DISPLAY ROTATION APPARATUS AND ROTATING METHOD THEREOF

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ABSTRACT

A display rotation apparatus and rotating method thereof are disclosed. A display rotation apparatus, interposed between a fixed body and a moving body and rotating the moving body about the fixed body, comprising plural joint parts coupled to the moving body; plural arm parts, one end coupled to the joint part and the other end coupled to the fixed body, comprising a link member and a hinge member configured to joint act; and a driving part, coupled to the hinge member, rotating the arm part can rotate the display in variable directions.
FIG. 9

Start

Receiving an input signal corresponds to rotation amount of a rotation part  

Determining a base value by calculating rotation amount of each driving part that corresponds to distance and angle between a moving part and a fixed body from the input signal and generating control signals for driving parts

Rotating each driving part of plural arm parts by receiving the control signal

Determining a comparative value by measuring rotation amount of the driving part

Does the difference between the comparative value and the base value meet tolerance?

No

Yes

End
DISPLAY ROTATION APPARATUS AND ROTATING METHOD THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of Korean Patent Application No. 10-2006-0053633 filed with the Korean Intellectual Property Office on Jun. 14, 2006, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND

1. Technical Field

The invention is related to a display rotation apparatus and rotating method thereof.

2. Description of the Related Art

Flat panel displays, such as TV’s or monitors employing LCD, PDP, LED, etc., provide the benefit of allowing efficient use of spaces, and are fast replacing Braun tube TV’s and monitors. The increase in demand for such flat panel displays is expected to continue into the future. In particular, flat panel LCD or PDP TV’s, often referred to as “wall-mount TV’s,” are fixedly attached to wall surfaces for use. When viewing a wall-mount TV thus fixed, the largest viewing angle is achieved directly in front of the TV.

However, when the TV is fixed to a wall surface, the position that allows the largest viewing angle of the TV screen is also fixed, and as a viewer changes his position, adequate viewing may not be obtained. It is difficult to modify the TV’s position with the conventional wall-mount TV, because there is little or no distance between the TV and the wall, and even if the TV is spaced from the wall surface by means of additional members, it is not possible to rotate the TV to a desired orientation. Also, attempting to resolve such problems using an apparatus to maintain some distance may result in another problem of degrading the elegant appearance and the efficiency in utilizing an indoor space, which are important benefits of wall-mount TV’s.

SUMMARY

An aspect of the invention is to provide a display rotation apparatus that maintains the advantage of wall-mount TV’s in utilizing an indoor space efficiently and achieves the largest viewing angle even when a viewer changes his position.

One aspect of the invention, a display rotation apparatus, interposed between a fixed body and a moving body and rotating the moving body about the fixed body, comprises plural joint parts coupled to the moving body; plural arm parts, one end coupled to the joint part and the other end coupled to the fixed body, comprising a link member and a hinge member configured to joint act; and a driving part, coupled to the hinge member, rotating the arm part is disclosed. This display rotation apparatus can rotate the display in variable directions.

A moving body may include a very display. But, when a moving body may be distinguished from a display, a display rotation apparatus may further comprise a display hinge coupled to the moving body and a rotation part, coupled to the moving body, rotating the display about the moving body. This configuration couples the display to the moving body in some distance and enables the display to rotate in variable directions.

Also, a rotation part may comprise a tension member coupled to two points on the display opposite to each other about the rotation axis of the display, a roller member configured to guide the path of the tension member and a motor part positioned on the path of the tension member and configured to apply a tensile force on the tension member. The rotation part may provide the power the display to rotate about the moving body.

A motor part may comprise a motor, a slip pulley coupled to the driving axis and the tension member is coupled to the slip pulley. The slip pulley is an apparatus to prevent the motor from compulsory rotation by external force by slipping.

Meanwhile, a joint part may comprise a first joint part coupled to the moving body, a second joint part coupled to the moving body and separates from the first joint part, and the arm part may comprise a first arm part coupled to the first joint part and a second arm part coupled to the second joint part. The moving body can be rotated left and right by the two arm parts. When a third joint part coupled to the moving body at the position apart from a virtual straight line that links the first joint part and the second joint part be comprised, the moving body can be rotated in three dimensions.

A driving part may comprise a power part generating rotation force and a rotation part receiving the rotation force from the power part. And a rotation part comprise a rotating driving axis coupled to the power part, a clutch part coupled to the driving axis and a driven axis contacting the clutch part. It may be preferable that the rotation force of driving part is smaller than the friction force between the clutch part and the driven axis. Also, it may be preferable that the friction force between the clutch part and the driven axis is smaller than the cogging torque of the power part. The driving part provides the power to expand and contract the arm part. The configuration of the rotation part prevent the damage of motor by compulsory rotation.

A distance detecting sensor attached to the moving body and configured to generate signal corresponding to the distance between the moving body and the fixed body may be attached to the moving body. The distance detecting sensor measures the distance between moving body and the fixed body in real time, to prevent collision of the moving body and the fixed body.

Another aspect of the invention provide a method of rotation, for a display rotation apparatus interposing between a fixed body and a moving body and rotating the moving body against the fixed body and comprising plural arm parts that one end coupled to the joint part and the other end coupled to the fixed body and comprising a link member and a hinge member configured to joint act apparatus. The method rotates the moving body by controlling the driving part of the rotation apparatus. The method includes receiving an input signal corresponding to the rotation amount of the moving body, determining a base value by calculating rotation amount of each driving part that corresponds to distance and angle between a moving part and a fixed body from the input signal and generating control signals for
driving parts; and rotating each driving part of plural arm parts by receiving the control signal.

[0016] Also, when plural distance detecting sensors are attached to the moving body and configured to generate signal corresponding to the distance between the moving body and the fixed body, the rotation method may further comprise receiving the distance signal from the distance detecting sensor after rotating the driving part and stopping the rotation of each driving part, if the distance between the moving body and the fixed body meets the predetermined tolerance by processing the distance signal. This rotation method may prevent the display to collide against the fixed body.

[0017] Meanwhile, the rotation method may further comprise determining a comparative value by measuring rotation amount the of the driving part after rotating the driving part; rotating the driving part, if the difference between the comparative value and the base value exceeds the tolerance, by comparing the comparative value and the base value; and stopping the rotation of the driving part when the difference between the comparative value and the base value meets the tolerance, by repetitively performing the rotating and the determining. The display may positioned accurately by repetitive loops.

[0018] Additional aspects and advantages of the invention will be set forth in part in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] FIG. 1 is a plan view of a display rotation apparatus according to a first disclosed embodiment of the invention.

[0020] FIG. 2 is an example illustrating an operation of a display rotation apparatus according to a first embodiment of the invention.

[0021] FIG. 3 is a side elevational view of a first driving part according to a first embodiment of the invention.

[0022] FIG. 4 is a cross sectional view of a rotation part of a first driving part according to a first embodiment of the invention.

[0023] FIG. 5 is a side elevational view and partial magnified view of a display rotation apparatus according to a second embodiment of the invention.

[0024] FIG. 6 is a plan view of a display rotation apparatus according to a second embodiment of the invention.

[0025] FIG. 7 is a perspective view of a display rotation apparatus according to a third embodiment of the invention.

[0026] FIG. 8 is a perspective view of a display rotation apparatus according to a fourth embodiment of the invention.

[0027] FIG. 9 is a flow chart of a method of driving a display rotation apparatus according to a fifth embodiment of the invention.

DETAILED DESCRIPTION

[0028] Embodiments of the display rotation apparatus and a rotation method thereof according to certain aspects of the invention will be described below in more detail with reference to the accompanying drawings. In the description with reference to the accompanying drawings, those components are rendered the same reference number that are the same or are in correspondence regardless of the Figure number, and redundant explanations are omitted. Also, the basic principles will first be described before discussing the preferred embodiments of the invention.

[0029] Reference will now be made in detail to the embodiments of the present general inventive concept, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below in order to explain the present general inventive concept by referring to the Figures.

[0030] FIG. 1 is a plan view of a display rotation apparatus according to a first disclosed embodiment of the invention. FIG. 2 is an example illustrating an operation of a display rotation apparatus according to a first embodiment of the invention. In FIG. 1 and FIG. 2 are illustrated a display rotation apparatus 10, a moving body 11, a display 11a, a coupling member 11b, a first arm part 12, a first link member 12a, a first hinge member 12b, a second link member 12c, a second hinge member 12d, a second arm part 13, a third link member 13a, a third hinge member 13b, a fourth link member 13c, a fourth hinge member 13d, a fixed body 14, a first joint part 15a, a second joint part 15b.

[0031] The display rotation apparatus 10 in this embodiment comprises two arm parts 12, 13 and enables the display 11a to rotate left and right. The description of the coupling and function of each element is as follows.

[0032] The display 11a can include not only a flat-type LCD, PDP TV or monitor but also all same kinds of video devices. The coupling member 11b is typically mounted on the display 11a. According to the embodiment of the invention, the moving part includes the display 11a and the coupling member 11b. Alternatively, the moving part 11b includes the coupling member 11b only. In case that no additional coupling member 11b is attached on the display 11a, the moving part 11 becomes the display 11a.

[0033] The moving part 11 is coupled to the first joint part 15a and the second joint part 15b, respectively. The first joint part 15a and the second joint part 15b are coupled to the first arm part 12 and the second arm part 13, respectively. In this embodiment of the invention, each of the first joint part 15a and the second joint part 15b comprises a hinge member. Accordingly, the moving lines of the first arm part 12 and the second arm part 13 lay on a plane.

[0034] The first arm part 12 comprises the first and second link member 12a, 12c, the first hinge member 12b that couples the first and second link member 12a, 12c, and the second hinge member 12d used for coupling to the fixed body 14. The second arm part 13 has similar structure to that of the first arm part 12.

[0035] However fixed body 14 may be a very wall, in this embodiment, it means a member utilized to attach a display to a wall. The fixed body 14 is coupled to the first and second arm part 12, 13, the second hinge member 12d and the fourth hinge member 13d.

[0036] The first and second joint part 15a, 15b and the first to fourth hinge member 12b, 12d, 13b, 13d couples the link
member 12a, 12c, 13a, 13b to fixed body 14, moving body 11, enabling the joint action of the first and second arm part 12, 13 on a virtual plane.

[0037] Meanwhile, the first driving part 16 and the second driving part (not shown) respectively coupled to the first and second arm part 12, 13 provides the extending and contracting power. The first driving part 16 may be coupled to one of the first and second joint part 15a, 15b and the first to fourth hinge member 12b, 12c, 13a, 13d. The coupling to the first hinge member 12b or to the third hinge member 13b may be preferable. Also, it may be preferable that a third driving part is coupled to at least one of the second hinge member 12d and the fourth hinge member 13d, to prevent the first and second arm part 12, 13 from becoming a fixed end from the fixed body 14. The detail description of constitution and operation of the first driving part 16 is as follows.

[0038] FIG. 3 is a side elevational view of a first driving part according to a first embodiment of the invention. FIG. 4 is a cross sectional view of a rotation part of a first driving part according to a first embodiment of the invention. In FIG. 3 and FIG. 4 are illustrated a first driving part 16, a power part 21, a rotation part 22, a clutch part 22a, a driving axis 222, a driven axis 221. However, the first driving part 16 coupled to the first hinge member 12b of the first arm part 12 is shown only in FIG. 3, the second driving part coupled to the second arm part has similar structure.

[0039] As in FIG. 3, the first driving part 16 comprises the power part 21 and rotation part 22. The power part 21 comprises a motor and the rotation part 22 is an axis transmitting the power of the motor to the exterior. In FIG. 3, the power part 21 and rotation part 22 is coupled to the first link member 12a and the second link member 12c respectively at the first hinge member 12b. Finally, the first arm part 12 in FIG. 1 extends or contracts when the first driving part 16 is driving.

[0040] Meanwhile, As in FIG. 4, the rotation part 22 comprise the driving axis 222 directly coupled to the rotation axis of the motor, the clutch part 222a coupled to the driving axis 222, and the driven axis 221 that receives power when contacted clutch part 222a. The clutch part 222a, the friction force controlling part, may be coupled to or be separated from the driving axis 222 in FIG. 4. In this embodiment, the clutch part 222a is coupled to the driving axis 222, but it may be coupled to the driven axis 221. The washer 227b between the clutch part 222a and the driven axis 221 maintains constant friction force.

[0041] The operation method of the rotation part 22 is described. When the driving axis 222 is rotated by the driving force of the motor, the clutch part 222a and the driven axis 221 do not slip because the driving force is smaller than the friction force of the clutch part 222a. However, when the driven axis 221 is rotated compulsorily by external force, a slipping occurs because the friction force of the clutch part 222a is smaller than the cogging torque of motor. The cogging torque refers to the force required to rotate the motor compulsorily. When the friction force of the clutch part 222a is larger than the cogging torque of motor, damage by compulsory rotation of motor by external force is prevented. To control this friction force, the washer 227b may be interposed between the clutch part 222a and the driven axis.

[0042] Meanwhile, the distance detecting sensor 17 is attached to the moving body 11 in FIG. 1. The distance detecting sensor 17 prevents the collision against the wall by detecting the distance between the moving body 11 and the fixed body 14 or the distance between the moving body 11 and the wall in real time. It may be preferable that the distance detecting sensor 17 is attached to the moving body 11, especially to the corner of the display 11a.

[0043] Meanwhile, FIG. 2 is an example illustrating an operation of a display rotation apparatus according to a first embodiment of the invention. When the moving body 11 is rotated left or right, the extension of the first arm part 12 and the second arm part 13 differs. Accordingly, the moving body 11 is rotated in one direction.

[0044] FIG. 5 is a side elevational view and partial magnified view of a display rotation apparatus according to a second embodiment of the invention. FIG. 6 is a plan view of a display rotation apparatus according to a second embodiment of the invention. In FIG. 5 and FIG. 6 are illustrated a display rotation apparatus 50, a moving body 51, a first arm part 52, a second arm part 53, a fixed body 54, a first joint part 55a, a second joint part 55b, a display 56, a connecting part 59a, 59b, a coupling part 58, a rotation part 57, a tension member 571, a roller member 572, a motor part 573, a motor 573a, a pulley 573b, a tension control apparatus 574, an elastic body 60.

[0045] The operation of the first and second arm part 52, 53 in this embodiment is similar to that of the first embodiment in FIG. 1 to FIG. 4, the description below is focused to the difference. The moving body 51 and the display 56 in this embodiment are distinct elements and hinge coupled at the coupling part 58. Accordingly, the moving body 11 can be rotated left and right by the first and second arm part 52, 53 as in the embodiment of FIG. 1 and also the display 56 can be rotated up and down about moving body 51.

[0046] The detail description of up-down rotation in this embodiment, referring the magnified cross sectional view in FIG. 5 is as follows. The display 56 comprises the connecting part 59a, 59b and the tension member 571 is coupled to the connecting part 59a, 59b. An additional member may be interposed between the connecting part 59a, 59b and the display 56 and the connecting part 59a, 59b may be formed in that additional member. It may be preferable that the connecting part 59a, 59b is formed symmetrically about coupling part 58, the rotation axis, for the display 56 to rotate harmoniously up and down.

[0047] The elastic body 60 is interposed between the display 56 and the moving body 51, to oppose the gravity momentum of the display 56. A flat TV’s weight is up to several tens kilogram in general. If these elastic body 60 are not interposed between the moving body 51 and the display 56 as in FIG. 5, the display 56 may be dropped down about the coupling part 58 and the tension member 571 is in high tension by this momentum. Motor operation in this situation may overload the motor by the tension of the tension member 571.

[0048] The elastic body 60 may be a coil type spring as in FIG. 5. There may be lots of variation that accomplishes the same function. Also, to prevent the dropping down of the display 56 by the gravity momentum, the elastic body 60 may be coupled to any point of the moving body 51 and the display 56.

[0049] Meanwhile, the rotation part 57 comprises the tension member 571, the roller member 572, the motor part 573, the motor 573a, the slip pulley 573b and the tension control apparatus 574.
The tension member 571 may be a wire, a belt, a chain and etc. A wire is used in this embodiment. As in the FIG. 5, the tension member 571 is coupled to the connecting part 101a, 101b. The roller member 572, guiding the path, and the motor part 573, providing the tension member 571 with power, are coupled to the tension member 571. Two roller member 572's are used in the embodiment of FIG. 1. The number of roller member can vary adequately. The motor part 573 comprises the slip pulley 573a and the motor 573b. The tension member 573 is coupled to the slip pulley 573a. In FIG. 1, the tension member 571 is a wire and the slip pulley 573b of corresponding number is coupled. When the tension member 573 is a chain, a corresponding sprocket may be used. Meanwhile, the motor part 573 may be coupled to the moving body 51 as in FIG. 5, and also to be coupled to the display 56.

The slip pulley 573a in this embodiment, with the controlled friction force, does not allow slipping on tension member 571 during the rotation of the motor 573b. It allows slipping when the motor 573b is not driving and external force moves tension member 571. The detail description about the principles of the slip pulley 573a is as follows.

The slip pulley 573a transmits the power of motor 573b to the tension member 571, and finally allows the display 56 to rotate up and down. Accordingly, the friction force between the slip pulley 573a and the tension member 571 is large enough to move the display 56. Namely, there may be no slip between the slip pulley 573a and the tension member 571, when the motor 573b rotates. On the other side, the tension member 571 is moved compulsorily by external force, not by the driving of the motor 573b, there may be some slip to prevent the motor 573b from rotating compulsorily. Namely, the friction force between the slip pulley 573a and the tension member 571 should be smaller than the cogging torque of motor 573b.

The tension control apparatus 574 is located on the path of the tension member 571 and coupled to the tension member 571. The tension control apparatus 574 may comprise a kind of pulley. The location may be varied to control the tension. Because the shape and structure of the tension control apparatus 574 is well known to a person skilled in the art, the detail description is omitted. In the embodiment of FIG. 5, the tension control apparatus 574 is fixed to the moving body 51 but the fixing point can vary to display 56.

FIG. 7 is a perspective view of a display rotation apparatus according to a third embodiment of the invention. In FIG. 7 are illustrated a display rotation apparatus 70, a moving body 71, a display 71a, a coupling member 71b, a first arm part 72a, a second arm part 72b, a third arm part 73c, a first hinge member 73a, a second hinge member 73b, a third hinge member 73c, a fourth hinge member 73d, a fifth hinge member 73e, a sixth hinge member 73f, a power part 74, a first joint part 75a, a second joint part 75b, a distance detecting sensor 77.

This embodiment is about the display rotation apparatus 70 that enables moving body 71 to rotate up, down, left and right with the first to third arm part 72a, 72b, 72c. As description on the first to third arm part 72a, 72b, 72c is given above in the description of FIG. 1, the description given below is focused on the different aspects.

The first to third arm part 72a, 72b, 72c in this embodiment has structure that enables joint action. One end of each arm part is coupled to moving body 71 and the other end is fixed body 74. The coupling to the moving body 71 is achieved with the interposed the first to third joint part 75a, 75b, 75c. The first to third joint part 75a, 75b, 75c, comprising a ball joint, can rotates more than one direction. In detail with the coupling locations of the first to third joint part 75a, 75b, 75c, the first joint part 73c is coupled to the moving body 71 at the point apart from virtual straight line that links the first joint part 75c and second joint part 75b. Coupling between the first to third joint part 75a, 75b, 75c and the first to third arm part 72a, 72b, 72c enables the moving body 71 to rotate in variable directions.

Meanwhile, the second, fourth and sixth hinge member 73b, 73d, 73f is interposed and coupled respectively between the other end of the first to third arm part 72a, 72b, 72c and the fixed body 74.

Meanwhile, the distance detecting sensor 77 is attached to the moving body 71, especially to the corner of the display 71b. The distance detecting sensor 77 prevents display 71b to collide against the wall during the rotation by detecting distance to the fixed body 74 or the wall. Also, as noted in the description of the first embodiment in FIG. 1, the driving part coupled to the first to third arm part 72a, 72b, 72c drives the first to third arm part 72a, 72b, 72c.

The operation method of the display rotation apparatus 70 according to this embodiment is described. When the command to rotate the display 71b left, right, up and down is inputted, the driving part attached to the first to third arm part 72a, 72b, 72c operates to extend the first to third arm part 72a, 72b, 72c for predetermined rotation amount. Consequently, the display 71b is rotated in viewer demand angle. Additionally, the distance between the wall and display 71b is detected by distance detecting sensor 77 in real time. In case the display 71b gets too close with the wall, safe distance between the wall and display 71b is acquired by extending the arm part that heals the collision location.

FIG. 8 is a perspective view of a display rotation apparatus according to a fourth embodiment of the invention. The moving body 81 is rotated by the four arm part 82a, 82b, 82c, 82d in this embodiment.

The detail description of rotation method of display rotation apparatus in the embodiment in FIG. 7 is given below.

FIG. 9 is a flow chart of a method of driving a display rotation apparatus according to a fifth embodiment of the invention. The description of the driving method of this embodiment, referring the display rotation apparatus in FIG. 7, is as follows. In FIG. 7, the display rotation apparatus 70 comprises the first to third arm part 72a, 72b, 72c is shown, but embodiment corresponding to the flow chart of FIG. 9 may be applicable to all display rotation apparatus 70 that comprises more than three arm parts.

As in FIG. 7, when the first to third arm part 72a, 72b, 72c are coupled to the moving body 71 on a plane, the motion of the moving body 71 is controlled in three dimensions by controlling the length of the first to third arm part respectively. Coupling of the first to third arm part 72a, 72b, 72c on a plane refers that coupling third arm part 72c at the point apart from the virtual straight line that links coupling points of the first and second arm part 72a, 72b to the moving body 71. This coupling of the first to third arm part
Referred to the flow chart of FIG. 9, the rotation of the display rotation apparatus 70 is described. Operation S91 is that of a command to rotate the moving body 71 being inputted. The display rotation apparatus 70 is close to the fixed body 74 in initial state. In this state, a viewer in front of the display can get good viewing angle. But, when a viewer changes his position the viewing angle of the display gets smaller. Accordingly, the viewer can control the viewing angle of display by rotating the moving body 71, using the remote control and etc. These input signal from remote control may be received by the receiving apparatus attached to the display rotation apparatus 70.

Operation S92 of FIG. 9 is that of determining a base value by calculating rotation amount of each driving part of the plural arm part 72a, 72b, 72c that corresponds to distance and angle between a moving part 71 and a fixed body 74 from the input signal and generating control signals for each driving parts. Namely, Input signal from remote control is calculated to the rotation amount of driving part by control part. This calculated values becomes a base value and then compared to the comparative value that described below.

Operation S93 of FIG. 9 is that of rotating each driving part of plural arm parts by receiving the control signal. The motor of the driving part is operated to the rotation amount determined by control part. The rotation amount of driving part is measured by the sensor attached to the driving part and inputted as a comparative value. A hall element and magnet may be used in these sensors.

Operation S94 of FIG. 9 is that of determining a comparative value by measuring rotation amount of the driving part. The rotation amount of the driving part is measured correctly by the hall element and magnet attached to the driving part.

Meanwhile, during the rotation of the display rotation apparatus 70 in this way, the moving body 71 may collide against the fixed body 74 for many reasons. Accordingly, the distance detecting sensor 77 sends the signal of distance between moving body 71 and fixed body 74 to the control part in real time. The control part may stop the rotation if the distance signal meets the tolerance and may extend the arm part in collision direction to prevent collision. The ‘tolerance’ refers to the pre-inputted minimum distance to prevent the collision between the moving body 71 and fixed body 74.

The control method is to prevent the collision between the moving body 71 and fixed body 74 using distance detecting sensor 77. Also, the collision prevention may be accomplished as follows: measuring the rotation of the hinge member, rotation axis of arm part, by resist element attached to the hinge member, sending the measured value to the control part, identifying the location the moving body 71 by rotation amount of hinge member of each arm part, and controlling the rotation of arm part by control part.

What is claimed is:

1. A display rotation apparatus, interposed between a fixed body and a moving body and rotating the moving body about the fixed body, the display rotation apparatus comprising:
   - plural joint parts coupled to the moving body;
   - plural arm parts, one end coupled to the joint part and the other end coupled to the fixed body, comprising a link member and a hinge member configured to joint act;
   - a driving part, coupled to the hinge member, rotating the arm part and;
   - a display hinge coupled to the moving body; and
   - a rotation part, coupled to the display and the moving body, rotating the display about the moving body.

2. The display rotation apparatus of claim 1, wherein the joint part comprises:
   - a first joint part coupled to the moving body; and
   - a second joint part coupled to the moving body and separates from the first joint part, and

3. The display rotation apparatus of claim 1, wherein the rotation part comprises:
   - a tension member coupled to two points on the display opposite to each other about the rotation axis of the display;
   - a roller member configured to guide the path of the tension member; and
   - a motor part positioned on the path of the tension member and configured to apply a tensile force on the tension member.

4. The display rotation apparatus of claim 3, wherein the motor part comprises:
   - a motor; and
   - a slip pulley coupled to the driving axis, and

5. The display rotation apparatus of claim 1, wherein the driving part comprises:
   - a power part generating rotation force; and
   - a rotation part receiving the rotation force from the power part, and

   the rotation part comprises:
   - a rotating driving axis coupled to the power part; and
   - a clutch part coupled to the driving axis; and
a driven axis contacting the clutch part, and
the rotation force of the driving part is smaller than the friction force between the clutch part and the driven axis.
6. The display rotation apparatus of claim 6, wherein the friction force between the clutch part and the driven axis is smaller than the cogging torque of the power part.
7. The display rotation apparatus of claim 1, further comprising a distance detecting sensor attached to the moving body and configured to generate signal corresponding to the distance between the moving body and the fixed body.
8. A display rotation apparatus, interposed between a fixed body and a moving body and rotating the moving body about the fixed body, the display rotation apparatus comprising:
   plural joint parts coupled to the moving body;
   plural arm parts, one end coupled to the joint part and the other end coupled to the fixed body, comprising a link member and a hinge member configured to joint act;
   a driving part coupled to the hinge member and rotating the arm part, and
said joint part comprises
   a first joint part coupled to the moving body;
   a second joint part coupled to the moving body and separated from the first joint part; and
   a third joint part coupled to the moving body at the position apart from a virtual straight line that links the first joint part and the second joint part, and
said arm part comprises
   a first arm part coupled to the first joint part;
   a second arm part coupled to the second joint part; and
   a third arm part coupled to the third joint part.
9. The display rotation apparatus of claim 8, wherein the rotation part comprises:
   a tension member coupled to two points on the display opposite to each other about the rotation axis of the display;
   a roller member configured to guide the path of the tension member; and
   a motor part positioned on the path of the tension member and configured to apply a tensile force on the tension member.
10. The display rotation apparatus of claim 9, wherein the motor part comprises:
   a motor; and
   a slip pulley coupled to the driving axis, and
the tension member is coupled to the slip pulley.
11. The display rotation apparatus of claim 8, wherein the driving part comprises:
   a power part generating rotation force; and
   a rotation part receiving the rotation force from the power part, and
the rotation part comprises:
   a rotating driving axis coupled to the power part;
   a clutch part coupled to the driving axis; and
   a driven axis contacting the clutch part, and
the rotation force of the driving part is smaller than the friction force between the clutch part and the driven axis.
12. The display rotation apparatus of claim 11, wherein the friction force between the clutch part and the driven axis is smaller than the cogging torque of the power part.
13. The display rotation apparatus of claim 8, further comprising a distance detecting sensor attached to the moving body and configured to generate signal corresponding to the distance between the moving body and the fixed body.
14. A method of rotating the moving body, for a display rotation apparatus intervening between a fixed body and a moving body and rotating the moving body about the fixed body and comprising plural arm parts that one end coupled to the joint part and the other end coupled to the fixed body and comprising a link member and a hinge member configured to joint act, the method comprising:
   receiving an input signal corresponding to the rotation amount of the moving body;
   determining a base value by calculating rotation amount of each driving part that corresponds to distance and angle between a moving part and a fixed body from the input signal and generating control signals for driving parts; and
   rotating each driving part of plural arm parts by receiving the control signal.
15. The method of claim 14, wherein plural distance detecting sensors are attached to the moving body and configured to generate signal corresponding to the distance between the moving body and the fixed body, further comprising:
   receiving the distance signal from the distance detecting sensor after rotating the driving part; and
   stopping the rotation of each driving part, if the distance between the moving body and the fixed body meets the predetermined tolerance by processing the distance signal.
16. The method of claim 14, further comprising:
   determining a comparative value by measuring rotation amount of the driving part after rotating the driving part;
   rotating the driving part, if the difference between the comparative value and the base value exceeds the tolerance, by comparing the comparative value and the base value; and
   stopping the rotation of the driving part when the difference between the comparative value and the base value meets the tolerance, by repetitively performing the rotating and the determining.

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