

Jan. 19, 1960

S. GOTOR CARRAU
ELECTROLYTIC CONDENSER

2,922,090

Filed Jan. 27, 1955

2 Sheets-Sheet 1

FIG 1

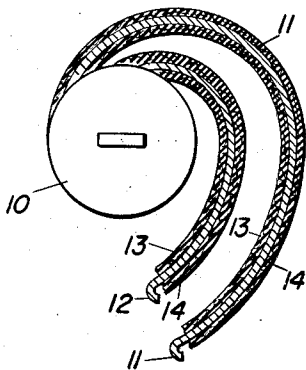
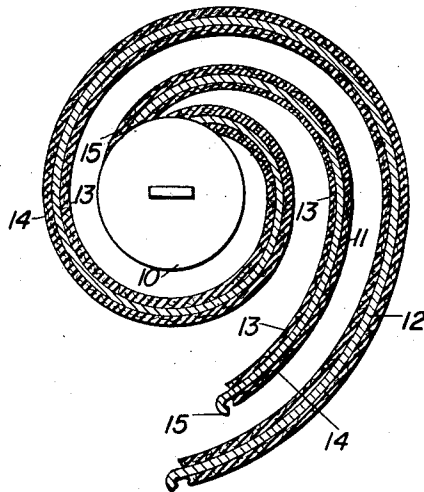


FIG 2

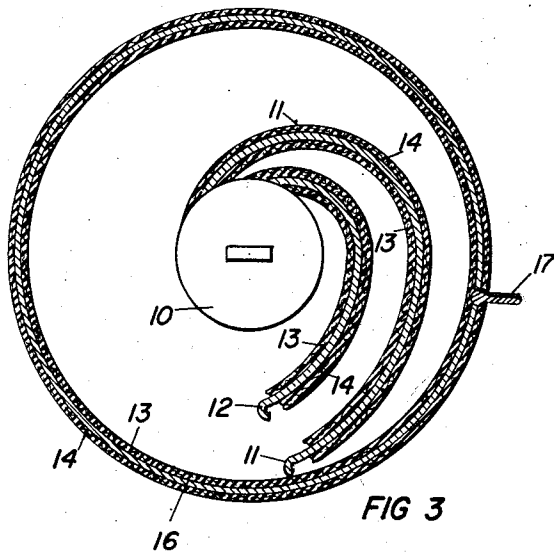


FIG 3

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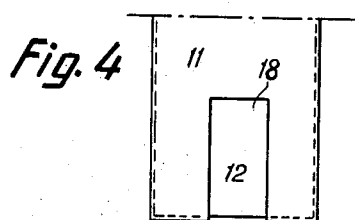
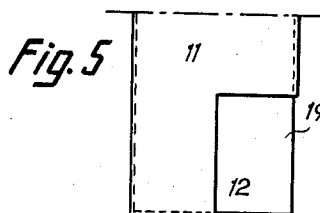
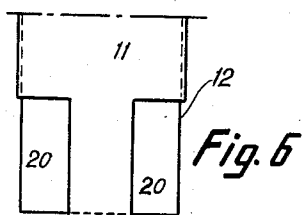
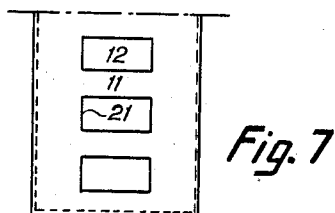
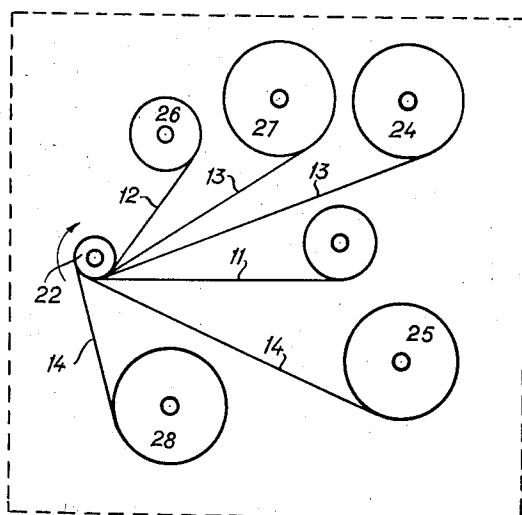


Fig. 8



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ELECTROLYTIC CONDENSER

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4 Claims. (Cl. 317—230)

The electrolytic condensers known hitherto, particularly those of the type called dry condensers, consist of two laminations made of aluminum, coiled the one over the other and having interposed therebetween a lamination of an absorbent material which retains the suitable electrolyte for the operation of the ensemble.

In the usual types for direct currents, the one lamination may be subjected to chemical processes or mechanical operations for increasing its surface area thus increasing capacity; thereafter it is electrolytically oxidized to form an aluminum oxide layer that covers all the surface thereof and apparently functions as a dielectric. The other aluminum lamination or cathode is placed against the said positive lamination or anode, the cathode merely serving for giving the suitable polarity to the electrolyte that impregnates the finished condenser bobbin.

The winding of these condensers always has been performed so that the unformed aluminum or cathode envelopes the positive aluminum, the two laminations being left trimmed at about the same position at the end of the bobbin, with the cathode at the outer side and covering the bobbin. The absorbent material, usually a paper strip does not end at the tip of the aluminum laminations and generally extends further around the bobbin.

It may be appreciated that in the last turn of the condenser bobbin there is always an external turn which is not covered by the associated electrode.

It is a well known fact that the useful life of all of the condensers of this type is restricted by the gradual formation of corrosion on the outer face of the last turn of cathode. In fact, it has been ascertained that a condenser having a very noticeable leakage current and no other damage, may be placed in an operating condition which is about the same as the initial condition, when it is deprived of the last turn where the corrosion is present.

These corrossions are formed by oxidation of the aluminum with production of aluminum oxide compounds such as alumina (Al_2O_3). These oxidations which are already formed on the aluminum lamination due to the natural oxidation under exposure to the atmospheric air, increase to the pureness of the aluminum itself and also of the materials forming the electrolyte, as well as the pH of the said aluminum.

Now, it has been found that by subjecting the external section of the last turn of the cathodic lamination to the action of an electric field (that is, subjecting to an electric field the portion of aluminum which does not have opposed thereto a corresponding portion of the opposite electrode), a deoxidizing effect takes place on the aluminum and prevents, or at least diminishes, the above corrosion effects, thus eliminating one of the causes responsible for the aging of the electrolytic condensers. This always takes place in the condensers involved, sooner or later and independently of the condenser effective working time. It is obvious that the improvements of the invention constitute a great advantage over the known

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art since, on the one hand the useful life of the condenser is lengthened and, on the other hand the condenser that is put in operation after a period of storage regains its initial specifications easily, particularly that of the leakage current, which fact does not take place with any of the condensers now available in the market.

Several constructions may be utilized to constitute the electrostatic field on the outer face of the last turn of the condenser bobbin, by arranging things so that the cathode always has a positive anode respective thereto on both its faces. The simplest manner of attaining this is by cutting the last turn of the cathodic lamination. In this manner the field lines produced are normal to both the laminations throughout the length of the latter. However, since the field intensities which usually are involved in this kind of condensers are usually rather high, due to the fact that the working voltages are somewhat high, it is not at all necessary that the two electrodes forming the field be opposed to one another, and the same may be placed close to one another in a more or less direct fashion, so that an electrostatic field is always formed and associated with the cathode outer face. This alternative embodiment may be carried into practice by forming the cathode outer turn with openings or by trimming portions thereof which leave the anode exposed therethrough and across the absorbent paper. A field will likewise be created between these anode portions and the external cathode surface and will meet with the above requirements.

In the case of trimming the last cathode turn, the anode remains as a covering and at the outer side of the latter another field is created with respect to the metal casing of the condenser which generally is connected to the cathode.

The above features may be also obtained by furnishing the condenser with a shield electrically connected with the condenser anode and so arranged that it surrounds the condenser bobbin thus forming an external spire.

In order to facilitate the discussion, a sheet of drawings is attached to the present specification and shows diagrammatically two developed cross sections of condenser bobbins according to the invention as compared with a similar view of a conventional condenser bobbin, which are cited solely by way of examples by no means restrictive of the scope of the invention.

In the drawings:

Figure 1 shows a diagrammatical cross section of a conventional condenser bobbin showing how the last outer turn of the laminations corresponds to a cathode;

Figure 2 shows a condenser according to the invention wherein the cathode is thoroughly covered by the anode;

Figure 3 shows a condenser according to the invention with the cathode surrounded by an additional anode;

Figure 4 is a plan view of the end of the ensemble of the condenser strip according to the invention;

Figures 5 to 7, inclusive, show embodiments of the invention based on the principle of Figure 3, and

Figure 8 is an operative layout of a winder utilizable for the manufacture of condensers according to the invention.

The condenser bobbin 10 is formed of a cathode 11 and an anode 12 and respective strips made of dielectric and absorbent material such as paper, shown at 13, 14 in which strips the electrolyte is located. Generally speaking the correlation of these electrodes and electrolyte is common in condensers of the type set forth, and also the nature of the electrolyte formulation. The cathode 11 is merely an aluminum lamination for transferring the operative polarity to the electrolyte. Anode 12 is an aluminum lamination chemically or mechanically treated for providing a rough surface and further oxidized.

According to the constructions hitherto common, both electrodes 11 and 12, with their insulations 13 and 14 are wound as an assembled strip, and once a suitable length of this strip for obtaining the desired capacity is coiled, the strip is cut and the ends of the elements thereof are left in the arrangement shown in the Figure 1.

In this figure it may be appreciated that the cathode lamination is that which surrounds the other.

According to a feature of the invention, described with reference to Figure 2, the anode 12 is not terminated just at the end of the cathode, but it is lengthened and made to extend a little more than a complete turn around the bobbin, that is from the point 15 adjacent to the cathode until it covers the end of the same, so that the cathode is completely covered by the anode, or alternatively the last cathode turn is cutoff.

The same covering effect may be attained by arranging a supplemental anode 16 around the usual condenser bobbin, such as shown in the Figure 3, which anode merely consists in a formed aluminum lamination or a piece of condenser anode, which is electrically connected with the anode 12 by means of a connection partially shown in the drawing and marked with the numeral 17.

In these two embodiments, wherein the external face of an anode is at the outside of the bobbin, the outer portion of the anode has as its cathode the proper condenser metallic casing.

These two embodiments are based on what might be called direct association of the outer surface area of the cathode end with the anode that is superimposed thereon; but due to the reasons pointed out in the introduction, where the condenser working voltages are high enough, an indirect association may be obtained by placing the cathode terminal outer surface of Figure 2 at a short distance from the anode outer surface. This may be carried through by trimming the cathode end as described in connection with the Figures 4 to 7, inclusive.

In Figure 4 the cathode end has a trimmed central portion with parallel edges so that an elongated rectangular recess 18 is formed, which extends from the cathode terminal edge.

In Figure 5 the recess 19 is restricted or comprises half the width of the lamination forming the cathode, so that the end of the latter has a recessed instep at one side thereof.

In Figure 6 the relative positions of the recess and the cathode sections of Figure 4 have been reversed, so that now the cathode has two recesses 20 similar to that marked 19 in Figure 5, between which an intermediate cathode section is located.

In Figure 7 the recesses described have been changed to rectangular shaped openings 21 distributed along the cathode end.

Within the general scope described, it is also possible to develop the cathode screening by reversing the relative positions of the two electrodes during the condenser winding operation. This arrangement is likewise new since the fact of mounting the cathode at the outside of the condenser bobbin is derived from the special manner according to which the actual winding machines work.

In Figure 8 there is schematically illustrated the arrangement of a winding machine utilizable for the manufacture of condensers according to the invention. 22 is

the condenser bobbin formed by the described elements and denoted with the same reference numerals.

Cathode 11 unwinds from the bobbin and is surrounded by the corresponding papers 13, 14 fed by the bobbins 24, 25 respectively.

Anode 12 may be supplied in continuous form by means of a corresponding bobbin 26 and covered by papers 13, 14 supplied by the bobbins 27, 28 respectively. But in many cases, in order to avoid waste, the anodes are generally cut in lengths proportional to the capacities required and these strips—generally less than one meter long—are inserted in the condenser at the very moment of making the bobbin. Thus it is understood that since the operator is placed in front of the machine, these anodes should be inserted in the inner part of the bobbin in order that the same are always within the operator's sight.

Were the relative positions of the two electrodes reversed, the inner ends of the assembled strip are liable to be exposed to the corrosion effects which are to be avoided by the present invention, and it is obvious that the same construction described for the outer ends of the electrodes may be likewise applied to the inner ends of the same in all the cases where the practice may be shown to be desirable.

It may be easily understood that any shape given to the recesses or openings described, as well as eventual changes in the number and distribution thereof will be likewise covered by the principles of the present invention. It may, thus, be constructed in any shape and size, with the most suitable materials, since all this remains within the scope of the following claims.

I claim:

1. An electrolytic condenser comprising a dielectric covered cathode strip and a dielectric covered anode strip extending spirally outwardly from a common center with the dielectric covered cathode strip and dielectric covered anode strip forming alternate layers along a radius of the condenser, the end of said cathode strip being on the outside of the condenser and having at least one aperture therein exposing a portion of said anode strip for causing a charge of the same nature as the charge on the anode on both sides of said cathode strip.

2. An electrolytic condenser as claimed in claim 1 in which the end of said cathode strip has apertures in both edges of the end thereof to form recesses in the sides of the end of said cathode strip.

3. An electrolytic condenser as claimed in claim 1 in which said cathode strip has an open sided aperture therein to form a recess in the end of said cathode strip.

4. An electrolytic condenser as claimed in claim 1 in which said cathode strip has at least one closed sided aperture therein exposing a portion of the anode strip.

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