To design and build a mousetrap powered car essay sample

Situation

The Good Shepherd Lutheran College requires a mousetrap-powered car to be designed and built for a Grade 12-assessment piece. The mousetrap car distance achiever must be designed to go the furthest distance possible using a medium sized mousetrap and any other materials needed. A test will then be carried out over a flat floor and higher marks will be awarded to the further the mouse trap racer goes, whilst taking into consideration the time it takes to go the distance.

Design Brief

To design and build a mousetrap powered car that can travel the furthest distance possible over a flat surface in a relatively short period of time.

Constraints

Compared to a large mousetrap or rattrap, the power from the mousetrap is limited because only a medium sized mousetrap can be used. There is a time limit of 6 lessons to build and design the mousetrap car; this limits the amount of time for testing and modifications both before and after the prototype has been built.

Investigation

When designing a mousetrap racer there are a few things that are needed to be successful. Friction, aerodynamics and size all need to be taken into careful consideration when designing the car. Friction will generally only occur between the wheels, pulleys and axels if used and when designing

something to go far and fast friction is not wanted. To make sure that excess friction doesn't occur, measures can be taken such as making sure that everything is the right tension and that the material used for the wheels won't slip on the ground. When designing the car, aerodynamics should be taken into account by making sure that there isn't any flat surfaces facing the front of the car. The lighter and smaller the car, the less weight there is on the wheels, which means that the mousetrap will be able to pull the axel faster.

Idea's

Basic Design Drag-car type Design

A pulley system Two-wheel Design

Realisation

The main body of the car is made from lightweight, 2mm thick aluminium. Attached to the main body are the four square 5x10mm wide pieces of pipe, with 5. 5mm holes drilled through them. These pieces of pipe were attached to each other using a strong bonding agent ' Araldite', this was done with the axels in the holes so that the they were aligned straight. The wheels were then made with 3mm-balsa wood, using a protractor to mark out one wheel. The wood was cut using a band saw and the remaining small bumps were then ridded of using a sander. Once one had been made the other was measured-up by using the first as a stencil, the same process as aforementioned was then used again to make the wheel. Once the 5mm axel had been cut using a hacksaw, a washer was stuck on each wheel and the

axel then threaded through. Hot glue was then used to connect the axels onto the wheels. The drill press was then used again to drill holes through the remaining main body part, and also the mousetrap. A bolt was then threaded through the mousetrap and body and tightened with a shifting spanner. A strong, lightweight, narrow piece of plastic was then attached to the mousetrap by means of sticky-tape. Finally, to attach the axel to the mousetrap small gauge fishing line was used with a loose slipknot at the end of the string.

Evaluation

The mousetrap-powered car that I designed and built was unsuccessful in its attempt to fulfil the requirements given. The drag-car design failed to beat its first attempt of four meters in five seconds, the main problem being that the mousetrap wasn’t powerful enough to pull the large back wheels even when attached to the hole closest to the axel. However, the design was not a complete failure because with slightly smaller back wheels and a smaller arm on the mousetrap, the car would most likely be able to travel a distance of over ten meters. The reason these modifications weren’t carried out before the final test was because the short time space provided wasn’t enough after the preliminary construction process.

Construction Methods

Basic Design – The basic design is the building block for all the other suggested methods. This concept is very basic and although it is almost certain that it will work, it won’t break any new ground in doing so. The body, wheels and axels are usually made out of wood in these designs.

Drag-car Type Design – This design is shaped around a drag car, which is built for speed. The drag cars large rear wheels means that it will make more distance in each revolution of the axel. The small front wheels let the weight lean forward whilst lightening the overall weight of the car. The body would be made out of aluminium and the axels of 4mm round steel. The axels would then sit in slightly bigger holes drilled into 10mm square steel pipe. The mousetrap would be attached with a bolt at the front of the mousetrap. The 20cm diameter wheels would be made out of 3mm-balsa wood.

A pulley system – A pulley system could be used in conjunction with any of the other cars. A pulley system lightens the load on the mousetrap, allowing it to snap shut faster and therefore making the car go faster. The pulleys could be made out of plastic because of its lightweight properties or meccano-style metal ones.

Two-wheel Design – The two-wheel design works on the principal of having less weight to go faster. The mousetrap is simply hung on the axel, and then pinned into the wheels at the other end. As the mousetrap shuts it pulls itself around and moves forward. However this design has many flaws, some of these flaws are that a slight bump would send it off coarse and the string is only very small so it doesn’t have much time to accelerate or cruise. The design could also be a complete failure if the mousetrap isn’t strong enough to pull itself over.

Final Choice

The drag-car type design is the method that I chose to build because the time constraints meant that I wouldn’t be able to iron out the flaws of the

two-wheel design and the pulley system in time. Some adjustments to the drag-car would be beneficial such as tapered sides; this will get rid of excess weight. More than one hole for the mousetrap to be attached will help for finding the correct distance needed from the axel to the mousetrap.