

# Design and Fabrication of Elevator Safety Mechanism

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## ABSTRACT:-

Many research activities were developed in order to study the elevator safety mechanisms. Safety mechanism by including governors and sensors are tested before. So, we tried to find out one more suitable mechanism which can prevent elevator failures or safe working of an elevator. By using Rack and Pinion mechanism & Dynamo, electric energy is generated which can be stored in the battery.

## KEYWORDS:-

- 1) Mechanism Elevator Safety Mechanism
- 2) Mechanically Operated Safety Mechanism
- 3) Safety for Elevator over Speeding
- 4) Electronic Sensor Failure
- 5) Rack and Pinion Mechanism

## INTRODUCTION:-

In regular life it is becoming common to live in high rise buildings due to scarcity of land and its prices, since access for people living in this kind of building to their floor is made easy by lift.

It has been found that over the past decades 27 people were killed in elevator accidents each year, according to the U.S bureau of labor statistics and the CPSC, which does report on injury and death associated with elevators. Injuries from elevators affect about 10200 people every year. The main reason encountered for the failure in an elevator is due to cable break. Due to this above reason we can see that how elevator safety is needed and therefore in elevator it is required or needed to introduce elevator safety mechanism that restrain the elevator from dropping if it's supporting cable broke.

Thus, in 1852 Elisha Graves Otis designed the first safety for elevators. This device was a system of involving a spring operated cams that affianced the guide rails in an elevator shaft when the cable broke. Like these, many researchers

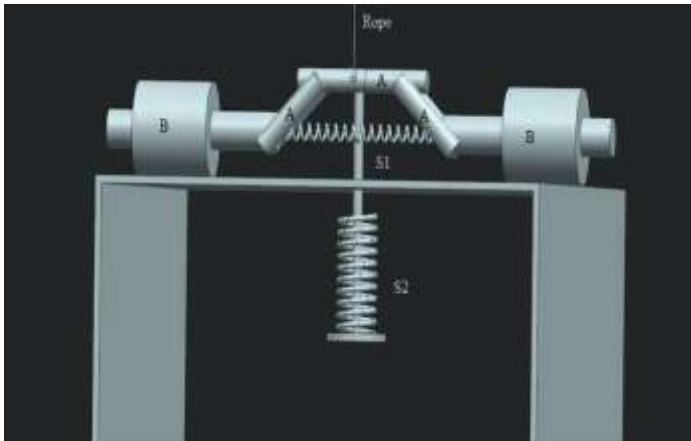
invented elevator safety mechanisms and they are over speed Governors and safety gear, so when a descending lift exceeds a specified speed, the over speed governor will lock the governor rope that will actuate the safety gear and it will grip the guide rails firmly and stop the lift safely. Other safety mechanism is a buffer that reduces the impact of lift car when descending lift exceeds its limit of travel in a failure. Now a day the type of mechanism used for safety purpose is electromagnetic catch safety mechanism which comprises motion sensor that will activate when lift's speed goes beyond a specified speed limit and electromagnetic mechanism will grip the guide rails.

## WORKING:

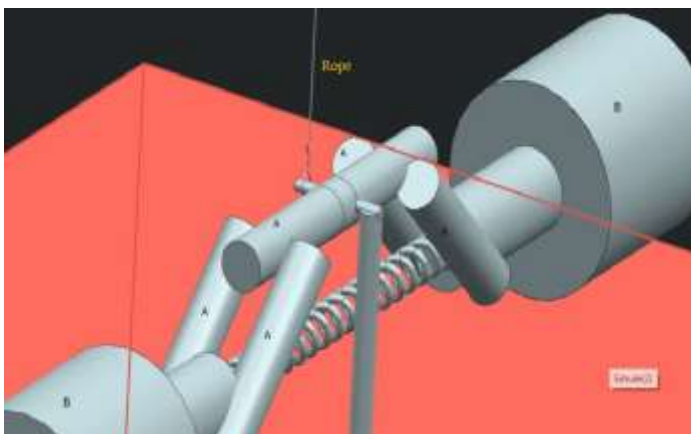
It has been found that electronic sensor which are used in present days in elevator are not work properly due to some reasons and they are listed below:-

- Defective door sliding – Failures of the open sensors to recognize hands or legs may cause the door close pinching hands or worse, arms. Failing to properly open can lead to limb loss, and crushes bone.
- Over speed – This is the most common cause of elevator litigation, Passengers may suffer serious injuries to the ankles, knees and other body parts. Counterweight malfunction or control systems fail to detect and correct over speed conditions and stop the elevator so, due to this passengers are thrown to the floor or against the cab wall due to the elevator moving at the excessive speed. For example – in a New York city Pan Plaza building, an elevator travelled from the 46<sup>th</sup> floor to the basement, impacting at about 1000feet per minute.
- Other electronic failures are soldered joints can fail in many ways like electro migration and formation of brittle inter metallic layers. Some failure shows only at extreme joint temperatures, hindering trouble shooting.
- Relay failure – Every time the contacts of an electromechanical relay are opened or closed, there is a certain amount of contact wear.

Therefore, to overcome this problem of electronics, the other way to stop the elevator is by mechanical means. So, our main focus is to prepare a mechanical operated safety mechanism. A mechanism is explained below:-



In our mechanism we have used two helical springs namely S1 and S2, a round bar “B” and support bush “A” as shown above, Rack and pinion mechanism. S2 spring is hardened and S1 is normal spring. The spring S2 is hardened up to we obtained the required stiffness. Whenever lift works properly, the rope is under tension and during this moment S2 spring will be in a contract position, a locking round bar is in unlocked position. But due to any accidental reasons, a rope breaks so that, tension acting on the rope releases. So because of this accidental reasons spring S2 expands and the locking bar locks in the hole of locking structure. After repairing, the rope will be again in tension due to this spring S2 contracts and this spring force will try to unlock the round bar but it may not happen in absence of spring S1 so the main purpose of spring S1 is that it helps to unlock the round bar in a smooth way from locking structure.



The purposes of support bushes are to grip both the round bars and the spring S1 together. In the above figure, we can

see that one end of the rope is connected to the support bush and other end of the rope is connect of pulley which is attached to the top of the frame.

Other reasons for failure of an elevator is that whenever there is a power cut off and due to that a person who is in the elevator may trapped for sometime in the middle of the two floors. To overcome this problem, we have used rack and pinion mechanism. Rack is attached to the wall and the pinion is attached to the lift. Whenever the lift is in working at that moment, rack and pinion gets meshed with each other so the linear motion of lift will give the rotary motion to the pinion. This rotary motion of the pinion converted to electrical energy and that will store in battery. So, whenever there is a power cut off, the stored energy in the battery is now used for this purpose for safely travel of the lift to the next upcoming floor.

#### SUMMARY:-

- The project carried by us is a step to move towards better safety mechanism.
- Our mechanism may be used in the future in case of accidental failures.
- As we have observed that our mechanism is totally mechanically operated so we don't even need to think of electronic sensor's failure.
- As Electronic sensor gets failed then Mechanical locking mechanisms is used.

#### CONCLUSION:-

Now-a-days electronic sensors and electromagnetic mechanism are use for controlling the elevator. But because of the failure of the electronic sensors, the controlling of over speeding elevator will not be done properly. So to overcome this we design safety mechanism that totally works on mechanical means. So, accidents due to over speeding of an elevator will be prevented by using our mechanism and that removes the human lives from danger.

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