S by the optical scanning-type touch panel of the present invention. **FIG. 33** is a schematic diagram showing a state of implementing of the optical scanning-type touch panel. In **FIG. 33**, however, illustration of the constituent members other than the optical units **1**_a_, **1**_b_, recurrence reflection sheet **7** and display screen **10** is omitted. Incidentally, **FIG. 33** shows an example in which a finger is used as the indicator S.

[**0076**] The MPU **5** controls the polygon controller **4** to rotate the respective polygon mirrors **15** in the optical units **1**_a_ and **1**_b_, and thereby angularly scanning the laser light from the respective light emitting elements **11**. As a result, the reflected light from the recurrence reflection sheet **7** enters the respective light receiving elements **13**. The amounts of the received light that entered the respective light receiving elements **13** as mentioned above are obtained as the light receiving signals which are the outputs of light receiving signal detectors **3**_a_ and **3**_b_.

[**0077**] Further, in **FIG. 33**, θ**00** and ϕ**00** represent the angles from a reference line connecting both of the optical units **1**_a_ and **1**_b_ to the respective light receiving elements, θ**0** and ϕ**0** represent the angles from the reference line connecting both of the optical units **1**_a_ and **1**_b_ to the ends of the recurrence reflection sheet **7**, θ**1** and ϕ**1** represent the angles from the reference line to one end of the indicator S on the reference line side, and θ**2** and ϕ**2** represent the angles from the reference line to another end of the indicator S on the opposite side to the reference side, respectively.

[**0078**] When the indicator S is present in the optical path of the scanning light on the display screen **10**, the light projected from the optical units **1**_a_ and **1**_b_ and then reflected from the indicator S does not enter the light receiving elements **13**. Therefore, in a state as shown in **FIG. 33**, the reflected light does not enter the light receiving element **13** in the optical unit **1**_a_ when the scanning angle is in a range between 0° and θ0, the reflected light enters that light receiving element **13** when the scanning angle is in a range between θ0 and θ1, and the reflected light does not enter that light receiving element **13** when the scanning angle is in a range between θ1 and θ2. Similarly, the reflected light does not enter the light receiving element **13** in the optical unit **1**_b_ when the scanning angle is in a range between 0° and ϕ0, the reflected light enters that light receiving element **13** when the scanning angle is in a range between ϕ**0** and ϕ**1**, and the reflected light does not enter that light receiving element **13** when the scanning angle is in a range between ϕ1 and ϕ2,

[**0079**] Next, the following description will explain a process of calculating a coordinate of a central position (indicated position) of the indicator S (a finger in this example) from the cut-off range calculated in the above-mentioned manner. First, the conversion of an angle into an orthogonal coordinate based on the triangulation will be explained. As shown in **FIG. 34**, the position of the optical unit **1**_a_ is set as an origin O, the right side and upper side of the display screen **10** are set as the X-axis and Y-axis, and the length of the reference line (the distance between the optical units **1**_a_ and **1**_b_) is set as L. Moreover, the position of the optical unit **1**_b_ is set as B. When a central point P(Px, Py) on the display screen **10** indicated by the indicator S is positioned at angles of θ and ϕ with respect to the X-axis from the optical units **1**_a_ and **1**_b_, the values of X coordinate Px and Y coordinate Py of the point P can be calculated according to the principle of the triangulation as shown by equations (1) and (2) below, respectively.

$$Px(\theta,\phi)=(\tan\phi)\div(\tan\theta+\tan\phi)\times L \tag{1}$$

$$Py(\theta,\phi)=(\tan\theta\cdot\tan\phi)\div(\tan\theta+\tan\phi)\times L \tag{2}$$

[**0080**] By the way, since the indicator S (finger) has a dimension, when the detection angle at the timing of rise/fall of the detected light receiving signal is adopted, as shown in **FIG. 35**, four points (P1 through P4 in **FIG. 35**) on the edge of the indicator S (finger) are detected. These four points are all different from the indicated central point (Pc in **FIG. 35**). Thus, a coordinate (Pcx, Pcy) of the central point Pc is calculated as follows. Pcx and Pcy can be expressed as shown by the following equations (3) and (4), respectively.

$$Pcx(\theta,\phi)=Pcx(\theta\mathbf{2}+d\theta/\mathbf{2},\ \phi\mathbf{1}+d\phi/\mathbf{2}) \tag{3}$$

$$Pcy(\theta,\ \phi)=Pcy(\theta\mathbf{1}+d\theta/\mathbf{2},\ \phi\mathbf{1}+d\phi/\mathbf{2}) \tag{4}$$

[**0081**] Then, by substituting θ**1**+dθ/**2** and ϕ**1**+dϕ/**2** expressed by equations (3) and (4) for θ and ϕ of equations (1) and (2) above, the coordinate of the indicated central point Pc can be obtained.

[**0082**] In the above-mentioned example, the average value of the angle is calculated first and then substituted into the triangulation converting equations (1) and (2) to calculate the coordinate of the central point Pc as the indicated position. However, it is also possible to calculate the coordinate of the central point Pc by first calculating the orthogonal coordinates of the four points **P1** through **P4** from the scanning angle according to the triangulation converting equations (1) and (2) and then calculating the average of the calculated coordinate values of the four points. Moreover, it is also possible to determine the coordinate of the central point Pc as the indicated position by considering parallax and easy viewing of the indicated position.

[**0083**] By the way, as mentioned above, since the angular velocity of the rotation of the respective polygon mirrors **15** is constant, the information about the scanning angle is obtainable by measuring the time. **FIG. 36** is a timing chart showing the relationship between the light receiving signal from the light receiving signal detector **3**_a_ and the scanning angle θ and scanning time T of the polygon mirror **15** in the optical unit **1**_a_. When the scanning angular velocity of the polygon mirror **15** is constant, if the scanning angular velocity is represented by ω, a proportional relationship as shown by equation (5) below is established between the scanning angle θ and the scanning time T.

$$\theta=\omega\times T \tag{5}$$

[**0084**] Therefore, the angles θ**1** and θ**2** at the time of the fall and rise of the light receiving signal establish the relationships shown by equations (6) and (7) below with the scanning time t**1** and t**2**.

$$\theta\mathbf{1}=\omega\times t\mathbf{1} \tag{6}$$

$$\theta\mathbf{2}=\omega\times t\mathbf{2} \tag{7}$$

[**0085**] Thus, when the scanning angular velocity of the polygon mirrors **16**_a_ and **16**_b_ is constant, it is possible to measure the cut-off range and coordinate position of the indicator S (finger) by using the time information.

[**0086**] Moreover, in the optical scanning-type touch panel of the present invention, it is possible to calculate the size (the diameter of the cross section) of the indicator S (finger)