Emergency Exit Lockset for Grille Doors or Windows

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ABSTRACT

In the event of an emergency, allowing unhindered escape from a building can be difficult at time. The grille door of any premises is commonly locked by a locking device or a padlock through the holes of the locking brackets. However, in case of an emergency or a panic situation, the key to open the locking device may not be available and loss of lives could happen. This invention, the emergency lockset is designed to enable one of the locking brackets to be easily detached from the structure and to allow the grille door to open without using a key. This Emergency Exit Lockset for Grille Doors or Windows is characterized by a rectangular elongated housing with a detachable locking bracket held by a movable plunger and an actuator which is linked to the plunger. The housing of the emergency exit lockset is installed in the frame of the grille structure. Upon triggering, the actuator retracts the plunger and the detachable locking bracket is released and separated from its housing. This invention takes into consideration the function of the grille door which is to maintain the security of the premises because the actuator that releases the locking bracket is mounted inside the premises. With the benefit thorough safety and security, specifications can be devised to optimize the emergency exit grille door through the use of specialized design of this prototype.

INTRODUCTION

Human need housing for shelter or other related daily activities. Housing improves the well-being of the people and integrates social factors into economic development. It involves human enterprise and is a key sector of the economy which is a pre-requisite to national socio-economic development. The housing sector plays a unique role in the development process and is considered a prerequisite and objective for development [1]. Housing should be free from all sort of criminal activities so as to accord the inhabitant the opportunity of realizing the full potentialities of qualitative housing as enshrine within the united nation context of adequate housing. In an effort to have personal safety of the property, residences will fit their houses or apartments with burglary proof devices to prevent potential burglar especially in a high density, low amenity residential neighbourhood due to higher degree of crimes [2]. Likewise, the fitted barriers are now becoming a source of concern due to its resultant effect on emergency situation such as fire. Fire has claims lot of lives and property. Some of which is as a result of non-accessibility to the trapped victims inside the buildings. Today, most buildings with grille doors and windows are designed without the fire escape features.

The present invention relates generally to an emergency release system comprises of at least one lockset housing being mounted at grille window frame, at least one engaging means mounted to one edge of the grille window, at least one latching assembly integrated with said lockset housing from top cover of said lockset housing and at least one actuating means mounted from inside of premises. Said actuating means is in connection with said latching assembly by using at least one cable to trigger disengagement of grille window from its grille window frame for emergency escape.

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This invention relates in general to a permanently metal grille door or window with a built in slotted structural cum with quick release locking system mechanism which in an emergency could be released by pulling a cable located on the inner side of the window.

The objectives of this research are as below:

(i) To enable one of the locking brackets to be easily detached from the structure and to allow the grille door to open without using a key; and
(ii) To innovate existing mechanical mechanism with electronics functionalities such as automatic detachment system with smoke buzzer, alarm connectivity, and reset button.

LITERATURE REVIEW

Fires in buildings are related to either the human error or human negligence. Even a small fire can cause devastation. Statistics from 1990 to 1999, showed that there were 154,987 fire cases in Malaysia. From that figures, 23,911 or 15.45% cases involved buildings [3]. From this statistic, it showed that residential buildings are the highest risks of possibility of fire break out which includes high-rise accommodation buildings such as flats buildings, apartment buildings and condominiums [4].

In Malaysia, it is a trend that all doors and windows are fitted with iron grills as an extra safety precaution to restrict the intruder from entering their buildings. At the same time, besides having extra precautions, this practice has created a death trap to building occupants. Fitting an iron grille to all doors and windows has reduced the chance for the building occupants to exit the building if a fire breaks out [3].

Practically, buildings are demand to be designed of accessibility. Hence, this is not to the same extent of emergency evacuation safety [5]. If windows have security grilles, it is important that the residents understand how to access to them for emergency evacuation. Serious incidents have occurred where people have been trapped and died in fires because the security grilles were permanently fixed or did not have quick release devices.

During fire, deaths are mostly caused by smoke or smoke inhalation instead of direct burning. Smoke and heat become a major threat in building fire. The Emergency Exit Lockset for Grille Doors or Windows has been suggested to carter for the increasing fire incidences compared to the conventional design. Among the issues of fire safety issues in residential buildings trending in Malaysia are installing extra safety precautions in the form of iron grilles for security reasons have created an additional obstacle for occupants in the event of fire. Increasing research on fire safety needs to be focusing on the required optimum fire safety measures compliance with the existing regulation. However, such regulations have not been fully developed to specify with the design of buildings in Malaysia. Hence, the use of grille doors and windows in building required further research in the field of fire safety particularly when victims got trapped within a locked, secured grille doors or windows during fire.

METHODOLOGY

The methodology to be applied for the study is as shown in Figure 1 and must be done step by step and follow the process flow at below to achieve the stated objectives.

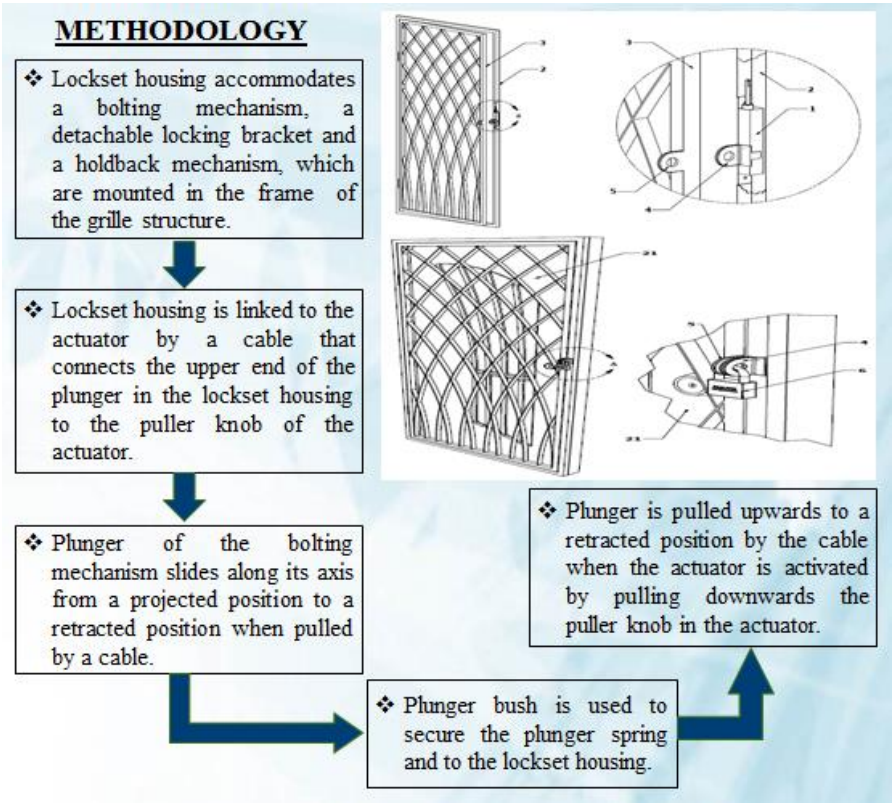


Figure 1. Design of working principles.

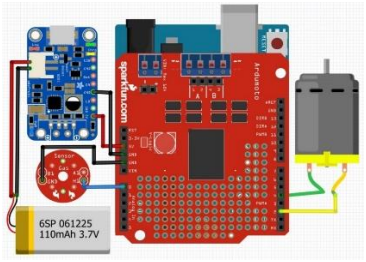
A quick release locking system comprising:

(i) An elongated rectangular lockset housing is supported by a window frame and an outer face of grille window;
(ii) An actuator comprising hold back mechanism, plunger spring and stopper having a cable joining the actuator to the elongated rectangular lockset housing by a plunger.
(iii) The quick release locking system, wherein the window frame includes a plunger, a plunger spring and a stopper. The plunger can be moved to a retracted position when pulled by the cable and returns to its original projected position by the pressure of the plunger spring and the pressure of the plunger spring is adjusted by the plunger spring and stopper.
(iv) The quick release locking system, wherein the holdback mechanism which has a stopper that prevents the plunger from returning to its projected position after the plunger is pulled to a retracted position.
(v) The quick release locking system, wherein the elongated rectangular lockset housing is held in the window frame by the plunger.
(vi) The quick release locking system, wherein the actuator consists of a hold back mechanism, plunger spring and stopper.

Figure 2. Finalized prototype development.

Figure 2 showed the finalized prototype development of the emergency exit lockset for grille door with electronics functionalities such as automatic detachment system with smoke buzzer, alarm connectivity, and reset button as shown in Figure 3.

The automatic detachment system is powered by 12V lead acid battery. The function of the solar power manager board is to charge the battery. By maximizing the output power of solar panels under various sunlight, battery charge can be maintained. A main powered smoke alarm is used in this system to trigger signal from smoke alarms and will be sent to the Arduino Uno board. Then, a control signal will be sent to motor driver board. The motor driver board will amplify the control signal and drives the actuator. A DC gear motor is used as actuator will retract the plunger [6].



Power Supply	Battery using adaptor or Solar panel @ socket plug
Power Failure	Installed battery level indicator at the controller box. If battery is LOW, buzzer will be activated indicating the need to replace the battery.
Standby Mode	LED blinking indicator system
Time Activation	Within 10 secs

Figure 3. Innovative approach.

RESULTS AND DISCUSSION

Grills in housing are pre-fabricated materials normally made of metal in form of iron fitted on the door, window, balcony or stair ways in order to provide and enhance security and safety of a building especially against unauthorized intrusion. It has always been given adequate attention in building finishing of residential housing.

In accordance with the present invention, the quick release locking system for grille window is provided which has a rectangular elongated housing supporting a window structure in which a plunger slides between projected and retracted positions. In the projected position, the plunger is projected through the built in slotted structure thus holding it in the housing. The plunger is movable to a retracted position in response to a pull by an externally attached cable at one end of the plunger and thus releases the built in slotted structure from the housing. The cable can only be pulled from the inside of the premises through the actuator. When the plunger is pulled, the quick release locking system' mechanism will be driven to open the grille window. The opened grille window can be locked back by pushing the grille window structure to its initial position. The benefits to the community are as listed below:

(i) Security and inherit safety features;
(ii) Door cannot be opened from the outside when it is locked;
(iii) Those inside the building can use these doors by activating the panic mechanism from the inside of the door;
(iv) Can be opened quickly during an emergency; and even young adults can even activate it.

CONCLUSION

The use of grille in doors and windows need to be furthered research in terms of fire safety when the victims got trapped in a locked grille. In such fire emergency situation, these grille doors or windows stand as a barrier to rescue operation and have caused significance loss of human lives. By designing the Emergency Exit Lockset for Grille Doors or Windows makes effort to identify the relation of safety and security of the fire incidence, recognizing the importance of the new proposed mechanism in saving lives.

In the past, efforts have been made to alleviate this problem by providing different type of devices with different release mechanisms for windows. However, some of the release mechanisms are not effective due to their complexity in operation, require maintenance and not reliable. To overcome the above shortcomings, an emergency release system for grille window is designed whereby one of the grille window is able to be detached or disengaged from its window's frame structure easily without the need of using a locking key.

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