SMART MULTIFUNCTIONAL PADLOCK THROUGH RFID FOR BIKE OR OTHERS

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This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of…….. The member of the supervisory is as follow:

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Supervisor Name : Ts. Mohd Syafik Bin Jumali

Date :

ABSTRAK

Matlamat Projek Tahun Akhir ini adalah untuk merekabentuk sistem pengunci gembok melalui RFID dan meningkatkan fungsi gembok "standard" kepada gembok pelbagai fungsi. Pada dasarnya, gembok adalah kunci mudah alih yang terdiri daripada badan pepejal, mekanisme mengunci dan U-shackle. Untuk projek ini, yang dikenali sebagai "Smart Multifunctional Padlock through RFID for bike or others", ia akan memberi tumpuan kepada matlamat ini, yang bertujuan meningkatkan fungsi gembok piawai yang sepenuhnya disesuaikan dengan aksesori penting untuk penyimpanan objek kecil dan mengunci basikal dan reka bentuk sistem mengunci padlock dengan menggunakan sistem RFID. Gembok akan datang dengan pelbagai fungsi yang menggunakan sebagai gembok "standard", boleh memasang aksesori untuk mengunci basikal atau menyimpan objek kecil yang selamat dalam kes keselamatan. Dengan itu, untuk menghasilkan gembok tanpa kunci, gembok menggunakan sistem penguncian berdasarkan RFID yang melekat tag RFID untuk membuka kunci gembok. Oleh itu, laporan ini juga akan cuba untuk menjelaskan ringkas bahan dan reka bentuk produk ini.

ABSTRACT

The aim of this Final Year Project's was to design the locking system of padlock through RFID and improve the functional of standard padlock to multifunctional padlock. Basically, padlocks are portable locks consist of solid body, locking mechanism and U-shackle. For this project, which is called Smart Multifunctional Padlock through RFID for bike or others, it will be focusing on this objective, which are to improve the functional of standard padlock that are fully customizable with essential accessories for small objects storage and locking bicycles and to design the locking system of padlock by using RFID system. The padlock will come up with various function which using as a standard padlock, can plug the accessories for locking the bike or to keep small objects safe in a security case. With that, to produce the padlock keyless, the padlock using locking system based on RFID which are attached the RFID tags to unlock the padlock. So, this report also will it try to explain brief the material and design of this product.

DEDICATION

To my beloved parents who always there for me

Md Nor bin Daud and Zaliha bt Mohd Yusof

To my siblings

Azma Syuhaida

Syakiraa

Syahiraa

Muhammad Syafiq

To my lecturer and supervisor, for their guidance and encouragement

Ts Muhammad Syafik bin Jumali

To my friends, for their unconditionally support to complete this final year project.

ACKNOWLEDGEMENTS

The satisfaction, which accompanies the successful completion of the project, is incomplete without the mention of a few names. I take this opportunity to acknowledge the efforts of the many individuals who helped me make this project possible. Firstly, I would like to express my heartfelt appreciation and gratitude to my project guide as my Supervisor who is Ts Muhammad Syafik bin Jumali for encouragement, guidance, critics, advices, suggestion and motivation on developing this project.

In addition, I would like to express my sincerest gratitude and deepest thankfulness to my parent for their love, support and encouragement that they had given to me. My sincere appreciation goes to all lecturers and members of the Manufacturing Engineering Technology Department, UTeM, who helped me in any ways and made my education journey in UTeM pleasant and unforgettable. Many thanks go to BMMP member group for their excellent co-operation, inspirations and supports during this study. This four years' experience will be remembered as important memory for me to face the new chapter of life as an engineer.

The experience was novel one and I would like to thank all the people who have lent their valuable time for the recording of the data and completion of the report

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CHAPTER 1

INTRODUCTION

The aim of this chapter is to provide an overview of the smart multifunctional padlock through RFID for bike or other applications. Basically, padlocks are portable locks consist of solid body, locking mechanism and U-shackle. There are various assorted styles of padlocks but the basic design and operation are still the same. Most of the padlocks use metal materials on the body with the exclusion of disc of the padlock. When the size of the padlock increases then the larger keyway and locking mechanism.

For this project, which is called Smart Multifunctional Padlock through RFID for bike or others, it will be focusing on this objective, which are to improve the functional of standard padlock that are fully customizable with essential accessories for small objects storage and locking bicycles and to design the locking system of padlock by using RFID system.

The goal of this project is to maximize the function of the padlock. Basically, it can be classified in many ways according to the design locking system and the material from which the padlock made. For this project, the padlock will come up with various function which using as a standard padlock, can plug the accsesories for locking the bike or to keep small objects safe in a security case. With that, to give it the padlock keyless, the padlock using locking system based on RFID which are attached the RFID tags to unlock the padlock. So, this report also will it try to explain brief the material and design of this product.

1.1 Background of Project

In particular, in the residential area, crime incidents have occurred widespread in recent years. Even a padlock locks the door, a thief with certain equipment still opened the padlock. Usually, it is not possible to open the padlock securing that a digital mechanical device uses password or code. However, there is still uncontrollable crime incidents in the residential area by a thief. One study shows that young burglars steal from a desire for fun and excitement due to school truancy or a belief in the low likelihood of apprehension. (Soh & Bin, 2012). With many specialized functions, locks were designed and built. Basically, locks that are designed to withstand or prevent open blown. Various locks can be opened or closed by various keys. However, the key that closed them can only unlock it. The keyhole that prevents a thief from exploring the positions is the most important of the lock parts. (Sultan Idris Education University, 2017).

Also the most common padlocks are one of the worst security locks. The padlock will open in seconds, including the picking of the single pin. Paperclip, bamboo shoots, food cans, raking and anything fit in the keyhole can unlock the padlock. It shows that these padlock types are worst and does not compromise the safety of so many people. It also has special tools for bypassing the padlock. (Ralph, 2015)

Security of the padlock is the first element that need to be emphasized in this field especially at the locking mechanism of the padlock. So, to maximize the security of the padlock by substitute the keyway to RFID locking system which are the padlock can lock and unlock it either using RFID tag or using our own smartphone. In recent years, usage of a smartphone is not just to connect the people as the communication tools, but it also can be a platform and medium to create an application RFID system. Nowadays, the technology provides better

features and designs in the smartphone. Besides, the smartphone has remarkable power in computation as well as an awfully helpful operation such as wireless internet access by Wi-Fi. With the state-of-the-art mobile applications, the system gets to be more intelligent and smarter. Moreover, the purpose of RFID in this product is to lock and unlock the padlock by putting the additional movement detection system and GPS. As soon as any hacking attempt comes, the module will send an alert by the SIM Card to the mobile numbers put in the app.

1.2 Problem Statement

The cylinder pin-tumbler lock used in padlocks is one of the most common types of lock. Most mechanical padlocks are fitted to door-like things and have two separate physical parts. One part, like the static part of the door, is fitted to the frame and is essentially a robust metal reinforcement for a hole cut into the door itself.. Also the most common padlocks are one of the worst security locks. The padlock will open in seconds, including the picking of the single pin. Paperclip, bamboo shoots, food cans, raking and anything fit in the keyhole can unlock the padlock. It shows that these padlock types are worst and does not compromise the safety of so many people. It also has special tools for bypassing the padlock. This kind of padlock has weak security against attacks of any kind. It could be nothing more than a home gate decoration, a bicycle, a motorcycle or something valuable. People who have not realized this bad security are advised to alert them more.. 3(Joshua, E. 2016).

According to (Statistics, 2018), for the past three years the property crime are highest crime but in every year it is decrease although it is the highest crime. Based on the property crimes, the vehicle and house break-in and theft are highest crime on the property crimes.

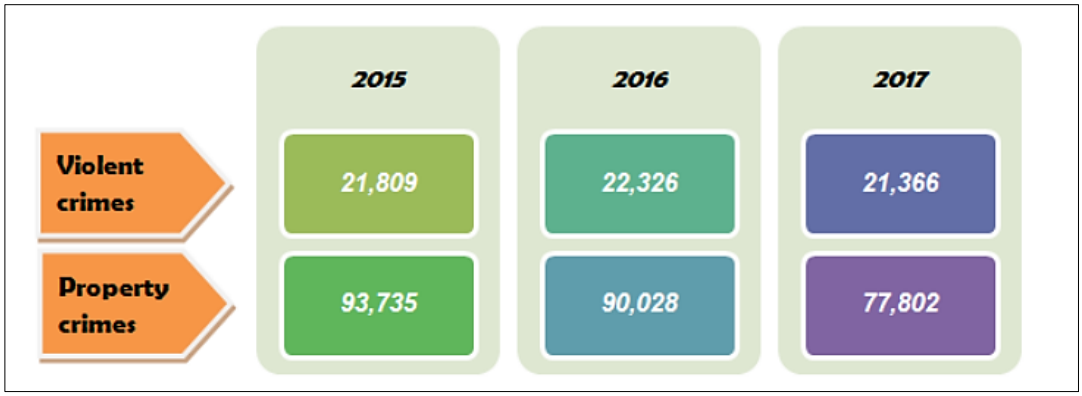

Figure 1.1 : Crime Index by Type of Crime, Malaysia (2015 - 2017)

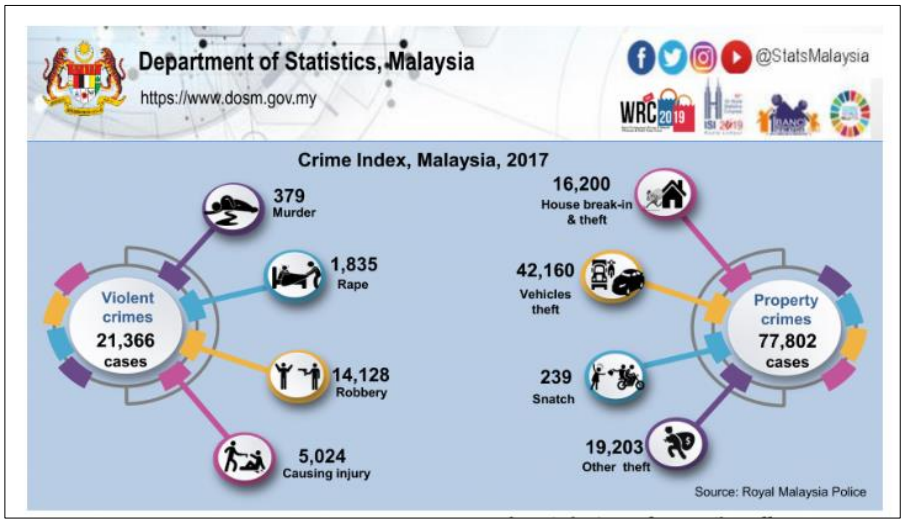

Figure 1.2 : Shows the Crime Index 2017

From that, the solution to overcome the problem is optimize the padlock security by using RFID function which are users no need to worry about using the padlock because the padlock can lock and unlock it using RFID tags or smartphone. In addition, the padlock can be manage using our smartphone. So that, it is easily for users to monitor the condition of padlock for mobile app.

The locks most frequently in use today rely on a single. There are many types of padlock but with same function which is to lock the fitted things such as door, locker and so on.

Notwithstanding, some applications require multiple function of the padlocks combining both key and combination function. From that, we improve the functional of the standard padlocks that are fully customizable with essential accessories for small objects storage and locking bicycles. Considering that, our project is to improve the locking system and functional of the padlock to make it more practical and ease the users by using the padlock.

1.3 Objective

The objectives of this project are as follows :

1. To design the locking system of the padlock by using RFID system.
2. To improve the functionality from standard padlock to multifunctional padlock.

1.4 Scope of Project

The scope of the project include the following areas:

1. Improve the design from standard padlock to multifunctional padlock.
2. Design the security case and accsesories for locking bikes that can attach to the padlock.
3. Design the padlock by using RFID for locking system of the padlock.
4. Design and fabricate a prototype of padlock
5. Identify the RFID used for the padlock.

1.5 Project Significance

This project will be significance to ease the users manage their padlock without worry about safety or security of the padlock. This project also convinience for bikers due to the

multifunction of the padlock which is the padlock can plug with foldable bike accsesories to lock the bicycles or motorcycles. At the same time, keeping their small object safe in the security case.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter will discuss the literature review that was related to smart multifunctional padlocks through RFID for bikes or others. Furthermore, in this chapter will include the briefing on the development of padlocks, overview of the RFID and understanding the system of the RFID. In addition, the variables for this research will be aspect in functionality of padlocks, the level of security and the design of padlocks.

2.2 Theoretical Framework

Figure 1 shows the Theory of Inventive Problem Solving (TRIZ) that applied in this research.

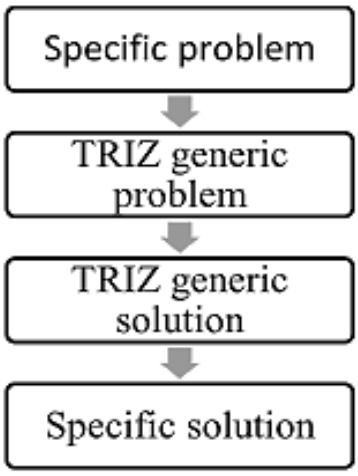

Figure 2.1 : TRIZ Framework (Roystrattonntuacuk, n.d.)

Theory of Inventive Problem Solving (TRIZ), It enhances the product innovation and design process area. Based on this theory, a high-quality product can be innovated, future failures can be anticipated and next generation invented. The main goals of applying this theory in this study are to obtain an ideal design, to solve the problems and to systematically structure the process of innovation. TRIZ also improves the product design and the contradiction can be resolved when a problem is structured. (Wa, Lee, & Ibrahim, 2018)

2.3 Development of Padlocks

Padlock development stems psychologically from practical safety needs for individuals, groups, or individuals within groups. They can be characterized on the basis of lock types, lock shapes, lock engravings, lock materials, and lock mechanisms. Some locks and keys are not only very beautiful and colorful in art, they also have different designs.

Lasaroff (2016) had invented a padlock that can release the padlock lock cylinder. While the lock cylinder can be released, the locking balls inside the padlock can still be maintained. It is a self-created idea and in the independent claim the invention has been proven. This design was done to improve its effectiveness by adding a function that can be released from the body from the lock cylinder of the padlock. Since the small parts of the padlock such as the cam members and the locking balls are very easy to drop and can be easily broken or unlocked by another person, this design provides a solution that the padlock can release without loosening the lock cylinder.. It decreases the possibility that other people will lose or break small parts. Figure 2 shows the padlock which was invented by Lasaroff (2016).

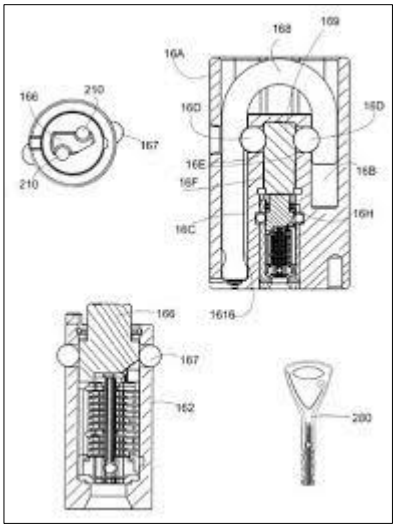

Figure 2.2 : Normal Padlock

Jiaqiang (2004) had invented a new padlock that you can use either a key or a cipher. The padlock has a long leg and the two sidewalls have a short leg, which can receive each other's leg. Two bolts, two shackle holes that allow the shackle to pass it, a lock bolt mechanism and a spring are the basic parts in the padlock. The padlock's middle part consists of lock cylinder and cylinder housing. It is possible to receive a first key by axial or inward. Finally, a drive pin is connected to the few parts of the lock cylinder and the housing of the cylinder. In order to improve its effectiveness, this design was carried out by adding the reset cipher and a second key function. To lock or reset the cipher, the second key can be inserted into the padlock. This function prevents anyone from unlocking the padlock and resetting the cipher without permission. Figure 3 shows the padlock which was invented by Jiaqiang (2004).