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Simple Magnetic Levitation Train

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Abstract: *It is based on the like poles repelling principle of magnetism. It consists of magnetic strip, wood material, propeller and motor. The two long magnetic strips are made as rail, and they are glued to the long piece of wood as a base or ground in such a way that the north pole of the magnet stays up. A 3D printed model is used as train, two magnetic strips are glued at the bottom of the train. The train is placed on the rail, it should levitate because the north poles of the rail and train magnets faces each other. The train might slide right or left and that also can be controlled by side supports..*

Keywords: Maglev Levitation, Train, Propel, Magnets, Poles

I. INTRODUCTION

As the world continues to grow and the cities are continuing to become more crowded and congested, the normal transportation will not be able to handle these overpopulated areas. Hence it is of utmost important and necessary to develop alternate modes of transport or to modify existing ones. Travel time is a critical issue for all transport modes. Rail transport has higher running speed than road transport and easy accessibility than air transport. However, for long-distance travel, the travelling speed of high-speed trains is still too low to compete with air transport on distance longer than 800 km. For mass transport in urban areas, noise and vibration are of concern for the people living along the railway lines. These are limitations to the further development of rail transport to compete with other modes of transport. Efficient and effective principles and techniques must be employed to develop better transport mode to address most of the problems facing nowadays

II. LITERATURE REVIEW SUMMARY

A literature review on maglev trains reveals that they are high-speed transportation systems that use magnetic levitation to eliminate friction and achieve smooth and efficient travel. The MAGLEV TRAIN uses the electromagnetic force which is generally created between the magnets mounted on the bottom of the vehicle and the coils which are attached to the ground or guide way over which the trains move The findings indicate that maglev technology holds great promise for future transportation systems, offering a potential solution to congestion and improving overall efficiency in the transportation sector. Maglev is a method of propulsion that uses magnetic levitation to propel vehicles with magnets rather than with wheels, axles and bearings. With maglev, a vehicle is levitated a short distance away from a guide way using magnets to create both lift and thrust

III. METHODOLOGY

Using two long magnetic strips as rails, attach them to a long piece of wood, which serves as the base or ground. Ensure that the north side of the magnetic strip faces upward. For the train itself, attach two magnetic strips to the bottom. When the train is placed on the rail, it will levitate due to the same poles of magnets facing each other. The train's lateral movement can be controlled by side supports, not allowing it to slide to the left or right. In the front, mount a propeller with the help of a shaft. Inside the train, place a DC motor that drives the shaft. The motor's speed is controlled by a controller. The power supply is provided through traditional means.

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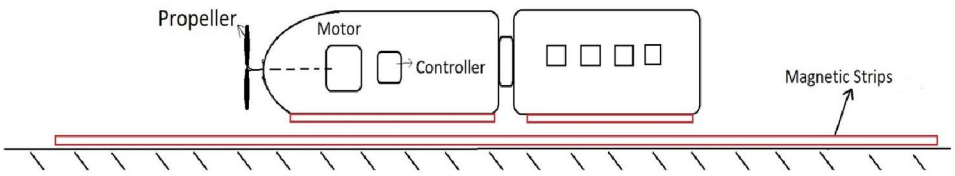


Figure 1.1 Model Layout of MAGLEV

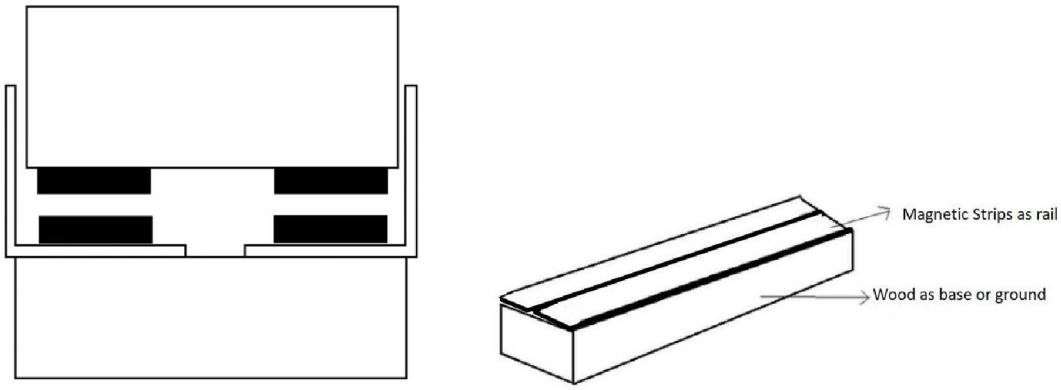
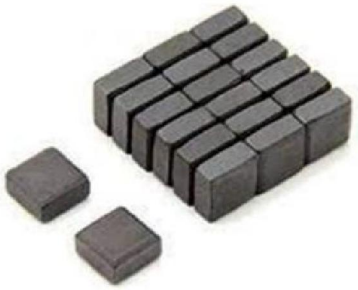


Figure 1.2 Magnetic rail track

IV. COMPONENTS

Ferrite Block Magnet: A ferrite is a ceramic material made by mixing and firing large proportions of iron (III) oxide (Fe_2O_3, rust) blended with small proportions of one or more additional metallic elements, such as strontium, barium, manganese, nickel, and zinc. Unlike other ferromagnetic materials, most ferrites are not electrically conductive, making them useful in applications like magnetic cores for transformers to suppress eddy currents. Each magnet can lift up to 100 grams.



Wooden Basement: They provide support to the rails. They transfer the loads from the rails to the ballast and subgrade. These maintain proper alignment of the track. These hold the rails to proper gauge in all situations.
Figure 1.4

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Brushless D C Motor: It is a synchronous motor using a direct current (DC) electric power supply. It uses an electronic controller to switch DC currents to the motor windings producing magnetic fields which effectively rotate in space and which the permanent magnet rotor follows. The controller adjusts the phase and amplitude of the DC current pulses to control the speed and torque of the motor. This control system is an alternative to the mechanical commutator (brushes) used in many conventional electric motors. Figure1.5

Propeller blade: A propeller blade is a rounded blade that rotates in a circle, helping to move a vehicle by pushing against water or air. Propellers use the laws of physics to propel, or drive forward, an aircraft or a boat. The basic structure of a propeller is a spinning or rotating shaft with wide, curved blades attached to it.
Figure 1.6

V. RESULTS AND DISCUSSIONS

- Magnetic levitation trains are capable of exceeding speeds of more than 180 km/h, surpassing conventional trains.
- Friction is reduced
- Reduced technical issues such as vibrations, rail wheel wear, and rolling noise.
- Less energy is required compared to conventional trains, making it eco-friendly to nature

VI. FUTURE SCOPE FOR MAGLEV

- MAGLEV trains are known for their exceptional speed capabilities. In the future, MAGLEV systems can be further developed to provide high-speed transportation between major cities and regions. With speeds reaching several hundred miles per hour, MAGLEV trains could revolutionize long-distance travel, making it faster and more efficient than ever before.
- MAGLEV trains have the potential to revolutionize freight(goods) transportation by offering high-speed, efficient, and environmentally friendly options for moving goods. Dedicated MAGLEV freight lines could significantly improve logistics and supply chain operations, enabling faster delivery times and reducing transportation-related emissions
- The concept of Hyperloop, a high-speed transportation system using near-vacuum tubes, shares some similarities with MAGLEV technology. In the future, there could be possibilities for integrating MAGLEV principles into Hyperloop systems, creating even faster and more efficient modes of transportation.
- Continued investment in research and development can lead to further advancements in MAGLEV technology. Improvements in energy efficiency, cost-effectiveness, safety measures, and passenger comfort can be explored, ensuring that MAGLEV trains become a viable and sustainable transportation option in the future.

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VII. CONCLUSION

- The Maglev train system seems to be a more sustainable and faster mode of transportation compared to conventional train systems.
- Using magnets instead of fossil fuels increases the efficiency of maglev trains and eliminates the emission of greenhouse gases into the atmosphere, making them eco-friendly in nature
- The track of a Maglev train is smaller compared to that of conventional trains, which allows it to use less space. The track is built above the ground
- The maglev train levitates above the track, therefore it does not experience mechanical friction or rail wear, and thus requires low maintenance
- Although the construction costs of Maglev trains are much higher compared to conventional train systems due to the requirement of a high initial investment and the need to build a completely new track system, they cannot be modified to operate on the existing track system
- The repelling force between two magnets with same poles facing each other varies based on the distance between the magnets. The repelling force increases when the two magnets get closer to each other

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