Nov. 23, 1937. R. U. CLARK 2,099,797

ELECTROLYTIC CONDENSER UNIT

Filed March 19, 1935 2 Sheets-Sheet 1

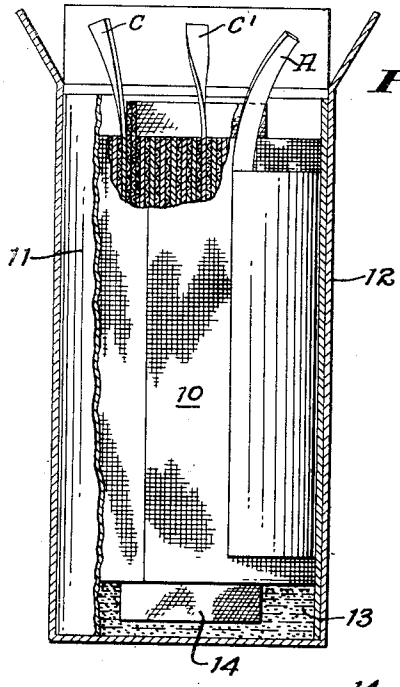


Fig. 1.

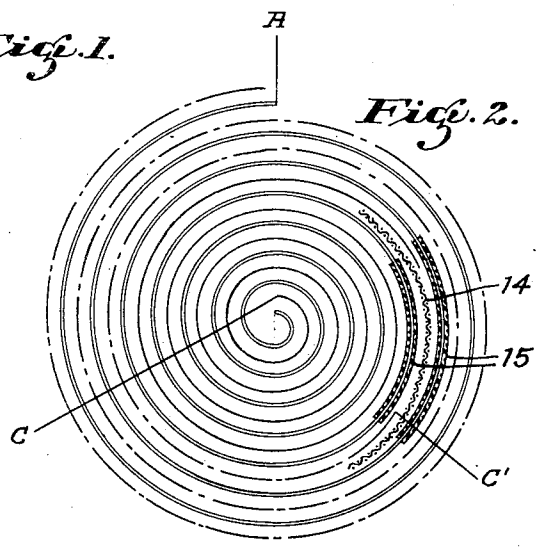


Fig. 2.

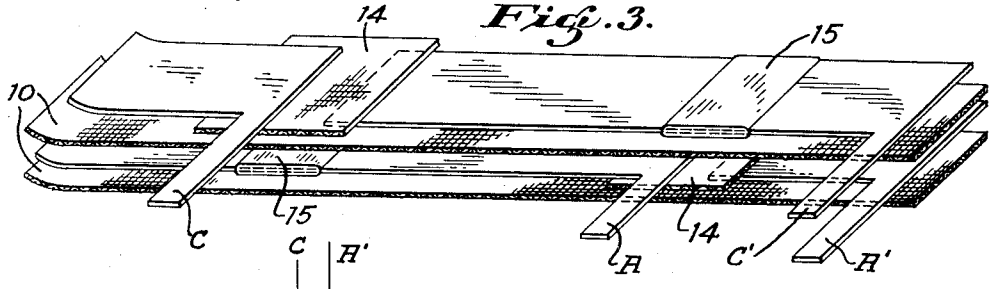


Fig. 3.

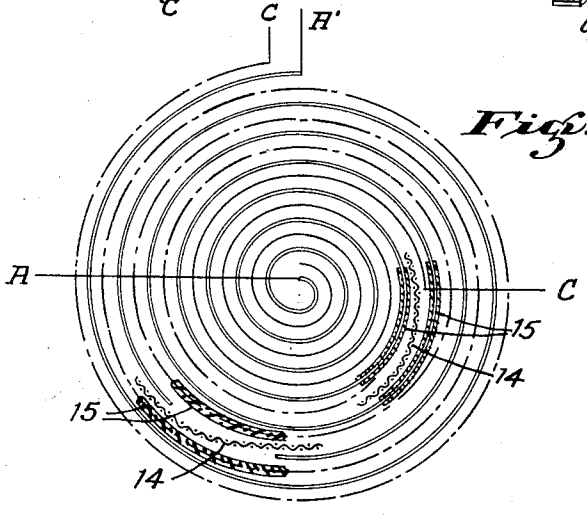


Fig. 4.

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ELECTROLYTIC CONDENSER UNIT

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Fig. 5.

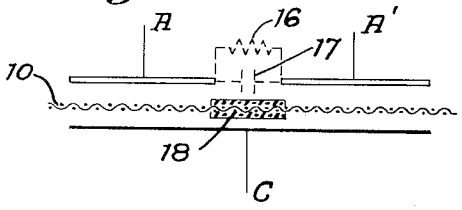


Fig. 6.

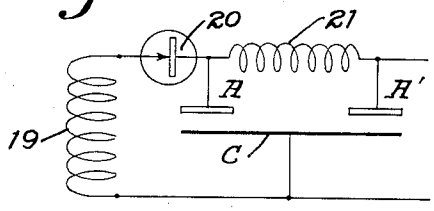


Fig. 7.

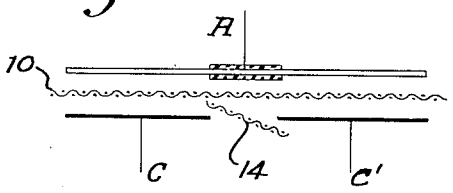


Fig. 8.

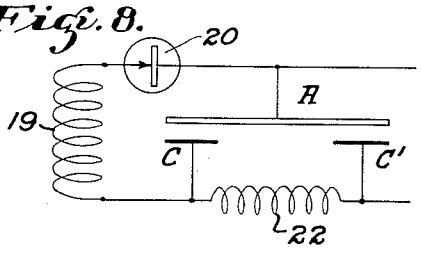


Fig. 9.

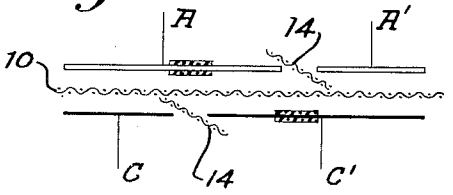


Fig. 10.

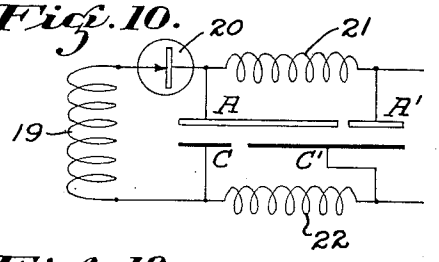


Fig. 11.

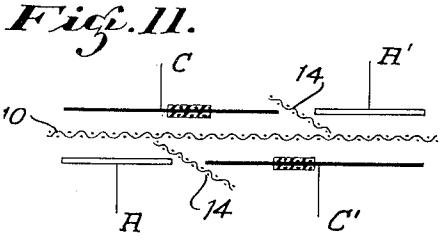


Fig. 12.

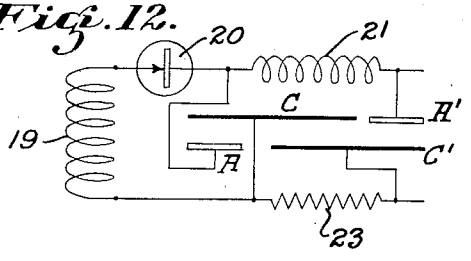
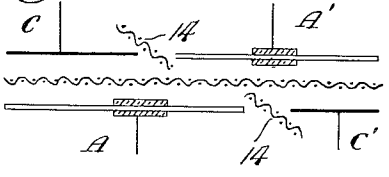


Fig. 13



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Patented Nov. 23, 1937

2,099,797

UNITED STATES PATENT OFFICE

2,099,797

ELECTROLYTIC CONDENSER UNIT

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Application March 19, 1935, Serial No. 11,768

33 Claims. (Cl. 175—315)

This invention relates to electrolytic condensers, and more particularly to an improved construction for an electrolytic condenser of the type having a plurality of foil electrodes wound spirally in staggered and overlapping relation to produce a plurality of capacitances in a single unit.

An object of the invention is to provide in a single unit a plurality of capacitances so arranged and isolated that interfering and undesirable capacitive and current leakage effects will be avoided.

Another object of the invention is to provide a new and novel construction for electrolytic condensers of the so-called semi-dry type having a common anode and/or a common cathode.

A further object of the invention is to provide, in a multiple capacitance electrolytic condenser of the wound foil type, means which will effectively isolate the individual capacitances and prevent detrimental reactions therebetween.

In its simplest form, a multiple unit condenser of the type contemplated by this invention comprises a plurality of filmed and unfilmed electrodes wound in staggered and overlapping relation with an electrolyte impregnated gauze disposed therebetween. While this construction will be found suitable for some uses, it will be wholly unsuited to other uses because of detrimental reactions between the electrodes. An example of one of the latter uses is where the condenser unit is connected in a complicated filter circuit, such as is customary in radio and other thermionic tube devices, for smoothing intercyclic variations in a rectified alternating current. If the multiple capacitance condenser unit is used in such a circuit, precautions must be taken to isolate the individual capacitances to prevent stray capacity, current leakage and similar detrimental effects. It is, therefore, a further and more specific object of this invention to provide new and novel arrangements for the electrodes, and a novel insulating means for the electrolyte which will provide a plurality of capacitances in a single unit assembly without the above defects.

In the arrangement contemplated by this invention the anodes or positive electrodes are of a filming metal foil and the cathodes or negative electrodes are of either a filming or non-filming metal foil. For the anodes aluminum foil is most suitable and while the cathodes may be constructed of aluminum foil, where a non-filming cathode is required nickel foil will be suitable. The anodes are preformed electrically, in accordance with the well known film formation process, to produce on their surfaces a very thin dielectric film. This film acts as an insulator against the passage of current to the anode and, therefore, serves as the dielectric element of the condenser. When these electrodes are assembled in the condenser unit the positive and negative electrodes will be separated by a strip of gauze or other similar material. This strip of separating medium is impregnated with an electrolyte which serves as a conductor between the anode and cathode surfaces and the amount of capacity provided by the cooperating anodes and cathodes is then largely dependent upon the overlapping areas of the anode and cathode electrodes.

Where it is desirable to produce a multiple capacitance condenser unit, it is the practice to roll the electrodes thereof spirally in staggered and overlapping relation in such a manner that either a common anode or a common cathode condenser will result. For example, in a two capacitance unit only three electrodes will be required, one of said electrodes, either a cathode or an anode, being common to the other electrodes which will respectively be either anodes or cathodes. In the common cathode type of condenser unit the two uncommon electrodes (anodes) carry a heavy insulating film and, therefore, it is the least difficult of the multiple capacitance units to manufacture, but even with this type of condenser there is a slight possibility of capacity effects directly between the anodes of the condenser. There is also the same possibility of current leakage between these electrodes. On the other hand, in the common anode type of condenser the possibility of stray capacity and/or current leakage between the uncommon electrodes (cathodes) is much greater than in the common cathode type of condenser unit. This is due to the fact that generally neither of the two uncommon electrodes (cathodes) has much, if any, dielectric on its surface.

Both the common anode and common cathode types of condensers, when constructed as above, become still more difficult to manufacture if the electrodes are arranged to provide three or more separate capacitances in the condenser unit. This is because the common electrodes of any two or more capacitances, in such a lapped or staggered arrangement, form a continuous chain of capacitances, and unless some means is provided to isolate the several capacitances from each other, as for example, by interrupting the electrolyte therebetween, detrimental effects will be produced. In multiple capacitance condenser units of this type it has been suggested to provide a relatively high voltage formation upon the electrodes between which a leakage path can exist when the condenser unit is in operation. Such a condition would prevail should the electrodes, between which the leakage occurs, be connected to opposite ends of a choke coil in a filter circuit. In such a position the leakage path will detrimentally effect the operation of the condenser unit. However, if a high voltage

film formation alone is relied upon to prevent leakage between these electrodes, a high power factor will exist between any two filmed electrodes. Stray capacitances will also be established between adjacent sections of the condenser. These stray capacitances will offset the advantages sought to be gained by the use of a multiple capacitance unit. When the multiple capacitance unit is of the non-polarized type there will, in the absence of effective precautions against current leakage and stray capacitance, be produced other undesirable reactions and objectionable results, particularly if the condenser unit is used in a high voltage alternating current system.

To eliminate the above defects and provide a multiple capacitance condenser unit, the present invention contemplates a number of improved arrangements which make it possible to build multiple capacitance condenser units for practically any circuit connection in which any type and combination of types of electrolytic condensers are at present required.

For a better understanding of the invention reference should be had to the accompanying drawings wherein there is shown, by way of illustration and not of limitation, preferred embodiments thereof.

In the drawings:

Figure 1 is a vertical sectional view, with parts broken away to disclose the interior arrangement of a condenser unit constructed in accordance with the invention,

Figure 2 is a schematic diagram showing the arrangement and relative positions of the electrodes of a condenser unit constructed in accordance with one embodiment of the invention,

Figure 3 is a developed view showing the arrangement of the electrodes, separating gauze and other elements of a condenser constructed in accordance with this invention,

Figure 4 is a view similar to Figure 2, showing the arrangements of electrodes which will result from a winding of the arrangement illustrated in Figure 3 in a spiral, as is the practice in constructing wound condensers,

Figures 5 to 12 inclusive, show diagrammatically various arrangements and combinations of electrodes as contemplated by this invention, and exemplary simplified circuit diagrams therefor, and

Figure 13 is a diagrammatic showing similar to that illustrated in Figure 11, but with the filmed anodes disposed in overlapping relation.

To facilitate an understanding of the invention there is illustrated in the drawings two forms of condenser units with variations of each form. One of these forms involves the use of three electrodes to provide a condenser unit having two capacitances and the other form involves the use of four electrodes to provide a condenser unit having three capacitances. It will of course be understood that variations other than those illustrated will be possible without departing from the spirit of the invention. For instance, the number of electrodes might be multiplied and rearranged to produce more capacitances and/or functions in a single unit than are herein described.

A condenser of the first above form is illustrated in Figures 1 and 2 of the drawings. As shown in Figure 1 the condenser unit has a common anode A and two cathodes C and C' which are wound upon each other in a spiral fashion with an electrolyte impregnated gauze 10 therebetween. Because of the parallel disposition of the electrode A with respect to the electrodes C and C' it is necessary to provide two strips of the electrolyte impregnated gauze 10. This insures that there will always be a portion of the electrolyte between the adjacent areas of the different electrodes. The electrodes A, C and C', when wound in this manner with an electrolyte impregnated gauze 10, will finally assume an exterior contour which is substantially elliptical. About the roll so formed there is applied a suitable wrapping 11 of paper which will hold the roll intact. The electrodes with the wrapping 10 are then inserted in a suitable container 12 which, as illustrated, is of rectangular shape. After this electrode assembly has been thus placed into the container 12 the top and bottom ends thereof are filled with an insulating and hard drying compound 13 that completely seals the condenser unit and prevents evaporation and leakage of the electrolyte. Interposed between the cathodes C and C' there is an insulating barrier 14 which, in its preferred form, comprises a short strip of varnished cambric and an insulating coating of wax or varnish 15 upon the anode A adjacent the space between the two cathodes C and C'. The varnished cambric forming the insulating barrier 14 is cut somewhat wider than the electrolyte carrying gauze 10 so that when the roll of electrodes is finally completed the edges of the varnished cambric will project outwardly at the ends of the roll. With this arrangement it will be seen that when the insulating compound 13 is poured into the ends of the container 12 the portion of the condenser unit within the cylinder formed by the insulating barrier 14 will be completely insulated from that portion of the condenser unit lying outside of the insulating barrier 14. The developed length of the insulating barrier 14 is proportioned with respect to its radial position in the roll so as to form at least one complete convolution about the center of the assembled roll and in conjunction with the waxed or varnished portion of the anode A it serves to completely insulate the two sections of the condenser insofar as the electrolyte between the several electrodes is concerned.

In Figure 2 of the drawings the anode A is illustrated by double lines and the cathodes C and C' are illustrated respectively by a dot and dash and a full line. The insulating barrier 14 is here shown as lapped under the cathode C and as extending around and over the end of the cathode C'. This results in what might be termed a diagonal disposition of the insulating barrier 14 between the separated ends of the cathodes C and C'. In this figure of the drawings the waxed or varnished portion 15 of the anode A is shown as at two points, one at each side of the insulating barrier 14. In actual practice the waxed or varnished portion 15 will be applied to the common electrode for a distance of approximately six inches and as a result there will be formed within the condenser roll at least one complete convolution of waxed electrode. The reason for showing two waxed or varnished portions 15 in this drawing is to illustrate, without complications, the manner in which the varnished cambric forming the insulating barrier 14 cooperates with the waxed or varnished portion of the anode. These condensers very seldom reach a maximum diameter of more than one and one-half inches. It will therefore be seen that a waxed portion of from four to six inches in length and a strip of varnished cambric not substantially greater in length will be suf-

ficient to provide a complete barrier between any two radial portions of the condenser roll.

The modification of the invention illustrated in Figures 3 and 4 of the drawings is of the second above referred to form. As here shown, the condenser unit has an anode A which is common to two cathodes C and C' and the cathode C' is common to a portion of the anode A and a second anode A'. In this arrangement, like the one above described, there are provided two strips of electrolyte impregnated gauze 10. As shown in Figure 3 the several electrodes are arranged in staggered and overlapping relation with a piece of varnished cambric 14 disposed so as to form an insulating barrier between the anodes A and A' and between the cathodes C and C'. Adjacent the space thus provided between the like electrodes there is also shown a waxed or varnished portion 15 which cooperates with the insulating barrier 14 to completely seal the electrolyte into three distinct areas.

When the elements illustrated in Figure 3 are rolled up with the electrolyte impregnated gauze 10 therebetween, the final arrangement of the electrodes with respect to each other will be substantially as illustrated in Figure 4 of the drawings. As here illustrated the anodes A and A' are shown by double lines and as separated by an outer insulating barrier 14. The cathodes C and C' are indicated respectively by a dot and dash and a full line. These latter electrodes are separated and insulated from each other by an inner insulating barrier 14. At this latter point the anode A is shown waxed at two points as explained in connection with Figure 2 of the drawings. Adjacent the outer insulating barrier 14, the cathode C is likewise provided with a waxed or varnished portion 15 as indicated above. In the claims following this description the insulating barrier 14 is defined as disposed between successive and/or coincident electrodes. By these expressions it is to be understood that the barriers are disposed between the separated ends of the electrodes that are located in the same spiral course of the completed roll.

In Figure 5 of the drawings there is illustrated a variation of the modification illustrated in Figures 1 and 2. This variation provides a condenser having a common cathode C and two anodes A and A'. Indicated by dotted lines between the anodes A and A' there is a leakage resistance 16 and a small capacitance 17. The leakage resistance 16 and the capacitance 17 are of course not contemplated by the invention, but it will be readily understood that in the absence of an insulating and separating barrier between the anodes A and A' there will, because of the presence of electrolyte therebetween, be a possibility of a current leakage and/or a capacitive action between the two anodes and that in the event of such an action the operation of the condenser might be seriously affected. However, with the interposition of an insulating barrier 14, as described above, between the anodes A and A', the leakage effect represented at 16 and the capacitive effect represented at 17 will be substantially if not entirely eliminated.

In this figure of the drawings attention is also called to the fact that the insulating barrier is provided in a different manner than is the barrier 14 previously described. As here shown the insulating barrier, designated by the numeral 18, between the anodes A and A' is produced by impregnating the gauze 10 with wax or other non-absorbing and insulating substance. The insulating wax or substance 18 is preferably applied to the gauze 10 for a sufficient length thereof to form a substantially cylindrical insulating layer between the adjacent capacitances of the condenser when the electrodes and the gauze 10 are finally and tightly rolled into their final positions to form the condenser unit. This insulating means 18 may be used at any point where an insulating barrier is desired.

In Figure 6 there is shown a schematic diagram of a possible use for a multiple capacitance condenser unit having electrodes arranged as just described. In this diagram the numeral 19 designates the secondary or output circuit of a transformer which supplies current to a rectifier 20, the output of which flows through a choke coil 21. In this instance the anode A is connected to one end of the choke 21 with the anode A' connected to the other side of the transformer winding 19. This provides in a single unit having three electrodes two capacitances in parallel with the transformer 19 and the rectifier 20, one at each end of the choke coil 21.

In Figure 7 of the drawings there is shown a two capacitance condenser unit having a common anode A and two cathodes C and C'. As here shown, the cathodes C and C' are separated by an insulating barrier 14 of the type previously described. This condenser is shown in Figure 8 as connected to a circuit similar to that described above except that there is a choke 22 in the negative side of the rectifier circuit. In this instance the anode A is connected to the output of the rectifier 20 and the cathodes C and C' are connected to opposite ends of the choke 22.

In Figure 9 of the drawings, there is shown a condenser unit constructed similar to the one described in connection with Figures 3 and 4 of the drawings. This condenser has what might be termed a common anode A and a common cathode C'. The anode A cooperates with a cathode C and a portion of the common cathode C', and the common cathode C' cooperates with a portion of the common anode A and a second anode A'. Disposed between the anodes A and A' and between the cathodes C and C' there are shown insulating barriers 14. The barrier 14 may be omitted between the anodes A and A', if the circuit conditions warrant. With this arrangement it will be seen that a capacitance will be established between the anode A and the cathodes C and C'. This will result in two capacitances and the cathode C' in cooperation with the anode A' will constitute a third capacitance. Such an arrangement of electrodes will be found particularly suitable for a filter circuit of the type illustrated in Figure 10, wherein there is a choke coil connected in each side of the filter circuit. When the four leads of the condenser unit are connected, as here shown, a capacitance will be established across the filter circuit at each end of the chokes 20 and 22 and a third capacitance will be established diagonally between the two choke coils 21 and 22.

In the variation of the invention illustrated in Figure 11 of the drawings, there is provided two common cathodes C and C' and two anodes A and A'. The common cathodes C and C' cooperate respectively with the anodes A and A' to form two capacitances, and the two cathodes C and C' cooperate with each other to establish a third capacitance. If the common cathodes C and C' are each formed of a filming metal foil such as aluminum it will be possible to produce

a film upon one or the other by properly applying a film forming voltage thereto. This film may be formed at the factory or it may be allowed to form later when the condenser has been connected into a particular circuit. In the latter event, the formation of the film upon one or the other of the cathodes C and C' will be controlled by the voltage potential existing between these electrodes. If it is previously determined upon which of the two cathodes a film is desired this can be accomplished by constructing the other cathode of a non-filming metal such as nickel.

A representative circuit in which the last above described condenser unit will find application is shown in Figure 12 of the drawings. In this circuit there is a choke coil 21 in the high side of the filter circuit and a resistance 23 in the low side of the circuit. In this instance there is established two capacitances in parallel relation with the transformer winding 19, between the ends of the choke coil 21 and the resistance 23. The third capacitance provided by this unit is, with this arrangement, established across the resistance 23. If it is assumed that the choke coil is more positive in electrical potential than the resistance 23 it will be evident that a dielectric film will be formed upon the left-hand portion of the cathode C' when the condenser unit is in use.

In the variation of the invention illustrated in Figure 13 of the drawings, the shielding capacitance is shown as formed between like electrodes or the anodes of the condenser unit rather than between the cathodes, as illustrated in Figure 11 of the drawings. In this arrangement it will be obvious that the oxide films upon the two anodes A—A', because of this directional resistance characteristic, will prevent any leakage or current flow from one of the main capacitances to the other of the main capacitances. The opposed oxide films of this arrangement, together with the fact that when rolled the overlapping portions of the anodes form a complete cylindrical shield between the main capacitances, makes it unnecessary to provide any additional barriers or insulating means between the electrodes or upon the electrolyte carrying spacer. In other words, when the condenser electrodes are rolled, as is contemplated by the invention, the overlapping portions of the anodes A—A' with their films will form a static shield that will be positioned between the two main capacitances.

In these latter modifications and variations of the invention it will be understood that the intermediate condenser may operate with the applied D. C. voltage either in series aiding or series opposing relation to the applied D. C. voltage on one of the other two capacitances. When more than two sections which might interfere are included in a single condenser unit it may be desirable to include in the unit one or more neutral or independent capacitances between the interfering capacitances. In other words by properly disposing the anodes and cathodes with respect to each other it will be possible in a multiple capacitance unit, constructed in accordance with this invention, to eliminate the effects of stray leakage and/or capacitance between sections. At this point it should be explained that while a very low capacitance may be established between adjacent foils at the insulating barrier, as is the case with any spaced electrodes, this capacitance because of the relative wide spacing thereof and the absence of electrolyte at this point will be of no consequence as its value is in the order of micro-microfarads rather than microfarads.

From the above it will be apparent that a novel feature of the invention resides in the interposition of the insulating barrier between the successive and/or coincident electrodes so as to divide the electrolyte into separate paths and thereby establish independently operating capacitances, and while the invention has been illustrated and described in connection with multiple capacitance condenser units, it is to be understood that the invention may be applied to multiple capacitance condenser units in which the separate capacitances are formed by separate and independent anodes and cathodes.

While I have, for the sake of clearness and in order to disclose the invention so that it can be readily understood, described and illustrated specific devices and arrangements, I desire to have it understood that this invention is not limited to the specific means disclosed, but may be embodied in other ways that will suggest themselves to persons skilled in the art. It is believed that this invention is new and it is desired to claim it so that all such changes as come within the scope of the appended claims are to be considered as part of this invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. An electrolytic condenser comprising a common filmed electrode, two other unfilmed electrodes disposed in spaced relation, one adjacent each end and in overlapping relation with said common filmed electrode, said electrodes being wound spirally in a single assembly to provide a plurality of capacitances, a continuous electrolyte disposed between said filmed and unfilmed electrodes, and an insulated area upon said common filmed electrode located opposite the space between the ends of said two unfilmed electrodes for limiting the electrolytic path between said electrodes to the overlapping areas thereof.

2. In an electrolytic condenser of the multiple capacitance type, the combination of a common unfilmed electrode, cooperating filmed electrodes disposed in spaced relation adjacent and overlapping an end of said common unfilmed electrode, a continuous electrolyte disposed between said electrodes, and an insulating coating upon said common unfilmed electrode for interrupting the electrolyte contact therewith over the area opposite the space between said cooperating filmed electrodes.

3. An electrolytic condenser comprising a series of filmed and unfilmed electrodes of different areas wound spirally in spaced relation to form a series of overlapping filmed and unfilmed areas between said electrodes in a single assembly, an electrolytic paste disposed spirally between cooperating electrodes of lowest resulting impedance, and an insulating barrier interrupting the electrolyte paste adjacent the space separating the overlapping filmed and unfilmed areas of said electrodes to prevent undesirable reactions between said latter electrodes.

4. An electrolytic condenser comprising a series of spaced filmed and unfilmed electrodes wound spirally to provide a series of filmed and unfilmed overlapping areas between adjacent electrodes and a non-overlapping relation between like electrodes in a single assembly, an electrolytic paste disposed between the filmed and unfilmed overlapping areas of said electrodes, an insulating barrier interrupting the electrolyte paste adjacent the space separating the like non-overlap-

ping electrodes, and an insulating coating upon the adjacent filmed and/or unfilmed overlapping electrode cooperating with said insulating barrier to prevent stray currents between the spaced non-overlapping electrodes.

5. An electrolytic condenser comprising a series of spaced filmed and unfilmed electrodes wound spirally in two parallel courses with portions of the filmed electrodes in overlapping relation with portions of the unfilmed electrodes and portions of the unfilmed electrodes overlapping other filmed electrodes, an electrolyte between the overlapping portions of said electrodes, an insulating barrier disposed in the space separating the spaced electrodes, and a coating of wax upon the adjacent overlapping electrodes cooperating with said barrier to interrupt the electrolyte contact with said overlapping electrodes between the ends of said spaced electrodes.

6. An electrolytic capacitor, the combination of a plurality of filmed electrodes, a plurality of unfilmed electrodes, said filmed and unfilmed electrodes being wound respectively in two spiral courses with at least one of the electrodes in one course overlapping two electrodes of an unlike character in the other course, a continuous electrolyte carrying spacer disposed between the courses of electrodes, and an insulating barrier formed in the spacer between the ends of the successive filmed electrodes in one spiral course and between the ends of the successive unfilmed electrodes in the other spiral course to provide a plurality of isolated capacitances between a filmed and an unfilmed electrode.

7. An electrolytic condenser comprising a series of filmed electrodes spaced end to end and wound in a spiral course, a series of unfilmed electrodes spaced end to end and wound in a second spiral course parallel with said first spiral course with portions of the filmed and unfilmed electrodes overlapping to form capacitances therebetween, a continuous electrolyte carrying spacer disposed between the spiral course of said electrodes, and an insulating means upon the electrolyte carrying spacer at points adjacent the spaces between the ends of the successive like electrodes of each course for interrupting the electrolyte between the successive overlapping areas of said electrodes, to thereby produce a single condenser unit having a plurality of capacitances between which current leakage and detrimental capacity effects are avoided.

8. An electrolytic condenser comprising a series of filmed and a series of unfilmed electrodes each wound in spaced relation and in a separate continuous spiral course in a single unit with portions of the filmed and unfilmed electrodes respectively overlapping unfilmed and filmed portions to form capacitance paths therebetween, a continuous electrolyte impregnated spacing means between the overlapping portions of said electrodes, and an insulating barrier disposed adjacent the space between the ends of successive like electrodes of each series and interrupting the electrolyte between the successive overlapping areas of said electrodes to thereby produce a condenser unit having a plurality of capacitances between which leakage and detrimental capacity effects are avoided.

9. In an electrolytic capacitor, the combination of a plurality of filmed electrodes, a plurality of unfilmed electrodes, said filmed and unfilmed electrodes being wound in spaced relation to each other and in separate spiral courses so that portions of at least one filmed electrode will overlap at least two of the unfilmed electrodes and at least one of said unfilmed electrodes will overlap at least two filmed electrodes, a continuous electrolyte impregnated spacer disposed spirally between said filmed and unfilmed electrodes, and insulating means disposed between the successive filmed eelctrodes and successive unfilmed electrodes of each course constructed and arranged to interrupt the electrolyte path between the adjacent filmed electrodes and between the adjacent unfilmed electrodes to thereby isolate the capacity circuits between overlapping areas of the filmed and unfilmed electrodes.

10. In an electrolytic capacitor, the combination of a single anode, a plurality of cathodes, said anode being wound spirally in overlapping relation with said cathodes, an electrolyte disposed between said overlapping anode and said cathodes, an insulating means between said cathodes for preventing stray currents and capacity effects between said cathodes, and means upon said anode for insulating the electrolyte from said anode over an area thereof adjacent the space between the ends of said cathodes.

11. In an electrolytic capacitor, the combination of a plurality of anodes, a single cathode, said cathode being wound spirally in overlapping relation with said anodes, an electrolyte disposed between said overlapping cathode and said anodes, an insulating means disposed between the adjacent ends of said anodes, and an insulated area upon the overlapping cathode opposite the space between the ends of the cooperating anodes adapted to provide isolated capacity circuits between said anodes and the adjacent overlapping ends of said cathode.

12. A multiple capacitance electrolytic condenser unit comprising two spaced and filmed electrodes of different areas wound in spiral overlapping relation with two spaced and unfilmed electrodes of different areas, an electrolyte disposed between said filmed and unfilmed electrodes, whereby a main capacitance circuit will be provided in said condenser between the overlapping filmed and unfilmed areas of each larger and a smaller electrode, the disposition of said filmed and unfilmed electrodes of largest area with respect to each other being such that end portions thereof will overlap and establish an intermediate capacitance, and insulating means interrupting the electrolyte between said capacitances, whereby said intermediate capacitance will operate to prevent interfering effects between said main capacitance without sensibly affecting the operation of said main capacitances.

13. An electrolytic condenser comprising a series of filmed and unfilmed electrodes of film forming metal wound spirally into a single assembly to provide a plurality of main capacitances in which undesirable reactions between the electrodes forming said main capacitances are prevented by overlapping the extending ends of like electrodes of the main capacitances to form an additional capacitance in said assembly which will react with either or both of said ostensibly interfering electrodes without sensibly affecting the operation of the main capacitance forming areas of said electrodes.

14. In an electrolytic condenser unit of the multiple capacitance type, the combination of a common filmed electrode, a plurality of other unfilmed electrodes arranged in spaced relation to each other and in overlapping relation with portions of said common filmed electrode, said common filmed electrode having an insulating coating

thereupon throughout the area adjacent the space between said other unfilmed electrodes, and an insulating barrier disposed in the space between said other unfilmed electrodes, whereby said common filmed electrode and said other unfilmed electrodes will form at least two substantially independent capacitances.

15. In an electrolytic condenser unit of the multiple capacitance type, the combination of a common unfilmed electrode, a plurality of other filmed electrodes arranged in spaced relation to each other and in overlapping relation with portions of said common unfilmed electrode, said common unfilmed electrode having an insulating coating thereupon throughout the area adjacent the space between said other filmed electrodes, and an insulating barrier disposed in the space between said other filmed electrodes, whereby said common unfilmed electrode and said other filmed electrodes will form two substantially independent capacitances.

16. In an electrolytic condenser unit of the multiple capacitance type, the combination of a common filmed electrode, a filmed and an unfilmed electrode arranged in spaced relation to each other and in overlapping relation with portions of said common filmed electrode, said common filmed electrode having an insulating coating thereupon throughout the area adjacent the space between said filmed and unfilmed electrodes, and an insulating barrier disposed in the space between said filmed and unfilmed electrodes, whereby said common filmed electrode and said filmed and unfilmed electrodes will form at least two substantially independent capacitances.

17. In an electrolytic condenser unit of the multiple capacitance type, the combination of a common filmed electrode of metal foil, a plurality of other filmed electrodes of metal foil wound spirally and in spaced relation to each other and in overlapping relation with portions of said common filmed electrode, an electrolyte retaining fabric between the overlapping portions of said common filmed electrode and said other filmed electrodes, said common filmed electrode having an insulating coating upon the area thereof adjacent the space between said other filmed electrodes, and an insulating means disposed in the space between said other filmed electrodes, whereby said common filmed electrode and said other filmed electrodes will form at least two substantially independent capacitances.

18. In an electrolytic condenser unit of the multiple capacitance type, the combination of a common unfilmed electrode of metal foil, a plurality of other filmed electrodes of metal foil wound spirally and in spaced relation to each other and in overlapping relation with portions of said common unfilmed electrode, an electrolyte retaining fabric between the overlapping portions of said common unfilmed electrode and said other filmed electrodes, said common unfilmed electrode having an insulating coating of wax upon the area thereof adjacent the space between said other filmed electrodes, and an insulating means disposed in the space between said other filmed electrodes, whereby said common unfilmed electrode and said other filmed electrodes will form at least two substantially independent capacitances.

19. In an electrolytic condenser unit of the multiple capacitance type, the combination of a common filmed electrode of metal foil, a plurality of other filmed electrodes of metal foil wound spirally and in spaced relation to each other and in overlapping relation with portions of said common filmed electrode, an electrolyte retaining fabric between the overlapping portions of said common filmed electrode and said other filmed electrodes, said common filmed electrode having an insulating coating upon the area thereof adjacent the space between said other filmed electrodes, and an insulating means disposed in the space between said other filmed electrodes, whereby said common filmed electrode and said other filmed electrodes will form at least two substantially independent capacitances.

20. In an electrolytic condenser unit of the multiple capacitance type, the combination of a common filmed electrode, a plurality of other unfilmed electrodes arranged in spaced relation with each other and in overlapping relation with the ends of said common filmed electrode, said common filmed electrode and said other unfilmed electrodes being wound spirally in spaced relation, a continuous electrolyte impregnated material for holding said filmed and unfilmed electrodes in spaced relation and providing a current conducting path therebetween, and insulating means disposed in the space between said other unfilmed electrodes, and an insulating coating upon said common filmed electrode adjacent and cooperating with said insulating means, whereby said common filmed electrode and said other unfilmed electrodes will form two substantially independent capacitances.

21. In an electrolytic condenser unit of the multiple capacitance type, the combination of a common unfilmed electrode, a plurality of other filmed electrodes arranged in spaced relation with each other and in overlapping relation with the ends of said common unfilmed electrode, said common unfiled electrode and said other filmed electrodes being wound spirally in spaced relation, a continuous electrolyte impregnated material for holding said filmed and unfilmed electrodes in spaced relation and providing a current conducting path therebetween, and insulating means disposed in the space between said other filmed electrodes, and an insulating coating upon said common unfilmed electrode adjacent and cooperating with said insulating means, whereby said common unfilmed electrode and said other filmed electrodes will form two substantially independent capacitances.

22. A separator for the filmed and unfilmed electrodes of a multiple capacitance electrolytic condenser unit in which the filmed and unfilmed electrodes are wound in the manner described, comprising a continuous ribbon like member having spaced portions thereof impregnated with an electrolyte and carrying within itself an insulating medium between said electrolyte impregnated portions, whereby the capacitance units formed by the filmed and unfilmed electrodes operating through said electrolyte will be substantially isolated from each other.

23. A separator for the filmed and unfilmed electrodes of a multiple capacitance electrolytic condenser unit in which the filmed and unfilmed electrodes are wound in the manner described, comprising a continuous ribbon like fabric having spaced portions thereof impregnated with an electrolyte and with other portions between said electrolyte impregnated portions impregnated with an insulating medium, whereby the capacitance units formed by said electrolyte between the filmed and unfilmed electrodes will be substantially isolated from each other.

24. A plurality of electrolytic condensers of the roll type arranged in a single unit comprising a coiled cathode, a plurality of co-acting filmed anodes coiled with said common cathode to co-operate therewith and spaced from each other, an absorbent separator arranged between said common cathode and said anodes, an electrolyte carried by said absorbent separator, and means carried by said absorbent separator for interrupting the electrolyte between the portions thereof which cooperate with said filmed anodes.

25. A plurality of electrolytic condensers of the roll type arranged in a single unit comprising a common filmed anode, a plurality of co-acting cathodes coiled with said common filmed anode to cooperate therewith and spaced from each other, an absorbent separator arranged between said common filmed anode and said cathode, an electrolyte carried by said absorbent separator, and means carried by said absorbent separator for interrupting the electrolyte between the portions thereof which cooperate with said cathodes.

26. An electrolytic condenser comprising a series of filmed electrodes wound spirally in two layers with a space between adjacent electrodes of each layer and with an opposite electrode of the other layer overlapping said space, whereby at least two capacity circuits will be provided between the cooperating electrodes, an electrolytic paste disposed between the layers of said electrodes, an insulating barrier disposed in the space between the successive electrodes of each layer, and means carried by said space overlapping electrode cooperating with said barrier to prevent undesirable reactions between capacitances formed by the cooperating electrodes.

27. In an electrolytic condenser, the combination of a plurality of cathodes of dielectric film forming metal, an electrolyte carrying spacer disposed between and separating said cathodes, and a filmed anode for each of said cathodes separated therefrom by said electrolyte carrying spacer and cooperating with said cathodes to form independent capacitances, said cathodes being of a greater length than the cooperating anodes and having ends extending in spaced and overlapping relation with each other, whereby the overlapping end of one of said cathodes will develop a dielectric film when the condenser is in use.

28. In an electrolytic condenser, the combination of a plurality of cathodes of dielectric film forming metal, an electrolyte carrying spacer disposed between and separating said cathodes, and a filmed anode for each of said cathodes separated therefrom by said electrolyte carrying spacer and cooperating with said cathodes to form independent capacitances, said cathodes being of a greater length than the cooperating anodes and having ends extending in lapped and cooperating relation with each other to form a non-polarized capacitance between the independent capacitances formed between said cathodes and said anodes.

29. An electrolytic condenser comprising a series of filmed and unfilmed electrodes wound in two spiral courses and in spaced and overlapping relation in a single assembly with at least two like electrodes in one spiral course co-operating with an unlike electrode in the other spiral course, a continuous electrolyte disposed between said filmed and unfilmed electrodes, and an insulating coating upon and intermediate the ends of each overlapping electrode located opposite the space between the ends of its co-operating overlapped electrodes for limiting the electrostatic field between said electrodes to the overlapped filmed and unfilmed areas thereof.

30. In an electrolytic condenser of the multiple capacitance type, the combination of a common filmed electrode, two cooperating unfilmed electrodes disposed in spaced relation one adjacent and overlapping each end of said common electrode, one of said latter electrodes being longer than the other and forming a common unfilmed electrode, an additional filmed electrode disposed adjacent the extending end of said common unfilmed electrode, a continuous electrolyte disposed between said electrodes, and a coating of insulating material upon each of said common electrodes opposite the space between their two cooperating electrodes for limiting the electrolytic path between said electrodes to the overlapping filmed an unfilmed areas thereof.

31. In an electrolytic capacitor, the combination of a plurality of filmed electrodes of different areas, a plurality of unfilmed electrodes of different areas, said filmed and unfilmed electrodes being wound spirally in two parallel courses with the electrodes of largest areas in partial overlapping relation with each other, an electrolyte disposed spirally between said filmed and unfilmed electrodes, insulating means disposed between the successive overlapping capacitance forming areas of the electrodes of each course, and an insulating coating upon the electrodes of larger area of each course dividing the overlapping portions of said electrodes from the remaining portions thereof to isolate the capacity circuits between the overlapping areas of said electrodes and the capacity circuits formed by the remaining portions thereof.

32. A multiple capacitance electrolytic condenser unit comprising a filmed and an unfilmed electrode of film forming metal and of different areas wound respectively in spiral overlapping relation with an unfilmed and a filmed electrode also of film forming metal and of different areas, an electrolyte disposed spirally between said filmed and unfilmed electrodes, whereby a main capacitance circuit will be provided between each large and a smaller electrode in said condenser unit, the character and disposition of said electrodes of larger area with respect to each other being such that the adjacent end portions thereof will overlap and establish an intermediate capacitance between two like electrodes which will operate to prevent interfering effects between the capacitances established through the electrolyte between said larger and smaller electrodes.

33. In an electrolytic condenser of the character described, the combination of a series of electrodes comprising at least one cathode and one anode, a second series of electrodes arranged in spaced relation with said first series having at least one anode and one cathode, the anodes of each series being of greater area than the cathodes and being arranged in partial overlapping relation with respect to each other, and a continuous electrolyte carrying spacer disposed between each series of electrodes, whereby the overlapping ends of said anodes will prevent detrimental interference between the main capacitance forming areas of said anodes and cathodes.

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