Dec. 12, 1939. C. DE LANGE ET AL 2,183,092

ELECTROLYTIC CONDENSER AND METHOD OF MAKING THE SAME

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Fig. 1

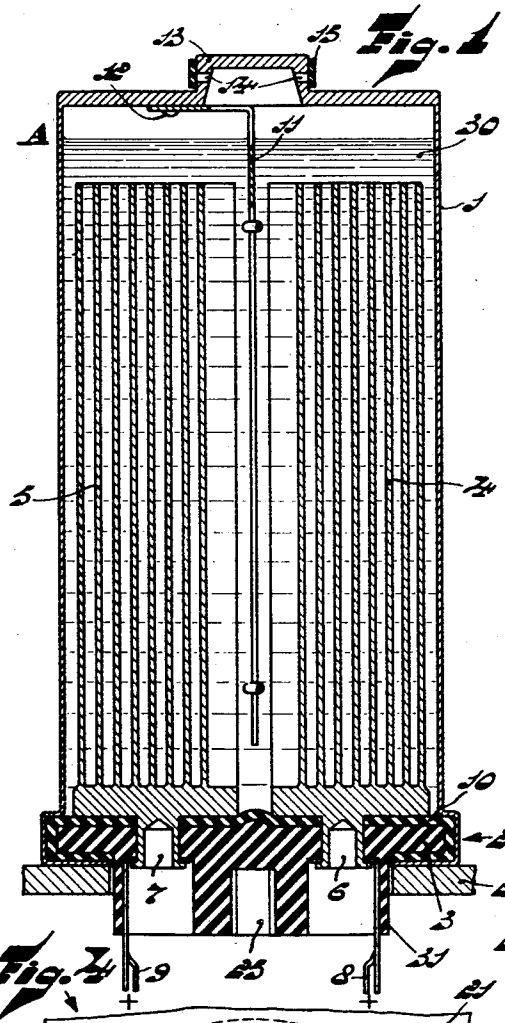


Fig. 3

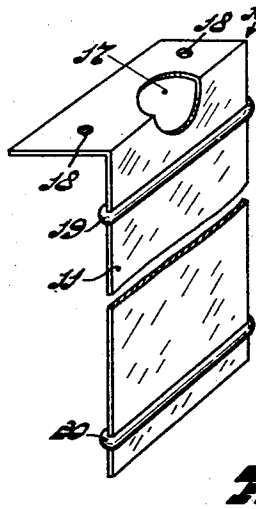


Fig. 2

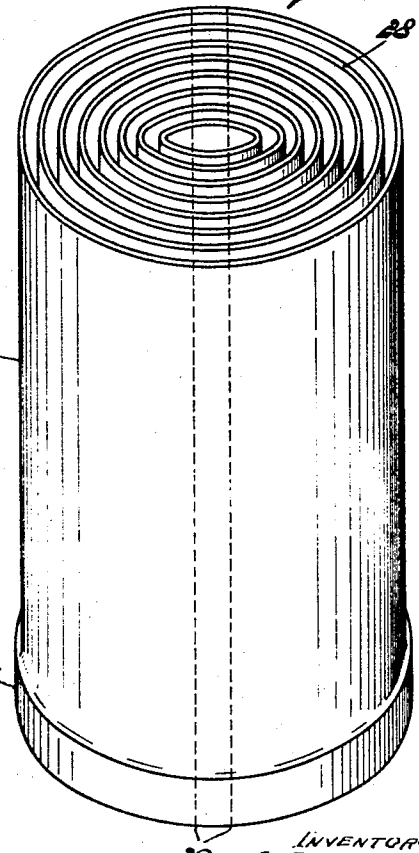
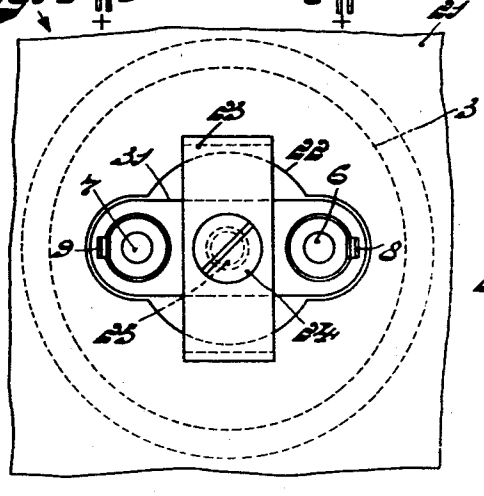


Fig. 4



INVENTORS
C. de Lange and
A. J. J. Lambeek
BY
E. F. Wendroth
ATTORNEY

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ELECTROLYTIC CONDENSER AND METHOD OF MAKING THE SAME

Cornelis de Lange and Adriaan Jan Juriaan Lambeek, Eindhoven, Netherlands, assignors to N. V. Philips' Gloeilampenfabrieken, Eindhoven, Netherlands

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3 Claims. (Cl. 175—315)

The present invention relates to electrolytic condensers in which a plurality of electrodes are housed within a common container, and to a method of making the same.

In many cases, for example in a bipolar electrolytic condenser, it is desirable to arrange a plurality of electrodes in a single container, and numerous constructions of this type have been proposed. Such constructions, however, generally have the disadvantages that they are expensive to manufacture, are of relatively large size per unit capacity, and have a high series resistance.

It is of considerable importance that the series resistance—which depends upon the length of the path of the current flowing from the current supply conductor through the electrolyte to the dielectric i. e. the oxide film—be as short as possible. In many known electrolytic condensers the container consists of conductive material and is used as a supply conductor for the electrolyte, and the series resistance is consequently substantially determined by the specific resistance of the electrolyte. In such condensers particularly when they are used on comparatively high operating voltages, this resistance has an appreciable value. As the specific resistance of an electrolyte at an operating voltage of 500 volts has a value of the order of magnitude of 10,000 ohm. cm., it is evident that to keep the series resistance as low as possible the anode construction must be such that the path of the current flowing from the anode to the container must be as short as possible.

One object of our invention is to overcome the above disadvantages and to produce a condenser of the above type which is inexpensive to manufacture.

Another object is to reduce the size as well as the series resistance of such condensers.

A further object is to produce a condenser which can be readily mounted on a panel.

A still further object is to provide electrodes which can be manufactured by drawing or impact extrusion.

Still further objects and advantages of the present invention will be apparent to those skilled in the art from the following particular description.

In accordance with the invention, we produce a plurality of electrodes from a single body of substantially the same size as the internal dimensions of the container, by dividing this body along planes parallel to its longitudinal axis. The electrodes so formed are arranged within a common container so as to be insulated from each other, and are provided with individual supply conductors.

Such a construction makes it possible to arrange within a container of a given size, a plurality of condenser units each of which has the highest possible capacity, while at the same time the series resistance is very low. Furthermore, the manufacture of the condenser is greatly simplified because it is possible to obtain a plurality of electrodes after only a single body has been produced, for example, by means of the more or less complicated process of drawing or of impact extrusion.

According to a particular advantageous embodiment of the invention, the electrodes are produced from a body having a bottom portion and coaxial cylindrical ribs arranged perpendicularly thereon. Such a body can easily be produced by so-called impact extrusion, which however, requires special dies and high pressures apparatus, and thus is, rather expensive. However, if only a single body is made by this method and this body is axially divided, for example by sawing, into a plurality of electrodes, the cost is much less than if each electrode were produced individually by extrusion. As a result the efficiency of the device utilized for drawing or for impact extrusion is considerably increased. Furthermore there is very little loss of material, because there is substantially no loss in material in extruding the body, and there is very little loss in dividing this body into the individual electrodes.

To reduce the series resistance we prefer to use at least one partition of a non-filming material which extends into the spaces formed between the individual electrodes and divides the space within the container into compartments in each of which one of the above mentioned electrodes is arranged. Thus, each electrode is surrounded on all sides by a wall which acts as a supply conductor for the electrolyte, and as a result the current path and the series resistance are very small. By making these partitions of a non-film forming metal we prevent the formation on their surfaces of an oxide layer which, because of its high resistance, would again increase the series resistance. Furthermore, such an oxide layer is undesirable because it generally forms a dielectric layer, with the result that a second capacity is connected in series with the capacity formed by the electrode and the electrolyte, and unfavorably influences the total capacity of the condenser.

In order that the invention can be clearly understood and readily carried into effect, we shall describe the same more fully with reference to the accompanying drawing in which

Figure 1 is a sectionized side-view of a condenser according to the invention,

Fig. 2 is a perspective view of the body from which the anodes of Fig. 1 are formed,

Fig. 3 is a perspective view of the partition of Fig. 1, and

Fig. 4 is a plane view of a panel with the condenser of Fig. 1 mounted thereon.

The condenser shown in Fig. 1 comprises a cup-shaped metal container 1, for instance of aluminum, whose upper end is formed with a proturbance 12 having two holes 14 closed by a rubber band 15 which, in known manner, relieves the pressure developed within the container during operation. The lower end of the container is closed by a member 3 of suitable insulating material, such as "Bakelite", and to effect a liquid-tight joint, the edge of container 1 is spun at 2 over the edge of member 3 with the interposition of a gasket 10, for instance of rubber.

Within container 1 are two electrodes 4 and 5 having projecting portions 6 and 7 respectively, which extend through apertures in gasket 10 and member 3. The ends of portions 6 and 7 are riveted over with the interposition of suitable terminal lugs 8 and 9.

As shown in Fig. 2, the electrodes 4 and 5 are produced from a single body 26 consisting of a bottom portion 27 and a plurality of concentric annular portions 29 extending perpendicular thereto. Such a body may be readily produced by extrusion, the portions 6 and 7 of Fig. 1 being formed at the same time. Instead of dividing body 26 into two parts, it can of course be divided along planes passing through its axis into any desired number of parts.

As appears from Fig. 1, electrodes 4 and 5 are spaced apart so as to be insulated from one another, and a partition 11 of a non-filming material which is not attached by the electrolyte, such as ferro-chromium, stainless steel, or chromed aluminium, extends between them. Partition 11 and container 1 act as a current supply conductor for the electrolyte 30, which is of a suitable type, and acts as the cathode of the two condenser units in which the formed electrodes 4 and 5 act as anodes. To increase the capacity of the condenser, the surface of anodes 4 and 5 may be etched, and to prevent corrosion thereof they are located below the level of the electrolyte 30, which must be, for example, at A.

As shown in Fig. 3, partition 11 is bent at right angles at 16, and in the middle of the bend a large aperture 17 is provided which facilitates the escape of the gas produced during operation in the left half of the container through the apertures 14.

During the manufacture of container 1, which may also be effected by the so-called impact extrusion, two tips 12 are formed (only one being visible in Fig. 1). The electrical and mechanical connection of partition 11 to container 1 is effected by inserting tips 12 in apertures 18 provided in partition 11 and by riveting over the ends of tips 12. As partition 11 is comparatively long and thin, it is rather weak and may move in the space between the electrodes 4 and 5, and come into contact with the latter. To prevent such contact, rubber rings 19 and 20 are provided at different points on partition 11 (see Fig. 3).

It is evident that instead of a single flat partition as shown, it is possible to use complex partitions which divide the container into three or more compartments, the number of which depends on the number of formed electrodes which are arranged on the bottom 3 and insulated from one another.

Fig. 4 illustrates, by way of example, one manner of mounting the condenser on a mounting plate 21, which is provided with an aperture 22 through which the projecting part 31 of the member 3 of Fig. 1 extends. The condenser is secured to plate 21 by a U-shaped strap 23, whose ends bear upon the plate and which is secured to member 3 by a screw 24 which engages threads of a bore 25 in member 3. The aperture is not exactly the shape of part 31, but is given the shape shown to effect a saving on punching tools, a special tool being superfluous. Only two normal circular punches are used in this case, viz. one of smaller diameter for punching two apertures at left and at right and one of larger diameter for punching away the material between these two apertures.

It will be noted that construction of a container according to the invention is very compact which results in a saving of space and makes such condensers very suitable for many purposes, for example, filters for rectifiers which, as is well-known, employ at least two condensers for smoothing the pulsatory direct current. If two individual electrolytic condensers are used, as is customary, these condensers each occupy a certain space on the frame plate on which the rectifier and the filters are arranged. Besides, the mounting of these two condensers requires twice as much work. It will be clear without further explanation that the use of a single condenser according to the invention has an appreciable advantage, as regards required space and time required for mounting.

While we have described our invention in connection with specific examples and applications we 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 we claim is:

1. In the manufacture of electrolytic condensers having a plurality of electrodes arranged within a common container, the steps of extruding a body which matches the internal dimensions of the container, and dividing said body along planes parallel to its longitudinal axis to form the electrodes.

2. In the manufacture of electrolytic condensers having a plurality of electrodes arranged within a common container, the steps of forming a single body having a bottom portion and a plurality of concentric annular portions extending perpendicular to the bottom portion, and dividing said body along planes parallel to the axis of said annular portions to form said electrodes.

3. An electrolytic condenser comprising a common container, an electrolyte, a plurality of electrodes arranged in spaced relationship within said container and insulated therefrom, each electrode being in the shape of a sector of a cylindrical body and having a base portion and a plurality of parallel extensions perpendicular to the base portion, and a supply conductor for each of said electrodes.

CORNELIS DE LANGE.
ADRIAAN JAN JURIAAN LAMBEEK.