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(54) Titre : DISPOSITIF ET PROCEDE POUR L'USINAGE D'UNE PLAQUE D'ANODE POUR ELECTROLYSE
(54) Title: APPARATUS AND METHOD FOR MACHINING ANODE PLATE FOR ELECTROLYSIS

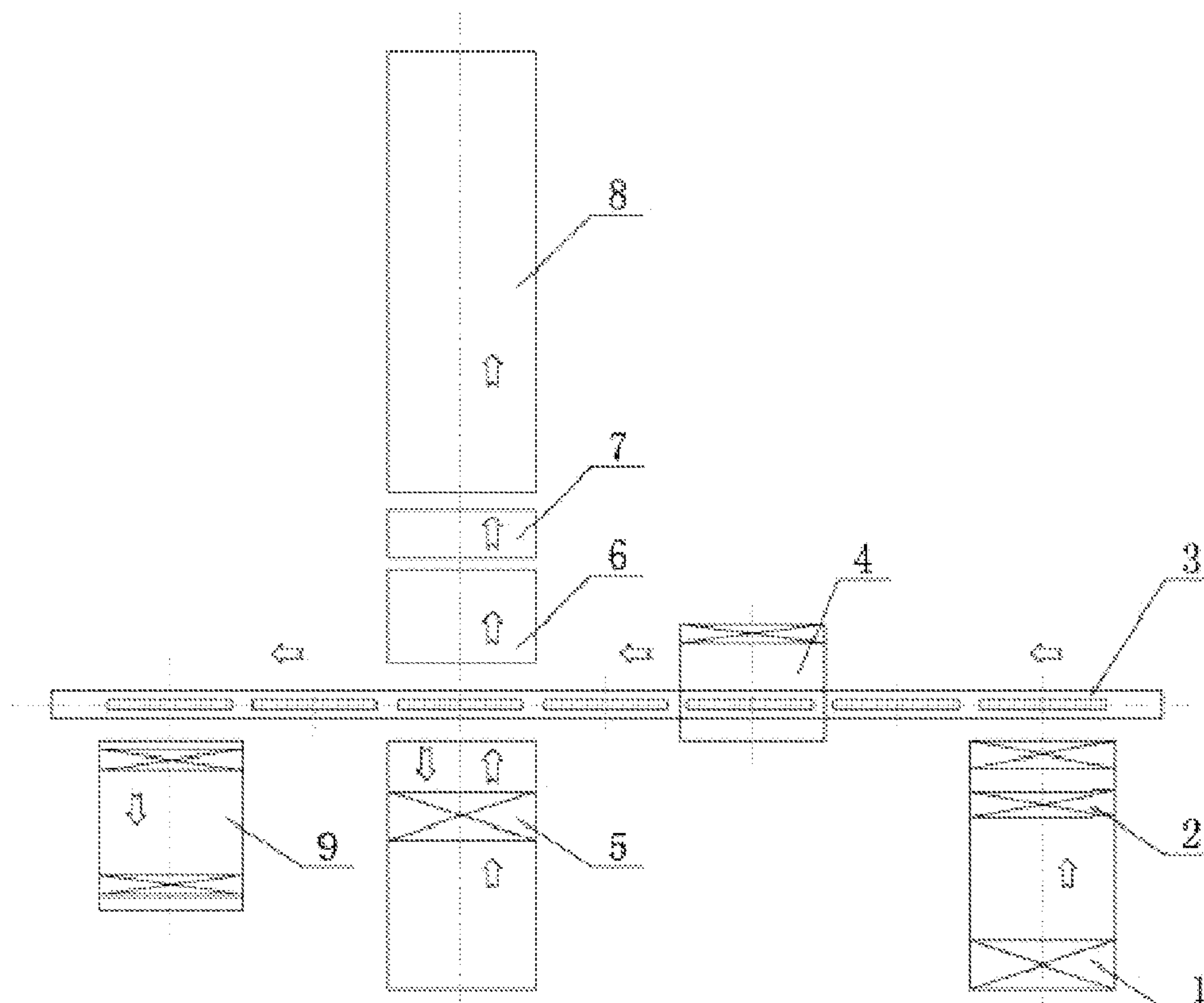
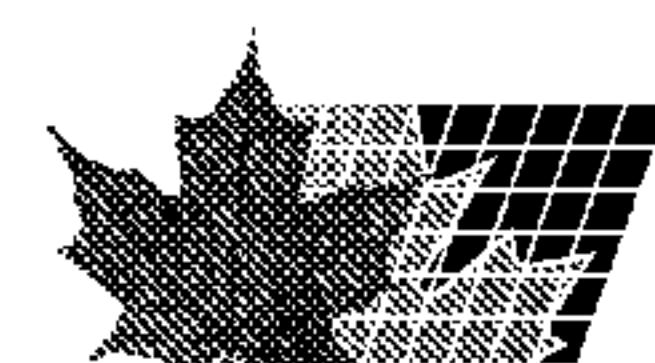


图 1 /FIG.1

(57) Abrégé/Abstract:

A device and method for machining anode plate for electrolysis, comprising a transverse movement device (3), a panel-shaping press and thickness measuring device (4), a bottom milling device (6) and a lateral milling device (5). The bottom milling device (6)



(57) **Abrégé(suite)/Abstract(continued):**

is arranged on one side of the transverse movement device (3), and downstream the panel-shaping press and thickness measuring device (4) in transverse direction. The lateral milling device (5) is arranged on the other side of the transverse movement device (3), and downstream the panel-shaping press and thickness measuring device (4) in transverse direction. The lateral milling device (5) and bottom milling device (6) can be operated individually, and the efficiency of anode plate machining is improved.

1 ABSTRACT

2 An apparatus and method for processing anode plate for electrolysis, the apparatus includes
3 a transverse transmission device (3) for transmitting the anode plate in a transverse direction; a
4 plate-flattening and thickness-measuring device (4) for flattening the anode plate and measuring
5 a thickness of the anode plate; a hanger bottom milling device (5) configured to mill a bottom
6 surface of a hanger of the anode plate, disposed at a first side of the transverse transmission
7 device (3) and positioned downstream of the plate-flattening and thickness-measuring device (4)
8 in the transverse direction; and a hanger side milling device (6) configured to mill a side surface
9 of the hanger of the anode plate, disposed at a second side of the transverse transmission
10 device (3) and positioned downstream of the plate-flattening and thickness-measuring device (4)
11 in the transverse direction.

1 APPARATUS AND METHOD FOR PROCESSING ANODE PLATE FOR ELECTROLYSIS**2 FIELD**

3 Embodiments of the present invention generally relate to a field of copper electrolysis
4 technology, more particularly, to an apparatus and method for processing an anode plate for
5 electrolysis.

6 BACKGROUND

7 An anode plate for electrolysis is generally manufactured via casting, thus a deformation
8 and a dimension error of the anode plate are large. In order to improve a drape coefficient and an
9 electrical efficiency in production of the anode plate, and to reduce a short circuit and a contact
10 resistance of the anode plate, the anode plate is needed to process by an anode plate
11 processing apparatus.

12 The apparatus usually includes an anode receiving-separating-rectifying-weighting device, a
13 plate-flattening and thickness-measuring device, a defective anode plate receiving device, a
14 hanger side milling device, a hanger bottom milling device and an arranging device.

15 In anode plate processing apparatus in the related art, the hanger side milling device and
16 the hanger bottom milling device are connected (i.e. arranged) in series, namely, the anode plate
17 will be processed by the hanger bottom milling device after passing through the hanger side
18 milling device. Since the milling area of the hanger to be processed by the hanger side milling
19 device is large and a milling feed of the hanger is small, particularly, the anode plate with a large
20 hanger milling thickness is required to mill by the hanger side milling device several times. Thus,
21 a lot of processing time for hanger side milling is needed, causing decreasing of an operation
22 efficiency of the anode plate process apparatus.

23 SUMMARY

24 Embodiments of the present invention seek to solve at least one of the problems existing in
25 the related art to at least some extent.

26 An apparatus for processing an anode plate for electrolysis according to embodiments of a
27 first broad aspect of the present invention, includes: a transverse transmission device for
28 transmitting the anode plate in a transverse direction; a plate-flattening and thickness-measuring
29 device for flattening the anode plate being transmitted on the transverse transmission device and
30 measuring a thickness of the anode plate being transmitted on the transverse transmission

1 device; a hanger bottom milling device configured to mill a bottom surface of a hanger of the
2 anode plate, disposed at a first side of the transverse transmission device and positioned
3 downstream of the plate-flattening and thickness-measuring device in the transverse direction;
4 and a hanger side milling device configured to mill a side surface of the hanger of the anode
5 plate, disposed at a second side of the transverse transmission device and positioned
6 downstream of the plate-flattening and thickness-measuring device in the transverse direction.

7 With disposing the hanger bottom milling device and the hanger side milling device at a first
8 side and a second side of the transverse transmission device respectively, when it is not needed
9 to mill the side surface of the hanger of the anode plate flattened and measured by the
10 plate-flattening and thickness-measuring device, the anode plate can be directly transmitted to
11 the hanger bottom milling device to mill the bottom surface of the hanger. When the anode plate
12 flattened and measured by the plate-flattening and thickness-measuring device is needed to mill
13 the side surface of the hanger, the anode plate is transmitted to the hanger side milling device to
14 mill the side surface of the hanger, and then the anode plate is transmitted to the hanger bottom
15 milling device to mill the bottom surface of the hanger. In other words, the hanger side milling
16 device and the hanger bottom milling device are connected (i.e. arranged) in parallel, and
17 operate independently from each other, thus the operation of the hanger side milling device will
18 not affect the operations of the hanger bottom milling device and the whole apparatus, thus
19 improving the operation efficiency of the apparatus.

20 In some embodiments, the hanger bottom milling device is opposite the hanger side milling
21 device in a direction perpendicular to the transverse direction.

22 In some embodiments, the apparatus further includes a plate receiving device configured to
23 receive the anode plate, and a conveying-separating-rectifying-weighting device configured for
24 chain-conveying the received anode plates, separating the received anode plates, vertically
25 rectifying the hangers of the anode plates and weighting the received anode plates, the plate
26 receiving device and the conveying-separating-rectifying-weighting device being arranged in
27 series and disposed upstream of the plate-flattening and thickness-measuring device in the
28 transverse direction.

29 In some embodiments, the plate receiving device and the
30 conveying-separating-rectifying-weighting device are disposed at the second side of the

1 transverse transmission device and adjacent to an upstream end of the transverse transmission
2 device.

3 In some embodiments, the apparatus further includes a defective anode plate collecting
4 device configured to remove and collect a defective anode plate and disposed downstream of
5 the hanger bottom milling device and the hanger side milling device.

6 In some embodiments, the defective anode plate collecting device is disposed at the second
7 side of the transverse transmission device and adjacent to a downstream end of the transverse
8 transmission device.

9 In some embodiments, the apparatus further includes a lifting device and an anode plate
10 conveying-arranging device which are disposed downstream of the first milling device in turn in
11 the direction perpendicular to the transverse direction.

12 The method for processing an anode plate for electrolysis according to embodiments of a
13 second broad aspect of the present invention, includes: transmitting the anode plate in a
14 transverse direction via a transverse transmission device; flattening the anode plate and
15 measuring a thickness of the anode plate during transmitting the anode plate in the transverse
16 direction; judging whether the flattened and measured anode plate being needed to mill a side
17 surface of the hanger by a hanger side milling device; milling a bottom surface of the hanger of
18 the flattened and measured anode plate by a hanger bottom milling device if the flattened and
19 measured anode plate is not needed to mill the side surface of the hanger; and milling the side
20 surface of the hanger of the flattened and measured anode plate by the hanger side milling
21 device, and then milling the bottom surface of the hanger by the hanger bottom milling device if
22 the flattened and measured anode plate is needed to mill the side surface of the hanger.

23 The method for processing an anode plate for electrolysis according to embodiments of the
24 present invention, can improve operation efficiency.

25 In some embodiments, the method further includes judging whether the flattened and
26 measured anode plate being qualified before judging whether the side surface of the hanger of
27 the flattened and measured anode plate is needed to mill by the hanger side milling device, and
28 removing and collecting a defective anode plate if the flattened and measured anode plate is
29 defective.

1 In some embodiments of the present invention, the method further includes arranging the
2 anode plate with the bottom surface of the hanger being milled via a lifting device and an anode
3 plate conveying-arranging device.

4 Additional aspects and advantages of embodiments of present invention will be given in part
5 in the following descriptions, become apparent in part from the following descriptions, or be
6 learned from the practice of the embodiments of the present invention.

7 BRIEF DESCRIPTION OF THE DRAWINGS

8 These and other aspects and advantages of embodiments of the present invention will
9 become apparent and more readily appreciated from the following descriptions made with
10 reference to the accompanying drawings, in which:

11 Fig. 1 is a schematic view of an apparatus for processing an anode plate for electrolysis
12 according to an embodiment of the present invention;

13 Fig. 2 is a flow char of a method for processing an anode plate for electrolysis according to
14 an embodiment of the present invention.

15 DETAILED DESCRIPTION

16 Reference will be made in detail to embodiments of the present invention. The embodiments
17 described herein with reference to drawings are explanatory, illustrative, and used to generally
18 understand the present invention. The embodiments shall not be construed to limit the present
19 invention. The same or similar elements and the elements having same or similar functions are
20 denoted by like reference numerals throughout the descriptions.

21 In the specification, unless specified or limited otherwise, relative terms such as "central",
22 "longitudinal", "side", "front", "rear", "right", "left", "inner", "outer", "lower", "upper", "horizontal",
23 "vertical", "above", "below", "up", "top", "bottom" as well as derivative thereof (e.g., "horizontally",
24 "downwardly", "upwardly", etc.) should be construed to refer to the orientation as then described
25 or as shown in the drawings under discussion. These relative terms are for convenience of
26 description and do not require that the present invention be constructed or operated in a
27 particular orientation.

28 Fig. 1 is a schematic view of an apparatus for processing an anode plate for electrolysis
29 according to an embodiment of the present invention. As shown in Fig. 1, directions of hollow
30 arrows indicate transmitting directions of the anode plate. The apparatus for processing an

1 anode plate for electrolysis according to embodiments of the present invention includes a
2 transverse transmission device 3, a plate-flattening and thickness-measuring device 4, a hanger
3 side milling device 5 and a hanger bottom milling device 6.

4 Specifically, the transverse transmission device 3 transmits the anode plate in a transverse
5 direction (the left-right direction in Fig. 1), from upstream to downstream. During transmitting, the
6 respective devices of the apparatus expect for the transverse transmission device 3 can
7 correspondingly process or machine the anode plate.

8 Here, the transverse direction is the left right direction in the Fig. 1, and the transverse
9 transmission device 3 can transmit the anode plate in the left-right direction in Fig. 1, in which the
10 right side is the upstream side of the apparatus and the left side is the downstream side of the
11 apparatus.

12 The plate-flattening and thickness-measuring device 4 is used to flatten the anode plate and
13 to measure a thickness of the anode plate when the anode plate is being transmitted on the
14 transverse transmission device 3. In other words, when the anode plate on the transverse
15 transmission device 3 is transmitted to the plate-flattening and thickness-measuring device 4, the
16 plate-flattening and thickness-measuring device 4 can flatten the anode plate and measure the
17 thickness of the anode plate.

18 The hanger bottom milling device 6 is used to mill a bottom surface of the hanger of the
19 anode plate. The hanger bottom milling device 6 may be disposed at a first side of the transverse
20 transmission device 3 (for example, an upper side of the transverse transmission device 3 in Fig.
21 1) and positioned downstream of the plate-flattening and thickness-measuring device 4 in the
22 transverse direction. Thus, the bottom surface of the hanger of the anode plate may be milled
23 after the anode plate is processed by the plate-flattening and thickness-measuring device 4.

24 The hanger side milling device 5 is used to mill a side surface of the hanger of the anode
25 plate. The hanger side milling device 5 may be disposed at a second side of the transverse
26 transmission device 3 (for example, a lower side of the transverse transmission device 3) and
27 positioned downstream of the plate-flattening and thickness-measuring device 4 in the
28 transverse direction. Thus, the side surface of the hanger of the anode plate may be milled after
29 the anode plate is processed by the plate-flattening and thickness-measuring device 4.

30 With the apparatus for processing an anode plate for electrolysis according to embodiments of
31 the present invention, the anode plate flattened and measured by the plate-flattening and

1 thickness-measuring device 4 can be transmitted to the hanger side milling device 5 or the
2 hanger bottom milling device 6 selectively.

3 For example, a first anode plate is transmitted to the hanger side milling device 5 to mill the
4 side surface of the hanger of the first anode plate, a second anode plate next to the first anode
5 plate may be directly transmitted to the hanger bottom milling device 6 to mill the bottom surface
6 of the hanger thereof, if the second anode plate is not needed to mill the side surface of the
7 hanger thereof. Thus, the operation of the hanger side milling device 5 will not affect the
8 operation of the hanger bottom milling device 6.

9 The first anode plate with the side surface of the hanger being milled is transmitted to the
10 hanger bottom milling device 6 to mill the bottom surface of the hanger, and the flattened and
11 measured anode plate which is not needed to mill the side surface of the hanger thereof, can be
12 directly transmitted to the hanger bottom milling device 6 to mill the bottom surface of the hanger.
13 Generally, the side surface of the hanger is milled for several times, so that the milling of the
14 surface of the hanger needs more time. With the apparatus of the embodiments of the present
15 invention, the milling of the side surface of the hanger will not affect the milling of the bottom
16 surface of the hanger, thus, the operation efficiency of the apparatus is improved.

17 With disposing the hanger bottom milling device 6 and the hanger side milling device 5 at
18 the first side and the second side of the transverse transmission device 3 respectively, when the
19 flattened and measured anode plate is not needed to mill the side surface of the hanger, the
20 flattened and measured anode plate can be directly transmitted to the hanger bottom milling
21 device 6 to mill the bottom surface of the hanger. When the flattened and measured anode plate
22 is needed to mill the side surface of the hanger, the flattened and measured anode plate will be
23 transmitted to the hanger side milling device 5 to mill the side surface of the hanger first, after
24 milling the side surface of the hanger, the anode plate is transmitted to the hanger bottom milling
25 device 6 to mill the bottom surface of the hanger. In other words, the hanger side milling device 5
26 and the hanger bottom milling device 6 are arranged in parallel, and operate independently of
27 each other. The operation of the hanger side milling device 5 will not affect the operations of the
28 hanger bottom milling device 6 and the whole apparatus, thus the operation efficiency of the
29 apparatus is improved.

30 In some embodiments, as shown in Fig. 1, the hanger bottom milling device 6 is opposite to
31 the hanger side milling device 5 in a direction perpendicular to the transverse direction. Thus, it is

1 convenient to transmit the anode plate with the side surface milled to the hanger bottom milling
2 device 6 from the hanger side milling device 5, thus the operation efficiency is further improved.

3 In some embodiments, the apparatus may further include a plate receiving device 1 used to
4 receive the anode plate, and a conveying-separating-rectifying-weighting device 2 for
5 chain-conveying the received anode plates, separating the received anode plates, vertically
6 rectifying the hangers of the anode plates and weighting the received anode plates.

7 The plate receiving device 1 and the conveying-separating-rectifying-weighting device 2 are
8 arranged in series and disposed upstream of the plate-flattening and thickness-measuring device
9 4 in the transverse direction, as shown in Fig. 1. Thus, the anode plate can be processed initially,
10 then transmitted to the transverse transmission device 3 piece by piece, which facilitates the
11 further processing of the anode plate.

12 Moreover, the plate receiving device 1 and the conveying-separating-rectifying-weighting
13 device 2 are disposed at the second side of the transverse transmission device 3 and adjacent to
14 an upstream end of the transverse transmission device 3. Thus, the plate receiving device 1, the
15 conveying-separating-rectifying-weighting device 2 and the hanger side milling device 5 are
16 disposed at the same side of the transverse transmission 3 so as to provide a sufficient operation
17 space for the apparatus at the first side.

18 In some embodiments, as shown in Fig. 1, the apparatus may further include a defective
19 anode plate collecting device 9 which is used to remove and collect a defective anode plate and
20 is disposed downstream of the hanger bottom milling device 6 and the hanger side milling device
21 5. Thus, the defective anode plate selected by the plate-flattening and thickness-measuring
22 device 4 can be collected by the defective anode plate collecting device 9 and then removed
23 from the apparatus.

24 Alternately, the defective anode plate collecting device 9 may be disposed at the second
25 side of the transverse transmission device 3 and adjacent to a downstream end of the transverse
26 transmission device 3, thus providing the sufficient operation space for the apparatus at the first
27 side.

28 In some embodiments, as shown in Fig. 1, the apparatus may further include a lifting device
29 7 and an anode plate conveying-arranging device 8 which are disposed downstream of the
30 hanger bottom milling device 6 in turn in the direction perpendicular to the transverse direction.

1 Thus, the anode plate, whose the bottom surface of the hanger is milled by the hanger bottom
2 milling device 6, can be arranged and transmitted out of the apparatus.

3 Alternately, the lifting device 7 and the anode plate conveying-arranging device 8 may be
4 disposed at the first side of the transverse transmission device 3, thus facilitating the operating
5 the processed anode plate.

6 Other components and operations of the apparatus for processing an anode plate for
7 electrolysis according to embodiments of the present invention may be commonly known by
8 those skilled in the art, detailed descriptions thereof are omitted herein.

9 An operation of the apparatus for processing an anode plate for electrolysis will be
10 described with reference to Fig. 1.

11 Firstly, the anode plate to be processed is separated and weighted by the plate receiving
12 device 1 and the conveying-separating-rectifying-weighting device 2, and the hangers of the
13 anode plate is vertically rectified by the conveying-separating-rectifying-weighting device 2, then
14 the anode plate is transmitted onto the transverse transmission device 3.

15 Next, the anode plate is transmitted to the plate-flattening and thickness measuring device 4
16 by the transverse transmission device 3, the anode plate is flatten and a thickness of the anode
17 plate is measured by the plate-flattening and thickness measuring device 4, so as to classify the
18 anode plates into three types according to the thicknesses of the anode plates.

19 The three types of the anode plates are the defective anode plate, the anode plate being not
20 needed to mill the side surface of the hanger and the anode plate being needed to mill the side
21 surface of the hanger.

22 After the classification, the defective anode plates are transmitted to the defective anode
23 plate collecting device 9 and removed from the apparatus; the anode plate being not needed to
24 mill the side surface of the hanger is transmitted to the hanger bottom milling device 6 directly to
25 mill the bottom surface of the hanger; the anode plate being needed to mill the side surface of the
26 hanger is transmitted to the hanger side milling device 5 to mill the side surface of the hanger,
27 after the milling of the side surface of the hanger, the anode plate is transmitted to the hanger
28 bottom milling device 6 to mill the bottom surface of the hanger.

1 Finally, after the milling of the bottom surface of the hanger, the anode plate is arranged and
2 transmitted out of the apparatus by the lifting device 7 and the anode plate conveying-arranging
3 device 8.

4 Fig. 2 is a flow char of a method for processing an anode plate for electrolysis according to
5 an embodiment of the present invention. The method for processing an anode plate for
6 electrolysis according to embodiments of the present invention includes:

7 Step S10, transmitting an anode plate in a transverse direction via a transverse transmission
8 device 3.

9 Step S20, flattening the anode plate and measuring a thickness of the anode plate during
10 transmitting the anode plate in the transverse direction.

11 Step S30, judging whether the flattened and measured anode plate being needed to mill a
12 side surface of the hanger by a hanger side milling device 5.

13 Step S40, milling a bottom surface of the hanger of the flattened and measured anode plate
14 by a hanger bottom milling device 6 if the flattened and measured anode plate is not needed to
15 mill the side surface of the hanger.

16 Step S50, milling the side surface of the hanger of the flattened and measured anode plate
17 by the hanger side milling device 5, and then milling the bottom surface of the hanger by the
18 hanger bottom milling device 6, if the flattened and measured anode plate is needed to mill the
19 side surface of the hanger.

20 With the method according to embodiments of the present invention, the operation of the
21 hanger side milling device 5 cannot affect the operations of the hanger bottom milling device 6
22 and the whole apparatus, thus the operation efficiency of the apparatus is improved.

23 In some embodiments, the method further includes the step of judging whether the flattened
24 and measured anode plate being qualified before judging whether the side surface of the hanger
25 of the flattened and measured anode plate is needed to mill by the hanger side milling device 5,
26 and removing and collecting the defective anode plate if the flattened and measured anode plate
27 is defective. Thus, the detective anode plates and the qualified anode plates can be
28 distinguished and transmitted respectively, and the rate qualify of the anode plate can be
29 improved.

1 In some embodiments, the method further includes the step of arranging the anode plate
2 with the bottom surface of the hanger being milled via a lifting device and an anode plate
3 conveying-arranging device, thus facilitating the succeeding processes of the processed anode
4 plate.

5 The method according to embodiments of the present invention can dreamily improve
6 processing efficiency of the anode plate. And other procedures and steps in the method are
7 commonly known by those skilled in the art, which are omitted herein.

8 Although explanatory embodiments have been shown and described, it would be
9 appreciated by those skilled in the art that the above embodiments cannot be construed to limit
10 the present invention, and changes, alternatives, and modifications can be made in the
11 embodiments without departing from spirit, principles and scope of the present invention.

WE CLAIM:

1. An apparatus for processing an anode plate for electrolysis, comprising:
 - a transverse transmission device for transmitting the anode plate in a transverse direction;
 - a plate-flattening and thickness-measuring device for flattening the anode plate being transmitted on the transverse transmission device and measuring a thickness of the anode plate being transmitted on the transverse transmission device;
 - a hanger bottom milling device configured to mill a bottom surface of a hanger of the anode plate, disposed at a first side of the transverse transmission device and positioned downstream of the plate-flattening and thickness-measuring device in the transverse direction; and
 - a hanger side milling device configured to mill a side surface of the hanger of the anode plate, disposed at a second side of the transverse transmission device and positioned downstream of the plate-flattening and thickness-measuring device in the transverse direction.
2. The apparatus according to claim 1, wherein the hanger bottom milling device is opposite the hanger side milling device in a direction perpendicular to the transverse direction.
3. The apparatus according to claim 1 or 2, further comprising a plate receiving device configured to receive the anode plate, and a conveying-separating-rectifying-weighting device configured for chain-conveying the received anode plates, separating the received anode plates, vertically rectifying the hangers of the anode plates and weighting the received anode plates, the plate receiving device and the conveying-separating-rectifying-weighting device being arranged in series and disposed upstream of the plate-flattening and thickness-measuring device in the transverse direction.
4. The apparatus according to claim 3, wherein the plate receiving device and the conveying-separating-rectifying-weighting device are disposed at the second side of the transverse transmission device and adjacent to an upstream end of the transverse transmission device.

5. The apparatus according to any one of claims 1-4, further comprising a defective anode plate collecting device configured to remove and collect a defective anode plate and disposed downstream of the hanger bottom milling device and the hanger side milling device.

6. The apparatus according claim 5, wherein the defective anode plate collecting device is disposed at the second side of the transverse transmission device and adjacent to a downstream end of the transverse transmission device.

7. The apparatus according any one of claims 1-6, further comprising a lifting device and an anode plate conveying-arranging device which are disposed downstream of the hanger bottom milling device in turn in the direction perpendicular to the transverse direction.

8. A method for processing an anode plate for electrolysis, comprising steps of:
transmitting the anode plate in a transverse direction via a transverse transmission device;
flattening the anode plate and measuring a thickness of the anode plate during transmitting the anode plate in the transverse direction;
judging whether the flattened and measured anode plate being needed to mill a side surface of the hanger by a hanger side milling device;
milling a bottom surface of the hanger of the flattened and measured anode plate by a hanger bottom milling device if the flattened and measured anode plate is not needed to mill the side surface of the hanger; and
milling the side surface of the hanger of the flattened and measured anode plate by the hanger side milling device, and then milling the bottom surface of the hanger by the hanger bottom milling device if the flattened and measured anode plate is needed to mill the side surface of the hanger.

9. The method for machining an anode plate for electrolysis according to claim 8, further comprising judging whether the flattened and measured anode plate being qualified before

judging whether the side surface of the hanger of the flattened and measured anode plate is needed to mill by the hanger side milling device, and

removing and collecting a defective anode plate if the flattened and measured anode plate is defective.

10. The method for machining an anode plate for electrolysis according to claim 9, further comprising arranging the anode plate with the bottom surface of the hanger being milled via a lifting device and an anode plate conveying-arranging device.

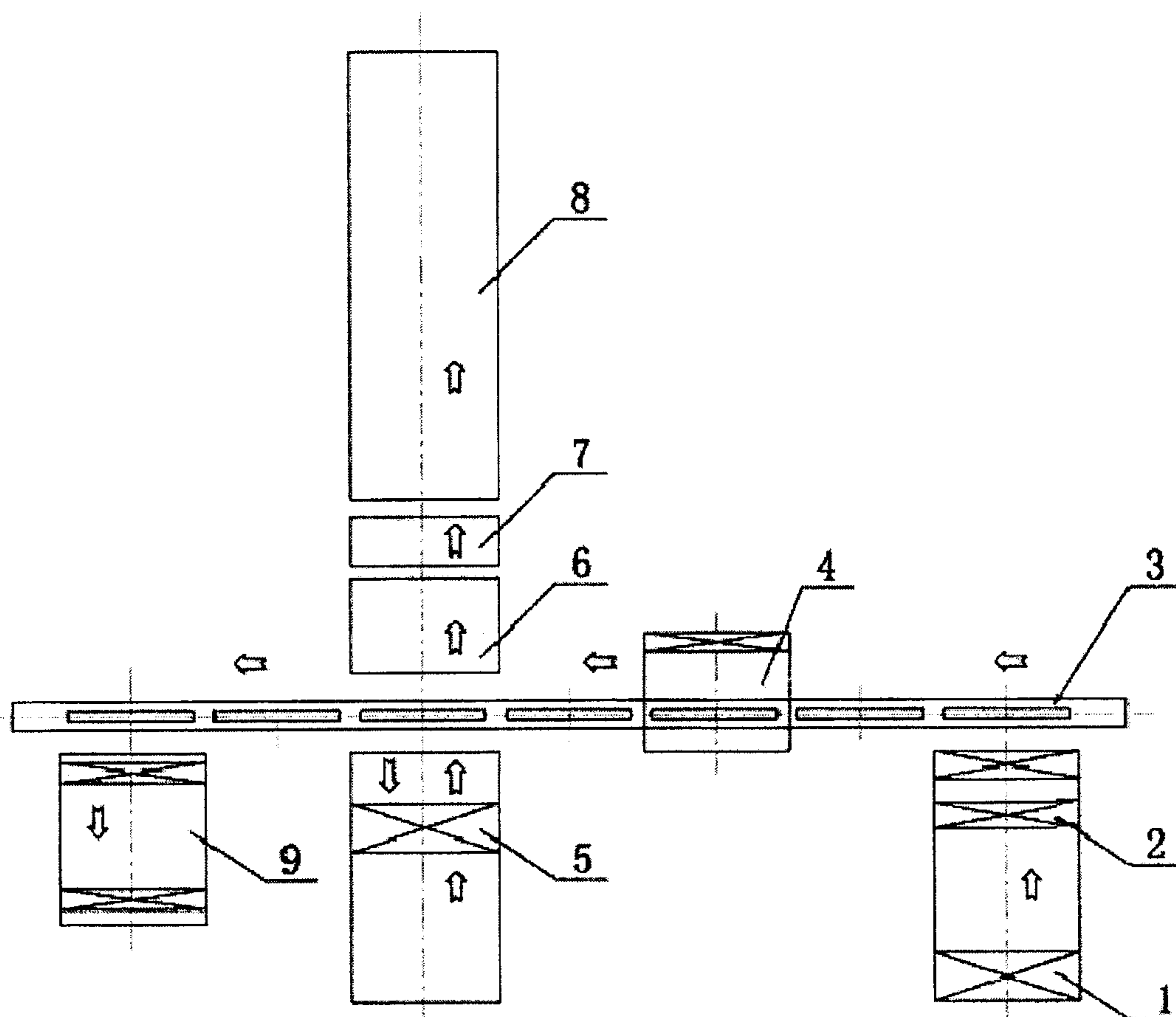


Fig. 1

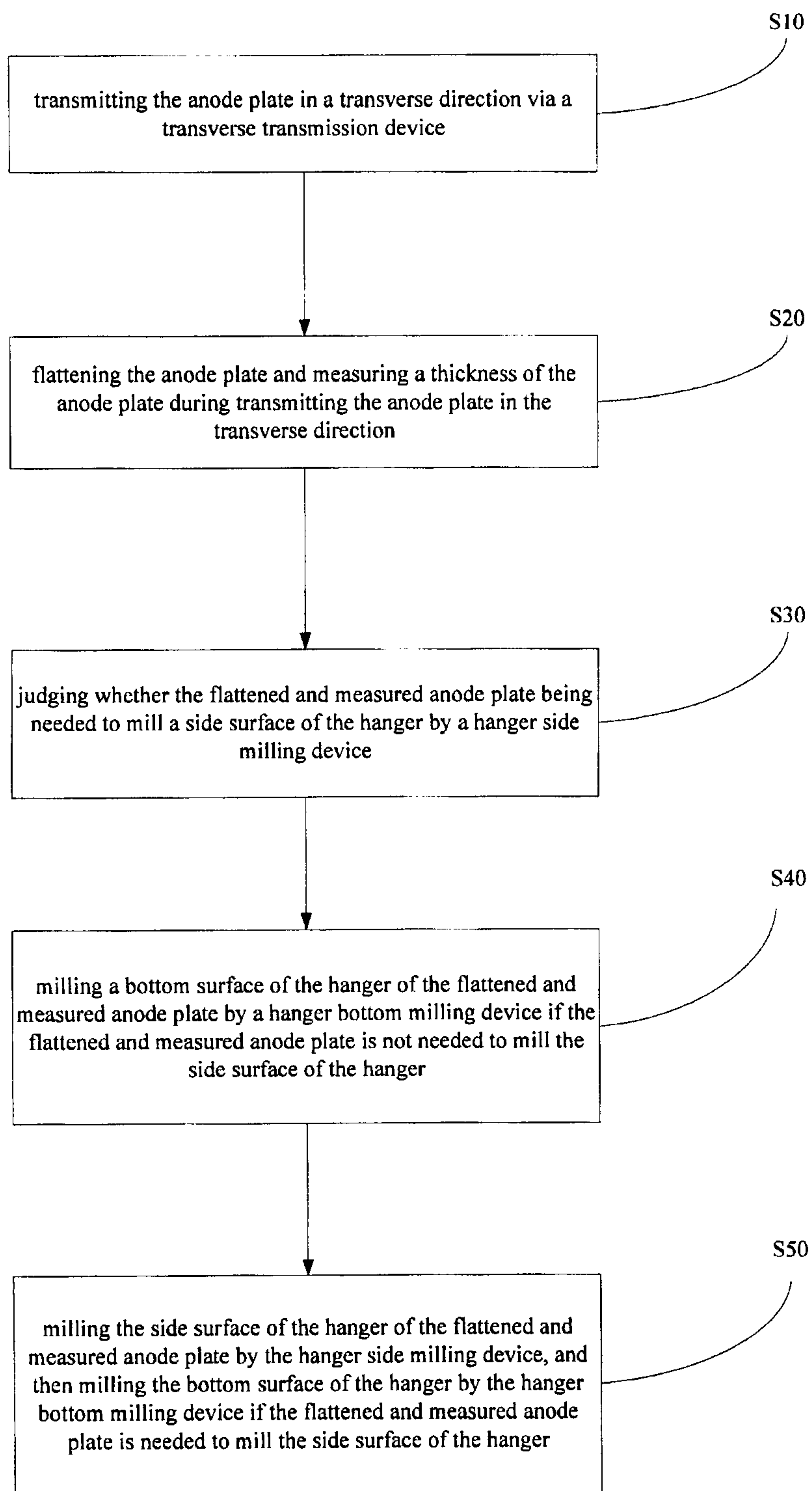


Fig. 2

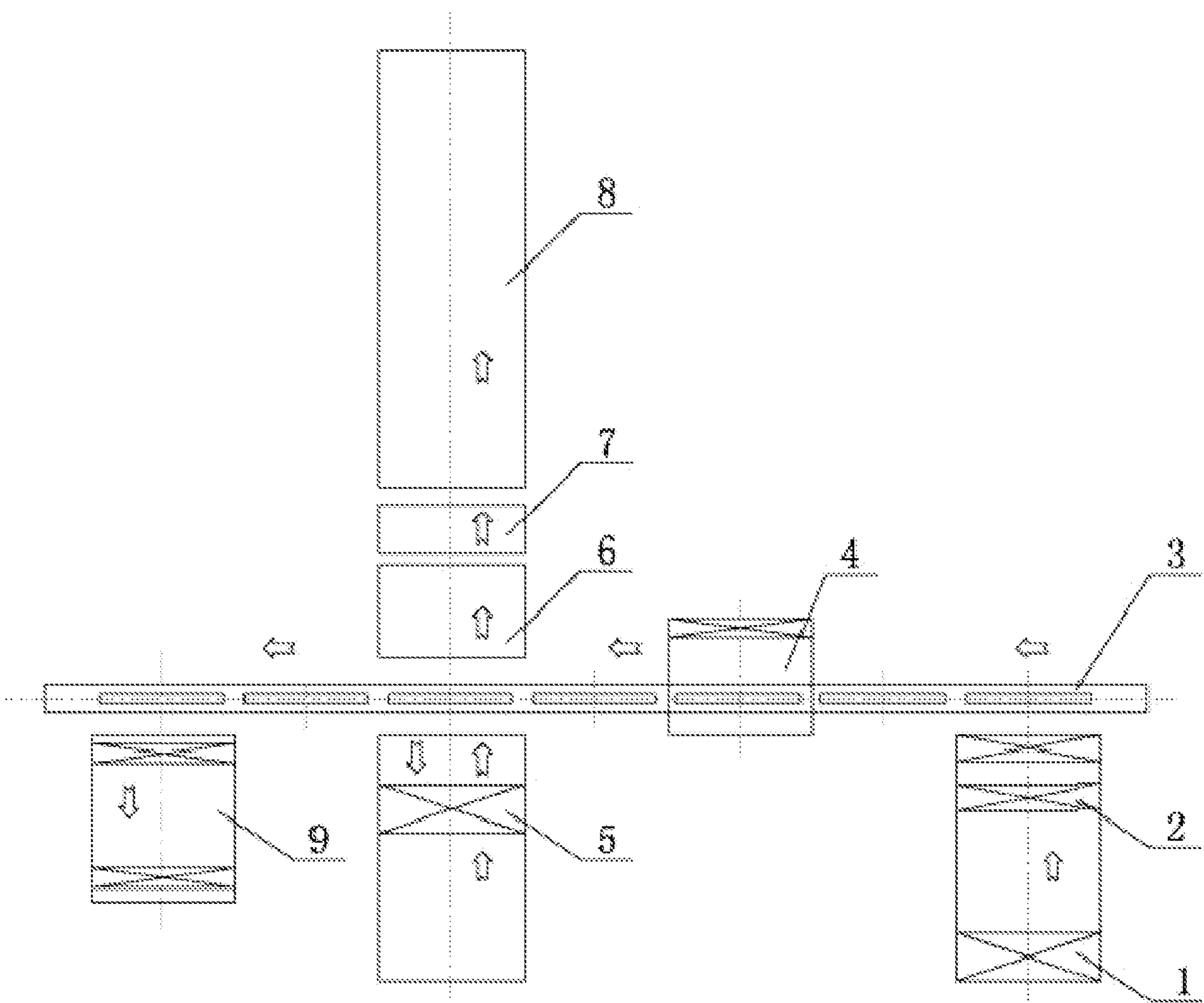


图 1 /FIG.1