POWER TRACTION AND SUSPENSION SYSTEM OF MAGLEV TRAIN

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I. Introduction

Maglev train has the advantages of low energy consumption, low noise, strong climbing ability, high operation speed, large acceleration space and more comfortable than wheel rail train. And in China, the distance between cities is different from Japan and other countries. Under such conditions only the maglev train has the advantage of competing with the aircraft.

Since 2002, the world's first commercial maglev train line operators started running in Shanghai. By 2016, China's first commercial operation in low speed maglev demonstration line which has completely independent property rights - Changsha Maglev Express Start running.

II. Power Traction and Suspension Systems

2.1 Electro Magnetic Suspension

As shown in

Fig. 1, the suspension principle and drive of long stator for EMS is based on the attractiveness of regular conductors magnet and ferromagnetic long stator rail. The electromagnet is dynamically

adjusted by the air gap sensor and the acceleration sensor so that the air gap can be maintained at 8 mm and 12 mm in accordance with the operating speed to ensure safe life characteristics.

2.2. Electro Dynamic Suspension

As shown in Fig. 2, EDS is based on the principle of electromagnetism magnetic levitation. The superconducting magnet coils are laterally mounted at the end of each unit and at the transition, and induced eddy currents in the track coil. The train can suspension when increase to a certain speed. The height of the suspended air gap is between 100 mm and 150 mm, and the adjustment device can be omitted. Since the principle of magnetic flux leakage is large, we need to shield passengers.

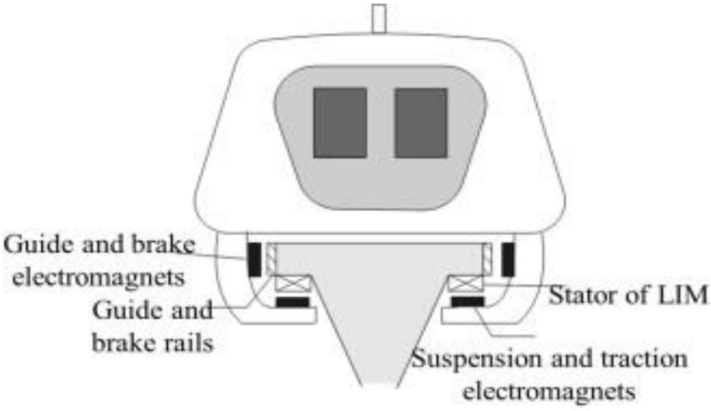

Fig. 1. EMS

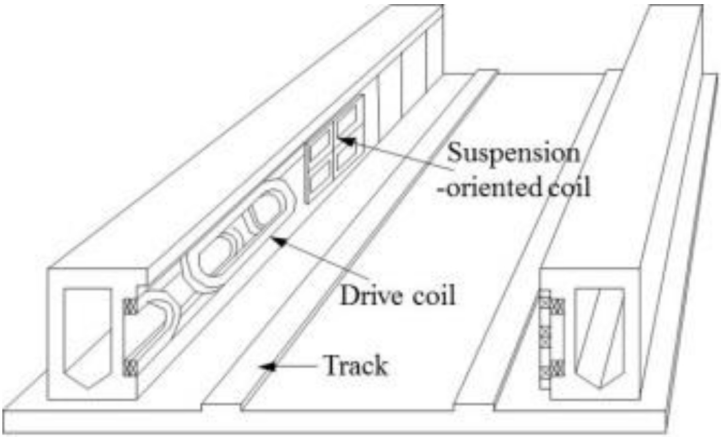

Fig. 2. EDS

III. Comparison of Two Electromagnetic Systems

EMS covers a large range of operation, in smaller traffic and lower speed can also be used economically. It's economic only the traffic volume is very large for Japan's EDS because of the high investment. Table 1 compares the differences between the two systems.

Table 1. Differences Between the Two Systems

	EMS	EDS
Design	Adjustable electromagnet	Superconducting magnets
Principles	The closed-loop control of support, guidance and drive	The coupling of support, guidance and drive

	are decoupled.	requires additional stabilization measures.
	The guide and support systems are arranged separately in the rails.	Side wall suspension.
Track	T	U
vehicle	Outer riding on the rails	Buckle on the rails.
EMER	The magnet can fall on the sled.	Designed by the aircraft standard wheel.
Drive power supply	synchrotron long linear motor with a yoke; Supply voltage: 0 kV～15 kV,1200A, 0 Hz～250 H	synchrotron long linear motor with no yoke; Supply voltage: 0 kV～ 22 kV,1000A, 0 Hz～56 Hz

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