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(54) Titre : DISPOSITIF DE COMMANDE
(54) Title: CONTROL DEVICE

(57) Abrégé/Abstract:
A control device is provided for controlling a cursor motion of an electronic device. The control device includes a holder, a sleeve, and a detecting module. The holder has a first surface near a force-exerting position of the user, a second surface connected with the first surface, and an accommodation space at least facing the second surface. The holder provides a light transmission means beside the accommodation space. The detecting module is used for detecting at least one of a rotating action and a moving action of the sleeve through the light transmission means. The light transmission means includes a transparent zone, a vacant zone and an open zone or the combination of two or more thereof. The light transmission means is located at a suitable position of the holder. Consequently, the influence of the falling dust on the accuracy and sensitivity of the detecting module will be minimized.

CONTROL DEVICE

ABSTRACT OF THE DISCLOSURE

A control device is provided for controlling a cursor motion of an electronic device. The control device includes a holder, a sleeve, and a detecting module. The holder has a first surface near a force-exerting position of the user, a second surface connected with the first surface, and an accommodation space at least facing the second surface. The holder provides a light transmission means beside the accommodation space. The detecting module is used for detecting at least one of a rotating action and a moving action of the sleeve through the light transmission means. The light transmission means includes a transparent zone, a vacant zone and an open zone or the combination of two or more thereof. The light transmission means is located at a suitable position of the holder. Consequently, the influence of the falling dust on the accuracy and sensitivity of the detecting module will be minimized.

CONTROL DEVICE

FIELD OF THE INVENTION

[0001] The present invention relates to a control device, and more particularly to a control device for controlling a cursor shown on a display screen.

BACKGROUND OF THE INVENTION

[0002] With increasing development of the modern technologies and the electronic industries, a variety of electronic devices such as computers, notebook computers, mobile phones or digital cameras have become indispensable parts of the human lives. Furthermore, most users may frequently come into contact with computers. By using a mouse, a keyboard or any other peripheral device to operate the computer, the selecting, dragging or circumscribing function through the cursor motion or the typing function through the keyboard may be achieved.

[0003] Nowadays, many peripheral devices are developed to replace the mouse, or a keyboard and a mouse are combined together in order to operate the computer. For example, a multiple-cylinder control device is disclosed in US Patent No. 6,300,938. The surface of the cylinder has a pattern indicative of a resolution. In response to movement or rotation of the cylinder, the sensor outside the cylinder may detect the resolution of the surface of the cylinder, thereby issuing a signal to control the motion of a cursor shown on the display screen. Furthermore, a single-cylinder control device is disclosed in US Patent No. 6,337,680. The surface of the cylinder also has a pattern indicative of a resolution. The sensor for detecting movement or rotation of the cylinder is also disposed outside the single cylinder. Furthermore, a device having a sensor within a control cylinder is disclosed in US Patent Publication No. 20110134031. An

aperture is formed in an upward face of the control cylinder near a force-exerting position of the user. The sensor within the control cylinder should be aligned with the aperture to assure correct detection.

[0004] However, the above techniques still have some drawbacks. For example, if the sensor is disposed outside the cylinder, the sensitivity of the sensor is readily affected by the foreign dust. On the other hand, if the sensor is disposed within the cylinder, the assembling complexity is increased because the sensor should be aligned with the small aperture. Moreover, a channel constituted by the aperture may result in a faster airflow during operation of the control device. Under this circumstance, the foreign dust is possibly introduced into the inner portion of the cylinder from top to bottom, and thus the sensor is contaminated by the dust. Moreover, if the diameter of the dust is substantially equal to the diameter of the small aperture, the dust may be directly blocked in the aperture. Consequently, the detecting efficacy of the sensor is deteriorated.

SUMMARY OF THE INVENTION

[0005] For eliminating the drawbacks from the conventional control device, the present invention provides an improved control device. In the control device of the present invention, a sensor is disposed within a holder, and the holder is equipped with a transparent structure to reduce the influence of the foreign dust on detecting function of the sensor. As a consequence, the detecting efficacy of the sensor will be enhanced.

[0006] The present invention also provides a control device, in which a sensor is disposed within a holder but the detecting surface of the sensor does not face the upward surface of the holder, which is near a force-exerting position of the user. As a consequence, the possibility of falling down the dust on the detecting surface of the sensor due to gravity will be minimized.

[0007] The present invention further provides a control device, in which a sleeve is sheathed around a holder for facilitating the user to operate. The convex structures or the concave structures on the outer surface of the sleeve are not responsible for providing the functions of serving as resolutions. Consequently, the convex structures or the concave structures on the outer surface of the sleeve may have various geometric profiles in order to enhance touch feel and the comfort.

[0008] In accordance with a first aspect of the present invention, there is provided a control device for controlling a cursor motion of an electronic device. The control device includes a holder, a sleeve, and a detecting module. The holder includes a first surface, a second surface and an accommodation space. The first surface is near a force-exerting position of the user. The second surface is connected with the first surface. The accommodation space at least faces the second surface and is disposed within the holder. The holder provides a light transmission means, and the light transmission means is located beside the accommodation space. The sleeve is sheathed around the holder, wherein the sleeve is rotatable and movable on the first surface of the holder. The detecting module is accommodated within the accommodation space for detecting at least one of a rotating action and a moving action of the sleeve through the light transmission means. If at least one portion of the light transmission means is located at the first surface, the light transmission means includes a first transparent zone of the first surface. If the light transmission means is not located at the first surface, the light transmission means includes at least one of a vacant zone, a second transparent zone and an open zone.

[0009] In an embodiment, an inner surface of the sleeve is detected by the detecting module, and the detecting module is sheltered by the sleeve, wherein the inner surface of the sleeve faces the light transmission means.

[0010] In an embodiment, the sleeve has an outer surface for allowing the user to apply an external force thereon. A touch-feel enhancing mechanism is formed on the outer surface of the sleeve. In addition, the touch-feel enhancing mechanism includes a plurality of unit structures which are not parallel with a longitudinal direction of the sleeve.

[0011] In an embodiment, the unit structures are convex structures or concave structures. The convex structures or the concave structures are not responsible for providing a function of being detected by the detecting module. Each of the convex structures or the concave structures has a geometric profile selected from at least one of a point shape, a block shape and a strip shape.

[0012] In an embodiment, the unit structures are convex structures or concave structures. The convex structures or the concave structures are not responsible for providing a function of being detected by the detecting module. The convex structures or the concave structures are regularly or irregularly distributed on the outer surface.

[0013] In an embodiment, the unit structures are convex structures or concave structures. The convex structures or the concave structures are not responsible for providing a function of being detected by the detecting module. The convex structures or the concave structures are continuously or discontinuously distributed on the outer surface.

[0014] In an embodiment, the sleeve is constituted by a single supporting layer or a composite supporting layer, wherein the composite supporting layer further includes a reinforcing layer.

[0015] In an embodiment, the touch-feel enhancing mechanism is constituted by the single supporting layer, or constituted by at least one portion of the composite supporting layer, or constituted by a friction

enhancing structure with a friction coefficient identical to the reinforcing layer.

[0016] In an embodiment, if the holder includes a transparent structure as the first transparent zone or the second transparent zone of the light transmission means, a detecting surface of the detecting module faces the transparent structure and an inner surface of the sleeve. Alternatively, if the holder includes an opaque structure and the vacant zone is formed in the opaque structure and located at the second surface, a detecting surface of the detecting module faces the vacant zone and an inner surface of the sleeve. Alternatively, the detecting module has a detecting surface and the sleeve has an inner surface facing the detecting surface. Moreover, if the light transmission means includes the open zone, the first surface or the second surface is not arranged between the detecting surface and the inner surface, so that the detecting surface is located beside the inner surface.

[0017] In an embodiment, the control device further includes a housing for accommodating the holder, a positioning shaft, a pushing seat including a magnetic element, a pressing element and a sensing unit. The positioning shaft, the pushing seat, the pressing element and the sensing unit are all accommodated within the housing. The holder is fixed on the pressing element. The pressing element is rotatably fixed on an end of the positioning shaft. The end of the positioning shaft is penetrated through the pushing seat and sustained against the pressing element. When an external force is exerted on the pushing seat through the sleeve, a distance between the pushing seat and the pressing element is changed, so that a change of a magnetic field of the magnetic element is received by the sensing unit.

[0018] In accordance with a second aspect of the present invention, there is provided a control device for controlling a cursor motion of an

electronic device. The control device includes a holder, a sleeve, and a detecting module. The holder includes a first surface and a second surface. The first surface is near a force-exerting position of the user. The second surface is opposed to the first surface. An accommodation space is formed in the holder and at least connected with the second surface. The sleeve is sheathed around the holder, wherein the sleeve is rotatable and movable on the first surface of the holder. The detecting module is accommodated within the accommodation space for detecting a rotating action and a moving action of the sleeve through an inner surface of the sleeve which is not overlapped with the first surface of the holder.

[0019] In an embodiment, a touch-feel enhancing mechanism is further formed on an outer surface of the sleeve opposed to the inner surface. A convex structure or a concave structure is served as a unit structure of the touch-feel enhancing mechanism. The unit structure is not responsible for providing a function of being detected by the detecting module. The unit structure has a geometric profile selected from at least one of a point shape, a block shape and a strip shape, and the unit structure in the strip shape is not parallel with a longitudinal direction of the sleeve.

[0020] In an embodiment, a touch-feel enhancing mechanism is further formed on an outer surface of the sleeve opposed to the inner surface. A convex structure or a concave structure is served as a unit structure of the touch-feel enhancing mechanism. If the touch-feel enhancing mechanism includes a plurality of unit structures, the unit structures are not responsible for providing a function of being detected by the detecting module. Moreover, the unit structures are regularly or irregularly distributed on the outer surface.

[0021] In an embodiment, a touch-feel enhancing mechanism is further formed on an outer surface of the sleeve opposed to the inner

surface. A convex structure or a concave structure is served as a unit structure of the touch-feel enhancing mechanism. If the touch-feel enhancing mechanism includes a plurality of unit structures, the unit structures are not responsible for providing a function of being detected by the detecting module. Moreover, the unit structures are continuously or discontinuously distributed on the outer surface.

[0022] In an embodiment, the sleeve is constituted by a single supporting layer or a composite supporting layer, wherein the composite supporting layer further includes a reinforcing layer.

[0023] In an embodiment, the touch-feel enhancing mechanism is constituted by the single supporting layer, or constituted by at least one portion of the composite supporting layer, or constituted by a friction enhancing structure with a friction coefficient identical to the reinforcing layer.

[0024] In an embodiment, if at least one of the first surface and the second surface of the holder includes a transparent structure, a detecting surface of the detecting module faces the transparent structure and the inner surface of the sleeve. Alternatively, if the second surface of the holder includes a vacant zone, a detecting surface of the detecting module faces the vacant zone and the inner surface of the sleeve which is not overlapped with the first surface. Alternatively, the detecting module has a detecting surface and the first surface or the second surface of the holder is not arranged between the detecting surface and the inner surface of the sleeve, so that the detecting surface is located beside the inner surface of the sleeve which is not overlapped with the first surface.

[0025] In an embodiment, the control device further includes a housing for accommodating the holder, a positioning shaft, a pushing seat including a magnetic element, a pressing element and a sensing unit. The

positioning shaft, the pushing seat, the pressing element and the sensing unit are all accommodated within the housing. The holder is fixed on the pressing element. The pressing element is rotatably fixed on an end of the positioning shaft. The end of the positioning shaft is penetrated through the pushing seat and sustained against the pressing element. When an external force is exerted on the pushing seat through the sleeve, a distance between the pushing seat and the pressing element is changed, so that a change of a magnetic field of the magnetic element is received by the sensing unit.

[0026] In an embodiment, the control device further includes a control switch, which is disposed within the housing and disposed under a touching part of the pressing element. In response to a downward force exerted on the holder, the touching part is driven to press the control switch, so that the control switch is triggered to generate a signal.

[0027] In an embodiment, the control device further includes a microprocessor, which is disposed within the accommodation space.

[0028] In accordance with a third aspect of the present invention, there is provided a control device for controlling a cursor motion of an electronic device. The control device includes a holder, a sleeve, and a detecting module. The holder includes a transparent structure and an accommodation space, wherein the accommodation space is disposed within the holder. The sleeve is sheathed around the holder, wherein the sleeve is rotatable and movable on the holder. The detecting module is accommodated within the accommodation space and having a detecting surface facing the transparent structure. Moreover, at least one of a rotating action and a moving action of the sleeve is detected by the detecting module through the transparent structure.

[0029] In an embodiment, the holder further includes a first surface near a force-exerting position of the user and a second surface connected with the first surface. A region of the first surface is provided by the transparent structure. Alternatively, a region of the second surface is provided by the transparent structure. Alternatively, the first surface and the second surface are provided by the transparent structure so as to define the accommodation space.

[0030] In an embodiment, at least one of plural convex structures or plural concave structures formed on an outer surface of the sleeve is contactable by the user. The convex structures or the concave structures are not responsible for providing a function of being detected by the detecting module. Moreover, the convex structures or the concave structures are regularly or irregularly distributed on the outer surface.

[0031] In an embodiment, at least one of plural convex structures or plural concave structures formed on an outer surface of the sleeve is contactable by the user. The convex structures or the concave structures are not responsible for providing a function of being detected by the detecting module. Moreover, the convex structures or the concave structures are continuously or discontinuously distributed on the outer surface.

[0032] In accordance with a fourth aspect of the present invention, there is provided a control device for controlling a cursor motion of an electronic device. The control device includes a holder, a sleeve, and a detecting module. The holder includes a first surface and a second surface. The first surface faces upwardly. The second surface is opposed to the first surface and faces downwardly. In addition, an accommodation space is formed under the second surface. The sleeve is sheathed around the holder, wherein the sleeve is rotatable and movable on the first surface of

the holder. The detecting module is accommodated within the accommodation space for detecting a rotating action and a moving action of the sleeve through a non-downward inner surface of the sleeve.

[0033] In an embodiment, the control device further includes a housing for accommodating the holder, a positioning shaft, a pushing seat including a magnetic element, a pressing element and a sensing unit. The positioning shaft, the pushing seat, the pressing element and the sensing unit are all accommodated within the housing. The holder is fixed on the pressing element. The pressing element is rotatably fixed on an end of the positioning shaft. The end of the positioning shaft is penetrated through the pushing seat and sustained against the pressing element. When an external force is exerted on the pushing seat through the sleeve, a distance between the pushing seat and the pressing element is changed, so that a change of a magnetic field of the magnetic element is received by the sensing unit.

[0034] In an embodiment, if at least one of the first surface and the second surface of the holder includes a transparent structure, a detecting surface of the detecting module faces the transparent structure and the inner surface of the sleeve. Alternatively, if the second surface of the holder includes a vacant zone, a detecting surface of the detecting module faces the vacant zone and the inner surface of the sleeve which is not overlapped with the first surface. Alternatively, the detecting module has a detecting surface and the first surface or the second surface of the holder is not arranged between the detecting surface and the inner surface of the sleeve, so that the detecting surface is located beside the inner surface of the sleeve which is not overlapped with the first surface.

[0035] In accordance with a fifth aspect of the present invention, there is provided a control device for controlling a cursor motion of an

electronic device. The control device includes a holder, a sleeve, and a detecting module. The holder includes a first surface and a second surface. The first surface faces upwardly. The second surface is connected with the first surface. In addition, an accommodation space facing the second surface is formed in the holder. The sleeve is sheathed around the holder, wherein the sleeve is rotatable and movable on the first surface of the holder. The detecting module is accommodated within the accommodation space. Moreover, the detecting module includes a non-upward detecting surface for detecting a rotating action and a moving action of the sleeve.

[0036] In an embodiment, the control device further includes a housing for accommodating the holder, a positioning shaft, a pushing seat including a magnetic element, a pressing element and a sensing unit. The positioning shaft, the pushing seat, the pressing element and the sensing unit are all accommodated within the housing. The holder is fixed on the pressing element. The pressing element is rotatably fixed on an end of the positioning shaft. The end of the positioning shaft is penetrated through the pushing seat and sustained against the pressing element. When an external force is exerted on the pushing seat through the sleeve, a distance between the pushing seat and the pressing element is changed, so that a change of a magnetic field of the magnetic element is received by the sensing unit.

[0037] In an embodiment, if at least one of the first surface and the second surface of the holder includes a transparent structure, a detecting surface of the detecting module faces the transparent structure and the inner surface of the sleeve. Alternatively, if the second surface of the holder includes a vacant zone, a detecting surface of the detecting module faces the vacant zone and the inner surface of the sleeve which is not overlapped

with the first surface. Alternatively, the detecting module has a detecting surface and the first surface or the second surface of the holder is not arranged between the detecting surface and the inner surface of the sleeve, so that the detecting surface is located beside the inner surface of the sleeve which is not overlapped with the first surface.

[0038] The above objects and advantages of the present invention will become more readily apparent to those ordinarily skilled in the art after reviewing the following detailed description and accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0039] FIG. 1 is a schematic exploded view illustrating a control device according to a first embodiment of the present invention;

[0040] FIG. 2 is a schematic top view illustrating the bottom shell of the control device according to the first embodiment of the present invention;

[0041] FIG. 3 is a schematic exploded view illustrating some components of a control module of the control device according to the first embodiment of the present invention;

[0042] FIG. 4 is a schematic bottom view illustrating the holder of the control device according to the first embodiment of the present invention;

[0043] FIG. 5 is a schematic exploded view illustrating some components of a control module of a control device according to a second embodiment of the present invention;

[0044] FIG. 6 is a schematic exploded view illustrating some components of a control device according to a third embodiment of the present invention;

[0045] FIG. 7 is a schematic exploded view illustrating some components of a control device according to a fourth embodiment of the present invention;

[0046] FIG. 8 is a schematic front view illustrating a first exemplary sleeve used in the control device of the present invention;

[0047] FIG. 9 is a schematic side view illustrating the first exemplary sleeve used in the control device of the present invention;

[0048] FIG. 10 is a schematic front view illustrating a second exemplary sleeve used in the control device of the present invention;

[0049] FIG. 11 is a schematic side view illustrating the second exemplary sleeve used in the control device of the present invention;

[0050] FIG. 12 is a schematic front view illustrating a third exemplary sleeve used in the control device of the present invention;

[0051] FIG. 13 is a schematic front view illustrating a fourth exemplary sleeve used in the control device of the present invention;

[0052] FIG. 14 is a schematic front view illustrating a fifth exemplary sleeve used in the control device of the present invention;

[0053] FIG. 15 is a schematic front view illustrating a sixth exemplary sleeve used in the control device of the present invention;

[0054] FIG. 16 is a schematic front view illustrating a seventh exemplary sleeve used in the control device of the present invention;

[0055] FIG. 17 is a schematic front view illustrating an eighth exemplary sleeve used in the control device of the present invention; and

[0056] FIG. 18 is a schematic front view illustrating a ninth exemplary sleeve used in the control device of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0057] In this context, the term "holder" denotes a functional component for providing at least one of a function of guiding the sleeve

and a function of supporting the sleeve. The holder may have various implementation examples. In the present invention, the holder which is served as a component of the control device may be an integral structure or a combination of several structures. With respect to the housing of the control device, in response to a downward force, at least one portion of the holder may be moved upwardly or downwardly or at least one portion of the holder does not be moved upwardly or downwardly. Under this circumstance, at least one portion of the holder may provide a length larger than a supporting surface of the sleeve along a longitudinal direction of the sleeve. The sleeve is supported by at least one portion of the supporting surface. Moreover, the sleeve is guided by at least one portion of the supporting surface, so that the sleeve is rotatable and/or movable relative to at least one portion of the holder. Optionally, if the holder is composed of several structures, in response to a downward force, a portion of the holder may be moved upwardly or downwardly or a portion of the holder does not be moved upwardly or downwardly. Under this circumstance, the sleeve may be attached on another portion of the holder to perform at least one of a rotating action and a moving action.

[0058] In this context, the term "sleeve" denotes various implementation examples of the sleeve made of a rubbery material. For example, the sleeve used in the control device of the present device may be (but not limited to be) sheathed around the holder. A portion of the holder is served as the supporting surface. The geometric profile of the sleeve only roughly matches the geometric profile of the holder. Consequently, the sleeve is rotatable or movable relative to the holder.

[0059] In this context, the term "light transmission means" has various implementation examples. For example, the light transmission means may be a light-transmissible zone contained in an opaque physical

structure for allowing light or light signals to pass through. The light-transmissible zone of the light transmission means may be a vacant zone. Alternatively, a transparent material or a transparent structure may be filled into the vacant zone to form a transparent zone, and the transparent zone is served as the light transmission means. Optionally, an opaque physical structure with a geometric profile for allowing light signals to pass through may be served as the light transmission means. That is, the opaque physical structure has an open zone for allowing two separate spaces to be in communication with each other. In other words, the open zone may be served as the light transmission means of the present invention. Optionally, if a physical structure is a transparent structure made of a single material or a composite material, the transparent structure may be served as the light transmission means of the present invention.

[0060] In this context, the term "touch-feel enhancing mechanism" is a mechanism for allowing the user to recognize different stimulation levels of skin during the control device is operated by the user. However, the user does not feel uncomfortable in response to the different stimulation levels for a long use time. Moreover, the material of the touch-feel enhancing mechanism may be identical to or different from the material of the sleeve. In a case that the material of the touch-feel enhancing mechanism is identical to the material of the sleeve, the touch-feel enhancing mechanism may be implemented by designing the geometric profiles thereof. It is noted that the above descriptions are presented herein for purpose of illustration and description only.

[0061] FIG. 1 is a schematic exploded view illustrating a control device according to a first embodiment of the present invention. As shown in FIG. 1, the control device 6 comprises a holder 1, a circuit module 2, a circuit module 5, a sleeve 3, and a housing 4. In the first embodiment,

the housing 4 comprises a bottom shell 41 and an upper cover 42. An operating space 40 is defined between the bottom shell 41 and the upper cover 42 for accommodating most components of the control device 6. For example, the holder 1, the circuit module 2, the circuit module 5, the sleeve 3 and a plurality of control elements 24 are accommodated within the operating space 40.

[0062] A hollow part 421 and a slot 422 are formed in the upper cover 42. The control elements 24 and a control element 54 are disposed under the hollow part 421, and exposed to the hollow part 421. The sleeve 3 is sheathed around the holder 1, and exposed to the slot 422. In addition, a wrist rest 13 and a plaque 14 are disposed on the upper cover 42. The wrist rest 13 is made of a soft material or an elastic material. The wrist rest 13 is a device used to support the wrist. Corresponding to the hollow part 421, the plaque 14 also has a plurality of apertures to expose the underlying control elements 24.

[0063] Furthermore, most components of the control device 6 are accommodated within the operating space 40, and fixed on the bottom shell 41. FIG. 2 is a schematic top view illustrating the bottom shell 41 of the control device according to the first embodiment of the present invention. Please refer to FIGS. 1 and 2. In the first embodiment, the circuit module 5 comprises a circuit board 51, a plurality of control switches 53, and a control element 54. The circuit board 51 is fixed on the bottom shell 41. The control switches 53 are disposed on the circuit board 51. Some of the control switches 53 are aligned with corresponding control elements 24 that are disposed over the control switches 53. The control element 24 may be a key, a wheel, a scrolling ball or any other operable element by a user's hand. The function of controlling a mouse cursor is achievable by simply pressing or rotating the control element 24 to trigger a corresponding

control switch 53 of the circuit module 5. The example of the control element 24 is presented herein for purpose of illustration and description only. It is noted that numerous modifications and alterations may be made while retaining the teachings of the invention.

[0064] Moreover, a circuit module 7 is further accommodated within the operating space 40, and fixed on the bottom shell 41. The circuit module 7 comprises a circuit board 71 and a transmission interface 72. The transmission interface 72 is located at a side of the circuit board 71. Moreover, a perforation 423 is formed in a lateral rim of the upper cover 42 for allowing the transmission interface 72 to penetrate through. In this embodiment, the circuit module 5 and the circuit module 7 are disposed on separate and independent circuit boards. Alternatively, the circuit module 5 and the circuit module 7 may be integrated into a single circuit board. Other circuit modules which will be described as follows may be integrated into the above circuit module or may be independent circuit modules. For designing the independent circuit modules, the independent circuit modules may be in communication with each other or in communication with an external electronic device through wires (or transmission lines) and the connecting interface, or the independent circuit modules may separately transmit and receive signals.

[0065] FIG. 3 is a schematic exploded view illustrating some components of a control module of the control device according to the first embodiment of the present invention. Please refer to FIGS. 1, 2 and 3. The holder 1 is accommodated within the operating space 40, and located at a front side of the circuit module 5. In addition, the holder 1 is aligned with the slot 422 of the upper cover 42. Two docking parts 114 are located at both ends of the stick-like holder 1, respectively. Moreover, a positioning module comprises a positioning shaft 115. The positioning

shaft 115 is arranged between the holder 1 and the circuit module 5. Each of the both ends of the positioning shaft 115 is penetrated through a corresponding pushing seat 116 and a corresponding pressing element 117. In particular, after each end of the positioning shaft 115 is sequentially penetrated through a pivotal hole 1161 of the corresponding pushing seat 116 and a corresponding elastic element 1164, the end of the positioning shaft 115 is inserted into a pivotal hole 1171 of the corresponding pressing element 117. In the first embodiment, the positioning shaft 115 is directly fixed on the bottom shell 41 through a fixing part 1151 of the positioning module. Alternatively, the positioning shaft 115 is fixed on the bottom shell 41 through any other fixing part (not shown). The way of fixing the positioning shaft 115 is presented herein for purpose of illustration and description only.

[0066] The pushing seat 116 further comprises a sustaining part 1162 and a sheathing part 1163. The sheathing part 1163 is arranged between the sustaining part 1162 and the pivotal hole 1161. A magnetic element (not shown) is disposed within the sheathing part 1163. Moreover, a sensing unit 343 is fixed on the bottom shell 41, and located beside the magnetic element that is disposed within the sheathing part 1163. Consequently, the magnetic element within the sheathing part 1163 can be sensed by the sensing unit 343. Moreover, the sheathing part 1163 of the pushing seat 116 is sheathed around the pivotal hole 1173 of the pressing element 117. The pushing seat 116 is movable along the pivotal hole 1173. In addition, the pushing seat 116 is movable on the positioning shaft 115. In a case that an external force is exerted on the sustaining part 1162 of the pushing seat 116 along a longitudinal direction of the positioning shaft 115, the pushing seat 116 is moved toward the pressing element 117. At the same time, the relative distance between the

magnetic element and the sensing unit 343 is changed, and the elastic element 1164 on the positioning shaft 115 is compressed. Moreover, due to the elastic potential energy of the compressed elastic element 1164, the pushing seat 116 is returned to the original position where no external force is exerted on the pushing seat 116.

[0067] Moreover, the pressing element 117 further comprises a touching part 1174 and a docking part 1175. The touching part 1174 and the docking part 1175 are located at the positions corresponding to the holder 1. The docking part 1175 of the pressing element 117 and the corresponding docking part 114 of the holder 1 are coupled with each other, and the docking part 114 is contacted with the pressing element 117. A control switch 55 is disposed under the touching part 1174. The pressing element 117 is rotatable relative to the positioning shaft 115. When a downward force is exerted on the holder 1, the pressing element 117 is driven to rotate. Consequently, the touching part 1174 is moved for a specified traveling distance to press the control switch 55. At the moment when the control switch 55 is pressed by the touching part 1174, a triggering signal is generated. After the downward force is eliminated, the touching part 1174 is returned to the original position where the touching part 1174 is only in contact with the control switch 55.

[0068] FIG. 4 is a schematic bottom view illustrating the holder 1 of the control device according to the first embodiment of the present invention. Please refer to FIGS. 1 and 4. The sleeve 3 has an axial hole. Consequently, the sleeve 3 may be sheathed around a first surface 111 of the holder 1, which is near a force-exerting position of the user. The length of the sleeve 3 along the longitudinal axis is shorter than the length of the holder 1. Consequently, the sleeve 3 is movable on the first surface 111 of the holder 1, and rotatable within the operating space 40 and relative

to the first surface 111 of the holder 1. As shown in FIGS. 1 and 4, the holder 1 further comprises a second surface 112 and an accommodation space 113. The second surface 112 is connected with the first surface 111. The accommodation space 113 faces the second surface 112. The sleeve 3 with the axial hole may be sheathed around the first surface 111 of the holder 1. Furthermore, the circuit module 2 is accommodated within the accommodation space 113. The circuit module 2 comprises a circuit board 23, at least one detecting module 22, and a microprocessor 21. The at least one detecting module 22 and the microprocessor 21 are disposed on the circuit board 23. The detecting module 22 has a detecting surface 221 for detecting at least one of a rotating action and a moving action of the sleeve 3, thereby generating a control signal to control a cursor motion of an electronic device.

[0069] Moreover, in the first embodiment, the second surface 112 of the holder 1 is bent as the sidewall and the inner surface of the holder 1. The second surface 112 faces the accommodation space 113. In other words, the holder 1 has a geometric profile with an open zone. After the sleeve 3 is sheathed around the holder 1, the accommodation space 113 of the holder 1 is in communication with an inner surface 31 of the sleeve 3 which is not overlapped with the first surface 111 of the holder 1. In such way, when the detecting surface 221 of the detecting module 22 within the accommodation space 113 emits a light signal, the light signal may be directly projected to the inner surface 31 of the sleeve 3 which is not overlapped with the first surface 111 of the holder 1 through the open zone of the geometric profile. Moreover, the first surface 111 or the second surface 112 of the holder 1 is not arranged between the detecting surface 221 and the inner surface 31 of the sleeve 3, so that the detecting surface 221 is located beside the inner surface 31 of the sleeve 3. In the first

embodiment, the open zone under the second surface 112 of the holder 1 is served as a light transmission means. Consequently, the detecting module 22 within the accommodation space 113 is effective to detect at least one of the rotating action and the moving action of the sleeve 3.

[0070] It is noted that the second surface 112 connected with the first surface 111 is not restricted to the specified profile of the first embodiment. FIG. 5 is a schematic exploded view illustrating some components of a control module of a control device according to a second embodiment of the present invention. In a case that the holder 11 is opaque and has an elliptic or circular cross section, the first surface 121, which is near a force-exerting position of the user, still faces upwardly. The second surface 122 is connected with the first surface 121 and has an elliptic profile. The accommodation space 123 faces the second surface 122, and is enclosed by the first surface 121 and the second surface 122. Under this circumstance, if the user wants to accommodate the detecting module 26 within the accommodation space 123 for detecting at least one of a rotating action and a moving action of the sleeve 3, the detecting surface 261 of the detecting module 26 should face the inner surface 31 of the sleeve 3 and can detect the rotating action and the moving action of the sleeve 3. In a case that the detecting module 26 is an optical sensor, the first surface 121 of the holder 11 is opaque, and the second surface 122 of the holder 11 has a vacant zone 1221. Under this circumstance, the detecting surface 261 of the detecting module 26 faces the vacant zone 1221 of the second surface 122 of the holder 11 and the inner surface 31 of the sleeve 3 which is not overlapped with the first surface 121 of the holder 11.

[0071] Consequently, the detecting signal may be transmitted to or reflected by the inner surface 31 of the sleeve 3 through the vacant zone

1221. It is noted that the vacant zone 1221 of the second surface 122 of the holder 11 may be located at any suitable position of the second surface 122 as long as the rotating action or the moving action of the inner surface 31 of the sleeve 3 which is not overlapped with the first surface 121 can be detected by the detecting module 26. That is, in this embodiment, the vacant zone 1221 is served as the light transmission means. Consequently, the detecting module 26 is effective to detect at least one of the rotating action and the moving action of the sleeve 3 through the vacant zone 1221 of the second surface 122. The holder 11 of this embodiment has some benefits. For example, since the vacant zone 1221 is not located at the upward first surface 121, the possibility of entering the falling dust into accommodation space 123 due to gravity will be minimized. That is, the detecting surface 261 is difficultly contaminated by dust.

[0072] Moreover, the holder may comprise two structures, which are made of two materials. These two structures are combined together or integrally formed in a suitable manner. Consequently, a portion of the holder is transparent. FIG. 6 is a schematic exploded view illustrating some components of a control device according to a third embodiment of the present invention. As shown in FIG. 6, the holder 15 comprises a transparent structure 131 and a non-transparent structure 132. The transparent structure 131 and the non-transparent structure 132 are combined together or integrally formed. In this embodiment, the transparent structure 131 has a first transparent zone 1311 at the first surface and a second transparent zone 1312 at the second surface. The first transparent zone 1311 or the second transparent zone 1312 is served as the light transmission means. Under this circumstance, as long as the detecting surface 281 of the detecting module 28 is accommodated within the accommodation space 123 and located within the range of the

transparent structure 131, at least one of the rotating action and the moving action of the sleeve 3 can be detected by the detecting module 28.

[0073] FIG. 7 is a schematic exploded view illustrating some components of a control device according to a fourth embodiment of the present invention. Like the holder 1 of the first embodiment, the holder 17 of the fourth embodiment is an opaque structure and the open zone is served as the light transmission means. In comparison with the holder 1 of the first embodiment, the holder 17 of the fourth embodiment has a perforated zone or a vacant zone, and a transport structure is filled into or combined with the perforated zone or the vacant zone. Consequently, the holder 17 has a first transparent zone 1411. The first transparent zone 1411 may be served as a part of the light transmission means. Under this circumstance, the detecting surface 341 of the detecting module 34 may detect the upper inner surface 31 of the sleeve 3 through the original open zone or detect the downward inner surface 31 of the sleeve 3 (or the inner surface 31 of the sleeve 3 which is overlapped with the first surface 141) through the first transparent zone 1411.

[0074] From the above discussions, in this embodiment, the first surface which is near the force-exerting position of the user is served as the light transmission means. For minimizing the possibility of falling down the dust on the detecting surface, the perforated zone or the vacant zone is formed in the first surface of the opaque holder which is near the force-exerting position of the user. After a transparent material or a transparent structure is filled into the perforated zone or the vacant zone by a gluing process or an assembling process, the possibility of entering the falling dust into accommodation space due to gravity will be minimized. Under this circumstance, the upward surface 141 is still effective to be severed as the light transmission means.

[0075] FIG. 8 is a schematic front view illustrating a first exemplary sleeve used in the control device of the present invention. FIG. 9 is a schematic side view illustrating the first exemplary sleeve used in the control device of the present invention. In the first exemplary sleeve 3, a touch-feel enhancing mechanism is formed on an outer surface 32 of the sleeve 3. The touch-feel enhancing mechanism has a plurality of unit structures 321. For example, in the first exemplary sleeve 3, the unit structure 321 is a convex structure. The unit structure 321 is not responsible for providing the function of being detected by the detecting module 22. Whereas, the unit structure 321 is used for increasing the touch feel of operating the control device. Preferably, the height of the unit structure 321 protruded from the outer surface 32 of the sleeve 3 is equal to or smaller than the thickness of a single supporting layer 35, which constitutes the main body of the sleeve 3. Moreover, the height of the unit structure 321 protruded from the outer surface 32 of the sleeve 3 should not be so high in order to prevent the uncomfortable feel of operating the control device. In this embodiment, the sleeve 3 comprises a plurality of unit structures 321. These unit structures 321 are uniformly distributed or discretely arranged around the outer surface 32 of the sleeve 3 at substantially regular intervals. In this embodiment, the unit structures 321 have strip-shaped geometric profiles. The strip-shaped unit structures 321 are not parallel with a longitudinal direction X of the sleeve 3. That is, these unit structures 321 are arranged around the outer surface 32 at an inclined angle relative to the longitudinal direction X of the sleeve 3.

[0076] The unit structures are not restricted to the convex structures. FIG. 10 is a schematic front view illustrating a second exemplary sleeve used in the control device of the present invention. FIG. 11 is a schematic side view illustrating the second exemplary sleeve used in the control

device of the present invention. In the second exemplary sleeve 103, a concave structure is served as a unit structure 322. The sleeve 103 is constituted by a composite supporting layer including a reinforcing layer 33. The reinforcing layer 33 is used for providing the inner surface 31 and optimizing the inner surface 31. Consequently, the rotating signal or the moving signal generated by the sleeve 103 can be sensitively and actually responded to and received by the detecting module. In addition, the unit structures 322 are formed on the outer surface 32 of the sleeve 103. Alternatively, in the sleeve 103 constituted by the composite supporting layer, the outer surface 32 is provided by the reinforcing layer 33, and the unit structures 322 (e.g. concave structures) are formed on the reinforcing layer 33. Alternatively, if the sleeve 103 is constituted by a single supporting layer, concave structures may be served as the unit structures 322 as long as the controlling function of the sleeve 103 and the function of the sleeve 103 to be detected are not largely influenced by the concave structures.

[0077] From the above discussions, the convex structures or the concave structures of the touch-feel enhancing mechanism may be constituted by a single supporting layer of the sleeve, or constituted by at least one portion of a composite supporting layer of the sleeve. Alternatively, the touch-feel enhancing mechanism may comprise a friction enhancing structure with a friction coefficient identical to the reinforcing layer in order to strengthen the frequently touched touch-feel enhancing mechanism. The reinforcing layer may be applied to the touch-feel enhancing mechanism and the outer surface as long as the function of increasing the touch feel by the touch-feel enhancing mechanism is not adversely affected. Moreover, if the enhanced touch feel is achieved by the friction force, the touch-feel enhancing mechanism may comprise a

friction enhancing structure with a friction coefficient higher than the outer surface of the sleeve.

[0078] FIG. 12 is a schematic front view illustrating a third exemplary sleeve used in the control device of the present invention. FIG. 13 is a schematic front view illustrating a fourth exemplary sleeve used in the control device of the present invention. In the second exemplary sleeve as shown in FIG. 8, the unit structures 321 have linear strip-shaped geometric profiles. On the other hands, as shown in FIG. 12, the unit structures 323 of the sleeve 105 have curvy strip-shaped geometric profiles. Moreover, as shown in FIG. 13, the unit structures 324 of the sleeve 107 have saw-toothed or spiral strip-shaped geometric profiles. In this context, the strip-shaped geometric profile indicates that the length of the unit structure along a specified direction is much longer than the length of the unit structure along any other direction. The length of the unit structure along the specified direction may be greater than, smaller than or equal to the length of the sleeve along the longitudinal direction of the sleeve. In other words, some of the unit structures 323 of the touch-feel enhancing mechanism of the third exemplary sleeve 105 are continuously distributed on the outer surface 32 of the sleeve 105; and the unit structures 324 of the touch-feel enhancing mechanism of the fourth exemplary sleeve 107 are continuously distributed on the outer surface 32 of the sleeve 107. FIG. 14 is a schematic front view illustrating a fifth exemplary sleeve used in the control device of the present invention. As shown in FIG. 14, the unit structures 325 are discontinuously distributed on the outer surface 32 of the sleeve 109.

[0079] In addition to the strip-shaped geometric profiles, the unit structures 325 of the touch-feel enhancing mechanism of the sleeve 109 may have other geometric profiles. For example, the lengths of the unit

structure along a first direction and a second direction are substantially identical, but much longer than the length of the unit structure along a third direction. Moreover, as shown in FIG. 15, the unit structure 326 of the sleeve 201 has a block shape such as a circular shape, an elliptic shape, an irregular polygonal shape or a regular polygonal shape. The length of the unit structure 326 on the outer surface 32 is much larger than the height of convex structure or the depth of the concave structure with respect to the outer surface 32. In a case that the touch-feel enhancing mechanism comprises a plurality of unit structures 326 distributed on the outer surface 32 of the sleeve 201, these unit structures 326 are not responsible for providing the function of being detected by the detecting module. Consequently, these unit structures 326 may be regularly distributed on the outer surface 32 of the sleeve 201. Alternatively, as shown in FIG. 16, the unit structures 327 may be irregularly distributed on the outer surface 32 of the sleeve 203.

[0080] FIG. 17 is a schematic front view illustrating an eighth exemplary sleeve used in the control device of the present invention. In the eighth exemplary sleeve 205, the lengths of the unit structure 328 along all direction are substantially identical. That is, the unit structure 328 has a point shape. The length of the unit structure 328 on the outer surface 32 of the sleeve 205 is substantially equal to the height of convex structure or the depth of the concave structure with respect to the outer surface 32. It is noted that these unit structures 328 may be continuously or discontinuously distributed on the outer surface 32 of the sleeve 205, or regularly or irregularly distributed on the outer surface 32 of the sleeve 205.

[0081] The unit structures with various geometric profiles may be collocated with each other in order to enhance the touch feel during

operation and increase amusement. FIG. 18 is a schematic front view illustrating a ninth exemplary sleeve used in the control device of the present invention. As shown in FIG. 18, the unit structure 329 of the ninth exemplary sleeve 207 has a geometric profile composed of point and block shapes. The unit structures 329 are distributed on the outer surface 32 of the sleeve 207. Of course, various unit structures composed of convex structures and concave structures may be used to constitute the touch-feel enhancing mechanism of the present invention.

[0082] While the invention has been described in terms of what is presently considered to be the most practical and preferred embodiments, it is to be understood that the invention needs not be limited to the disclosed embodiment. On the contrary, it is intended to cover various modifications and similar arrangements included within the spirit and scope of the appended claims which are to be accorded with the broadest interpretation so as to encompass all such modifications and similar structures.

WHAT IS CLAIMED IS:

1. A control device for controlling a cursor motion of an electronic device, said control device comprising:

a holder comprising a first surface, a second surface and an accommodation space, wherein said first surface is near a force-exerting position of an user, said second surface is connected with said first surface, and said accommodation space at least faces said second surface and is disposed within said holder, wherein said holder provides a light transmission means, and said light transmission means is located beside said accommodation space;

a sleeve sheathed around said holder, wherein said sleeve is rotatable and movable on said first surface of said holder; and

a detecting module accommodated within said accommodation space for detecting at least one of a rotating action and a moving action of said sleeve through said light transmission means,

wherein if at least one portion of said light transmission means is located at said first surface, said light transmission means comprises a first transparent zone of said first surface, wherein if said light transmission means is not located at said first surface, said light transmission means comprises at least one of a vacant zone, a second transparent zone and an open zone.

2. The control device according to claim 1, wherein an inner surface of said sleeve is detected by said detecting module, and said detecting module is sheltered by said sleeve, wherein said inner surface of said sleeve faces said light transmission means.

3. The control device according to claim 1, wherein said sleeve has an outer surface for allowing said user to apply an external force thereon, wherein a touch-feel enhancing mechanism is formed on said outer surface

of said sleeve, and said touch-feel enhancing mechanism comprises a plurality of unit structures which are not parallel with a longitudinal direction of said sleeve.

4. The control device according to claim 3, wherein said unit structures are convex structures or concave structures, wherein said convex structures or said concave structures are not responsible for providing a function of being detected by said detecting module, wherein each of said convex structures or said concave structures has a geometric profile selected from at least one of a point shape, a block shape and a strip shape.

5. The control device according to claim 3, wherein said unit structures are convex structures or concave structures, wherein said convex structures or said concave structures are not responsible for providing a function of being detected by said detecting module, wherein said convex structures or said concave structures are regularly or irregularly distributed on said outer surface.

6. The control device according to claim 3, wherein said unit structures are convex structures or concave structures, wherein said convex structures or said concave structures are not responsible for providing a function of being detected by said detecting module, wherein said convex structures or said concave structures are continuously or discontinuously distributed on said outer surface.

7. The control device according to claim 3, wherein said sleeve is constituted by a single supporting layer or a composite supporting layer, wherein said composite supporting layer further comprises a reinforcing layer.

8. The control device according to claim 3, wherein said touch-feel enhancing mechanism is constituted by said single supporting layer, or constituted by at least one portion of said composite supporting layer, or

constituted by a friction enhancing structure with a friction coefficient identical to said reinforcing layer.

9. The control device according to claim 1, wherein if said holder comprises a transparent structure as said first transparent zone or said second transparent zone of said light transmission means, a detecting surface of said detecting module faces said transparent structure and an inner surface of said sleeve; or wherein if said holder comprises an opaque structure and said vacant zone is formed in said opaque structure and located at said second surface, a detecting surface of said detecting module faces said vacant zone and an inner surface of said sleeve; or wherein said detecting module has a detecting surface and said sleeve has an inner surface facing said detecting surface, and if said light transmission means comprises said open zone, said first surface or said second surface is not arranged between said detecting surface and said inner surface, so that said detecting surface is located beside said inner surface.

10. The control device according to claim 1, wherein said control device further comprises a housing for accommodating said holder, a positioning shaft, a pushing seat including a magnetic element, a pressing element and a sensing unit, wherein said positioning shaft, said pushing seat, said pressing element and said sensing unit are all accommodated within said housing, wherein said holder is fixed on said pressing element, said pressing element is rotatably fixed on an end of said positioning shaft, and said end of said positioning shaft is penetrated through said pushing seat and sustained against said pressing element, wherein when an external force is exerted on said pushing seat through said sleeve, a distance between said pushing seat and said pressing element is changed, so that a change of a magnetic field of said magnetic element is received by said sensing unit.

11. A control device for controlling a cursor motion of an electronic device, said control device comprising:

a holder comprising a first surface and a second surface, wherein said first surface is near a force-exerting position of an user, said second surface is opposed to said first surface, and an accommodation space is formed in said holder and at least connected with said second surface;

a sleeve sheathed around said holder, wherein said sleeve is rotatable and movable on said first surface of said holder; and

a detecting module accommodated within said accommodation space for detecting a rotating action and a moving action of said sleeve through an inner surface of said sleeve which is not overlapped with said first surface of said holder.

12. The control device according to claim 11, wherein a touch-feel enhancing mechanism is further formed on an outer surface of said sleeve opposed to said inner surface, wherein a convex structure or a concave structure is served as a unit structure of said touch-feel enhancing mechanism, wherein said unit structure is not responsible for providing a function of being detected by said detecting module, wherein said unit structure has a geometric profile selected from at least one of a point shape, a block shape and a strip shape, and said unit structure in said strip shape is not parallel with a longitudinal direction of said sleeve.

13. The control device according to claim 11, wherein a touch-feel enhancing mechanism is further formed on an outer surface of said sleeve opposed to said inner surface, wherein a convex structure or a concave structure is served as a unit structure of said touch-feel enhancing mechanism, wherein if said touch-feel enhancing mechanism comprises a plurality of unit structures, said unit structures are not responsible for providing a function of being detected by said detecting module, wherein

said unit structures are regularly or irregularly distributed on said outer surface.

14. The control device according to claim 11, wherein a touch-feel enhancing mechanism is further formed on an outer surface of said sleeve opposed to said inner surface, wherein a convex structure or a concave structure is served as a unit structure of said touch-feel enhancing mechanism, wherein if said touch-feel enhancing mechanism comprises a plurality of unit structures, said unit structures are not responsible for providing a function of being detected by said detecting module, wherein said unit structures are continuously or discontinuously distributed on said outer surface.

15. The control device according to claim 11, wherein said sleeve is constituted by a single supporting layer or a composite supporting layer, wherein said composite supporting layer further comprises a reinforcing layer.

16. The control device according to claim 15, wherein said touch-feel enhancing mechanism is constituted by said single supporting layer, or constituted by at least one portion of said composite supporting layer, or constituted by a friction enhancing structure with a friction coefficient identical to said reinforcing layer.

17. The control device according to claim 11, wherein if at least one of said first surface and said second surface of said holder comprises a transparent structure, a detecting surface of said detecting module faces said transparent structure and said inner surface of said sleeve; or wherein if said second surface of said holder comprises a vacant zone, a detecting surface of said detecting module faces said vacant zone and said inner surface of said sleeve which is not overlapped with said first surface; or wherein said detecting module has a detecting surface and said first surface

or said second surface of said holder is not arranged between said detecting surface and said inner surface of said sleeve, so that said detecting surface is located beside said inner surface of said sleeve which is not overlapped with said first surface.

18. The control device according to claim 11, wherein said control device further comprises a housing for accommodating said holder, a positioning shaft, a pushing seat including a magnetic element, a pressing element and a sensing unit, wherein said positioning shaft, said pushing seat, said pressing element and said sensing unit are all accommodated within said housing, wherein said holder is fixed on said pressing element, said pressing element is rotatably fixed on an end of said positioning shaft, and said end of said positioning shaft is penetrated through said pushing seat and sustained against said pressing element, wherein when an external force is exerted on said pushing seat through said sleeve, a distance between said pushing seat and said pressing element is changed, so that a change of a magnetic field of said magnetic element is received by said sensing unit.

19. The control device according to claim 18, wherein said control device further comprises a control switch, which is disposed within said housing and disposed under a touching part of said pressing element, wherein in response to a downward force exerted on said holder, said touching part is driven to press said control switch, so that said control switch is triggered to generate a signal.

20. The control device according to claim 11, wherein said control device further comprises a microprocessor, which is disposed within said accommodation space.

21. A control device for controlling a cursor motion of an electronic device, said control device comprising:

a holder comprising a transparent structure and an accommodation space, wherein said accommodation space is disposed within said holder;

a sleeve sheathed around said holder, wherein said sleeve is rotatable and movable on said holder; and

a detecting module accommodated within said accommodation space and having a detecting surface facing said transparent structure, wherein at least one of a rotating action and a moving action of said sleeve is detected by said detecting module through said transparent structure.

22. The control device according to claim 21, wherein said holder further comprises a first surface near a force-exerting position of an user and a second surface connected with said first surface, wherein a region of said first surface is provided by said transparent structure, or a region of said second surface is provided by said transparent structure, or said first surface and said second surface are provided by said transparent structure so as to define said accommodation space.

23. The control device according to claim 21, wherein at least one of plural convex structures or plural concave structures formed on an outer surface of said sleeve is contactable by said user, wherein said convex structures or said concave structures are not responsible for providing a function of being detected by said detecting module, wherein said convex structures or said concave structures are regularly or irregularly distributed on said outer surface.

24. The control device according to claim 21, wherein at least one of plural convex structures or plural concave structures formed on an outer surface of said sleeve is contactable by said user, wherein said convex structures or said concave structures are not responsible for providing a function of being detected by said detecting module, wherein said convex structures or said concave structures are continuously or discontinuously

distributed on said outer surface.

25. A control device for controlling a cursor motion of an electronic device, said control device comprising:

a holder comprising a first surface and a second surface, wherein said first surface faces upwardly, said second surface is opposed to said first surface and faces downwardly, and an accommodation space is formed under said second surface;

a sleeve sheathed around said holder, wherein said sleeve is rotatable and movable on said first surface of said holder; and

a detecting module accommodated within said accommodation space for detecting a rotating action and a moving action of said sleeve through a non-downward inner surface of said sleeve.

26. The control device according to claim 25, wherein said control device further comprises a housing for accommodating said holder, a positioning shaft, a pushing seat including a magnetic element, a pressing element and a sensing unit, wherein said positioning shaft, said pushing seat, said pressing element and said sensing unit are all accommodated within said housing, wherein said holder is fixed on said pressing element, said pressing element is rotatably fixed on an end of said positioning shaft, and said end of said positioning shaft is penetrated through said pushing seat and sustained against said pressing element, wherein when an external force is exerted on said pushing seat through said sleeve, a distance between said pushing seat and said pressing element is changed, so that a change of a magnetic field of said magnetic element is received by said sensing unit.

27. The control device according to claim 25, wherein if at least one of said first surface and said second surface of said holder comprises a transparent structure, a detecting surface of said detecting module faces

said transparent structure and said inner surface of said sleeve; or wherein if said second surface of said holder comprises a vacant zone, a detecting surface of said detecting module faces said vacant zone and said inner surface of said sleeve which is not overlapped with said first surface; or wherein said detecting module has a detecting surface and said first surface or said second surface of said holder is not arranged between said detecting surface and said inner surface of said sleeve, so that said detecting surface is located beside said inner surface of said sleeve which is not overlapped with said first surface.

28. A control device for controlling a cursor motion of an electronic device, said control device comprising:

a holder comprising a first surface and a second surface, wherein said first surface faces upwardly, said second surface is connected with said first surface, and an accommodation space facing said second surface is formed in said holder;

a sleeve sheathed around said holder, wherein said sleeve is rotatable and movable on said first surface of said holder; and

a detecting module accommodated within said accommodation space, wherein said detecting module comprises a non-upward detecting surface for detecting a rotating action and a moving action of said sleeve.

29. The control device according to claim 28, wherein said control device further comprises a housing for accommodating said holder, a positioning shaft, a pushing seat including a magnetic element, a pressing element and a sensing unit, wherein said positioning shaft, said pushing seat, said pressing element and said sensing unit are all accommodated within said housing, wherein said holder is fixed on said pressing element, said pressing element is rotatably fixed on an end of said positioning shaft, and said end of said positioning shaft is penetrated through said pushing seat

and sustained against said pressing element, wherein when an external force is exerted on said pushing seat through said sleeve, a distance between said pushing seat and said pressing element is changed, so that a change of a magnetic field of said magnetic element is received by said sensing unit.

30. The control device according to claim 28, wherein if at least one of said first surface and said second surface of said holder comprises a transparent structure, a detecting surface of said detecting module faces said transparent structure and said inner surface of said sleeve; or wherein if said second surface of said holder comprises a vacant zone, a detecting surface of said detecting module faces said vacant zone and said inner surface of said sleeve which is not overlapped with said first surface; or wherein said detecting module has a detecting surface and said first surface or said second surface of the said holder is not arranged between said detecting surface and said inner surface of the said sleeve, so that said detecting surface is located beside said inner surface of said sleeve which is not overlapped with said first surface.

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