Nov. 10, 1936. J. B. BRENNAN 2,060,022

ELECTROLYTIC CONDENSER

Filed Jan. 18, 1934

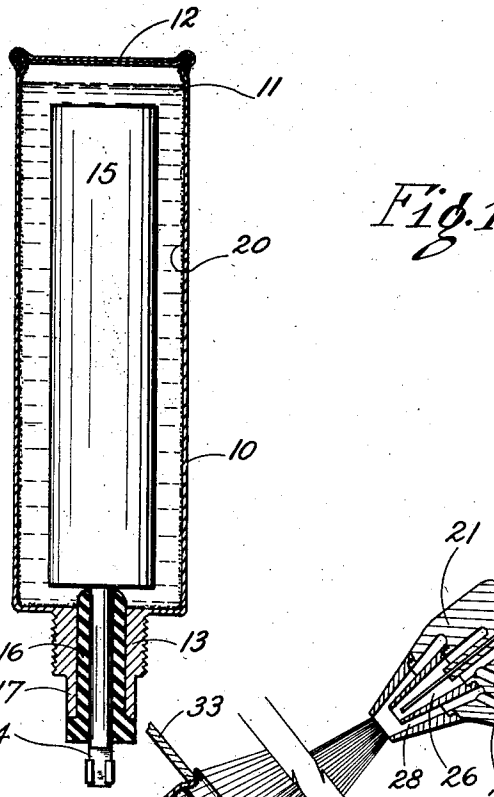
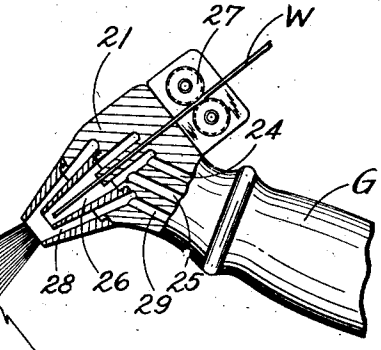


Fig. 1



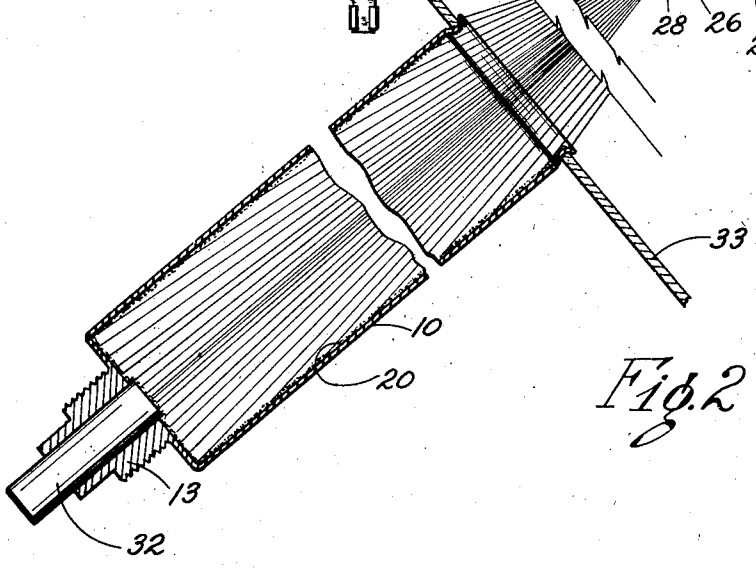


Fig. 2

Inventor
JOSEPH B. BRENNAN

By Richey & Watts.

Attorneys

Patented Nov. 10, 1936

2,060,022

UNITED STATES PATENT OFFICE

2,060,022

ELECTROLYTIC CONDENSER

Joseph B. Brennan, Fort Wayne, Ind.

Application January 18, 1934, Serial No. 707,148

5 Claims. (Cl. 175—315)

This invention relates to electrolytic devices such as electrolytic condensers, rectifiers, or lightning arresters of the type embodying an anode having a dielectric film thereon and a cathode on which no film is formed.

In devices of this character, the container for holding the electrolyte ordinarily is the cathode and frequently comprises an aluminum can provided with means for connection into the electrical circuit. Aluminum cans are desirable from the standpoint of appearance, and also because they can be produced very cheaply by an extrusion method. However, when such cans are used as cathodes in electrolytic condensers, the electrolyte ordinarily employed has a corrosive effect on the aluminum and it has been necessary heretofore to protect the aluminum by chromium plating the inside of the cans. This process is not only expensive but also has the effect of slightly increasing the resistance of the condenser.

It is among the objects of my invention to provide a method for protecting the internal surfaces of containers and cathodes for electrolytic devices, which can be carried out economically and expeditiously. Another object is to provide a protecting surface for the internal surfaces of containers and cathodes for electrolytic devices which can be produced economically and which will afford permanent protection. A further object is to provide a cathode for electrolytic condensers which will reduce the resistance of the condenser as compared to previous practices.

Briefly, I attain the objects outlined above by spraying or otherwise coating the surface of the cathode exposed to the electrolyte with finely divided molten copper or other suitable metal, thus producing a roughened, somewhat porous surface of protecting metal, which surface is conductive throughout its area.

Further objects and advantageous features of my invention will become apparent from the following description of a preferred form thereof, reference being made to the accompanying drawing in which Figure 1 is a cross section through a condenser made according to my invention; and Figure 2 diagrammatically illustrates a method of spraying the inside of the containers.

Referring to the drawing in which my invention is illustrated in conjunction with a well known type of electrolytic condenser, the reference character 10 indicates the container in general. This comprises the cathode of the condenser and also the container for the electrolyte 11. The container is closed by any suitable cap member 12, and if desired the cap may be provided with a vent to allow the escape of gases generated within the condenser. At its lower end, the container is provided with a threaded neck portion 13 which serves as an electrical terminal for the cathode and which is hollow to permit passage of the terminal 14 for the anode 15. The terminal is insulated from the neck portion by a rubber sleeve 16, and a fluid tight joint is produced by crimping in the projecting sleeve 17 to compress the rubber insulation against the terminal member 14. The anode 15 comprises a cylinder or tube of film-forming material having a dielectric film suitably formed thereon, and preferably the anode is constructed according to the disclosure of my application Serial No. 662,107, filed March 22, 1933, in which I disclose an anode having a conductive surface of finely divided film forming material sprayed thereon, whereby the capacity of the anode is greatly increased.

In order to protect the aluminum cathode and container 10 from the corrosive action of the electrolyte 11, I cover the internal surfaces thereof with a layer of finely divided particles of copper indicated by 20. The copper is sprayed into the container in a molten condition by an atomizing gun with the result that the minute particles of molten copper adhere to the interior surface of the aluminum can and effectively protect it against the corrosive action of the electrolyte. Furthermore, each particle of copper apparently makes electrical contact with an adjacent particle or particles, so that the entire surface is conductive throughout. Because of the finely divided condition of the copper, the area of copper actually in contact with the electrolyte is increased greatly as compared to the area of the container itself. By reason of this great increase in area, the resistance to flow of current between the electrolyte and the cathode is greatly reduced, and likewise the current density per unit of area of the cathode actually in contact with the electrolyte is reduced and thus destructive arcing and heating up of the cathode and electrolyte is eliminated. The coating is somewhat porous so that the electrolyte may permeate therethrough, but it nevertheless effectively protects the aluminum can against corrosion.

In Figure 2, I have illustrated diagrammatically the method and apparatus which I preferably employ to form the porous layer on the inside of the container. This comprises a spray gun G having a head 21 to which oxygen and acetylene

or other suitable gases may be supplied through passages 24 and 25 extending through the handle of the gun and terminating in a mixing chamber 26. The copper or other suitable metal is supplied by a wire W which is fed into the center of the mixing chamber by feeding mechanism 27.

The metal is melted by the acetylene flame and atomized by a blast of compressed air or other suitable gas supplied to the annular chamber 28 through the passageway 29. The atomized metal is directed into the container 20 to deposit the protective film or layer thereon and the gun may be manipulated by hand to produce an even deposit of the desired thickness. I have obtained good results by using an oxy-acetylene flame to fuse a copper wire and by employing a blast of compressed air at about 60 lbs. pressure per square inch to atomize the molten metal. The gun is preferably held close to the entrance or opening of the container so that the copper is quite hot when it impinges on the surface of the aluminum and thus a rather dense deposit is formed. If desired, the passageway in the neck 13 may be protected from the molten copper by a plug 32, and a shield 33 may be used to prevent copper from striking the outside of the container and marring its appearance.

This method causes the molten or plastic particles of metal to impinge upon the interior of the container with sufficient force to adhere thereto and to cohere to each other. The layer of deposited metal is apparently conductive throughout and seems to be somewhat porous and microscopically honey-combed, roughened, and reticulated throughout. The electrolyte is thus able to penetrate the surface and accordingly the area of contact between the electrolyte and the conductive cathode layer is very large. I prefer to coat the entire inner surface of the cathode, but this is not essential as corrosion will be substantially prevented by a relatively small area of copper, for the copper has a greater tendency to go into solution than aluminum.

From the foregoing description of a preferred form of my invention, it will be seen that I have provided a container for electrolytic devices which can be produced cheaply and rapidly with a small capital investment and which will not corrode. Condensers embodying my containers or cathodes have a lower resistance than prior types of condensers and are free from troubles caused by arcing between the electrolyte and cathode.

While I have described a preferred form of my invention in connection with electrolytic condensers, it is to be understood that various modifications and changes can be made within the scope and spirit of my invention. My containers and cathodes and my method of producing containers and cathodes can be applied to other types of electrolytic devices, and various other suitable materials can be employed. It is, therefore, to be understood that my patent is not limited by the foregoing description of one embodiment of my invention or in any manner other than by the appended claims when given the range of equivalents to which my patent may be entitled.

Reference is hereby made to my copending application Serial No. 738,804, filed August 7, 1934, and to my copending application Serial No. 32,416, filed July 20, 1935.

I claim:

1. A method of treating the surfaces of hollow containers adapted to be employed as cathodes for electrolytic condensers and the like comprising spraying the inside surfaces of the container which come into contact with the electrolyte with finely divided particles of molten metal to deposit a protective and conductive layer on said surfaces.

2. A method of making cathodes for electrolytic condensers and the like comprising forming a hollow container for electrolyte of material corrodable by the electrolyte, and spraying the inside surfaces of the container which come into contact with the electrolyte with finely divided plastic particles of a metal which is not corroded by the electrolyte thereby producing a protective and conductive layer of metallic particles on said surfaces.

3. A method of making cathodes for electrolytic condensers and the like comprising forming a hollow container for electrolyte of aluminum, and spraying at least a portion of the inside surfaces of the container which come in contact with the electrolyte with finely divided plastic particles of copper thereby producing a porous protective and conductive layer of copper on said surfaces.

4. The method of protecting the surfaces of cathodes of electrolytic condensers which comprises depositing on the surfaces of the cathodes which are exposed to the electrolyte a layer of finely divided particles of molten metal which adhere to the cathode and cohere to each other to provide a porous conductive layer having a large superficial area.

5. A method of providing a surface for cathodes of electrolytic condensers which consists in spraying a base of film-forming metal with finely divided plastic particles of copper, thereby providing the cathode with a porous, protective and conductive coating of copper, having a large superficial area adapted to be exposed to the electrolyte.

JOSEPH B. BRENNAN.