

DUAL-DIRECTIONAL HINGE

1. Field of the Invention

The present invention relates to a hinge for a portable device such as a mobile phone, a notebook computer, or a PDA (Personal Digital Assistant), and more particularly to a dual-directional hinge which can be rotated about a horizontal pintle and a vertical axle.

2. Description of Related Art

A portable device such as a mobile phone, a notebook computer, or a PDA (Personal Digital Assistant) generally has a body and a monitor (or panel) pivotally mounted on the body by a hinge.

By the conventional hinge, the monitor can be turned about only a horizontal axis to change the vertical viewing angle, and cannot be turned left or right to change the horizontal viewing angle.

Therefore, the invention provides a dual-directional hinge to mitigate or obviate the aforementioned problems.

The main objective of the present invention is to provide a dual-directional hinge which can be turned about a horizontal axis and a vertical axis.

Other objectives, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

IN THE DRAWINGS

Fig. 1 is a perspective view of a dual-directional hinge in accordance with the present invention;

Fig. 2 is an exploded perspective view of the dual-directional hinge in Fig. 1;

Fig. 3 is a front plan view of the dual-directional hinge;

Fig. 4 is a schematic view of a portable device assembled with the dual-directional hinge;

Fig. 5 is a side plan view of the dual-directional hinge;

Fig. 6 is an operational side plan view of the dual-directional hinge being turned about a horizontal pintle;

Fig. 7 is a top plan view of the dual-directional hinge; and

Fig. 8 is an operational top plan view of the dual-directional hinge being turned about a vertical axle.

With reference to Figs. 1-4, a dual-directional hinge in accordance with the present invention can be assembled in a portable device with a body (20) and a monitor (60), such as a mobile phone, a notebook or a PDA.

The hinge has an L-shaped first supporting member (10), being composed of a first upright arm (not numbered) and a first lateral arm (not numbered) perpendicular to the first upright arm. The first supporting member (10) is mounted under the monitor (60) of the portable device. A non-circular opening (11) is defined through the first lateral arm of the first supporting member (10). A first positioning lug (12) and a second positioning lug (13) are symmetrically formed at two diametrically opposite sides of the non-circular opening (11).

An L-shaped second supporting member (40), being composed of a second upright arm (not numbered) and a second lateral arm (not numbered)

perpendicular to the second upright arm, is rotatably mounted on the body (20) of the portable device and on the first supporting member (10). A circular opening (41) is defined through the second lateral arm and aligned with the first non-circular opening (11). The second lateral arm further has two apertures (42) respectively defined at two diametrically opposite sides of the circular opening (41) and in communication with the circular opening (41). A third positioning lug (43) is formed outside the circular opening (41) and aligned with the second positioning lug (13) on the first supporting member (10). A tube (44) is horizontally and rotatably inserted in the second upright arm and mounted on the body (20) of the portable device.

A vertical axle (30) with a non-circular cross section corresponding to the non-circular opening (11) is inserted through the non-circular opening (11) and circular opening (41) to rotatably install the second supporting member (40) on the first supporting member (10). A first washer (31) is provided outside the vertical axle (30) and between the first supporting member (10) and second supporting member (40).

A first collar (49) is fastened at a distal end of the vertical axle (30) away from the first supporting member. A first resilient member (48) is provided outside the vertical axle (30) and between the first collar (49) and the second supporting member (40). A positioning ring (45) is received in the circular opening (41) and provided outside the vertical axle (30), and has two protrusions (46) formed at two diametrically opposite sides of an external circumference thereof and respectively located in the apertures (42). A first resilient member (48) is provided outside the vertical axle (30) and between the first collar (49)

and the positioning ring (45), and a second washer (47) is provided between the first resilient member (48) and the positioning ring (45).

An L-shaped seat (50), being composed of a third upright arm and a third lateral arm, is mounted at a free end of the second lateral arm of the second supporting member (40). A circular hole (51) is defined through the third upright arm of the seat (50), and two notches (52) are respectively defined at a front side and a rear side of the third upright arm of the seat (50).

A horizontal pintle (53) has a first part (not numbered) extending through the circular hole (51) of the seat (50), a second part (not numbered) secured in the body (20) of the portable device, and a flange (not numbered) formed between the first part and the second part. The first part of the horizontal pintle (53) has a circular shaft (55) formed at a distal end thereof and a non-circular shaft (54) formed between the circular shaft (55) and the flange, wherein a diameter of the circular shaft is smaller than that of the non-circular shaft (54), and the non-circular shaft (54) is received in the hole (51) of the third upright arm of the seat (50).

A second collar (584) is fastened on the circular shaft (55). A third washer (56), a positioning disk (58), a second resilient member (582), and a fourth washer (583) are in turn provided between the third upright arm and the second collar (584). The third washer (56) has two ears (57) respectively located in the notches (52) and two domes (561) formed at a surface facing the positioning disk (58). The positioning disk (58) is provided outside the non-circular shaft (54) for turning along with the horizontal pintle (53), and has multiple recesses (581) for positioning the domes (561) on the third washer (56).

With reference to Figs. 4-6, when a user raises the monitor (60), the second supporting member (40) along with the first supporting member (10) is rotated about the tube (44), and the seat (50) is rotated about the horizontal pintle (53), so the monitor (60) is turned about a horizontal axis extending through the tube (44) and the horizontal pintle (53). When the monitor (60) is in a certain position such as a vertical position, the domes (561) of the third washer (56) can be located in the corresponding recesses (581) to position the monitor (60).

With reference to Figs. 4, 7 and 8, in the raised situation, when the monitor (60) is horizontally turned about the vertical axle (30), the first supporting member (10) along with the vertical axle is rotated about the second supporting member (40) and the seat (50) until the third positioning lug (43) abuts the first positioning lug (12) or the second positioning lug (13). Therefore, the horizontal viewing angle of the monitor (60) is changed.

It is to be understood, however, that even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosure is illustrative only, and changes may be made in detail, especially in matters of shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

CLAIMS:

1. A dual-directional hinge comprising:

a first supporting member (10) having a first upright arm, a first lateral arm perpendicular to the first upright arm, and a non-circular opening (11) defined through the first lateral arm;

a vertical axle (30) with a non-circular cross section extending through the non-circular opening (11) of the first supporting member (10), and having a first collar (49) fastened at a distal end away from the first supporting member (10);

a second supporting member (40) having a second upright arm, a second lateral arm perpendicular to the second upright arm, and a circular opening (41) defined through the second lateral arm, the vertical axle (30) extending through the circular opening (41) to enable the first supporting member (10) along with the vertical axle (30) to rotate about the second supporting member (40);

a seat (50) having a third lateral arm mounted on a distal end of the second lateral arm, a third upright arm perpendicular to the third lateral arm, and a circular hole (51) defined through the third upright arm; and

a horizontal pintle (53) having a first part rotatably extending through the circular hole (51) of the seat (50), a second part, a flange between the first part and the second part, and a second collar (584) fastened at a distal end of the first part.

2. The dual-directional hinge as claimed in claim 1, wherein the vertical axle (30) has a first washer (31) provided outside the vertical axle (30) and between the first supporting member (10) and second supporting member (40);

and the second supporting member (40) further has two apertures (42) defined at two diametrically opposite sides of the circular opening (41) and in communication with the circular opening (41), a positioning ring (45) received in the circular opening (41) and provided outside the vertical axle (30) and having two protrusions (46) formed at two diametrically opposite sides of an external circumference of the positioning ring (45) and respectively located in the apertures (42), a first resilient member (48) provided outside the vertical axle (30) and between the first collar (49) and the positioning ring (45), and a second washer (47) provided between the first resilient member (48) and the positioning ring (45).

3. The dual-directional hinge as claimed in claim 1 or 2, wherein the first supporting member (10) further has a first lug (12) and a second lug (13) formed on the first lateral arm and symmetrically at two diametrically opposite sides of the non-circular opening (11); and the second supporting member (40) further has a third lug (43) formed on the second lateral arm and aligned with the second lug (13).

4. The dual-directional hinge as claimed in any one of the preceding claims, wherein the first part of the horizontal pintle (53) comprises of a circular shaft (55) formed at the distal end thereof, and a non-circular shaft (54) formed between the circular shaft (55) and the flange, and has a third washer (56), a positioning disk (58), a second resilient member (582), and a fourth washer (583) in turn provided between the seat (50) and the second collar (584).

5. The dual-directional hinge as claimed in claim 4, wherein the seat (50) has two notches (52) defined at two sides of the circular hole (51), and the third

washer (56) has two ears (57) respectively located in the notches (52).

6. The dual-directional hinge as claimed in claim 4 or 5, wherein the third washer (56) has at least one dome (561) formed at a surface facing the positioning disk (58); and the positioning disk (58) has multiple recesses (581) defined at a surface facing the third washer (56) for positioning the at least one dome (561).

7. The dual-directional hinge as claimed in any one of the preceding claims, wherein the second supporting member (40) further has a tube (44) rotatably mounted in the second upright arm.