Magnetic levitation transport system

Abstract

This paper outlines a novel transport system based on magnetic levitation technology, aimed at simplifying design, lowering costs, and increasing the efficiency of movable element systems. The system can be applied in various fields, such as fluid extraction, elevators, and horizontal load transportation. This system utilizes only permanent magnets and does not rely on external power sources, offering significant cost reductions in operations and maintenance.

1 Introduction

The invention discussed here relates to a magnetic levitation transport system, particularly one comprising a movable element in magnetic levitation. Current transport technologies rely heavily on mechanical and electromagnetic systems, which often come with drawbacks such as mechanical wear, the need for continuous power supply, and complex maintenance. Moreover, Maglev train systems require intricate infrastructure and electromagnetic field controls, making them costly and difficult to implement.

This paper proposes a system that overcomes these challenges by employing permanent magnets arranged to allow both efficient movement and reduced costs. The system is particularly suited for applications such as the extraction of fluids (e.g., water or crude oil), vertical movement of elevators, and horizontal transportation of goods.

2 System overview

2.1 Components of the system

The transport system consists of the following primary components:

- A **rotatable shaft** supported by bearings in a fixed supporting frame.
- **Permanent driving magnets** arranged along the shaft, with each magnet's poles phase-shifted by 120º.
- A set of **propulsion magnets**, configured to move a **movable element** via magnetic interaction.
- **Guide rails** equipped with magnetic elements to maintain the movable element in levitation.

2.2 Phase-shifted magnets

The driving magnets are the key innovation in this system. Each magnet is phase-shifted by +120º and -120º in relation to neighboring magnets along the shaft. This arrangement generates a progressive magnetic field as the shaft rotates, causing movement in the longitudinal direction. The propulsion magnets interact with this field, propelling the movable element without any physical contact.

2.3 Movable element and guide rails

The movable element is levitated and guided by two parallel rails. Both the element and the rails are equipped with magnets that repel one another, ensuring that the movable element remains suspended, avoiding friction and mechanical wear.

3 Preferred embodiments

3.1 First embodiment

In the first embodiment, the system employs driving magnets arranged on the outside of the shaft. Each driving magnet is annular and diametrically polarized. The movable element moves along two guide rails, and the system can be configured for horizontal or vertical movement.

3.2 Second embodiment

The second embodiment introduces a closed-loop conveyor belt configuration. The movable element is composed of hinged plates, each equipped with propulsion magnets. This version of the system allows for continuous transport in a loop, making it suitable for industrial applications.

4 Technical problem and solution

The primary technical problem solved by this system is the creation of a transport mechanism that is simple, cost-effective, and efficient. By relying solely on permanent magnets, the system eliminates the need for external power sources and reduces the overall complexity of the infrastructure required for its operation.

4.1 Advantages

- **No external power source:** The use of permanent magnets ensures that the system does not require a continuous power supply.
- **Low operating and maintenance costs:** With no need for mechanical parts to make contact, the system avoids wear and tear, lowering maintenance requirements.
- **Efficient movement:** The phase-shifted magnetic fields provide smooth, precise movement of the movable element.

5 Method of operation

The method of moving the movable element includes the following steps:

1. **Positioning:** The movable element is placed in an initial position.
2. **Rotation:** The shaft is driven in a rotational motion, generating a progressive magnetic field that interacts with the propulsion magnets.
3. **Halting:** The rotation is stopped when the element reaches the desired location.

The direction of movement can be adjusted by changing the direction of shaft rotation.

6 Materials and applications

6.1 Magnet materials

The system can use magnets made from various alloys, including:

- **Neodymium-Iron-Boron**: High magnetic field intensity, best suited for low-temperature environments.
- **Samarium-Cobalt**: Suited for high-temperature applications, but with lower field intensity.
- **Aluminum-Nickel-Cobalt**: For extreme temperature conditions up to 500^{o}C.

6.2 Applications

The transport system can be adapted for several applications, including:

- Extraction of fluids from deep reservoirs.
- Vertical movement of industrial or residential elevators.
- Horizontal transportation of goods, people, or animals.

7 Conclusion

This magnetic levitation transport system presents a revolutionary approach to transport systems by leveraging permanent magnets for levitation and propulsion. It addresses current technological limitations by providing a low-cost, energy-efficient, and maintenance-free solution suitable for a wide range of industrial and residential applications.

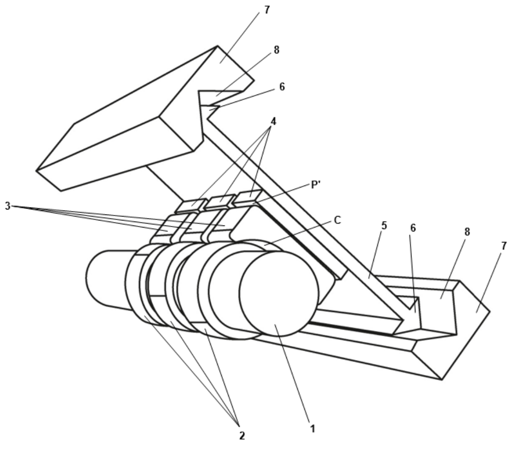

Figure 1

Figure 1: Axonometric view of the transport system with key components labeled.

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