

ELECTROLYTIC RECOVERY DEVICE FOR GOLD OR SILVER

TECHNICAL FIELD

The present invention relates to devices for electrolytic
5 recovery of gold from gold-containing solution and devices for
electrolytic recovery of silver from silver-containing solution,
and in particular to an electrolytic recovery device for gold or
silver that enables easy stripping of gold or silver
electrodeposited on the surface of a barrel cathode.

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BACKGROUND ART

As a method for recovering gold from gold plating liquid,
gold-containing waste water resulting from the recycling of
electronic components, and so forth, an electrolytic process has
15 been widely implemented. Further, as a method for recovering
silver from silver plating liquid, silver-containing waste water
such as fixing photographic liquid, or the like, an electrolytic
process has been widely implemented.

As a device for electrolytic recovery of silver from
20 silver-containing solution, there has been known a silver recovery
device that has, for example, an electrolytic cell, an anode placed
in the electrolytic cell, a cathode detachably placed around the
anode in the electrolytic cell, and electric connectors for the
cathode and anode, being placed outside the electrolytic cell, in
25 which the electrolytic cell has an electrically conductive contact
surface and a holding portion for holding a deformable portion of
the cathode relative to the contact surface so as to establish

electric connection from the cathode connector to the cathode (see, e.g., Patent Document 1).

As a device for electrolytic recovery of silver from silver-containing solution, there has also been known an electrolytic recovery device comprising, for example, an electrolytic cell, an anode placed in the cell, a reference electrode placed in the cell, a cathode detachably placed in the cell (the cathode having an inner surface opposed to the anode and an outer surface opposed to the reference electrode), and means for reducing deposition of silver on the outer surface of the cathode (see, e.g., Patent Document 2).

As a device for electrolytic recovery of gold from gold-containing solution such as gold plating waste water or the like, there has been disclosed a device for electrolytic recovery of gold from gold plating waste water or cleaning water used in gold plating, using, for example, a Ti rotating cathode. In this device, in order to prevent stripping and dropping of electrodeposited gold, an oxide film is removed from the front and rear surfaces of the Ti rotating electrode, using hydrogen fluoride, hydrochloric acid, or nitric-hydrofluoric acid (see, e.g., Patent Document 3).

Further, there has been known a recovery device for recovering valuable metal from cyan-containing waste water by supplying cyan waste water containing valuable metal such as gold or the like into an electrolytic cell having an anode made of insoluble material, and then electrolyzing while rotating the cathode plate to cause valuable metal such as gold or the like to be deposited on the surface

of the cathode plate (see, e.g., Patent Document 4).

However, in an electrolytic recovery device using a barrel cathode such as is described in the above mentioned Patent Documents 1 and 2, mounting and removing of the barrel cathode with respect
5 to the electrolytic cell is troublesome as the cathode material itself is thin and the cathode has many cut-outs formed along the upper edge thereof.

Moreover, the deposited silver may be stripped off from the cathode, which causes short-circuiting between the anode and the
10 cathode, promoting consumption of the anode and hindering continuation of electrolysis.

Further, although a noble metal electrolytic recovery device disclosed in Patent Document 3 is considered capable of preventing noble metal from being stripped off and dropping from a Ti rotating
15 electrodes but keeping the noble metal closely adhered to the Ti rotating electrode, the noble metal electrolytic recovery device has a problem in that, as the noble metal electrodeposited on the Ti rotating electrode is closely adhered over the entire surface of the electrode from the upper edge to the lower edge thereof,
20 the noble metal cannot be easily stripped off from the Ti rotating electrode even when a spatula or a hammer is used, for repetitive use of the Ti rotating electrode.

A noble metal recovery device disclosed in the above described Patent Document 4 differs from an electrolytic recovery device
25 according to the present invention in that a disk cathode is used, rather than a barrel cathode.

The above described disk cathode has a problem in that, as

noble metal such as gold, silver or the like, is densely electrodeposited on the front and rear surfaces of the disk cathode, the electrodeposited noble metal cannot be easily stripped off from the cathode even when a spatula or a hammer is used.

5 Prior Art Document

Patent Documents

Patent Document 1: Japanese Patent Laid-open Publication No. Hei6-240483

10 Patent Document 2: Japanese Patent Laid-open Publication No. Hei8-92782

Patent Document 3: Japanese Patent Laid-open Publication No. Hei11-92985

Patent Document 4: Japanese Patent Laid-open Publication No. Hei10-18074

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DISCLOSURE OF THE INVENTION

Problems to be Solved by the Invention

20 The present invention aims to provide an electrolytic recovery device for gold or silver, using a barrel rotating cathode made of stainless steel, titanium, or the like, the electrolytic recovery device being improved such that the gold or silver electrodeposited on the cathode can be easily stripped off so that the barrel rotating cathode can be repeatedly used.

Means for Solving the Problems

25 The present inventors have accomplished the invention described below in order to solve the above described problems.

That is, according to the present invention, there are

provided the following devices.

(1) An electrolytic recovery device for gold or silver, comprising an electrolytic layer, a control device, an anode, and a barrel cathode, wherein the barrel cathode has an insulating cap
5 attached thereto along an entire circumferential lower edge thereof and a plurality of band insulators detachably attached in one position in a longitudinal direction on an outer circumferential surface thereof with a space ensured between the band insulators, so that electrodeposited gold or silver is easily stripped off from
10 the barrel cathode by detaching the band insulators.

(2) The electrolytic recovery device for gold or silver described above (1), wherein an upper portion of the barrel cathode may be a lid having a degassing hole formed thereon.

(3) The electrolytic recovery device for gold or silver
15 described above (1) or (2), wherein the insulating cap and the band insulators may be made of plastic or rubber.

(4) The electrolytic recovery device for gold or silver described above (1) to (3), wherein the band insulators may be detachably attached by a screw in one position in the longitudinal
20 direction on the outer circumferential surface of the barrel cathode.

(5) The electrolytic recovery device for gold or silver described above (1) to (4), wherein the anode may be placed on an outer side of the barrel cathode placed in the electrolytic cell.

25 (6) The electrolytic recovery device for gold or silver described above (1) to (5), wherein gold or silver electrodeposited on a surface of the barrel cathode may be stripped off in a barrel

shape by removing the screw fixing the band insulators and removing the band insulators.

EFFECT OF THE INVENTION

5 According to the present invention, employment of a specially prepared barrel cathode enables easy stripping and recovery of gold or silver deposited on the barrel cathode from gold or silver electrolytic recovery liquid. Further, the barrel cathode can be repeatedly used after the gold or silver is stripped off therefrom
10 and recovered.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view showing one embodiment of an electrolytic recovery device for silver according to the present
15 invention;

Fig. 2 is a perspective view of a barrel cathode in the electrolytic recovery device shown in Fig. 1;

Fig. 3 is a perspective view of the barrel cathode in the electrolytic recovery device shown in Fig. 1, the cathode being
20 upside down; and

Fig. 4 is a perspective view of electrolytic silver stripped off from the cathode.

BEST MODE FOR CARRYING OUT THE INVENTION

25 In the following, the present invention will be described in further detail referring to the diagrams.

[First Embodiment]

A case of recovering electrolytic silver, using an electrolytic recovery device for gold or silver according to the present invention, will be described.

Fig. 1 is a perspective view of an electrolytic recovery device for silver according to the present invention, and Fig. 2 is a perspective view of a barrel cathode of the electrolytic recovery device shown in Fig. 1. In consideration of workability, economy, and so forth, a barrel cathode 3 having a diameter of 250 mm and a height of 370 mm is used.

As shown in Figs. 1 and 2, an electrolytic cell 1 has a control device 2 formed integral thereto for current control. At the middle inside the electrolytic cell 1, the barrel cathode 3 is fixed by a screw 13 to a cathode fixing bar 10 secured to the electrolytic cell 1 so that the barrel cathode 3 rotates around the cathode fixing bar 10 as an axis. After completion of silver deposition, the barrel cathode 3 can be easily detached from the electrolytic cell 1 by removing the screw 13. Further, an anode 4 is provided opposed to (facing) the outer circumference of the barrel cathode 3. In this embodiment, as shown in Fig. 1, four anodes 4 are provided surrounding the barrel cathodes 3 in four directions.

The present invention is mainly characterized by an arrangement which enables easy stripping of the silver deposited on the barrel cathode 3 and the barrel cathodes 3 prepared such that the deposited silver will not drop from the cathode during electrolysis.

That is, the barrel cathode 3 of an electrolytic recovery device for silver according to the present invention has a lid 11

for covering the upper surface thereof, as shown in Fig. 2. The lid 11 has a plurality of degassing holes 12 formed thereon and an opening formed at the center thereof for fixing the barrel cathode 3 to the cathode fixing bar 10 by the screw 13.

5 As shown in Fig. 3, the bottom part of the barrel cathode 3 is open with no lid provided to the lower surface of the barrel cathode 3, and an insulating cap 7 is attached around the entire circumferential lower edge of the barrel cathode 3.

10 A plurality of band insulators 6 are detachably attached by screws 9 in one position in the longitudinal direction on the outer circumferential surface 5 of the barrel cathode 3 with a space in-between.

15 In a case where the band insulators 6 are attached to be continuous with no space in-between, the deposited silver will be stripped off from the cathode with the band insulators 6 as a boundary and will drop during electrolysis. Therefore, ensuring the space 8 is important. That is, the space 8 prevents the silver deposited around the barrel cathode 3 from being stripped off. The space 8 is ensured in one position in the first embodiment, though
20 the space 8 may be ensured in two or more positions. The space 8 is preferably between 1 mm and 10 mm wide, and more preferably between 3 mm and 7 mm wide. A space of 1 mm wide or smaller is not preferable as silver may be stripped off during electrolysis, and a space of 10 mm wide or larger is also not preferable as the silver
25 will not be easily stripped off.

 According to the present invention, material for the barrel cathode 3 may include, e.g., titanium, stainless steel, and the

like, and that for the anode may include mesh titanium coated with platinum or platinum alloy.

According to the present invention, material for the insulating cap 7 and the band insulator 6, which are provided on
5 the barrel cathode 3 to facilitate stripping of the silver deposited on the barrel cathode 3, may include, e.g., polyethylene, polypropylene, polycarbonate, plastic including nylon and polyester, and the like, and rubber, such as natural rubber, polyurethane rubber, nitrile rubber, silicon rubber, and so forth.

10 In the following, recovery of silver from silver-containing waste water, using an electrolytic recovery device for silver according to the present invention, will be described. Waste water targeted by the electrolytic recovery device is mainly used silver plating liquid discharged from a plating plant and recovery liquid
15 after use in dissolving and stripping off silver from electronic components and so forth.

Initially, a polyethylene insulating cap 7 is attached to the barrel cathode 3 around the entire circumferential lower edge thereof. Then, polyethylene band insulators 6 are fixed to the
20 barrel cathode 3 by the screws 9 in two positions in the longitudinal direction on the outer circumferential surface 5 of the barrel cathode 3. In the fixing, a space 8 of 5 mm wide is ensured between the band insulators 6 such that the band insulators 6 remain separated, as shown in Fig. 2. The thus prepared barrel cathode
25 3 is fixed to the cathode fixing bar 10 of the electrolytic cell 1 by the screw 13.

Thereafter, silver recovery waste water 14 is filled in the

electrolytic cell 1 and the control device 2 is turned on so that silver contained in the waste water is deposited on the barrel cathode 3 through electrolysis. Accordingly, electrolytic silver is deposited in the space 8, so that the electrolytic silver, being
5 separated along the polyethylene band insulators 6, remains continuous thanks to the electrolytic silver deposited in the space 8. As a result, the silver is not stripped off and does not drop from the cathode.

Then, the barrel cathode 3 is taken out of the electrolytic
10 cell 1 and the screws 9 fixing the band insulators 6 are removed to remove the band insulators 6. With the above, the deposited electrolytic silver 16 can be easily stripped off from the barrel cathode 3, as shown in Fig. 4. Fig. 4 shows a portion 17 (electrolytic silver deposited in the space) of the barrel
15 electrolytic silver 16 stripped off, the portion 17 being deposited in the space 8 and then cut.

[Second Embodiment]

A second embodiment relates to an electrolytic recovery device for gold. The above description on an electrolytic recovery
20 device for silver in the first embodiment can be similarly applied to an electrolytic recovery device for gold simply by reading "silver" in the description as "gold". Thus, further description is omitted here to avoid duplication.

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INDUSTRIAL APPLICABILITY

With employment of a specially prepared barrel cathode, an electrolytic recovery device for gold or silver according to the

present invention enables easy stripping and recovery of gold or silver deposited on a barrel cathode from gold or silver electrolytic recovery liquid, and thus achieves efficient recovery of gold or silver. That is, wider industrial applicability can be
5 ensured. Further, as the barrel cathode can be repeatedly used after stripping off and recovery of gold or silver, wider industrial applicability can be ensure also in view of material saving.

CLAIMS

1. An electrolytic recovery device for gold or silver, comprising:

5 an electrolytic layer;

a control device;

an anode; and

a barrel cathode,

wherein

10 the barrel cathode has an insulating cap attached thereto along an entire circumferential lower edge thereof and a plurality of band insulators detachably attached in one position in a longitudinal direction on an outer circumferential surface thereof with a space ensured between the band insulators, so that
15 electrodeposited gold or silver is easily stripped off from the barrel cathode by detaching the band insulators.

2. The electrolytic recovery device for gold or silver according to claim 1, wherein an upper portion of the barrel cathode is a
20 lid having a degassing hole formed thereon.

3. The electrolytic recovery device for gold or silver according to claim 1 or 2, wherein the insulating cap and the band insulators are made of plastic or rubber.

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4. The electrolytic recovery device for gold or silver according to any one of claims 1 to 3, wherein the band insulators are

detachably attached by a screw in one position in the longitudinal direction on the outer circumferential surface of the barrel cathode.

5 5. The electrolytic recovery device for gold or silver according to any one of claims 1 to 4, wherein the anode is placed on an outer side of the barrel cathode placed in the electrolytic cell.

6. The electrolytic recovery device for gold or silver according
10 to any one of claims 1 to 5, wherein gold or silver electrodeposited on a surface of the barrel cathode is stripped off in a barrel shape by removing the screw fixing the band insulators and removing the band insulators.