UNITED STATES PATENT OFFICE.

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ELECTROLYTE.

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To all whom it may concern:

Be it known that I, EDWARD C. BROADWELL, a citizen of the United States, and a resident of Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Electrolytes Utilizable for the Electrodeposition of Metals; and I hereby declare that the following is a full, clear, and exact description of the same.

The object of this invention is to insure a very rapid, uniform and economical deposition of the metal used, by the use of an electrolyte utilizable for coating metals with an ornamental or protecting coating.

In carrying out my invention the electrolyte used consists mainly of a readily soluble sulfonate, preferably the naphthalene disulfonate is used, in conjunction with an inorganic salt or salts. The metal or metals are deposited by the ordinarily used electrolytic practice of transfer from soluble anode or anodes.

In the electro-deposition of zinc and alloys thereof containing just sufficient aluminum or cadmium or like metals having a brightening influence upon zinc, I utilize in preference a solution of zinc sulfate of sufficient density in conjunction with zinc naphthalene di-sulfonate. The proportions may vary through a wide range dependent on the current, and the purpose for which the deposit is desired.

The organic salts used are produced in a manner indicated by the following equations:

$$\underset{\text{Naphthalene}}{C_{10}H_8} + \underset{\text{Sulfuric acid}}{H_2SO_4} = \underset{\text{Naphthalene mono-sulfonic acid}}{C_{10}H_7SO_3H} + \underset{\text{Water}}{H_2O}$$

$$\underset{\text{Naphthalene}}{C_{10}H_8} + 2\underset{\text{Sulfuric acid}}{H_2SO_4} = \underset{\text{Naphthalene di-sulfonic acid}}{C_{10}H_6\begin{Bmatrix}SO_3H\\SO_3H\end{Bmatrix}} + \underset{\text{Water}}{2H_2O}$$

$$\underset{\text{Naphthalene mono sulfonic acid}}{2C_{10}H_7SO_3H} + \underset{\text{Zinc}}{Zn} = \underset{\text{Naphthalene mono zinc sulfonate}}{\begin{Bmatrix}C_{10}H_7SO_3\\C_{10}H_7SO_3\end{Bmatrix}Zn} + \underset{\text{Hydrogen}}{H_2}$$

$$\underset{\text{Naphthalene di sulfonic acid}}{C_{10}H_6\begin{Bmatrix}SO_3H\\SO_3H\end{Bmatrix}} + Zn = \underset{\text{Naphthalene di zinc sulfonate}}{C_{10}H_6\begin{Bmatrix}SO_3\\SO_3\end{Bmatrix}Zn} + \underset{\text{Hydrogen}}{H_2}$$

Of course I can utilize in the same manner other of the carbocyclic sulfonic acid salts either with or without the salt of an inorganic nature.

I do not limit myself to zinc coatings but have in view all metals for ornamental or protective coatings and consider, a part from any theory of electrolysis, I have, (in the utilization of cheaply producible sulfonic acid) the needed complexity heretofore furnished by such organic acids as oxalic citric, and tartaric as well as a process capable of as good or better results than previously obtainable.

I claim as my invention:

1. An electrolyte comprising an inorganic salt of the metal to be deposited and a carbocyclic sulfonic acid salt of said metal.

2. An electrolyte comprising a salt of the metal to be deposited, and the salt of a metal to alloy therewith and the carbocyclic sulfonic acid salt of the metal to be deposited.

3. An electrolyte for metal deposition containing a carbocyclic sulfonic acid salt of said metal.

4. In conjunction with the inorganic salts of the metal to be deposited, dissolved in an electrolyte, the naphthalene di-sulfonate of the same metal.

5. An electrolyte embracing zinc sulfate and zinc naphthalene di-sulfonate.

6. An electrolyte embracing zinc sulfate and zinc naphthalene di-sulfonate and a small percentage of aluminum sulfate.

In testimony whereof I have hereunto subscribed my name in the presence of two subscribing witnesses.

EDWARD C. BROADWELL.

Witnesses:
C. H. HILLS,
WM. C. SMITH.