US 20070114342A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2007/0114342 A1

Lee (43) Pub. Date: May 24, 2007

(54) CONTROLLER FOR MONITOR

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(21) Appl. No.: 11/656,130

(22) Filed: Jan. 22, 2007

(30) Foreign Application Priority Data

Jul. 23, 2004 (KR) 20-2004-0021137

Publication Classification

(51) Int. Cl.
A47F 5/12 (2006.01)
A45D 19/04 (2006.01)

(52) U.S. Cl. 248/133; 248/127

(57) ABSTRACT

An apparatus for adjusting an inclination angle of a monitor is disclosed. The apparatus is capable of supporting a monitor and adjusting an inclination angle of the same and includes a monitor ward support member for supporting one surface of a monitor, a base ward support member for supporting a base surface, an upper connection member for connecting an upper side of the monitor ward support member and an upper side of the base ward support member, and a lower connection member for connecting a lower side of the monitor ward support member and a lower side of the base ward support member.

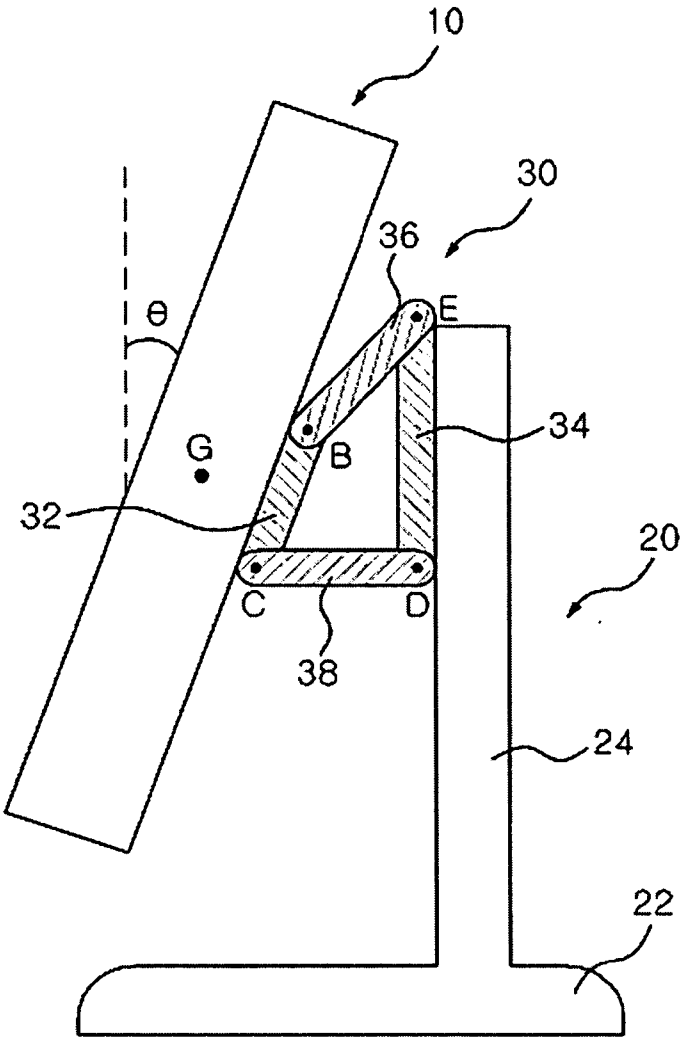

Fig. 1

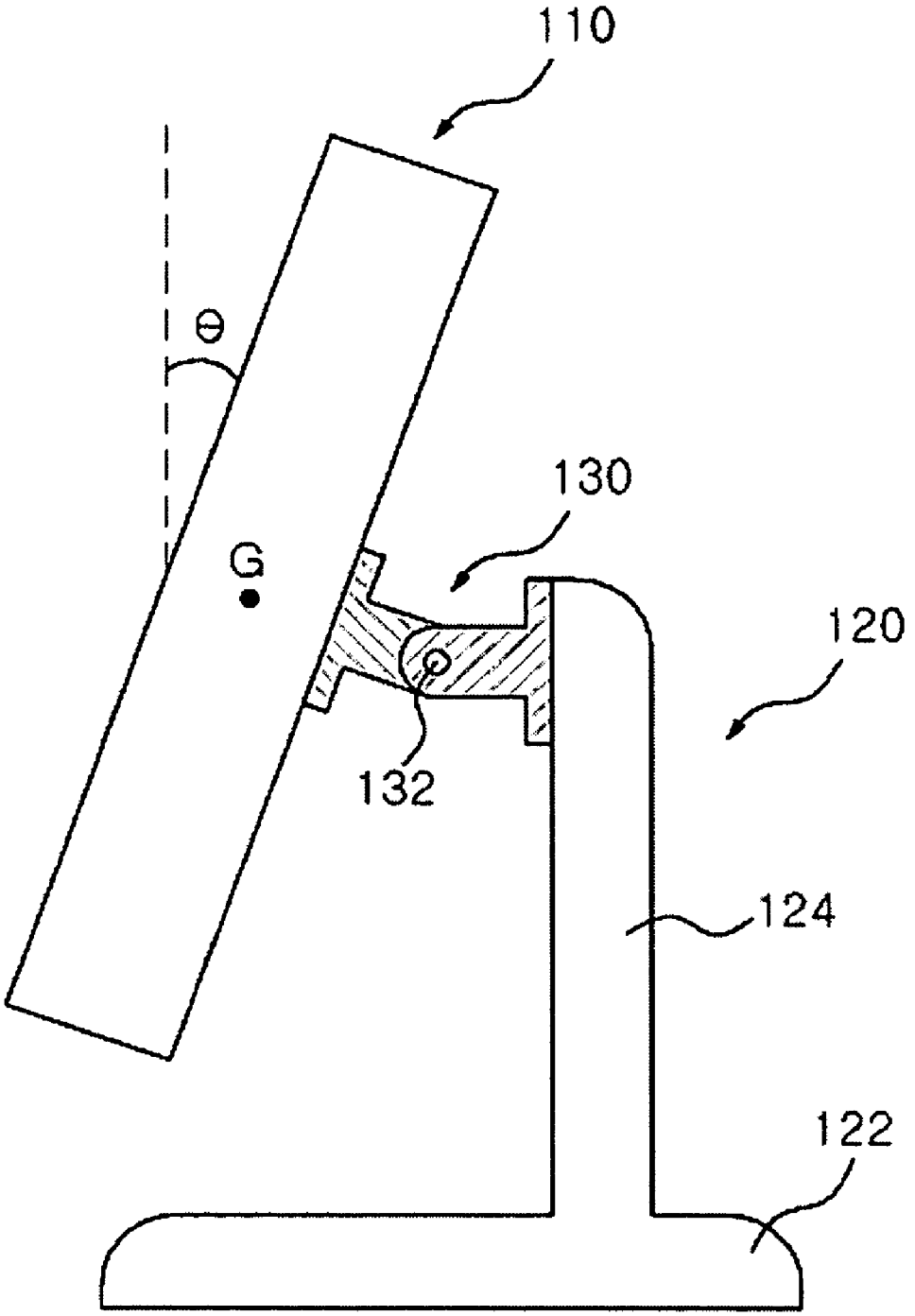

Fig. 2

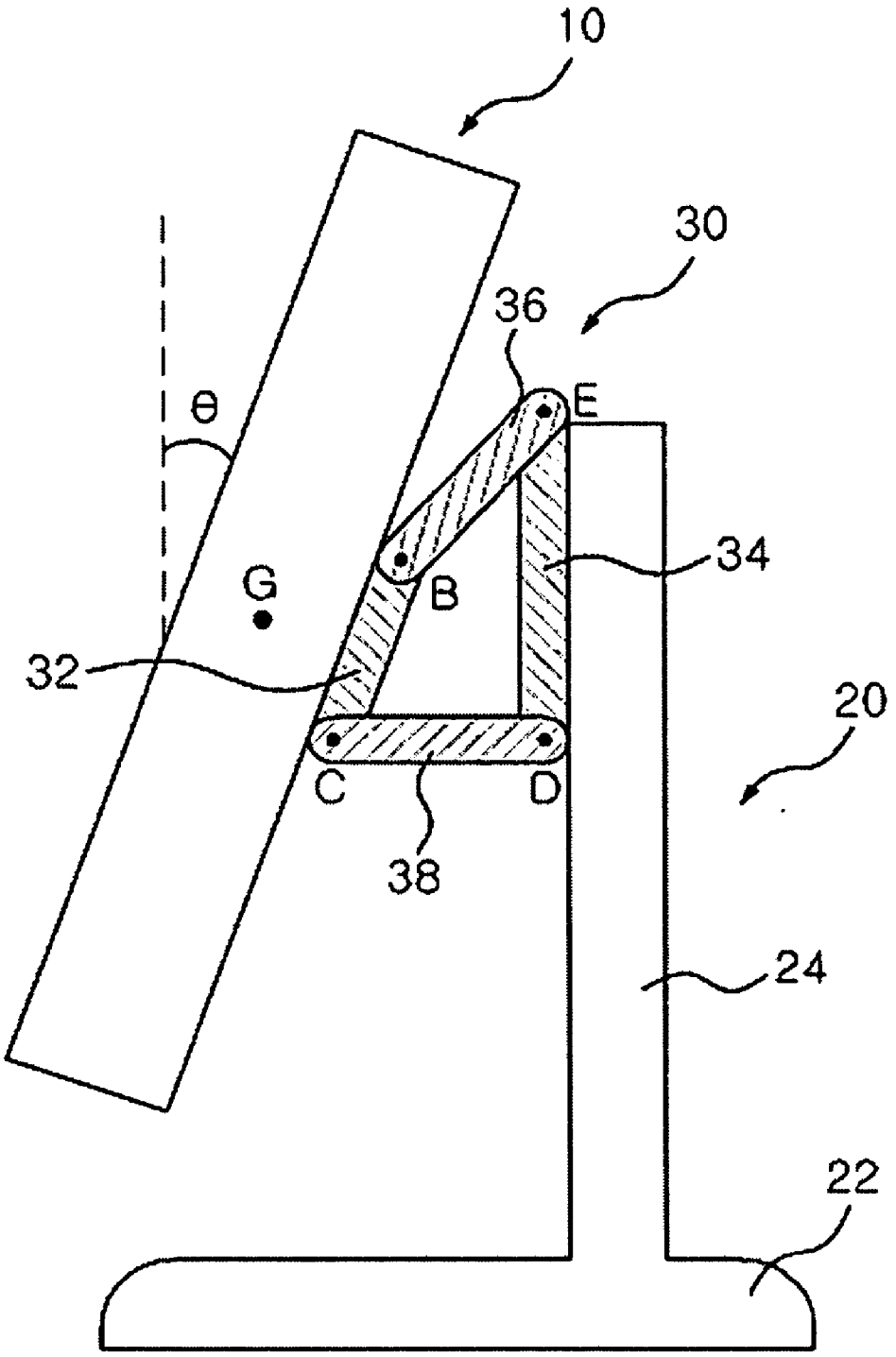

Fig. 3

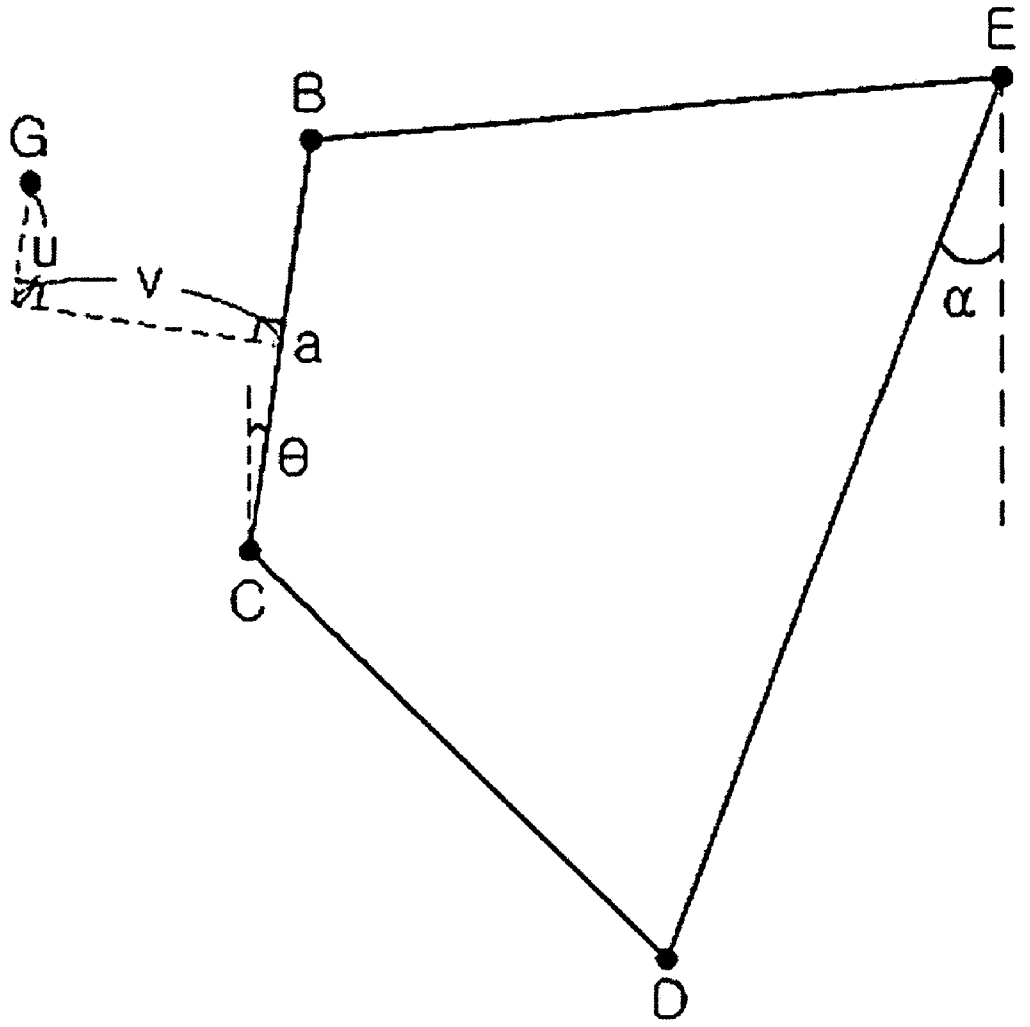

Fig. 4

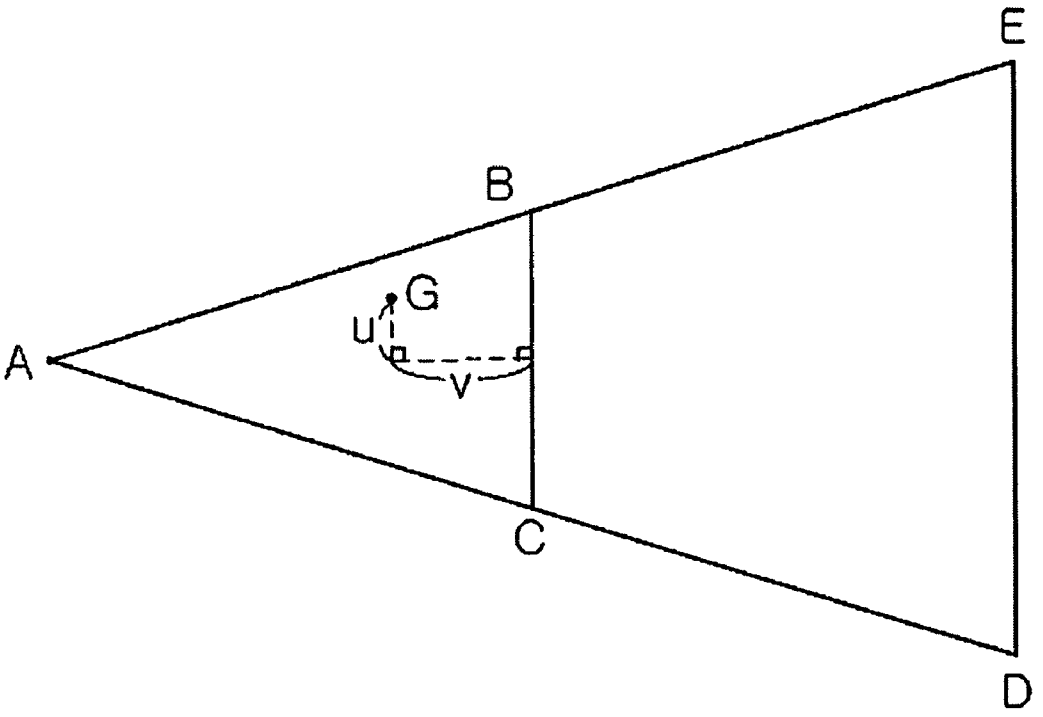

Fig. 5

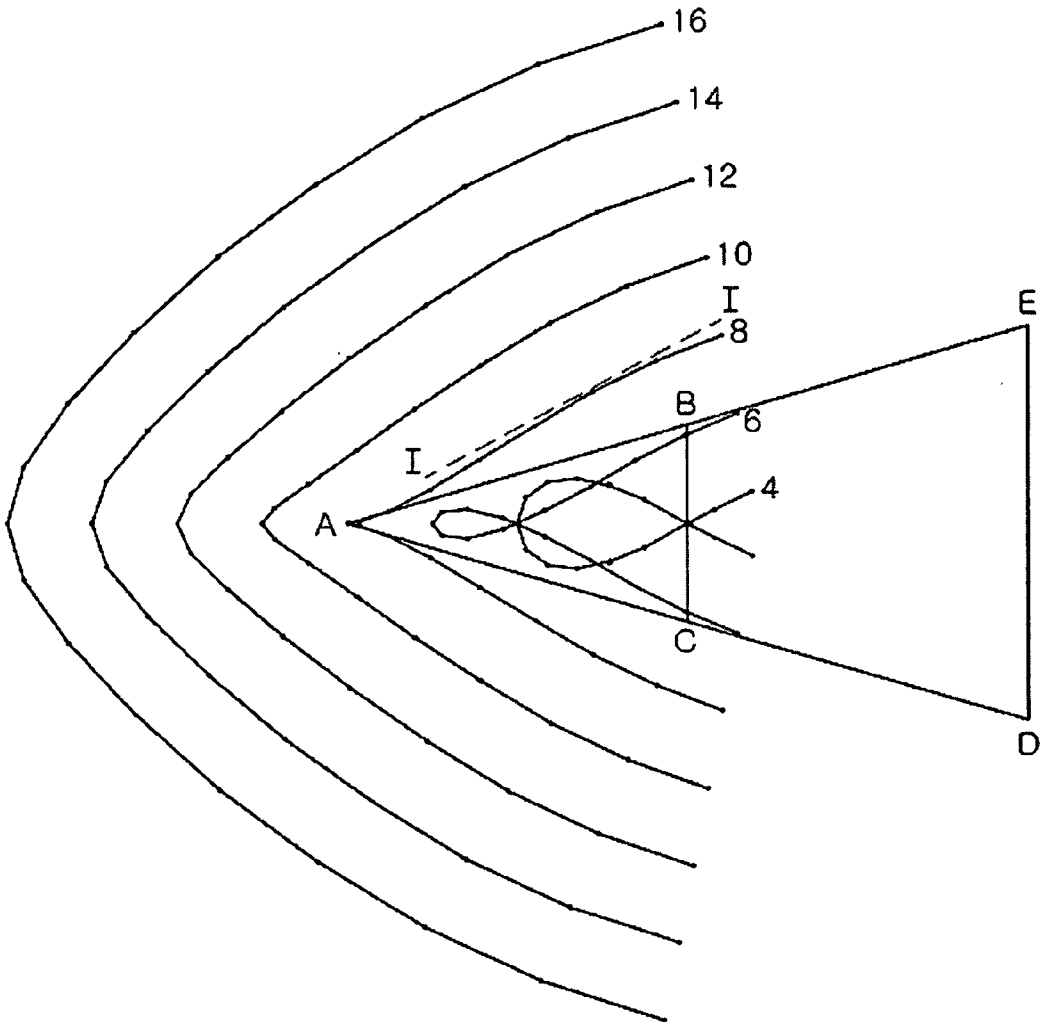

Fig. 6

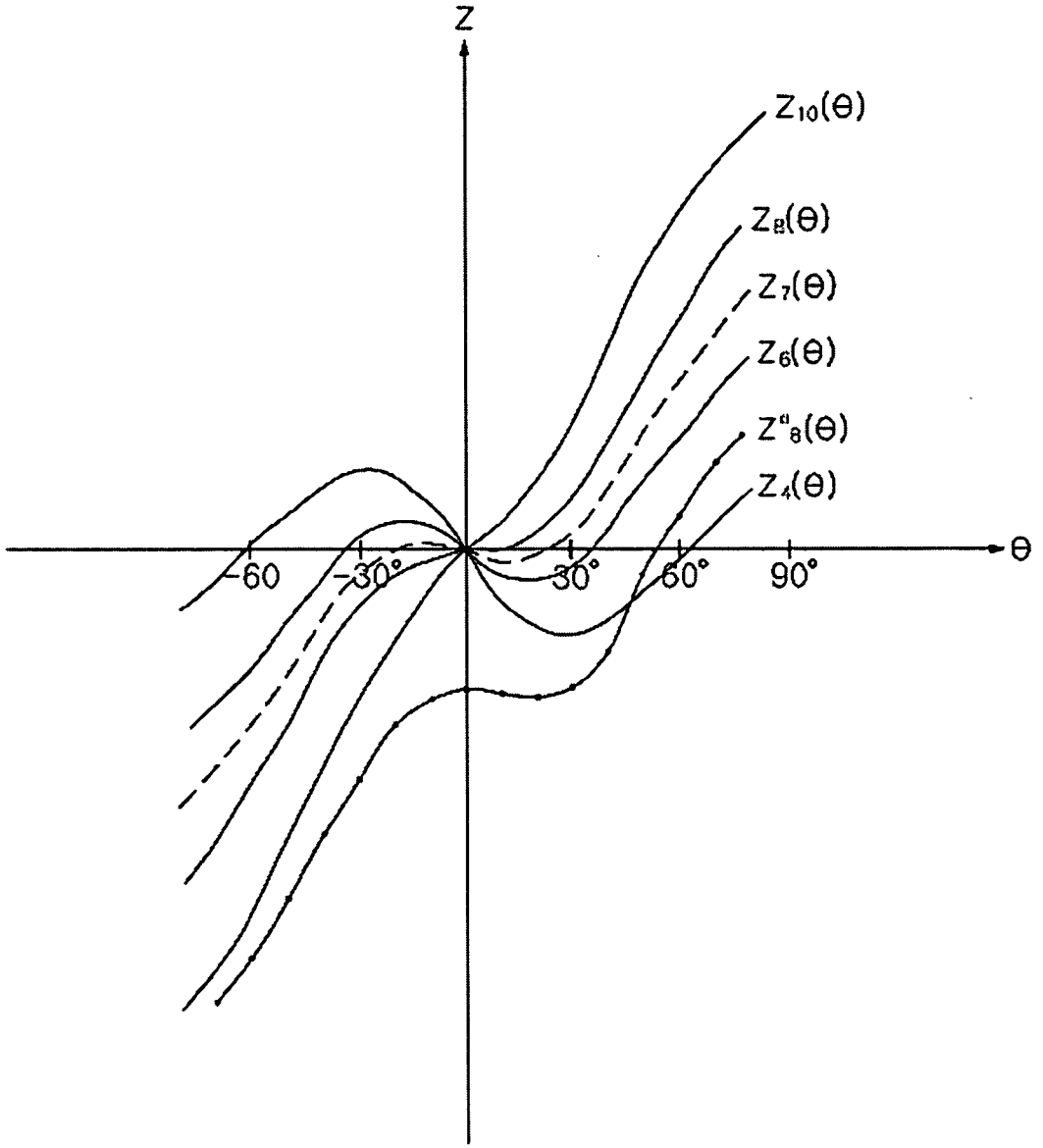

Fig. 7

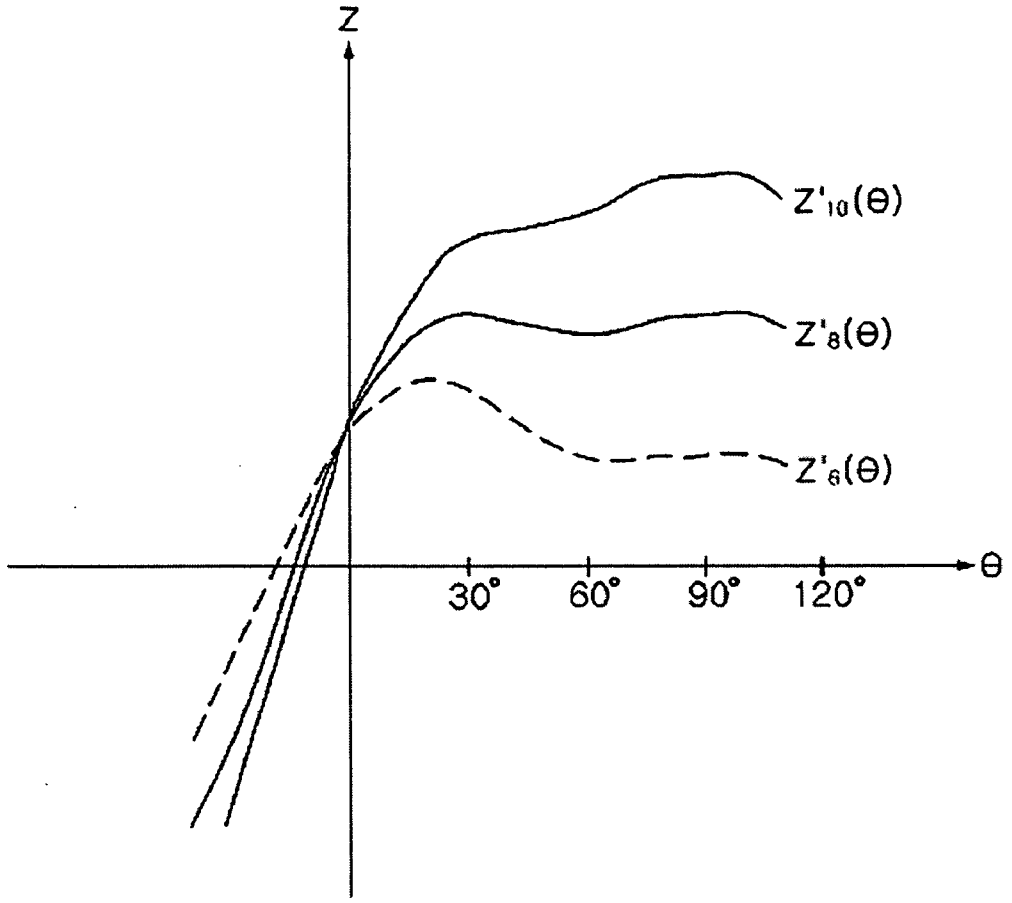

Fig. 8A

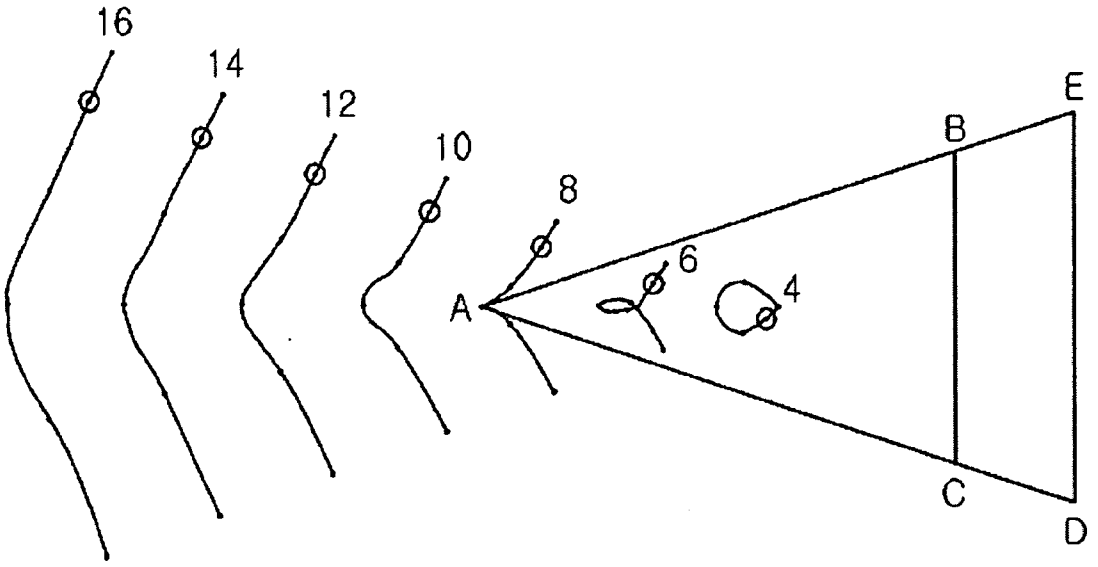

Fig. 8B

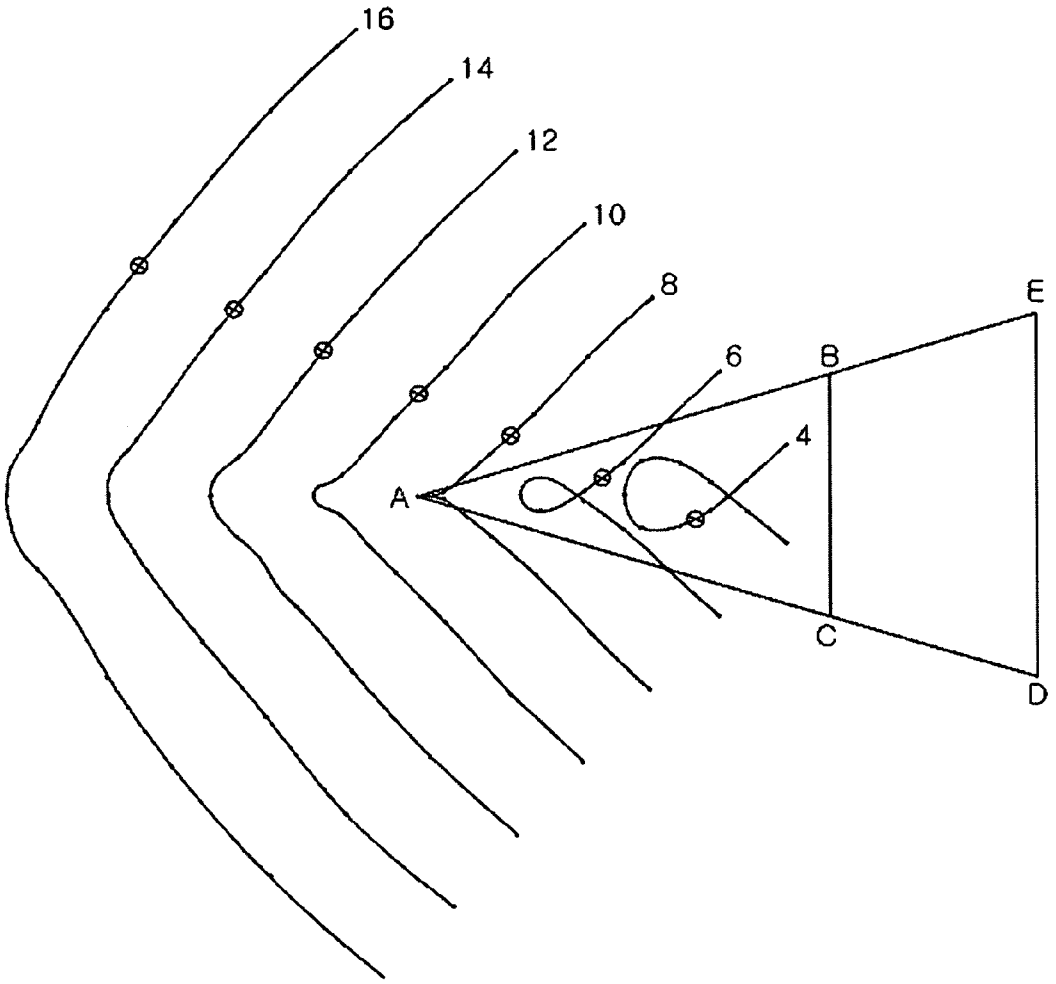

Fig. 8C

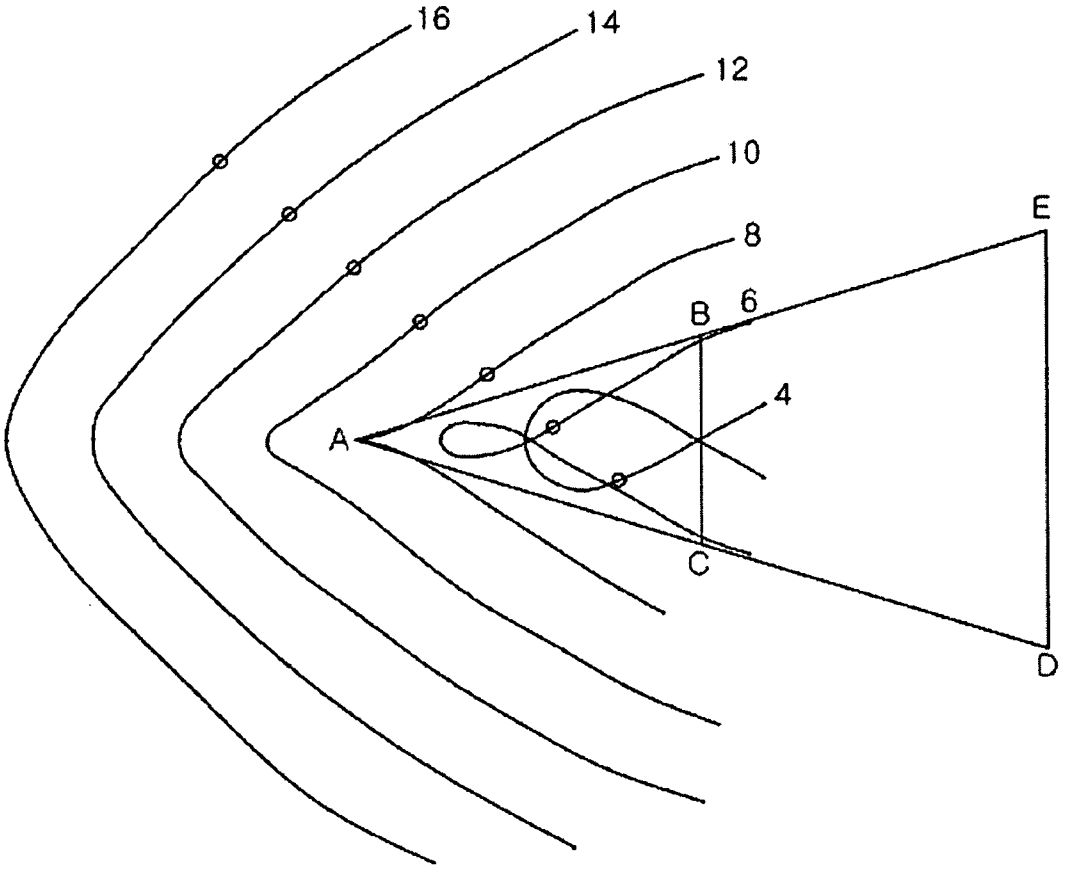

Fig. 8D

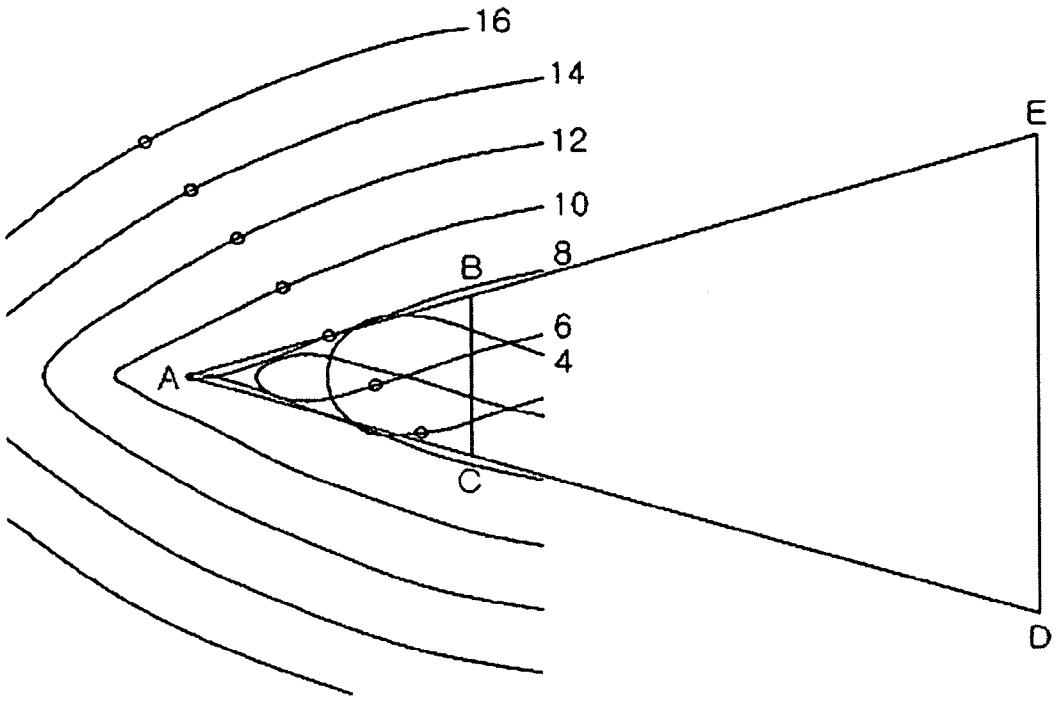

Fig. 9A

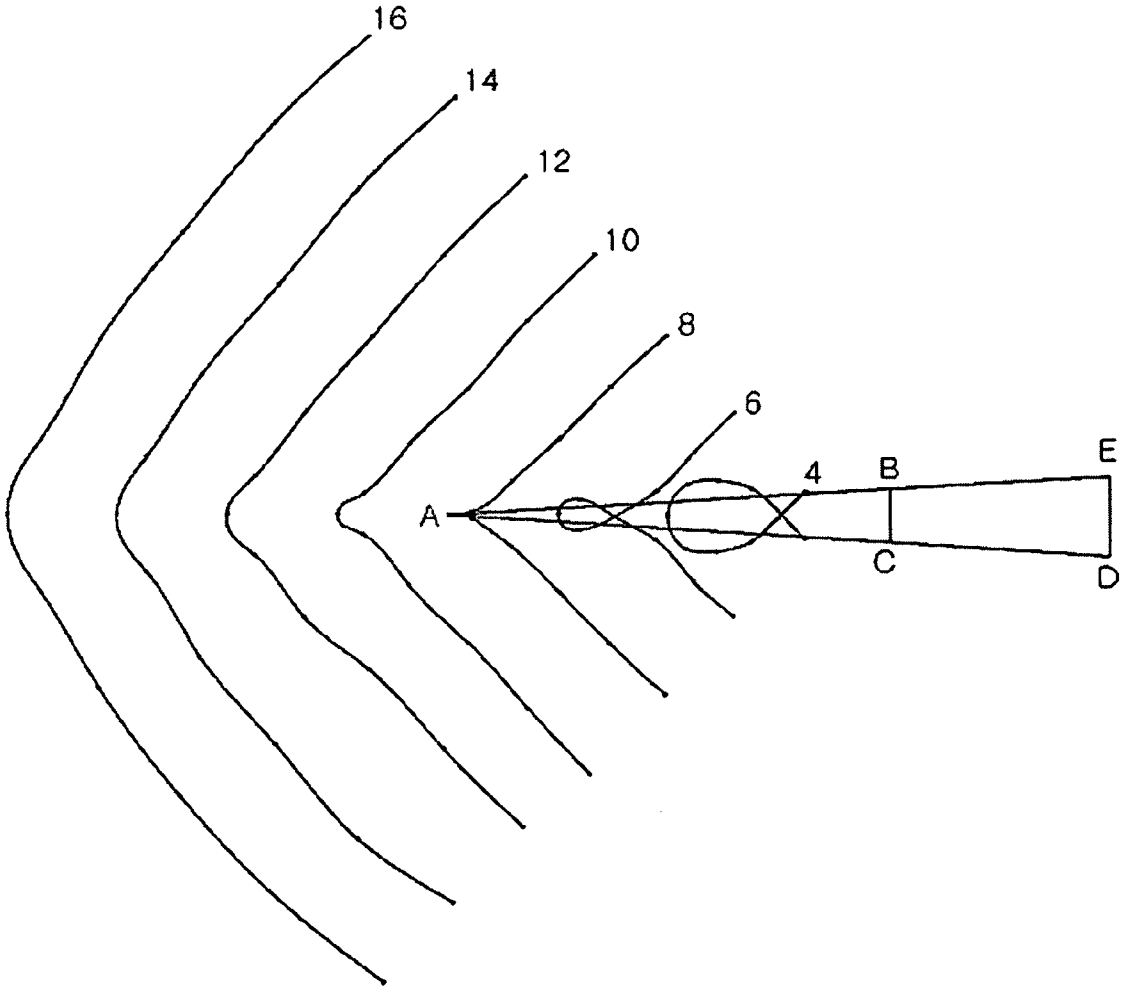

Fig. 9B

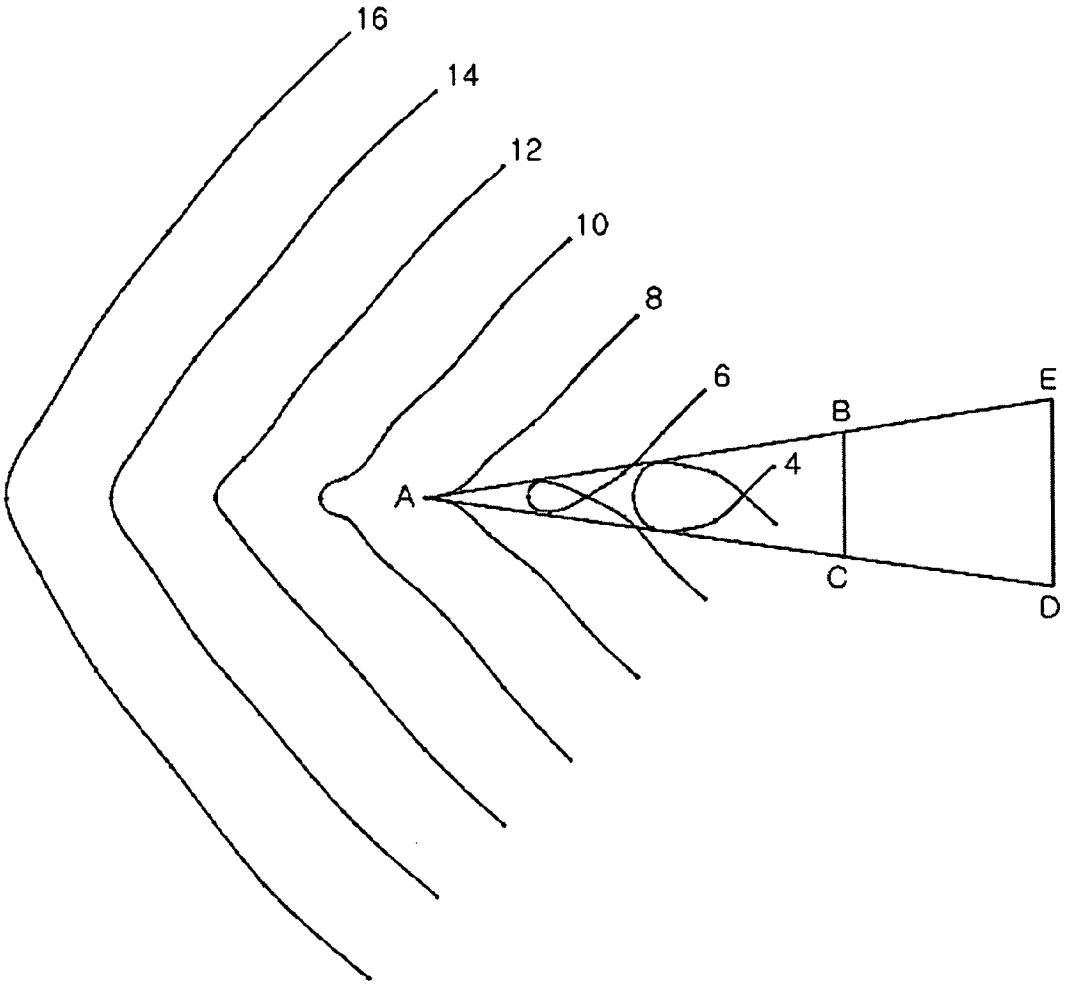

Fig. 9C

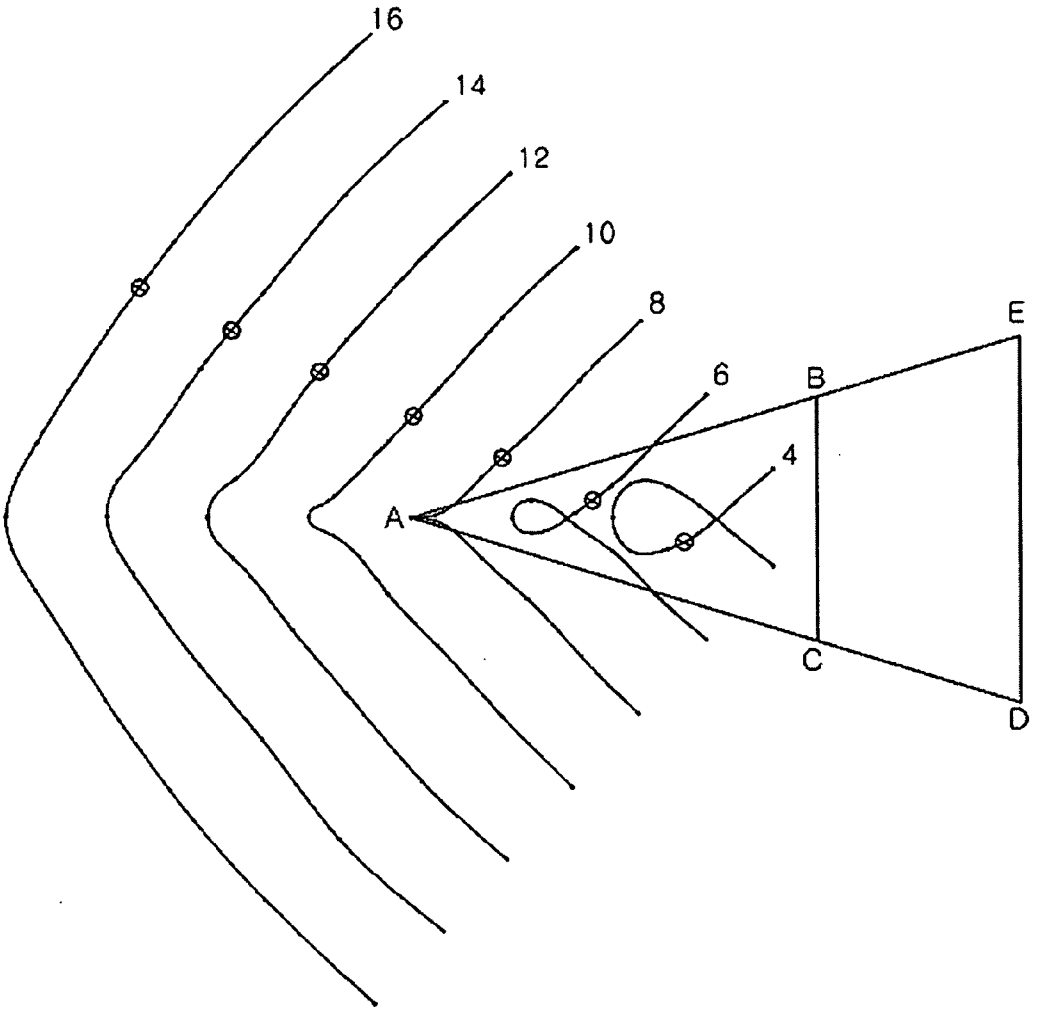

Fig. 9D

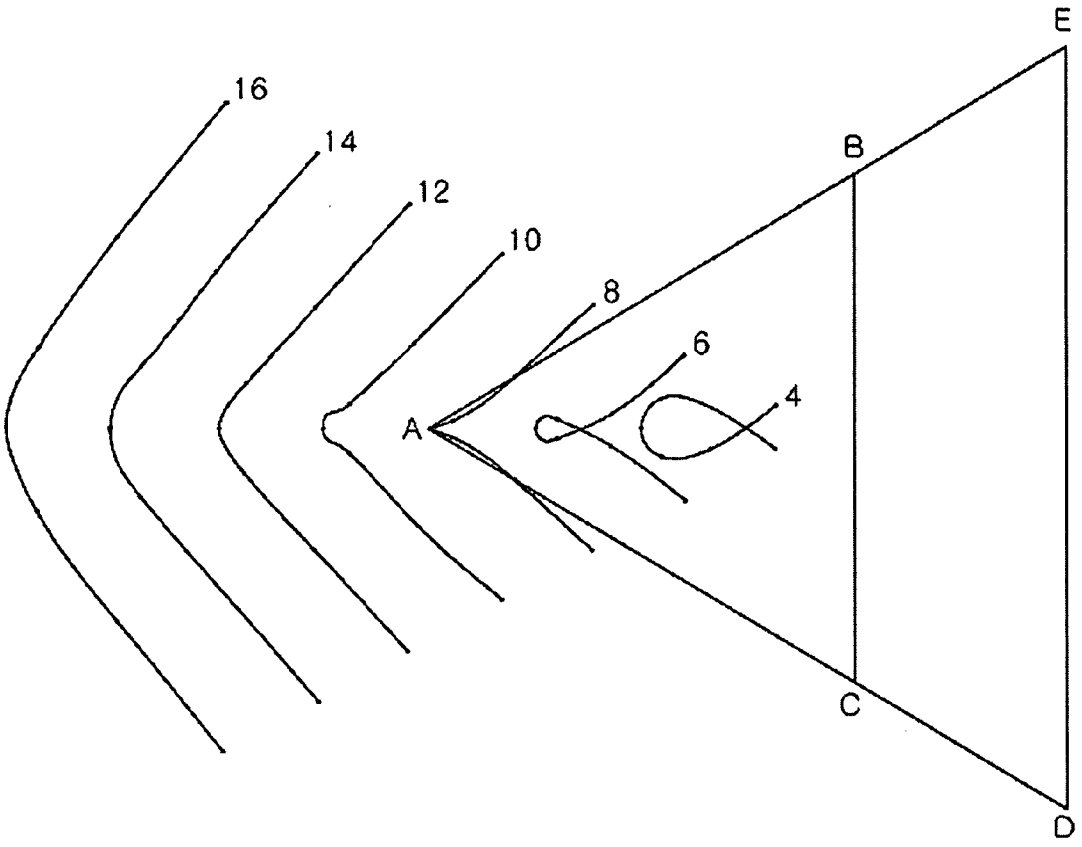

Fig. 10A

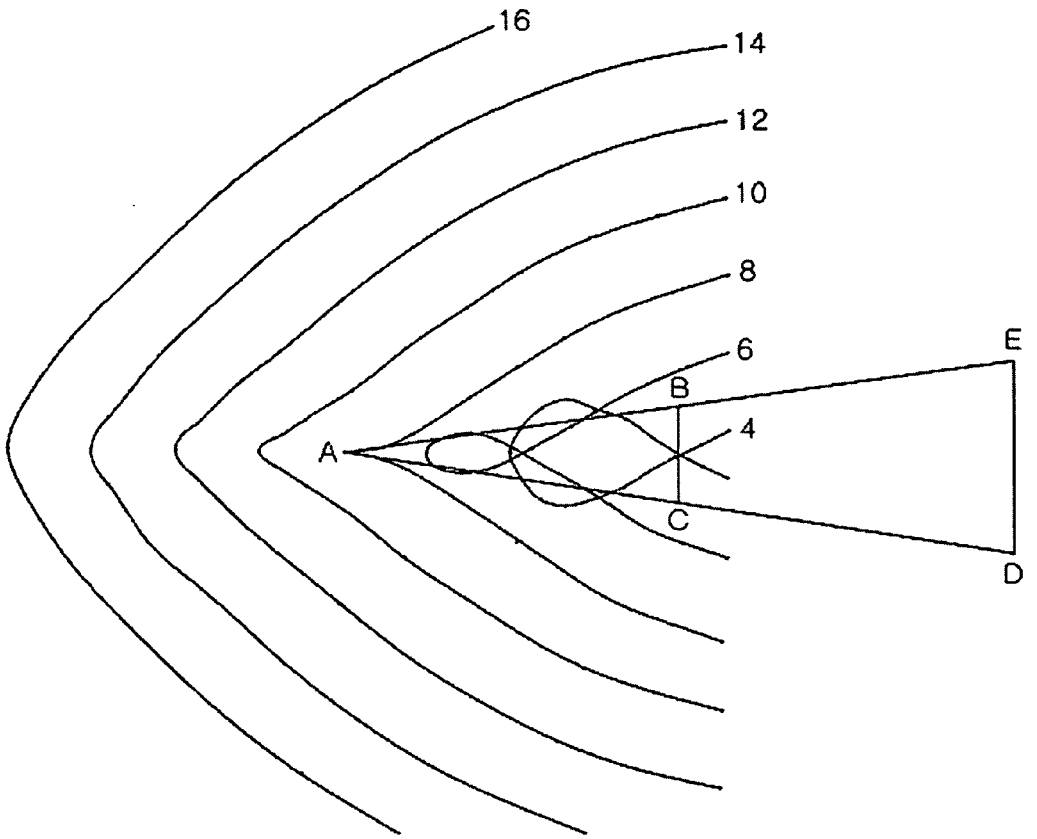

Fig. 10B

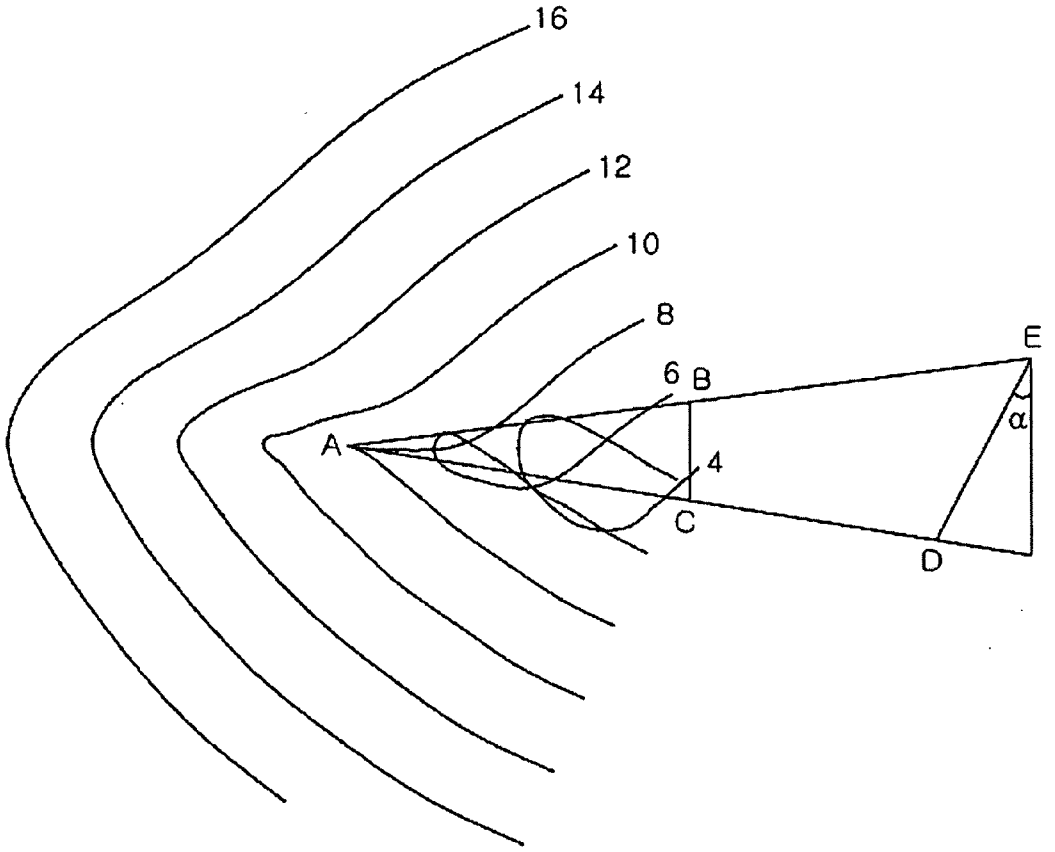

Fig. 11

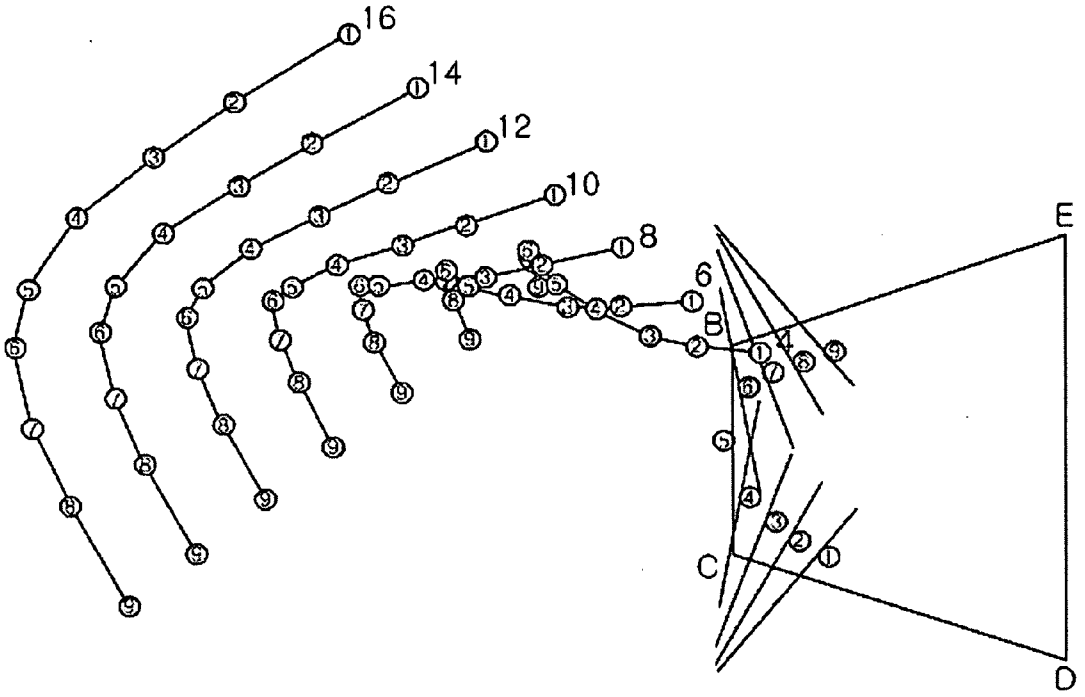

Fig. 12

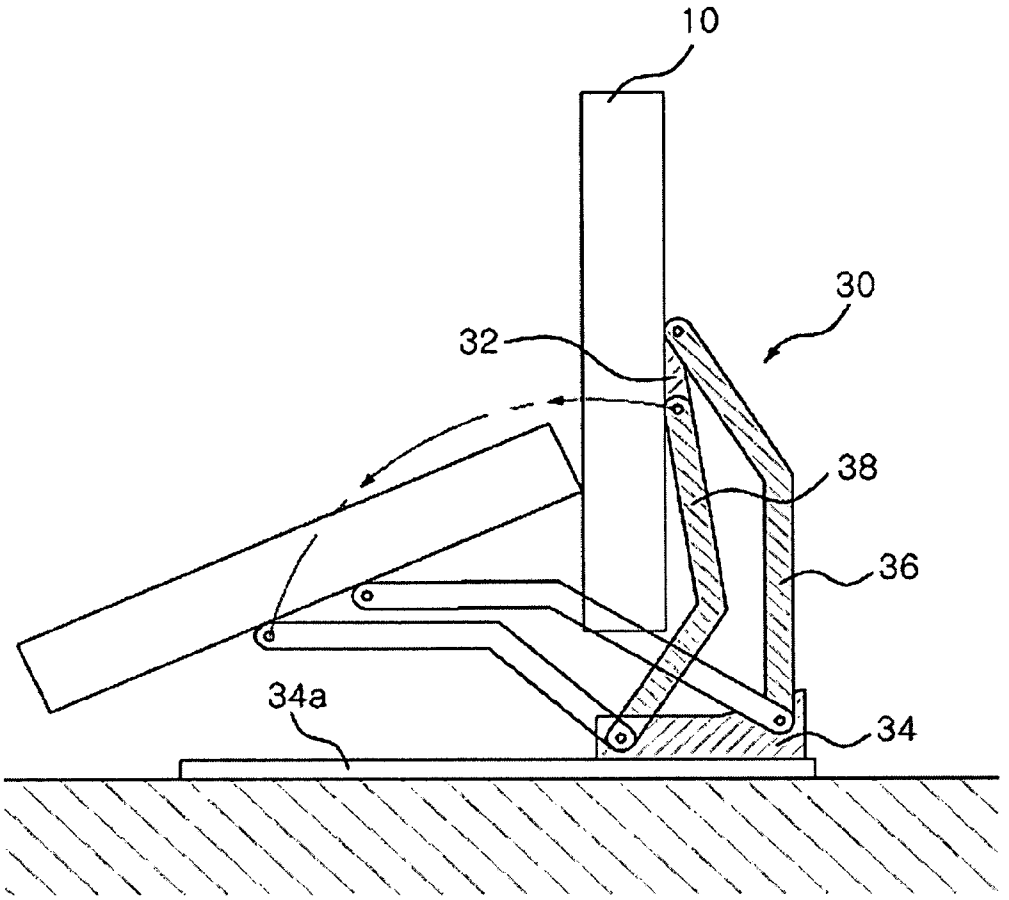

Fig. 13

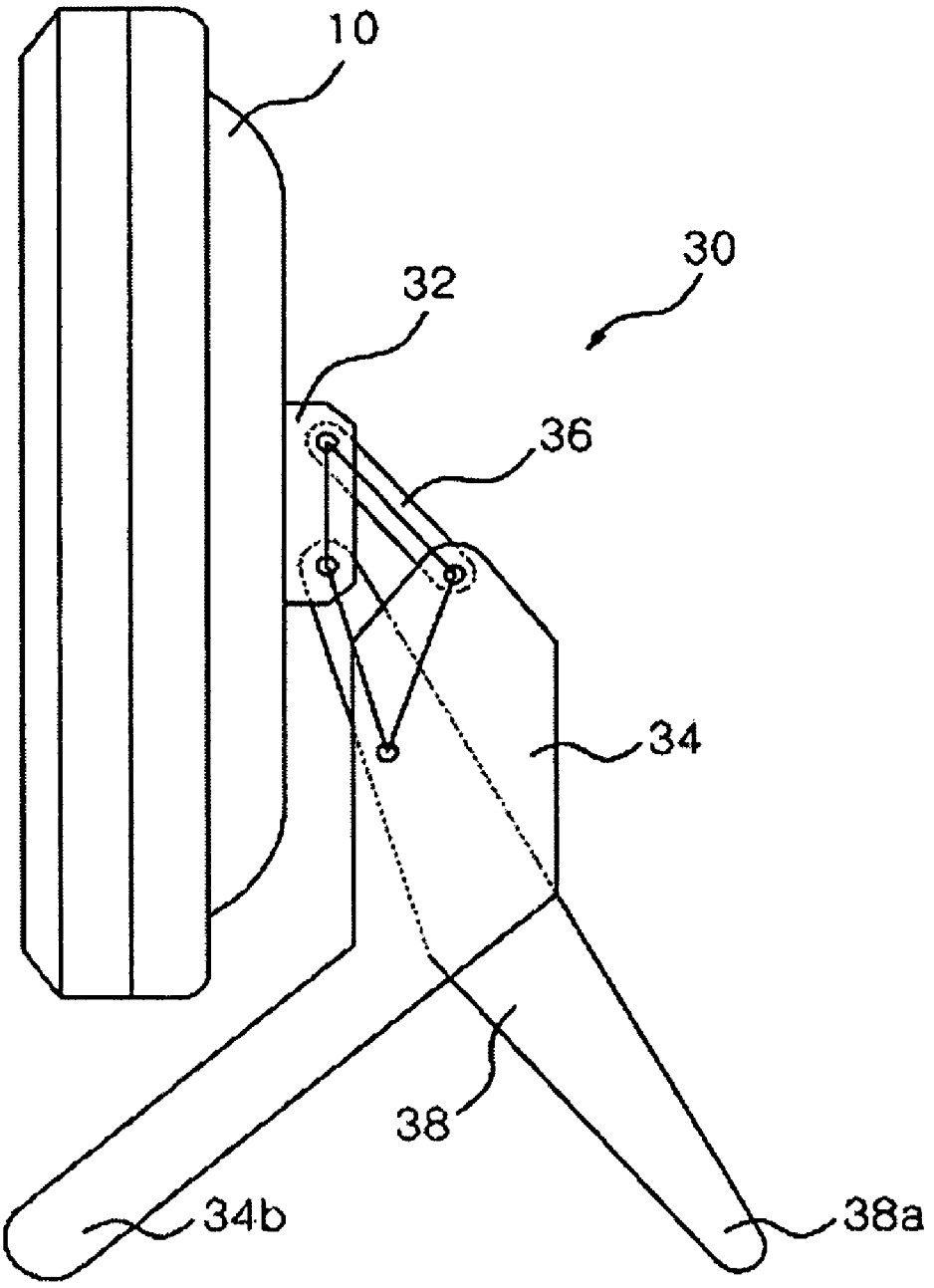

Fig. 14

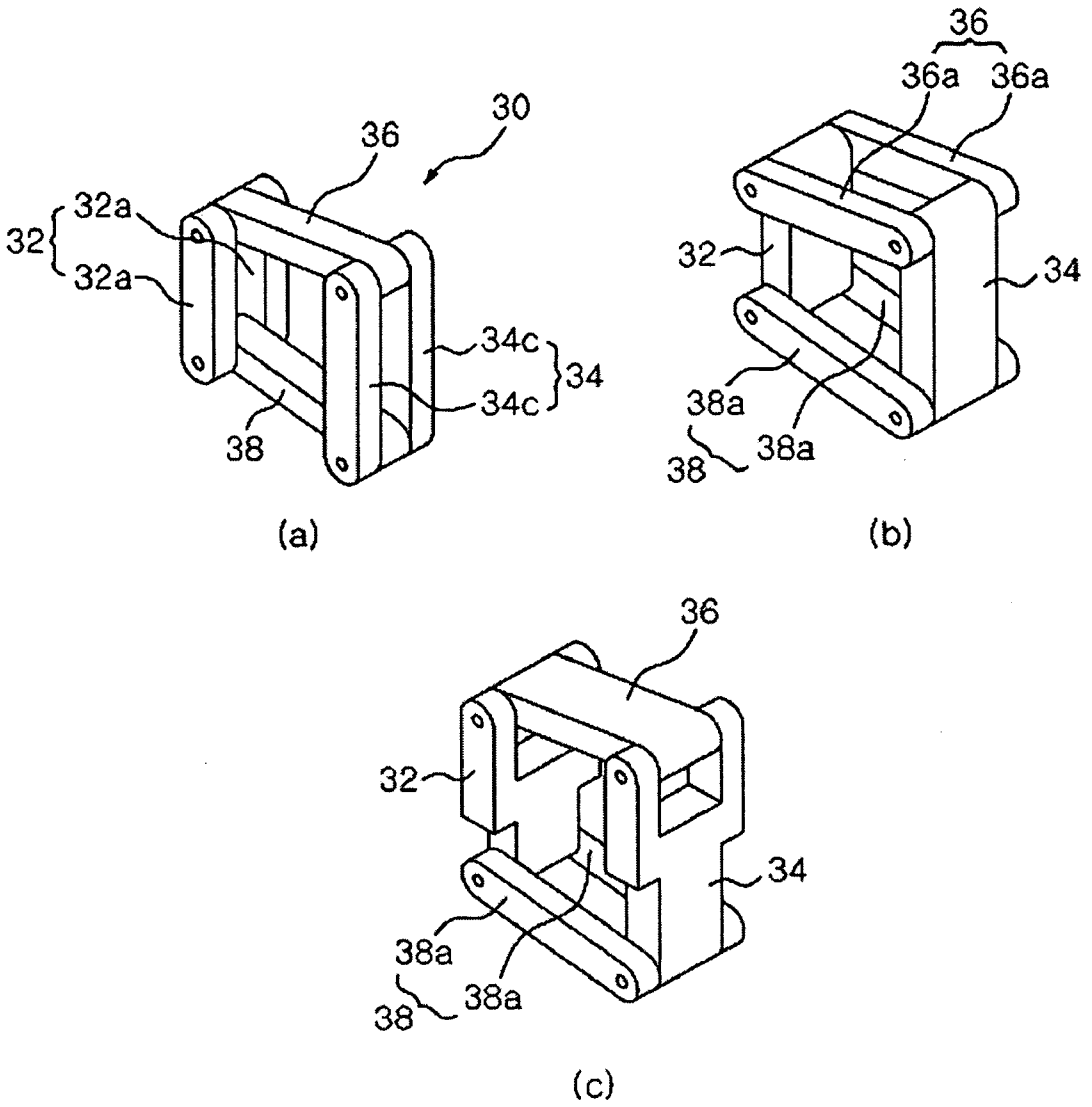
36
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Fig. 15

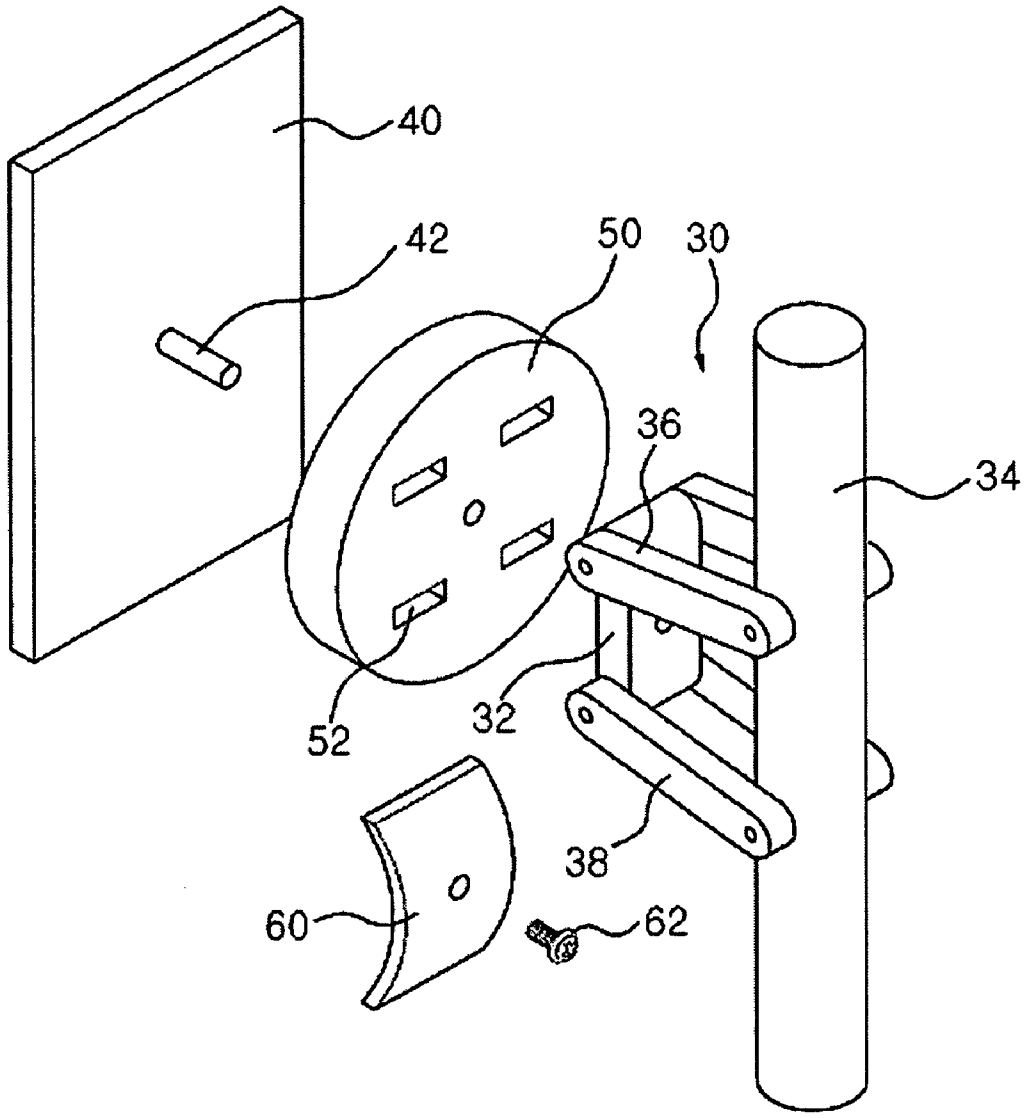


Fig. 16

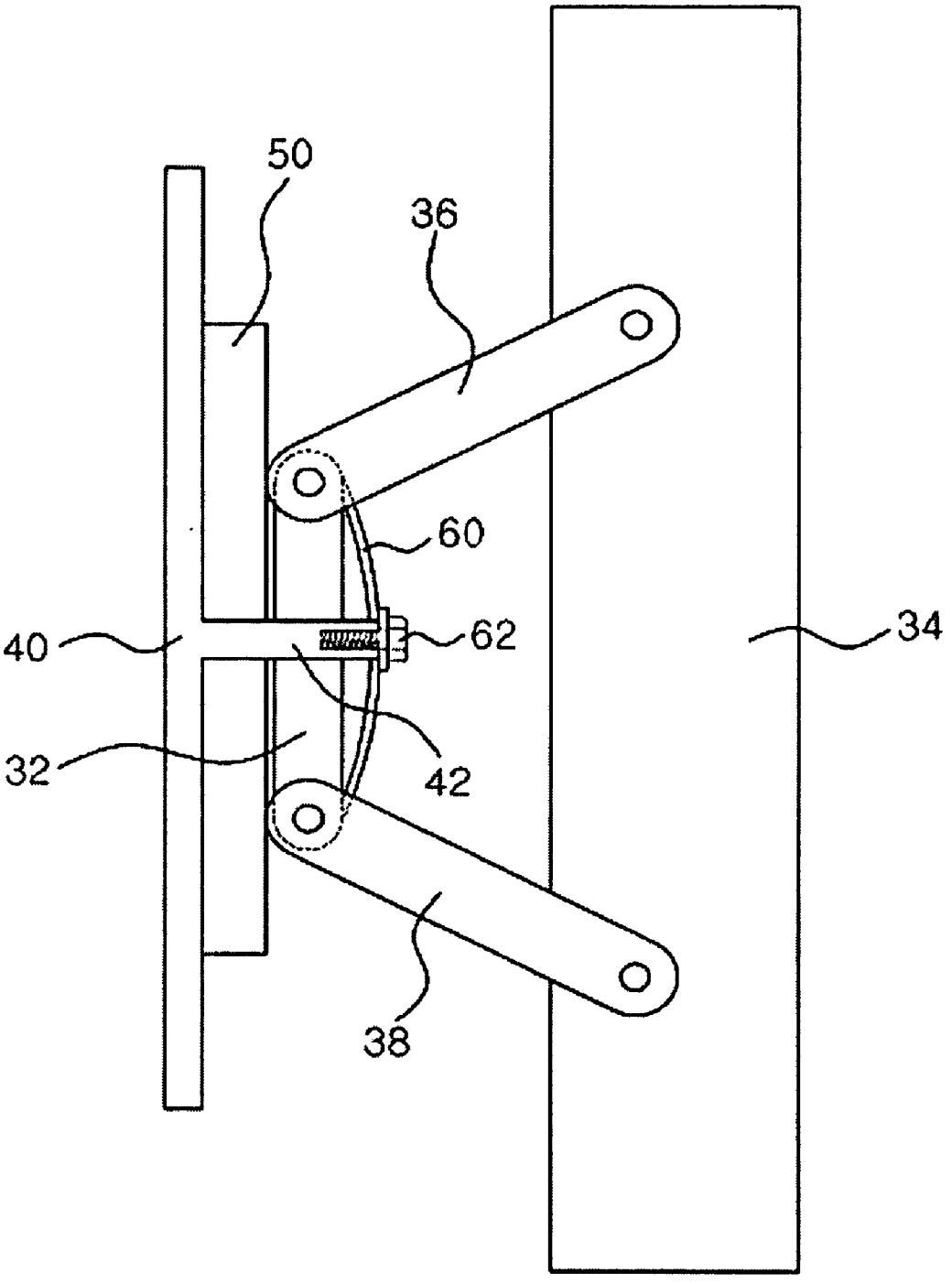
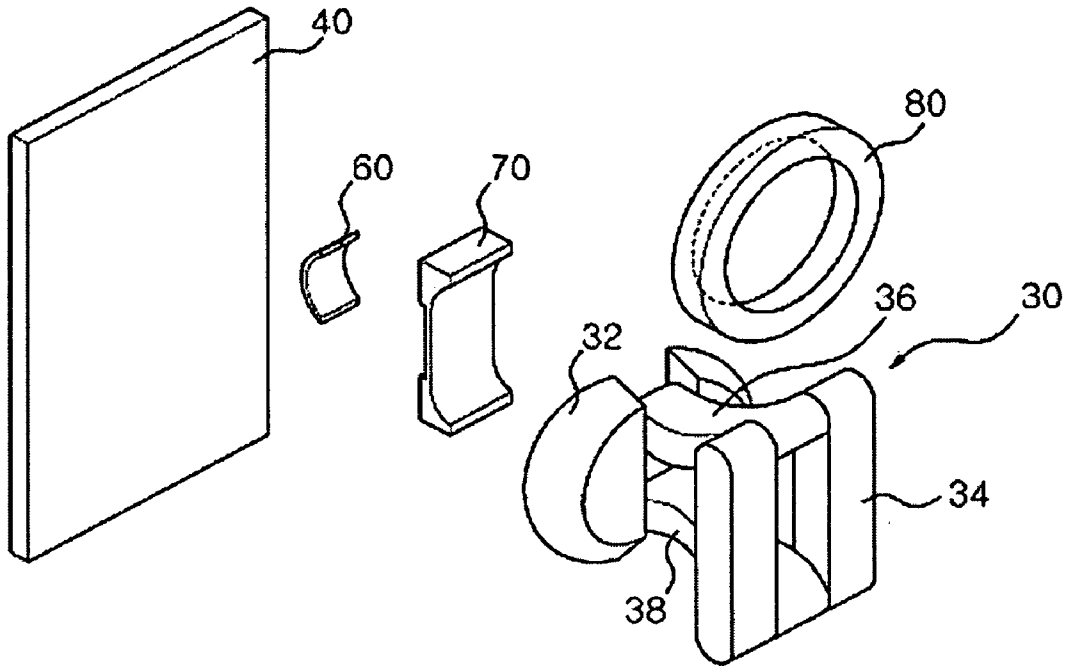
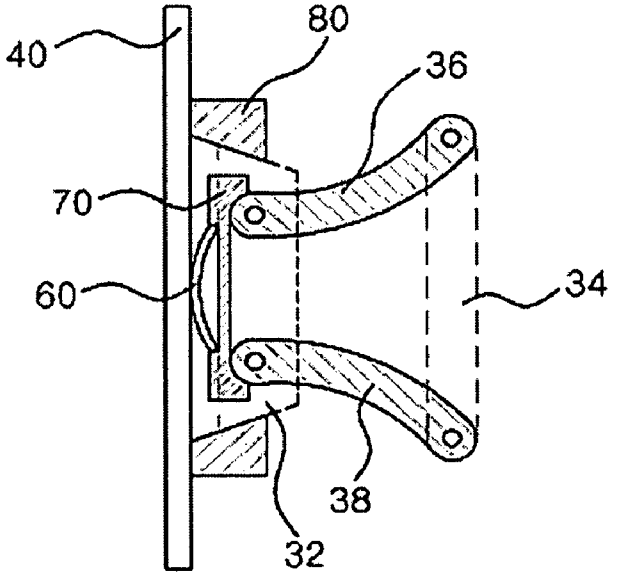


Fig. 17



(a)



(b)

CONTROLLER FOR MONITOR

TECHNICAL FIELD

[0001] The present invention relates to an apparatus for adjusting an inclination angle of a monitor, and in particular to a monitor fixing apparatus which is capable of stably supporting and adjusting an inclination angle of a monitor.

BACKGROUND ART

[0002] As the use of a thin flat type display monitor such as a PDP (Plasma Display Panel), a LCD (Liquid Crystal Display) monitor, etc. rises, a thin flat panel type monitor has been fixed using a vertical stand of which upper end is fixed at the back surface of the monitor, as compared to a conventional method in which a CRT (Cathode Ray Tube) monitor is supported using a leg type stand fixed at a lower surface of the monitor.

[0003] FIG. **1** is a view illustrating a conventional monitor support apparatus. As shown therein, a back surface of a monitor **110** is engaged with a stand **120** and is positioned at a certain height from a floor. Here, the stand **120** includes a support **122** contacting with the floor, and a base **124** vertically integral with the support **122**. The monitor **110** is hinge-engaged (**132**) with the base **124** of the stand **120** using an engaging device **130**. With the above construction, the monitor **110** is inclined at a certain angle θ with respect to a vertical surface.

[0004] A certain friction force is applied to the hinge **132** in order to stably maintain an inclination angle θ. This method is capable of preventing the monitor **110** from being tilted downwards due to gravity force, but when it is needed to change an inclination angle, a certain force exceeding a stop friction force should be applied, so that tilting the monitor using hands is difficult.

[0005] In order to overcome the above problems, a reverse direction torque is generated using a spring, so that the generated torque is balanced with gravity force. Here, the spring is additionally used, the construction gets complicated. In the case that the size of torque changes, a balancing operation may be difficult. When it is needed to use the monitor tilted in a horizontal state, since the spring continuously operates, the monitor automatically rises and returns to a vertical state.

[0006] In the case of monitor support devices, they should be designed to support many monitors having different weights, so that the elastic forces of the springs adapted thereto should be differently determined depending on the weights of the monitors. A certain spring having a high elastic force should be used in order to support a heavy display apparatus such as PDP. In this case, it is impossible to change the angles with hands.

[0007] According to a conventional monitor support method, the weight center G of the monitor **110** is sharply moved up based on the change of an inclination angle θ. In particular, in the case of the monitor **110** which is used for a long time in an office, school, etc, the center height of the monitor **110** may largely change even when the inclination angle of the monitor **110** is slightly changed. When the center height of the monitor **110** largely changes, the user of the monitor may feel pain at neck or eyes.

[0008] There may be a certain method of overcoming the above problems by additionally providing a height adjusting apparatus at the stand **120** and further adjusting the height after the inclination angle is adjusted. However, this method may give the user harder work. Since the weight center G of the monitor **110** is distanced from the hinge **132**, with the hinge **132** being adapted to adjust the inclination angle of the monitor, the inclination angle may easily change due to the torque generated by the weight of the monitor **110**. In order to prevent the above problems, a friction force should be disadvantageously provided or a spring should be additionally provided.

[0009] Therefore, a method and apparatus, which are capable of preventing the inclination and inclination angles of a monitor from being changed and capable of changing the height of the center of the monitor at a minimum degree even when the inclination angle of the monitor is changed, are urgently needed.

DISCLOSURE OF INVENTION

[0010] Accordingly, it is an object of the present invention to overcome the problems encountered in the conventional art.

[0011] It is another object of the present invention to provide an apparatus for adjusting an inclination angle of a monitor, which is capable of stably supporting a monitor and easily changing an inclination angle of the monitor.

[0012] It is further another object of the present invention to provide an apparatus for adjusting an inclination angle of a monitor in which a change of an inclination angle of a monitor due to a weight of the monitor is minimized.

[0013] To achieve the above objects, there is provided an apparatus for adjusting an inclination angle of a monitor, comprising a monitor ward support member for supporting one side of a monitor; a base ward support member which is engaged and supported by a base surface; an upper connection member which connects an upper side of the monitor connection member and an upper side of the base ward support member, with the upper connection member being rotatable; and a lower connection member which connects a lower side of the monitor ward support member and a lower side of the base ward support member, with the lower connection member being rotatable.

[0014] A monitor ward line length corresponding to a straight line length between a point B and a point C, with the point B corresponding to a side surface center at which the monitor ward support member and the upper connection member are engaged, and with the point C corresponding to a side surface center at which the monitor ward support member and the lower connection member are engaged, is shorter than a base ward line length corresponding to a straight line length between a point E and a point D, with the point E corresponding to a side surface center at which the base ward support member and the upper connection member are engaged, and with the point D corresponding to a side surface center at which the base ward support member and the lower connection member are engaged.

[0015] An upper side line length corresponding to a straight line length between a point B and a point E, with the point B corresponding to a side surface center at which the monitor ward support member and the upper connection

member are engaged, and with the point E corresponding to a side surface center at which the base ward support member and the upper connection member are engaged, is the same as a lower side line length corresponding to a straight line between a point C and a point D, with the point C corresponding to a side surface center at which the monitor ward support member and the lower connection member are engaged, and with the point D corresponding to a side surface center at which the base ward support member and the lower connection member are engaged.

[0016] An upper side line length corresponding to a straight line length between a point B and a point E, with the point B corresponding to a side surface center at which the monitor ward support member and the upper connection member are engaged, is longer than a lower side line length corresponding to a straight line length between a point C and a point D, with the point C corresponding to a side surface center at which the monitor ward support member and the lower connection member are engaged, and with the point D corresponding to a side surface center at which the base ward support member and the lower connection member are engaged.

[0017] An upper side line length corresponding to a straight line length between a point B and a point E, with the point B corresponding to a side surface center at which the monitor ward support member and the upper connection member are engaged, is shorter than a lower side line length corresponding to a straight line length between a point C and a point D, with the point C corresponding to a side surface center at which the monitor ward support member and the lower connection member are engaged, and with the point D corresponding to a side surface center at which the base ward support member and the lower connection member are engaged.

[0018] The base surface, which supports the base ward support member, is a wall surface or one surface of a stand member.

[0019] The base surface, which supports the base ward support member, is a floor.

[0020] The base ward support member has an elongated column shape.

[0021] The base ward support member and lower connection member include support parts, which are extended downwards, respectively.

[0022] The monitor ward support member or the base ward support member includes two elongated support parts, with the upper connection member or the lower connection member being engaged between the elongated support parts of the monitor ward support member or the base ward support member.

[0023] The upper connection member or the lower connection member includes two elongated support parts, with the monitor ward support member or the base ward support member being engaged between the elongated support parts of the upper connection member or the lower connection member.

[0024] The monitor ward end of the upper connection member or the lower connection member contacts with one surface of the monitor and is pressurized for thereby generating a certain friction force.

[0025] A back surface groove corresponding to the shape of an end of the upper connection member or the lower connection member is formed at a portion at which the monitor contacts with the upper connection member or the lower connection member.

[0026] A monitor ward end of the upper connection member or the lower connection member contacts with the plate attached to one surface of the monitor and is pressurized for thereby generating a certain friction force.

[0027] A back surface groove corresponding to the shape of an end of the upper connection member or the lower connection member is formed at a portion at which the plate contacts with the upper connection member or the lower connection member.

[0028] There are further provided a protrusion engaging part protruded backwards from one surface of the monitor; an elastic member which passes through the protrusion engaging part; and an engaging member which is engaged with the protrusion engaging part and pressurizes the elastic member toward the monitor, whereby the monitor is engaged by passing through the protrusion engaging part into the monitor ward support member.

[0029] There are further provided a plate which includes a protrusion engaging part protruded backwards from one surface of the monitor; an elastic member which passes through the protrusion engaging part; and an engaging member which is engaged with the protrusion engaging part and pressurizes the elastic member toward the plate, whereby the plate is engaged by passing through the protrusion engaging part into the monitor ward support member.

[0030] There is further provided a rotation plate, which is provided in front of the elastic member and passes through the protrusion engaging part.

[0031] A back surface groove corresponding to the shape of an end of the upper connection member or the lower connection member is formed at a portion at which the rotation plate contacts with the upper connection member or the lower connection member.

[0032] A rim of the monitor ward support member is formed in a circular or arc shape, with a ring being inserted onto the rim of the monitor ward support member and being engaged at one surface of the monitor.

[0033] There is further provided a plate, which is provided between the ring and one surface of the monitor, with the plate being engaged at one surface of the monitor, and with the plate being engaged with the ring.

[0034] A guide pad is provided at an end contacting with the upper connection member or the lower connection member.

[0035] The guide pad is pressurized by an elastic member supported by the monitor, with the guide pad being pressurized toward the end of the upper connection member or the lower connection member.

BRIEF DESCRIPTION OF DRAWING

[0036] The present invention will become better understood with reference to the accompanying drawings which

are given only by way of illustration and thus are not limitative of the present invention, wherein;

[0037] FIG. **1** is a side view illustrating a conventional apparatus for adjusting an inclination angle of a monitor;

[0038] FIG. **2** is a side view illustrating an apparatus for adjusting an inclination angle of a monitor according to the present invention;

[0039] FIG. **3** is a schematic view illustrating an apparatus for adjusting an inclination angle of a monitor according to the present invention;

[0040] FIG. **4** is a schematic view illustrating a length ratio in the apparatus of FIG. **3**;

[0041] FIG. **5** is a graph of a weight center G expressed as an inclination angle θ of a monitor ward line BC and a horizontal distance V of FIG. **4** are changed according to the present invention;

[0042] FIG. **6** is a graph expressed as a height of a weight center G is changed with a variable of an inclination angle θ of FIG. **5**;

[0043] FIG. **7** is a graph expressed a height of a weight center G is changed with a variable of an inclination angle θ in the case that an included angle α of a base ward line ED of FIG. **4** is 30°;

[0044] FIGS. **8**A, **8**B, **8**C and **8**D are graphs illustrating the movements of a weight center G when the size of a triangle AED is changed in a state that a triangle ABC is fixed in a similar isosceles triangle of FIG. **4**;

[0045] FIGS. **9**A, **9**B, **9**C and **9**D are graphs illustrating the movements of a weight center G when a vertical angle of an apex A is changed in a state that a length ratio of lines AB and BE is fixed at 1:0.5 in a similar isosceles triangle of FIG. **4**;

[0046] FIGS. **1**OA and **10**B are graphs illustrating a movement state of a weight center G in a rectangular hinge structure of another structure;

[0047] FIG. **11** is a graph illustrating a trajectory of a weight center G in the case that a vertical distance u of a weight center G is not 0 in FIG. **4**;

[0048] FIG. **12** is a view illustrating an apparatus for adjusting an inclination angle of a monitor according to another embodiment of the present invention;

[0049] FIG. **13** is a view illustrating an apparatus for adjusting an inclination angle of a monitor according to further another embodiment of the present invention;

[0050] FIGS. **14**A, **14**B, and **14**C are views illustrating various examples of an apparatus for adjusting an inclination angle of a monitor;

[0051] FIG. **15** is a disassembled perspective view illustrating a constriction that an apparatus for adjusting an inclination angle of a monitor is engaged according to the present invention;

[0052] FIG. **16** is a side cross sectional view illustrating a state that each element is engaged in an apparatus for adjusting an inclination angle of a monitor according to the present invention; and

[0053] FIGS. **17**A and **17**B are disassembled perspective views illustrating another state that each element is engaged in an apparatus for adjusting an inclination angle of a monitor and a side cross sectional view illustrating an engaged state of the apparatus.

BEST MODE FOR CARRYING OUT THE INVENTION

[0054] The preferred embodiments of the present invention will be described with reference to the accompanying drawings.

[0055] FIG. **2** is a side view illustrating an apparatus for adjusting an inclination angle of a monitor according to the present invention. As shown therein, a monitor **10** is attached at a base **24** at an upper side of a support **22** of a stand **20** using a monitor inclination adjusting apparatus **30**. With the above construction, an inclination angle θ of the monitor **10** can be adjusted.

[0056] A monitor ward support member **32** is a plate shaped member, with a back surface of the monitor **10** being engaged at the monitor ward support member **32**. A base ward support member **34** is a plate shaped member attached to the base **24**. An upper connection member **36** and a lower connection member **38** are engaged at the upper and lower sides of the monitor ward support member **32** and the base ward support member **34**. A certain engaging plate member (not shown) may be adapted between the monitor ward support member **32** and the monitor **10** for an easier attachment.

[0057] The both ends of each of the upper connection member **36** and the lower connection member **38** are hinged at the upper and lower ends of the monitor ward support member **32** and the base ward support member **34**. The center axis points of the hinged portions are indicated by B, C, D and E. Namely, the center point of the lateral side, in which the monitor ward support member **32** and the upper connection member **36** are hinged, is indicated by the point B, and the center point of the lateral side, in which the monitor ward support member **32** and the lower connection member **38** are hinged, is indicated by the point C, and the center point of the lateral side, in which the lower side engaging member **38** and the base ward support member **34** are hinged, is indicated by the point D, and the center point of the lateral side, in which the base ward support member **34** and the upper connection member **38** are engaged, is indicated by the point E.

[0058] In the monitor inclination adjusting apparatus **30**, the monitor ward support member **32**, the base ward support member **34**, and the upper connection member **36** and the lower connection member are linked in a rectangular shape. With the above construction, it is called a rectangular hinge structure.

[0059] According to the structure in which four members are linked with each other for supporting the monitor and adjusting the inclination, various movement characteristics can be obtained by adjusting the length and length ratio of each member. Namely, a certain support function well adapted to each user can be implemented by properly amending the length of each member.

[0060] FIG. **3** is a schematic view illustrating an apparatus for adjusting an inclination angle of a monitor according to

the present invention. Namely, FIG. **3** is a schematic view of a monitor inclination adjusting apparatus **30** of FIG. **2**. As shown in FIG. **3**, the line connecting the points B and C is called a monitor ward line, and the line connecting the points C and D is called a lower side line. The line connecting the points D and E is called a base ward line. The line connecting the points E and B is called an upper side line.

[0061] In the drawings, the point G represents the weight center of the monitor, and a relative horizontal distance from the center point "a" of the monitor ward line BC is "v", and a vertical distance from the same is "u". Here, the reference character α is an included angle between the base ward line and the vertical line. A relative height value of the weight center G is "z".

[0062] Variables, which meet different conditions, can be searched by setting each variable in the drawings. For example, even when the inclination angle θ of the monitor is changed, when it is needed to make the height "z" of the weight center of the monitor lower, a certain condition can be searched by changing part of the monitor ward line, lower side line, base ward line or upper side line. The above condition searching procedure is called a characteristic condition determination of a rectangular hinge structure.

[0063] FIG. **4** is a schematic view illustrating a length ratio of FIG. **3**. As shown therein, a certain method is disclosed in order to minimize the movement of the height of the weight center among the characteristics of the rectangular hinge structure. This method is called an isosceles triangle chart method.

[0064] The isosceles triangle ABC consists of the points B and C with respect to the apex A. A similar shape isosceles triangle AED is formed by extending the lines AB and AC. As shown in FIG. **3**, "α" is set "**0**", and the upper line BE and the lower line CD are made same. With the above condition, the position of the weight center G of the monitor is changed by increasing the inclination angle θ by 10°, 20°, 30°, etc. or decreasing the same by **−10°, −20°, −30°, etc. The above movements are shown in the graphs.**

[0065] FIG. **5** is a graph illustrating the changes of the weight center G in which the inclination angle of the monitor ward line BC of FIG. **4** is changed with the horizontal distance "v" as a variable. As shown therein, the position of the weight center G of the monitor is changed by increasing the inclination angle θ by 10°, 20°, 30°, etc. or decreasing the same by −10°, −20°, −30°, etc.

[0066] The vertical distance "u" is set 0, and the length of the line BC is set 4, the length of the line ED is set 8, the height of the triangle ABC is set 5, and the height of the triangle AED is set 10. Since the movement characteristic is determined only based on the length ratio of each line, the units are omitted.

[0067] In the case that the horizontal distance "v" is 4 (numbers indicated at the sides of each trajectory represent horizontal distance), the position of the weight center G is changed along the trajectory formed in a shape of "α" as the inclination angle θ is changed. In the case that the horizontal distance "v" is 6, the loop drawn by the trajectory of the weight center G gets small with a shape that a front side of the loop is thin, with the entire shape being longitudinal. When the inclination angle θ is 0, the dots are formed at the horizontal position with respect to the apex A. When the inclination angle θ is increased by 10°, the dots are formed at the upper sides, and when the inclination angle θ is decreased by 10°, the dots are formed at the lower side.

[0068] In the case that the horizontal distance "v" is 8, a cusp is drawn with respect to the apex A of the triangle. A curve shaped trajectory, which is similar with an inclined straight line I-I, is drawn at the upper and lower sides. When the horizontal distance "v" increases, exceeding 8, the inclination angle θ gets smoother at an angle of 0°. As it is distanced from the angle 0°, a trajectory similar with a straight line is drawn.

[0069] Namely, the portion, which has a certain movement similar with the straight line among the trajectories of the weight center G when the horizontal distance "v" is above 8, may be used for achieving a constant position of the weight center G of the present invention. FIG. **6** is a graph when the movement of the weight center G is expressed with the inclination angle θ adapted as a variable.

[0070] FIG. **6** is a graph in which the changes of the height of the weight center of FIG. **5** are expressed with an inclination angle θ which is adapted as a variable. As shown therein, "z" represents the vertical height of the weight center G, which is expressed with a reference point **0** determined when the inclination angle θ is 0. In the graph, the number indicated beside "z" represents the horizontal distance "v".

[0071] The curves of the functions $z_{,v}(\theta)$ will be described. The inclination is smooth in a section in which the inclination angle is −20° through +20°. When the horizontal distance "v" is 6, 7 or 8, the inclinations are small, and a changed range is less.

[0072] In the ranges of the inclination angle, and horizontal distance, since the height of the weight center does not change, the monitor is not tilted down only when there is less friction force, so that the monitor can be stably fixed in place. More efficient effects can be obtained by adjusting the included angle α of the base ward line ED.

[0073] FIG. **7** is a graph in which the changes of the height of the weight center G are expressed with an inclination angle θ , which is adapted as a variable, in the case that the included angle α of the base ward line ED is 30°. As shown in FIG. **7**, when the angle α is 30°, the movements of the function $z'_{,v}(\theta)$ are not changed between 30° and 100°.

[0074] Namely, the trajectories formed near the straight line I-I of FIG. **5** can be horizontally inclined by adjusting the included angle α, so that there are no changes in the height of the weight center G. In the case that the horizontal distance "v" is 6, the inclination angle θ is between 0° and 70°. In the case that the horizontal distance "v" is 8, the height "z" of the weight center G is constant between 25° and 105°.

[0075] Therefore, in the case that the base ward line is inclined at a certain angle, it is possible to more easily maintain the fixed weight center height of the monitor, so that the monitor can be prevented from being tilted forwards, moving down and having a sharply changing height by changing the angle of the base ward line. The operations that the above advantages are obtained even when the rectangular hinge structure is changed in various structures will be described.

[0076] FIGS. **8**A, **8**B, **8**C and **8**D are graphs of the movements of the weight center G when the size of the triangle AED is changed in a state that the triangle ABC is not changed in the similar isosceles triangle of FIG. **4**. In a state that the angle α is set 0, FIG. **8**A is a graph when the length ratio of the lines AB and BE is 1:0.25, and FIG. **8**B is a graph when the length ratio of the same is 1:0.5, and FIG. **8**C is a graph when the length ratio of the same is 1:1, and FIG. **8**D is a graph when the length ratio of the same is 1:2.

[0077] As shown in FIGS. **8**A, **8**B, **8**C and **8**D, the trajectory of the weight center G forms the apex A (v is 8). When the horizontal distance "v" is less than 8, a α-shaped curve is formed. When the horizontal distance "v" is larger than 8, a convex curve having an apex is formed. As the length ratio of the line BE gets increased, the size of the loop increases, and the apex gets sharp.

[0078] In the hinge structure, as the inclination angle θ increases, the angle CBE increases. When the angle CBE becomes 180°, the monitor or object installed at the monitor ward line BC contacts with the point E. In this case, since it does not change the inclination angle θ anymore, the range of the angle θ is determined. As shown in FIGS. **8**A, **8**B, **8**C and **8**D, the inclination angle θ is limited within a range of 17°, 27°, 39°and 50°, which angles are indicated as a small circle in the trajectory of the drawing. As the length ratios of the lines AB and BE increase, the limiting range of the inclination angle θ increases.

[0079] In the case that the length ratio of the lines AB and BE increase, the range of the inclination angle is advantageously widened. Here, the lengths of the upper line and the lower line should be extended. The conditions of the range of the inclination angle and the installation position of the monitor may be properly selected based on a user's demand.

[0080] For example, in the apparatus for attaching a flat panel monitor, it is enough when the inclination angle is adjusted within a range of −10° to +10°. In the case that the monitor is installed near a wall, as shown in FIG. **8**A, it is needed to decrease the length ratio of the lines AB and BE, and the horizontal distance "v" is set 6. In the case that it is needed to adjust the monitor within a wider range of −50° to +50° (for example, when the monitor is mounted on a ceiling), as shown in FIG. **8**D, it is needed to increase the length ratio of the lines AB and BE, and the horizontal distance "v" is set 8.

[0081] FIGS. **9**A, **9**B, **9**C and **9**D are graphs illustrating the movements of the weight center G when the apex angle of the apex A is changed in a state that the length ratio of the lines AB and BE is set 1:0.5 in the similar isosceles triangle of FIG. **4**. In FIG. **9**A, the apex angle is 8.96°, and in FIG. **9**B, the apex angle is 17.98°, and in FIG. **9**C, the apex angle is 6.42°, and in FIG. **9**D, the apex angle is 77.36°.

[0082] As a result, the trajectories of the weight center G as shown in FIGS. **9**A, **9**B, **9**C and **9**D are same. Namely, the movements are performed in the same ways even though there are significant differences in the rectangular structures each having four hinges. If the length ratio of the lines AB and BE changes, the above same phenomenon may occur.

[0083] The movements of the rectangular hinge structures change based on the values of the length ratio of the lines AB and BE, but do not change based on the apex angle of the apex A. In the case that the rectangular hinge structure having the above characteristics is used, the user can save time needed for designs and has many conveniences. As described above, the inclination angle θ is limited within a range of 42°, 33°, 27° and 18° as shown in FIGS. **9**A, **9**B, **9**C and **9**D.

[0084] FIGS. **10**A and **10**B are graphs illustrating the movements of the weight center G in a different rectangular hinge structure. As shown in FIG. **10**A, there is shown a graph illustrating the movements of the weight center G in a state that the lengths of the lines BE and CD are same, and the line ED is vertical. As shown in FIG. **10**B, there is shown a graph illustrating the movements of the weight center G in a state that the lengths of the lines BE and CD are different, and the line ED is inclined at an inclination angle α with respect to the line ED.

[0085] As shown therein, in a range of the inclination angle from −30° to +30°, the orbit curves of FIG. **10**B are very similar with the orbit curves when the rectangular hinge using the rectangular structure of FIG. **10**A are inclined at an angle α.

[0086] In the case that the inclination angle θ is out of the range, as the absolute value is increased, the orbit curves of FIG. **10**B get similar with the trajectories of the movements of the orbit curves. Since almost needs are met in a range of −30° to +30° in an actual adaptation, it is preferred to tile the line CD at a certain angle as shown in FIG. **10**B.

[0087] For example, in the case that the horizontal distance "v" is 8 at the curve of FIG. **10**B, the inclination angle has a horizontal orbit in a range of **−10°** to +30°, and the inclination angle of the range corresponds to the inclination angle which is most common when using the flat panel monitor. As shown in FIG. **6**, the changes of "z" may be expressed like $z'_{,8}(\theta)$ in accordance with the conditions of the rectangular hinge structure. The height is constant in a state that the inclination angle θ is in a range of −10° to +30°.

[0088] FIG. **11** is a graph illustrating the trajectories of the weight center G when the vertical distance "u" of the weight center G of FIG. **4** is not 0. As shown therein, the position of the line BC decreases by 10° with respect to the position **5** (in which the inclination angle θ is 0°). In addition, the position of the same is inclined towards the positions 4, 3, 2, and 1 or increases by 10°. When the position of the same is inclined toward the positions 6, 7, 8 and 9, the trajectories drawn along the horizontal distance "v" are expressed by numbers corresponding to each position.

[0089] For example, in the case that the vertical distance "u" is 4, the weight center G point moves as shown in FIG. **10**B. As shown in FIG. **11**, the curve having the horizontal distance "v" of 8 advantageously has a wider range for maintaining more horizontal states as compared to the trajectories. The apparatus of FIG. **10**B is installed, with the line DE being inclined at a certain angle. As shown in FIG. **11**, it is advantageously possible to make the line DE vertical. As described above, the rectangular hinge apparatus is constituted using an isosceles triangle. With the above construction, an inclination angle adjusting apparatus, which operates with many different movements, may be constituted by adjusting length ratio, inclination angle, included angle, horizontal length, vertical length, etc.

[0090] FIG. **12** is a view illustrating an apparatus for adjusting an inclination for a monitor according to another

embodiment of the present invention. As shown therein, the upper connection member **36** and the lower connection member **38** engaged at the monitor ward support member **32** are longitudinally extended, and the base ward support member **34** is contacted with the base surface of the floor.

[**0091**] The upper connection member **36** and the lower connection member **38** are preferably bent at intermediate portions so that they don't contact with the monitor **10**. A thin panel shaped support **34***a* is preferably attached to a lower surface of the base ward support member **34**.

[**0092**] The upper connection member **36** and the lower connection member **38** are extended, and the base ward support member **34** is contacted with the floor base surface, so that the monitor **10** can move in a big angle range. When pulling the monitor **10**, the upper connection member **36** and the upper connection member **38** move down along an arc line, so that the inclination angle of the monitor can increase.

[**0093**] When pulling the monitor **10** forwards, the monitor **10** lies down. In this case, the monitor **10** can be used in a digital note mode. When the monitor **10** has a touch screen, it can be more efficiently used in the digital note mode.

[**0094**] The flat panel monitor, which has recently been developed, has a digital note function using the touch screen. It is needed to develop the monitor having both a viewing function and a digital note function. In the viewing mode, the monitor preferably has an inclination angle in a range of −5° to +45° and is installed away from a user at a certain higher height "z". In the digital note mode, the monitor preferably has an inclination angle in a range of +45° to +90° and is installed not away from a user at a certain lower height "z".

[**0095**] Since the conventional monitor fixing apparatus is independently adjusted because the inclination angle and the position of the weight center do not cooperatively operate, it is needed to disadvantageously adjust various conditions whenever the user selects the digital note mode or the viewing mode. The conventional monitor fixing apparatus with a ball mount cannot support a large weight, so that the position may be easily moved when a certain weight is applied to the monitor in the digital note mode.

[**0096**] However, in the case that the monitor is changed into the digital node mode or the viewing mode using the rectangular hinge structure according to the present invention, various conditions may be adjusted at one time, so that easier and quicker mode conversions are achieved. In addition, even when a certain weight generated during the use of the digital note is applied, each support member can fully support the weight, so that the positions cannot easily change.

[**0097**] As shown in FIG. **12**, the monitor inclination adjusting apparatus **30** includes an extended support **34***a*, so that the monitor inclination adjusting apparatus **30** does not fall down in the digital note mode. The support **34***a* does not have an important role in the viewing mode of the monitor. As shown in FIG. **13**, even when the support **34***a* may be removed, the same functions are performed.

[**0098**] FIG. **13** is a view illustrating the monitor inclination adjusting apparatus according to further another embodiment of the present invention. As shown in FIG. **13**, the lower connection member **38** and the base ward support member **34** are crossed downwards, and the support parts **38***a* and **34***b* of the lower side support the floor base surface.

[**0099**] The principles of the rectangular hinge structure are adapted in the same manner. Namely, the support parts **38***a* and **34***b* of the lower connection member **38** and the base ward support member **34** are crossed downwards, so that the monitor inclination adjusting apparatus **30** can be stably supported.

[**0100**] Here, a friction force between the support part **38***a* of the lower connection member **38** and the floor surface is adjusted larger than the friction force between the support part **34***b* of the base ward support member **34** and the floor surface, so that only the support part **34***b* of the base ward support member **34** of the front side is moved in a state that the support part **38***a* of the lower connection member **38** of the back surface is fixed. A rubber member may be covered on the support part **38***a* of the lower connection member **38** of the bask surface or wheels may be installed at the support part **34***b* of the base ward support member **34**.

[**0101**] FIGS. **14**A, **14**B and **14**C are views illustrating various constructions of the monitor inclination adjusting apparatus according to the present invention. As shown therein, various constructions may be adapted in order to constitute the rectangular hinge apparatus.

[**0102**] FIG. **14**A is a view illustrating a monitor inclination adjusting apparatus **30** in which the monitor ward support member **32** includes two parallel elongated support parts **32***a*, and the base ward support member **34** includes two parallel elongated support parts **34***c*. The upper connection member **36** and the lower connection member **38** are inserted between the elongated support parts **32***a* and **34***c* of the monitor ward support member **32** and the base ward support member **34**.

[**0103**] As shown in FIG. **14**B, the upper connection member **36** and the lower connection member **38** include two parallel elongated support parts **36***a* and **38***a*, respectively. The monitor ward support member **32** and the base ward support member **34** are inserted into the same.

[**0104**] As shown in FIG. **14**C, the monitor ward support member **32** and the base ward support member **34** are arranged in a Y-shape, and the upper connection member **36** is inserted into the upper side, and two elongated support parts **38***a* are inserted into the lower side.

[**0105**] FIG. **15** is a disassembled perspective view illustrating the constructions of the monitor inclination adjusting apparatus according to the present invention, and FIG. **16** is a lateral cross sectional view illustrating an engaged state of each element according to the present invention. As shown in FIGS. **15** and **16**, the plate **40**, which engages the monitor (not shown), includes a protrusion engaging part **42** at the center of the back surface, and the protrusion engaging part **42** is engaged, passing through the monitor ward support member **32** of the monitor inclination adjusting apparatus **30**.

[**0106**] The protrusion engaging part **42**, which passes through the monitor ward support member **32**, is engaged using a bolt **62** through an elastic member **60**. Here, the elastic member **60** is preferably formed of a plate spring, with the elastic member **60** being adapted to pull the

protrusion engaging part **42**, so that the plate **40** and the monitor ward support member **32** get closer from each other.

[**0107**] The upper connection member **36** and the lower connection member **38** are engaged at the lateral side of the monitor ward support member **32**. The ends of the upper connection member **36** and the lower connection member **38** are extended a little and are protruded toward the plate **40**. The plate **40** and the monitor ward support member **32** get closer from each other using the elastic member **60**, so that the back surface of the plate **40** contacts with the ends of the upper connection member **36** and the lower connection member **38**.

[**0108**] The ends, which contact with the back surface of the plate **40**, of the upper connection member **36** and the lower connection member **38** do not easily move due to friction force. When the elastic member **60** pulls the plate **40** as the bolt **62** is tightened, with the bolt **62** being adapted to tighten the elastic member **60**, the upper connection member **36** and the lower connection member **36** do not rotate, so that the plate **40** is prevented from being naturally tilted forwards or being fallen downwards,

[**0109**] The rotation plate **50** is further provided between the plate **40** and the monitor ward support member **32**, so that the plate **40** can be more smoothly rotated. A back surface groove **52** may be formed at a back surface of the rotation plate **50**, with the back surface groove **52** corresponding with the shapes of the ends of the upper connection member **36** and the lower connection member **38**. Here, it is preferred that the back surface groove **52** of the rotation plate **60** contacts with the ends of the upper connection member **36** and the lower connection member **38** at wider surfaces. Here, the back surface groove **52** may be formed at the back surface of the plate **40** in a state that the rotation plate **50** is not provided.

[**0110**] FIG. **17**A is a disassembled perspective view illustrating a monitor inclination adjusting apparatus according to still further another embodiment of the present invention, and FIG. **17**B is a side cross sectional view illustrating an engaged state of the present invention. As shown therein, the plate **40** is engaged at the monitor ward support member **32** having a circular or arc shaped rim, and a ring **80** is inserted thereinto. Here, the plate **40** is engaged at the monitor inclination adjusting apparatus **30** and is rotatable. The ring **80** rotates along the rim of the monitor ward support member **32**.

[**0111**] The ring **80** and the plate **40** are engaged using a bolt, etc. A pad **70** is provided at an inner side of the ring **80** and contacts with the upper connection member **36** and the lower connection member **38**, respectively. An elastic member **60** is inserted between the outer end of the guide pad **70** and the plate **40**.

[**0112**] Here, the elastic member **60** is a plate spring capable of transferring an elastic force in a direction that the plate **40** pushes the guide pad **30** in an opposite direction, so that the guide pad **70** is pushed in a direction of the monitor inclination adjusting apparatus **30**, and the ends of the upper connection member **36** and the lower connection member **38** are pressurized. A friction force inhibits the pressurized upper connection member **36** and lower connection member **38** from rotating, with the upper connection member **36** and the lower connection member **38** being fixed in place.

[**0113**] Here, the ring **80** and the monitor ward support member **32** closely contact at a certain inclination angle. Adjusting the direction of the inclination allows the ring **80** and the plate **40** to become closer with the monitor ward support member **32**, so that with one element of the elastic member **60**, it is possible to tighten each element.

[**0114**] The plate spring may be installed at the base ward support member **34** or at both sides. Here, the upper connection member **36** is moved along a downward curve, and the lower connection member **38** is moved along an upward curve, so that it does not contact with the tapered inner surface of the ring **80**. In the case that the upper connection member **36** and the lower connection member **38** are moved along straight lines, the upper connection member **36** and the lower connection member **38** contact with the inner side of the ring **80**, so that there is a certain limit in the movements of the upper and lower connection members **36** and **38**.

INDUSTRIAL APPLICABILITY

[**0115**] As described above, the monitor inclination angle adjusting apparatus according to the present invention is able to stably support the monitor, with the inclination angle of the monitor being easily adjusted.

[**0116**] Changing the inclination angle of the monitor due to the weight of the monitor is minimized in the present invention.

[**0117**] The present invention is directed to minimizing the changes of the height of the weight center of the monitor even when the inclination angle changes.

[**0118**] In the present invention, the monitor is designed to be rotatable. The monitor is stably supported without movements.

[**0119**] As the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described examples are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the meets and bounds of the claims, or equivalences of such meets and bounds are therefore intended to be embraced by the appended claims.

1. An apparatus for adjusting an inclination angle of a monitor, comprising:

a monitor ward support member for supporting one side of a monitor;

a base ward support member which is engaged and supported by a base surface;

an upper connection member which connects an upper side of the monitor connection member and an upper side of the base ward support member, with the upper connection member being rotatable; and

a lower connection member which connects a lower side of the monitor ward support member and a lower side of the base ward support member, with the lower connection member being rotatable.

2. The apparatus of claim 1, wherein a monitor ward line length corresponding to a straight line length between a

point B and a point C, with the point B corresponding to a side surface center at which the monitor ward support member and the upper connection member are engaged, and with the point C corresponding to a side surface center at which the monitor ward support member and the lower connection member are engaged, is shorter than a base ward line length corresponding to a straight line length between a point E and a point D, with the point E corresponding to a side surface center at which the base ward support member and the upper connection member are engaged, and with the point D corresponding to a side surface center at which the base ward support member and the lower connection member are engaged.

3. The apparatus of claim 1, wherein an upper side line length corresponding to a straight line length between a point B and a point E, with the point B corresponding to a side surface center at which the monitor ward support member and the upper connection member are engaged, and with the point E corresponding to a side surface center at which the base ward support member and the upper connection member are engaged, is the same as a lower side line length corresponding to a straight line between a point C and a point D, with the point C corresponding to a side surface center at which the monitor ward support member and the lower connection member are engaged, and with the point D corresponding to a side surface center at which the base ward support member and the lower connection member are engaged.

4. The apparatus of claim 1, wherein an upper side line length corresponding to a straight line length between a point B and a point E, with the point B corresponding to a side surface center at which the monitor ward support member and the upper connection member are engaged, is longer than a lower side line length corresponding to a straight line length between a point C and a point D, with the point C corresponding to a side surface center at which the monitor ward support member and the lower connection member are engaged, and with the point D corresponding to a side surface center at which the base ward support member and the lower connection member are engaged.

5. The apparatus of claim 1, wherein an upper side line length corresponding to a straight line length between a point B and a point E, with the point B corresponding to a side surface center at which the monitor ward support member and the upper connection member are engaged, is shorter than a lower side line length corresponding to a straight line length between a point C and a point D, with the point C corresponding to a side surface center at which the monitor ward support member and the lower connection member are engaged, and with the point D corresponding to a side surface center at which the base ward support member and the lower connection member are engaged.

6. The apparatus of claim 1, wherein said base surface, which supports the base ward support member, is a wall surface or one surface of a stand member.

7. The apparatus of claim 1, wherein said base surface, which supports the base ward support member, is a floor.

8. The apparatus of claim 7, wherein said base ward support member has an elongated column shape.

9. The apparatus of claim 1, wherein said base ward support member and lower connection member include support parts, which are extended downwards, respectively.

10. The apparatus of claim 1, wherein said monitor ward support member or said base ward support member includes two elongated support parts, with the upper connection member or the lower connection member being engaged between the elongated support parts of the monitor ward support member or the base ward support member.

11. The apparatus of claim 1, wherein said upper connection member or said lower connection member includes two elongated support parts, with the monitor ward support member or the base ward support member being engaged between the elongated support parts of the upper connection member or the lower connection member.

12. The apparatus of claim 1, wherein the monitor ward end of the upper connection member or the lower connection member contacts with one surface of the monitor and is pressurized for thereby generating a certain friction force.

13. The apparatus of claim 11, wherein a back surface groove corresponding to the shape of an end of the upper connection member or the lower connection member is formed at a portion at which the monitor contacts with the upper connection member or the lower connection member.

14. The apparatus of claim 1, wherein a monitor ward end of the upper connection member or the lower connection member contacts with the plate attached to one surface of the monitor and is pressurized for thereby generating a certain friction force.

15. The apparatus of claim 14, wherein a back surface groove corresponding to the shape of an end of the upper connection member or the lower connection member is formed at a portion at which the plate contacts with the upper connection member or the lower connection member.

16. The apparatus of claim 1, further comprising:

a protrusion engaging part protruded backwards from one surface of the monitor;

an elastic member which passes through the protrusion engaging part; and

an engaging member which is engaged with the protrusion engaging part and pressurizes the elastic member toward the monitor,

whereby the monitor is engaged by passing through the protrusion engaging part into the monitor ward support member.

17. The apparatus of claim 1, further comprising:

a plate which includes a protrusion engaging part protruded backwards from one surface of the monitor;

an elastic member which passes through the protrusion engaging part; and

an engaging member which is engaged with the protrusion engaging part and pressurizes the elastic member toward the plate,

whereby the plate is engaged by passing through the protrusion engaging part into the monitor ward support member.

18. The apparatus of claim 16, further comprising a rotation plate, which is provided in front of the elastic member and passes through the protrusion engaging part.

19. The apparatus of claim 18, wherein a back surface groove corresponding to the shape of an end of the upper connection member or the lower connection member is formed at a portion at which the rotation plate contacts with

the upper connection member or the lower connection member.

20. The apparatus of claim 1, wherein a rim of the monitor ward support member is formed in a circular or arc shape, with a ring being inserted onto the rim of the monitor ward support member and being engaged at one surface of the monitor.

21. The apparatus of claim 20, further comprising a plate which is provided between the ring and one surface of the monitor, with the plate being engaged at one surface of the monitor, and with the plate being engaged with the ring.

22. The apparatus of claim 20, wherein a guide pad is provided at an end contacting with the upper connection member or the lower connection member.

23. The apparatus of claim 22, wherein said guide pad is pressurized by an elastic member supported by the monitor, with the guide pad being pressurized toward the end of the upper connection member or the lower connection member.

24. The apparatus of claim 17, further comprising a rotation plate, which is provided in front of the elastic member and passes through the protrusion engaging part.

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