An auxiliary support to be installed onto a chair armrest is disclosed. The auxiliary support includes a first adjusting arm that is able to pivot up and down and has one end formed as a rotating end that is vertically connected to a connecting end of the armrest, a second adjusting arm that is able to pivot up and down and forward and backward and has one end formed as a rotating end that is transversely connected to a connecting end at an opposite end of the first adjusting arm, and a supporting tray that is connected to an opposite end of the second adjusting arm and is adjustably inclinable for supporting a portable device (e.g., a tablet computer or a book). Thereby, a user sitting in the chair can put the portable device on the auxiliary support and operate it comfortably.
Fig. 8
AUXILIARY SUPPORT INSTALLED ONTO CHAIR ARMREST

BACKGROUND OF THE INVENTION

[0001] 1. Technical Field

[0002] The present invention relates to an auxiliary support to be installed onto a chair armrest for supporting a portable device. The auxiliary support allows multidirectional adjustment so that a user sitting in the chair can operate the portable device comfortably. The auxiliary support thus frees the user hands from holding the portable device, so the user can freely use his/her both hands to do other works.

[0003] 2. Description of Related Art

[0004] Led by the fervent love to Apple iPad, tablet computers have rapidly swept across the market of consumer electronics. This urges manufacturers to invest more in developing portable devices, such as those operating with Windows or Android. Microsoft is expected to launch Windows 8 or Windows Phone to further fuel the battle in the near future. These portable devices feature for touch control, which is easier to operate and provides users with fresh and pleased using experience totally different from traditional desktop computers and laptop computers. Besides, they are portable in nature, so they can be used anywhere conveniently.

[0005] When sitting in a chair before a desk, a user may have to take care of other works in addition to operating a portable device. In this case, the user has to hold the portable device with one hand, and operate it with the other hand. Before finishing the operation and resting the portable device on the desk, the user's hands will never be free to do other works. Repeatedly taking up and putting down the portable device is absolutely an inconvenience to the user. If the working space on the desktop is insufficient, the user can be terribly troubled and inefficient in dealing with his/her works.

[0006] For making the operation of the portable device more convenient, some proposals have been made. For example, China Patent No. CN201120110079 has provided a device that is mainly composed of a fixed rod, a first rotating rod, an adapter, a second rotating rod and a supporting tray. The fixed rod is fixedly connected to a chair. The first rotating rod is pivotally connected to the fixed rod. The adapter and the first rotating rod are pivotally connected. The second rotating rod and the adapter are also pivotally connected. The supporting tray is attached to the second rotating rod, so the supporting tray can be positioned in various directions and angles. After the support is fixed to the chair, a portable device can be placed on the supporting tray so that a user sitting in the chair can easily operate the portable device without holding it in hand. This allows the user to freely use his/her both hands to do other works and frees the user from the concern about where to put the portable device. Also, by using this support, the portable device will not take space on the desktop.

However, since the prior-art supports have the fixing rod fixed to the bottom of the chair seat, and has the first rotating rod pivoting outward, it would be difficult to adjust the altitude and position of the portable device placed on the supporting tray. For example, when the first rotating rod pivots upward to bring the supporting tray to a desired altitude, and then the second rotating rod pivots inward to draw the supporting tray toward the user, it is likely that the supporting tray is too far to be reached by the user's hands. In this case, the user may have to adjust the first rotating rod upward or downward to ensure that the supporting tray, after the second rotating rod pivots, is reachable to his/her hands. Nevertheless, doing this can cause the altitude of the supporting tray changed, in turn making the portable device be positioned too high or too low.

[0007] In addition, the prior-art support has the supporting tray pivotable, inclinable and movable along the second rotating rod. Thus, adjustment of the supporting tray requires many operational steps. This not only complicates the operation of the supporting tray, but also makes the adjustment of the supporting tray difficult and inconvenient.

SUMMARY OF THE INVENTION

[0008] Hence, for remedying the inconvenience in adjusting an existing auxiliary support that is installed on a chair for supporting a portable device, the present invention provides an auxiliary support that is directly installed onto an armrest that is vertically adjustable. The auxiliary support includes a first adjusting arm that is pivotally connected to the armrest so that the rotating rod upward or downward to ensure that the supporting tray, after the second rotating rod pivots, is reachable to his/her hands. Nevertheless, doing this can cause the altitude of the supporting tray changed, in turn making the portable device be positioned too high or too low.

[0009] The technical scheme used by the present invention to solve the technical problem is providing the auxiliary support comprising a first adjusting arm that is able to pivot up and down and has one end formed as a rotating end that is vertically connected to a connecting end of the armrest, a second adjusting arm that is able to pivot up and down and forward and backward and has one end formed as a rotating end that is transversely connected to a connecting end at an opposite end of the first adjusting arm, and a supporting tray that is connected to an opposite end of the second adjusting arm and is adjustably inclinable. In the foregoing scheme, the connecting end of the first adjusting arm and the rotating end of the second adjusting arm are connected by a connecting member, the connecting member having one end formed as a rotating end and one end formed as a connecting end, a rotatable positioning unit being provided between the rotating end of the connecting member and the connecting end of the first adjusting arm, and another rotatable positioning unit being provided between the connecting end of the connecting member and the rotating end of the second adjusting arm.

[0010] In the foregoing scheme, a rotatable positioning unit is provided between the rotating end of the first adjusting arm and the connecting end of the armrest.

[0011] In the foregoing scheme, the rotatable positioning unit comprises a guiding portion that is formed centrally in the connecting end and is for receiving a toothed member pushed outward by a spring, the connecting end and the toothed member both annularly formed with teeth to always engage with each other, the rotating end also having teeth for engaging with the teeth of the toothed member, a fastening member pivotally fastening the rotating end to the connecting end, and a pushbutton being attached to an outer side of the rotating end, so that pins of the pushbutton pass through the rotating end and abut against the toothed member.
In the foregoing scheme, the connecting end has an outer periphery thereof formed with a limiting recess for providing a predetermined angular range, and the rotating end has a retaining portion to be received in the limiting recess.

In the foregoing scheme, the supporting tray has a lower edge thereof provided with a lower retaining portion, and two lateral retainers are slidably attached to a lower surface of the supporting tray so as to be expanded and retracted with respect to two sides of the supporting tray, in which each said lateral retainer has an outer end provided with a holding portion.

In the foregoing scheme, a stationary case is attached to an outer side of the lower retaining portion of the supporting tray.

In the foregoing scheme, each of the lateral retainers has two legs for passing through two through holes formed on the supporting tray and being slidably received in two channels formed at the lower surface of the supporting tray and covered by a covering plate, and each of the two legs is terminated with an inward bent hook portion that is to be retained by a stop portion formed in the channel.

In the foregoing scheme, each of the channels is partially narrowed to provide a narrowed segment for closely fitting the corresponding leg.

In the foregoing scheme, the second adjusting arm has a terminal thereof fixedly connected to a spherical joint that has a ball part, and a universal unit corresponding to the supporting tray is provided to receive the ball part.

In the foregoing scheme, the spherical joint has a lower end thereof provided with a fixing portion to be fixedly connected with the connecting seat at the terminal of the second adjusting arm, the fixing portion has an upper end thereof formed as the ball part, and the universal unit comprising a lower hemispherical recess formed on the supporting tray and a combining member that is fixed to the supporting tray and has a lower surface thereof formed with an upper hemispherical recess so that the ball part is rotatably received between the upper and lower hemispherical recesses.

In the foregoing scheme, a raised retaining portion that is formed like a continuous circle near a top of the ball part and defines therein moving area, while two symmetrical raised retaining portions are formed at two sides of a ceiling of the upper hemispherical recess so that the two raised retaining portions are received in the moving area.

In the foregoing scheme, a notch is formed in the lower hemispherical recess of the supporting tray for receiving a pushed member, and a pushing element is screwed into the supporting tray corresponding to the pushed member, so that the pushed member is pressed by the pushing element to tightly abut against the ball part.

The benefits of the present invention include that the disclosed auxiliary support, when installed onto the armrest, allows the supporting tray supporting a portable device to be easily adjusted to a position where the portable device can be easily operated by means of adjusting the first and second adjusting arms up/down, right/left and forward/backward, and vertically adjusting the armrest. Additionally, when the auxiliary support is not in use, the first and second adjusting arms and the supporting tray can be folded and retracted at the outer side of the armrest, so the auxiliary support will not take space and hinder the user’s motions. Furthermore, the combination of the spherical joint and the universal unit allows the supporting tray to be positioned in any direction simply and easily yet prevents the supporting tray from being over inclined.

**BRIEF DESCRIPTION OF THE DRAWINGS**

- FIG. 1 is a perspective view of the present invention.
- FIG. 2 is a perspective view of the present invention taken in a different direction.
- FIG. 3 is an exploded view of the present invention.
- FIG. 4 is an exploded view of the present invention taken in a different direction.
- FIG. 5 is an exploded view of a connecting end and a rotating end of the present invention.
- FIG. 6 is an exploded view of the connecting end and the rotating end of the present invention taken in a different direction.
- FIG. 7 is a cross-sectional view of the connecting end and the rotating end of the present invention.
- FIG. 8 illustrates operation of the connecting end and the rotating end of the present invention.
- FIG. 9 illustrates pivot limits of a first adjusting arm of the present invention.
- FIG. 10 is an exploded view of a supporting tray of the present invention.
- FIG. 11 is an exploded view of a supporting tray of the present invention taken in a different direction.
- FIG. 12 is a cross-sectional view of the supporting tray and a second adjusting arm of the present invention.
- FIG. 13 is a cross-sectional view of the supporting tray and the second adjusting arm of the present invention taken in a different direction.
- FIG. 14 and FIG. 15 illustrate adjustment of the supporting tray of the present invention.
- FIG. 16 is an exploded view of a lateral retainer of the supporting tray of the present invention.
- FIG. 17 is an exploded view of the lateral retainer of the supporting tray of the present invention taken in a different direction.
- FIG. 18 illustrates adjustment of the lateral retainers on the supporting tray of the present invention.
- FIG. 19 illustrates the lateral retainer of the supporting tray of the present invention being stopped when pulled outward.

**DETAILED DESCRIPTION OF THE INVENTION**

Referring to FIG. 1 and FIG. 2, according to the present invention, an auxiliary support 1 is attached to connecting end a1 at an outer side of a vertically movable armrest 2. The auxiliary support 1 includes a first adjusting arm 11 whose rotating end a2 is pivotally connected to the connecting end a1 of the armrest 2, so that the first adjusting arm 11 is allowed to pivot up and down. The first adjusting arm 11 further has an opposite connecting end a3, which is coupled to a rotating end a4 of a connecting member 13, so that the connecting member 13 is allowed to pivot right and left. The connecting member 13 further has an opposite connecting end a5, which is coupled to a rotating end a6 of a second adjusting arm 12, so that the second adjusting arm 12 is allowed to pivot front and back. The second adjusting arm 12 further has an opposite end coupled with an adjustable inclinable supporting tray 14.

Referring also to FIG. 3 and FIG. 4, between each of the connecting ends a1 of the armrest 2, the first adjusting arm
11 and the connecting member 13 and its corresponding rotating end a₁ of the first adjusting arm 11, the connecting member 13 or the second adjusting arm 12, there is a rotatable positioning unit A. In addition to the connecting end a₁, the rotating end a₂, the rotatable positioning unit A further has a toothed member a₃, a spring a₄, a fastening member a₅, and a pushbutton a₆. The detailed configuration of the rotatable positioning unit A can be seen in FIG. 5, FIG. 6 and FIG. 7. The connecting end a₁ is centrally formed with a guiding portion a₁₁ for positioning the toothed member a₃ and guiding it to move. A spring a₄ is arranged between the toothed member a₃ and the connecting end a₁ so that the toothed member a₃ is resiliently propped outward by the spring a₄. The toothed member a₃ and the connecting end a₁ have teeth a₁₃ and a₁₄ that always engage with each other. The connecting end a₁ has its outer periphery formed with a limiting recess a₁₅ for providing a predetermined angular range, and the rotating end a₂ has a retaining portion a₂₁ to be received in the limiting recess a₁₅. The rotating end a₂ also has teeth a₂₃ for engaging with the teeth a₁₃ of the toothed member a₁. In addition, a fastening member a₅ can pass through the rotating end a₂ and fixed to the guiding portion a₁₁ of the connecting end a₁ so that the rotating end a₂ is pivotally fixed and rotatable. A pushbutton a₆ including a plurality of pins a₆₃ has the pins a₆₃ passing through the rotating end a₂ and then abut against the toothed member a₃. Thus, as shown in FIG. 8 and FIG. 9, in response to pushing or releasing the pushbutton a₆, the toothed member a₃ moves transversely, thereby making the teeth a₁₃ of the toothed member a₃ and the teeth a₂₃ of the rotating end a₂ disengage from or engage with each other, in turn allowing the components of the rotating end a₂ (such as the first adjusting arm 11, the second adjusting arm 12 and the connecting member 13) to pivot. Moreover, since the retaining portion a₂₁ of the rotating end a₂ is limited by the limiting recess a₁₅ of the connecting end a₁, the pivot angle of the components of the rotating end a₂ is limited in a predetermined range.

Furthermore, the connection between the second adjusting arm 12 and the supporting tray 14 is shown in detailed in FIG. 10 through FIG. 13. The second adjusting arm 12 has its terminal provided with a connecting seat 121 that is connected to a spherical joint 31. The spherical joint 31 includes a fixing portion 311 inserted into and fixedly held by the connecting seat 121. The fixing portion 311 is formed atop with a ball part 312. Near the top of the ball part 312, a raised retaining portion 313 is formed like a continuous circle that defines therein moving area 314.

Additionally, the supporting tray 14 has a universal unit corresponding to the spherical joint 31 for receiving the ball part 312. The universal unit comprises a lower hemispherical recess 141 provided on the supporting tray 14, a notch 142 formed at one side of the lower hemispherical recess 141, a pushing element 35 screwed into the supporting tray 14 from outside and corresponding to the notch 142, and a pushed member 34 received in the notch 142, so that by rotating the pushing element 35, the pushed member 34 is pushed or released.

A combining member 32 is fixed to the supporting tray 14 and facing the lower hemispherical recess 141. The combining member 32 is its lower surface formed with an upper hemispherical recess 321. At two side of the ceiling of the upper hemispherical recess 321, there are symmetrical raised retaining portions 322. The two raised retaining portions 322 are allowed to move within the moving area 314 of the spherical joint 31. Finally, a cover 33 is inlaid to the supporting tray 14 for covering the whole universal unit.

Thereby, as shown in FIG. 14 and FIG. 15, in virtue of the spherical joint 31 having the ball part 312 and the universal unit received between the upper and lower hemispherical recesses 321, 141, the supporting tray 14 can be inclined in any direction. Meanwhile, the raised retaining portion 313 of the spherical joint 31 and the raised retaining portion 322 in the upper hemispherical recess 321 jointly limit the inclining angle of the supporting tray 14, so as to prevent the supporting tray 14 from being over inclined and making the portable device drop. Also, the easy rotatory operation of the pushing element 35 can make the supporting tray 14 positioned reliably. Thus, the overall adjusting and positioning operation of the supporting tray 14 is simpler and easier, and can adjust and position the supporting tray 14 as a user desires more rapidly and more precisely.

Then, referring to FIG. 16 through FIG. 19, the supporting tray 14 at the terminal of the second adjusting arm 12 has its lower edge provided with a lower retaining portion 146, and a stationary case 147 is attached to the outer side of the lower retaining portion 146. Two lateral retainers 15 are slidably attached to the lower surface of the supporting tray 14 to be expanded and retracted with respect to two sides of the supporting tray 14. Each of the lateral retainers 15 has a holding portion 150 formed at an outer end thereof and has two legs 151 each terminated with an inward bent hook portion 152. After the two legs 151 pass through two through holes 140 formed on the supporting tray 14, they are slidably received in two channels 143 formed at the lower surface of the supporting tray 14 and covered by a covering plate 16. Each of the channels 143 is partially narrowed to provide a narrowed segment 144 for closely fitting the corresponding leg 151. The hook portion 152 at the terminal of the leg 151 is to hook a stop portion 145 formed in the channel 143, so that the lateral retainer 15 can be pulled outward or pushed inward, for fittingly holding a portable device placed on the supporting tray 14.

Thus, when a portable device (e.g. a tablet computer or the like) is positioned on the supporting tray 14, the first and second adjusting arms 11, 12 and the connecting member 13 can be operated to move the supporting tray 14 up or down and forward or backward. Plus the vertical adjustability of the armrest 2, the supporting tray 14 can be easily adjusted to a position allowing a user to operate the portable device comfortably. When the auxiliary support 1 is not needed, the first and second adjusting arms 11, 12 and the supporting tray 14 can be folded and retracted at the outer side of the armrest 2, so the auxiliary support 1 not in use will not take space and hinder the user’s motions.

What is claimed is:

1. An auxiliary support to be attached to an outer side of a vertically adjustable armrest, the auxiliary support comprising a first adjusting arm that is able to pivot up and down and has one end formed as a rotating end that is vertically connected to a connecting end of the armrest, a second adjusting arm that is able to pivot up and down and forward and backward and has one end formed as a rotating end that is transversely connected to a connecting end at an opposite end of the first adjusting arm, and a supporting tray that is connected to an opposite end of the second adjusting arm and is adjustably inclinable.

2. The supporting device of claim 1, wherein the connecting end of the first adjusting arm and the rotating end of the
second adjusting arm are connected by a connecting member, the connecting member having one end formed as a rotating end and an opposite end formed as a connecting end, a rotatable positioning unit being provided between the rotating end of the connecting member and the connecting end of the first adjusting arm, and another rotatable positioning unit being provided between the connecting end of the connecting member and the rotating end of the second adjusting arm.

3. The supporting device of claim 1, wherein a rotatable positioning unit is provided between the rotating end of the first adjusting arm and the connecting end of the armrest.

4. The supporting device of claim 2, wherein the rotatable positioning unit comprises a guiding portion that is formed centrally in the connecting end and is for receiving a toothed member pushed outward by a spring, the connecting end and the toothed member both annularly formed with teeth to always engage with each other, the rotating end also having teeth for engaging with the teeth of the toothed member, a fastening member pivotally fastening the rotating end to the connecting end, and a pushbutton having a plurality of pins being attached to an outer side of the rotating end, so that the pins pass through the rotating end and abut against the toothed member, thereby pushing the toothed member to move and making the teeth of the toothed member and the teeth of the rotating end disengage from or engage with each other.

5. The supporting device of claim 4, wherein the connecting end has an outer periphery thereof formed with a limiting recess for providing a predetermined angular range, and the rotating end has a retaining portion to be received in the limiting recess.

6. The supporting device of claim 1, wherein the supporting tray has a lower edge thereof provided with a lower retaining portion, and two lateral retainers are slidably attached a lower surface of the supporting tray so as to be expanded and retracted with respect to two sides of the supporting tray, in which said lateral retainers has an outer end provided with a holding portion.

7. The supporting device of claim 6, wherein a stationary case is attached to an outer side of the lower retaining portion of the supporting tray.

8. The supporting device of claim 6, wherein each of the lateral retainers has two legs for passing through two through holes formed on the supporting tray and being slidably received in two channels formed at the lower surface of the supporting tray and covered by a covering plate, and each of the two legs is terminated with an inward bent hook portion that is to be retained by a stop portion formed in the channel.

9. The supporting device of claim 8, wherein each of the channels is partially narrowed to provide a narrowed segment for closely fitting the corresponding leg.

10. The supporting device of claim 1, wherein the second adjusting arm has a terminal thereof fixedly connected to a spherical joint that has a ball part, and a universal unit corresponding to the supporting tray is provided to receive the ball part.

11. The supporting device of claim 10, wherein the spherical joint has a lower end thereof provided with a fixing portion to be fixedly connected with the connecting seat at the terminal of the second adjusting arm, the fixing portion has an upper end thereof formed as the ball part, and the universal unit comprising a lower hemispherical recess formed on the supporting tray and a combining member that is fixed to the supporting tray and has a lower surface thereof formed with an upper hemispherical recess so that the ball part is received between the upper and lower hemispherical recesses.

12. The supporting device of claim 11, wherein a raised retaining portion that is formed like a continuous circle near a top of the ball part and defines therein moving area, while two symmetrical raised retaining portions are formed at two sides of a ceiling of the upper hemispherical recess so that the two raised retaining portions are received in the moving area.

13. The supporting device of claim 11, a notch is formed in the lower hemispherical recess of the supporting tray for receiving a pushed member, and a pushing element is screwed into the supporting tray corresponding to the pushed member, so that the pushed member is pressed by the pushing element to tightly abut against the ball part.

14. The supporting device of claim 3, wherein the rotatable positioning unit comprises a guiding portion that is formed centrally in the connecting end and is for receiving a toothed member pushed outward by a spring, the connecting end and the toothed member both annularly formed with teeth to always engage with each other, the rotating end also having teeth for engaging with the teeth of the toothed member, a fastening member pivotally fastening the rotating end to the connecting end, and a pushbutton having a plurality of pins being attached to an outer side of the rotating end, so that the pins pass through the rotating end and abut against the toothed member, thereby pushing the toothed member to move and making the teeth of the toothed member and the teeth of the rotating end disengage from or engage with each other.

15. The supporting device of claim 14, wherein the connecting end has an outer periphery thereof formed with a limiting recess for providing a predetermined angular range, and the rotating end has a retaining portion to be received in the limiting recess.