June 1, 1971 P. GELB 3,582,477

SELECTIVE ELECTROPLATING METHOD

Filed Feb. 20, 1969 2 Sheets-Sheet 1

FIG. 1

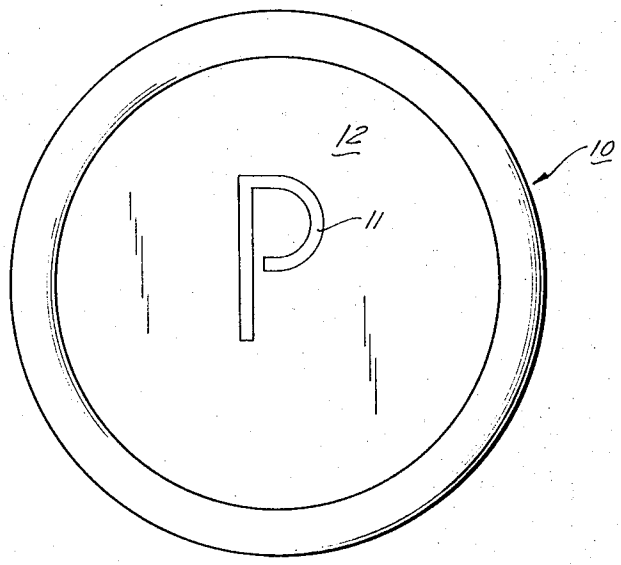


FIG. 2

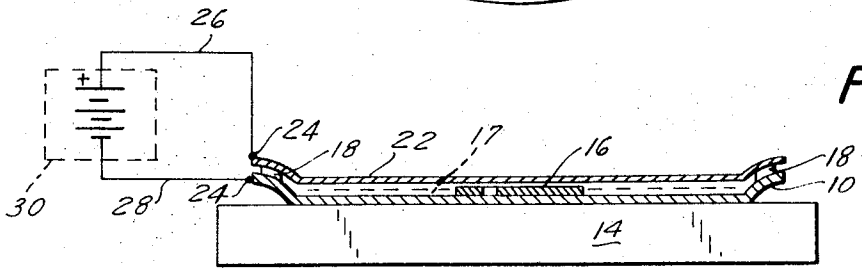
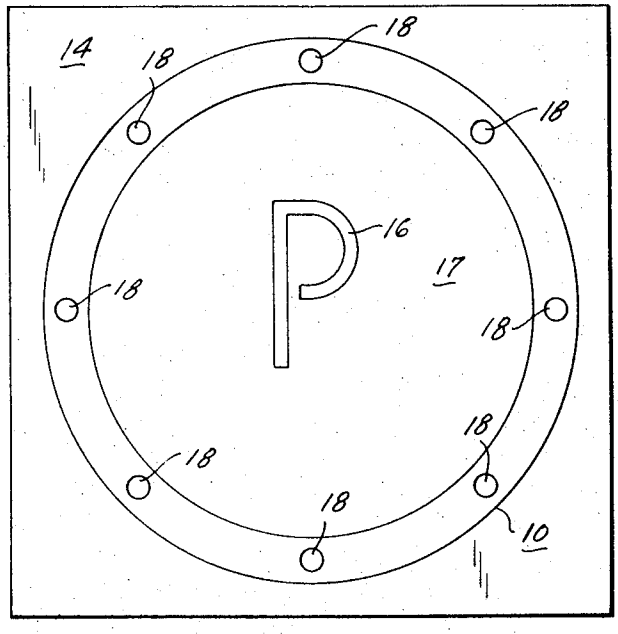


FIG. 3



INVENTOR
PAUL GELB

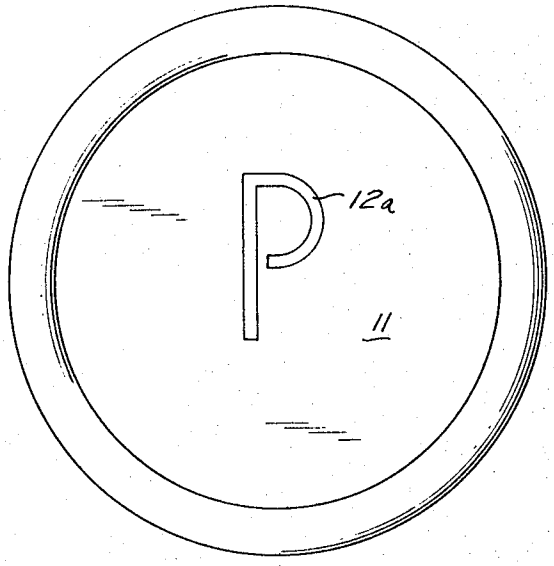
BY
Curtis, Morris & Safford
ATTORNEYS

June 1, 1971 P. GELB 3,582,477

SELECTIVE ELECTROPLATING METHOD

Filed Feb. 20, 1969 2 Sheets-Sheet 2

FIG. 4



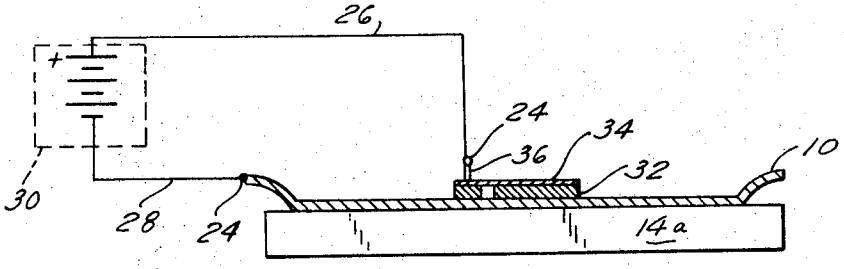


FIG. 6

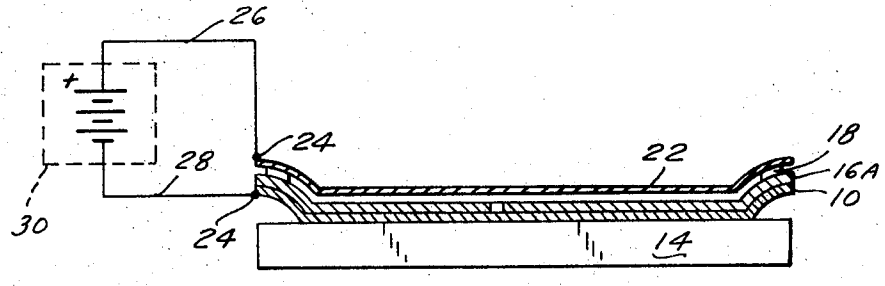


FIG. 5

INVENTOR
PAUL GELB
BY
Curtis, Morris & Safford
ATTORNEYS

United States Patent Office 3,582,477 Patented June 1, 1971

3,582,477

SELECTIVE ELECTROPLATING METHOD

Paul Gelb, 43—23 Colden St.,
Flushing, N.Y. 11355

Filed Feb. 20, 1969, Ser. No. 800,865
Int. Cl. B44c 1/04; C23b 5/70
U.S. Cl. 204—18 3 Claims

ABSTRACT OF THE DISCLOSURE

A method of selectively plating a layer of metal from a solution of electrolyte onto predetermined areas of an electrically conductive member which functions as a cathode. A formed, cathodic, and electrically conductive master is placed on the surface of the member to be selectively plated, the master having exposed portions corresponding to the areas to be selectively plated. An anode is spaced from the master and the cathode and an electric plating current is applied between the cathode and the anode so that the selected areas are plated.

This invention relates to selectively plating a layer of metal onto predetermined areas of a metal cathode member.

The desirability of being able to plate a precious metal such as gold onto a metal surface, e.g., various items of silverware such as trays, plates, bowls and the like has long been recognized. However, as far as it is known, it has not been feasible to do this by any method which is simple enough, yet accurate enough, to give an economical and commercially acceptable product. Accordingly, it is an object of the present invention to provide a method for selectively plating a layer of metal onto a metallic member which is economical, does not require large capital investment, and may be performed with a minimum of hand labor.

The foregoing and other objects and advantages of the present invention will be apparent to those skilled in the art from considering the following description of the drawings of the preferred embodiments of the invention, but such description and drawings should not be considered as limiting the scope of the invention.

In the drawings:

FIG. 1 is a top view showing a silver dish having a central bowl portion selectively plated with gold to leave a silver monogram letter;

FIG. 2 is a side schematic view showing apparatus for carrying out the present invention of selectively electroplating;

FIG. 3 is a top view of the dish to be selectively plated showing the positioning of non-conductive spacers electrolyte and a holding magnet as well as a metal master which defines the monogram letter;

FIG. 4 is a view similar to FIG. 1 of a dish wherein the monogram has been plated in gold and the bowl of the dish has been allowed to remain in silver;

FIG. 5 is similar to FIG. 2 but shows the type of master used to achieve the result of FIG. 4; and

FIG. 6 is an alternate method of providing the gold monogram of FIG. 4 but using a porous cellular carrier for the electrolyte.

Referring to the drawings, and praticularly to FIG. 1, a silver dish **10** is shown which has thereon a selected area **12** which is to be gold plated and an area **11** in the form of the letter "P" which is to remain unplated.

Apparatus for carrying out the present invention is illustrated in FIG. 2. A holding magnet **14** is set in place and on top of the magnet the dish **10** to be plated is placed. A metal master **16** corresponding to the area **11** to be

unplated is then placed in the dish **10**. Non-conductive spacers **18** are spotted about the flange of the dish **10**. It is to be understood that a non-conductive spacer such as a perforated plastic piece may similarly be used as a spacer and merely positioned on top of the metal master **16** if desired. Also the anode may be supported above the master by any other suitable means.

Into the dish **10** a suitable electrolyte **17** is placed. In actual gold plating, the electrolyte used was a gold cyanide, either patassium or sodium gold cyanide, $KAu(CN)_2$ or $NaAu(CN)_2$. However, a gold chloride electrolyte may be used if desired, or other plating solutions which are well known to those skilled in the art.

In the illustrated embodiment, an anode member **22** conforming to the dish **10** is placed on top of the spacers **18** and held in a spaced position relative to the dish and the master. Clips **24** are used to connect an anode lead **26** to the anode **22** and a second lead **28** is connected to the cathode **10**. The leads **26** and **28** are then connected to a power source **30**. Such power sources are well known and provide low voltage, low current D.C. power.

As an example of the present invention a dish **10** was placed on a magnet **14** and a thin steel master **16** was placed on the dish so that the dish and master served as a composite cathode. The anode **22** was positioned in spaced relation to the cathode and connection made to the power source. Using a solution of potassium gold cyanide, a voltage of two and one-half volts and a current of .25 amp. for three minutes gave satisfactory plating.

It was found that the use of the composite cathode formed by the dish **10** and the metal master **16** resulted in a sharp outline defining the plated areas from the unplated areas.

In order to form a master **16** for more sophisticated detailed areas, such as the border **15** of dish **10**, it is recommended that an iron plating bath be used to electro-from about a piece, similar to that to be plated, a metal master corresponding exactly to the pieces to be plated. The thin master formed by such electroform process, which is well known to those in the plating art, is then used in the present invention by cutting out the areas which are to be selectively plated. The use of such a formed master gives excellent registry and insures the proper cooperation between the master and the piece.

In addition, if desired, the anode may be formed by electroforming so that it corresponds substantially to the surface of the piece to be plated and more accurate control between the cathode and the anode may be obtained.

If desired, the magnetic holder can be formed by electforming. After the holder is formed it can then be permanently magnetized or used with an energizable electric magnet.

In the embodiment of FIG. 4 the area to be selectivey plated consists of the monogram letter "P" 12*a* and the border area **15**. To achieve this effect the master **16***a* is preferably formed so that it corresponds to the piece **10** and has cut-out portions **17** and **19** in the form of the areas to be plated. The relationship between the anode, dish, spacers and the master as shown in FIG. 5 are substantially the same as those shown in FIG. 2.

Since the present invention utilizes the principle of creating a resist to plating in the areas to be left unplated, advantageously the magnet may also be made as a plating member with the dish **10** so that a sandwich is created leaving only the areas to be plated exposed. Therefore, the sandwich of magnet, dish (piece) and master may be put into a suitable plating bath with the sandwich placed onto a cathode and any suitable anode added to these both to accomplish the plating.

In another embodiment of the invention as shown in FIG. 6, the metal master **16** is replaced with a porous cel-

lular member constructed out of a foam material such as very small pore cellular rubber and this porous member **32** serves as a carrier for the electrolyte. If a design is placed on the member **32** so that only the portions to be plated are not in contact with the dish **10**, an anode **34** may be placed above the member **32** and connected by suitable means such as the stud **36** to the anode **26**. By this means, a deposit of gold from a suitable electrolyte solution (such as gold cyanide) carried by the sponge member **32** may be selectively deposited on the surface of the dish **10** beneath the raised portions.

In still another embodiment the member **32** is formed from magnetically attracted porous material. This may be accomplished by the use of ferrite powder compounded into the member when it is formed. With such a member the anode **34** may be made magnetic so as to provide a low force magnetic pull against the member **32** tending to lift it away from the surface to be plated. The base magnet **14***a* (as shown in FIG. 6) can be of the electrical type so that it has a magnetic pull of substantially higher force than the anode **34**. By intermittently energizing the magnet **14***a* the anode **34** will lift the member **32** away from the surface of dish **10** for sufficient time to release the trapped gases.

Since the magnet **14***a* pulls the member **32** tightly against dish **10**, a slight flow of electrolyte during the lifted condition will not cause plating where not desired. The strong magnetic pull of magnet **14***a* causes a resist to plating where the member **32** contacts the dish **10**.

It is believed that the electrical conductivity of the master **16** whereby it becomes electrically joined to the dish **10** to form a composite cathode assists in the selective plating obtained. While preferred embodiments of the present invention have been described, it is to be understood that various modifications may be made within the scope and spirit of this disclosure.

What is claimed:

1. A method of selectively plating a layer of metal onto a predetermined area of an electrically conductive member adapted to function as a cathode comprising the steps of

(1) connecting said member to a source of electrical current whereby said member is cathodic;

(2) positioning adjacent to said member a magnetically attractable formed conductive master having exposed portions therein corresponding to the areas of the member to be selectively plated;

(3) positioning a magnet adjacent said member whereby said master is attracted by the magnet and fixed in place relative to the member by holding power of the magnet;

(4) spacing an anode from the cathode member;

(5) supplying a plating electrolyte at the selected areas of the member to be plated; and

(6) applying an electric plating current between the cathodic member and the anode whereby the selected areas of the member are plated with a metal.

2. A method of selectively plating a layer of metal as defined in claim **1** wherein the member has a surface of silver in the areas to be plated and the metal plated thereon is gold or a gold containing alloy.

3. A method of selectively plating a layer of metal as defined in claim **2** wherein the electrolyte is a solution of gold cyanide or chloride.

References Cited

UNITED STATES PATENTS

981,750	1/1911	Dollinger	204—8
2,475,434	7/1949	Moss	204—15
2,890,992	6/1959	Hoehl	204—297
3,223,599	12/1965	Taylor	204—15
3,261,769	7/1966	Coe et al.	204—15
3,415,723	12/1968	Bedi et al.	204—15

FOREIGN PATENTS

417,477	2/1967	Switzerland.

TA-HSUNG TUNG, Primary Examiner

T. TUFARIELLO, Assistant Examiner

U.S. Cl. X.R.

204—297M