



Radio Wave Signal Letterbox

Tan Chin Chai^{1*}

^a *Mechanical Engineering Department
Seberang Perai Polytechnic
13500 Pulau Pinang, Malaysia*

¹cctan@psp.edu.my

Abstract

The radio wave signal system is a process of transmitting information from a place and received in another place without the use of any wire or cable connection. This innovative of radio wave signal letterbox has been created to solve the problems facing by the flat residents. This idea is triggered when conducting observation studies on flats and interviews with their residents. It is found that many people who stayed in flats often faced the problems regard the safety of their letterboxes. Among the problem is the loss of letters and residents often forgot to collect letters. The invasions problem also occurs in the letterbox. This radio wave signal letterbox is divided into two parts as outdoor and indoor unit. The outdoor unit is installed in the letterbox while the indoor unit is installed inside the house. Outdoor unit function as the transmitter while indoor unit as the receiver. With the innovation of this radio wave signal letterbox, the problem faced by the flat residents can be overcome in where the signal will be given when the letter is dropped into the letterbox. This radio wave signal letterbox also contains security features that are completed with a buzzer in the indoor unit which it will sound when the letterbox is enclosed or the letterbox door is open. The use of this radio wave signal letterbox is very effective for flats and building.

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1. Introduction

People in ancient used drums, smoke, horns and flag as a method of sending signals or message for long distances (Frenzel 1995, quoted in Fiona 2005). However, this practice is limited to certain distances and conditions. Long distance communication is continued where the writing of word messages and letters will be sent to other places using horses, boats, trains and so on. The emergence of electronic communication systems such as radio and television has improved human ability in sharing information. Nowadays, the use of radio wave signalling systems is the fastest transmission of information from a place to another without any wires or cables. It is also known as wireless communication system. Radio waves are a type of electromagnetic radiation with wavelengths in the electromagnetic spectrum longer than infrared light. Radio waves have a frequency of 300 GHz to as low as 3 kHz, although some definitions describe waves greater than 1 or 3 GHz as microwaves, or include lower frequency waves. At 300 GHz, the same wavelength is 1 mm (0.039 in), and at 3 kHz is 100 km (62 miles). Like all other electromagnetic waves, everything moves at the speed of light. The naturally occurring radio waves are produced by lightning, or by astronomical objects.

Radio wave signal letterbox is one of innovation that can be use either in office, multi-storey buildings and residential areas especially flats. The idea of this system design has been derived from the observation studies and interviews with the residents in flats located in Penang.

* Tan Chin Chai. Tel.: +0195505975
E-mail address: cctan@psp.edu.my

From the observation study, it was found that the existing letterboxes in the flats were unsafe and under disorder. Social problems are one of the causes of vandalism in the public property and the letterbox is one of them. In addition, the lack of concern from the local community and the management of the flats are also the main factors exposed to the incursion of the letterbox. The design of radio wave signal letterbox is to give message to the resident if any letter drop in their letterbox. The system is more user-friendly, and it is emphasising the security features of the mail and the letterbox. This innovative is to overcome the various problems suffered by the flat residents such as often forget to collect letters, letterboxes are often infringed, letterboxes are always unlocked and the unsafe environment. With this radio wave signal letterbox, it can remind the occupants residents to be more alert with their letters. This system can provide an early signal as soon as a letter was inserted or dropped into their letterbox and the residents will be able to collect their letter as soon as possible.

The main objective of the radio wave signal letterbox is to keep the letter and letterbox safe. Besides, residents will be alert by receiving a message or signal when a letter is dropped into the letterbox or the invasion occurs in the letterbox. Through this innovative letterbox, the problems faced by residents can be solve. However, there are also some limited requirement for this design. Among those includes the distance between the transmitter and receiver. It must be less than 25 meters and operated by electricity and battery so that the sensors can detect all objects that are inserted or dropped into the letterbox well, including letters and papers. The advantages of this system can be to facilitate the residents to receive information more quickly and accurately. They do not need to check the letterbox if the buzzer does not sound or the LED light does not turn on. This design does not require a large space for the installation of the circuit either in indoor unit or outdoor unit. In addition, this circuit system is user friendly and does not require high installation cost. The figure below illustrate the condition of the letterboxes that are unmanageable and are in unsafe condition.



Figure 1 Condition of damaged and unmanageable letterboxes at flat



Figure 2 The Condition of losing the padlock of the letterbox



Figure 3 The Condition of a damaged lock at the letterbox

2. Design and Manufacture

The radio wave signal letterbox is one of the electronic circuits which it is systematically connected with electronic components and is wrapped in printed circuit boards so that electrical current can flow perfectly. The electronic components used in this circuit system include microchip, transmitter, rectifier, voltage regulator, limit switch, encoder, decoder, buzzer, signal cable, sensor, resistor, wire connector, LED light, power supply and so on. A radio wave signal letterbox is made in 2 parts as outdoor unit and indoor unit. The outdoor unit is installed in the letterbox completed with sensor, reset key, buzzer and controller. While the buzzer, LED lights and sensor are attached to the indoor unit. The radio wave signal letterbox is using a WiFi or wireless modem to send messages or data from the outdoor unit to the indoor unit via a connector called the telecommunications transmitter.

This circuit system in radio wave signal letterbox has the limit of reception of the wave between the outdoor unit and the indoor unit which is less than 25 meters. It's easily operated because the frequency of the signal can penetrate the resistance around quickly without any wires. The signal frequency used in this circuit system is 315MHz. Indoor unit are completed with LED lights where the light will be lit when the letter is inserted into the radio wave signal letterbox. The purpose is to deliver the message to the host to collect the letter. In addition, the radio wave signal letterbox is also specially designed and placing a buzzer in the indoor unit as a safety warning tool. The buzzer will have sound when the door of letterbox is open. The sensors used to detect all types of objects except black objects that are dropped into the letterbox. With completed LED light and buzzer, it can make the residents to know their letterbox status at all times.

3. Tests and Results

After installation and soldering are completed, a series of tests will be conducted to ensure the functionality and the integrity of the circuit system of the radio wave signal letterbox. First, the test of transmission and reception of signals by putting outdoor units and indoor units in range of altitude but the distance must be within 25 meters. Second, the sound of buzzer of this circuit system is tested. Third, test the functionality of the LED light. Next is followed by tested on remote control and WiFi modem. The test results of the radio wave signal letterbox are obtained that this circuit system working well when tested on the transmission and reception of the signal and the distance. In addition, this letterbox can operate well when receiving mail too. The signal will be received by the indoor unit as soon as the outdoor unit received the letter. The sound of the buzzer is working well when the letterbox door are is open. Throughout the tests, there were no damage and problems found on transmitter, sensors and WiFi modems. Figure 4 below show the position of electronic components in outdoor unit and indoor units.

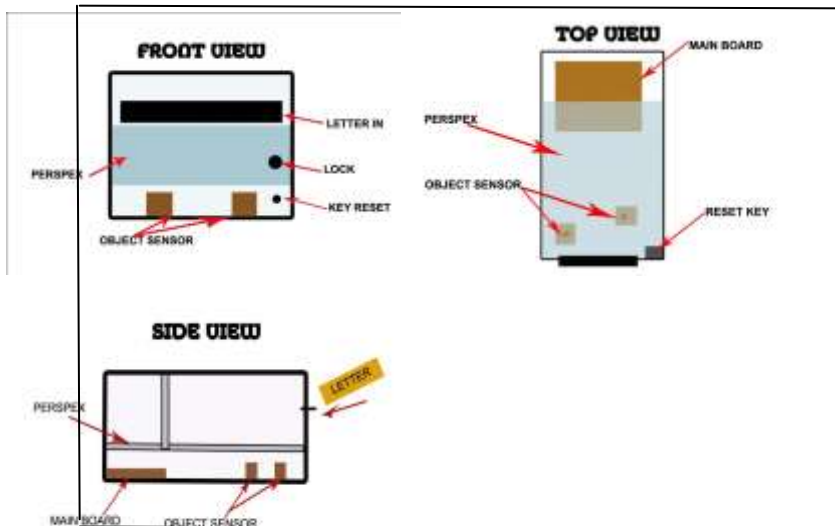


Figure 4 Position of electronic components in the radio wave signal letterbox



Figure 5 Position of reset components, limit switches and sensors



Figure 6 Position of electronic components in outdoor units



Figure 7 Position of electronic components in the indoor unit



Figure 8 Radio wave signal letterbox

4. Conclusion

The developed radio wave signal letterbox was installed in the flat. There are several testing methods that have been conducted to identify and evaluate the achievement of the predefined functionality. The results of these tests have shown that this circuit system of radio wave signal letterbox has an achievement capability for good delivery and acceptance levels of signal. In conclusion, shown that the ability of radio wave signal box can overcome the problem of existing letterboxes in the residential area. Therefore, this circuit system can help to keep safety for the letterbox and alert the residents whenever they received the letter. Hence, the residents are able to collect their letters as soon as possible. Beside that, the intrusion problem and loss of the letter can be minimized.

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