

**COORDINATE INPUT AND DETECTION DEVICE  
AND INFORMATION DISPLAY AND INPUT  
APPARATUS**

**BACKGROUND OF THE INVENTION**

**[0001]** 1. Field of the Invention

**[0002]** The present invention generally relates to coordinate input and detection devices and information display and input apparatuses, and more particularly to a coordinate input and detection device employed in, for instance, an optical coordinate input device, an optical coordinate detection device, or an optical touch panel and to an information display and input apparatus including such a coordinate input and detection device and an information display unit having a display, such as a large screen display unit with a touch panel, an electronic blackboard, a video conference apparatus, a large scale projection touch panel apparatus, a display-integrated tablet, or a multimedia board.

**[0003]** 2. Description of the Related Art

**[0004]** Generally, in conferences or at the presentations of studies, a blackboard or a whiteboard is often employed as an information transfer medium that enables a large number of people to see the content of a study or proceedings at the same time. Recently, there has been an increased demand for an electronic blackboard, which can store and print out on papers what is written thereon.

**[0005]** Further, there has been developed an information display and input system that inputs a position or information to a computer in real time, which position or information is indicated or written on a touch panel on a display by a finger of an operator or a touch pen, and displays a variety of information corresponding to the indicated position or written information.

**[0006]** In such a system, it is necessary to detect with high accuracy an indicated position, or a touched position, on the surface of the touch panel when the inputs are made from the touch panel.

**[0007]** For instance, Japanese Patent No. 2678231 discloses, as a coordinate input and detection device detecting an indicated position on the surface of a touch panel, a device that has numerous optical emitters and detectors arranged in positions opposing each other on the periphery of the touch panel surface of a display screen to form a light beam matrix all over the touch panel surface so that a position where light beams are interrupted (hereinafter referred to as a light beam interruption position) by a contact of a finger or a pen with the touch panel can be detected.

**[0008]** Since the above-mentioned device has an advantage of achieving a high signal to noise ratio (S/N), the application of the device is extendable to a large-scale display unit. However, since the resolution of detection is proportional to a distance between each two adjacently arranged optical emitters or detectors, the device requires a large number of optical emitters and detectors to be arranged with narrow pitches so as to detect an input coordinate value with high accuracy. Therefore, the signal processing circuit of the optical emitters and detectors becomes complicated, thus increasing costs.

**[0009]** Japanese Laid-Open Patent Application No. 5-53717 discloses an optical two-dimensional coordinate

input device that projects a light beam such as a laser beam from each of two points outside a touch panel to scan a region defined by projection angles of each light beam. According to the device, the angles of a position of a pen used exclusively for the device for retroreflecting the projected light beams are obtained from the lights reflected from the pen so as to calculate the coordinate position of the pen by applying the obtained angles to the principle of triangulation.

**[0010]** This coordinate input device, however, requires the pen used exclusively therefor, thus having an operational problem that an input to the device cannot be made by means of a finger or any pen other than the pen used exclusively for the device.

**[0011]** Japanese Laid-Open Patent Application No. 11-85376 discloses a device that has a pair of light emitting and receiving units each including a light emitting element, a light receiving element, and a polygon mirror disposed outside both corners of one side of a display panel. According to the device, the polygon mirrors are turned to scan almost all the surface of the display panel by means of two light beams. The light beams are reflected by retroreflective sheets provided on the longitudinal sides of the display panel to be detected by the light receiving elements of the above-described pair of the light emitting and receiving units so that a coordinate position is calculated by employing the principle of triangulation.

**[0012]** This device allows an input by means of a finger or a pen, provides a good visual recognizability, and is relatively easily enlarged in size. However, the device includes mechanical rotating parts, thus generating noises and vibrations. Therefore, the device has a difficulty in increasing detection accuracy in addition to problems of failure and durability.

**[0013]** The inventor of the present invention has already proposed a coordinate input and detection device that includes at least a couple of emitting means each-projecting a light beam that is a parallel beam of an approximately uniform thickness in a direction perpendicular to a touch panel and has a sector shape in a direction parallel to the touch panel. According to the device, the light beams travel over a given region of the touch panel almost parallel to the surface thereof to be reflected by retroreflective sheets provided on the peripheral portion of the touch panel. The reflected lights are detected by at least a couple of intensity distribution detection means, which are optical-electrical transducers such as charge coupled devices (CCDs), so that the intensity distribution of each light is detected. The coordinate value of a position where the lights beams traveling over the given region of the touch panel are interrupted is detected by the intensity distributions of the light beams.

**[0014]** According to the above-described device, by interrupting a part of each light beam projected all over the given region of the touch panel by indicating a position on the surface of the touch panel by means of any indicator such as a finger or a pen, the coordinate value of the light beam interruption position is detected with high accuracy so that a desired input operation is performed. Therefore, the device dispenses with a special pen including a reflective material. Further, since the device does not employ a mechanical scanning mechanism such as a polygon mirror, the device is