

TITLE OF THE INVENTION
APPARATUS AND METHOD FOR SENSING SMALL PARCELS OR THE
LIKE IN MAILBOXES

5 **BACKGROUND OF THE INVENTION**

a) Technical Field of the Invention

The present invention relates to a method for sensing small parcels, documents or the like in mailboxes, and in particular, a sensing method by
10 multiple reflection of infrared light beams. The present invention also relates to an apparatus for sensing small parcels, documents or the like in mailboxes.

b) Description of the Prior Art

15 In the past, many efforts have been made to devise a mechanism or an apparatus that signals when small parcels, documents, mails, or the like have been deposited in a mailbox. These signalling devices are designed to eliminate any special visits to the mailbox by signalling to the recipient when there are mails or documents in the box.

20 In Singapore, Housing Development Board (HDB) flats are provided with mailboxes for the residents, and are positioned at the void deck (ground floor) of the flats, or, in some residential area, somewhat remote from the residence or business such that the recipient of the mail must make a special visit to the mailbox to check whether any mail or
25 documents are deposited in the box. Particularly, almost all mailboxes located at the HDB flats are normally metal containers without a transparent door. The recipient needs to open the door of the mailbox in order to check there are mails or documents in the mailbox.

A conventional method of detection the presence of a small parcel
30 or document within the mailboxes, a photoelectric sensor is mounted at an appropriate location within the mailbox. However if the parcel or the like is too small and not placed in front of the sensor, its presence will not be detected. To overcome such drawback and to detect reliably the presence of the parcel or the like of various sizes or when the parcel or
35 the like is randomly placed within the mailbox, an array of a plurality of photoelectric sensors are used. Obviously, this will inevitably increase the cost of the sensing device.

Another conventional prior art, which indicates the presence of mails is the mechanical triggering type device. This device typically senses opening and closing of the mailbox door by the postman. A typical mechanical trigger device is shown in U.S. Pat. No. 4,520,350, issued to Henry C Huang on 28 May 1985, which has a button which is depressed in abutment with the closed mailbox door. Referring to Figs. 1 and 2, there is shown respectively a diagrammatic view in perspective of a conventional mailbox incorporating the transmitting circuits and a schematic diagram of the transmitting circuits of the conventional art. As the door 26 opens away from the button 22, a spring 38 presses the button 22 outwardly. The button 22 triggers an electrical signalling system when the button 22 springs outwardly in response to the open door 26. The button 22 mechanism is mounted to the inside wall of the mailbox and must be precisely positioned to properly engage the close door 22 of the mailbox.

With respect to the transmitting circuit, as shown in Fig. 2, the mailbox 2 houses a transmitter 42 that includes transmitting circuits, an encoder 42b and a battery supply 42c. The encoder 42b includes a manually operable code selector that controls the particular code to be transmitted. The transmitter is connected to an antenna 44 extending from the top of the mailbox 2. When the box is opened the momentary impulse will be transmitted to alert the recipient.

Existing mailboxes are built in a wide variety of different structural designs and dimensions, and therefore such conventional mechanical triggering mechanism which are mounted to an interior wall portion of the mailboxes, cannot be easily installed in a wide variety of differently designed mailboxes. For example, typical mechanical triggering mechanisms are not adapted for use with mailboxes having slot-type openings with doors that pivot inwardly about a high pivot axis. Conventional mechanical triggering mechanisms as described in the prior art are only usable with a narrow range of mailbox designs and dimensions.

Other drawbacks of these conventional devices are unreliable, costly, and require individual mounting modifications. These devices are not well adapted for mounting to different types and sizes of existing mailboxes, especially for use in mailboxes mounted on an external wall of the HDB flats.

Another conventional type of device for signalling the arrival of mail is a photoelectric triggering device. The presence of mails, parcels or letters within the mailbox interrupts the light path between the emitter and receiver of the photoelectric sensor or based on the amount of light reflected from the object concerned (depending on the types of photoelectric sensor used), which then triggers an electric signalling system. Photoelectric sensors tend to be relatively expensive. These devices must be mounted within the mailbox in particular configurations to utilize the light beam, and therefore the operability of these systems is dependent upon the design and dimensions of the mailbox. In other words, a particular conventional photoelectric device may not function properly or even operate in mailboxes having different structures and dimensions. A purchaser of a photoelectric device may be required to also purchase a new mailbox that is compatible with the device.

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It is therefore, a purpose of the invention to provide a simple and inexpensive apparatus for sensing small parcels, mails or the like when such objects have been deposited in a mailbox. The present invention also provides a method for sensing small parcels or documents or the like in mailboxes by multiple reflection of infrared light beams.

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SUMMARY OF THE INVENTION

A principal object of the invention is to provide a relatively simple and cost efficient apparatus for sensing small parcels, mail or the like in the mailbox, comprising an infrared emitter and a photo sensor and a pair of mirror stripes, wherein the mirror stripes are mounted on the sidewalls of the mailbox, facing each other to provide multiple reflection of light.

It is, therefore, an object of the invention to provide a method for sensing mail or parcels in the mailbox by multiple reflection of infrared light beam by the two mirror stripes.

Yet another object of the invention is to provide a method for sensing mail or parcels in mailbox, wherein an invisible zigzag grid of infrared light beam is created across the mailbox by the infrared emitter and the photo sensor in combination with the two mirror stripes to cover a wide area instead of an array of sensor for the same coverage. A further object of the invention is to provide an apparatus for sensing mail

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or parcels in mailbox, wherein randomly placed article or various sizes within the mailbox can be detected.

One aspect of the present invention is to provide an apparatus and method for sensing small parcels or documents in mailbox, wherein only a pair of infrared emitter and receiver together with a pair of mirror stripes are needed. These components are formed to provide a wide detection area. In accordance with the present invention mounting both the emitter and receiver at the bottom edge of the stipulated area and also having an acute angle of incidence for the infrared light can easily accommodate the size of the parcel and document to be detected. The acute angle of incidence increases the number of bounces and hence create a fine zigzag grid of infrared light beam for detection.

Yet a further object of the present invention is to provide a method for sensing small parcels, document or the like by way of interruption of the beam created by the emitter and receiver.

Other objects and advantages of the present invention will become apparent to those skilled in the art from the following detailed description read in conjunction with the attached drawings and claims appended hereto.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature and objects of the invention, reference should be made to the following detailed description taken in conjunction with the accompanying drawings, in which

Fig. 1 is a diagrammatic view in perspective of a conventional mailbox incorporating the transmitting circuits.

Fig. 2 is a schematic diagram of the transmitting circuits of the conventional art.

Fig. 3 is a schematic view showing the location of the infrared emitter, the infrared light receiver, and the 2 mirror stripes mounted within a mailbox in accordance with the present invention.

Fig. 4 is a top view schematically showing the zigzag infrared light beam in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, there is shown the preferred embodiment of the present invention. Fig. 3 shows a schematic view of the four main components of the present invention. The first component is the mailbox having four sidewalls 301, 303, 304, 305 with either a front opening 302 or a slot 306. The second component is an infrared emitter 341, which is fixed at the lower section within the mailbox, close to the bottom corner of the mailbox. The third component is a photo sensor 342 which is located at the lower section of the mailbox, close to the bottom corner of the mailbox, having the same sidewall with that of the infrared emitter 341 and at the same height from the base of the mailbox. In this case, an infrared LED is used as the emitter 341 and an infrared light receiver 342 is used as the photo sensor 342. The last components of the present invention is a pair of mirror stripes (first and second) 331, 332 mounted opposite to each other, onto the sidewalls 301, 303 of the mailbox. In accordance with the present invention the two mirror stripes 331, 332 are positioned at the same height from the base of the mailbox and are vertically disposed onto the sidewalls 301, 303.

The mailbox of the present invention is provided with a front opening 302 for the insertion or placing documents, mails or small parcels into the mailbox for office use (open concept) or a slot 306 for use by residence where privacy and protection against theft is of concerned.

In accordance with the present invention, as shown in Fig. 4, infrared beam 333 is emitted from the infrared emitter 341 and bounces onto the opposing second mirror stripe 303 at the sidewall 303 at an angle of incidence θ_L . The infrared beam 333 is then reflected at an angle of θ_r that equals the angle of incidence. In the preferred embodiment of the present invention, the emitter 341 and the infrared light receiver 342 are mounted in such a way that the incident infrared beam and the reflected beam form into an invisible zigzag grid of infrared light beam across the bottom of the mailbox.

In practice, a parcel or a mail inserted through the front opening 302 or dropped through the slot 306 of the mailbox will interrupt the beam. In other words, any interruption of the beam by the parcel or mail or the like will result in its detection. In the present invention, a single sheet of paper dropped into the mailbox can be easily detected in

accordance with the present apparatus and method provided that its width is greater than that of the mailbox.

- In accordance with the present invention, the method for sensing small parcels or the like in mailbox having the front opening 302 or slot 306 and a plurality of enclosed sidewalls 301, 303, 304, 305, comprising the steps of
- (a) emitting infrared light beam bouncing onto a pair of mirror stripes mounted onto the inner wall of the mailbox and creating a fine zigzag grid of infrared light across the mailbox; and
 - 10 (b) sensing said zigzag grid upon interruption of infrared light beam; thereby the interruption of the beam by the small parcels is detected.

The infrared emitter 341 and the photo sensor (infrared light receiver) 342 are mounted at an angle at either end within the mailbox such that the infrared beam 333 emitted bounces off the opposing mirror stripes 331, 332, which can thus create an invisible zigzag grid (referring to Figs.3 and 4) across the mailbox. In accordance with the present method, any randomly dropped small parcels or mails can be detected.

While the invention has been described with respect to a preferred embodiment, it will be clear to those skilled in the art that modifications and improvements may be made to the invention without departing from the spirit and scope of the invention. Therefore, the invention is not to be limited by the specific illustrative embodiment, but only by the scope of the appended claims

**CLAIMS**

1. An apparatus for sensing small parcels or the like in mailbox having a front opening or slot and a plurality of enclosed sidewalls comprising
5 (a) a first mirror stripe mounted at the lower section of the inner sidewall of the mailbox;
(b) a second mirror stripe mounted at the lower section of another inner sidewall of the mailbox, wherein the first and the second mirror stripes face each other;
10 (c) an infrared emitter mounted within the mailbox and at one bottom corner of the mailbox at an angle such that infrared beam emitted from the infrared emitter bounces off the mirrors, creating an invisible zigzag grid across the mailbox, thereby any interruption
15 of the beam by a small parcel is detected.
2. A method for sensing small parcels or the like in mailbox having a front opening or slot and a plurality of enclosed walls comprising the steps of
20 (a) creating infrared light beam bouncing onto a pair of mirror stripes mounted onto the inner wall of the mailbox and forming a fine zigzag grid of infrared light across the mailbox; and
(b) sensing said zigzag grid upon interruption of infrared light beam; thereby the interruption of the beam by the small parcels is
25 detected.
3. An apparatus for sensing small parcels or the like as set forth in Claim 1, wherein the infrared emitter and the infrared light receiver are arranged at an acute angle capable of emitting infrared beam
30 bouncing off the opposing mirror stripes to create the invisible zigzag grid across the mailbox.
4. A method for sensing small parcel or the like as set forth in Claim 2, wherein the infrared emitter emits light beam at an acute angle
35 capable of bouncing off at the opposing mirror stripes to create the invisible zigzag grid across the mailbox.
5. An apparatus for sensing small parcels or the like as set forth in Claim 1, wherein a front opening or slot is provided at the mailbox

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for the insertion or placing documents, mails or small parcels into the mailbox.



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