opening width of the optical scanning unit in scanning a diagonal section of the predetermined region with light. In the optical scanning-type touch panel of the fifth invention, the width of the deflecting unit is made substantially equal to the scanning surface opening width of the optical scanning unit in scanning the diagonal section of the predetermined region with light so as to eliminate an unnecessary light receiving surface from the deflecting unit and prevent reception of disturbing light.

[0012] An optical scanning-type touch panel of the sixth 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 optical scanning-type touch panel satisfies a condition

$$d/2+w<D \tan \delta$$

[0013] where D is a distance from the optical scanning unit to the deflecting unit, w is a width on the deflecting unit from a path of the scanning light to an end on the predetermined region side, d is a beam width of the scanning light, and δ is a scanning start angle.

[0014] In the optical scanning-type touch panel of the sixth invention, it is possible to certainly scan light within the predetermined region by satisfying the relationship as described above.

[0015] An optical scanning-type touch panel of the seventh invention comprising: a light retro-reflector provided outside of a predetermined region; an optical scanning unit for angularly scanning light in a plane substantially parallel to the predetermined region; and a light receiving unit for receiving reflected light of scanning light of the optical scanning unit from the light retro-reflector, 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 optical scanning unit is provided with a protective film having a maximum reflectance at an angle of incidence corresponding to a scanning angle at which the quantity of the reflected light is minimum. In the optical scanning-type touch panel of the seventh invention, the optical scanning unit is provided with the protective film having the maximum reflectance at an angle of incidence corresponding to a scanning angle at which the quantity of the reflected light is minimum so as to improve the light receiving signal level in scanning the position at which the quantity of the reflected light is minimum with light.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] **FIG. 1** is a schematic diagram showing the basic structure of an optical scanning-type touch panel of the present invention;

[0017] **FIG. 2** is a perspective view showing the structure of an optical unit and optical path;

[0018] **FIG. 3** is a plan view showing the relationship between the scanning light and reflected light in the optical scanning-type touch panel;

[0019] **FIG. 4** is an illustration showing profiles of the scanning light and reflected light cut along the C--C line of **FIG. 3**;

[0020] **FIG. 5** is a front view of an aperture mirror;

[0021] **FIG. 6** is a front view of an aperture mirror;

[0022] **FIG. 7** is a schematic diagram of a scanning light receiving system using the aperture mirror of **FIG. 6**;

[0023] **FIG. 8** is a graph showing the relationship between the scanning angle and the light receiving scanning surface opening width;

[0024] **FIG. 9** is a front view of an aperture mirror;

[0025] **FIG. 10** is a side sectional view of the aperture mirror;

[0026] **FIG. 11** is a graph showing the relationship between the film thickness of a protective film of the aperture mirror and the reflectance;

[0027] **FIG. 12** is a graph showing the wave length-reflectance characteristic of an antireflection film of the aperture mirror;

[0028] **FIG. 13** is a graph showing the reflectance characteristic of a cold mirror coat and the transmittance characteristic of a visible cut-off filter;

[0029] **FIG. 14** is a schematic diagram showing the layout design of the optical members of an optical unit and a state of scanning light;

[0030] **FIG. 15** is a plan view of a polygon mirror;

[0031] **FIG. 16** is a graph showing the relationship between the film thickness of a protective film of the polygon mirror and the reflectance;

[0032] **FIG. 17** is a schematic diagram showing a state of implementation of the optical scanning-type touch panel;

[0033] **FIG. 18** is a schematic diagram showing the principle of triangulation for detecting a coordinate;

[0034] **FIG. 19** is a schematic diagram showing an indicator and a cut-off range;

[0035] **FIG. 20** is a timing chart showing the relationship between the light receiving signal and the scanning angle and scanning time; and

[0036] **FIG. 21** is a schematic diagram showing the principle of measurement of the diameter of a cross section of the indicator.

BEST MODE FOR IMPLEMENTING THE INVENTION

[0037] The following description will explain the present invention in detail with reference to the drawings illustrating an embodiment thereof. **FIG. 1** is a schematic diagram showing the basic structure of an optical scanning-type touch panel of the present invention.

[0038] In **FIG. 1**, reference numeral **10** is a rectangular display screen of a CRT, flat display panel (PDP, LCD, EL, etc.) or projection-type image display device of electronic equipment such as a personal computer, and the optical scanning-type touch panel is constructed as the display screen of a PDP (Plasma Display Panel) in this embodiment.