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Inventor(s)	LEE; Kyoung Ho et al.

ELECTRODE DRIVING APPARATUS

Abstract

The electrode driving apparatus is for driving an electrode that is coated with an active material, and includes a main base, a sub base spaced apart from and parallel to the main base, a shaft extending from the sub base toward the opposite side to the main base, an electrode driving roller that rotates about the shaft and is in contact with the electrode, and a position adjuster that is located between the main base and the sub base and regulates a gap between the main base and the sub base.

Inventors: **LEE; Kyoung Ho (Daejeon, KR), KIM; Min Ki (Daejeon, KR), KANG; Ryeon Ho (Daejeon, KR), KWON; Ki Sun (Daejeon, KR)**

Applicant: **LG ENERGY SOLUTION, LTD.** (Seoul, KR)

Family ID: **1000008600560**

Assignee: **LG ENERGY SOLUTION, LTD. (Seoul, KR)**

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims the benefit of the priority of Korean Patent Application No. 10-2021-0183212, filed on Dec. 20, 2021, which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] The present invention relates to an electrode driving apparatus and, more particularly, to an electrode driving apparatus for driving an electrode that is used in the manufacture of a secondary battery.

BACKGROUND ART

[0003] Recently, the price of energy sources is increasing due to the depletion of fossil fuels, interest in environmental pollution is growing, and demands for eco-friendly alternative energy sources have become an indispensable factor for the future life. Accordingly, research on technologies for generating various powers, such as photovoltaic, wind, and tidal powers, is continuing, and power storage devices, such as batteries, for more efficiently using the generated electric energy are also drawing much attention.

[0004] Furthermore, as technical development and demands for electronic mobile devices and electric vehicles using batteries increase, demands for batteries as energy sources are rapidly increasing. Accordingly, lots of research on the batteries capable of coping with those various demands are being carried out.

[0005] Batteries for storing electric energy may be generally classified into primary batteries and secondary batteries. The primary batteries are disposable consumable batteries, but the secondary batteries are rechargeable batteries which are manufactured by using a material in which oxidation and reduction processes between an electric current and substances are repeatable. That is, when the reduction reaction to the material is performed by the electric current, power is recharged. Also, when the oxidation reaction to the material is performed, the power is discharged. Such recharging and discharging may be performed repeatedly to generate electricity.

[0006] In particular, in terms of materials, there are high demands for lithium secondary batteries, such as lithium ion batteries and lithium ion polymer batteries, having advantages such as the high energy density and discharge voltage and the output stability.

[0007] The secondary batteries are rechargeable unlike the primary batteries, and classified into coin-type batteries, cylindrical batteries, prismatic batteries, and pouch-type batteries depending on shapes of battery cases.

[0008] Each of the cylindrical secondary batteries includes an electrode assembly wound in a jell-roll shape, a case for accommodating therein the electrode assembly together with an electrolyte, and a cap assembly for sealing an opening of the case. Typically, the electrode assembly employed in the cylindrical secondary battery includes a positive electrode plate, a separator, and a negative electrode plate. The positive electrode plate includes a positive electrode coating portion, in which a positive electrode collector is coated with a positive electrode active material, and a positive electrode non-coating portion, which is not coated. Similarly, the negative electrode plate includes a negative electrode coating portion, in which a negative electrode active material is applied on a negative electrode collector, and a negative electrode non-coating portion, which is not coated. An electrode tab is installed in each of the positive electrode non-coating portion and the negative electrode non-coating portion. A porous separator is located between the positive electrode plate and the negative electrode plate. The separator insulates the positive electrode plate and the

negative electrode plate from each other, while allowing active material ions to be exchanged between the electrode plates, thereby causing an electrochemical reaction. The positive electrode plate, the separator, and the negative electrode plate are sequentially stacked and wound, and thus, a jelly-roll type electrode assembly is manufactured.

[0009] Accordingly, an apparatus for driving an electrode is required to manufacture a jelly-roll type electrode assembly used in a cylindrical secondary battery or to inspect and additionally process an electrode used in a secondary battery.

[0010] An electrode driving apparatus may include rollers through which an electrode passes, but an electrode driving apparatus according to the related art has a structure in which all rollers through which an electrode passes are provided on a single plate. Therefore, when the width of an electrode is changed due to replacement of the electrode, each roller has to be replaced according to the width of the electrode, and the position of each roller on a shaft has to be individually adjusted.

[0011] This method takes a lot of response time for the replacement and deteriorates the efficiency of the entire process due to complicated work.

[0012] In order to solve the above limitation, there is a need for a method that can reduce the time consumed when the position of the roller needs to be corrected due to the change in width of the electrode and can simplify the work.

DISCLOSURE OF THE INVENTION

Technical Problem

[0013] The present invention has been made to solve the above limitation, and an objective of the present invention is to collectively adjust the positions of electrode driving rollers through which an electrode passes. Accordingly, the electrode driving rollers are easily moved or placed on the same line, and thus, the time required for rearrangement of the electrode driving rollers due to the change in the width of the electrode is reduced. In addition, the operation is simplified, and thus, the efficiency of the entire process is enhanced. In addition, an objective of the present invention is to provide an electrode driving apparatus capable of assisting in producing stable products by reducing meandering when supplying electrodes.

Technical Solution

[0014] An electrode driving apparatus according to the present invention is for driving an electrode that is coated with an active material, and the electrode driving apparatus includes a main base, a sub base spaced apart from and parallel to the main base, a shaft extending from the sub base toward the opposite side to the main base, an electrode driving roller that rotates about the shaft and is in contact with the electrode, and a position adjuster that is located between the main base and the sub base and regulates a gap between the main base and the sub base.

[0015] The electrode driving roller may be connected to the sub base and fixed in an axial direction while rotating about the shaft.

[0016] The electrode driving roller may include a large diameter portion and a small diameter portion having a smaller diameter than the large diameter portion, wherein a distance between the sub base and the large diameter portion is less than a distance between the sub base and the small diameter portion.

[0017] The electrode driving roller may further include a tapered portion which connects the large diameter portion and the small diameter portion to each other and decreases in diameter toward the small diameter portion.

[0018] The position adjuster may include a nut passing through the main base and a screw shaft which extends from the sub-base and passes through the nut and is fastened to the nut.

[0019] The electrode driving apparatus may further include a handle which passes through the sub base, is connected to the screw shaft, and rotates together with the screw shaft.

[0020] The electrode driving apparatus may further include a position indicator, which is located on an outer surface of the sub base and indicates a distance between the sub base and the main base, and a reference shaft, which extends from the main base to pass through the position indicator.

[0021] The electrode driving apparatus may further include a cap which is mounted to the shaft and located on an end of the shaft opposite the sub base with the electrode driving roller therebetween.
[0022] The electrode driving apparatus may further include a guide shaft which is connected to the main base, extends in a direction toward the sub base, passes through the sub base, and guides movement of the sub base.
[0023] The electrode driving apparatus may further include a servo motor which is connected to the position adjuster and regulates operation of the position adjuster.

Advantageous Effects

[0024] An electrode driving apparatus according to the present invention is for driving an electrode that is coated with an active material, and includes a main base, a sub base spaced apart from and parallel to the main base, a shaft extending from the sub base toward the opposite side to the main base, an electrode driving roller that rotates about the shaft and is in contact with the electrode, and a position adjuster that is located between the main base and the sub base and regulates a gap between the main base and the sub base.
[0025] Accordingly, when it is necessary to correct the positions of electrode driving rollers, through which an electrode passes, because the width of the electrode is changed due to a change in the type of electrode, etc., the positions of the electrode driving rollers are collectively adjusted. Therefore, the electrode driving rollers are easily moved or placed on the same line, and thus, the time and energy required for rearrangement of the electrode driving rollers due to the change in the width of the electrode may be reduced. In addition, the operation is simplified, and thus, the efficiency of the entire process may be enhanced. In addition, the electrode driving apparatus may assist in producing stable products by reducing meandering when supplying electrodes.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] FIG. **1** is a front view schematically illustrating an electrode driving apparatus according to an embodiment of the present invention.
[0027] FIG. **2** is a side view schematically illustrating an electrode driving apparatus according to an embodiment of the present invention.
[0028] FIG. **3** is a side view schematically illustrating a case in which the width of an electrode driven by an electrode driving apparatus according to an embodiment of the present invention is increased.
[0029] FIG. **4** is a side view schematically illustrating an electrode driving apparatus according to another embodiment of the present invention.

MODE FOR CARRYING OUT THE INVENTION

[0030] Hereinafter, embodiments of the present invention will be described in detail with reference to the accompanying drawings so as to be easily carried out by a person skilled in the art to which the present invention pertains. However, the present invention may be embodied in various different forms, and is neither limited nor restricted to the following embodiments.
[0031] In order to clearly describe the present invention, detailed description of parts irrelevant to the invention or detailed descriptions of related well-known technologies that may unnecessarily obscure subject matters of the invention will be omitted. In the specification, when reference numerals are given to components in each of the drawings, the same or similar components will be designated by the same or similar reference numerals throughout the specification.
[0032] Also, terms or words used in this specification and claims should not be restrictively interpreted as ordinary meanings or dictionary-based meanings, but should be interpreted as meanings and concepts conforming to the technical ideas of the present invention on the basis of the principle that an inventor can properly define the concept of a term so as to describe his or her

invention in the best ways.
[0033] FIG. **1** is a front view schematically illustrating an electrode driving apparatus **1** according to an embodiment of the present invention, and FIG. **2** is a side view schematically illustrating the electrode driving apparatus **1** according to an embodiment of the present invention.
[0034] The electrode driving apparatus **1** according to an embodiment of the present invention may drive an electrode **12** of which a surface is partially coated with an active material **17**. The electrode **12** is supplied from an electrode roll **11** on which the electrode **12** is wound in a roll-shape, and the supplied electrode **12** may be moved by rotation of electrode driving rollers **300** while being in contact with the electrode driving rollers **300**. The electrode is wound onto take up roll **14**.
[0035] Referring to FIGS. **1** and **2**, the electrode driving apparatus **1** according to an embodiment of the present invention may include a main base **10**, a sub base **100**, a shaft **200**, and an electrode driving roller **300**, and a position adjuster **400**.
[0036] The main base **10** is configured to be connected to several components of the electrode driving apparatus **1**, and thus, the main base **10** may have a plate shape having a flat surface.
[0037] According to the related art, all components necessary for driving an electrode are provided on a main base **10**. Therefore, it is difficult to control the components collectively. The electrode driving apparatus **1** according to an embodiment of the present invention to solve the above limitation may include a sub base **100** for collectively regulating certain components. The electrode driving apparatus **1** may include a plurality of sub bases **100** according to the type and number of components to be regulated.
[0038] The sub base **100** may be spaced apart from and parallel to the main base **10** and have a plate shape having a flat surface like the main base **10**. Specifically, the sub base moves certain components from the surface of the main base **10** while being spaced apart from the main base **10**, and thus, may have a plate shape having a smaller surface area than the main base **10**.
[0039] The electrode driving apparatus **1** requires a shaft on which a roller for driving the electrode **12** is located and which can rotate the roller. As an example of such a shaft, the electrode driving apparatus **1** according to the present invention may include a shaft **200**.
[0040] The shaft **200** may extend from the sub base **100** toward the opposite side to the main base **10**. Since the electrode driving roller **300** has to rotate about the shaft **200**, the shaft **200** may preferably have a cylindrical shape. However, the embodiment is not limited thereto.
[0041] As an example of a configuration for driving the electrode **12** by means of rotation, the electrode driving apparatus **1** according to the present invention may include an electrode driving roller **300**. The electrode driving roller **300** may be connected to the shaft **200**, and this connection may be made in a manner in which the shaft **200** passes through the center of the electrode driving roller **300**. The electrode driving roller **300** connected in this manner may rotate about the shaft **200**.
[0042] The electrode driving roller **300** may have a cylindrical shape to drive the electrode **12** while being in contact with However, the embodiment is not limited the electrode **12**. thereto.
[0043] When the electrode driving apparatus **1** is operated, the electrode driving roller **300** may continuously rotate while the electrode **12** travels. Since the electrode **12** travels while being in contact with the surface, it may be necessary to limit the movement of the electrode driving roller **300** in an axial direction. As an example of a method of fixing the electrode driving roller **300** in the axial direction, the electrode driving roller **300** according to the present invention may be connected to the sub base **100** and fixed in the axial direction while rotating about the shaft **200**.
[0044] Although fixed to the sub base **100**, the electrode driving roller **300** has to be able to rotate about the shaft **200**. Therefore, the electrode driving roller **300** may be connected to the sub base **100** using parts such as bearings. The method of connecting the electrode driving roller **300** to the sub base **100** using a bearing is merely an example. Accordingly, parts and methods for connection between the electrode driving roller **300** and the sub base **100** are not limited thereto, and other

forms are also applicable.
[0045] The electrode **12** may travel in a state in which an active material **17** is applied on the surface thereof. The active material **17** may be partially applied on the surface of the electrode **12**. A portion coated with the active material **17** may be a coating portion **12***a*, and a portion not coated with the active material **17** may be a non-coating portion **12***b*.
[0046] Since the non-coating portion **12***b* of the electrode **12** is additionally processed while the electrode **12** is driven by the electrode driving apparatus **1**, a free space may be required between the electrode driving roller **300** and the non-coating portion **12***b* of the electrode **12**. Therefore, the electrode driving roller **300** according to the present invention may include a large diameter portion **310** and a small diameter portion **320**.
[0047] The small diameter portion **320** may have a smaller diameter than the large diameter portion **310**, and a distance between the sub base **100** and the large diameter portion **310** may be less than a distance between the sub base **100** and the small diameter portion **320**.
[0048] The outer circumference of the large diameter portion **310** may be in contact with the coating portion **12***a* of the electrode **12**, and the outer circumference of the small diameter portion **320** may face the non-coating portion **12***b* of the electrode **12**. Therefore, when the coating portion **12***a* of the electrode **12** travels in contact with the large diameter portion **310**, a free space may be formed between the uncoated portion **12***b* of the electrode **12** and the small diameter portion **320**. Accordingly, the non-coating portion **12***b* may be easily processed.
[0049] Accordingly, the large diameter portion **310** and the small diameter portion **320** may provide an effect of increasing the efficiency of additional operations such as processing required for the electrode **12**.
[0050] The electrode driving apparatus **1** according to the present invention may further include a processing device **13** that is used for additional operations such as processing described above. This varies depending on the type of processing, and thus, a detailed description thereof will be omitted.
[0051] The electrode driving apparatus **1** according to an embodiment of the present invention may include a position adjuster **400** as an example of a configuration for collectively regulating components connected to the sub base **100**.
[0052] The position adjuster **400** is located between the main base **10** and the sub base **100** and may regulate a gap between the main base **10** and the sub base **100**. That is, in the electrode driving apparatus **1** according to the present invention, the electrode driving roller **300** may be moved along with the movement of the sub base **100**. Therefore, when the electrode driving apparatus **1** is provided with a plurality of electrode driving rollers **300**, even if the width of the electrode **12** is changed due to the change in the type of the electrode **12**, the positions of the electrode driving rollers **300** may be collectively corrected by the movement of the sub base **100** using the position adjuster **400** without the need to replace or adjust each of the electrode driving rollers **300**.
[0053] The position adjuster **400** may regulate the gap between the main base **10** and the sub base **100** by moving the sub base **100**. Therefore, the position adjuster **400** may have a configuration in which the length of the position adjuster **400** itself may be regulated between the main base **10** and the sub base **100** or a configuration in which the gap is regulated while the position adjuster **400** moves through the main base **10** or the sub base **100**.
[0054] When the plurality of sub bases **100** are provided in the electrode driving apparatus **1**, the sub bases **100** may be respectively linked with different position adjusters **400**.
[0055] Among examples of the configurations described above, as an example of the configuration in which the position adjuster **400** moves through the main base **10** and regulates the gap between the main base **10** and the sub base **100**, the position adjuster **400** according to the present invention may have a configuration of a ball screw. Specifically, the position adjuster **400** may include a screw shaft **410** and a nut **420**.
[0056] The screw shaft **410** may be fixed to the sub base **100** so as to be movable together with the sub base **100**, and the nut **420** may be fixed to the main base **10**. In more detail, the nut **420** having

a spiral screw groove, which is formed on the inner circumferential surface, may pass through the main base **10**, and the screw shaft **410** having a screw groove, which is formed on the outer circumferential surface and faces the screw groove of the nut **420**, may extend and pass through the nut **420**.

[0057] Accordingly, the screw grooves of the screw shaft **410** and the nut **420** are engaged with each other while the screw shaft **410** is rotated, and the screw shaft **410** may linearly move in the axial direction. The gap between the main base **10** and the sub base **100** may be regulated by the linear motion of the screw shaft **410** in the axial direction.

[0058] When the position adjuster **400** of the electrode driving apparatus **1** has the form of a ball screw that includes the screw shaft **410** and the nut **420**, the gap between the main base **10** and the sub base **100** may be intuitively and easily regulated.

[0059] When the position adjuster **400** has the form of a ball screw and the gap between the main base **10** and the sub base **100** is regulated while the screw shaft **410** rotates, a component for easily rotating the screw shaft **410** may be required. As an example of the component, the electrode driving apparatus **1** according to an embodiment of the present invention may further include a handle **500**.

[0060] The handle **500** may pass through the sub base **100** and be connected to the screw shaft **410**. Accordingly, when the handle **500** is rotated, the screw shaft **410** may be rotated together. Also, as the screw shaft **410** is rotated, the screw shaft **410** and the nut **420** may be fastened to each other. That is, the handle **500** may regulate the linear motion of the screw shaft **410** by means of the rotation, and further regulate the gap between the main base **10** and the sub base **100**.

[0061] The handle **500** may have a circular cross-section to facilitate rotation, and further include a structure such as a knob. The handle **500** may have a shape generally used in vehicles or mechanical devices.

[0062] When the electrode driving apparatus **1** includes the handle **500** connected to the screw shaft **410**, the screw shaft **410** may be easily rotated. Accordingly, there is an effect in that the position of the sub base **100** may be conveniently and easily corrected.

[0063] When the gap between the main base **10** and the sub base **100** is regulated by the position adjuster **400**, if the position of the sub base **100** or the distance between the main base **10** and the sub base **100** are known, the position adjuster **400** may be used efficiently. Therefore, as an example of a configuration for efficiently using the position adjuster **400**, the electrode driving apparatus **1** according to an embodiment of the present invention may further include a reference shaft **800** and a position indicator **900**.

[0064] The position indicator **900** may indicate the distance between the main base **10** and the sub base **100**. For example, the position indicator **900** may indicate the position of the sub base **100** using the main base **10** as a reference point. The numerical value for the distance indicated by the position indicator **900** may be shown electronically or in the form of gradations, and this may vary depending on the type of the position indicator **900** used.

[0065] The position indicator **900** may be located on the outer surface of the sub base **100** so as to move along with the movement of the sub base **100**. Preferably, the position indicator **900** may be located on the upper surface of the sub base **100** so that an operator can easily check the position indicator **900** when the gap between the main base **10** and the sub base **100** is regulated.

[0066] The reference shaft **800** may be connected to the main base **10** and extend from the main base **10** to pass through the position indicator **900**. Therefore, the position indicator **900** may move in the axial direction of the reference shaft **800**.

[0067] Since the reference shaft **800** extends to pass through the position indicator **900**, the horizontal cross-section of the reference shaft **800** may have the same shape as the cross-section of a space formed in the position indicator **900**. The reference shaft **800** may have a cylindrical shape so that the position indicator **900** may be easily moved, but the embodiment is not necessarily limited thereto.

[0068] When the operator can check the distance between the main base **10** and the sub base **100** by means of the position indicator **900**, the process of regulating the position of the sub base **100** may be efficiently performed. In addition, the position values of the sub base **100** according to the types or widths of electrodes **12** are accumulated, and thus, usable data may be formed.
[0069] As an example of a configuration for connecting the main base **10** and the sub base **100** to each other in addition to the position adjuster **400**, an embodiment of the present invention may further include a guide shaft **700**.
[0070] The guide shaft **700** may be connected to the main base **10**, extend in a direction toward the sub base **100**, and pass through the sub base **100**. Since the guide shaft **700** passes through the sub base **100**, the sub base **100** may be in contact with the outer circumferential surface of the guide shaft **700** and move in the axial direction of the guide shaft **700**.
[0071] The guide shaft **700** has to guide the constant movement of the sub base **100**. Accordingly, when a plurality of guide shafts **700** passing through a single sub base **100** are provided, these guide shafts may be arranged in parallel to each other. In addition, the guide shaft may be positioned in parallel to the screw shaft **410** when arranged together with the screw shaft **410** described above.
[0072] The guide shaft **700** may be formed in a cylindrical shape, but the embodiment is not necessarily limited thereto.
[0073] The guide shaft **700** may share the load of the sub base **100** supported by the position adjuster **400** and assist the movement of the sub base **100**. Through this, it is possible to enhance the stability of the entire electrode driving apparatus **1**.
[0074] FIG. **3** is a side view schematically illustrating a case in which the width of the electrode **12** driven by the electrode driving apparatus **1** according to an embodiment of the present invention is increased.
[0075] One of the objectives of the present invention is to collectively correct the positions of the electrode driving rollers **300** when conditions, such as the types of the electrode **12** or the widths of the electrode **12**, are changed. A configuration for collectively correcting the electrode driving rollers **300** may be described through an example in which the width of the electrode **12** is increased.
[0076] Comparing FIGS. **2** and **3** with each other, when the width of an electrode **12** is increased compared to the electrode **12** used in the previous process, the electrode driving roller **300** may be moved in the direction toward the main base **10**.
[0077] Specifically, the sub base **100** and the electrode driving roller **300** may be moved so that the position of the end of the non-coating portion **12***b* of the previously used electrode **12** coincides with the position of the end of a non-coating portion **12***b* of the replaced electrode **12**. While the electrode **12** travels in the electrode driving apparatus **1**, a tab formed on the non-coating portion **12***b* of the electrode **12** may be processed. The electrode driving roller **300** may be moved on the basis of the end of the non-coating portion **12***b* of the electrode **12** in order to maintain the same position at which the tab is processed. On the other hand, when the width of the electrode **12** decreases, the electrode driving roller **300** may be moved in a direction away from the main base **10**. This is merely one example, and the moving direction of the electrode driving roller **300** according to the change of the electrode **12** is not necessarily limited thereto.
[0078] FIG. **4** is a side view schematically illustrating an electrode driving apparatus **1** according to another embodiment of the present invention.
[0079] Hereinafter, a detailed description of the same configuration as that of the electrode driving apparatus **1** according to the embodiment of the present invention is omitted.
[0080] Referring to FIG. **4**, an electrode driving roller **300** of the electrode driving apparatus **1** according to the present invention may further include a tapered portion **330** which connects the large diameter portion **310** and the small diameter portion **320** to each other and has a shape decreasing in diameter as approaching the small diameter portion **320**. The tapered portion **330**

may be formed in a diagonal shape when the electrode driving apparatus **1** is viewed from the side, or may be formed in a curved shape.

[0081] When the tapered portion **330** is formed between the large diameter portion **310** and the small diameter portion **320**, there is an effect in that physical damage occurring on the surface of the electrode **12** in contact with the electrode driving roller **300** may be reduced.

[0082] As an example of a configuration for blocking the end of a shaft **200** that is not connected to the sub base **100**, the electrode driving apparatus **1** according to the present embodiment may further include a cap **600**.

[0083] The cap **600** is mounted to the shaft **200** and may be located on the opposite side from the sub base **100** with the electrode driving roller **300** therebetween.

[0084] The cap **600** may have a cylindrical shape, in which a space through which the shaft **200** passes is formed inside the center, and may have the diameter equal to the diameter of the small diameter portion **320**.

[0085] When the electrode driving roller **300** is not connected to the sub base **100**, the electrode driving roller **300** may be fixed by the cap **600** so as not to move in an axial direction. In addition, the end of the shaft **200** is blocked, and thus, interference with the shaft **200** may be reduced during the process.

[0086] The electrode driving apparatus **1** may automate the regulation of the gap between the main base **10** and the sub base **100** using the position adjuster **400**. As an example of a configuration for automation, the electrode driving apparatus **1** according to the present embodiment may further include a servo motor **15**.

[0087] The servo motor **15** may be connected to the position adjuster **400** and regulate operation of the position adjuster **400**. Here, the position values of the sub base **100** according to the types or widths of electrodes **12**, which are accumulated by a position indicator **900** described above, may be provided to the servo motor **15** as usable data.

[0088] The electrode driving apparatus **1** according to the present embodiment may further include a control device for automating the operation of the position adjuster **400**, and a programmable logic controller (PLC) or the like may be used as the control device. This is merely one example, and other components required for automation may be added.

[0089] The electrode driving apparatus **1** according to the present invention may further include additional components necessary for processes performed while the electrode **12** travels. For example, components, such as a buffer device for regulating a traveling speed of the electrode **12** and a vision device for inspecting the surface of the electrode **12**, may be further included.

[0090] When it is necessary to correct the positions of the electrode driving rollers **300**, through which the electrode **12** passes, due to the occurrence of changes, such as the types of electrode **12** and the widths of the electrode **12**, the electrode driving apparatus **1** according to the present invention may collectively adjust the positions of the electrode driving rollers **300**. Accordingly, the time and energy required for rearrangement of the electrode driving rollers **300** may be reduced. In addition, the operation is simplified, and thus, the efficiency of the entire process may be enhanced.

[0091] Although the present invention is described by specific embodiments and drawings, the present invention is not limited thereto, and various changes and modifications may be made by a person skilled in the art to which the present invention pertains within the technical idea of the present invention and equivalent scope of the appended claims.

DESCRIPTION OF THE SYMBOLS

[0092] **1**: Electrode driving apparatus [0093] **10**: Main base [0094] **11**: Electrode roll [0095] **12**: Electrode [0096] **12***a*: Coating portion [0097] **12***b*: Non-coating portion [0098] **13**: Processing device [0099] **14**: Winding device [0100] **15**: Servo motor [0101] **17**: Active material [0102] **100**: Sub base [0103] **200**: Shaft [0104] **300**: Electrode driving roller [0105] **310**: Large diameter portion [0106] **320**: Small diameter portion

[0107] **330**: Tapered portion [0108] **400**: Position adjuster [0109] **410**: Screw shaft [0110] **420**: Nut

[0111] **500**: Handle [0112] **600**: Cap [0113] **700**: Guide shaft [0114] **800**: Reference shaft [0115] **900**: Position indicator

Claims

1. An electrode driving apparatus for driving an electrode that is coated with an active material, the electrode driving apparatus comprising: a main base; a sub base spaced apart from the main base; a shaft extending from the sub base in a direction away from the main base; an electrode driving roller that rotates about the shaft and is in contact with the electrode; and a position adjuster that is located between the main base and the sub base and regulates a gap between the main base and the sub base.
2. The electrode driving apparatus of claim 1, wherein the electrode driving roller is connected to the sub base and fixed in an axial direction while rotating about the shaft.
3. The electrode driving apparatus of claim 1, wherein the electrode driving roller comprises: a large diameter portion; and a small diameter portion having a smaller diameter than the large diameter portion, wherein a distance between the sub base and the large diameter portion is less than a distance between the sub base and the small diameter portion.
4. The electrode driving apparatus of claim 3, wherein the electrode driving roller further comprises a tapered portion which connects the large diameter portion and the small diameter portion to each other and decreases in diameter toward the small diameter portion.
5. The electrode driving apparatus of claim 1, wherein the position adjuster comprises: a nut passing through the main base; and a screw shaft which extends from the sub-base and passes through the nut and is fastened to the nut.
6. The electrode driving apparatus of claim 5, further comprising a handle which passes through the sub base, is connected to the screw shaft, and rotates together with the screw shaft.
7. The electrode driving apparatus of claim 1, further comprising: a position indicator which is located on an outer surface of the sub base and indicates a distance between the sub base and the main base; and a reference shaft which extends from the main base to pass through the position indicator.
8. The electrode driving apparatus of claim 1, further comprising a cap which is mounted to the shaft and located on an end of the shaft opposite the sub base with the electrode driving roller therebetween.
9. The electrode driving apparatus of claim 1, further comprising a guide shaft which is connected to the main base, extends in a direction toward the sub base, passes through the sub base, and guides movement of the sub base.
10. The electrode driving apparatus of claim 1, further comprising a servo motor which is connected to the position adjuster and regulates operation of the position adjuster.