The present invention provides a slide module, comprising a plurality of guide rods; a plurality of elastic members; a first component having a first fastener and a plurality of guide holes; and a second component having a second fastener and a plurality of fastening holes that correspond to the plurality of guide holes of the first component; wherein the first component and the second component are configured to slide with respect to each other; each of the elastic members is configured to shield a respective guide rod; each of the guide rods is configured to be fastened in a respective fastening hole at the second component, and traverse through a respective guide aperture at the first component; and a longitudinal axis across the respective centers of the first fastener and the second fastener is configured to be parallel to each of the guide rods.
SLIDE MODULE, SLIDE APPARATUS AND ELECTRONIC DEVICE HAVING THE SAME

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority to Chinese Patent Application No 200820214046 3, filed on November 27, 2008, the entire contents of which are incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates to a portable information terminal, in particular, to a slide module, a slide apparatus and an electronic device having the same.

BACKGROUND OF THE RELATED ART

The portable information terminal comprises many kinds according to its appearance, such as, bar style, flip style, folding style and slide style.

A bar portable information terminal has a single housing, on which a data input/output unit, a transmitter and a receiver are mounted. The mini keyboard for the data input/output unit are naked, so the bar portable information terminal goes wrong easily.

A flip portable information terminal comprises a main body, a flip panel and a hinge module connecting the main body with the flip panel. A data input/output unit, a transmitter and a receiver are mounted on the main body of the flip portable information terminal. The flip panel covers the mini keyboard for the data input/output unit to prevent the mini keyboard from going wrong.

A folding portable information terminal comprises a main body, a folding apparatus and a hinge module connecting the folding apparatus with the main body. The folding apparatus is rotated to open or close. When the folding apparatus is in tight contact with the main body, the portable information terminal is set to be in a stand-by mode, so as to prevent a fault.
A slide portable information terminal comprises a main body, a cover and a slide module. The cover can slide along the orientation of the length of the main body, and the slide module connects the main body with the cover. FIG 1 is a schematic diagram of a slide module of the prior art. The slide module comprises a first plastic flake 210, and a second plastic flake 220, in which the first plastic flake 210 comprises a first guide rod 213 and a first guide rod guide hole 214, and connects with a main body by a first connecting part 212. The second plastic flake 220 comprises a second guide rod 223 and a second guide rod guide hole 224, and connects a main body by a second connecting part 212. A spring 230 is configured between the first plastic flake 210 and the second plastic flake 220. A first slide rod 215 and a first slide groove 216 of the first plastic flake 210 fit with a second slide groove 226 and a second slide rod 225 of the second plastic flake 220, respectively, so the first plastic flake 210 and the second plastic flake 220 can move with respect to each other. The first plastic flake 210 and the second plastic flake 220 comprise a first fastener 212 and a second fastener 222, respectively, and the first fastener 212 and the second fastener 222 connect with the main body.

FIG.2-4 are schematic diagrams of an initial state, an intermediate state and a final state of the slide module of the prior art. When in the original position, the spring 230 is in a free state. When the cover SB is pushed to move with respect to the main body NB, the second plastic flake 220 moves with respect to the second plastic flake 210, and the guide rod is penetrated through the guide rod guide hole and compresses the spring. When the guide rod moves to a position that the first plastic flake 210 and the second plastic flake 220 are in the horizontal position, the elastic force of the spring is maximal. And the slide module keeps moving according to the force of the spring and release the elastic force, meanwhile the cover SB is moved successively with respect to the main body MB until the spring recovers to a free state.

The main shortcomings of the prior art is that the line connecting the centers of the first fastener 212 and the second fastener 222 form an angle to the orientation
of the first guide rod 213, the second guide rod 223 and the spring 230, which makes the first plastic flake 210 and the second plastic flake 220 form a torque when the slide module is moving. Therefore, the first plastic flake 210 and the second plastic flake 220 deform and wear easily.

5 SUMMARY OF THE INVENTION

To solve the aforementioned problems, one embodiment of the present invention provides a slide module, comprising a plurality of guide rods, a plurality of elastic members, a first component having a first fastener and a plurality of guide holes, and a second component having a second fastener and a plurality of fastening holes that correspond to the plurality of guide holes of the first component, wherein the first component and the second component are configured to slide with respect to each other, each of the elastic members is configured to shield a respective guide rod, each of the guide rods is configured to be fastened in a respective fastening hole at the second component, and traverse through a respective guide aperture at the first component, and a longitudinal axis across the respective centers of the first fastener and the second fastener is configured to be parallel to each of the guide rods.

According to one embodiment of the present invention, when the first component and the second component are moving with respect to each other, the two components are substantially subject to the elastic forces caused by the elastic members along the direction of the guiding rods. Therefore, the torque that causes deformation of the components is effectively avoided during the movement.

One embodiment of the present invention further provides a sliding apparatus comprising a main body, a sliding case, and a sliding module, wherein the sliding module is configured to connect the main body and the sliding case; the first fastener is configured to be connected to the main body; and the second fastener is configured to be connected to the sliding case.

One embodiment of the present invention further provides an electronic device.
comprising the sliding apparatus set forth above.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The foregoing and other features and advantages of the invention will be better understood from the following detailed description of preferred embodiments of this invention when taken conjunction with the accompanying drawings in which:

- FIG 1 is a schematic diagram of the slide module of prior art.
- FIG. 2 is a schematic diagram of an initial state of the slide module of the prior art.
- FIG. 3 is a schematic diagram of an intermediate state of the slide module of the prior art.
- FIG. 4 is a schematic diagram of a final state of the slide module of the prior art.
- FIG. 5 is an explosion schematic diagram of the slide module in some embodiments of the present invention.
- FIG. 6 is an assembly schematic diagram of the slide module in some embodiments of the present invention.
- FIG. 7 is a front view of the second component in some embodiments of the present invention.
- FIG. 8 is a local enlarge of the stopper in some embodiments of the present invention.
- FIG. 9 is a front view of the first component in some embodiments of the present invention.
- FIG. 10 is a local enlarge of the slide groove in some embodiments of the present invention.
- FIG. 11 is a schematic diagram of an initial state of the slide module of in some embodiments of the present invention.
- FIG. 12 is a schematic diagram of an intermediate state of the slide module of in some embodiments of the present invention.
FIG. 13 is a schematic diagram of a final state of the slide module of in some embodiments of the present invention.

FIG 14 is an explosion schematic diagram of the slide module in some embodiments of the present invention.

FIG. 15 is an assembly schematic diagram of the slide module in some embodiments of the present invention.

FIG. 16 is a front view of the first component in some embodiments of the present invention.

FIG. 17 is a local enlarge of the slide groove in some embodiments of the present invention.

FIG. 18 is a front view of the second component in some embodiments of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The aforementioned features and advantages of the invention as well as additional features and advantages thereof will be clearly understood hereafter as a result of a detailed description of the following embodiments when taken conjunction with the drawings.

As shown from FIG. 5 to FIG. 13, the slide module comprises a plurality of elastic members 14, a plurality of guide rods 13, a first component 11 and a second component 12, wherein, the first component 11 and the second component 12 can slide with respect to each other. The first component 11 includes a first fastener 111, and the second component 12 includes a second fastener 121. The first component 11 and the second component 12 further comprise a plurality of guide holes and a plurality of fastening holes. One end of the guide rod 13 is installed in the fastening hole and the other end of the guide rod 13 traverse through the guide hole. The elastic member 14 is configured to shield the guide rod 13. A longitudinal axis across the respective centers of the first fastener of the first fastener 111 and the second fastener of the second fastener 121 is in parallel to the
guide rod 13 A first slide member is arranged on the side of the first component 11 corresponding to the second component 12, and comprises a slide groove 113, a second slide member 123 is arranged on the side of the second component 12 corresponding to the first component 11, and is configured to slide in the slide groove 113. The first slide member is in the middle of first component 11. A stopper 124 is arranged on one end of the second slide member 123. The structure of the stopper 124 is shown in FIG 7, and the stopper 124 comprises a protrusion 135. The first slide member comprises a clamping groove 136 corresponding to the second slide member 123. When the spring is in an initial state or the elastic force provided by the spring reaches a value, the protrusion 135 cooperates with the clamping groove 136 to prevent the second slide member 123 from disengaging the slide groove 113.

In some embodiments, at least one of the first component 11 and the second component 12 is configured with a plurality of guide holes 13, and the rest component is configured with a plurality of fastening holes 114.

The guide rod 13, the first component 11 and the second component 12 are manufactured via an injection molding technology. The guide rod 13 installed in the first component 11 is transversed through the guide hole 122 in the second component 12. And the guide rod 13 installed in the second component 12 is transversed through the guide hole 112 in the first component 11. When the slide module is installed in the slide apparatus, the first fastener 111 connects with a slide case 15 of the slide apparatus; and the second fastener 121 connects with a main body 16 of the slide apparatus. The longitudinal connection between the centers of the first fastener 111 and the second fastener 121 is configured to be parallel to the slide groove 113 and the second slide member 123, and further maintain parallel to the guide rod 13 and the elastic member 14 during the sliding process. Therefore, it can prevent the first component 11 and the second component 12 forming a torque and wearing easily.

Further more, the first component 11 and the second component 12
comprises a plurality of notches 125, and the notch 125 is right above the guide hole, to fasten the elastic member 14 when the elastic member 14 is pressed or extended 

Further more, the longitudinal connection between the centers of the first fastener 111 and the second fastener 121 is in the middle of the slide module. 

Further more, the first slide member is in the middle of the first component 11, and the second slide member 123 is in the middle of the second component 12 

Further more, the quantity of the guide rod and the elastic member is identical, and the guide rod and the elastic member are provided symmetrically on both sides of the first slide member. 

FIG. 11 is a schematic diagram of a close state of a slide apparatus. The slide apparatus comprises a slide case 15, a main body 16 and the slide module above mentioned. The first fastener 111 connects with the slide case 15 of the slide apparatus; and the second fastener 121 connects with the main body 16 of the slide apparatus. In FIG. 11, the slide module is in an initial state. And the elastic member is in a free state and the elastic force is zero. 

As shown in FIG. 12, when the slide case 15 is pushed, the slide case 15 moves along a guide rail 152 with respect to the second member 16. The slide case 15 puts the first component to move, and the first component 11 slides with respect to the second component 12 and presses the elastic member 14 to generate an elastic force. When the stopper 124 moves to the other end of the slide groove 113, the first fastener 111 and the second fastener 121 is horizontal, and the amount of compression of the elastic member 14 is up to maximum and the elastic force is up to maximum. The slide apparatus is in a half open state, and the position the slide case 15 reaches is the stagnation point of the slide apparatus. The elastic member has no component force in the slide direction of the slide apparatus, and the slide apparatus is in a balance state. 

As shown in FIG 13, because of the elastic force from the elastic member, the first component 11 slides with respect to the second component 12 in an opposite
direction. The slide case 15 continually slides with respect to the main body 16 along a guide rail 152, until the first component 11 goes back to the original position with respect to the second component 12. The elastic member 14 is released to a free state and the slide apparatus is opened completely. The keyboard 161 appears and the slide case 15 reaches to the top position. The elastic member 14 is pressed slightly to provide the first slip part with a maintain force, so the first slip part won’t shake.

When the user closes the slide apparatus, just pushes the slide case 15 downwards. And the slide case 15 slides downwardly with respect to the main body 16, and repeats the motion to open the slide apparatus in an opposite direction.

In this embodiment, the elastic member 14 is a spring.

The slide module with this structure is easy to be assembled, in particular, a small spring is assembled very quickly and simply to thereon. The structure is steady and the spring is hard to deform. The first component 11 and the second component 12 don’t form a torque while moving, which will reduce the deformation and the abrasion of the components. The thickness of the slide module is small.

In FIG. 14-18, the slide module comprises a plurality of elastic members 34, a plurality of guide rods 33, a first component 31 and a second component 32, wherein, the first component 31 and the second component 32 may slide with respect to each other. The first component 31 includes a first fastener 311 and the second component 32 includes a second fastener 321. A plurality of guide holes is set in both of the first component 31 and the second component 32. A plurality of guide first fastening holes 314 is arranged on the first component 31. A plurality of guide second fastening holes 325 is arranged on the second component 32. One end of the guide rod 33 is installed in the first fastening hole 314 or the second fastening hole 325 and the other end of the guide rod 33 is penetrated through the guide hole; and the elastic member 34 is configured to shield the guide rod 33. A longitudinal connection between the centers of the first fastener 311 and the second
fastener 321 is configured to be parallel to the guide rod 33. A first slide member is arranged on the side of the first component 31 corresponding to the second component 32, comprising a slide groove 313, a second slide member 323 is arranged on the side of the second component 32 corresponding to the first component 31, being configured to slide in the slide groove 313. The first slide member is in the middle of the first component 31. A stopper 324 is arranged on one end of the second slide member 323. The structure of the stopper 324 is shown in FIG. 18, and the stopper 324 is a dove-tail slot structure. One end of the slide groove 313 comprises a clamping part 317. Both sides of the dove-tail slot have a protrusion and both sides of the clamping part 317 have a clamping groove. When the elastic force reaches a value and the spring is an original state, the protrusion is limited in the clamping groove to fasten the connection and prevent the second slide member 323 ejecting from the slide groove 313. The guide rod 33, the first component 31 and the second component 32 are manufactured via an injection molding technology. The guide rod 33 installed in the first component 31 is penetrated through the guide hole 322 in the second component 32. The guide rod 33 installed in the second component 32 is penetrated through the guide hole 312 in the first component 31. Because the motion process of this slide module is the same with the above slide module, it is unnecessary to describe it one by one.

For the foregoing description, the slide apparatus with a slide module can be used for an electronic device. Illustrated by the example of smart phone, the first component is installed in the slide cover of the smart phone. The slide cover mainly comprises a screen for displaying an image or video, a functional keyboard for being input some functional instructions, a speaker outputting sound and a microphone receiving a sound. The second component is installed in the main body of the smart phone. The surface of the main body comprises a keyboard for inputting words or/and numbers. When the smart phone is closed, the slide cover is right over the main body and shadows the keyboard in the main body. When the
user wants to operate the smart phone, the cover slides with respect to the main body.

The foregoing description, for purpose of explanation, has been described with reference to specific embodiments. However, the illustrative discussions above are not intended to be exhaustive or to limit the invention to the precise forms disclosed. Many modifications and variations are possible in view of the above technologies. The embodiments are chosen and described in order to best explain the principles of the invention and its practical applications, to thereby enable others skilled in the art to best utilize the invention and various embodiments with various modifications as are suited to the particular use contemplated.
WHAT IS CLAIMED IS:

1. A slide module, comprising:
   a plurality of guide rods;
   a plurality of elastic members,
   a first component having a first fastener and a plurality of guide holes, and
   a second component having a second fastener and a plurality of fastening holes that correspond to the plurality of guide holes of the first component,
   wherein
   the first component and the second component are configured to slide with respect to each other,
   each of the elastic members is configured to shield a respective guide rod,
   each of the guide rods is configured to be fastened in a respective fastening hole at the second component, and traverse through a respective guide aperture at the first component, and
   a longitudinal axis across the respective centers of the first fastener and the second fastener is configured to be parallel to each of the guide rods.

2. The slide module according to the claim 1, wherein the second component has a plurality of guide holes and the first component has a plurality of fastening holes that correspond to the plurality of guide holes of the second component

3. The slide module according to the claim 1, wherein the longitudinal axis across the respective centers of the first fastener and the second fastener is configured to be disposed in the middle of the slide module.

4. The slide module according to the claim 1, wherein the first component comprises a first slide member having a slide groove, and the second component comprises a second slide member that is configured to slide along the slide groove of the first slide member.

5. The slide module according to the claim 4, wherein the first slide member is configured to be disposed in the middle of the first component
6. The slide module according to the claim 4, wherein, the second slide member further comprises a stopper disposed at one end of the second slide member to prevent the second slide member from disengaging the first slide member.

7. The slide module according to the claim 4, wherein the guide rods and the elastic members are disposed symmetrically on both sides of the first slide member.

8. The slide module according to the claim 1, wherein, at least one of the elastic members is a spring.

9. The slide module according to the claim 1, the second component further comprises a plurality of notches.

10. A slide apparatus comprising:
    a main body;
    a slide case; and
    a slide module according to claim 1, which is configured to connect the main body and the slide case.

11. A slide apparatus according to claim 10, wherein the first fastener is configured to be connected to the main body and the second fastener is configured to be connected to the slide case.

12. An electronic device comprising a slide apparatus according to claim 10.
INTERNATIONAL SEARCH REPORT

International application No
PCT/CN2009/075125

A. CLASSIFICATION OF SUBJECT MATTER

H04M 1/02 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC H04M 1/02, H05K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CPRS, CNKI, WPI, EPODOC SLIDE GUIDE ROD? ELASTIC HOLE? SPRING

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C

See patent family annex

* Special categories of cited documents

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search
20 Feb 2010 (20 02 2010)

Date of mailing of the international search report
11 Mar. 2010 (11.03.2010)

Name and mailing address of the ISA/CN
The State Intellectual Property Office, the P.R. China
6 Xitucheng Rd, Jimen Bridge, Haidian District, Beijing, China 100088
Facsimile No 86-10-62019451

Authorized officer
CAO, Yachun
Telephone No (86-10)6241 1427

Form PCT/ISA/210 (second sheet) (July 2009)
## INTERNATIONAL SEARCH REPORT

Information on patent family members

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