INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)

www.ijprems.com
editor@ijprems.com

Vol. 04, Issue 03, March 2024, pp: 700-702

e-ISSN : 2583-1062

Impact Factor: 5.725

DEVELOPMENT OF MAGNETIC TRAIN

Kutal Abhishek G[1], Auti Chetan B[2], Pawar Ritesh P[3], Shendkar Vivek R[4], Mrs. More A. G[5], Prof. Zadokar A. A[6]

[1,2,3,4]Students, Diploma Electrical In Engineering, Samarth Polytechnic, Belhe. Taluka – Junnar, Dist -Pune India.

[5]Guide: Diploma Electrical In Engineering, Samarth Polytechnic, Belhe. Taluka – Junnar, Dist -Pune. India.

[6]Coordinator, Diploma Electrical In Engineering, Samarth Polytechnic, Belhe. Taluka – Junnar, Dist -Pune. India.

DOI: https://www.doi.org/10.58257/IJPREMS33004

ABSTRACT

By using magnetic levitation technology to build a fast, economical, and eco-friendly form of transportation, the magnetic train project seeks to completely transform how people move. A prototype magnetic train system that can travel faster than current train systems will be designed and built as part of this project. Because traditional tracks and wheels are not required when using magnetic levitation technology, efficiency is boosted, and friction is decreased. As a result, passengers will be able to ride at much faster speeds on the magnetic train, cutting down on travel time and improving productivity. The magnetic train project prioritizes speed as well as reducing environmental effect. Through the use of magnetic levitation technology, the train uses less energy and generates less noise and vibration.

1. INTRODUCTION

It is more important than ever to have high-speed, environmentally friendly, and efficient transportation in today's hectic society. Conventional transportation means, such automobiles, buses, and trains, are frequently beset by problems like poor speed limits, pollution, and traffic jams. Consequently, there has been an increase in curiosity about alternate transportation systems that can deal with these issues. A notable example of this type of technology is the magnetic levitation (maglev) train. Strong magnets are used by maglev trains to levitate above the rails, doing away with the need for wheels and lowering resistance. This enables travel at speeds unmatched by traditional trains that is silent, energy-efficient, and smooth. Maglev technology has been developed for many years, with Germany, China, and Japan at the forefront of the field.

2. SYSTEM PROPOSED

The following elements are part of the magnetic train project's proposed system:

a) Magnetic levitation system: This system will raise the train off the tracks and move it ahead without requiring the train to make physical contact with the tracks. It does this by using magnetic levitation technology.

b) Propulsion system: To generate the magnetic force required to move the train ahead at a fast speed, the propulsion system will be made up of strong electromagnets.

c) Control system: To manage the train's direction, braking, and speed, an advanced control system will be put in place. To guarantee secure and effective operation, this system will rely on sensors and computer algorithms.

d) Power supply system: An electrical power supply system will be installed on board to power the magnetic train.

3. LITERATURE SURVEY

In order to reduce friction and achieve high speeds, magnetic levitation, or maglev, trains use magnetic fields to propel and hang themselves above the tracks. For a long time, the transportation industry has been interested in these trains because they have the potential to completely change how people travel by offering quicker, more effective, and more ecologically friendly options. The idea behind maglev trains originated in the early 1900s when researchers started experimenting with magnetic levitation as a form of propulsion. The first commercial maglev train systems were built in the 1980s after nations like Germany and Japan started to develop workable maglev train technologies in the 1960s.

Among the

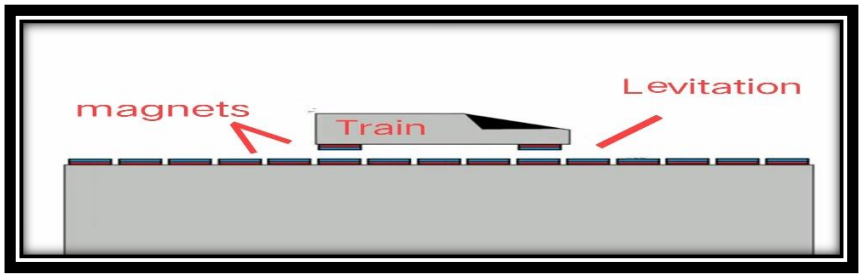

Fig.no 1 Levitation of magnetic Train

INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)

www.ijprems.com
editor@ijprems.com

Vol. 04, Issue 03, March 2024, pp: 700-702

e-ISSN : 2583-1062

Impact Factor: 5.725

Working Principle

Magnetic levitation, also known as maglev, is a method of levitating objects using magnetic fields. The principle behind magnetic levitation is based on the repelling force between two magnets with like poles facing each other. This repelling force can counteract the force of gravity, allowing an object to float or be suspended in the air. In a maglev system, superconducting magnets are used to create powerful magnetic fields that are capable of levitating an object. These magnets are usually cooled to extremely low temperatures using liquid nitrogen or helium to achieve superconductivity, which enables them to generate strong magnetic fields without resistance. The levitating object typically has magnets embedded in it that are oriented in a specific way to interact with the magnetic field of the superconducting magnets. As the object approaches the magnetic field, the repelling force between the magnets causes it to lift off the ground and float in mid-air. By controlling the strength and orientation of the magnetic fields, engineers can control the height and stability of the levitating object. This technology has been used in various applications, such as maglev trains, where the levitation of the train allows for frictionless movement and high speeds.

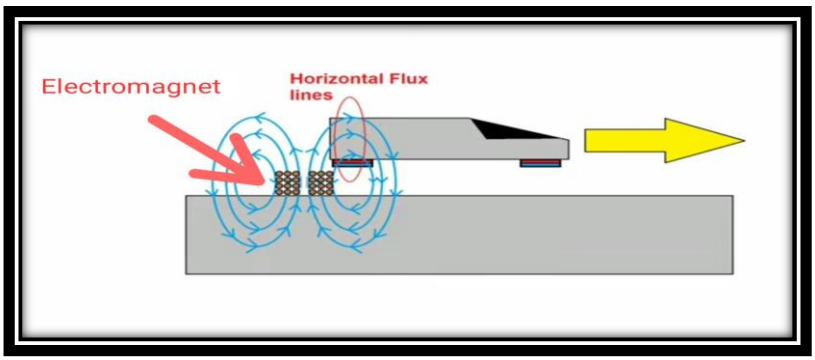

Fig.no. 2 Excitation of train

Working Principle

As shown in the figure by overcoming previous mistakes achieving accuracy the coil fluxes is exact horizontal to the direction of train magnet when supply on the horizontal flux excite the train magnet in the forward direction hence, the train moves in the direction of repulsion of horizontal fluxes. This operation done smoothly in case of high accuracy and due to that the train can excite properly & smoothly without friction and pollution. This is very noiseless operation. Due to this train get higher efficiency. If we apply or mount the greater number of coils and gives the supply alternately according to motion of train, then the long track can be developed. Its running cost is less but initial or construction cost is more. Due to use of electromagnets, it is easy to control the train. Hence, accidents will be less.

Control circuit.

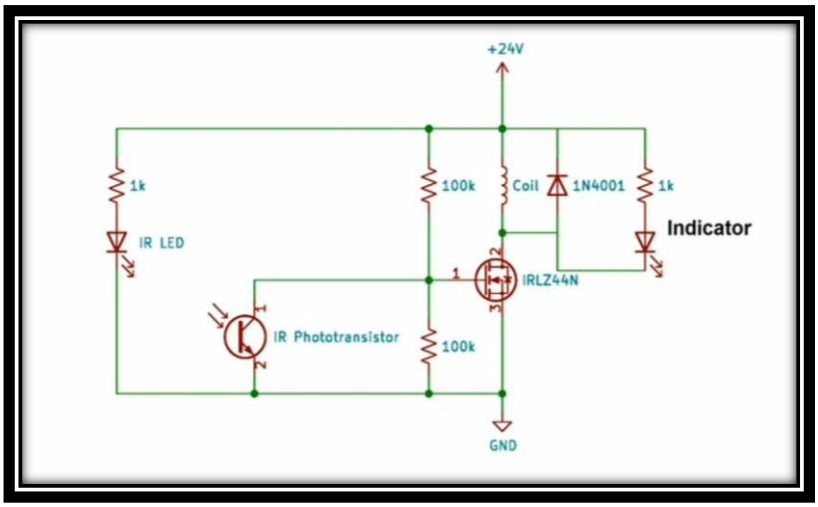

Fig.no. 1.3 control circuit

The circuit used for controlling the supply of the coil using IR photodiodes and IR LED.

To controlling of supply is very important for the working of train, If coil is continuously in the contact of the supply then train can't be moves as expected it`s movement is like a vibration. If the coil is continuously in the contact of supply, then there is chances of burning the coil. To avoid this control circuits are used. The above circuit as shown in figure is for a single coil control, but in the train, we have to used numbers of coils so we have numbers of circuits each coil have a single circuit. The 24-volt DC supply is given to the circuit by using transformer, which step down the AC

voltage and then it applies to the bridge rectifier, which convert AC supply to DC supply. After that the capacitor filter is used to neglect the AC components present in the DC supply. Then the purely DC supply is ready to apply to the circuit. Then positive terminal of the supply is directly connected to the terminals of all coils and the negative is given through MOSFET circuit by using IR photodiode and IR LED fitted in the track of the train. The one simple colorful LED is connected across the coil, which shows the on and off condition of the coil. It blows when the coil supply is on. In the connection of MOSFIT the one terminal is connected to the coil and other terminal is connected to the ground. The MOSFIT circuit is on through applying the gate pulls through IR sensors, Photodiode one terminal is connected to the ground (negative) and other is connected to MOSFET circuit for applying the gate pulls. The photodiode is control through using IR LED and the terminals of LED are connected to the directly 24-volt supply through resistor and the circuit is ready. The sensors are fitted across the track of the train when any part of the train is coming between sensors then the coil excite the train forwardly according to accurate arrangement of the train. And this excitation is observed through using LED fitted across the coil. After moving the train, the contact of sensors happens, and the coil stop exciting .so the train moves across the next sensors so second sensor active and at position of train stopes the second coil is active, Hence the train again excite, and movement occurs. Those the procedure continuously occurs, and next coil will be excited, so the train start working. Each coil has separate kit so proper arrangement is necessary.

4. CONCLUSION

To sum up, the idea of magnetic trains has the potential to completely transform the transportation sector. The technology provides a workable answer to the problems with contemporary transportation since it can drastically improve speed, efficiency, and safety while also lowering carbon emissions. The successful application of magnetic trains in a number of nations shows that this technology is feasible on a wider scale. These initiatives have demonstrated that magnetic trains can be a viable and affordable alternative to more conventional forms of transportation. Furthermore, research and innovation are still being done to further improve performance and lower costs as the development and evolution of magnetic train technology continue.

5. REFERENCES

[1] R. Hellinger and P. Mnich, “Linear motor-powered transportation: history, present status, and future outlook,” Proceedings of the IEEE, vol. 97, no. 11, pp. 1892–1900, 2009.

[2] H. W. Lee, K. C. Kim, and J. Lee, “Review of maglev train technologies,” IEEE transactions on magnetics, vol. 42, no. 7, pp. 1917–1925, 2006.

[3] M. Sharma, M. K. Arya, and I. Kumar, “Magnetic levitation (maglev): a technology on which vehicles propels.,” International Journal of Applied Engineering Research, vol. 13, no. 9, pp. 112–118, 2018.

[4] Y. G. Sun, W. L. Li, D. F. Chang, and Y. Teng, “Dynamic and decoupling analysis of the bogie with single EMS modules for low-speed maglev train,” Advanced Science and Technology Letters, vol. 121, pp. 83–88, 2016.

[5] J. Hu, W. Ma, X. Chen, and S. Luo, “Levitation stability and Hopf bifurcation of EMS maglev trains,” Mathematical Problems in Engineering, vol. 2020, pp. 1–12, 2020.

[6] J. Ding, X. Yang, Z. Long, and N. Dang, “Three-dimensional numerical analysis and optimization of electromagnetic suspension system for 200 km/h maglev train considering eddy current effect,” IEEE Access, vol. 6, pp. 61547–61555, 2018.

[7] T. Murai and T. Sasakawa, “Characteristics of SC coil configuration for EDS maglev to reduce leakage flux with strengthened magnetomotive force,” IEEJ Transactions on Industry Applications D, vol. 124, pp. 962– 967, 2004.

[8] V. M. Amoskov, et al., “Simulations of maglev EDS performance with detailed numerical models,” Vestnik Sankt-Peterburgskogo Universiteta, Prikladnaya Matematika, Informatika, Protsessy Upravleniya, vol. 14, no. 4, pp. 286–301, 2018.

[9] L. Hao, et al., “Study on electrodynamic suspension system with hightemperature superconducting magnets for a high-speed maglev train,” IEEE Transactions on Applied Superconductivity, vol. 29, no. 2, pp. 1–5, 2018.

[10] Y. Cai, et al., “Semianalytical calculation of superconducting electrodynamic suspension train using figure-eight-shaped ground coil,” IEEE Transactions on Applied Superconductivity, vol. 30, no. 5, pp. 1–9, 2020.

[11] Z. Long, G. He, and S. Xue, “Study of EDS & EMS hybrid suspension system with permanent-magnet Halbach array,” IEEE Transactions on magnetics, vol. 47, no. 12, pp. 4717–4724, 2011.