June 25, 1957 R. C. ANDERSON ET AL 2,797,194

METHOD OF ELECTROLYTICALLY RECOVERING PRECIOUS METALS FROM OTHER METAL BASES

Filed July 26, 1954

Fig. 1.

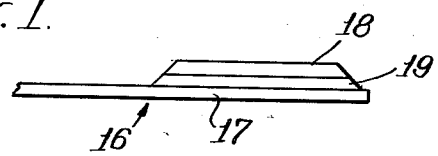
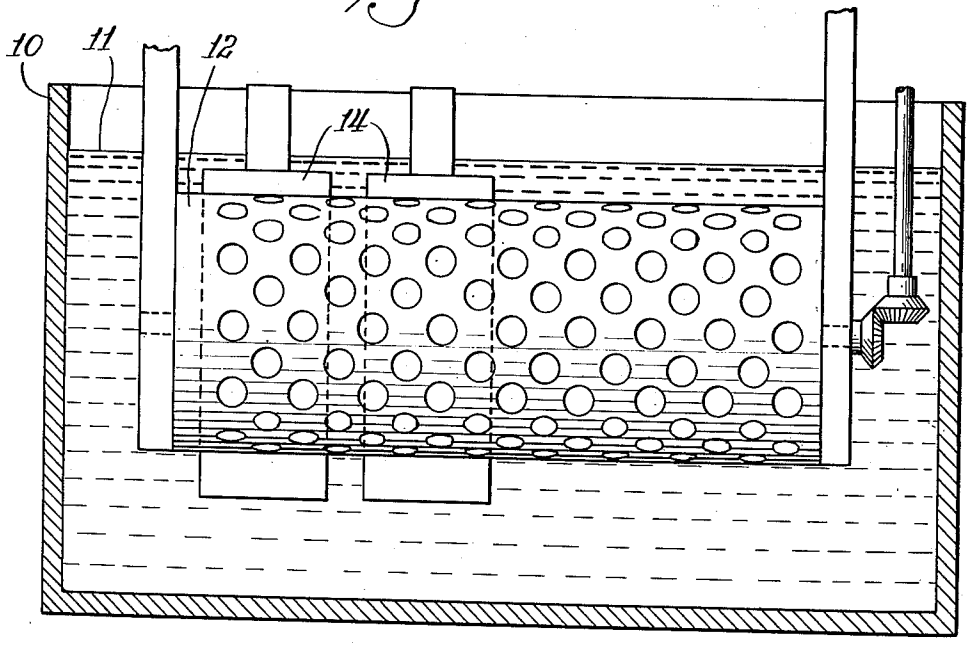


Fig. 2.



INVENTORS:
R. C. ANDERSON
R. E. HARR
BY
C. B. Hamilton.
ATT'Y

United States Patent Office 2,797,194
Patented June 25, 1957

2,797,194

METHOD OF ELECTROLYTICALLY RECOVERING PRECIOUS METALS FROM OTHER METAL BASES

Robert C. Anderson, Scotch Plains, N. J., and Russel E. Harr, Downers Grove, Ill.. assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York

Application July 26, 1954, Serial No. 445,848

7 Claims. (Cl. 204—146)

This invention relates to methods of and electrolytic baths for recovering precious metals from other metal bases, and more particularly to methods of and electrolytic baths for selectively eroding metals bonding precious metals to other metal bases.

When scrapping articles of manufacture, such as, for example, spring contact springs having precious metal contacts secured by a bonding metal, such as nickel or the like brazed to brass or bronze springs, it has been impossible in the past to recover the precious metal contacts, no process having been known which would economically recover one or more of these components without damage to the others.

An object of the invention is to provide methods of removing precious metals from metal bases.

Another object of the invention is to provide methods of and electrolytic baths for selectively eroding bonding metals securing precious metals to baser metals to recover the precious metals.

A further object of the invention is to provide methods of and electrolytic baths for eroding nickel previously bonding palladium contact metal and brass contact springs to recover the brass springs and the palladium contacts.

In a method illustrating certain features of the invention, an article comprising a precious metal cap secured to a metal base by a bonding metal, such as, for example, nickel, is made an anode in a bath in an aqueous solution of ammonium chloride and ammonium bichromate or sodium bichromate, and the nickel is eroded away electrolytically without affecting the cap which drops into the bath and may be recovered.

A complete understanding of the invention may be obtained from the following detailed description of methods and baths forming specific embodiments thereof when read in conjunction with the appended drawing, in which—

Fig. 1 is a fragmentary view of an article to be selectively eroded by methods forming specific embodiments of the invention, and

Fig. 2 is a top plan view of an apparatus for effecting a method forming one embodiment of the invention.

Referring now in detail to the drawing, there is shown therein a tank **10** containing an electrolyte **11** into which is immersed a tumbling barrel **12** of a well known type. The barrel **12** is made anodic with respect to cathodes **14** composed of copper, nickel, graphite or other suitable material, and suitable means (not shown) are provided for applying this potential. Articles **16**, which have brass bases or bodies **17**, palladium contacts **18** and bonding metal **19** composed of nickel brazed or welded to the caps **18** and the bodies **17**, are placed in the barrel **12** and the barrel is immersed into the electrolyte, after which a potential is applied to the barrel and the cathodes, and the bonding metal is dissolved completely without affecting the body members **17** or the caps **18**. The temperature need not be regulated. When the caps **18** drop off the bodies **17** and drop through holes in the barrel into the bottom of the container, they may be recovered whenever desired, the electrolyte being non-corrosive to the caps.

The electrolyte comprises an aqueous solution containing as the essential ingredients thereof ammonium chloride and ammonium bichromate or sodium bichromate, about ten percent ammonium chloride and about five percent ammonium bichromate or sodium bichromate being optimum proportions. The pH of the bath should be maintained within a range of from about five to seven and one-half and the pH of the bath is preferably kept at 6.8. Ammonium hydroxide additions are made to the bath from time to time to keep the pH of the bath within this range and as close as possible to the optimum value. During the process, the nickel goes into the solution as nickel chloride and the nickel is attacked before any of the palladium of the precious metal contacts **18**. The chromate ions in the solution inhibit dissolving of the brass and form dark brown complex chromate layers over the brass to prevent erosion thereof by the solution. The chromate combines with the copper and nickel to form precipitations which protect the brass against erosion of the recovery processes. Voltage of fifteen volts and an amperage of 600 amperes are maintained for a period of three hours and are effective to provide one hundred percent recovery of forty-four pounds of electrical contacts, nickel bonds and palladium caps in this time. In such electrical contacts, the caps or contacts **18** constitute the predominant portion of the weight. The articles are loosely contained in the barrel which rotates to thoroughly tumble the articles in the barrel and flush off all dissolved nickel.

The method and bath described hereinabove are very effective for removing any previous metal, such as gold, platinum and other platinum metals and silver, which are secured to the bodies of a non-precious metal by a third non-precious metal and maintain the precious metal parts intact without erosion. The bath is highly effective and efficient, while inexpensive and economical both in the cost of the materials of the bath and in the use thereof.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. The method of recovering a precious metal part from an article in which the part is secured to a cupric metal base by a nickel metal bond, which comprises making the article an anode in an electrolytic bath having a pH in the range of from about 5 to about 7.5 and composed of an aqueous solution of ammonium chloride and a salt of the group consisting of ammonium bichromate and sodium bichromate to dissolve the metal bond.

2. The method of recovering a precious metal cap from an article in which the cap is secured to a cupric metal base by a nickel bond, which comprises making the article an anode in an electrolytic bath of an aqueous solution of ammonium chloride and ammonium bichromate and having a pH in the range of from about 5 to about 7.5 to dissolve the metal bond.

3. The method of recovering a precious metal cap from an article in which the cap is secured to a cupric metal base by a nickel bond, which comprises making the article an anode in an electrolytic bath of an aqueous solution of ammonium chloride and sodium bichromate and having a pH in the range of from about 5 to about 7.5 to dissolve the bond.

4. The method of selectively eroding polymetal parts, which comprises immersing an article including a precious

metal member, a base metal member including copper as the major ingredient thereof and a nickel bonding member in an aqueous bath having therein as the essential ingredients thereof about ten percent ammonium chloride and about five percent of a salt of the group consisting of ammonium bichromate and sodium bichromate, making the article anodic in the bath, and adding ammonium hydroxide from time to time in such quantities to the bath as to maintain the pH of the bath within a range of from about 5 to about 7.5.

5. The method of selectively eroding polymetal parts, which comprises immersing an article including a precious metal member, a base metal member having copper as the major ingredient thereof and a nickel bonding member in an aqueous bath having a pH within the range of from about 5 to about 7.5 and having therein as the essential ingredients thereof about ten percent ammonium chloride and about five percent of a passivating salt of the group consisting of ammonium bichromate and sodium bichromate, and making the article anodic in the bath.

6. The method of selectively eroding polymetal parts, which comprises immersing an article including a precious metal member, a copper-bearing base metal member and a nickel bonding member in an aqueous bath having therein as the essential ingredients thereof about ten percent ammonium chloride and about five percent ammonium bichromate, making the article anodic in the bath, and adding ammonium hydroxide from time to time in such quantities to the bath as to maintain the pH of the bath within a range of from about 5 to about 7.5.

7. The method of selectively eroding polymetal parts, which comprises immersing an article including a precious metal member, a copper-bearing base metal member and a nickel bonding member in an aqueous bath having therein as the essential ingredients thereof about ten percent ammonium chloride and about five percent sodium bichromate, making the article anodic in the bath, and adding ammonium hydroxide from time to time in such quantities to the bath as to maintain the pH of the bath within a range of from about 5 to about 7.5.

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