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(54) **COPPER REMOVING DEVICE FOR CONDUCTIVE BAND**

(57) The present disclosure provides a copper removal device for a conductive tape. The copper removal device includes a copper removal bath and a conductive tape transport mechanism. The copper removal bath is configured to hold a copper removal solution. The copper removal bath is provided with a first slot hole and a second slot hole for a conductive tape to transversely pass through. The conductive tape transport mechanism is configured to transport the conductive tape, such that the conductive tape transversely passes through the copper removal bath via the first slot hole and the second slot hole and is immersed in the copper removal solution. The conductive tape is provided with an anode current. A cathode plate connected to a negative electrode of a power supply is provided in the copper removal bath, and the cathode plate is located above and/or below the conductive tape. In the present disclosure, when the conductive tape enters the copper removal bath, under the action of the cathode plate immersed in the copper removal solution, a copper layer on a surface of the conductive tape is ionized to generate copper ions that can move freely in the copper removal solution. In this way, the copper layer on the surface of the conductive tape is removed.

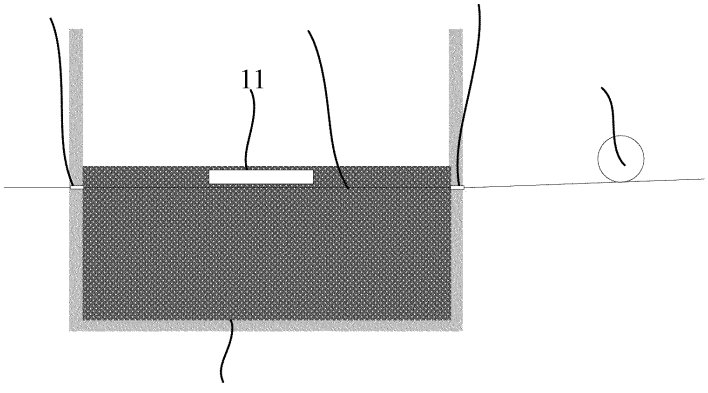

FIG. 1

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to the technical field of electroplating, and in particular to a copper removal device for a conductive tape.

BACKGROUND

[0002] With the development of technology, water electroplating devices are commonly used in industrial production to electroplate flexible film substrates. In the process of water electroplating, the current is usually conducted to the substrate through a conductive roller, thereby achieving the function of electroplating the substrate. Due to deficiencies in conductive roller design, the surface of the conductive roller is prone to forming a copper layer during the production process. The copper layer can puncture or scratch the film, greatly reducing the yield of the conductive film product and seriously affecting the overall production efficiency of the enterprise. At present, the conductive tape is used in the industry to achieve cathode conductivity and eliminate the structural design of a conductive roller, thereby avoiding copper from being deposited during copper plating and puncturing or scratching the film. For example, Chinese Patent Application CN113249770A provides a water electroplating device for electroplating a surface of a flexible film substrate, which uses a conductive tape instead of a conductive roller to provide a cathode current. However, in this method, the conductive tape is immersed in the electroplating solution for a long time, leading to the conductive tape being coated with a copper layer to compress the film, which results in a poor electroplating effect on the flexible film substrate.

SUMMARY

[0003] In view of this, an objective an embodiment of the present disclosure is to provide a copper removal device for a conductive tape, to solve the problem of the prior art, that is, since the conductive tape is immersed in the electroplating solution for a long time, it will be coated with a copper layer to compress the film.

[0004] In order to achieve the above objective, an embodiment of the present disclosure provides a copper removal device for a conductive tape. The copper removal device for a conductive tape includes a copper removal bath and a conductive tape transport mechanism, where the copper removal bath is configured to hold a copper removal solution; the copper removal bath is provided with a first slot hole and a second slot hole for a conductive tape to transversely pass through; the conductive tape transport mechanism is configured to transport the conductive tape, such that the conductive tape transversely passes through the copper removal bath via the first slot hole and the second slot hole and is immersed in the copper removal solution; and the conductive tape is provided with an anode current; and

a cathode plate connected to a negative electrode of a power supply is provided in the copper removal bath, and the cathode plate is located above and/or below the conductive tape.

[0005] In some possible implementations, the copper removal device further includes an anode conductive roller provided outside the copper removal bath and connected to a positive electrode of the power supply; and the anode conductive roller is in contact with the conductive tape, and is configured to conduct the anode current to the conductive tape.

[0006] In some possible implementations, the conductive tape transport mechanism includes:

a first inner limit roller and a second inner limit roller, where the first inner limit roller and the second inner limit roller are respectively located at a first end and a second end of the copper removal bath, and are configured to press down the conductive tape, such that the conductive tape is immersed in the copper removal solution.

[0007] In some possible implementations, the conductive tape transport mechanism further includes:

a plurality of first outer limit rollers and a plurality of second outer limit rollers, where the plurality of first outer limit rollers are located at a front end of the copper removal bath, and the plurality of second outer limit rollers are located at a rear end of the copper removal bath; and

the plurality of first outer limit rollers are configured to guide the conductive tape into the copper removal bath, and the plurality of second outer limit rollers are configured to guide the conductive tape out of the copper removal bath.

[0008] In some possible implementations, a first baffle plate and a second baffle plate are respectively arranged at positions of a side wall of the copper removal bath where the first slot hole and the second slot hole are provided.

[0009] In some possible implementations, a first water washing bath is provided at the front end of the copper removal bath; a side wall of the first water washing bath is provided with a third slot hole for the conductive tape to pass through; first upper and lower water washing spray pipes are provided in the first water washing bath; and the first upper and lower water washing spray pipes are configured to wash off dirt on two sides of the conductive tape.

[0010] In some possible implementations, a first transition bath is provided between the copper removal bath and the first water washing bath; and a side wall of the first transition bath is provided with a fourth slot hole for the conductive tape to pass through.

[0011] In some possible implementations, a second water washing bath is provided at the rear end of the copper removal bath; a side wall of the second water

washing bath is provided with a fifth slot hole for the conductive tape to pass through; second upper and lower water washing spray pipes are provided in the second water washing bath; and the second upper and lower water washing spray pipes are configured to wash off the copper removal solution on the two sides of the conductive tape.

[0012] In some possible implementations, a second transition bath is provided between the rear end of the copper removal bath and the second water washing bath; and a side wall of the second transition bath is provided with a sixth slot hole for the conductive tape to pass through.

[0013] In some possible implementations, the rear end of the second water washing bath is provided with an acid washing bath; the acid washing bath is provided with a seventh slot hole for the conductive tape to pass through; upper and lower acid washing spray pipes are provided in the acid washing bath; and the upper and lower acid washing spray pipes are configured to spray an acid solution, and the acid solution reacts with the copper removal solution on the two sides of the conductive tape.

[0014] The above technical solution has the following beneficial technical effects.

[0015] An embodiment of the present disclosure provides a copper removal device for a conductive tape. The copper removal device for a conductive tape includes a copper removal bath and a conductive tape transport mechanism, where the copper removal bath is configured to hold a copper removal solution; the copper removal bath is provided with a first slot hole and a second slot hole for a conductive tape to transversely pass through; the conductive tape transport mechanism is configured to transport the conductive tape, such that the conductive tape transversely passes through the copper removal bath via the first slot hole and the second slot hole and is immersed in the copper removal solution; the conductive tape is provided with an anode current; a cathode plate connected to a negative electrode of a power supply is provided in the copper removal bath, and the cathode plate is located above and/or below the conductive tape. In the embodiment of the present disclosure, when the conductive tape enters the copper removal bath, under the action of the cathode plate immersed in the copper removal solution, the copper layer on the surface of the conductive tape is ionized to generate copper ions that can move freely in the copper removal solution. In this way, the copper layer on the surface of the conductive tape is removed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] To describe the technical solutions in the embodiments of the present disclosure more clearly, the drawings required for the embodiments are briefly described below. Apparently, the drawings in the following description show merely some embodiments of the present disclosure, and a person of ordinary skill in the art may still derive other drawings from these drawings without creative efforts.

FIG. 1 is a first overall structural diagram of a copper removal device for a conductive tape according to an embodiment of the present disclosure;

FIG. 2 is a second overall structural diagram of the copper removal device for a conductive tape according to an embodiment of the present disclosure;

FIG. 3 is a first schematic diagram of a conductive tape transport mechanism according to an embodiment of the present disclosure;

FIG. 4 is a second schematic diagram of the conductive tape transport mechanism according to an embodiment of the present disclosure;

FIG. 5 is a schematic diagram of a copper removal bath with a baffle plate according to an embodiment of the present disclosure;

FIG. 6 is a structural diagram of a first water washing bath according to an embodiment of the present disclosure;

FIG. 7 is a structural diagram of a first transition bath according to an embodiment of the present disclosure;

FIG. 8 is a structural diagram of a second water washing bath according to an embodiment of the present disclosure;

FIG. 9 is a structural diagram of a second transition bath according to the embodiment of the present disclosure; and

FIG. 10 is a structural diagram of an acid washing bath according to an embodiment of the present disclosure.

[0017] Reference Numerals:

1. copper removal bath; 11. cathode plate; 12. first slot hole; 13. second slot hole; 14. first baffle plate; and 15. second baffle plate;
21. anode conductive roller; 22. first inner limit roller; 23. second inner limit roller; 24. first outer limit roller; and 25. second outer limit roller;
3. conductive tape;
4. first water washing bath; 41. third slot hole; 42. first upper and lower water washing spray pipes; and 43. third baffle plate;
5. first transition bath; and 51. fourth slot hole;
6. second water washing bath; 61. fifth slot hole; 62. second upper and lower water washing spray pipes; 63. fourth baffle plate; and 64. fifth baffle plate;
7. second transition bath; and 71. sixth slot hole; and
8. acid washing bath; 81. seventh slot hole; 82. upper and lower acid washing spray pipes; and 83. sixth baffle plate.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0018] Various features and exemplary embodiments of the present disclosure are described in detail below. Many specific details are demonstrated in the detailed description below to facilitate the comprehensive understanding of the present disclosure. However, those skilled in the art can implement the present disclosure without some of these specific details. The following description of the embodiments is intended only to provide a better understanding of the present disclosure by illustrating examples of the present disclosure. The drawings and the following description do not show at least some well-known structures and techniques to avoid unnecessary ambiguity to the present disclosure. Moreover, for clarity, the dimensions of some structures may be exaggerated. The features, structures, or characteristics described below may be incorporated into one or more embodiments in any suitable manner.

[0019] FIG. 1 is a first overall structural diagram of a copper removal device for a conductive tape according to an embodiment of the present disclosure. As shown in FIG. 1, the embodiment of the present disclosure provides a copper removal device for a conductive tape. The copper removal device includes copper removal bath 1 and a conductive tape transport mechanism. The copper removal bath 1 is configured to hold a copper removal solution. The copper removal bath 1 is provided with first slot hole 12 and second slot hole 13 for the conductive tape 3 to transversely pass through. That is, a transverse wall of the copper removal bath 1 is provided with the first slot hole 12 and the second slot hole 13. The conductive tape transport mechanism is configured to transport the conductive tape 3, such that the conductive tape 3 transversely passes through the first slot hole 12 of the copper removal bath 1 to enter the copper removal solution and leave the copper removal bath 1 from the second slot hole 13. An anode conductive roller 21 is provided outside the copper removal bath 1. The anode conductive roller 21 is connected to a positive electrode of a power supply and in contact with the conductive tape 3. The anode conductive roller is configured to conduct an anode current to the conductive tape 3. Cathode plate 11 connected to a negative electrode of the power supply is provided in the copper removal bath 1, and the cathode plate 11 is located above and/or below the conductive tape 3 and is provided on a side wall of the copper removal bath 1. In addition, in the embodiment of the present disclosure, the copper removal device for a conductive tape further includes a frame. The copper removal bath 1 is provided inside the frame. The conductive tape transport mechanism is provided on the frame. For example, the anode conductive roller 21 is rotationally provided on the frame. In the copper removal bath 1, under the action of the copper removal solution and the anode conductive roller 21, a copper layer on a surface of the conductive tape 3 is ionized to generate copper ions that can move freely in the copper removal solution. In this way, the copper layer on the surface of the conductive tape 3 fades into the copper removal solution. At this point, the copper removal solution includes copper ions. The current flows through the conductive tape 3, the copper removal solution, and the cathode plate 11 in sequence. The copper removal solution serves as electrolyte. The copper ions in the electrolyte move towards the cathode plate 11, and the copper ions react with electrons close to the cathode plate 11 to generate copper.

[0020] In the embodiment of the present disclosure, when the conductive tape 3 enters the copper removal bath 1, under the action of the cathode plate 11 immersed in the copper removal solution, the copper layer on the surface of the conductive tape 3 is ionized to generate copper ions that can move freely in the copper removal solution. In this way, the copper layer on the surface of the conductive tape 3 is ionized into the copper removal solution, thereby removing the copper layer on any surface of the conductive tape 3.

[0021] FIG. 2 is a second overall structural diagram of the copper removal device for a conductive tape according to an embodiment of the present disclosure. As shown in FIG. 2, in the embodiment of the present disclosure, copper layers on a first side and a second side of the conductive tape 3 can be removed simultaneously. At this point, two anode conductive rollers 21 are provided. The two anode conductive rollers are arranged up and down, rotationally provided on the frame, and respectively in contact with the first side and the second side of the conductive tape 3. Two cathode plates 11 are respectively arranged above and below the conductive tape 3. The copper layer on the first side of the conductive tape 3 is removed through the anode conductive roller 21 and the cathode plate 11 above the conductive tape 3, and the copper layer on the second side of the conductive tape 3 is removed through the anode conductive roller 21 and the cathode plate 11 below the conductive tape 3. In the embodiment of the present disclosure, the number of the anode conductive rollers 21 and the number of the cathode plates 11 can be flexibly set based on the number of the surfaces of the conductive tape 3 that need to remove the copper layer, thereby reducing production costs.

[0022] FIG. 3 is a first schematic diagram of the conductive tape transport mechanism according to the embodiment of the present disclosure. As shown in FIG. 3, in some embodiments, the conductive tape transport mechanism may further include first inner limit roller 22 and second inner limit roller 23. The first inner limit roller and the second inner limit roller are respectively located at a first end and a second end of the copper removal bath 1, and are rotationally provided on the side wall of the copper removal bath 1. The first inner limit roller 22 and the second inner limit roller 23 are partially or completely immersed in the copper removal solution, and are configured to press down the conductive tape 3, such that the conductive tape 3 is immersed in the copper removal solution. For example, in order to prevent the cop-

per removal solution in the copper removal bath 1 from leaking out from the first slot hole 12 and the second slot hole 13, the first slot hole 12 and the second slot hole 13 are arranged above the copper removal solution. At this point, when the conductive tape 3 transversely passes through the copper removal bath 1, the conductive tape 3 is not immersed in the electroplating solution. The first inner limit roller 22 and the second inner limit roller 23 are respectively arranged at the first end and the second end of the copper removal bath 1. The conductive tape 3 is pressed down through the first inner limit roller 22 and the second inner limit roller 23, such that the conductive tape 3 is immersed in the copper removal solution.

[0023] FIG. 4 is a second schematic diagram of the conductive tape transport mechanism according to the embodiment of the present disclosure. As shown in FIG. 4, in some embodiments, the conductive tape transport mechanism may further include a plurality of first outer limit rollers 24 and a plurality of second outer limit rollers 25. The plurality of first outer limit rollers 24 are located at a front end of the copper removal bath 1. The plurality of first outer limit rollers 24 guide a transport path of the conductive tape 3, allowing the conductive tape 3 to enter the copper removal bath 1 through the first slot hole 12. The plurality of second outer limit rollers 25 are located at a rear end of the copper removal bath 1, and the plurality of second outer limit rollers 25 guide the conductive tape 3 out of the copper removal bath 1 through the second slot hole 13.

[0024] FIG. 5 is a schematic diagram of the copper removal bath with a baffle plate according to an embodiment of the present disclosure. As shown in FIG. 5, first baffle plate 14 and second baffle plate 15 are respectively arranged at positions of the first slot hole 12 and the second slot hole 13 in the side wall of the copper removal bath 1. Optionally, the first baffle plate 14 and the second baffle plate 15 may be in the shape of a long strip, and have lengths matching the first slot hole 12 and the second slot hole 13, respectively. The first baffle plate and the second baffle plate are arranged on the side wall of the copper removal bath 1 by pasting. Alternatively, the first baffle plate 14 and the second baffle plate 15 are fixed to the side wall of the copper removal bath 1 through screw, etc. In the embodiment of the present disclosure, the first baffle plate 14 and the second baffle plate 15 respectively shield the first slot hole 12 and the second slot hole 13 to prevent the copper removal solution from flowing out of the copper removal bath 1.

[0025] FIG. 6 is a structural diagram of a first water washing bath according to an embodiment of the present disclosure. As shown in FIG. 6, the first water washing bath 4 is provided between the front end of the copper removal bath 1 and the plurality of first outer limit rollers 24. A side wall of the first water washing bath 4 is provided with third slot hole 41 for the conductive tape 3 to pass through. The conductive tape 3 transversely enters the first water washing bath 4 from the third slot hole 41. First upper and lower water washing spray pipes 42 are provided in the first water washing bath 4. The conductive tape 3 passes between the first upper and lower water washing spray pipes 42. In the embodiment of the present disclosure, the first upper and lower water washing spray pipes 42 spray a water washing solution to clean dirt on two sides of the conductive tape 3, thereby improving the copper removal quality of the conductive tape 3.

[0026] FIG. 7 is a structural diagram of a first transition bath according to an embodiment of the present disclosure. As shown in FIG. 7, in some embodiments, the first transition bath 5 is provided between the copper removal bath 1 and the first water washing bath 4. A side wall of the first transition bath 5 is provided with fourth slot hole 51 for the conductive tape 3 to pass through. After exiting from the first water washing bath, the conductive tape 3 does not directly enter the copper removal bath 1, but enters the first transition bath 5 through the fourth slot hole 51, so as to prevent the conductive tape 3 from carrying the water washing solution from the first water washing bath 4 into the copper removal bath 1. In the embodiment of the present disclosure, the first transition bath 5 isolates the copper removal bath 1 and the first water washing bath 4, so as to prevent the copper removal solution from mixing with the water washing solution to affect the concentration of the copper removal solution and reduce the copper removal efficiency.

[0027] FIG. 8 is a structural diagram of a second water washing bath according to an embodiment of the present disclosure. As shown in FIG. 8, in some embodiments, the second water washing bath 6 is provided between the rear end of the copper removal bath 1 and the plurality of second outer limit rollers 25. A side wall of the second water washing bath 6 is provided with fifth slot holes 61 for the conductive tape 3 to pass through. Second upper and lower water washing spray pipes 62 are arranged inside the second water washing bath 6. In the embodiment of the present disclosure, the second upper and lower water washing spray pipes 62 spray the water washing solution to clean the copper removal solution on the two sides of the conductive tape 3.

[0028] FIG. 9 is a structural diagram of a second transition bath according to the embodiment of the present disclosure. As shown in FIG. 9, in some embodiments, the second transition bath 7 is provided between the rear end of the copper removal bath 1 and the second water washing bath 6. A side wall of the second transition bath 7 is provided with sixth slot hole 71 for the conductive tape 3 to pass through. The second transition bath 7 prevents the copper removal solution in the copper removal bath 1 from entering the second water washing bath 6, so as to prevent the copper removal solution from mixing with the water washing solution to affect the water washing effect.

[0029] FIG. 10 is a structural diagram of an acid washing bath according to an embodiment of the present disclosure. As shown in FIG. 10, in some embodiments, a rear end of the second water washing bath 6 is provided

with the acid washing bath 8. The acid washing bath 8 is provided with seventh slot hole 81 for the conductive tape 3 to pass through. Upper and lower acid washing spray pipes 82 are provided in the acid washing bath 8. In the embodiment of the present disclosure, the upper and lower acid washing spray pipes 82 are configured to spray out an acid solution, allowing the acid solution to react with the partially reacted copper removal solution on the two sides of the conductive tape 3, thereby preventing the copper removal solution from entering the subsequent electroplating solution.

[0030] As shown in FIGS. 7 to 10, in some embodiments, third baffle plate 43 is provided at a position of the third slot hole 41 in an inner side wall of the first water washing bath 4. Optionally, the third baffle plate 43 may be in the shape of a long strip, and has a length matching the third slot hole 41. The third baffle plate is provided on the inner side wall of the first water washing bath 4 by pasting. Alternatively, the third baffle plate 43 is fixed to the inner side wall of the first water washing bath 4 through a screw, etc. In the embodiment of the present disclosure, the third baffle plate 43 shields the third slot hole 41, thereby preventing the water washing solution in the first water washing bath 4 from mixing with the copper removal solution in the copper removal bath 1.

[0031] In some embodiments, fourth baffle plate 63 and fifth baffle plate 64 are provided at positions of the fifth slot holes 61 in an inner side wall of the second water washing bath 6. Optionally, the fourth baffle plate 63 and the fifth baffle plate 64 may be in the shape of a long strip, and have lengths matching the second slot hole 13 and the third slot hole 41, respectively. A position of the fourth baffle plate 63 corresponds to a position of the second slot hole 13, and a position of the fifth baffle plate 64 corresponds to a position of the fifth slot hole 61. Optionally, the fourth baffle plate 63 and the fifth baffle plate 64 may be provided on the inner side wall of the second water washing bath 6 by pasting. Alternatively, the fourth baffle plate 63 and the fifth baffle plate 64 are fixed to the inner side wall of the second water washing bath 6 through screws, etc. In the embodiment of the present disclosure, the fourth baffle plate 63 shields the second slot hole 13, and the fifth baffle plate 64 shields the fifth slot hole 61, thereby preventing the copper removal solution in the copper removal bath 1 from entering the second water washing bath 6, and preventing the conductive tape 3 from carrying the water washing solution through the fifth slot hole 61 to the outside of the second water washing bath 6.

[0032] In some embodiments, sixth baffle plate 83 is provided at a position of the seventh slot hole 81 in an inner side wall of the acid washing bath 8. The sixth baffle plate 83 may be in the shape of a long strip, and has a same length as the fifth slot hole 61. The sixth baffle plate is configured to prevent the conductive tape 3 from carrying the water washing solution through the fifth slot hole 61. Optionally, the sixth baffle plate 83 is provided on the inner side wall of the acid washing bath 8 by pasting. Alternatively, the sixth baffle plate 83 is fixed to the inner side wall of the acid washing bath 8 through a screw, etc. In the embodiment of the present disclosure, the sixth baffle plate 83 prevents the conductive tape 3 from carrying the water washing solution through the fifth slot hole 61, thereby preventing the water washing solution in the second water washing bath 6 from mixing with a sulfuric acid solution in the acid washing bath 8.

[0033] A working principle of the copper removal device for a conductive tape provided by the embodiment of the present disclosure is as follows.

[0034] During operation, the anode conductive roller 21 is connected to the positive electrode of the power supply, and the cathode plate 11 is connected to the negative electrode of the power supply. The conductive tape 3 conducts the anode current to the first side and/or the second side of the conductive tape 3 through the anode conductive roller 21. Under limit of the first outer limit roller 24, the conductive tape 3 enters the copper removal bath 1 through the first slot hole 12 of the copper removal bath 1. The first inner limit roller 22 and the second inner limit roller 23 press the conductive tape 3 down into the copper removal solution. In the copper removal bath 1, under the action of the copper removal solution and the anode conductive roller 21, the copper layer on the surface of conductive tape 3 is ionized to generate copper ions that can move freely in the copper removal solution. Thus, the copper layer on the surface of conductive tape 3 fades into the copper removal solution. At this point, the copper removal solution includes copper ions. The current flows through the conductive tape 3, the copper removal solution, and the cathode plate 11 in sequence. The copper removal solution serves as electrolyte. The copper ions in the electrolyte move towards cathode plate 11, and the copper ions react with electrons close to cathode plate 11 to generate copper.

[0035] In some embodiments, the conductive tape 3 may first enter the first water washing bath 4. The first upper and lower washing spray pipes 42 spray the water washing solution to wash off dirt and the electroplating solution. The third baffle plate 43 is provided to avoid water from entering the copper removal bath 1.

[0036] In some embodiments, in order to better prevent the water washing solution in the first water washing bath 4 from mixing with the copper removal solution in the copper removal bath 1, the conductive tape 3 may first pass through the first transition bath 5 and then enter the copper removal bath 1.

[0037] In some embodiments, the copper layer of the conductive tape 3 is electrolyzed in the copper removal bath 1, and the second upper and lower washing spray pipes 62 in the second water washing bath 6 spray the water washing solution to wash off the copper removal solution on the conductive tape 3.

[0038] In some embodiments, in order to avoid the copper removal solution in the copper removal bath 1 from mixing with the water washing solution in the second water washing bath 6, the conductive tape 3 enters the sec-

ond transition bath 7 before entering the second water washing bath 6.

[0039] In some embodiments, in order to prevent the copper removal solution from entering the subsequent electroplating solution, the conductive tape 3 washed by the second water washing bath 6 enters the acid washing bath 8. The acid solution sprayed by the upper and lower acid washing spray pipes 82 in the acid washing bath 8 reacts with the partially reacted copper removal solution on the two sides of the conductive tape 3, thereby preventing the copper removal solution from entering the subsequent electroplating solution.

[0040] The embodiments of the present disclosure have the following beneficial effects:

In the embodiment of the present disclosure, when the conductive tape 3 enters the copper removal bath 1, under the action of the cathode plate 11 immersed in the copper removal solution, the copper layer on the surface of the conductive tape 3 is ionized to generate copper ions that can move freely in the copper removal solution. In this way, the copper layer on the surface of the conductive tape 3 is ionized into the copper removal solution, thereby removing the copper layer on any surface of the conductive tape 3.

[0041] In the embodiment of the present disclosure, copper layers on a first side and a second side of the conductive tape 3 can be removed simultaneously. At this point, two anode conductive rollers 21 are provided. The two anode conductive rollers are arranged up and down, rotationally provided on the frame, and respectively in contact with the first side and the second side of the conductive tape 3. Two cathode plates 11 are respectively arranged above and below the conductive tape 3. The copper layer on the first side of the conductive tape 3 is removed through the anode conductive roller 21 and the cathode plate 11 above the conductive tape 3, and the copper layer on the second side of the conductive tape 3 is removed through the anode conductive roller 21 and the cathode plate 11 below the conductive tape 3. In the embodiment of the present disclosure, the number of the anode conductive rollers 21 and the number of the cathode plates 11 can be flexibly set based on the number of the surfaces of the conductive tape 3 that need to remove the copper layer, thereby reducing production costs.

[0042] In the embodiment of the present disclosure, the first inner limit roller 22 and the second inner limit roller 23 cause the conductive tape 3 to completely immerse in the copper removal solution.

[0043] In the embodiment of the present disclosure, the first baffle plate 14 and the second baffle plate 15 respectively shield the first slot hole 12 and the second slot hole 13 to prevent the copper removal solution from flowing out of the copper removal bath 1.

[0044] In the embodiment of the present disclosure, the first upper and lower water washing spray pipes 42 spray a water washing solution to clean dirt on two sides of the conductive tape 3, thereby improving the copper removal quality of the conductive tape 3.

[0045] In the embodiment of the present disclosure, the second upper and lower water washing spray pipes 62 spray the water washing solution to clean the copper removal solution on the two sides of the conductive tape 3.

[0046] In the embodiment of the present disclosure, the upper and lower acid washing spray pipes 82 are configured to spray out an acid solution, allowing the acid solution to react with the partially reacted copper removal solution on the two sides of the conductive tape 3, thereby preventing the copper removal solution from entering the subsequent electroplating solution.

[0047] In addition, in the embodiment of the present disclosure, the baffle plate is provided to prevent the conductive tape 3 from carrying the solution when the conductive tape is transported.

[0048] The above are merely preferred embodiments of the present disclosure, and are not intended to limit the present disclosure. Any modifications, equivalent replacements, and improvements made within the spirit and principle of the present disclosure shall be all included in the protection scope of the present disclosure. An orientation or position relationship indicated by a term such as "upper", "lower", "inner" or "outer" is based on the orientation or positional relationship shown in the drawings, which is only for convenience of describing the present disclosure and simplifying the description, rather than indicating or implying that the apparatus or element referred to must have a particular orientation and be constructed and operated in a particular orientation, and therefore should not be construed as limiting the present disclosure. Moreover, the terms such as "first", "second", and "third" are used only for the purpose of description, rather than to indicate or imply relative importance.

[0049] In addition, in the embodiments of the present disclosure, unless otherwise clearly specified, meanings of terms such as "mount", "connected to", and "connected with" should be understood in a broad sense. For example, the connection may be a fixed connection, a removable connection, or an integral connection; may be a mechanical connection or an electrical connection; may be a direct connection or an indirect connection by an intermediate medium; or may be intercommunication between two components. Those of ordinary skill in the art may understand specific meanings of the foregoing terms in the present disclosure based on a specific situation.

[0050] Although the present disclosure has been described with reference to the preferred embodiments, various improvements can be made and components therein can be replaced with equivalents without departing from the scope of the present disclosure. In particular, as long as there is no structural conflict, the technical features in the embodiments may be combined in any way. The present disclosure is not limited to the specific embodiments disclosed herein, but should include all technical solutions falling within the scope of the claims.

[0051] In the present disclosure, the copper removal

device for a conductive tape includes a copper removal bath for holding a copper removal solution and a conductive tape transport mechanism for transporting a conductive tape, where the copper removal bath is provided with a first slot hole and a second slot hole for a conductive tape to transversely pass through; the conductive tape transversely passes through the copper removal bath via the first slot hole and the second slot hole to be immersed in the copper removal solution; the conductive tape is provided with an anode current; a cathode plate connected to a negative electrode of a power supply is provided in the copper removal bath, and the cathode plate is located above and/or below the conductive tape. When the conductive tape enters the copper removal bath, under the action of the cathode plate immersed in the copper removal solution, the copper layer on the surface of the conductive tape is ionized to generate copper ions that can move freely in the copper removal solution. In this way, the copper layer on the surface of the conductive tape is ionized into the copper removal solution, thereby removing the copper layer on the surface of the conductive tape. In the present disclosure, the copper removal device for a conductive tape solves the technical problem that the electroplating effect on a flexible film substrate is poor due to the conductive tape that is coated with a copper layer after long-term immersion in the electroplating solution. Therefore, the copper removal device for a conductive tape of the present disclosure has practicality.

Claims

1. A copper removal device for a conductive tape, **characterized by** comprising a copper removal bath (1) and a conductive tape transport mechanism, wherein the copper removal bath (1) is configured to hold a copper removal solution; the copper removal bath (1) is provided with a first slot hole (12) and a second slot hole (13) for a conductive tape (3) to transversely pass through; the conductive tape transport mechanism is configured to transport the conductive tape (3), such that the conductive tape (3) transversely passes through the copper removal bath (1) via the first slot hole (13) and the second slot hole (14) and is immersed in the copper removal solution; and the conductive tape is provided with an anode current; and
   a cathode plate (11) connected to a negative electrode of a power supply is provided in the copper removal bath (1), and the cathode plate (11) is located above and/or below the conductive tape (3).

2. The copper removal device for the conductive tape according to claim 1, **characterized by** further comprising an anode conductive roller (21) provided outside the copper removal bath (1) and connected to a positive electrode of the power supply, wherein the anode conductive roller (21) is in contact with the conductive tape (3), and is configured to conduct the anode current to the conductive tape (3).

3. The copper removal device for the conductive tape according to claim 1, **characterized in that** the conductive tape transport mechanism comprises:
   a first inner limit roller (22) and a second inner limit roller (23), wherein the first inner limit roller and the second inner limit roller are respectively located at a first end and a second end of the copper removal bath (1), and are configured to press down the conductive tape (3), such that the conductive tape (3) is immersed in the copper removal solution.

4. The copper removal device for the conductive tape according to claim 3, **characterized in that** the conductive tape transport mechanism further comprises:

   a plurality of first outer limit rollers (24) and a plurality of second outer limit rollers (25), wherein the plurality of first outer limit rollers are located at a front end of the copper removal bath (1), and the plurality of second outer limit rollers are located at a rear end of the copper removal bath (1); and
   the plurality of first outer limit rollers (24) are configured to guide the conductive tape (3) into the copper removal bath (1), and the plurality of second outer limit rollers (25) are configured to guide the conductive tape (3) out of the copper removal bath (1).

5. The copper removal device for the conductive tape according to claim 1, **characterized in that** a first baffle plate (14) and a second baffle plate (15) are respectively arranged at positions of a side wall of the copper removal bath (1) where the first slot hole (12) and the second slot hole (13) are provided.

6. The copper removal device for the conductive tape according to any one of claims 1 to 5, **characterized in that** a first water washing bath (4) is provided at the front end of the copper removal bath (1); a side wall of the first water washing bath (4) is provided with a third slot hole (41) for the conductive tape (3) to pass through; first upper and lower water washing spray pipes (42) are provided in the first water washing bath (4); and the first upper and lower water washing spray pipes (42) are configured to wash off dirt on two sides of the conductive tape (3).

7. The copper removal device for the conductive tape according to claim 6, **characterized in that** a first transition bath (5) is provided between the copper removal bath (1) and the first water washing bath (4); and a side wall of the first transition bath (5) is provided with a fourth slot hole (51) for the conductive

tape (3) to pass through.

8. The copper removal device for the conductive tape according to any one of claims 1 to 5, **characterized in that** a second water washing bath (6) is provided at the rear end of the copper removal bath (1); a side wall of the second water washing bath (6) is provided with a fifth slot hole (61) for the conductive tape (3) to pass through; second upper and lower water washing spray pipes (62) are provided in the second water washing bath (6); and the second upper and lower water washing spray pipes (62) are configured to wash off the copper removal solution on two sides of the conductive tape (3).

9. The copper removal device for the conductive tape according to claim 8, **characterized in that** a second transition bath (7) is provided between the rear end of the copper removal bath (1) and the second water washing bath (6); and a side wall of the second transition bath (7) is provided with a sixth slot hole (71) for the conductive tape (3) to pass through.

10. The copper removal device for the conductive tape according to claim 8, **characterized in that** the rear end of the second water washing bath (6) is provided with an acid washing bath (8); the acid washing bath (8) is provided with a seventh slot hole (81) for the conductive tape (3) to pass through; upper and lower acid washing spray pipes (82) are provided in the acid washing bath (8); and the upper and lower acid washing spray pipes (82) are configured to spray an acid solution, and the acid solution reacts with the copper removal solution on the two sides of the conductive tape (3).

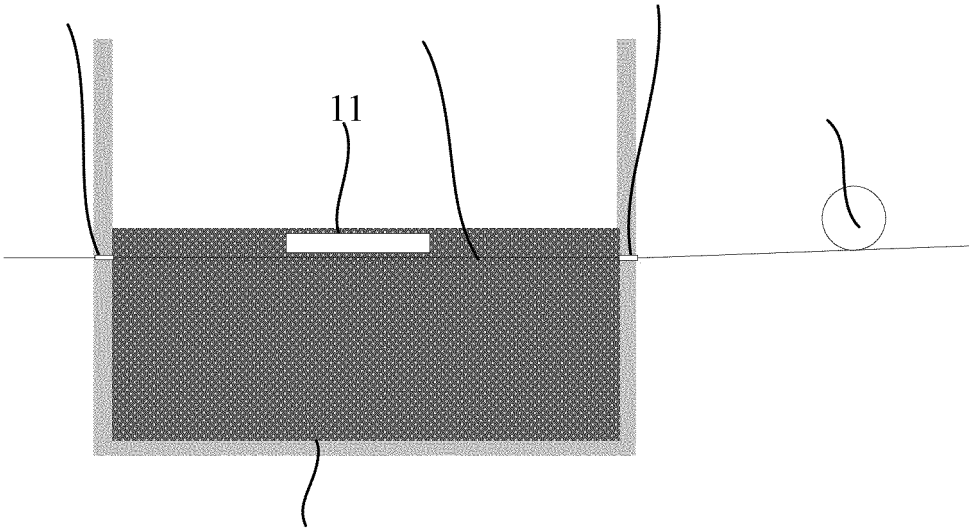

FIG. 1

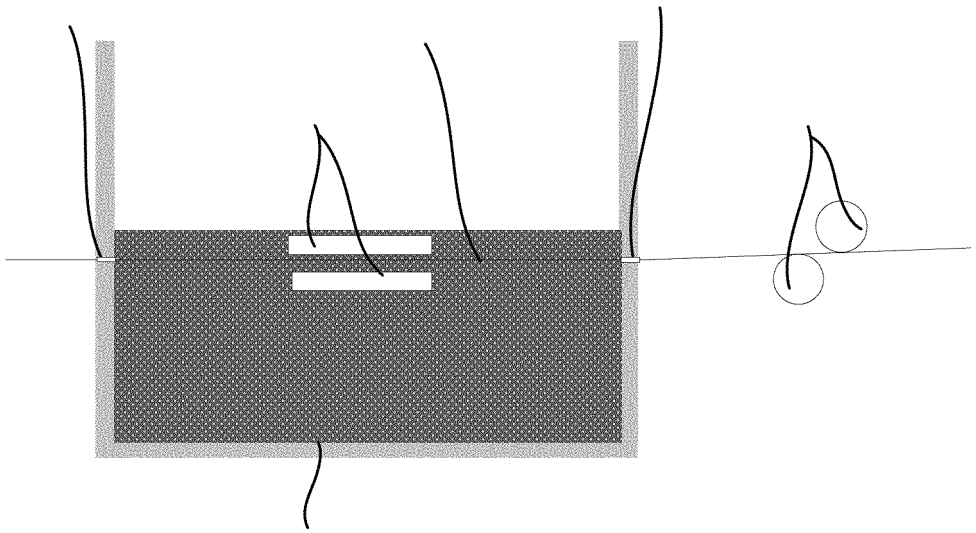

FIG. 2

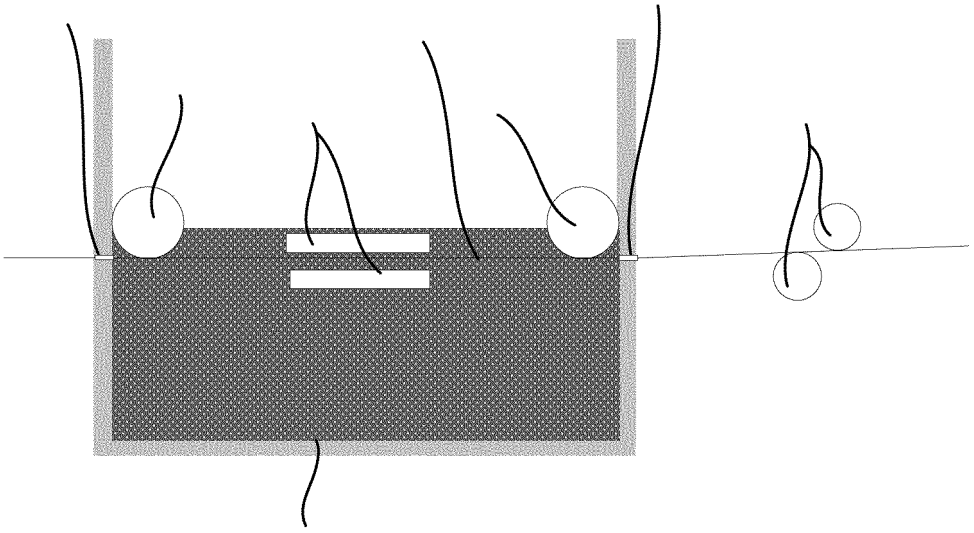

FIG. 3

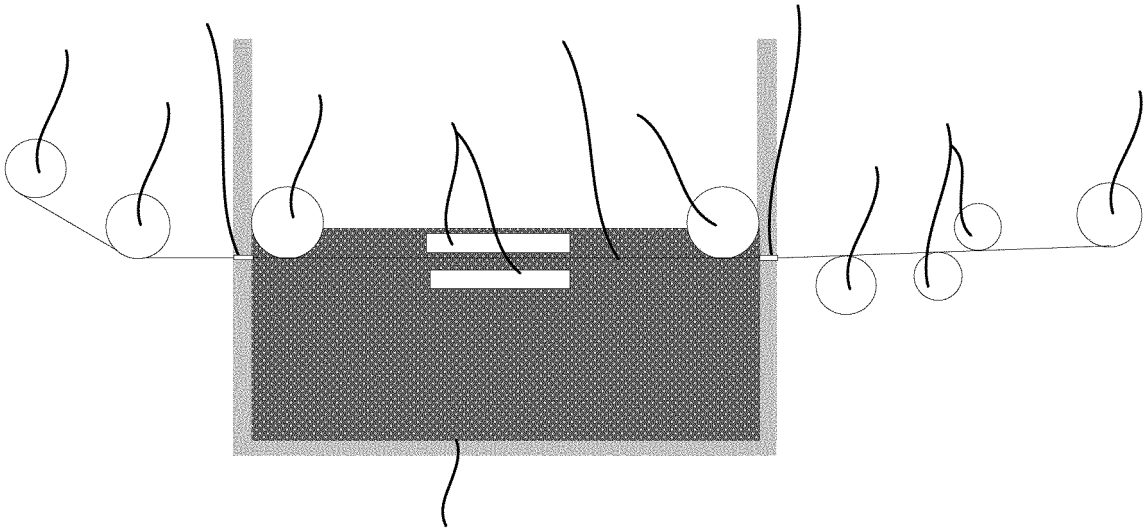

FIG. 4

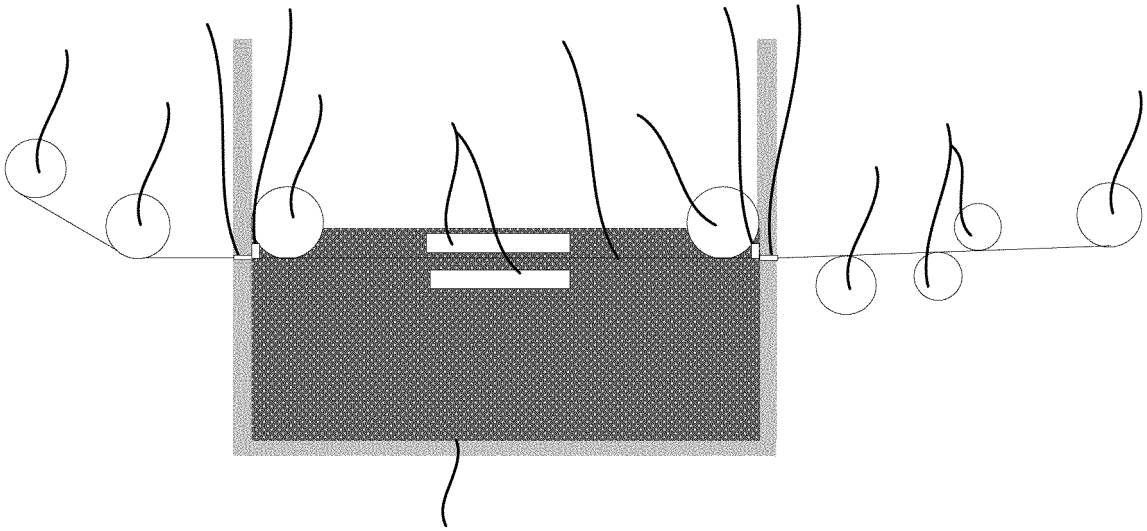

FIG. 5

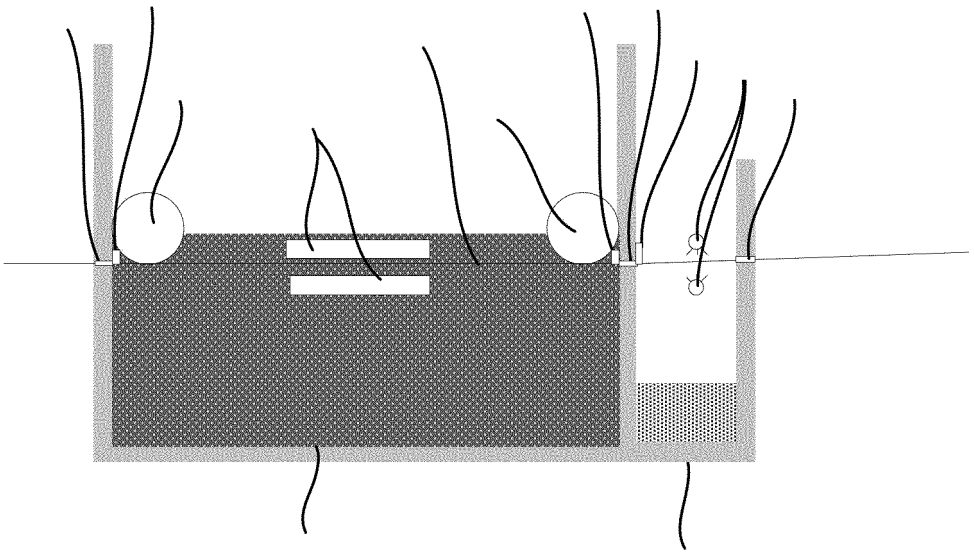

FIG. 6

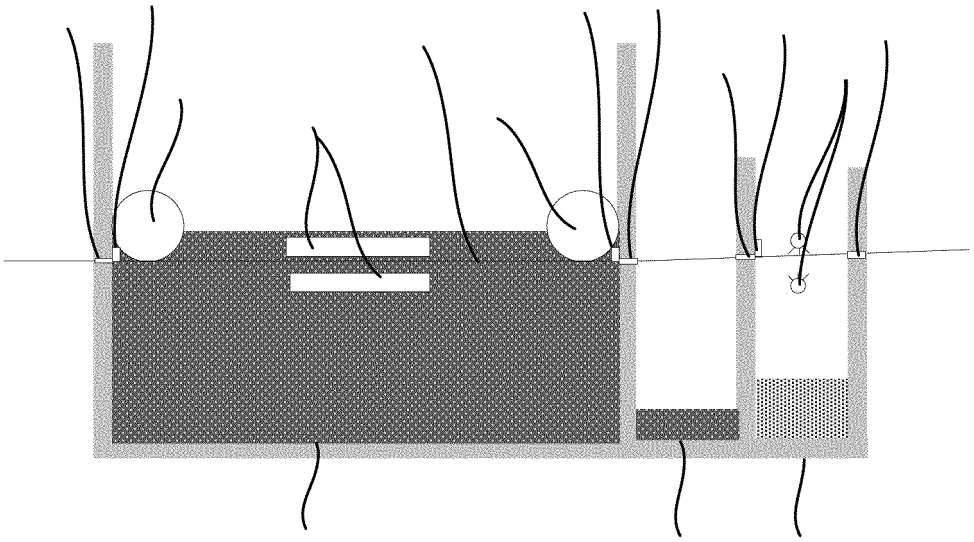

FIG. 7

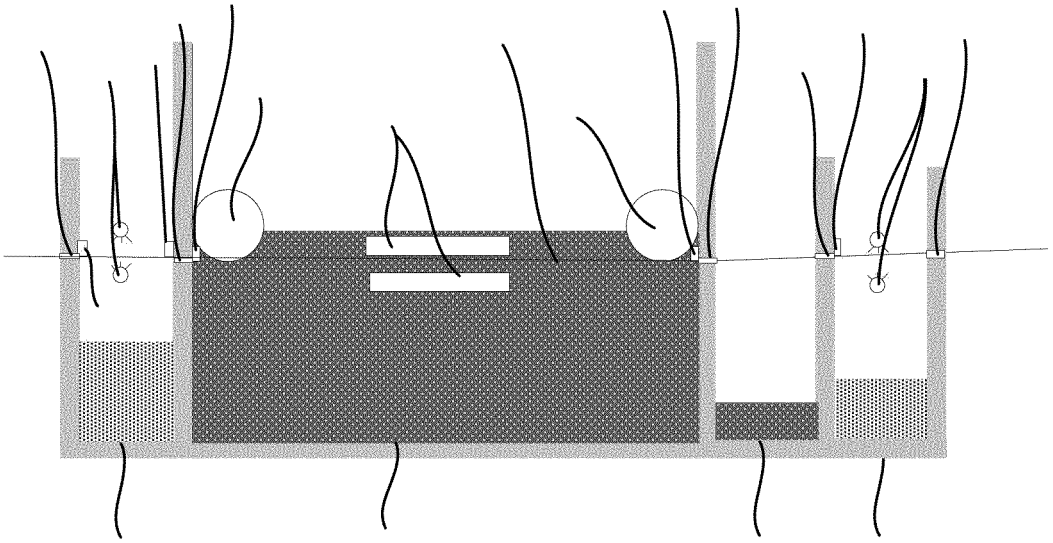

FIG. 8

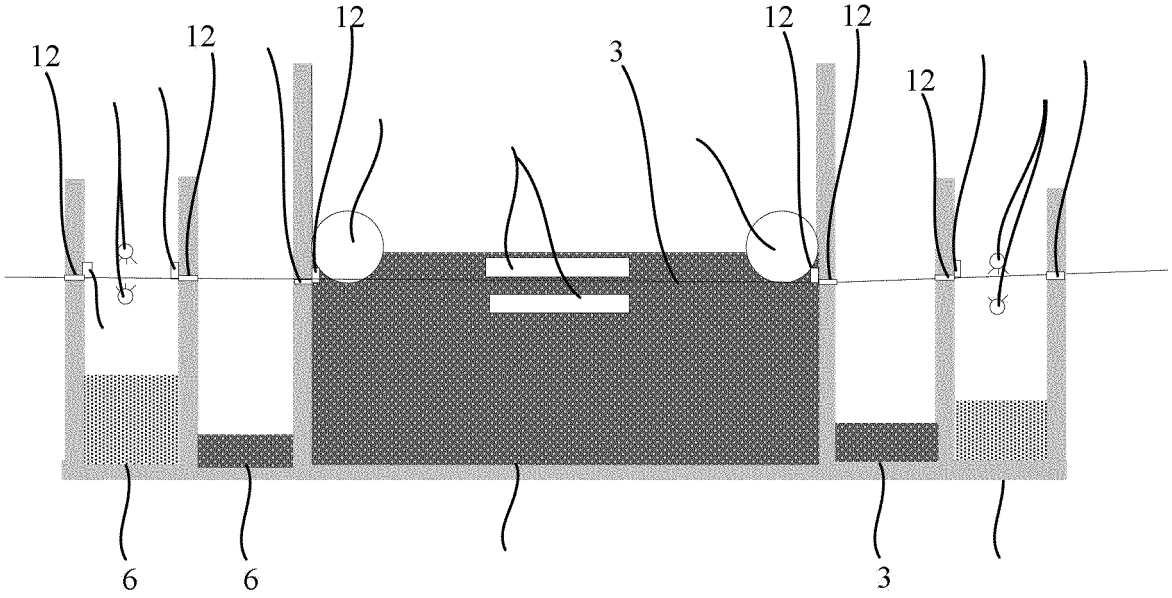

FIG. 9

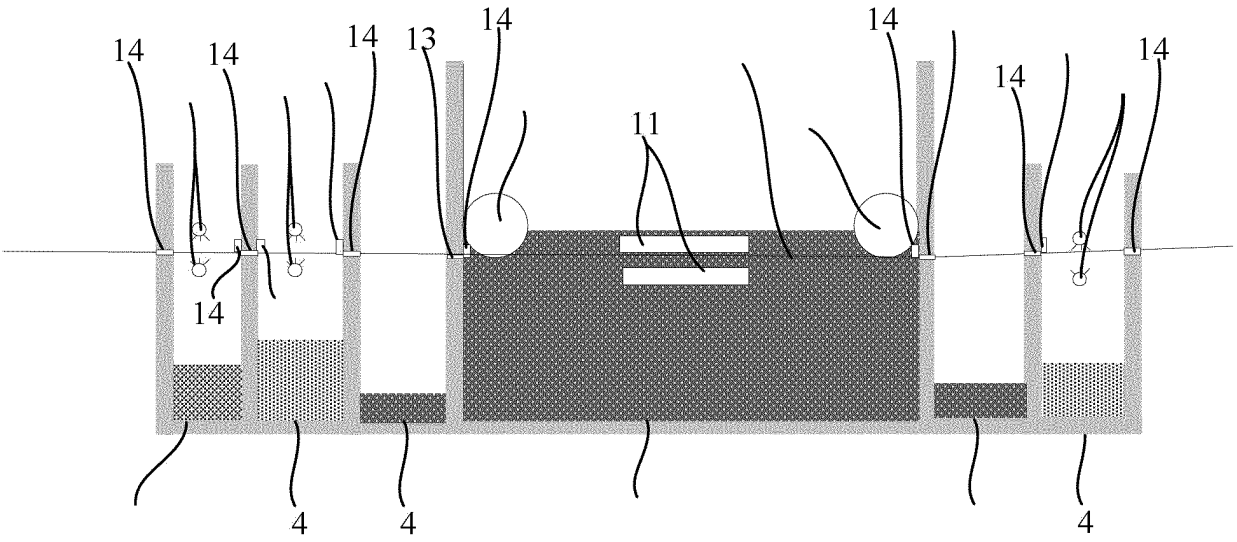

FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/083482

A. CLASSIFICATION OF SUBJECT MATTER

C25F5/00(2006.01)i; C25F7/00(2006.01)i; C25D17/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C25F, C25D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS, CNTXT, ENTXTC, VCN, VEN, CNKI, ISI: 导电带, 除铜, 去铜, 解镀, 退镀, 退铜, 镀铜, 阳极, 阴极, 镀件, 金属, stripping, electro, plat+, copper, recycl+, discard+, metal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 215560750 U (CHONGQING JIMAT NEW MATERIAL TECHNOLOGY CO., LTD.) 18 January 2022 (2022-01-18) description, paragraphs [0031]-[0033], and figures 1-2	1-10
Y	CN 204959074 U (SHENZHEN TAIRISHENG INDUSTRIAL CO., LTD.) 13 January 2016 (2016-01-13) description, paragraphs [0012]-[0013], and figures 1-2	1-10
Y	CN 210481570 U (FOSHAN CITY SHUNDE DISTRICT JIEYONG ELECTRICAL INDUSTRICAL CO., LTD.) 08 May 2020 (2020-05-08) description, paragraphs [0023]-[0046], and figures 1-2	1-10
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Y	CN 113249770 A (CHONGQING JIMAT NEW MATERIAL TECHNOLOGY CO., LTD.) 13 August 2021 (2021-08-13) description, paragraphs [0019]-[0024] and [0037], and figure 1	1-10

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 June 2023	**16 June 2023**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/083482

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A	CN 104342748 A (BOEING CO.) 11 February 2015 (2015-02-11) claims 1 and 12, and description, paragraphs [0077]-[0078]	1-10
A	CN 105297128 A (FOSHAN CITY NANHAI DISTR XINHENGLI HARDWARE MACHINERY FACTORY) 03 February 2016 (2016-02-03) description, paragraphs [0010]-[0014], and figure 1	1-10
A	US 6352636 B1 (GEN. ELECTRIC CO.) 05 March 2002 (2002-03-05) description, abstract, description, column 4, last paragraph to column 6, paragraph 3, and figures 1-4	1-10
A	JP 2000064099 A (CLOTH KK.) 29 February 2000 (2000-02-29) description, paragraphs [0002]-[0030], and figures 1-4	1-10
A	饶荣等 (RAO, Rong et al.). "废ABS 电镀件退镀液中铜的回收工艺研究 (Research on the Copper Recycling Process for the Stripping Solution of Waste ABS Plastic Electro-plating)" *南昌大学学报(工科版) (Journal of Nanchang University(Engineering & Technology))*, Vol. 37, No. 1, 28 March 2015 (2015-03-28), 7-10 page 8, section 1.2	1-10
PX	CN 114703538 A (CHONGQING JIMAT NEW MATERIAL TECHNOLOGY CO., LTD.) 05 July 2022 (2022-07-05) claims 1-10	1-10

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/083482

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 113249770 A **[0002]**