



Escalator Speed Control

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Abstract—Escalator speed control is a smart mechanical arrangement which facilitates the entry and exit from an escalator more stable and easy. The current scenario only promotes the young and physically healthy persons to use the technology to full extend. Here arises the need for a better escalator design which facilitates the travel of every people possible. Traditionally the escalator moves at a constant speed from the entrance to the exit. Many people, especially the children and old finds it difficult to manage the sudden speed difference occurred during the entry and exit of an escalator. Frequent accidents occur in this way in the traditional escalators which makes restrictions to the travel of the children and old people. The “Escalator Speed Control” is a mechanical arrangement which allows the entrance or exit, to or from an escalator more balanced. A new layer of chain drive is made installed which moves in only at half the speed of the remaining escalator. This facilitates the gradual speed rise there by eliminating the chance of accidents.

Index Terms—Chain Drive, Escalator, Gear Box, Speed Reduction

I. INTRODUCTION

Escalator is a locomotive device which is mainly installed in public places like airport, railway stations, shopping mall and other commercial buildings. It facilitates the to and fro movement of people and goods from one floor to another. Escalator is a mechanical device which continuously moves at a constant speed. People find it difficult to enter and exit an escalator due to the variation of speed when stepping in and moving out. The sudden change from rest to motion occurs when we enter or exit an escalator, as an effect of Inertia. The current situations only promote the young and physically healthy persons to use the technology to full extend.

Nearer to many of the escalators we could find the warning boards which warn us for being extra conceit. Many escalators prohibit its usage by the children and the old age without guidance. Here arises the need for a better escalator design which facilitates the travel of every people possible. Traditionally the escalator moves at a constant speed from the entrance to the exit.

Many people, especially the children and old finds it difficult to manage the sudden speed difference occurred when they step from the floor to the escalator or vice versa. Many inexperienced and physically week are not able to make themselves comfort with the sudden speed change. But for this we cannot decrease the speed of the escalator to that level because it will eventually slow down the total speed of the system which is not likely to happen. Because the time cannot be made sacrificed in this fast moving world. Here arose the need of engineering to provide better safety and comfort to the people who use the escalator. So we aim at decreasing the relative speed so that it is easy to enter and exit, to and from an escalator.

As a result of studies and research made in the present situation a remedial solution to exit this problem, the design of “Escalator Speed Control” was made. Escalator speed control is a mechanical arrangement which facilitates the entry and exit from an escalator more stable and easy by decreasing the relative speed of entry or exit.

A new layer of chin drive is installed in the top and bottom of the escalator. The power possessed for chain drive movement is from the end shaft of the escalator itself. So we need no additional motor or power source to drive the new technique that is installed. The chain drive moves only in the half speed of the main escalator, which make the relative speed of the escalator decrease and making it safer and comfortable. Frequent accidents occur in this way in the traditional escalators could be thus eliminated by the arrival of this new technique which takes away the restrictions to the travel of the children and old people.

The “Escalator Speed Control” is a mechanical arrangement which allows the gradual speed rise there by eliminating the chance of accidents. So for a safer and comfortable escalator travel it is advised to install this new and innovative mechanical arrangement in every part of the world. Let’s move to new highs more safely and comfortably by using the “Escalator Speed Control”.



II. STUDY OF SUBJECT

POWER TRANSMISSION THROUGH GEAR

Power transmission is the movement of energy from its place of generation to a location where it is applied to performing useful work. Power transmission is normally accomplished by belts, ropes, chains, gears, couplings and friction clutches. A toothed wheel that engages another toothed mechanism in order to change the speed or direction of transmitted motion.

A gear is a component within a transmission device that transmits rotational force to another gear or device. A gear is different from a pulley in that a gear is a round wheel which has linkages ("teeth" or "cogs") that mesh with other gear teeth, allowing force to be fully transferred without slippage. Depending on their construction and arrangement, geared devices can transmit forces at different speeds, torques, or in a different direction, from the power source

GEAR CLASSIFICATION

Gears or toothed wheels may be classified as follows:

1. According to the position of axes of the shafts.

The axes of the two shafts between which the motion is to be transmitted, may be

- a. Parallel
- b. Intersecting
- c. Non-intersecting and Non-parallel

GEARS FOR CONNECTING PARALLEL SHAFTS

Spur Gear

Teeth is parallel to axis of rotation can transmit power from one shaft to another parallel shaft. Spur gears are the simplest and most common type of gear. Their general form is a cylinder or disk. The teeth project radially, and with these "straight-cut gears". Spur gears are gears in the same plane that move opposite of each other because they are meshed together. Gear 'A' is called the 'driver' because this is turned by a motor. As gear 'A' turns it meshes with gear 'B' and it begins to turn as well. Gear 'B' is called the 'driven' gear.

Parallel Helical Gear

The teeth on helical gears are cut at an angle to the face of the gear. When two teeth on a helical gear system engage, the contact starts at one end of the tooth and gradually spreads as the gears rotate, until the two teeth are in full engagement.

This gradual engagement makes helical gears operate much more smoothly and quietly than spur gears. For this reason, helical gears are used in almost all car transmissions. Because of the angle of the teeth on helical gears, they create a thrust load on the gear when they mesh. Devices that use helical gears have bearings that can support this thrust load.

One interesting thing about helical gears is that if the angles of the gear teeth are correct, they can be mounted on

perpendicular shafts, adjusting the rotation angle by 90 degrees.

Herringbone gears:

To avoid axial thrust, two helical gears of opposite hand can be mounted side by side, to cancel resulting thrust forces. These are called double helical or herringbone gears

Rack and pinion

Rack and pinion gears are used to convert rotation (From the pinion) into linear motion (of the rack). A perfect example of this is the steering system on many cars. The steering wheel rotates a gear which engages the rack. As the gear turns, it slides the rack either to the right or left, depending on which way you turn the wheel. Rack and pinion gears are also used in some scales to turn the dial that displays your weight.

GEARS FOR CONNECTING INTERSECTING SHAFTS

1. Straight Bevel Gear

Bevel gears are useful when the direction of a shaft's rotation needs to be changed. They are usually mounted on shafts that are 90 degrees apart, but can be designed to work at other angles as well. The teeth on bevel gears can be straight, spiral or hypoid. Straight bevel gear teeth actually have the same problem as straight spur gear teeth as each tooth engages; it impacts the corresponding tooth all at once. Just like with spur gears, the solution to this problem is to curve the gear teeth. These spiral teeth engage just like helical teeth: the contact starts at one end of the gear and progressively spreads across the whole tooth.

On straight and spiral bevel gears, the shafts must be perpendicular to each other, but they must also be in the same plane. If you were to extend the two shafts past the gears, they would intersect. The bevel gear has many diverse applications such as locomotives, marine applications, automobiles, printing presses, cooling towers, power plants, steel plants, railway track inspection machines, etc.

NON-INTERSECTING AND NON-PARALLEL

1. WORM AND WORM GEAR

Worm gears are used when large gear reductions are needed. It is common for worm gears to have reductions of 20:1, and even up to 300:1 or greater.

Many worm gears have an interesting property that no other gear set has: the worm can easily turn the gear, but the gear cannot turn the worm. This is because the angle on the worm is so shallow that when the gear tries to spin it, the friction between the gear and the worm holds the worm in place.



III. PROPOSED METHODOLOGY

PRINCIPLE USED

Speed reduction occurs when a gear with lesser teathed gear is meshed with a gear with more gear teeth. In this, a simple mechanical gear arrangement is been made to facilitate the speed reduction. Whenever two gears are meshed together the rotation will be always in the opposite direction. So to make similar direction movement possible an idler gear is made installed.

The speed of the drive is made exactly half in the top and bottom chain drives in order to co-match the revolutions made.

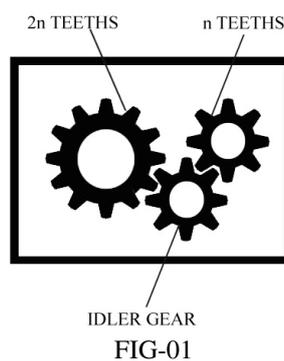
GEAR BOX

The Escalator Speed Control is the mechanical arrangement which consist of mainly three drives namely a driver gear, an idler gear and driven gear. This arrangement is made after the following Conditions.

Condition 01 - The driven gear of the Escalator Speed Control System is the extension made in the shaft of the main escalator. This facilitates in the single motor usage in the whole system.

Condition 02 - An Idler is to be installed in between the two gears namely, the driver and driven gear. This facilitates the rotation of the driver and the driven gear in the same direction.

Condition 03 - The Driven gear is to be designed in such a way that the number of gear tooth's present driven gear should be double to the number of tooth's that are present in the driver gear. These make sure that the speed is made half between the chain drive and the escalator.



COMPARISION OF PROPERTIES

The following are the comparative studies made by comparing the traditional escalator system and the proposed system of "Escalator Speed Control". Different properties are considered and studied.

Revolutions

When a complete revolution is been made by the driver gear, only a half revolution is made by the concerned gear inside the gear box.

Speed

When the escalator moves at a defined rate of speed, only the half speed is achieved by the top and bottom chain drives which are connected to them.

Relationship

Revolutions in gear \propto Speed of escalator

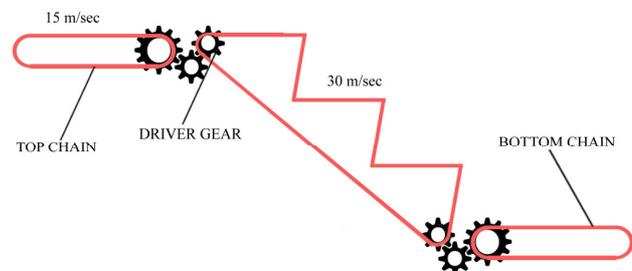
Or we can conclude that an equal change in revolution of gear result in an equal change in speed of escalator

WORKING PROCEDURE

Consider a person stepping on to the relatively slow moving chain drive. Since having only half the actual speed of the escalator in the chain drives makes the person more comfortable and allows him to maintain in an equilibrium position.

As the chain drive moves and reaches the main escalator the person is made to make his second step to the fast moving escalator. But it is note able that even though stepping to a fast moving escalator makes no discomfort to the person since the relative speed of the chain drive and the real escalator is comparatively low by the new and innovative technique namely the "Escalator Speed Control".

The person experiences a more stable movement in between the drives. This eliminates the chance of accidents and this makes them more user friendly to all age categories.



The above shown is a diagrammatic representation of the "Escalator Speed Control". A new layer of chin drive is installed in the top and bottom of the escalator namely, the top chain and bottom chain. The power possessed for chain drive movement is from the end shaft of the escalator itself.

The driven gear of the Escalator Speed Control System is the extension made in the shaft of the main escalator. So we need no additional motor or power source to drive the new technique that is installed. When a complete revolution is been made by the driver gear, only a half revolution is made by the additional gear inside the gear box, which make the relative speed of the escalator decrease and making it safer and comfortable. Frequent accidents occur in traditional escalators is eliminated by this new. The working is simple and cost of installation is also affordable.



I. CONCLUSION

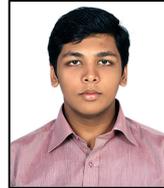
The “Escalator Speed Control” is a mechanical arrangement which allows the gradual speed rise there by eliminating the chance of accidents. So for a safer and comfortable escalator travel it is advisable to install this new and innovative mechanical arrangement in every part of the world. This ensures the safety to every person using it.

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