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Design and Fabrication of Hydraulic Escalator

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Abstract: ***AN escalator is a mechanics moving stair way common in place with a lot of foot traffic or where a convention al staircase would be a very long and tiring to climb. it can be seen malls shopping complex parking escalator are often installed in pair with an up escalator and adown escalator adjacent to each other while single escalator may be changed to go up and down according to the direction of heavier traffic at different time and day. escalator is similar that of conveyor but can be move inclined to move from one end of an escalator also include a handrail that moves in conjunction with the stairs. These gears have chain that loop \around the gear and run down each side of the escalator. The handrail that rider use for balance and safety on their ride up or down escalator are powered by the same system that power the faster the shaft revolves the metal ball swung out by centrifugal force a should the lift speed exceed a predetermined figure the governor actuates a brake.***

Keywords: ***AN escalator, mechanics moving, common, escalator, handrail, centrifugal***

I. INTRODUCTION

Fig 1.1: Escalator

Escalators are used around the world in places where elevator would be impractical. Principal areas of usage include department stores, stations), convention centers, hotels, arenas, stadiums, and public buildings. Escalators have the capacity to move a large number of people, and they can be placed in the same physical space as a staircase. They have no waiting interval (except during very heavy traffic), they can be used to guide people toward main exits or special exhibits,

And they may be weatherproofed for outdoor use. A non-functioning escalator can function as a normal staircase, whereas many other conveyances become useless when they break down.

1.1. Operation and Layout

Escalators, like moving walkways, move at constant speeds of around 0.3–0.6 metres (1–2 ft) per second. The typical angle of inclination of an escalator to the horizontal is 30 degrees, and the total difference in height can be about 18 metres (60 ft) or more. Modern escalators have single-piece aluminum or stainless steel steps that move on a system of tracks in a continuous loop.

Fig 1.2: Crisscross layout

Escalators have three typical configuration options: *parallel* (up and down escalators side by side or separated by a distance, seen often in metro stations and multilevel motion picture theaters), *crisscross* (minimizes space requirements by "stacking" escalators that go in one direction, frequently used in department stores or shopping centers), and *multiple parallel* (two or more escalators together that travel in one direction next to one or two escalators in the same bank that travel in the other direction).[1]

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1.2. Design and Layout Considerations

A number of factors affect escalator design. These include physical requirements, location, traffic patterns, safety considerations, and aesthetic preferences. Foremost, physical factors like the vertical and horizontal distance to be spanned must be considered. These factors will determine the length and pitch of the escalator. The building infrastructure must be able to support the heavy components. The escalator should be located where it can be easily seen by the general public. Furthermore, up and down escalator traffic should be physically separated and should not lead into confined spaces. be designed to cater for the peak traffic flow discharged from a train, without causing excessive bunching at the escalator entrance.

In this regard, escalators help in controlling the flow of people. For example, if an exit can only be accessed by an escalator, one cannot use it as an entrance unless one tries to use the escalator in the "wrong" direction. This may reduce security concerns. Escalators are sometimes used as the exit from an airport security checkpoint. Such an egress point would still generally be staffed to prevent its use as an entrance during times of light pedestrian traffic.

It is preferred that there is a staircase next to the escalator if the escalator is the primary means of transport between floors[] It may also be necessary to provide an elevator lift near the escalator for wheelchairs and disabled people. Finally, consideration should be given to the aesthetics of the escalator.

1.3. Safety

Fig 1.4: Escalator Safety Guidelines at Taipei Metro

Earlyeuropean Manufacturers

Hallé**,** Piat installed its "stepless" escalator in Harrods Knightsbridge store on Wednesday, November 16, 1898, though the company relinquished its patent rights to the department store. Noted by Bill Lancaster in The Department Store: a Social History, "customers unnerved by the experience were revived by shopmen dispensing free smelling salts and cognac."[19] The Harrods unit was a continuous leather belt made of "224 pieces ...strongly linked together traveling in an upward direction," and was the first "moving staircase" in England.

Hocquardt received European patent rights for the Fahrtreppe in 1906. After the Exposition, Halle continued to sell its escalator device in Europe but was eventually eclipsed in sales by other major manufacturers.

In the first half of the twentieth century, several manufacturers developed their own escalator products, though they had to market their devices under different names, due to Otis' hold on the trademark rights to the word "escalator." New York-based Peelle Company called their models the Motorstair, and Westinghouse called their model an Electric Stairway. The Toledo-based Haughton Elevator company referred to their product as simply Moving Stairs. This trademark is no longer in effect. Kone and Schindler introduced their first escalator models several decades after the Otis Elevator Co. but grew to dominance in the field over time. Today, they, Mitsubishi, and ThyssenKrupp are Otis' primary rivals. Schindler now stands as the largest maker of escalators and second largest maker of elevators in the world, though their first escalator installation did not occur until 1936. In 1979, the company entered the United States market by purchasing Haughton Elevator; a decade later, Schindler assumed control of the North American escalator/elevator operations of Westinghouse, forming Schindler's American division.

Kone expanded internationally by acquisition in the 1970s, buying out Swedish elevator manufacturer Asea-Graham, and purchasing other minor French, German, and Austrian elevator makers before assuming control of Westinghouse's European elevator business. As the last "big four" manufacturers held on to the escalator market, KONE first acquired Montgomery Elevator company, then took control of Germany's Orenstein & Koppel Rolltreppen.

II. COMPONENTS USED

- Escalator
- Pump
- Structure

2.1. Description

2.1.1. Escalator

An escalator is a vertical transportation device in the form of a moving staircase a conveyor which carries people between floors of a building. It consists of an motor-driven chain of individually linked steps. These steps are guided on either side by a pair of tracks which force them to remain horizontal.

Fig 4.1: Escalator

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2.1.2 Landing Platforms

These two platforms house the curved sections of the tracks, as well as the gears and motors that drive the stairs. The top platform contains the motor assembly and the main drive gear, while the bottom holds the step return idler sprockets. These sections also anchor the ends of the escalator truss. In addition, the platforms contain a floor plate and a comb plate.

The floor plate provides a place for the passengers to stand before they step onto the moving stairs. This plate is flush with the finished floor and is either hinged or removable to allow easy access to the machinery below. The comb plate is the piece between the stationary floor plate and the moving step.

It is so named because its edge has a series of cleats that resemble the teeth of a comb. These teeth mesh with matching cleats on the edges of the steps. This design is necessary to minimize the gap between the stair and the landing, which helps prevent objects from getting caught in the gap.

2.1.3 Truss

The truss is a hollow metal structure that bridges the lower and upper landings. It is composed of two side sections joined together with cross braces across the bottom and just below the top. The ends of the truss are attached to the top and bottom landing platforms via steel or concrete supports. The truss carries all the straight track sections connecting the upper and lower sections.

2.1.4 Balustrade

Either made of metal, sandwich panel, or glass it structures the handrails of the escalator. It also provides additional protection for the handrail and passengers. Some escalators have direction arrows on the ends of the balustrade. The button that turns on and off an escalator is also located at the ends of the balustrade. Also, moving walkways use balustrades in the same way.

2.1.5 Tracks

The track system is built into the truss to guide the step chain, which continuously pulls the steps from the bottom platform and back to the top in an endless loop. There are actually two tracks: one for the front wheels of the steps (called the step-wheel track) and one for the back wheels of the steps (called the trailer-wheel track).

The relative positions of these tracks cause the steps to form a staircase as they move out from under the comb plate. Along the straight section of the truss the tracks are at their maximum distance apart. This configuration forces the back of one step to be at a 90-degree angle relative to the step behind it. This right angle bends the steps into a shape resembling a staircase. At the top and bottom of the escalator, the two tracks converge so that the front and back wheels of the steps are almost in a straight line. This causes the stairs to lay in a flat sheetlike arrangement, one after another, so they can easily travel around the bend in the curved section of track.

The tracks carry the steps down along the underside of the truss until they reach the bottom landing, where they pass through another curved section of track before exiting the bottom landing. At this point the tracks separate and the steps once again assume a staircase configuration. This cycle is repeated continually as the steps are pulled from bottom to top and back to the bottom again.

2.1.6 Steps

The steps themselves are solid, one piece, die-cast aluminum or steel. Yellow demarcation lines may be added to clearly indicate their edges. In most escalator models manufactured after 1950, both the riser and the tread of each step is cleated (given a ribbed appearance) with comb-like protrusions that mesh with the comb plates on the top and bottom platforms and the succeeding steps in the chain. Seeberger- or "step-type" escalators (see below) featured flat treads and smooth risers; other escalator models have cleated treads and smooth risers.

The steps are linked by a continuous metal chain that forms a closed loop. The front and back edges of the steps are each connected to two wheels. The rear wheels are set further apart to fit into the back track and the front wheels have shorter axles to fit into the narrower front track. As described above, the position of the tracks controls the orientation of the steps.

2.1.7 Handrail

The handrail provides a convenient handhold for passengers while they are riding the escalator. In an escalator, the handrail is pulled along its track by a chain that is connected to the main drive gear by a series of pulleys. It is constructed of four distinct sections. At the center of the handrail is a "slider", also known as a "glider ply", which is a layer of a cotton or synthetic textile. The purpose of the slider layer is to allow the handrail to move smoothly along its track. The next layer, known as the "tension member", consists of either steel cable or flat steel tape, and provides the handrail with tensile strength and flexibility. On top of tension member are the inner construction components, which are made of chemically treated rubber designed to prevent the layers from separating. Finally, the outer layer—the only part that passengers actually see—is the cover, which is a blend of synthetic polymers and rubber. This cover is designed to resist degradation from environmental conditions, mechanical wear and tear, and vandalism.

In the factory, handrails are constructed by feeding rubber through a computer-controlled extrusion machine to produce layers of the required size and type in order to match specific orders. The component layers of fabric, rubber, and steel are shaped by skilled workers before being fed into the presses, where they are fused together.

In the mid-twentieth century, some handrail designs consisted of a rubber bellows, with rings of smooth metal cladding called "bracelets" placed between each coil. This gave the handrail a rigid yet flexible feel. Additionally, each bellows section was no more than a few feet long, so if part of the handrail was damaged, only the bad segment needed to be replaced. These forms of handrail have largely been replaced with conventional fabric-and-rubber railings.

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III. EXPERIMENTAL SETUP

When switch ON the three phase supply that time the pump will be sucked the oil from reservoir. Initially required amount of hydraulics stored in a tank. it is sucked by using hydraulic pump which is working by using electric power. The hydraulics is apply on the turbine blades or hydraulic motor which is connected with shaft. the shaft is rotated with respectively to applied hydraulic velocity. here the shaft is connected with escalator which is to rotate and lift up or down people smoothly. Then after oil goes through control valve. The escalator which having four control valves. The first valve is used to sucked the oil from reservoir. The second valve used to return the oil from pump. The third valve used to forward rotation of the escalator step The fourth valve used to reverse rotation of the escalator step. The control valve power pack is connected by two pipes, which used to recycling the oil.

By these processes the oil wastage is reduced.

IV. ADVANTAGES

- The process uses low cost.
- No extra skill is required for operating this system.
- Easier maintenance.
- Continuous operation is possible without stopping.
- More efficient.
- Less loss in transmission.

APPLICATIONS

- Shopping Mall
- Cinema Theater
- Departmental Store

V. CONCLUSION

This projects mainly save the time and reduced the human effort, the above 60 age reached persons struggle to clamp the steps because they are have a knee problem so this project very use full to them.

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