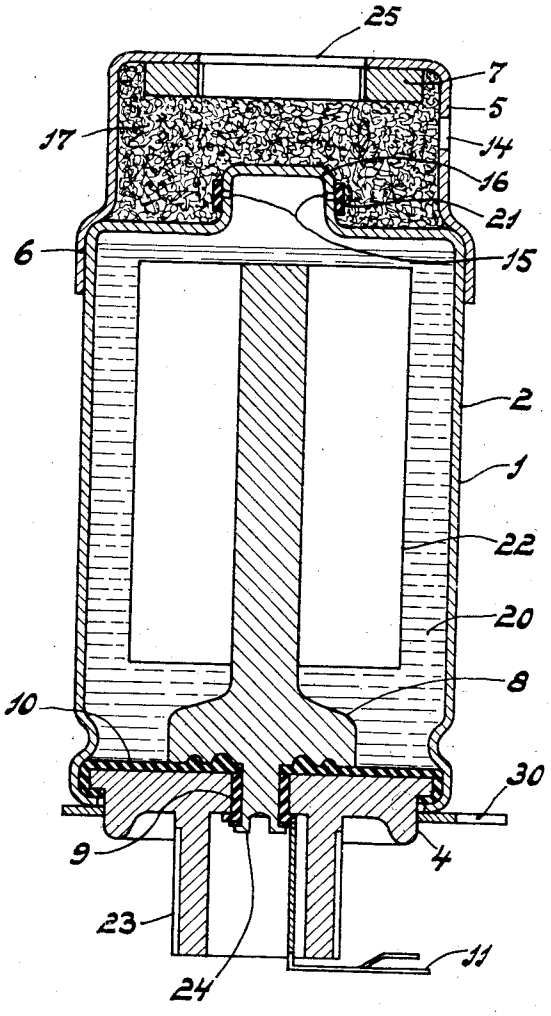
May 17, 1938. C. DE LANGE 2,117,792

ELECTROLYTIC CONDENSER

Filed Dec. 17, 1935 2 Sheets-Sheet 1

Fig. 1.



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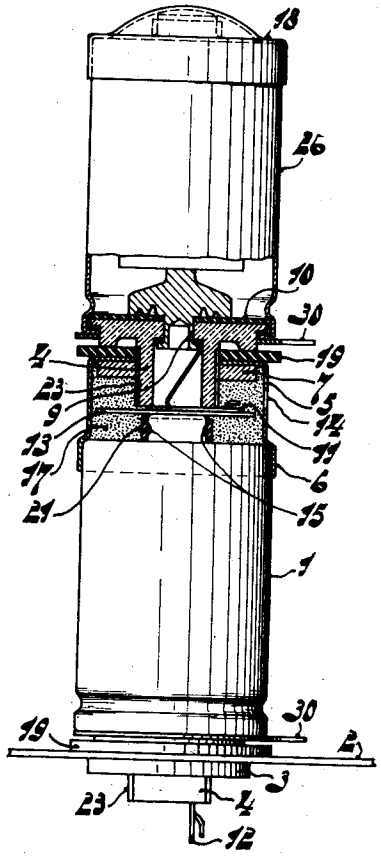


Fig. 2.

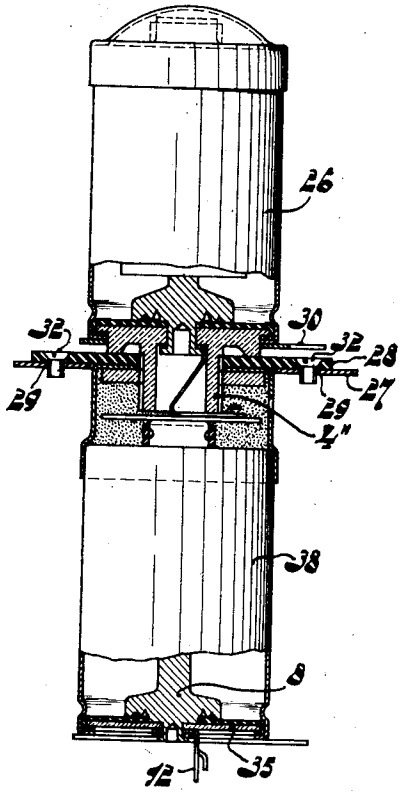


Fig. 3.

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ELECTROLYTIC CONDENSER

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In the Netherlands January 8, 1935

11 Claims. (Cl. 175—315)

My invention relates to electrolytic condensers, and to electrolytic condenser assemblies formed of a plurality of individual condenser units, each unit having its own container and connecting means.

To obtain the most efficient operating results it is necessary to design electrolytic condensers for operation on a definite range of voltages and for definite capacities. However, in many instances it is necessary to provide condensers for operation on higher voltages or for higher capacities than those for which the individual condensers are designed. To meet such conditions it has been the practice to individually mount a plurality of such condenser units and to provide therebetween the necessary connections to connect the units in parallel or series, depending upon conditions.

In the past there has been no suitable structure whereby a plurality of condenser units could be readily mechanically connected and also electrically connected in either parallel or series, nor has there been such a structure which could be efficiently mounted to a panel without providing additional means for this purpose.

In many cases the space into which such condensers are to be mounted is limited as to size and shape, and thus it is very necessary that such condensers be as compact as possible, and also that they may be mounted in a certain manner. For instance, in radio sets the space in which the condensers must be located is usually of an elongated shape, i. e., there is usually sufficient space above and below the chassis sub-panel; whereas the actual area available on the sub-panel is very limited. In such cases it is of great advantage to provide a condenser assembly of an elongated shape and which may be mounted completely above the sub-panel, or may be located partly below and partly above the sub-panel. It is also of advantage to be able to mount the condenser assembly in either of these positions with the use of the same construction.

Furthermore, it is desirable that the condenser units of the assembly be arranged in any number and may readily be electrically connected in either series or parallel.

The object of my invention is to provide an electrolytic condenser assembly which meets the above conditions, and for this purpose I form a condenser assembly from a plurality of electrolytic condenser units, which units are provided with means by which they can be mechanically secured together and electrically connected in either series or parallel.

In accordance with a particular embodiment of my invention, in which, for example, two condenser units are used, I provide one of the units with an externally-threaded projection, and the other unit with a cover at one end having a threaded member; this member cooperating with the projection to secure the units together.

By providing a mounting plate secured between adjacent units, the condenser may be readily mounted partly above and partly below a panel; a portion of the condenser being lowered through a clearance hole in the panel, and the mounting plate being secured to the panel. Furthermore, the condenser may be readily mounted with the units above a panel by extending through a hole of the panel the externally-threaded projection at the bottom of the lower unit; the condenser being secured thereto by means of a nut cooperating with the projection.

I also provide within the top cover of the units, means for relieving the pressure developed within the container of the unit during operation, and also means for preventing the electrolyte from being carried off with the escaping gases.

Furthermore, I provide means whereby the units may be electrically connected in either parallel or series; the series connection being automatically made upon mechanically securing the units together.

In order that the invention may be clearly understood and readily carried into effect, I shall describe same more fully in connection with the accompanying drawings, in which:

Figure 1 is a cross-sectional side view of a condenser unit according to the invention;

Fig. 2 is a partly-sectionized side view of a condenser having two units, both mounted above a panel;

Fig. 3 is a partly-sectionized side view of a condenser similar to Fig. 2, but mounted partly below a panel.

Referring to Figure 1, the condenser unit shown therein comprises a cup-shaped container 1 provided on its closed end with a dome-shaped protuberance 16 having two apertures 15. The container 1 may be drawn from a single sheet of metal, for instance of aluminum; the protuberance 16 being stamped in the sheet prior to the drawing, or formed during the drawing.

Encircling the protuberance 16 so as to cover the apertures 15 is a band 21 of elastic material, for instance rubber, which in known manner serves to relieve the gas pressure developed within the container 1 during the operation of the condenser.

Within the container 1 and fitting over a connecting-supporting rod 8 of conductive material, is an anode 22 of large surface area. The rod 8 is provided on its lower end with an extension of reduced diameter, which passes through a central aperture of a member 4 with the interposition of a bushing 9 of insulating material, for instance rubber. The member 4, which in this figure is of metal, is provided with an externally-threaded tubular projection 23, whose purpose will be explained hereinafter.

To electrically insulate the rod 8 from the member 4, and also to provide a liquid-tight seal therebetween, a gasket 10 of insulating material, for instance rubber, is provided between the lower surface of rod 8 and the upper surface of member 4, and extends around the edge of the member 4. To improve the seal the surface of the rod 8 contacting with the gasket 10 is provided with circular corrugations.

The rod 8 is secured to the member 4, for instance by riveting over its lower end, as shown at 24, whereby the gasket 10 and bushing 9 serve to make a liquid-tight seal, and to insulate the rod 8 from member 4. An anode connection 11 is provided between the bushing 9 and the riveted-over end of rod 8, thereby making contact with the rod 8 and anode 22. A disc-shaped member 30 provided with a soldering lip serves as a cathode connection; the disc-shaped part may be connected to the container 1 by means of soldering or welding.

The member 4 with rod 8 and anode 22 secured thereto, is fastened into the open end of the container 1, for instance by rolling the edge of the container around the periphery of the member 4; the interposed gasket 10 effecting a liquid-tight seal.

The container 21 is filled to a level above the top of the anode 22 with a suitable electrolyte 20. It is to be noted that the anode and the connecting member 8 are completely covered by the electrolyte, whereby no corrosion of the rod 8 at the surface of the electrolyte can occur, which would be the case if the rod 8 were led out at the top of the container.

Secured to the top of the container 21, for instance by spot-welding, soldering, or rolling, at the portion indicated by 6 is a cap-shaped cover 5 provided on its upper surface with a clearance hole 25 and on its side with an aperture 14. The cover 5, which is of metal, for instance aluminum, may be formed by drawing, and is provided with internally-threaded securing means, for example a nut 7 which may be secured thereto, for instance by welding. Instead of a separate nut 7, the top of cap 5 may be drawn downwardly into a tube which is internally threaded; this of course necessitating the use of a thicker material for the cover.

The space formed between the cover 5 and the top of container 21, is filled with a liquid-absorbing material 17, for instance sawdust, which, in the manner described in the U. S. Patent application Ser. No. 659,393 of Van Embden, now Patent No. 2,048,417, dated July 21, 1936, serves to absorb any moisture carried out by the gases escaping through the apertures 15.

Figure 2 illustrates a condenser composed of two condenser units 1 and 26, both mounted above a panel 2. While, for the purpose of illustration, only two condenser units are shown in Figs. 2 and 3, it should be understood that any number of units may be similarly connected and mounted.

As shown in Fig. 2, the condenser unit 1, which is of the same construction as shown in Figure 1, with exception of the member 4, which consists here of insulating material, the bushing 9 being omitted, is mounted with the tubular projection 23 passing through an aperture in the mounting plate 2, the unit being secured to the panel by means of a nut 3 engaging the threads of projection 23. Between the unit 1 and the panel 2 are disposed a spacing washer 19 of insulating material and a disc-shaped member 30 connected with the container and provided with a lip, to which a lead wire for the cathode may be soldered.

Mounted on top of condenser unit 1 is a second condenser unit 26. Unit 26 is of the same construction as condenser unit 1, with the exception that its upper end is not provided with a cover 5 for securing an additional unit, but has a cover 18 which serves to finish off the condenser and to provide a space for the liquid-absorbing material. The condenser unit 26 is secured to the condenser unit 1 by screwing the threaded projection 23' into the cooperating nut 7 of unit 1; a spacing washer 19 and member 30 being provided between the two units.

Thus it is seen that the units may be readily secured together, and that any number of units having the construction of unit 1 may be provided between units 1 and 26 in a similar manner.

As shown, the units 1 and 26 are electrically connected in parallel, and for this purpose an insulating disc 13 is provided between the anode connection 11 and the top of the container of unit 1, whereby the anode of condenser 26 is insulated from the cathode-container of unit 1. For connection in parallel, the pair of cathode-soldering lips 30, and the pair of anode soldering lips 11 and 12 must be each connected together. The disc 13 may be a plate formed of several layers of insulating material soaked in polystyrol, dried and stacked to the desired thickness.

In such parallel connection of the units, the external connection to the anode of unit 26 may be made by means of a conductor (not shown) passing through the aperture 14 and connected to the anode connection 11; the connection to the anode of unit 1 being made by means of an anode connection 12 having the same construction as connection 11 except that it is straightened out. The containers of the units which act as cathodes may be connected together and to the panel 2 by means of the soldering lips 30.

Condensers comprising a plurality of parallel-connected condenser units are particularly useful in high-voltage smoothing devices, in which case choke coils may be connected between the anode connections, and the cathode-connections 30 connected to the panel, which is grounded.

If it is desired to electrically connect units 1 and 26 in series, the disc 13 may be made of conductive material to thereby connect the anode connection 11 to the container 1. Alternatively, the disc 13 may be omitted entirely and the connection between the anode of unit 26 and the cathode-container of unit 1 made automatically when the units are screwed together. In the latter case the anode connection 11 makes direct electrical contact with the top of the protuberance 16, thus with the container 1.

In some cases it may be desirable to mount the condenser partly below a panel, and this may be readily done with substantially the same construction as shown in Fig. 2.

Such a mounting of the condenser is illustrated in Fig. 3, in which condenser units 26 and 36 are mounted one on each side of a panel

27. For this purpose the spacing washer 19 is replaced by a mounting plate 28 having extending portions provided with clearance holes 29. In mounting the condenser shown in Fig. 3, the lower unit 38 is passed through a clearance hole in plate 27, and is secured thereto by means of screws 32.

In such mounting of the condenser the threaded projection on the lower condenser unit serves no purpose, and hence the unit 38—which is similar in all other respects to unit 1—is provided with a flat disc 35 instead of the member 4. Such a construction also reduces the over-all length of the condenser.

The condenser units shown in Fig. 3 may be electrically connected in the same manner as described in connection with Fig. 2.

The mechanical connection between two adjacent units occurs in Fig. 2, as follows.

A cover 5 is secured to the member 4' of the unit 26 by means of the nut 7. The latter may be screwed on in this case as a separate part. The anode connection is soldered to the lip 11 and led out through the hole 14. The cover is then filled with liquid-absorbing material. After this treatment the unit 1 is secured by means of rolling or welding at its periphery 6 to the container of unit 1.

It will be noted from the above that the condenser units according to the invention, in addition to being readily secured together, mounted either above or partly on each side of a panel, and electrically-connected in either parallel or series, have the further advantages of being very compact and of substantially cylindrical contour.

While I have described my invention in connection with specific examples and applications, I do not wish to be limited thereto, but desire the appended claims to be construed as broadly as permissible in view of the prior art.

What I claim is:

1. An electrolytic condenser assembly consisting of a plurality of electrolytic condenser units each comprising an anode, an electrolyte, and an individual container acting as a cathode, means for mechanically interconnecting adjacent condenser units comprising an externally-threaded member forming part of one unit, a separate cover secured to the container of the adjacent unit, and an internally-threaded member secured to said cover and cooperating with said externally-threaded member, and means for securing said condenser assembly to a panel comprising a member secured between two adjacent units.

2. An electrolytic condenser assembly consisting of a plurality of electrolytic condenser units each comprising an anode, an electrolyte, a container acting as a cathode, means for mechanically interconnecting adjacent units comprising a threaded projection at the bottom of one unit, a cap-shaped cover on the top of the adjacent unit, and a threaded member in said cover, and liquid-absorbing material disposed within the space formed between said cover and the container.

3. An electrolytic condenser assembly consisting of a plurality of electrolytic condenser units, each unit comprising an anode, an electrolyte, a container acting as a cathode, and means for mechanically interconnecting adjacent units, said means comprising a threaded projection at the bottom of one unit, a cap-shaped cover on the top of the adjacent unit, and a threaded member in said cover, said cover being provided with an aperture for allowing for the escape of gases from the lower unit and for the passage of an anode connection.

4. An electrolytic condenser assembly consisting of a plurality of condenser units, each unit comprising an anode, an electrolyte, a container acting as a cathode, means for mechanically interconnecting adjacent units comprising a threaded tubular projection forming part of the bottom of one of said units, a separate cup-shaped cover slipped over the end of the adjacent unit and secured thereto and forming a space with the container thereof, and a threaded member within said space and cooperating with said projection, and means for electrically interconnecting two adjacent units comprising a conductive member connected to the anode of one unit and clamped between the end of said tubular projection and the container of the adjacent unit.

5. An electrolytic condenser assembly consisting of a plurality of condenser units adapted to be connected in parallel, each of said units comprising an anode, an electrolyte, and a container acting as a cathode, means for mechanically interconnecting adjacent units comprising a threaded projection forming part of the bottom of one unit, a separate cup-shaped cover secured to the container of the adjacent unit and forming a space therewith and a threaded member within said space and cooperating with said projection, a conductive member connected to the anode of one unit and extending through said tubular projection, and a member of insulating material interposed between said conductive member and the container of the adjacent unit to electrically insulate the units from each other.

6. An electrolytic condenser assembly consisting of a plurality of electrolytic condenser units each comprising an anode, an electrolyte, and a container, and means mechanically interconnecting adjacent units comprising a member forming part of one of said units and projecting from the bottom thereof, a separate cover on the adjacent end of the adjoining unit and forming a space with the container thereof, and securing means within said space and cooperating with said first member.

7. An electrolytic condenser assembly consisting of a plurality of electrolytic condenser units each comprising an anode, an electrolyte, and a metallic container, and means securing adjacent units together comprising a member forming part of one unit and projecting from the bottom thereof, a separate cover slipped over the top of the container of the adjacent unit and fixed thereto and forming a space therewith, and a second member within said space and cooperating with said first member.

8. An electrolytic condenser assembly consisting of a plurality of electrolytic condenser units each comprising an anode, an electrolyte, and a metallic container, and means securing adjacent units together comprising a threaded member forming part of one unit and projecting from the bottom thereof, and a separate cover mounted on the end of the container of the adjacent unit and provided with screw threads cooperating with the threads of said first member.

9. An electrolytic condenser assembly consisting of a plurality of electrolytic condenser units arranged one above the other and each comprising an anode, an electrolyte, and a container acting as a cathode, the bottom unit having a threaded tubular projection, means to mechanically interconnect two adjacent units comprising

a threaded tubular projection forming part of one unit, a cover secured to the second unit, and a threaded member within said cover and cooperating with said projection, and means comprising the threaded tubular projection of the bottom unit for mounting the assembly above a panel.

10. An electrolytic condenser assembly consisting of a plurality of condenser units, each unit comprising an anode, an electrolyte, a container formed of a single sheet of metal and having a dome-shaped protuberance provided with an aperture, and a ring of elastic material closing said aperture to form an exhaust valve, and fastening means for mechanically interconnecting each two adjacent units, said means comprising a projecting member forming part of one of said units, a cover at the end of the adjacent unit and provided with an exhaust aperture, said cover being secured to the container of said adjacent unit and enclosing the exhaust valve thereof, and a member within said cover and cooperating with the projecting member of the first unit to secure the units together.

11. An electrolytic condenser assembly consisting of a plurality of condenser units, each of said units comprising an anode, an electrolyte, and a container acting as a cathode, means for mechanically interconnecting adjacent units comprising a member forming part of one unit and projecting from one end thereof, a cover extending over the top of the container of the adjacent unit and secured thereto, a member within the space formed between said cover and container and cooperating with said projecting member, and means for automatically connecting the adjacent units electrically at a point within said space when the units are mechanically interconnected.

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