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ELECTROLYTIC CONDENSER AND METHOD OF MAKING THE SAME

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Fig. 1

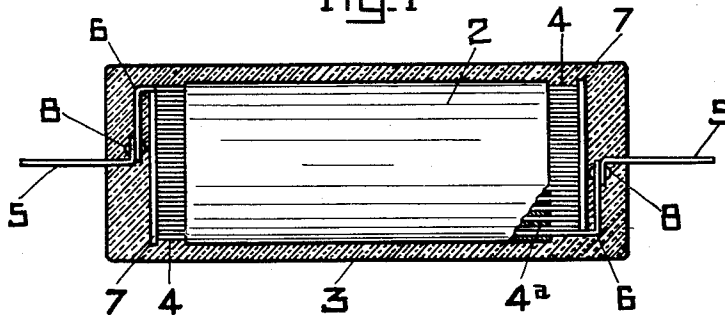


Fig. 2

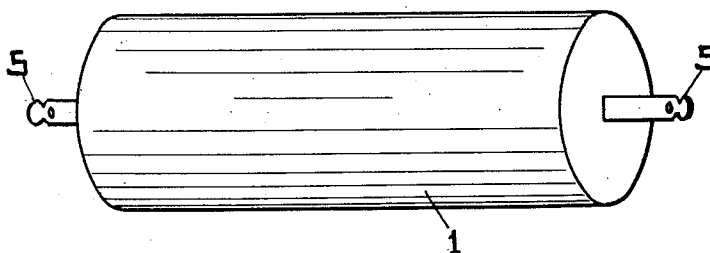
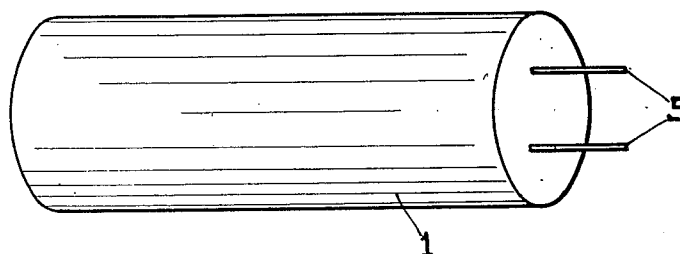


Fig. 3



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ELECTROLYTIC CONDENSER AND METHOD
OF MAKING THE SAME

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28 Claims. (Cl. 175—315)

My invention relates to electrolytic condensers, and the objects of the invention are to produce a new and improved electrolytic condenser and to provide a new and improved method of making such condensers.

To the above and other ends which will subsequently appear, the invention consists in the features of construction, arrangements of parts, and methods and compounds hereinafter described and particularly pointed out in the appended claims.

In the manufacture of dry or semi-dry type of electrolytic condensers it has been difficult to properly impregnate the condenser in order to obtain the full benefits of the entire capacity by eliminating voids. If the solution is too liquid and the condenser is impregnated therein, it will run out leaving voids, resulting in variable capacities and losses during production. If the condenser is impregnated with a paste of electrolyte it is difficult to apply the paste evenly throughout, especially when a separator such as cloth is used. My invention comprises applying a new and improved electrolyte to dry or semi-dry condensers which will easily and quickly impregnate a unit, such as a rolled unit, especially when a fibrous separator material is used, such as cloth. I have found that the novel compound is very liquid and viscous, especially when heated at certain temperatures, during which time the condenser can be impregnated; and when this compound cools it becomes substantially solid, thus remaining in the condenser unit, so that leaking—as has been found with other solutions of the ammonium glycol borate type—does not occur. Furthermore, if there should be slight minute voids, an advantage of my compound is that on cooling it expands and fills up such voids.

When the condenser is completed the unit becomes hard, solid and impermeable and it can be easily handled and assembled without injury. It is then possible for me, if found desirable, to assemble the condenser in a very light and close-fitting container, making the complete unit occupy much less space than has been the practice heretofore. Furthermore, I have found it unnecessary to mount same in another container, but by allowing it to cool in a small form or mould and then coating the condenser unit with a suitable varnish, I have found it possible to use the unit without an extra container such as cardboard or metal as has been the practice up to the present, and the solidified electrolyte itself

thus forms the outer enclosure for the condenser. As a further modification, the solid electrolyte filling the space in the mold or form may be replaced by some other mouldable material, preferably of an insulating character.

In the accompanying drawing illustrative of the invention:

Figure 1 is a vertical sectional view of a condenser constructed according to the invention;

Figure 2 is a perspective view of said condenser, and

Figure 3 is a corresponding view of a modification.

In the drawing the reference character 1 indicates a completed condenser according to the invention in which the rolled or wound condenser body 2 is mounted in and enclosed by the substance 3. This substance may comprise the impregnating material of the condenser body, since this possesses sufficient mechanical rigidity for the purpose. The condenser body comprises metallic foil sheets or plates 4a interwound with fibrous material as a cloth or gauze separator 4. The latter is brought out or extended beyond the foil or plates at each end of the condenser body 2 and same is surmounted by a washer of insulating material 7. An extension or connection from the condenser foil or plates is shown at 6 and same is bent over the ends of the condenser body and secured in position and connected to the terminal tags 5 by means of the bolt or other fastening means 8. On completion of this step the whole of the condenser body 2, connections 6, washers 7, bolt or rivet 8, and part of the terminal tags 5, are impregnated and moulded in the insulating substance 3. Alternatively the body 3 may be coated with a layer of insulating and/or protective varnish or similar material; or alternatively it may be formed around the condenser body 2 in any suitable mouldable material preferably of electrical insulating character.

As a modification the two connecting terminal lugs 5 may be arranged both at the same end of the condenser, as indicated in Figure 3, the internal construction of which will be an obvious slight modification of Figure 1.

Other advantages and features of the invention are evident or will be apparent from the scope of the appended claims.

The following details the method used in obtaining a dry electrolytic condenser, by producing an electrolyte which on cooling sets hard and acts as a protective coating, avoiding the necessity for the condensers to be sealed in another container.

The constituents of one formula for the novel electrolyte are urea, boric acid, glycerine, and ammonia, and a solution giving satisfactory results is made according to the following formula:

	Percent
Urea	48.6
Boric acid	42.1
Ammonia solution	6.5 (.910 density)
Glycerine	2.8

The constituents are mixed together, and fused by heat, the temperature of the resulting solution being raised until the viscosity of the solution is suitable for impregnation of the dry condenser rolls, made in the usual manner. The rolls are placed vertically in the solution and allowed to sink freely as the solution is absorbed, the impregnation being carried out at a suitable temperature for a period of at least two hours. The rolls are then removed and allowed to cool, when the electrolyte sets rock hard. The rolls must be allowed to cool for a period of at least three hours.

One modification involves the substitution of aniline for the ammonia solution. A suitable electrolyte in accordance with this modification is made up according to the following formula:

	Percent
Urea	46.14
Boric acid	42.1
Aniline	9.5
Glycerine	2.66

The urea, boric acid, glycerine, are heated up to a suitable temperature, and the aniline is added hot, and well stirred in. The rolls are then impregnated and allowed to cool as in the above prior method.

A further modification of the method is the substitution of potassium hydroxide for the ammonia solution. A suitable electrolyte for this modification is made according to the following formula:

	Percent
Urea	49.2
Boric acid	43.5
Potass. hydroxide	4.26
Glycerine	3.03

The ingredients are mixed and fused as above outlined, the solution obtained being heated to a temperature suitable for impregnation, the rolls being impregnated as above set forth.

A further modification of the original method involves the substitution of urea and ammonia solution by aniline; and a suitable electrolyte is made according to the following formula:

	Percent
Boric acid	31.7
Glycerine	47.6
Aniline	20.6

The glycerine is heated to a suitable temperature, when the boric acid is then added. When this has dissolved the aniline is then added, and the rolls are then impregnated and cooled as above set forth.

Various other changes may be made without departing from the spirit and scope of the invention.

It is to be understood that minor changes can be introduced into the relative proportions of the various ingredients specified; and also that ethylene glycol or other analogous alcohol may be substituted for the glycerine, in substantially

equivalent proportions. It is to be understood further that any of the solutions detailed may be diluted by the addition of water as may be desired to control the viscosity and the conductivity and other properties of the solutions; and further that the solutions may be prepared by mixing the ingredients in different order to that given without departing from the spirit of the invention.

I claim:

1. An electrolytic condenser comprising a rolled condenser body and an electrolytic material impregnating the body, said impregnating material itself maintaining the plies of the rolled body in proper relationship and completely enveloping the body and having sufficient rigidity to comprise a protective outer closure therefor.

2. A rigid and solid electrolytic condenser unit comprising a condenser body, an electrolytic material impregnating the condenser body, and a mechanically rigid outer closure for the condenser comprised of said material.

3. A rigid and solid electrolytic condenser unit comprising a condenser body and an electrolyte impregnating the condenser body, said electrolyte also forming a relatively thick layer on the outside of said body comprising a mechanically rigid protective closure for the condenser, and a coating of varnish thereon.

4. An electrolytic condenser comprising interleaved sheets wound into roll form, and an impregnating electrolyte of liquid and viscous character when heated to suitable temperature, and an additional quantity of said electrolyte moulded into a hard and solid mass in which the condenser body is embedded so that the outer portion of the impregnating material constitutes a mechanically rigid outer enclosure for the condenser unit.

5. A condenser comprising a body constituted by metallic sheets and interleaved fibrous material and provided with suitable outwardly projecting terminals; and an electrolyte with which the said fibrous material is impregnated and a mechanically rigid protective covering of said impregnating material in which the condenser body and the terminals are moulded.

6. A liquid and viscous electrolyte for an electrolytic condenser which on cooling sets hard, said electrolyte comprising the product of the mixture of boric acid, glycerine, urea and ammonia in suitable proportions.

7. A liquid and viscous electrolyte for an electrolytic condenser which on cooling sets hard, said electrolyte comprising the product of the mixture of boric acid, glycerine, urea and ammonia in substantially the following proportions; boric acid 42.1%; glycerine 2.8%; urea 48.6%; ammonia solution 6.5% (.910 density).

8. A liquid and viscous electrolyte for an electrolytic condenser which on cooling sets hard, said electrolyte comprising the product of the mixture of boric acid, glycerine, urea and aniline in suitable proportions.

9. A liquid and viscous electrolyte for an electrolytic condenser which on cooling sets hard, said electrolyte comprising the product of the mixture of boric acid, glycerine, urea and aniline in substantially the following proportions: boric acid 41.7%; glycerine 2.66%; urea 46.14%; aniline 9.5%.

10. A liquid and viscous electrolyte for an electrolytic condenser which on cooling sets hard, said electrolyte comprising the product of the mixture of boric acid, glycerine, urea and potassium hydroxide in suitable proportions.

11. A liquid and viscous electrolyte for an electrolytic condenser which on cooling sets hard, said electrolyte comprising the product of the mixture of boric acid, glycerine, urea and potassium hydroxide in substantially the following proportions: boric acid 43.51%; glycerine 3.03%; urea 49.2%; potassium hydroxide 4.26%.
12. A liquid and viscous electrolyte for an electrolytic condenser which on cooling sets hard, said electrolyte comprising the product of the mixture of boric acid, glycerine and aniline in suitable proportions.
13. A liquid and viscous electrolyte for an electrolytic condenser which on cooling sets hard, said electrolyte comprising the product of the mixture of boric acid, glycerine and aniline in substantially the following proportions: boric acid 31.8%; glycerine 47.6%; aniline 20.6%.
14. The method of producing electrolytic condensers which comprises interleaving metallic sheets with fibrous material to produce condenser bodies in roll form, preparing and raising the temperature of an electrolyte until the viscosity of the solution is suitable for impregnating the condenser rolls, and placing the rolls vertically into the heated solution and allowing them to sink freely as the solution is absorbed, thus automatically producing relative movement between the rolls and the electrolyte during the absorption step.
15. The method of producing electrolytic condensers which comprises interleaving metallic sheets with fibrous material to produce condenser bodies in roll form, preparing and raising the temperature of an electrolyte until the viscosity of the solution is suitable for impregnating the condenser rolls, placing the rolls vertically into the heated solution and allowing them to sink freely as the solution is absorbed, and removing the rolls at the end of the impregnation period and allowing them to cool and harden.
16. The method of producing electrolytic condensers which comprises interleaving metallic sheets with fibrous material to produce condenser bodies in roll form, preparing a liquid and viscous electrolyte which on cooling sets hard, raising the temperature of the electrolyte until the viscosity of the solution is suitable for impregnating the condenser rolls, placing the rolls vertically in the heated solution and allowing them to sink freely as the solution is absorbed, the impregnation being carried out at a suitable temperature for a period of at least two hours, then removing the rolls and allowing them to cool for a period of at least three hours when the solution becomes rock hard.
17. An electrolytic condenser comprising a body of metallic foil sheets and interleaved fibrous material wound into roll form, an electrolyte impregnating the fibrous material, and an additional quantity of said electrolyte surrounding the condenser body and constituting an impermeable, substantially rigid, outer covering for the condenser body.
18. An electrolyte of the alcohol-borate type to which has been added a hardening agent selected from the class of organic compounds consisting of urea and aniline.
19. An electrolyte of the glycerol or glycol-borate type to which has been added urea in such proportions that the electrolyte sets hard on cooling.
20. An electrolyte of the alkali-glycerol-borate type into which has been placed a substantial proportion of urea.
21. An electrolytic condenser impregnated with an electrolyte which sets solid and hard on cooling, and a rigid impervious casing of said electrolyte moulded around said condenser.
22. An electrolytic condenser in which the solidified electrolyte itself forms the outer condenser container, the electrolytic condenser thus produced being mechanically rigid, solid and impermeable.
23. A liquid and viscous electrolyte for an electrolytic condenser, which on cooling sets solid and rock hard, said electrolyte comprising the product of the mixture of boric acid, glycerine and another substance selected from the class of organic compounds consisting of urea and aniline.
24. A liquid and viscous electrolyte for an electrolytic condenser which on cooling sets hard and is solid and impermeable, said electrolyte comprising the product of the mixture of boric acid, glycerine and another substance selected from the class of organic compounds consisting of urea and aniline in suitable proportions, the constituents being mixed and fused together and the viscosity of the solution at elevated temperatures being suitable for impregnation of dry condenser rolls.
25. An electrolyte mixture comprising an alkali-glycol-borate to which has been added urea.
26. An electrolyte mixture comprising an alkali-glycerol-borate to which has been added urea.
27. An electrolyte mixture which is the product of a polyhydroxyl alcohol, an alkali borate and urea.
28. An electrolyte mixture comprising a polyhydroxyl alcohol-borate to which has been added aniline.

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