electrodes or "anodes" are immersed in the same electrolyte, as for example an aqueous solution of borax and boric acid. The several condensers can then be connected in parallel (with each other) to the same point or to different points in the filter network or other circuit. It is found, however, that adequate smoothing effect or "hum suppression" is in some cases difficult to obtain when the condensers have a common electrolyte, but that by shielding the individual anodes by enclosing them in cylinders of non-filming metal, and connecting the cylinders to the respective cathodes or to the common cathode when only one is used, the excessive hum can be eliminated. It was supposed, heretofore, in accordance with the well understood principles of shielding in radio practice, that the shields surrounding the anodes must be of metal, in order to conduct to ground or to the negative or low-potential side of the filter system the currents produced by the alternating electrostatic fields. Such shields, however, are relatively expensive and add materially to the total cost when condensers are manufactured in large quantities, say at the rate of five thousand or more per day. With metal shields there is also the possibility of the enclosed anode or anodes coming in contact with the shield, which may result in a short circuit. I have accordingly been led to devise my present invention, which has for its chief object to provide a condenser "unit" (using the latter term to mean a device in which the same electrolyte is used for a plurality of condensers) in which the several anodes are shielded from each other by non-conducting or insulating material. A further object is to provide a form of shielding which can be cheaply made of metal and conveniently and expeditiously applied in the course of assembling the condenser. To these and other ends the invention comprises the novel features and combinations hereinafter described.

Referring to the accompanying drawings,

Fig. 1 shows in perspective one form of my present invention, in which the anodes are isolated from each other by partitions of insulating material.

Fig. 2 is a sectional plan view on line 2—2 of Fig. 1.

Fig. 3 is a sectional plan view illustrating a modification.

Fig. 4 is a sectional plan view of a condenser embodying my invention and having also an insulating lining for the metal can.

Fig. 5 is a sectional plan view illustrating a form of my invention in which the insulating lining and partitions are integral with each other.

Fig. 6 is a sectional plan view illustrating another form of the invention, in which the shields are separable from each other but integral with the adjacent portions of the insulating lining.

Fig. 7 shows diagrammatically a filter circuit of the conventional type, employing a condenser in which my present invention is embodied.

Fig. 8 is a sectional plan view, illustrating another form of the invention.

A device such as is illustrated in Figs. 1 and 2 is commonly referred to as a condenser, but as a matter of fact it comprises three condensers having three filmed anodes or positive electrodes 10, 11, 12, and an electrolyte 13 and container 14 common to the three anodes, the container or can 14 being made of non-filming metal or other suitable conducting material and constituting the negative electrode or cathode. The anodes, of filming metal, preferably aluminum, are shown as made of strips of thin sheet metal coiled spirally around stems or rods 15, 16, 17, also of filming metal, to which the innermost turns of the spirals are securely fastened to afford good electrical connection. The filmed rods extend out of the can for connection with the external circuit or circuits and are insulated from each other. The closure of the can, usually a disk of insulating material through which the filmed rods 15, 16, 17 extend and in which the latter are firmly set for purposes of support, is not shown. The projecting rods form the positive terminals of the device, and the can may be connected to the negative side of the circuit in which the condenser is used, by soldering a conductor directly to the can; or it may have a threaded post 18 to serve as a terminal.

For the purpose of shielding the anodes 10, 11, 12, the can is divided into compartments by means of insulating partitions 19, composed of any suitable non-conducting or insulating material, preferably celluloid and preferably in the form of rectangular sheets wide enough, when bent and inserted into the can, to pass the spiral anodes and bring their vertical edges close to or in contact with the inner surface of the can. The partitions should extend from a plane well below the bottom of the anodes to a point well

above the top thereof. Preferably the partitions rest on the bottom of the can and extend out of the electrolyte. When the condensers have a common cathode and the latter is the container or can the partitions should be imperforate.

The filter circuit shown in Fig. 7 comprises reactance or choke coils 20, 21, and a condenser 22 of the type shown in Figs. 1 and 2. In this circuit the alternating component of the rectified current flows mainly as displacement current from the positive side of the circuit to the negative by way of the anodes 10, 11, 12, the electrolyte 13, and the common cathode 14. Very little, if any, of the unidirectional current flows through this path. The anode 12, connected in circuit between the rectifier 23 and the reactance 21, carries or "by-passes", to use the common term, a large part of the "ripple" or alternating component. The anode 10, connected between the reactances, by-passes a further but smaller part of the ripple, and the last anode 11 by-passes a still smaller part. Between each anode and the cathode there is a drop of voltage due to the resistance encountered, which drop is greater between the cathode and anode 12, for example, than between the cathode and anode 11 or 10. Current from and to anode 12 would tend to divide among the three paths. The current would not divide equally, since anode 12 has a short path (to the cathode) which would carry most of the current; but there would be some division, with the result that the paths from anodes 11 and 10 would carry some current besides their own. Similarly, the path from anode 10 would carry current not only from the latter anode but also some from anode 11. But with the insulating partitions or shields in place the several current paths are electrically separated. No division of currents can occur, despite the lesser drop in one path or another, and accordingly any "ripple" by-passed by one condenser is not re-introduced into the circuit at a point beyond.

If the can is not used as the cathode each anode may have its own cathode; or a single cathode independent of the can may be used, common to all the anodes. Such common cathode may be a simple rod of non-filming metal, as shown at 24, Fig. 3, arranged at the center of the can between the shields. In such case the shields or partitions are provided with vertical rows of perforations, as 25, to permit current to flow from the anodes to the cathode. This construction is useful when the can or vessel is made of glass or other insulating material, but it is apt to be less effective than an arrangement such as the one first described, since the electrical separation of the several current paths may not be so complete.

In some cases it is desirable to line the metal can with insulating material, for example celluloid. This may be done by bending a rectangular sheet of celluloid, inserting it in the can, and allowing it to spring out against the can. A lining of this form is shown at 26, Fig. 4. To permit flow of current to the can the lining may be perforated, as indicated in the figure. If desired, the lining and the shields may be integral with each other, as in Fig. 5, in which the lining is marked 27. Fig. 6 shows still another form, in which the insulating lining is in segments, 27a, 27b, 27c, integral with the non-conducting partitions, 19. The lining and shield construction shown in Fig. 5 may be made by molding, or by extruding a plastic material, as celluloid or hard rubber, or any suitable composition which will not harmfully contaminate the electrolyte. The parts shown in Fig. 6 may be made by molding or by extrusion, or by deforming a tube composed of material capable of being softened by heat or otherwise, as will be readily understood, perforating the tube before or after deformation, whichever is most convenient under the circumstances.

In the broader aspects of the invention the precise shape of the shielding is immaterial, but in general I prefer to have it conform more or less to the shape of the can, which, for economy of material in manufacture, is preferably cylindrical. The number of anodes is also immaterial. In Fig. 8 is shown a "unit" in which the can 14a, is right-angled in horizontal cross section, with six anodes 10 and six non-conducting shields 19.

All the shielding partitions shown can be made of metal, in which case they should be electrically connected to the cathode or to the negative terminal of the unit.

It is to be understood that the invention is not limited to the specific structures herein described but can be embodied in other forms without departure from its spirit.

I claim—

1. In an electrolytic condenser unit having a plurality of condensers comprising anodes, a common electrolyte, and a common cathode; and shielding partitions of non-conducting material between the anodes to prevent current from one anode to the cathode from flowing through a path in which current is flowing from another anode to the cathode.

2. An electrolytic condenser unit having a plurality of condensers comprising anodes, a common electrolyte, and a container of conducting material constituting a common cathode; and vertical partitions of non-conducting material dividing the container into compartments for the anodes, open to the inner surface of the container to permit direct flow of current between the anodes and the common cathode.

3. An electrolytic condenser unit having a plurality of condensers comprising anodes, a common electrolyte, and a containing vessel for the electrolyte, composed of non-filming conducting material and constituting a common cathode; and vertical shielding partitions of non-conducting material between the anodes, extending from the bottom of the vessel and above the electrolyte, to separate the anodes electrically while permitting current flow between the anodes and the cathode means.

4. An electrolytic condenser unit having a plurality of condensers comprising anodes, a common electrolyte, a container therefor, a common cathode disposed centrally of said container with the anodes substantially equi-spaced in respect thereto, shielding partitions between the various anodes, said shielding partitions defining a compartment for the cathode but permitting current flow between the anodes and the common cathode.

5. An electrolytic condenser unit having a plurality of condensers comprising anodes, a common electrolyte, shielding partitions of non-conducting material between the anodes, a common cathode for receiving current flowing from the anodes, and a container.

6. An electrolytic condenser unit having a plu-

rality of condensers comprising anodes, a common electrolyte, a container of conducting material constituting a common cathode, a lining for said container, said lining being of non-conducting material and having perforations enabling current flow from the anodes to the container, and shielding means electrically separating the anodes from one another.

7. An electrolytic condenser unit having a plurality of condensers comprising anodes, a common electrolyte, a container of conducting material constituting a common cathode, insulating means covering a portion of the inside surface of the container opposite the anodes while permitting the flow of current from the anodes to the container by paths including the portion of the inside surface of the container which is not covered thereby, and shielding partitions of insulating material between the anodes.

8. An electrolytic condenser unit having a plurality of condensers comprising anodes, a common electrolyte, a container of conducting material constituting a common cathode, insulating material covering the inside wall of said container except for openings permitting the flow of current from the anodes to the wall and cathode, vertically extending strips of insulating material partitioning the anodes from one another, there being one strip for each anode and each strip being flexed about its associated anode in such a manner as to bring the vertical edges thereof to the insulated wall of the container so as to form a compartment for the anode.

9. An electrolytic condenser unit having a plurality of condensers comprising anodes, a common electrolyte, a container of conducting material constituting a common cathode, and shielding partitions for the anodes, said shielding partitions constituting sleeves of insulating material, one individual to each anode and enclosing the same in a compartment, said sleeves having openings permitting current flow from the anodes to the cathode.

10. An electrolytic condenser unit having a plurality of condensers comprising anodes, a common electrolyte, a container of conducting material constituting a common cathode, and insulating means electrically separating each anode from one another and each anode from the cathode except for openings enabling the flow of current from the anodes to the cathode, said insulating means forming separate compartments surrounding each anode.

11. An electrolytic condenser unit having a plurality of condensers comprising anodes, a common electrolyte, a common cathode, shielding partitions for the anodes, said shielding partitions constituting sleeves of insulating material surrounding the anodes and electrically separating them from one another while permitting the flow of current from the anodes to the cathode.

12. An electrolytic condenser unit having a plurality of condensers comprising a common electrolyte, a container therefor, common cathode means of non-filming conducting material extending within the common electrolyte, a plurality of anodes extending within the common electrolyte, means forming individual compartments for each anode and for the common cathode means, said means including shielding partitions separating the anodes electrically while permitting current flow between the anodes and the cathode means.

13. An electrolytic condenser unit having a plurality of condensers comprising a container, a common electrolyte therein, a plurality of anodes of filming metal immersed in the common electrolyte, common unfilmed cathode means, and non-conducting partitioning means between the anodes serving to prevent current from one anode to the common cathode means from flowing through a path in which current is flowing from another anode to the common cathode means.

14. An electrolytic condenser unit having a plurality of condensers comprising common unfilmed cathode means, a common electrolyte, a plurality of anodes of filming material, and non-conducting partitioning means between the anodes serving to prevent current from one anode to the common cathode means from flowing through a path in which current is flowing from another anode to the common cathode means.

15. An electrolytic condenser unit having a metallic container for the entire electrolyte of the unit, the said container constituting also the common cathode for the unit, an electrolyte within said container and in electrical contact therewith, a plurality of anodes within said container, and partitioning means in said container for preventing current from one of said anodes to said common cathode from flowing through a path in which current is flowing from another of said anodes to said common cathode, the said partitioning means consisting of insulating material.

16. An electrolytic condenser unit having a plurality of condensers comprising vertically extending anodes, a common electrolyte, a container of conducting material constituting a common cathode, and a shield plate within said container and extending above, below and between said anodes, the said shield plate having its vertical edges close to the inner surface of the container and forming, with a part of the container, a compartment containing one of said anodes.

RALPH D. MERSHON.

CERTIFICATE OF CORRECTION.

Patent No.2,050,062. August 4, 1936.

RALPH D. MERSHON.

It is hereby certified that error appears in the printed specification of the above numbered patent reiquiring correction as follows: Page 2, second column, line 31, claim 1, for the words "In an" read An; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 17th day of November, A. D. 1936.

Henry Van Arsdale
Acting Commissioner of Patents.

(Seal)