

## APPARATUS FOR INPUTTING COORDINATES

### FIELD OF THE INVENTION

[0001] The present invention in general relates to an apparatus for inputting coordinates. More particularly, this invention relates to an optical type apparatus for inputting coordinates which determines coordinates of a position by detecting a direction in which an emitted light is shielded or reflected.

### BACKGROUND OF THE INVENTION

[0002] A conventional optical type apparatus for inputting coordinates includes an optical unit which is constructed in such a manner that a light emitting section and a light receiving section are integrally formed. The apparatus for inputting coordinates determines the coordinates of a position by sensing shielding of light due to a pointing means such as a stick, finger or the like, or by sensing light reflected by a reflecting member attached to the pointing stick.

[0003] FIG. 12A and FIG. 12B schematically shows a corner portion including the optical unit of a conventional apparatus for inputting coordinates. FIG. 12A is a perspective view showing the apparatus for inputting coordinates, and FIG. 12B is a front view when viewing the optical unit from a light emitting plane. A apparatus for inputting coordinates 1100 is composed of a coordinate input plane 1101 for inputting a coordinate position, an optical unit 1102, a reflecting section 1103, a support plate 1104 for fixing the coordinate input plane 1101, and a frame section 1105 for reinforcing the support plate 1104 and fixing the reflecting section 1103. More specifically, the optical unit 1102 has a light emitting section which emits light that is substantially parallel to the coordinate input plane 1101 and a light receiving section which receives the light traveling substantially parallel to the coordinate input plane 1101. The reflecting section 1103 reflects the light emitted from the optical unit 1102 to the identical direction.

[0004] In FIG. 12A, legend 1106 denotes an emission light port which is an outlet of light from the optical unit 1102, and legend 1107 denotes a screw for fixing the optical unit 1102 to the frame section 1105. Moreover, legend 1108 denotes a pointing stick and a finger for inputting a coordinate position (coordinate point) on the coordinate input plane 1101. In this case, for example, the pointing stick 1108 may be a finger as shown in FIG. 12A, and not a specific stick. The emission light port 1106 is also an incident light port which is an inlet of light incident upon the optical unit 1102. the light receiving section 401 is arranged on a position receiving the light traveling substantially parallel to the coordinate input plane 101. However, the light emitting section 301 and the light receiving section 401 are not limited to the arrangement as described above. For example, as shown in FIG. 8A and FIG. 8B, either of the light emitting section 301 and the light receiving section 401 may be arranged below the apparatus for inputting coordinates. By doing so, it is possible to reduce irregularities on the surface of the apparatus for inputting coordinates 100, and thus, to improve a user's operability.

[0005] The following is a description on an apparatus for inputting coordinates of this second embodiment, which calculates a coordinate point by sensing a direction of irradiation light reflected by the pointing stick. In this second

embodiment, identical legends are used to designate the same constituent parts as the above first embodiment and the details are omitted. FIG. 9A and FIG. 9B are views schematically showing a corner portion including an optical unit of the apparatus for inputting coordinates which senses a direction of irradiation light reflected by the pointing stick. FIG. 9A is a perspective view of the apparatus for inputting coordinates, and FIG. 9B is a front view showing the optical unit when viewing it from a light emitting side.

[0006] A apparatus for inputting coordinates 800 is composed retro-reflector for reflecting a probe light from the optical unit to the direction identical with an incident direction.

[0007] The apparatus for inputting coordinates 1200 irradiates a beam probe light from a light emitting section (not shown) of the optical unit 1202, and then, senses a direction of light reflected by the retro-reflection member of the pointing stick 1208 by a light receiving section (not shown) of the optical unit 1202, and thereby, detects a coordinate position of the pointing stick 1208.

[0008] In the conventional cases of irradiating a sector-shaped light so as to detect a shielding direction and irradiating a beam probe light so as to detect a reflecting direction, the optical unit is integrally formed, and thereby, it is possible to improve an availability of the apparatus for inputting coordinates. More specifically, the light emitting section and the light receiving section are made into a unit; therefore, there is no need of making a fine adjustment of an optical system included in the unit, and it is possible to accurately detect a direction (or position) by the pointing stick or the like.

[0009] However, the prior art has the following problems. More specifically, the conventional apparatus for inputting coordinates is constructed in a manner that the optical unit is merely attached to an upper portion of the coordinate input plane. For this reason, there is the case where the optical unit hinders the coordinate input; as a result, an operability is reduced.

[0010] Moreover, the conventional apparatus for inputting coordinates has the following problem that a detection accuracy is reduced in a specific area on the coordinate. FIG. 14A and FIG. 14B are views showing the area where the detection accuracy is reduced, and to explain the principle. As shown in FIG. 14A, in a lower portion of the coordinate input plane 1301, the detection accuracy on a left-side optical unit 1302L is taken into consideration. In this case, it is assumed that a right-side optical unit 1302R senses shielding by pointing means such as a finger in linear one direction.

[0011] Further, as shown in FIG. 14B, in the case where the pointing means 1303 vertically indicates the coordinate plane 1301, the indicated position and a position shielding the irradiation light coincident with each other. On the other hand, as shown in FIG. 14C, in the case where the pointing means 1303 obliquely indicates the coordinate input plane 1301, the indicated position (coordinate point) and a position shielding the irradiation light do not coincident with each other.

[0012] The pointing means 1303 is tilted, and as shown in FIG. 14A, the actual indicated position on the coordinate input plane 1301 is p, and a position of light shielding by the