Dec. 26, 1933. C. MANN 1,941,040

PROCESS AND DEVICE FOR CLEANING PRECIOUS METALS, ESPECIALLY SILVER

Filed Dec. 17, 1929

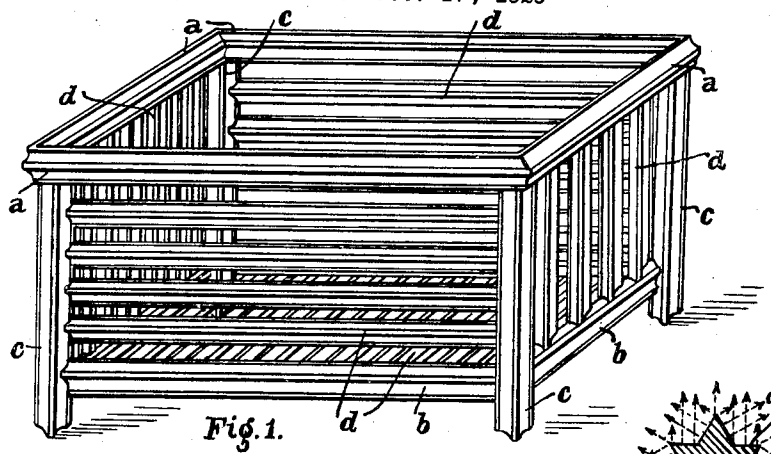


Fig. 1.

Fig. 9.

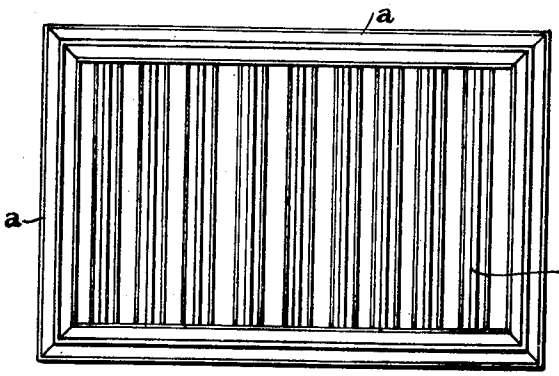


Fig. 2.

Fig. 3.

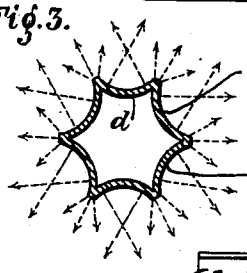


Fig. 4.

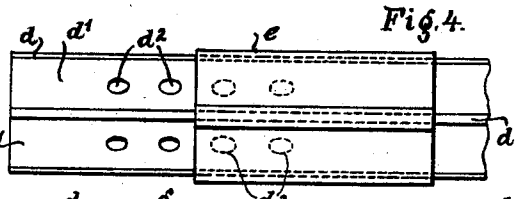


Fig. 6.

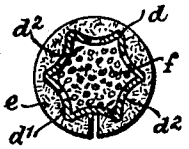
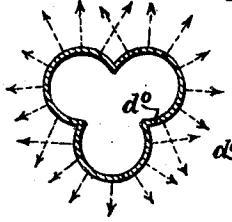


Fig. 5.

Fig. 7.



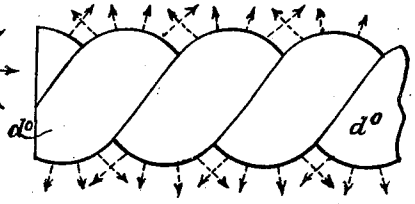


Fig. 8.

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Patented Dec. 26, 1933

1,941,040

UNITED STATES PATENT OFFICE

1,941,040

PROCESS AND DEVICE FOR CLEANING PRECIOUS METALS, ESPECIALLY SILVER

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Application December 17, 1929
Serial No. 414,681

2 Claims. (Cl. 204—7)

Various processes for cleaning articles plated with silver or any other precious metal or consisting wholly of such metal, according to which said articles were placed in an alkaline solution and subjected to an electrolytic contact action, have been tried and are a part of the prior art; in practice no one of these processes has, however, proved to be efficient. In these processes common household soda was used for the alkaline solution and aluminium or ordinary commercial zinc for the contact giving anode.

Common soda contains, among other impurities, certain substances insoluble in water, such as sulphur, iron, saltpetre and the like, which are in the alkaline bath attracted to the silver to be cleaned as by a magnet and which then during drying or afterwards during use are rubbed into the pores of the silver or silverplated articles, resulting in a gradual corrosion of the silver surface and giving these articles a very unsightly appearance. Also, this deterioration of the surface makes it increasingly more difficult to properly clean the articles in question.

In said processes the zinc or aluminium anode, which in itself developed insufficient quantities of hydrogen and oxygen in the alkaline solution used, generally took the form of a container consisting of more or less even surfaces, which form in its turn was unfavourable for an energetic evolution of the gases mentioned, the result being that the carbonate of lime precipitated from the hot solution was without hindrance able to settle down on the surfaces of said containers, there forming an insulating film which finally entirely eliminated the desired electrolytic action. It was therefore necessary to frequently subject these containers themselves to a troublesome and time-consuming cleaning process.

Cleaning silver and the like articles according to these processes therefore always required a considerable amount of time and was frequently injurious to the articles themselves; at the same time, the cleaning action was often uncertain and insufficient so that fatty films remained on the surface and the salts an acids contained in these further augmented the corroding action, whilst the bacilli contained and remaining alive in such fatty film could prove dangerous to the health of the subsequent user.

The present invention refers to a process and device for cleaning precious metals in the alkaline solution by electrolytic contact action, comprising the utilization of entirely new means and ensuring not only an absolutely perfect cleaning action in a minimum of time, but also a thorough disinfection of all articles cleaned; further, the new process has no kind of harmful action on the articles.

In the new process according to the present invention chemically pure sodium bicarbonate is used for the alkaline solution, to which are added catalytically active substances, as, for instance, charcoal, active carbon, active silicic acid or the like. The addition of these substances may be made to the cold or hot solution either before or during the cleaning process. The action of these catalytic substances, which themselves have no part in the electrolytic action, appears to consist in an alteration of the conditions of polarization in favour of a more thorough cleaning effect, in consequence of electro-osmotical processes.

The following comparison of the old process with the new will serve to demonstrate the superiority of the latter.

If soiled or greasy articles made of a precious metal are placed in a 10% solution of soda heated to a temperature of 80° Celsius (176° Fahrenheit) in the presence of aluminium, ten minutes are necessary before they appear clean. If, on the other hand, instead of soda a 10% solution of sodium bicarbonate is used, other conditions being equal, in consequence of the far more energetic gas evolution the same degree of cleaning will be attained in about one minute; in fact, this effect can be attained with a solution of sodium bicarbonate heated to only 30° C. (86° F.).

If now the above-mentioned catalytically active substances are added to the solution, the cleaning effect will be augmented to such a degree that a 0.5% solution at 25° C. (77° F.) will have the same effect in the same time as a 5% solution at 90° C. (194° F.) without said solutions.

However, it is possible to still further increase the efficiency of the process by using as an anode chemically pure zinc or a good aluminium alloy containing silver, these metals being so arranged that the contact between anode and the articles to be cleaned is as intimate as possible. These metals promote a very strong evolution of nascent hydrogen and oxygen in the alkaline solution, the hydrogen taking effect on the inorganic components of the grease or fat on the silver articles and deoxidizing them, whilst the oxygen acts upon the organic components (bacilli), oxidizing and killing them.

It is obvious that this action will be the more intense and rapid, the more intimate the contact of these gases is with the precious metal. This intense action is decidedly necessary, since scientific research has proved that a film of grease, so

thin that it is not visible to the eye, remaining on the articles, can contain many thousands of germs and bacilli, which can there multiply and cause great injury to health.

According to the present invention this necessary intimate contact between the anode metal and the articles to be cleaned may be attained by laying the former in the shape of chains on or between the articles in the alkaline solution.

Another form of the invention provides baskets made of hollow or solid bars of said anode metals (chemically pure zinc or an aluminium alloy rich in silver), these baskets being used as containers for the articles to be cleaned and being introduced together with them into the alkaline solution. The bars of these baskets are so profiled that a very extensive surface is obtained, this resulting in a very strong evolution of hydrogen and oxygen. Star shaped profiles in different forms are especially suitable for these rods.

Reference being had to the accompanying drawing, Fig. 1 shows a basket of the kind described in a perspective view, Fig. 2 being a plan view; Fig. 3 shows a section of the hollow rod used in the construction of said basket. The bars *a*, *b* used for the frame of the basket and the feet *c* are of larger and stronger section than the rods *d* of the walls and sides. The star shaped section of the bars results in a very intense, whirlpool-like action of the minute hydrogen and oxygen bubbles around the rods, since these bubbles are thrown off at right angles from the rod surfaces and constantly intercept, as shown in Figs. 3, 7, 8 and 9 by the dotted lines and arrows. By this means the carbonate of lime precipitated in the hot solution is prevented from settling down on the rods and there forming an insulating layer, as explained above. Again, the bubbles emitted by the different rods continually cross and intersect between two neighbouring rods, so that the solution is pervaded from all sides by such bubbles and the silver or other articles contained in the basket are subjected to a very intensive bombardment by the hydrogen and oxygen bubbles.

In localities with very calcareous water it may be of advantage to further augment the evolution of the gas bubbles on the rods by winding round them spirals *g* of the same metal as the rods, as shown in Fig. 6. Also, instead of rods with straight surfaces and star section, rods with rounded surfaces may be used; Figs. 7 and 8 show one form of construction of such a rod, in which the rounded ribs d^0 of the rod are wound spirally round its axis.

Fig. 4 shows in a view and Fig. 5 in cross section how the hollow rod *d* can be utilized as a container for the catalytically active substances *f*, which are introduced into the rod in the form of grains. These substances communicate with the cleaning solution via holes d^2 in the grooves d^1 of the rods. In order to protect these holes from clogging, a muff or sleeve *e* of pervious material, such as rubber sponge, felt or the like, is pushed over them; these sleeves *e* are easily removable and can then be separately cleaned. Better still is the use of a sleeve made of a metallic tissue of fine silver wire, as in this case the sleeve will be automatically cleaned simultaneously with the silver articles contained in the basket.

What I claim as my invention and desire to secure by Letters Patent, is:

1. The process of cleaning precious metals which consists in preparing a bath consisting of a solution of sodium bicarbonate and containing a catalyst and a zinc electrode, the said catalyst consisting of activated carbon, and utilizing the metal to be cleaned as a second electrode in said bath.

2. The process of cleaning precious metals which consists in preparing a bath consisting of a solution of sodium bicarbonate and containing a catalyst and an aluminum containing electrode, the said catalyst consisting of activated carbon, and utilizing the metal to be cleaned as a second electrode in said bath.

CARL MANN.