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Introdução à Engenharia Mecânica

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Título: Rail Lift

Rail Lift (R-Lift)

Our idea is to produce a system that not only will help elder people descending steep stairs but also people that needs carrying cargo up the hill.

The idea came to us while visiting Mouraria, where we noticed the typical steep roads and stairs. It occurred to us that we could do something to solve the mobility problem of elder people and also transporting goods to the top of this quarter. In brief, something to facilitate mobility in Mouraria.

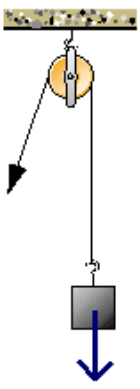
We went to Mouraria and talked with the local people that gave us some good feedbacks and advises about our idea.

SO WHAT IS THE R-LIFT?

The rail lift is a motor free system that works with the help of a counterweight. It consists on a chair, seated on rails, attached to a cable which is guided upstairs by wheels

In the end of the staircase, there is a pulley that turns the cable to downstairs direction which then will be attached to the counterweight that will make the chair's movement possible.

The downward movement is for people going downstairs. The upstairs movement is only possible for cargo within weight limits. So the chair will need a little barrier that can be fixed to the chair and make it possible to convert it into a basket so the cargo won't slip.



Fundamental is the breaking system which will be incorporated into the wheels moving on the rail. The breaks will be like the ones on a motorcycle. The wheels will have a break discs with rubber pads near it, and every time that the break handle (assembled on the right side of the chair) is activated, the rubber pads are pressed against the break discs slowing or even stopping the chair's progress. The breaks can be set so people don't need to be always pressing and releasing the breaking handle according to the velocity they wish to go.

On the bottom of the staircase, there will be a locking system which will prevent the chair to go up as soon as the person arrives to the end of the staircase and gets of the chair. This locking system will be composed by a hook that will firmly hold the chair on the bottom of the staircase. This hook can be released from the chair not only on the bottom of the staircase but also on top of it, so people upstairs can use the chair even if it's initially downstairs.

The chair will be connected to the chassi which will be connected to the wheel's axes. There will be 4 wheels in order to increase stability. The breaks will be installed on the back wheels.

The chair will move on top of one rail on which the wheels will safely roll. In order to move up and down the stairs the weight also has to have a rail system just like the chair.

Due to the fact that this is a system in which movement is induced by a counterweight, we had to establish weight limits. The weight is 40kg, so, keeping in mind the weight of the cable and chair, and frictional forces between the rails and the wheels and between the cable and the wheels the guide the cable upstairs, the maximum weight that this system can lift is 15kg, and the minimum weight that a person must have to go down the stairs is 45kg

One problem that occurred to us is the potential danger to people (children in particular) walking up or down the stairs not expecting the movement of the chair and getting hit by it. A solution to that problem is to put a safety barrier separating the system, which would guarantee the safety but increase the space demands for the whole system. If the stairs are very narrow the whole system (with the barrier) could occupy its total width, but as we're focusing on more broad stairs (next picture), we think that the whole system would leave a path on both sides so people can walk up and down easily.