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(54) CATHODE CONDUCTIVE MECHANISM, AND ELECTROPLATING SYSTEM

(57) The present disclosure relates to a cathode conduction mechanism and an electroplating system. The cathode conduction mechanism includes a first conductive belt and a first conductive belt assembly, the first conductive belt assembly including a first belt roll and a second belt roll, and the first conductive belt covering the first belt roll and the second belt roll; and a second conductive belt and a second conductive belt assembly, the second conductive belt assembly including a third belt roll and a fourth belt roll, and the second conductive belt covering the third belt roll and the fourth belt roll. According to the present disclosure, the lower conductive belt does not pass through the bottom of the electroplating bath to prevent leakage. The upper conductive belt and the lower conductive belt each are only driven by two belt rolls to greatly save a cost.

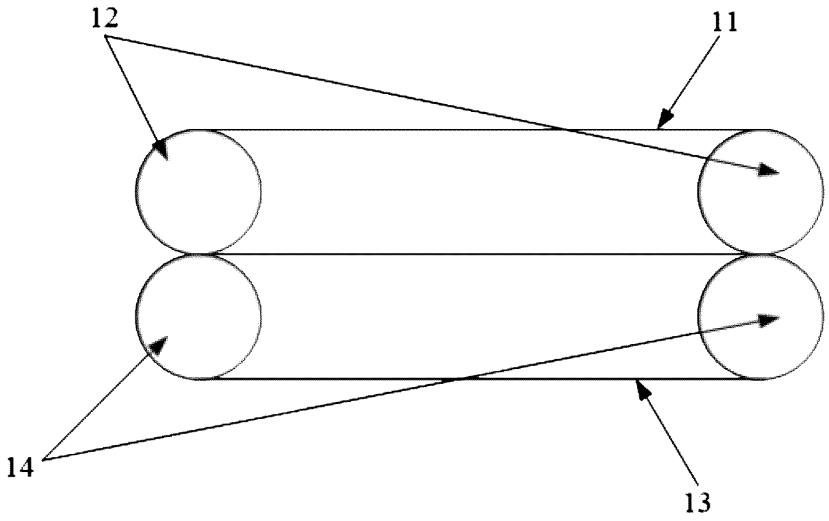

FIG. 1

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to the technical field of thin-film electroplating, and in particular to a cathode conduction mechanism and an electroplating system.

BACKGROUND

[0002] Electroplating is the process of using the principle of electrolysis to coat a thin metal or alloy layer onto a metal surface. It uses electrolysis to attach a metal film to the surface of metal or other materials to prevent metal oxidation (such as rust), thereby improving wear resistance, conductivity, reflectivity and aesthetics. With the development of modern industrial technologies, surface plating of a film substrate is increasingly popular, and has been widely applied to high-performance automotive films, plasma TV flat-panel displays, touch screens, solar cells, flexible printed circuit (FPC) boards, chip on film (COF), etc.

[0003] Concerning existing devices for producing a conductive thin film, the Chinese Patent Application No. CN 114182328A provides a cathode edge conduction mechanism and a cathode conduction module for a horizontal electroplating device. In this example, conductive belts are used to replace conventional conduction rolls to conduct the edge of a thin film. However, the conductive belts are short, which results in the present drawbacks that two belt pulleys of a lower conductive belt are located at the bottom of an electroplating bath, and the lower conductive belt passes through the bottom of the bath where an upper conductive belt is located. Consequently, the bath where the upper conductive belt is located is prone to leakage downwards. In addition, the lower conductive belt and the upper conductive belt are each driven by four conductive belt pulleys, which wastes cost.

SUMMARY

(I) Technical problem to be solved

[0004] In view of defects and shortages of the prior art, the present disclosure provides a cathode conduction mechanism and an electroplating system, to solve the technical problem that a lower conductive belt passes through a bottom of an electroplating bath to cause leakage at the bottom of the electroplating bath in the prior art.

(II) Technical solutions

[0005] To achieve the above objective, the present disclosure adopts the following main technical solutions:
According to an aspect, the present disclosure provides a cathode conduction mechanism. The cathode conduction mechanism includes a first conductive belt and a first conductive belt assembly, the first conductive belt assembly including a first belt roll and a second belt roll, and the first conductive belt covering the first belt roll and the second belt roll; and a second conductive belt and a second conductive belt assembly, the second conductive belt assembly including a third belt roll and a fourth belt roll, and the second conductive belt covering the third belt roll and the fourth belt roll, where the first belt roll comes in rolling contact with the third belt roll, and the second belt roll comes in rolling contact with the fourth belt roll.

[0006] Optionally, the second conductive belt is wider than the first conductive belt, and a wider portion of the second conductive belt over the first conductive belt is provided with a conductive brush; or, the first conductive belt is wider than the second conductive belt, and a wider portion of the first conductive belt over the second conductive belt is provided with the conductive brush.

[0007] Optionally, the conductive brush is connected to a copper bar.

[0008] Optionally, the first conductive belt assembly further includes a plurality of upper pressing wheels; and the plurality of upper pressing wheels are located between the first belt roll and the second belt roll, with a mounting height lower than a mounting height of each of the first belt roll and the second belt roll.

[0009] Optionally, the second conductive belt assembly further includes a plurality of lower pressing wheels; and the plurality of lower pressing wheels are located between the third belt roll and the fourth belt roll, with a mounting height higher than a mounting height of each of the third belt roll and the fourth belt roll.

[0010] Optionally, an upper auxiliary electrode bath is provided above the first conductive belt assembly, and openings for allowing the first conductive belt to pass through are respectively formed at two sides of the upper auxiliary electrode bath; and an upper copper etching mechanism for removing copper plated particles on a surface of a conductive layer of the first conductive belt is provided in the upper auxiliary electrode bath.

[0011] Optionally, a lower auxiliary electrode bath is provided below the second conductive belt assembly, and openings for allowing the second conductive belt to pass through are respectively formed at two sides of the lower auxiliary electrode bath; and an upper copper etching mechanism for removing copper plated particles on a surface of a conductive layer of the second conductive belt is provided in the lower auxiliary electrode bath.

[0012] According to another aspect, the present disclosure provides an electroplating system. The electroplating system includes an electroplating bath, as well as cathode conduction mechanisms provided in the electroplating bath in mirror symmetry, where the cathode conduction mechanisms are respectively located at two sides of a film feeding direction of a thin film; and a plurality of upper and lower electroplating anodes are provided in the electroplating bath, and the upper and lower

electroplating anodes are provided between the cathode conduction mechanisms at two sides of the electroplating bath.

[0013] Optionally, a thickening segment is further provided at a front end of a film coating segment of the electroplating bath, and the thickening segment is configured to thicken a plated layer at an edge of the thin film.

[0014] Optionally, a pre-plating bath is provided at a front end of the electroplating bath; and a conduction roll, a pass-over roll and an anode plate are provided in the pre-plating bath.

(III) Beneficial effects

[0015] The present disclosure has following beneficial effects:

[0016] According to the cathode conduction mechanism and the electroplating system provided by the present disclosure, the cathode conduction mechanism includes a first conductive belt and a first conductive belt assembly, the first conductive belt assembly including a first belt roll and a second belt roll, and the first conductive belt covering the first belt roll and the second belt roll; and a second conductive belt and a second conductive belt assembly, the second conductive belt assembly including a third belt roll and a fourth belt roll, and the second conductive belt covering the third belt roll and the fourth belt roll. The second conductive belt does not pass through the bottom of the electroplating bath to prevent leakage. The first conductive belt and the second conductive belt each are only driven by two belt rolls to greatly save a cost.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

FIG. 1 is an overall structural schematic view of a cathode conduction mechanism according to an embodiment of the present disclosure;

FIG. 2 is a side view of a cathode conduction mechanism according to an embodiment of the present disclosure;

FIG. 3 is a structural schematic view of a cathode conduction mechanism with a tensioning wheel according to an embodiment of the present disclosure;

FIG. 4 is a structural schematic view of a cathode conduction mechanism with an auxiliary electrode bath according to an embodiment of the present disclosure;

FIG. 5 is a front view of an overall structure of an electroplating system according to an embodiment of the present disclosure; and

FIG. 6 is a schematic view of an overall structure of a thickening groove according to an embodiment of the present disclosure.

[Reference numerals]

[0018]

10: cathode conduction mechanism, 11: first conductive belt, 12: first conductive belt assembly, 121: first belt roll, 122: second belt roll, 123: upper pressing wheel, 13: second conductive belt, 14: second conductive belt assembly, 141: third belt roll, 142: fourth belt roll, 143: lower pressing wheel, 15: conductive brush, 151: copper bar, 16: upper auxiliary electrode bath, and 17: lower auxiliary electrode bath;

20: electroplating bath, and 21: electroplating anode;

30: thin film; and

40: pre-plating bath, 41: conduction roll, 42: pass-over roll, and 43: anode plate.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0019] In order to facilitate a better understanding of the above technical solutions, the exemplary embodiments of the present disclosure are described in more detail below with reference to the accompanying drawings. Although the accompanying drawings show exemplary embodiments of the present disclosure, it should be understood that the present disclosure may be implemented in various forms and should not be limited to the embodiments set forth herein. The embodiments are provided for a more thorough understanding of the present disclosure, so as to make the scope of the present disclosure be fully conveyed to those skilled in the art.

[0020] As shown in FIG. 1, a specific implementation of the present disclosure provides a cathode conduction mechanism. The cathode conduction mechanism 10 includes first conductive belt 11, first conductive belt assembly 12, second conductive belt 13, and second conductive belt assembly 14. The first conductive belt assembly 12 includes first belt roll 121 and second belt roll 122. The first conductive belt 11 covers the first belt roll 121 and the second belt roll 122. The second conductive belt assembly 14 includes third belt roll 141 and fourth belt roll 142. The second conductive belt 13 covers the third belt roll 141 and the fourth belt roll 142. The first belt roll 121 comes in rolling contact with the third belt roll 141. The second belt roll 122 comes in rolling contact with the fourth belt roll 142. The second conductive belt 13 does not pass through the bottom of the electroplating bath to prevent leakage at the bottom of the electroplating bath. The first conductive belt 11 and the second conductive belt 13 each are only driven by two belt rolls to greatly save a cost.

[0021] As shown in FIG. 2, in some embodiments, the second conductive belt 13 is wider than the first conductive belt 11. A wider portion of the second conductive belt 13 over the first conductive belt 11 is provided with conductive brush 15. Or, the first conductive belt 11 is wider than the second conductive belt 13. A wider portion of

the first conductive belt 11 over the second conductive belt 13 is provided with the conductive brush 15. That is, in the embodiment, the first conductive belt 11 is not as wide as the second conductive belt 13, and a missing portion of the narrower conductive belt is provided with the conductive brush 15.

[0022] Specifically, due to structural limitations of a conduction mechanism in the prior art, the conductive belt is short. With a short time on the conductive belt, a current is transferred to a roll for driving the belt. Due to a small resistance and a little heating amount of the conductive belt, the conductive belt is hardly damaged by the current. However, the short conductive belt cannot satisfy a film coating requirement, so a plurality of conductive components are provided in an electroplating bath. In view of this, the first conductive belt 11 is narrower than the second conductive belt 13 in the cathode conduction mechanism 10 provided by the present disclosure. The wider portion of the second conductive belt 13 over the first conductive belt 11 is provided with the conductive brush 15. The first conductive belt 11 and the second conductive belt 13 are lengthened (for example, from 3 m to about 50 m). When the current passes through one end of each of the first conductive belt 11 and the second conductive belt 13 to the other end, more electric charges are accumulated on the first conductive belt 11 and the second conductive belt 13. Since the first conductive belt 11 and the second conductive belt 13 have a fixed thickness, the first conductive belt and the second conductive belt have a greater resistance, with the current to be increased by ten times. Consequently, a heating amount and a power voltage of each of the first conductive belt 11 and the second conductive belt 13 are increased, and the first conductive belt 11 and the second conductive belt 13 require a larger current bearing capacity. In the embodiment, by using the conductive brush 15 to contact the second conductive belt 13, the current is shunted from the second conductive belt 13. Therefore, the current on the first conductive belt 11 and the second conductive belt 13 is reduced, so as not to damage the first conductive belt 11 and the second conductive belt 13.

[0023] In some embodiments, due to a large number of the conductive brushes 15, the conductive brush 15 is connected to copper bar 151. In the embodiment of the present disclosure, with the copper bar 151, leads of all conductive brushes 15 can be gathered through the copper bar 151. This makes the whole machine wired more conveniently.

[0024] As shown in FIG. 3, in some embodiments, the first conductive belt assembly 12 further includes a plurality of upper pressing wheels 123. The plurality of upper pressing wheels 123 are located between the first belt roll 121 and the second belt roll 122, with a mounting height lower than a mounting height of each of the first belt roll 121 and the second belt roll 122. Compared with an existing device with a conductive belt structure, mounting seats of the upper pressing wheels 123 move up and down through a lifting cylinder. Only with the lifting cylinder, the upper pressing wheels 123 are driven to move up and down, thereby pulling a distance between the first conductive belt assembly 12 and the second conductive belt assembly 14 apart or close. In the present disclosure, the first conductive belt assembly 12 and the second conductive belt assembly 14 are fixed, and can share a same drive motor.

[0025] As shown in FIG. 3, in some embodiments, the second conductive belt assembly 14 further includes a plurality of lower pressing wheels 143. The plurality of lower pressing wheels 143 are located between the third belt roll 141 and the fourth belt roll 142, with a mounting height higher than a mounting height of each of the third belt roll 141 and the fourth belt roll 142. The second conductive belt 13 is tensioned through the plurality of lower pressing wheels 143, which prevents the second conductive belt 13 from shaking to affect a conduction quality. In the present disclosure, a tensioning portion of the second conductive belt 13 is mechanically tensioned by the plurality of lower pressing wheels 143. This omits an additional tensioning cylinder, simplifies a tensioning mechanism, and saves a cost.

[0026] Specifically, a portion to be lifted is changed into the upper pressing wheels 123, such that additional lifting control turns out to be unnecessary. While reducing the belt roll, the present disclosure further simplifies a drive mechanism, a lifting mechanism and a tensioning mechanism of the belt roll, thereby reducing the cost. FIG. 4 is a structural schematic view of a cathode conduction mechanism with an auxiliary electrode bath according to an embodiment of the present disclosure. As shown in FIG. 4, in some embodiments, upper auxiliary electrode bath 16 is provided above the first conductive belt assembly 12. Openings for allowing the first conductive belt 11 to pass through are respectively formed at two sides of the upper auxiliary electrode bath 16. An upper copper etching mechanism for removing copper plated particles on a surface of a conductive layer of the first conductive belt 11 is provided in the upper auxiliary electrode bath 16. Lower auxiliary electrode bath 17 is provided below the second conductive belt assembly 14. Openings for allowing the second conductive belt 13 to pass through are respectively formed at two sides of the lower auxiliary electrode bath 17. An upper copper etching mechanism for removing copper plated particles on a surface of a conductive layer of the second conductive belt 13 is provided in the lower auxiliary electrode bath 17.

[0027] Specifically, the first conductive belt 11 and the second conductive belt 13 are lengthened. That is, a distance between the first belt roll 121 and the second belt roll 122, and a distance between the third belt roll 141 and the fourth belt roll 142 are increased. Hence, an enough mounting space can be provided for the upper auxiliary electrode bath 16 and the lower auxiliary electrode bath 17.

[0028] As shown in FIG. 5, according to another aspect, a specific implementation of the present disclosure further provides an electroplating system. The electro-

plating system includes electroplating bath 20, as well as cathode conduction mechanisms 10 provided in the electroplating bath 20 in mirror symmetry. The cathode conduction mechanisms 10 are respectively located at two sides of a film feeding direction of thin film 30. A plurality of upper and lower electroplating anodes 21 are provided in the electroplating bath 20. The upper and lower electroplating anodes 21 are provided between the cathode conduction mechanisms 10 at two sides of the electroplating bath 20. Specifically, in electroplating, a plating solution is provided in the electroplating bath 20. The cathode conduction mechanisms 10 are respectively provided at the two sides of the film feeding direction of the thin film 30 and at an edge of the electroplating bath 20. The cathode conduction mechanisms 10 clamp an edge of the thin film 30 to conduct the thin film 30. An anode voltage is provided by the upper and lower electroplating anodes 21. The thin film 30 is electroplated through an electroplating circuit formed by the thin film 30, the upper and lower electroplating anodes 21, and the plating solution.

[0029] In some embodiments, a liquid inlet end of the electroplating bath 20 may further be provided with a thickening segment. The thickening segment may be structurally the same as a film coating segment. However, a mounting width between the cathode conduction mechanisms 10 in the thickening segment is slightly greater than a mounting width between the cathode conduction mechanisms in the film coating segment. That is, portions of the cathode conduction mechanisms 10 clamping the thin film 30 in the thickening segment are closer to the edge of the electroplating bath than portions of the cathode conduction mechanisms 10 clamping the thin film 30 in the film coating segment. Therefore, a plated layer of the thin film 30 on portions of the thickening segment and the film coating segment not overlapping at the edge of the electroplating bath is thickened, thereby improving a conductivity of the film coating segment.

[0030] According to the electroplating system provided by the embodiment of the present disclosure, since the whole structure of the cathode conduction mechanism 10 is provided in the electroplating bath 20, the second conductive belt 13 does not pass through the bottom of the electroplating bath 20 to prevent leakage. Meanwhile, few cathode conduction mechanisms 10 are required in the electroplating system, and two sides of the electroplating bath 20 each are only provided with one cathode conduction mechanism 10. This satisfies the film coating requirement, and greatly saves the cost.

[0031] As shown in FIG. 6, in some embodiments, pre-plating bath 40 is provided at a front end of the electroplating bath 20. Conduction roll 41, pass-over roll 42 and anode plate 43 are provided in the pre-plating bath 40. In the embodiment of the present disclosure, a metal layer with a certain thickness is provided first on the thin film 30 through the pre-plating bath 40, so as to improve a subsequent film coating quality.

[0032] The embodiment of the present disclosure has the following beneficial effects:

The second conductive belt 13 does not pass through the bottom of the electroplating bath to prevent leakage. The first conductive belt 11 and the second conductive belt 13 each are only driven by two belt rolls to greatly save a cost.

[0033] In the embodiment, by using the conductive brush 15 to contact the second conductive belt 13, the current is shunted from the second conductive belt 13. Therefore, the current on the first conductive belt 11 and the second conductive belt 13 is reduced, so as not to damage the first conductive belt 11 and the second conductive belt 13.

[0034] In the embodiment of the present disclosure, with the copper bar 151, leads of all conductive brushes 15 can be gathered through the copper bar 151. This makes the whole machine wired more conveniently.

[0035] In the embodiment of the present disclosure, the first conductive belt 11 and the second conductive belt 13 are lengthened. That is, a distance between the first belt roll 121 and the second belt roll 122, and a distance between the third belt roll 141 and the fourth belt roll 142 are increased. Hence, an enough mounting space can be provided for the upper auxiliary electrode bath 16 and the lower auxiliary electrode bath 17.

[0036] According to the electroplating system provided by the embodiment of the present disclosure, since the whole structure of the cathode conduction mechanism 10 is provided in the electroplating bath 20, the second conductive belt 13 does not pass through the bottom of the electroplating bath 20 to prevent leakage. Meanwhile, few cathode conduction mechanisms 10 are required in the electroplating system, and two sides of the electroplating bath 20 each are only provided with one cathode conduction mechanism 10. This satisfies the film coating requirement, and greatly saves the cost.

[0037] It should be understood that in the description of the present disclosure, terms such as "first" and "second" are used merely for a descriptive purpose, and should not be construed as indicating or implying relative importance, or implicitly indicating a quantity of indicated technical features. Thus, features defined with "first" and "second" may explicitly or implicitly include one or more of the features. In the description of the present disclosure, "a plurality of" means two or more, unless otherwise specifically defined.

[0038] In the present disclosure, unless otherwise clearly specified, the terms such as "mounting", "interconnection", "connection" and "fixation" are intended to be understood in a broad sense. For example, the "connection" may be a fixed connection, removable connection or integral connection; may be a mechanical connection or electrical connection; may be a direct connection or indirect connection using a medium; and may be a communication or interaction between two elements. Those of ordinary skill in the art may understand specific meanings of the above terms in the present disclosure based on a specific situation.

[0039] In the present disclosure, unless otherwise explicitly specified, when it is described that a first feature is "above" or "below" a second feature, it indicates that the first and second features are in direct contact or the first and second features are in indirect contact through an intermediate feature. In addition, when it is described that the first feature is "over", "above" and "on" the second feature, it indicates that the first feature is directly or obliquely above the second feature, or simply indicates that an altitude of the first feature is higher than that of the second feature. When it is described that a first feature is "under", "below" or "beneath" a second feature, it indicates that the first feature is directly or obliquely under the second feature or simply indicates that the first feature is lower than the second feature.

[0040] In the description of this specification, the description with reference to the terms such as "one embodiment", "some embodiments", "example", "specific example" or "some examples" means that specific features, structures, materials or characteristics described in connection with the embodiment or example are included in at least one embodiment or example of the present disclosure. In this specification, the schematic expression of the above terms is not necessarily directed to the same embodiment or example. Moreover, the specific features, structures, materials, or characteristics described may be combined in a suitable manner in any one or more embodiments or examples. In addition, those skilled in the art may combine different embodiments or examples described in this specification and characteristics of the different embodiments or examples without mutual contradiction.

[0041] Although the embodiments of the present disclosure are illustrated above, it should be understood that the above embodiments are merely illustrative and may not be construed as limiting the scope of the present disclosure. Changes, modifications, substitutions and variations may be made to the above embodiments by a person of ordinary skill in the art within the scope of the present disclosure.

Claims

1. A cathode conduction mechanism, wherein the cathode conduction mechanism (10) comprises:

   a first conductive belt (11) and a first conductive belt assembly (12), wherein the first conductive belt assembly (12) comprises a first belt roll (121) and a second belt roll (122), and the first conductive belt (11) covers the first belt roll (121) and the second belt roll (122); and
   a second conductive belt (13) and a second conductive belt assembly (14), wherein the second conductive belt assembly (14) comprises a third belt roll (141) and a fourth belt roll (142), and the second conductive belt (13) covers the third belt roll (141) and the fourth belt roll (142), wherein the first belt roll (121) comes in rolling contact with the third belt roll (141), and the second belt roll (122) comes in rolling contact with the fourth belt roll (142).

2. The cathode conduction mechanism according to claim 1, wherein

   the second conductive belt (13) is wider than the first conductive belt (11), and a wider portion of the second conductive belt (13) over the first conductive belt (11) is provided with a conductive brush (15); or,
   the first conductive belt (11) is wider than the second conductive belt (13), and a wider portion of the first conductive belt (11) over the second conductive belt (13) is provided with the conductive brush (15).

3. The cathode conduction mechanism according to claim 2, wherein
   the conductive brush (15) is connected to a copper bar (151).

4. The cathode conduction mechanism according to claim 1, wherein
   the first conductive belt assembly (12) further comprises a plurality of upper pressing wheels (123); and the plurality of upper pressing wheels (123) are located between the first belt roll (121) and the second belt roll (122), with a mounting height lower than a mounting height of each of the first belt roll (121) and the second belt roll (122).

5. The cathode conduction mechanism according to claim 1, wherein
   the second conductive belt assembly (14) further comprises a plurality of lower pressing wheels (143); and the plurality of lower pressing wheels (143) are located between the third belt roll (141) and the fourth belt roll (142), with a mounting height higher than a mounting height of each of the third belt roll (141) and the fourth belt roll (142).

6. The cathode conduction mechanism according to claim 1, wherein

   an upper auxiliary electrode bath (16) is provided above the first conductive belt assembly (12), and openings for allowing the first conductive belt (11) to pass through are respectively formed at two sides of the upper auxiliary electrode bath (16); and
   an upper copper etching mechanism for removing copper plated particles on a surface of a conductive layer of the first conductive belt (11) is provided in the upper auxiliary electrode bath

(16).

7. The cathode conduction mechanism according to claim 1, wherein

a lower auxiliary electrode bath (17) is provided below the second conductive belt assembly (14), and openings for allowing the second conductive belt (13) to pass through are respectively formed at two sides of the lower auxiliary electrode bath (17); and
an upper copper etching mechanism for removing copper plated particles on a surface of a conductive layer of the second conductive belt (13) is provided in the lower auxiliary electrode bath (17).

8. An electroplating system, comprising

an electroplating bath (20), as well as cathode conduction mechanisms (10) provided in a film coating segment of the electroplating bath (20) in mirror symmetry, wherein the cathode conduction mechanisms (10) are respectively located at two sides of a film feeding direction of a thin film (30); and
a plurality of upper and lower electroplating anodes (21) are provided in the electroplating bath (20), and the upper and lower electroplating anodes (21) are provided between the cathode conduction mechanisms (10) at two sides of the electroplating bath (20).

9. The electroplating system according to claim 8, wherein
a thickening segment is further provided at a front end of the film coating segment of the electroplating bath (20), and the thickening segment is configured to thicken a plated layer at an edge of the thin film (30).

10. The electroplating system according to claim 8, wherein
a pre-plating bath (40) is provided at a front end of the electroplating bath (20); and a conduction roll (41), a pass-over roll (42) and an anode plate (43) are provided in the pre-plating bath (40).

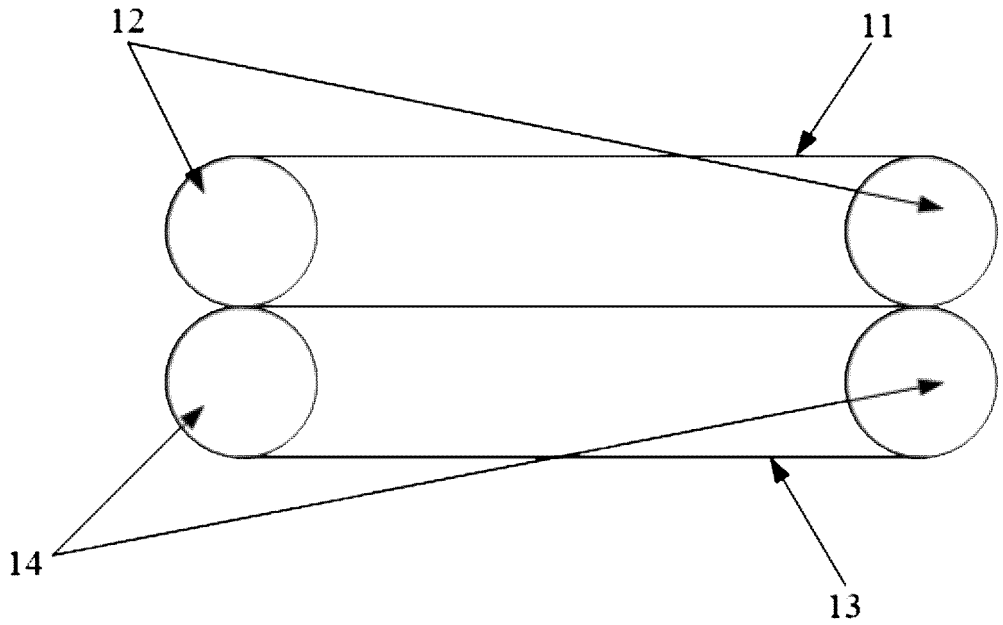

FIG. 1

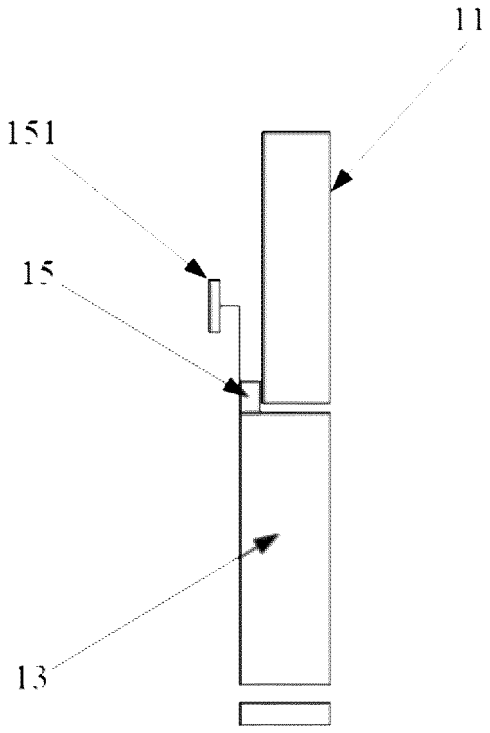

FIG. 2

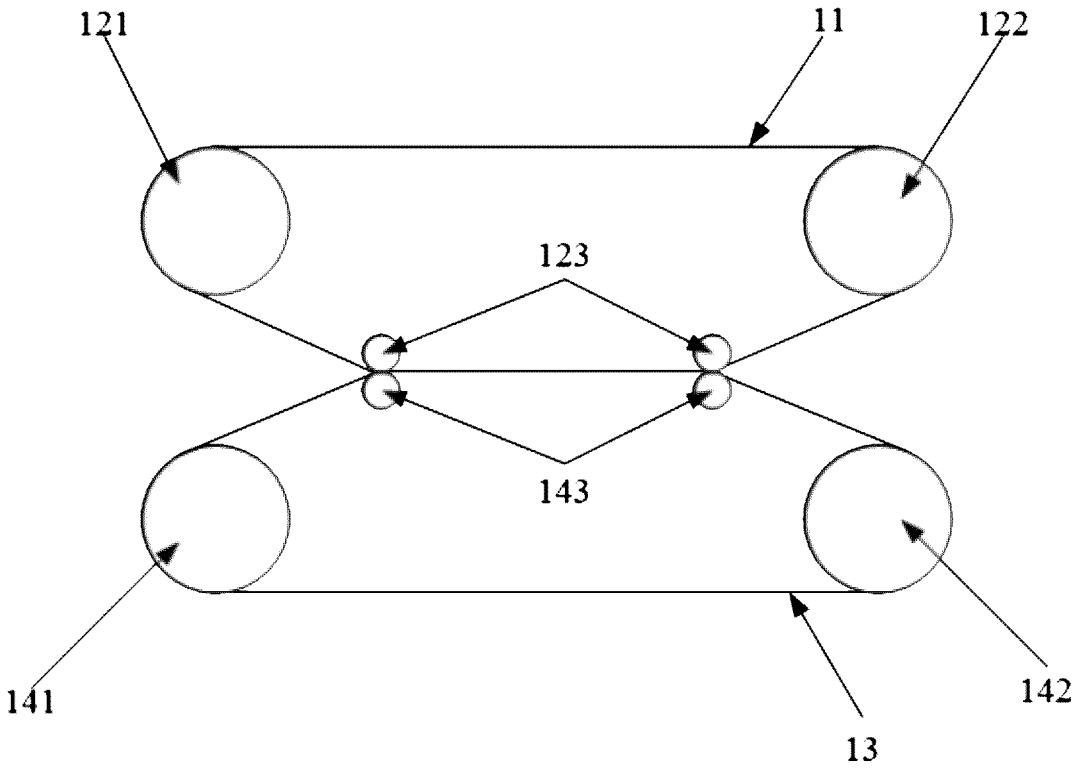

FIG. 3

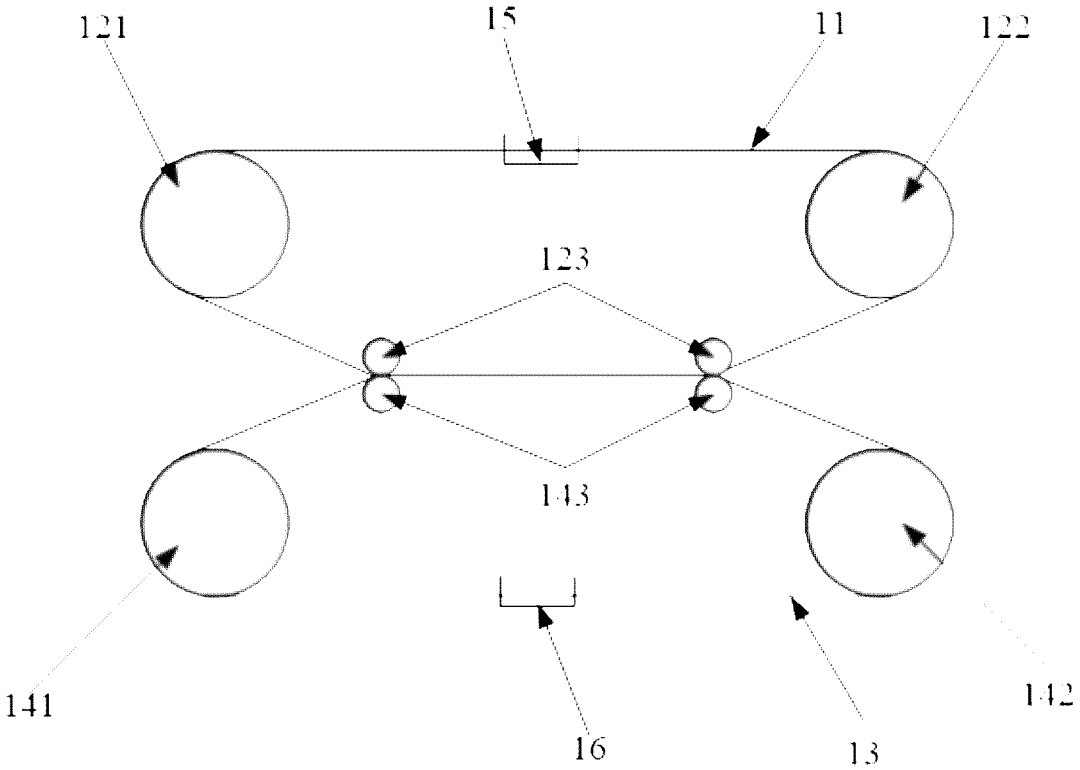

FIG. 4

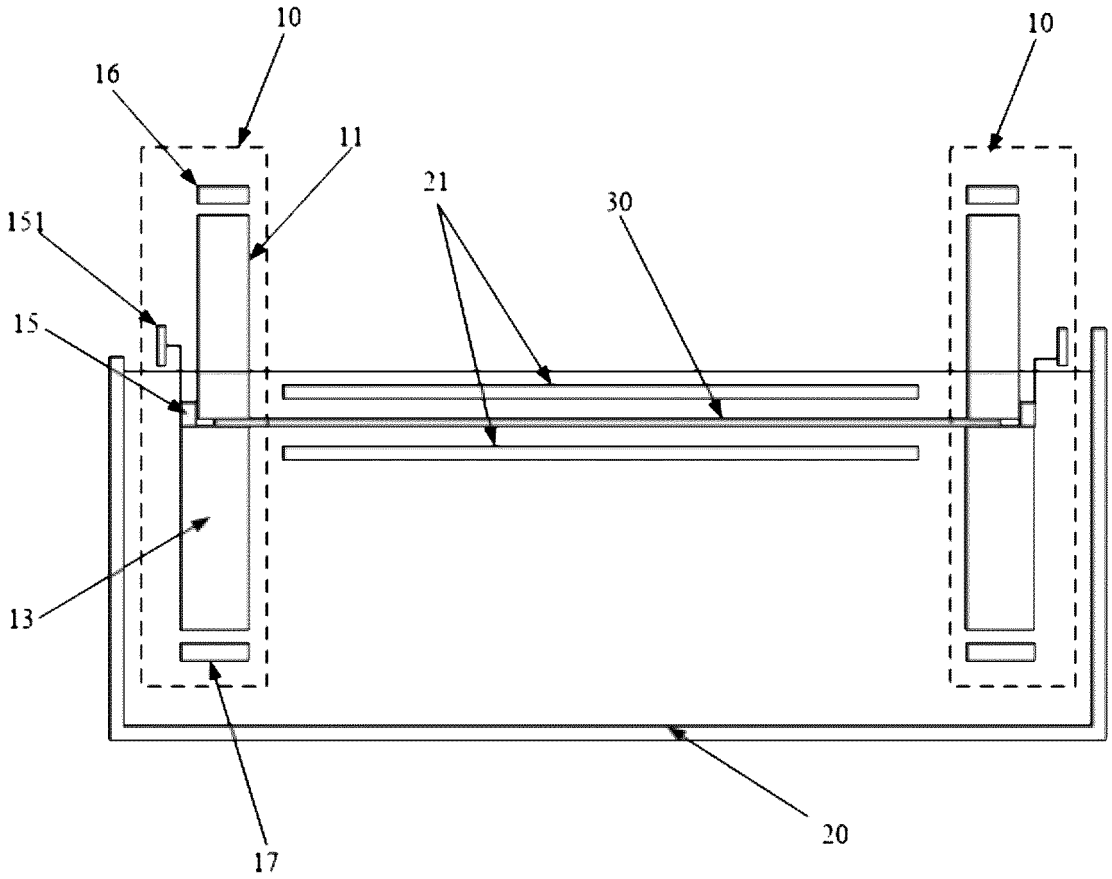

FIG. 5

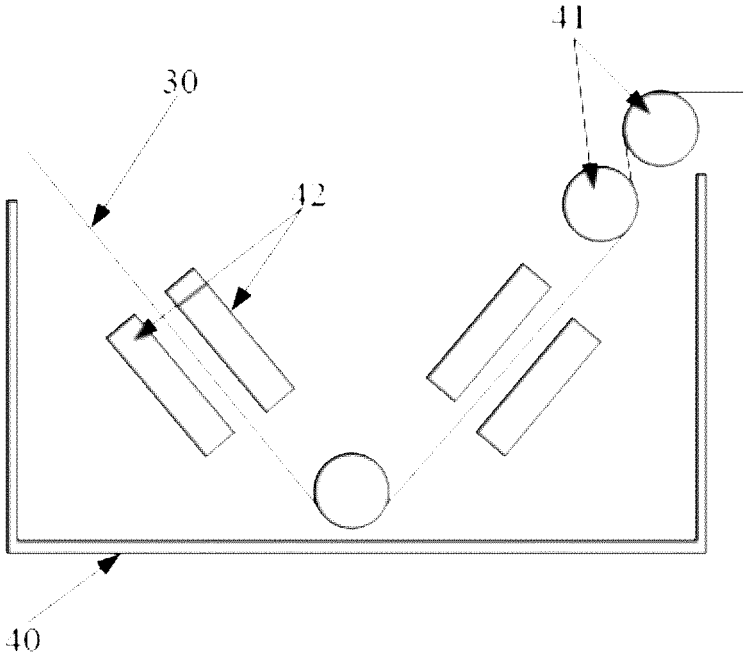

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/075610

A. CLASSIFICATION OF SUBJECT MATTER

C25D17/10(2006.01)i; C25D17/00(2006.01)i; C25D17/02(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)

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)

CNTXT, DWPI, ENTXT, ENTXTC, VEN, CNKI: 重庆金美新材料科技有限公司, 导电带, 导电皮带, 皮带, 导电辊, 导电轮, 辊, 轮, 皮带辊, 皮带轮, 上压, 下压, 压紧, 夹紧, 张紧, 电镀, electric+, conduct+, tape+, band+, roll+, wheel+, compact+, compress+, clamp+, tension+, electroplat+, plat+, electrodeposit+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 114150359 A (KUNSHAN XINMEIYUAN ELECTRONIC TECHNOLOGY CO., LTD.) 08 March 2022 (2022-03-08) description, paragraphs [0020]-[0035], and figures 1 and 3-5	8-10
Y	CN 114150359 A (KUNSHAN XINMEIYUAN ELECTRONIC TECHNOLOGY CO., LTD.) 08 March 2022 (2022-03-08) description, paragraphs [0020]-[0035], and figures 1 and 3-5	1-7
X	CN 217266090 U (KUNSHAN XINMEIYUAN ELECTRONIC TECHNOLOGY CO., LTD.) 23 August 2022 (2022-08-23) claims 1-10, and figures 1-8	8-10
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X	CN 215593226 U (NINGDE CONTEMPORARY AMPEREX TECHNOLOGY CO., LTD.) 21 January 2022 (2022-01-21) description, paragraphs [0052]-[0079], and figure 1	8-10

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 July 2023	**20 July 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.

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/075610

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 215593226 U (NINGDE CONTEMPORARY AMPEREX TECHNOLOGY CO., LTD.) 21 January 2022 (2022-01-21) description, paragraphs [0052]-[0079], and figure 1	1-7
Y	CN 114182328 A (SHENZHEN XINRUILONG PRECISION MACHINERY CO., LTD.) 15 March 2022 (2022-03-15) claims 1-10	4-7
X	CN 114164478 A (SHENZHEN XINRUILONG PRECISION MACHINERY CO., LTD.) 11 March 2022 (2022-03-11) description, paragraphs [0034]-[0053]	8-10
Y	CN 114164478 A (SHENZHEN XINRUILONG PRECISION MACHINERY CO., LTD.) 11 March 2022 (2022-03-11) description, paragraphs [0034]-[0053]	4-7
X	CN 114351220 A (KUNSHAN XINMEIYUAN ELECTRONIC TECHNOLOGY CO., LTD.) 15 April 2022 (2022-04-15) claims 1-10	8-10
A	CN 113247668 A (CHONGQING JIMAT NEW MATERIAL TECHNOLOGY CO., LTD.) 13 August 2021 (2021-08-13) entire document	1-10
A	CN 101473072 A (BASF SE) 01 July 2009 (2009-07-01) entire document	1-10
A	CN 202954119 U (HERUILIAN TECHNOLOGY (XIAMEN) CO., LTD.) 29 May 2013 (2013-05-29) entire document	1-10
A	CN 210458392 U (SHENZHEN HUIEMI NEW TECHNOLOGY CO., LTD.) 05 May 2020 (2020-05-05) entire document	1-10
A	CN 214612816 U (XIAMEN HAICHEN NEW MATERIAL TECHNOLOGY CO., LTD.) 05 November 2021 (2021-11-05) entire document	1-10
A	CN 215757718 U (CHONGQING JIMAT NEW MATERIAL TECHNOLOGY CO., LTD.) 08 February 2022 (2022-02-08) entire document	1-10
A	JP 2010095783 A (NIPPON STEEL ENG CO., LTD. et al.) 30 April 2010 (2010-04-30) entire document	1-10

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INTERNATIONAL SEARCH REPORT

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Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Claim 1: A cathode conductive mechanism, characterized in that the cathode conductive mechanism (10) comprises: a first conductive belt (11) and a first conductive belt assembly (12), the first conductive belt assembly (12) comprising a first belt roller (121) and a second belt roller (122), and the first conductive belt (11) wrapping outer sides of the first belt roller (121) and the second belt roller (122); and a second conductive belt (13) and a second conductive belt assembly (14), the second conductive belt assembly (14) comprising a third belt roller (141) and a fourth belt roller (142), and the second conductive belt (13) wrapping outer sides of the third belt roller (141) and the fourth belt roller (142), wherein the first belt roller (121) is in up-and-down rolling contact with the third belt roller (141), and the second belt roller (122) is in rolling contact with the fourth belt roller (142).

Claim 8: An electroplating system, characterized by comprising an electroplating bath (20), and cathode conductive mechanisms (10) mirror-symmetrically arranged at a coating section of the electroplating bath (20), wherein the cathode conductive mechanisms (10) are respectively located on two sides of a thin film (30) in a film feeding direction; and several upper and lower electroplating anodes (21) are provided in the electroplating bath (20), and the upper and lower electroplating anodes (21) are arranged between the cathode conductive mechanisms (10) on two sides of the electroplating bath (20).

The International Authority considers that the claims comprise two inventions set forth in independent claims 1 and 8, i.e., a cathode conductive mechanism having specific structures such as a conductive belt, and an electroplating system having cathode conductive mechanisms mirror-symmetrically arranged at the coating section. A cathode conductive mechanism itself is well-known. Claims 1 and 8 do not have a reference relationship, and the two cathode conductive mechanisms of claims 1 and 8 are only the same in name and substantially do not have other same or corresponding structural features. Therefore, the two inventions do not have a same or corresponding technical feature, obviously do not have a special technical feature that defines a contribution which the inventions make over the prior art, do not have a technical relationship therebetween, do not fall within a single general inventive concept, and therefore do not comply with the requirement of unity of invention and do not comply with PCT Rule 13.1.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☑ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/075610

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CN 114150359 A	08 March 2022	None	
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CN 215593226 U	21 January 2022	WO 2023000904 A1	26 January 2023
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JP 2010095783 A	30 April 2010	None	

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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