

## 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.

### 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 the 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 one 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. 62-5428/1987 discloses an optical position detecting method. In 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 also detectable.

[0004] An optical scanning-type touch panel for performing such a position detection by scanning light is constructed by a retro-reflector which is generally positioned on the outside of the display screen, a light emitting element for emitting light such as laser light, an optical scanning unit such as a polygon mirror for angularly scanning the emitted light, a deflecting element for deflecting the reflected light of the scanning light from the retro-reflector, and a light receiving element for receiving the deflected reflected light so that the light from the light emitting element is scanned by the optical scanning unit, the reflected light of the scanning light from the retro-reflector is reflected again by the optical scanning unit, and the resultant reflected light is received by the light receiving element through the deflecting element. When an indicator, such as a pen and arbitrary pen, is present on the path of the scanning light, the light reflected by the retro-reflector is not received by the light receiving element. It is therefore possible to detect the position of such an indicator based on the scanning angle of the optical scanning unit and the light receiving result at the light receiving element.

[0005] In such an optical scanning-type touch panel, in general, the larger the incident angle on the retro-reflector becomes, the lower the efficiency of retro-reflection becomes, and the longer the distance from the optical scanning unit to the retro-reflector becomes, the lower the luminance becomes because the reflected light from the

retro-reflector is wider due to the diffraction effect of the beam. Hence, in the case where the display region has a rectangular shape, since the diagonal section is the farthest point for scanning light and has a large incident angle, the level of the light receiving signal becomes lower at the diagonal section. As a result, the SIN ratio is impaired, causing a malfunction. In addition, it is also important to take some measures against disturbing light that impairs the S/N ratio.

[0006] The present invention was invented in view of such circumstances, and an object of the present invention is to provide an optical scanning-type touch panel capable of achieving a high SIN ratio by increasing the level of the light receiving signal and thereby accurately detecting the position of the indicator.

### DISCLOSURE OF THE INVENTION

[0007] An optical scanning-type touch panel of the first invention comprising: an optical scanning unit for angularly scanning light in a plane substantially parallel to a predetermined region; a deflecting unit for deflecting scanning light of the optical scanning unit; and a light receiving unit for receiving the deflected scanning light, for detecting a scanning light cut-off position, which is produced in the predetermined region by an indicator, based on a light receiving output of the light receiving unit that corresponds to a scanning angle, wherein the deflecting unit has an asymmetrical shape about an optical axis. In the optical scanning-type touch panel of the first invention, the deflecting unit is formed in an asymmetrical shape about the optical axis so as to enlarge the effective light receiving area for the scanning light and improve the light receiving signal level.

[0008] In an optical scanning-type touch panel of the second invention according to the first invention, the shape of the deflecting unit is asymmetrical in the scanning direction. In the optical scanning-type touch panel of the second invention, the shape of the deflecting unit is made asymmetrical in the scanning direction so as to enlarge the effective light receiving area for the scanning light and improve the light receiving signal level.

[0009] In an optical scanning-type touch panel of the third invention according to the first invention, the shape of the deflecting unit is asymmetrical in the height direction. In the optical scanning-type touch panel of the third invention, the shape of the deflecting unit is made asymmetrical in the height direction so as to enlarge the effective light receiving area for the scanning light and improve the light receiving signal level.

[0010] In an optical scanning-type touch panel of the fourth invention according to the third invention, the height of the deflecting unit is substantially equal to the height of the optical scanning unit. In the optical scanning-type touch panel of the fourth invention, the height of the deflecting unit is made substantially equal to the height of the optical scanning unit so as to eliminate an unnecessary light receiving surface from the deflecting unit and prevent reception of disturbing light.

[0011] In an optical scanning-type touch panel of the fifth invention according to the fourth invention, the predetermined region has a rectangular shape, and the width of the deflecting unit is substantially equal to a scanning surface