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"Automatic Window Evacuation System"

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Abstract: ***The automatic window evacuation system is built with the basic aim of rescuing people in times of fire in a multistorey building. The system is a lifesaving, personal, self-rescue device which lowers the user from a multistorey building. It is effective for use in buildings up to 260 feet (80 meters). When the situation is serious, and there's little time to react, It is the ultimate piece of survival gear for multi-story occupants. Another major application of this device is in construction purpose. The system consist of a frame with shafts on which pulley is mounted to maintain a constant speed ratio. It uses a governor to regulate the speed of the user while lowering from the building. The prototype demonstration shows the basic operation of the system in standard conditions.***

I. INTRODUCTION

Over the past years there is great increase in the number of people dying in the fire accidents. If we consider the example of metropolitan cities like Mumbai. Every month 10 to 12 major fire accidents take place in the Mumbai in which lots of people lose their lives and many causalities. In cities like Mumbai due to less space availability and high population multistorey buildings major part of residential places. A building above 15 meters in height is commonly called as a high-rise building in India. (Roughly ground plus four floors). The high-rise buildings are in the form of apartments, malls, hospitals or multiplexes in most of the urban areas of India. But at times of unusual accidents such as outbreak of fire in a multistorey buildings people have risk to their life due to absence of proper safety equipment and knowledge of safety practices which are to be implemented.

The fire accident in the 24-story Grenfell tower in London, in June 2017, claimed over 70 lives and injured 79 people. It is one of the worst disasters in the world and the incident threw a light to the fire safety concerns on high rise buildings across the globe. In India, the horrific Carlton Towers accident in Bengaluru in the year 2011, took the lives of 9 and injured 69 people. The recent Kamala Mills fire accident in Mumbai which claimed 14 lives gave a burning concern over the fire safety in India. The real estate industry saw a tremendous growth in the last decade. There are many fully occupied high-rise or multi-story buildings in major cities or many are still under construction but people are not taking the fire safety seriously.

When you plan to watch a movie in a multiplex, have you ever considered making a note of the fire exits? Or if you live in an apartment, have you ever checked the fire safety system of the building. Fire safety always takes a back burner in India. We do not emphasize on being proactive. Majority of the population are still not aware of the fire hazards or they do not even know how to react when there is a fire. Fire safety system helps us to prevent fire. It also helps us to understand the nature of fire and what steps we should take when there is a fire accident.

integral part of product design and manufacturing. Over the years, our industry has increased efforts to develop plastic materials, products and construction solutions with lower ignitability and limited impact on fire spread that have contributed to the ongoing reduction of fatalities, injuries and property damage due to fire.

Elevators of nowadays are constructed by using hydraulic and other complex systems. What we try to establish to develop an elevator that does not use the hydraulic system but more to the conventional system. The system that will be used in the course of this paper is the pulley system to lift. The reason for this includes the following: The systems of other elevator are complex and difficult to maintain; cost of maintaining an elevator is high and takes time to maintain; the construction and installation of other system of elevators are quite expensive compared to the conventional system. Skyscrapers are symbols of technological development, employed the services of elevators the movement of people from one floor to another without which the construction of skyscrapers could have been rendered useless. Consequently the purpose of this paper is to design and construct a convectional elevator. The materials used in the fabrication are steel bar, hollow bar, pulley, rope, wheel, and bearing. The first reference to an elevator is in the works of the Roman architect Vitruvius. In some literary sources of later historical periods, elevators were mentioned as cabs on a hemp rope and powered by hand or by animals. In the middle 1800's, there were many types of crude elevators that carried freight, most of them ran hydraulically.

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II. LITERATURE REVIEW

The most crucial aspect of a building's safety in the face of fire is the possibility of safe escape. An important precondition is that its fire safety facilities enable independent and adequate fire response performances by the building's occupants. In practice, it appears that the measures currently required by law do not always provide the support that people in burning buildings need. Consequently, understanding how individuals behave in the case of fire and fire evacuation is essential if we are to bring fire safety measures into line with occupants' needs during an incident.

This paper contains a review of the available literature on human behaviour in a fire so far as building safety is concerned. The findings are presented as an overview of the critical factors which determine occupants' fire response performances, namely the characteristics of fire, human beings and buildings. The study highlights that some of the assumptions about the existing paradigm of fire safety in buildings are not consistent with the knowledge set out in the literature. The key observation is that psychonomics appear to have significant influence on occupants' fire response performances. Accordingly, the traditional approach to fire safety will have to be supplemented by scientific knowledge from this field. Hence, there is a need for a new approach to fire safety design in buildings, which is set out herein. Fire is one of mankind's greatest discoveries but can also be a great source of danger in accidents. On average 8 in 1,000,000 people are killed every year in Europe and more are hospitalized due to fire. This risk has fortunately been addressed by governments which have continuously adjusted fire safety strategies. As a positive result, in the past 30 years the amount of fire deaths dropped by 65% in Europe. Buildings notably represent an important part of the places where fire has fatal consequences. Therefore, numerous national and regional fire safety regulations have been put in place targeting buildings specifically. Plastics are used in a wide and growing range of building and construction applications, from durable pipes and window frames to state of the art insulation solutions. The most crucial aspect of a building's safety in the face of fire is the possibility of safe escape. An important precondition is that fire safety facilities enable independent and adequate fire response performances by the building's occupant. In practice, it appears that the measures currently required by law do not always provide the support people need in burning buildings, consequently, understanding how individuals behave in an event of fire. Fire evacuation is essential if we are to bring fire safety measures into line with occupants needs during an incident. So far as building safety is concerned, the study highlights that some of the assumptions about the existing paradigm of fire safety in building are not consistent with the knowledge set out in the literature.

III. PROBLEM STATEMENT

High-rise buildings say an apartment, have a lot of people living in it. Given the multiple floors, in case of a fire accident, it makes evacuation very difficult as there are a lot of people who have to travel vertical distance on the stairs. A proper fire safety system which includes fire sprinklers, help to control fire and helps to avoid casualties.

1) As the firefighters have to travel a great vertical distance, evacuation becomes very much difficult.
2) As there is no awareness to fire safety, most often, the occupants do not know how to escape in the wake of an emergency. They are not even aware of the fire exit paths.
3) It takes time for firefighters to find out the cause of the fire in high-rise buildings.
4) which arises during the f ire in a multistory building is that the when the fire outbreaks there is nowhere to go as most of the exit points are blocked by the fire the only way is the window but we cannot go out of the window directly without the aid of any equipment. Hence we have to wait until the firefighters arrive.

Another major problem during fire is that when the fire outbreaks the electricity in the buildings is cutoff thus exits ways such as elevators and lifts gets shut down and staircases are full loaded due to the panic stricken mob.

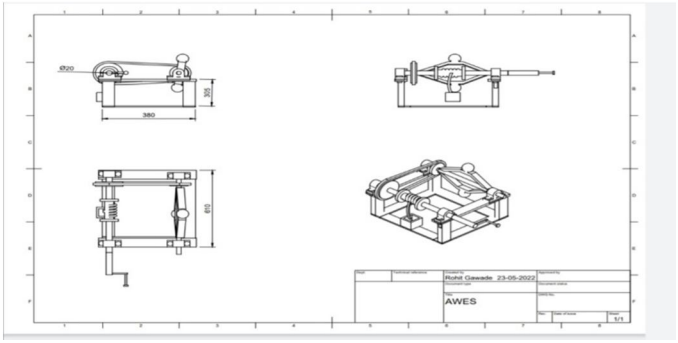


Fig2. Construction

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IV. OBJECTIVE

The project was started with the basic objective of

1) Designing a mechanically driven machine which could lower a person from a multistorey building at uniform speed in case of fire.
2) The system must be cheap so that most of the people should be benefitted from it another.
3) Major objective of project was not use any electrical component due to chances of failure of electrical component in case of fire.
4) Other objectives are to create enlightenment among people about fire safety and how to act when faced by such situation.

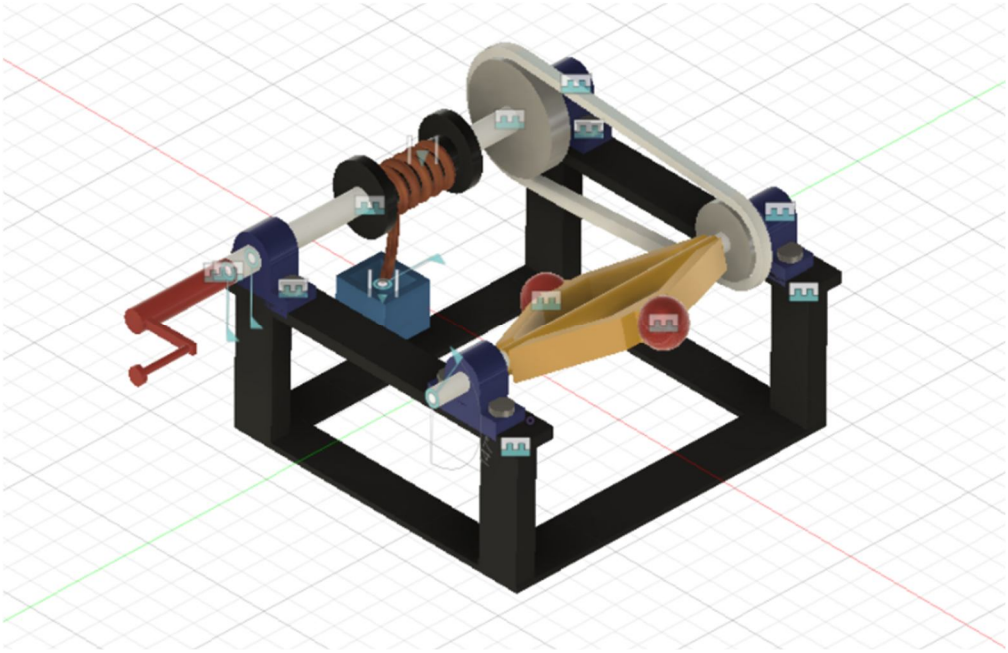


Fig1. CAD Model

The project has a great scope in future with advancement in technology further new innovation could be made in this project the project could be provided with a brake. The lock brake will be able to hold the device stable at one place hence this will be great use in the construction purpose. This project can be used in the construction industry as a load lifting device further it's the weight reduction can be done in the project by using a different material the project could also be made efficient by increasing its load carrying capacity. The device could be provided with a harness and a airbag this will reduce the chances of accident and the user could be saved in limited time providing comfort further the clutch plate could be changed by some other spring loaded device and sensitivity of the device must be increased so as to increase the response of the device. Now a days the lift are working on electricity and hydraulic operated the lift are high amount of electricity consumed, in the future electricity making sources are reduces, due to this reduction of sources lack of electricity. Therefore we use mechanical elements and create lift assembly that type of lift is used in high storey. This lift is totally free from electricity.

A. Design of Shaft

The various assumption in the torque theory:

A shaft is a rotating member usually of circular cross section (solid or hollow), which is used to transmit power and rotational motion. Axles are non-rotating member.

Elements such as gears, pulleys (sheaves), flywheels, clutches, and sprockets are mounted on the shaft and are used to transmit power from the driving device (motor or engine) through a machine.

The rotational force (torque) is transmitted to these elements on the shaft by press fit, keys, dowel, pins and splines.

The shaft rotates on rolling contact or bush bearings.

Various types of retaining rings, thrust bearings, grooves and steps in the shaft are used to take up axial loads and locate the rotating elements.

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Calculation of diameter of shaft:

Terms used:-

T= Twisting moment (or torque) acting on shaft.

J= polar moment of inertia (polar MI) of shaft about axis of rotation.

= Torsional shear stress N/mm^2.

L= Length of shaft in “mm”.

P= power transmitted in Kw

$T=\pi/16\ d^3$

We Know, From equation

$T/J = \pi/r$

As Our system is work without electricity, we can’t use electric motor or any power devices to run the shaft, so we can assume shaft diameter according to our system requirement. As we done system for low purpose weight mostly for 10kg and 20kg. so according to trail and error base

As per Our requirement Assume, diameter of shaft

d=20mm

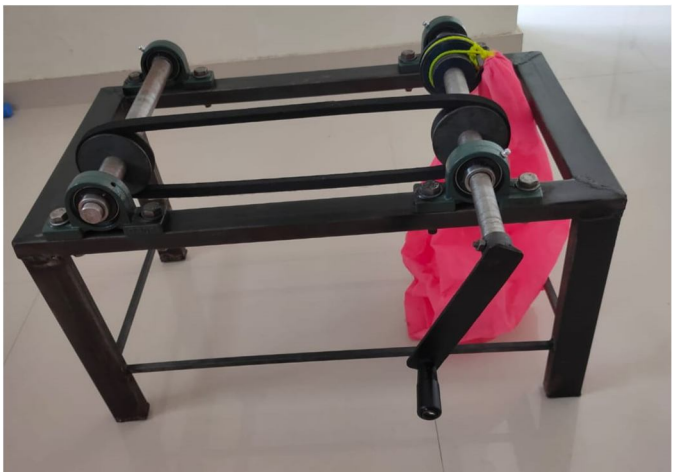


Fig6. Final Prototype Model

B. Design of Frame



Fig3. Frame

We have to constructed the frame of M.S material having dimension of

610mm×380× 305 mm

C. Design of Flat Belt



Fig4. Belt

The flat belt as shown in Fig. is mostly used in the factories and workshops, where a moderate amount of power is to be transmitted, from one pulley to another when the
two pulleys are not more than 8 metres apart.
When the endless belts are not available, then the belts are cut from big rolls and the ends are
joined together by fasteners. The various types of joints are
1. Cemented joint, **2.** Laced joint, and **3.** Hinged joint.
The cemented joint, as shown in made by the manufacturer to form an endless belt, is preferred than other joints.
Length of an Open Belt Drive. In open belt drive, both the pulleys rotate in the same direction
$L = \pi/2\ (76.2+76.2)+2(400)$
$L = 1039.38$ mm
$L = 1040$ mm
Length of open flat belt is 1040mm.

D. Design of Pulley



Fig5. Pulley

For pulley is
The Dimension for the pulley is
Outer Diameter = 76.2mm
Inner Diameter = 25mm

V. RESULT

Time taken by lift to go down and return to the top.
Distance between lift at top and surface of ground = 1000mm
Weight of lift without passengers = 1kg

SR.NO	Weight added to lift (kg)	Time taken by lift to go down when weight added (sec)	Time taken by lift to come up when weight is removed (sec)
1	2kg	7sec	8sec
2	3kg	5sec	8sec
3	4kg	3sec	8sec

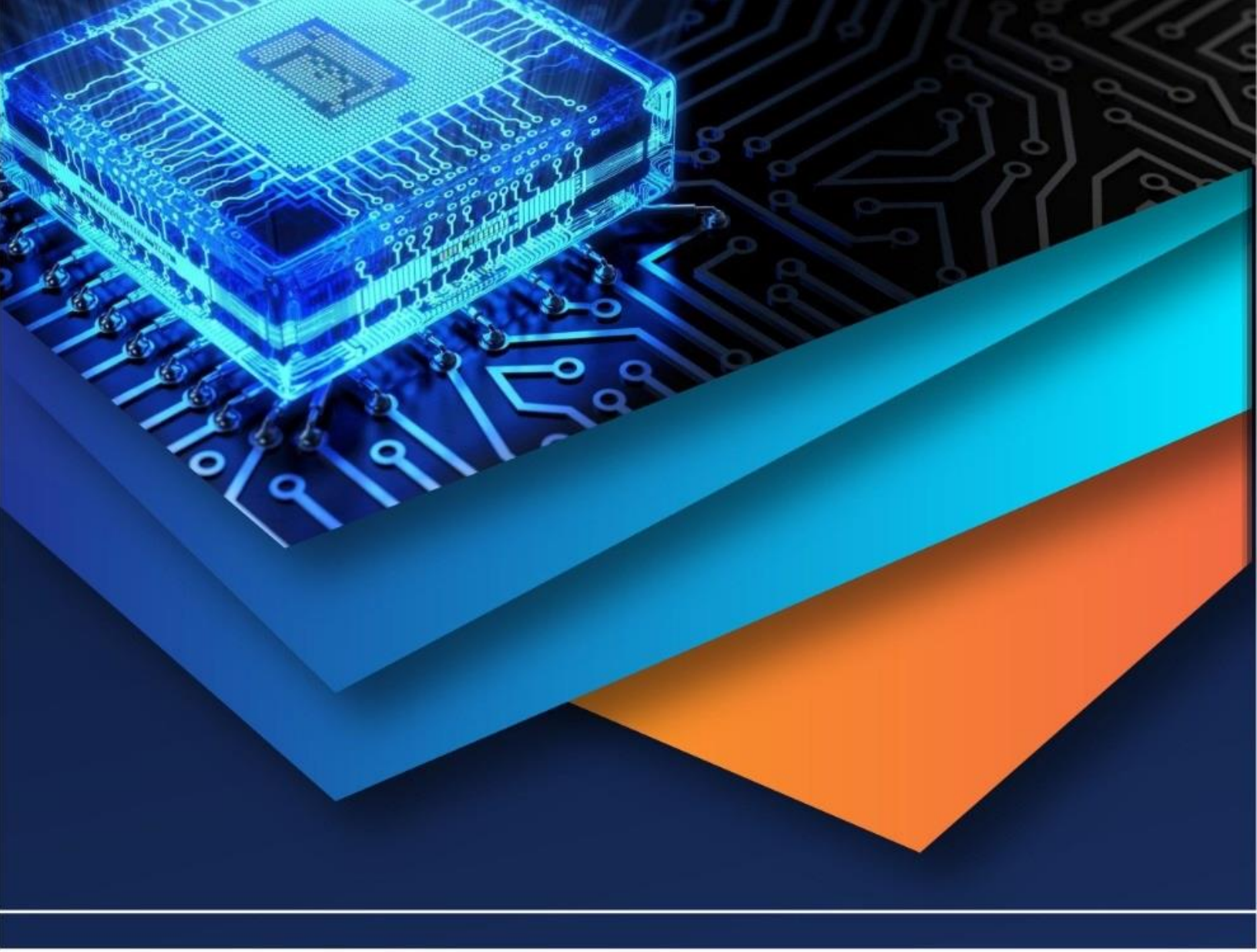
VI. CONCLUSION

The basic objective of our project was to enable a user come down from a multistorey building at a constant speed We have developed a system which controls the speed of the user while coming down from a building for achieving our objective we have use governor and clutch plate mechanism our project is an improved version of a product called sky-saver available in the market but the basic demerits of this device are that it is not cost efficient and does not work for varying load we have removed this demerit in our project. As almost everything described already for this design, we would like to say there are still numerous kinds of enhancement one can implement on this project to make it even more convenient the project we have made and present is quite efficient and is cost effective also.it has a great advantage over the sky-saver system present in today condition still locking brake can be provided and weight reduction can be done in this project.

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