

OPTICAL SCANNING-TYPE TOUCH PANEL

TECHNICAL FIELD

[0001] The present invention relates to an optical scanning-type touch panel for optically detecting the position of an indicator on a display screen of a display device on which information is displayed by a computer system, etc.

BACKGROUND ART

[0002] With the spread of computer systems, mainly personal computers, there has been used a device for inputting new information or giving various instructions to a computer system by pointing at a position on a display screen of a display device on which information is displayed by the computer system, with a person's finger or a specific indicator.

[0003] In order to perform an input operation with respect to the information displayed on such a display screen of the display device of a personal computer or the like by a touching method, it is necessary to detect a touched position (indicated position) on the display screen with high accuracy. As an example of such a method of detecting the indicated position on the display screen serving as a coordinate surface, Japanese Patent Application Laid-Open No. 57-211637/1982 discloses an optical position detecting method. According to this method, focused light such as a laser beam is scanned angularly from the outside of the display screen, an angle of a position where a special pen is present is calculated from each of two timings of reflected light from the special pen having reflecting means, and the calculated angles are applied to the triangulation principle to detect the coordinate of the position by calculation. This method can reduce the number of parts significantly, and can provide high resolution. However, there are problems in the operability, for example, that a special reflecting pen must be used, and the position of a finger, an arbitrary pen or the like is not detectable.

[0004] Another optical position detecting method is suggested in Japanese Patent Application Laid-Open No. 62-5428/1987. According to this method, a light retro-reflector is positioned on a frame on both sides of the display screen, return light of an angularly scanned laser beam from the light retro-reflector is detected, an angle of a position where a finger or pen exists is calculated from a timing that the light beam is cut off by the finger or pen, and the coordinate of the position is detected from the calculated angle according to the triangulation principle. In this method, the accuracy of detection can be maintained with a small number of parts, and the position of the finger, arbitrary pen or the like is detectable.

[0005] In such an optical scanning-type touch panel in which light is angularly scanned, the accuracy of detection of the position of the indicator largely depends on the accuracy of the optical axis of a light emitting element, light receiving element, lens, angular-scanning means (polygon mirror), etc., i.e., the preciseness of verticality and parallelism of these optical members. In particular, in this optical scanning-type touch panel, unlike optical scanning-type printers utilizing scanning light in a similar manner, since the probability that the scanning light comes into contact with the human body is high, the intensity of light to be used is not increased much if the influence of the scanning light

on the human body is taken into consideration; and since there is a limitation that the influence of attenuation is large because the optical path of the scanning light is longer compared with that of the optical scanning-type printers, a particularly high optical axis accuracy is required. However, it was hard to say that conventional optical scanning-type touch panels as mentioned above were designed by sufficiently taking the optical axis accuracy into consideration.

[0006] The present invention was invented in view of such a circumstance, and an object of the present invention is to provide an optical scanning-type touch panel capable of improving the optical axis accuracy and optically detecting a position with accuracy.

DISCLOSURE OF THE INVENTION

[0007] An optical scanning-type touch panel of the present invention is an optical scanning-type touch panel comprising: an optical scanner for angularly scanning light in a plane substantially parallel to a predetermined region; and an optical transceiver for projecting light onto the optical scanner and receiving part of scanning light of the optical scanner, for measuring a scanning light cut-off position, which is produced in the predetermined region by an indicator, based on a light receiving output of the optical transceiver that corresponds to a scanning angle, wherein the optical scanner and the optical transceiver are mounted on a single base body.

[0008] Another optical scanning-type touch panel of the present invention is an optical scanning-type touch panel comprising: an optical scanner for angularly scanning light in a plane substantially parallel to a predetermined region; and an optical transceiver for projecting light onto the optical scanner and receiving part of scanning light of the optical scanner, for measuring a scanning light cut-off position, which is produced in the predetermined region by an indicator, based on a light receiving output of the optical transceiver that corresponds to a scanning angle, wherein the optical scanner comprises a polygon mirror and a motor for rotating the polygon mirror, the optical transceiver comprises a light emitting element, a collimation lens for changing light from the light emitting element into parallel light, a light receiving element for receiving part of scanning light, an aperture mirror for limiting the parallel light from the collimation lens and reflecting part of the scanning light toward the light receiving element, a light receiving lens for focusing reflected light from the aperture mirror on the light receiving element and a slit plate for limiting focused light from the light receiving lens, and the polygon mirror, motor, light emitting element, collimation lens, light receiving element, aperture mirror, light receiving lens and slit plate are mounted on a single base body as one unit.

[0009] In the optical-scanning-type touch panels of the present invention, since the optical transceiver and the optical scanner are provided on a single base body as one unit, it is possible to accurately regulate the optical axis. Accordingly, highly accurate position detection results are obtained.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1 is a schematic diagram showing the basic structure of an optical scanning-type touch panel of the present invention; FIG. 2 is an illustration showing the