

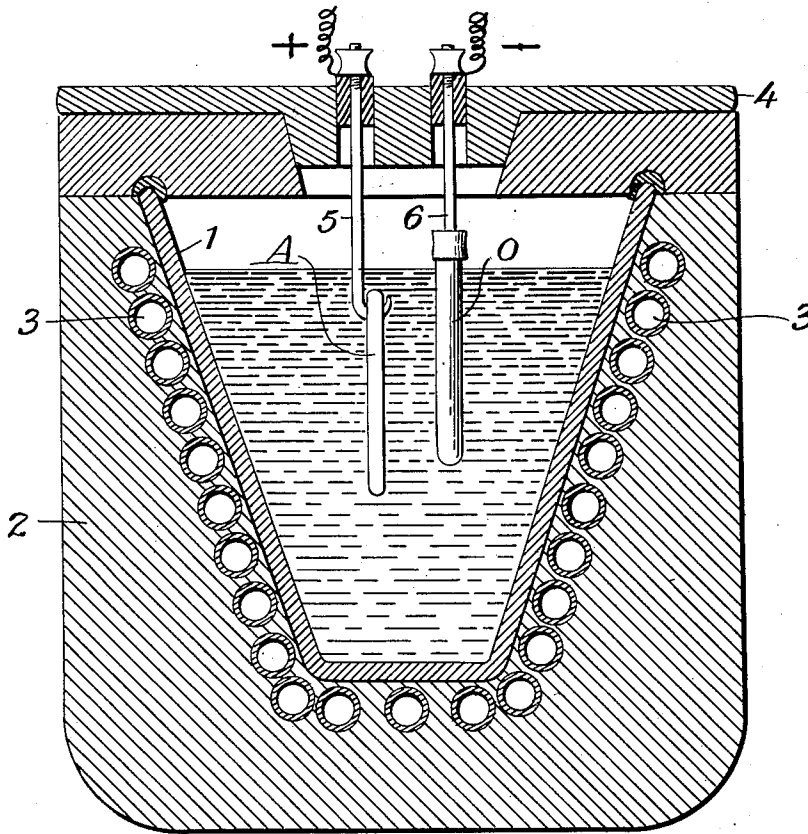
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ELECTROPLATING ALUMINUM, ETC., ON COPPER, ETC

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ELECTROPLATING ALUMINUM, ETC., ON
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1 Claim. (Cl. 204—19)

This invention is a novel improvement in the art of electroplating metals on other metals from low-melting fused compound baths without melting or compacting the deposited metal, the temperature of the bath being kept below the melting point of the metal to be deposited.

The general object of this invention is to electroplate metals which lie in the central group of the periodic system of chemical elements and whose electron shells except the outermost have been filled with electrons, on various other metals from low-melting fused chloride or bromide baths without the simultaneous deposition of hydrogen. Among the metals in such central group are beryllium, boron, magnesium, aluminum, silicon, zinc, gallium, germanium, arsenic, selenium, cadmium, indium, tin, antimony, tellurium, thallium, lead and bismuth.

I have discovered that aluminum can be plated onto metals from solutions in which aluminum chloride or bromide is the solvent and lithium or sodium chloride is the solute, and the particular object of the present invention is to electroplate aluminum on copper from an eutectic mixture of aluminum chloride and lithium chloride (both being anhydrous).

I will explain my method of plating aluminum on copper to enable others skilled in the art to understand and use the invention; and to facilitate an understanding thereof will explain the same in connection with an apparatus conventionally illustrated in the accompanying drawing forming part of this application and to which reference is made by the numerals designating parts referred to herein.

In accordance with my invention a vessel 1 of suitable size and shape is filled with a mixture of aluminum chloride (AlCl_3) and lithium chloride (LiCl) in approximately the proportions of 40.1 mole percent lithium chloride and 59.9 mole percent aluminum chloride; the melting point of such mixture is approximately 115° centigrade. During the filling of the vessel the material may be melted down by means of an electric heating coil (not shown) which can be lowered into the vessel.

The vessel 1 may be made of cast aluminum, pyrex glass, porcelain or any glazed ceramic material that will withstand a temperature of 130° centigrade; and may be heated by any suitable means; preferably by means of coiled steam pipes 3 surrounding the vessel (and preferably embedded in a non-heat conducting body 2 of any suitable kind in which the vessel is mounted or by which it is surrounded, the steam pipes being

connected to a suitable steam generator not shown), by which it can be maintained at a temperature of around 100° C.

The vessel is provided with a suitable close-fitting lid 4 of refractory material which will permit the electrical contact with the anode and cathode but will prevent loss of the material (AlCl_3) by sublimation. The lid 4 is provided with a cathode connection 5 and an anode connection 6 which can be connected with an electrical supply.

If the aluminum is to be electroplated on a small copper object; such object should be first polished, washed with alcohol, and dried. Then the polished object (indicated at O) is connected with or supported from the cathode connection 5; and a piece of 99.98% aluminum (indicated at A) is connected with the anode connection 6.

After the bath is melted in the vessel the aluminum piece A connected with the anode and the object O connected with the cathode are lowered into the bath and an electrical current, of about or less than 0.2 of an ampere per square centimeter of surface of the object to be plated, is passed through the bath. The heat generated by such electrical current is sufficient to keep the temperature of the mixture in the bath above its melting point.

The molten bath is an excellent conductor so that a current density of 0.1 of an ampere per square centimeter may be obtained with a drop in the potential of less than 2 volts across the electrodes, if they are not too far apart; (for instance not separated more than an inch and a half, or two inches).

In about half an hour the plating efficiency will begin to drop. This can be detected by the starting of tree-like or mossy growths of aluminum upon the surface of the cathode. When such dropping of plating efficiency appears the copper object (O) should be removed from the bath and placed in an electric furnace or other suitable heater wherein a temperature is maintained sufficient to melt off the plating mixture which adheres to the object. The object is then removed from the furnace and cooled, washed with water and rubbed with a woolen cloth.

The aluminum plating obtained by my method has the characteristic appearance of aluminum. If desired the plated object may be gently polished, washed with alcohol, and a second coat of aluminum deposited thereon in the manner above explained.

The composition of the bath may vary somewhat with the sublimation of the aluminum

chloride, but the melting point of the mixture is below 130° C. over the range of compositions from 37 to 44 mole percent of lithium chloride. The maximum temperature desirable is 160° C.

5 I may also use aluminum bromide as a solvent; and sodium chloride, lithium bromide, and sodium bromide as solutes.

10 In electroplating the other metals hereinabove referred to the same process could be followed as in electroplating aluminum, using the proper chloride or bromide as a solvent, and lithium or sodium chloride as the solute.

I claim:—

15 The herein described method of electroplating aluminum on copper; consisting in producing a

molten bath composed of a mixture of aluminum chloride and lithium chloride, placing in said bath the copper object to be plated and a substantially pure piece of aluminum, connecting said object and said piece respectively to the anode and cathode, passing an electric current of about 0.2 of an ampere per square centimeter of surface of the object through the bath between the object and piece, removing the object from the bath when the plating efficiency begins to drop, removing the plating mixture adhering to the plated object and finally cleaning the plated object.

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