UDC [УДК] 656.34
DOI 10.17816/transsyst20184372-79

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THE MAGLEV-SYSTEMS ON THE BASIS OF TRESTLE OF ARCH TYPE

Aim: To show that the trestle of arch type allows to realize various limiters of movements of the levitating vehicles.

Methods: Patent search, comparison with analogs, system approach.

Results: Options of designs of trestles for freight and passenger traffic are offered.

Conclusion: In all cases it is necessary to look for a compromise between achievement of the goal of functioning of maglev-system and costs of its construction and service.

Keywords: Maglev-systems, Trestle of arch type, Driving on a ceiling, Driving along a beam, Safe distance

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МАГЛЕВ-СИСТЕМЫ НА ОСНОВЕ ЭСТАКАДЫ АРОЧНОГО ТИПА

Цель: Показать, что при помощи арочной эстакады можно реализовать применение различных типов ограничителей перемещений магнитнолевитирующих транспортных средств.

Методы: Патентный поиск, сравнение с аналогами, системный подход.

Результаты: Предложены варианты конструкций эстакад для пассажирских и грузовых перевозок.

Выводы: Во всех случаях конструирования маглев-систем арочного типа необходимо искать компромисс между затратами на строительство и достижением цели функционирования системы.

Ключевые слова: Маглев-системы, Эстакада арочного типа, «езда по потолку», «езда вдоль балки», безопасное расстояние.

Received: 15.06.2018. Revised: 20.07.2018. Accepted: 01.10.2018.
Transportation Systems and Technology. 2018;4(3):72-79

doi: 10.17816/transsyst20184372-79

INTRODUCTION

We will call the guideway having an arch in cross section by trestle of an arch type. The arch trestle can be both by "opened", and by "closed". The monorail road in the city of Vappertel can be an example of the transport system with an opened trestle of arch type. The closed arch trestle (fig. 1) will allow to provide protection of vehicles against a rain, snow, strong wind gusts and other atmospheric phenomena. In Fig. 1: 1 – directly a trestle, 2 – the magnetic (electromagnetic) devices for propulsion of vehicles, 3 – the magnetic (electromagnetic) devices for levitation of vehicles are designated. Devices 3 can be replaced with aluminum rails.

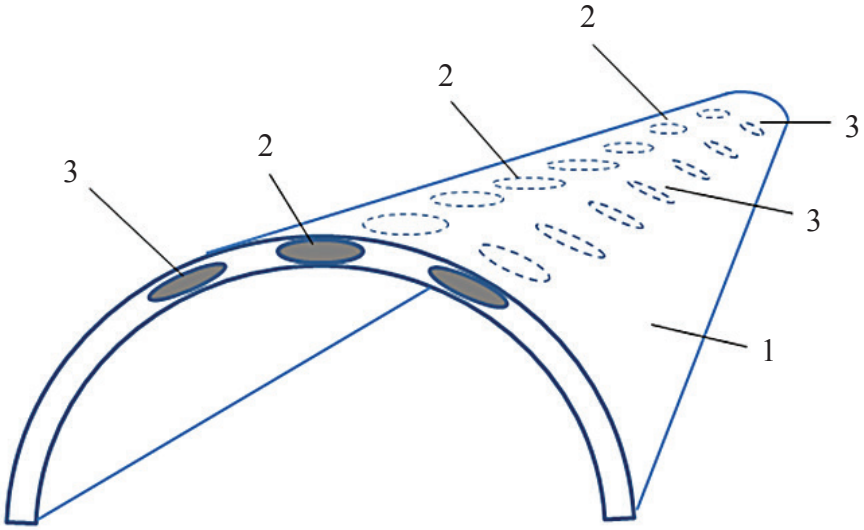

Fig. 1. The closed trestle of arch type

THE TRESTLE OF ARCH TYPE FOR CARGO TRANSPORT

In the cargo transport systems various decisions which are directed to reduction of cost of construction and operation of maglev-system can be applied.

The arch trestle allows to realize limiters of movements (LMV) of two types [2]. Partially envelope LMV can be formed in the top part of an arch trestle ("the driving on a ceiling"). Partially enveloped LMV can be formed on surface of an arch trestle («the driving on a roof»).

Implementation of these assumptions for transit of containers is shown in Fig. 2. Conditionally we will call suspended container 7 (upper) "by empty", hung container 4 (lower) – "by loaded". It is desirable that containers 4 and 7 had a streamline shape.

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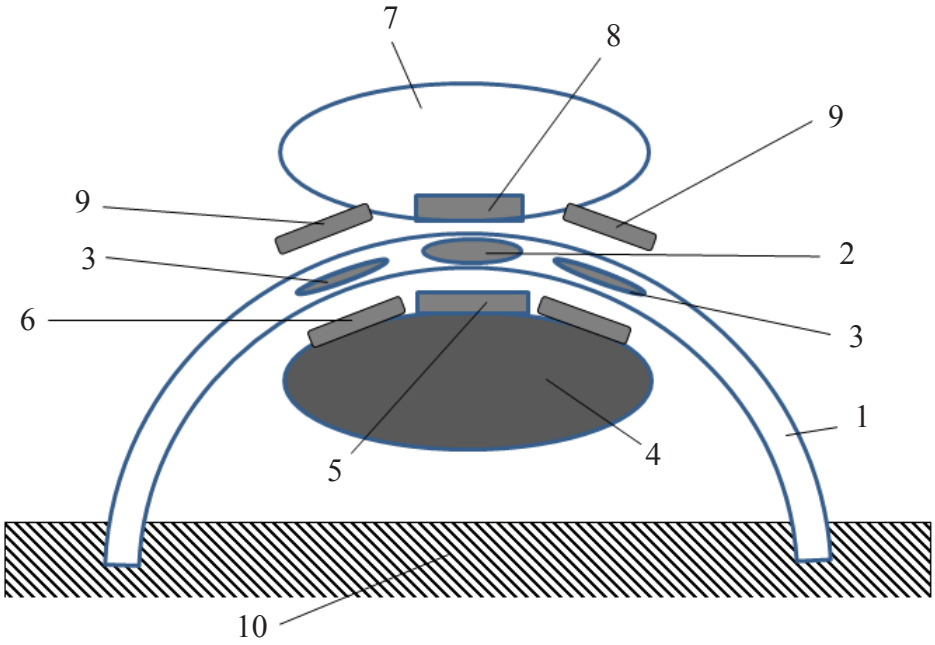

Fig. 2. The arch trestle for transportation of containers: 1 – the arch trestle; 2 – the round (coil) of a step's electromagnetic engine; 3 – the round (coil) of limiters of movements; 4 – the loaded container; 5, 8 – the magnetic sources for move of containers; 6, 9 – the magnetic sources for levitation of containers; 7 – the empty container; 10 – a supporting surface

Loaded container 4 levitates in the top part of an internal surface of trestle 1 as a result of interaction of coils 3 stator windings of the guideway and the magnetic sources 6 established on a container. Movement of container 4 will be carried out when passing electric current to coil 2 and his interaction with source of the magnetic field 5 which is also established on a container.

Empty container 7 can be moved into the opposite direction of movement of container 4 on external surface of trestle 1. His magnetic sources 8 and 9 in this case have to have different polarity to magnetic sources 5 and 6 of the loaded container 4.

Thus, it is possible to use both poles of a stator winding of the electromagnetic engine.

It is better to show the directions of movements of containers 4 and 7 concerning the trestle 1 in a longitudinal section (Fig. 3). When electric current feeds certain rounds 2, there are electromagnetic lines 11 under the influence of which the loaded container moves in direction 12 and the empty container in direction 13. container in direction 13.

Together with an arch trestle other designs can be used. For example, a beam can be used together with an arch trestle for transportation of ballons or minitanks.

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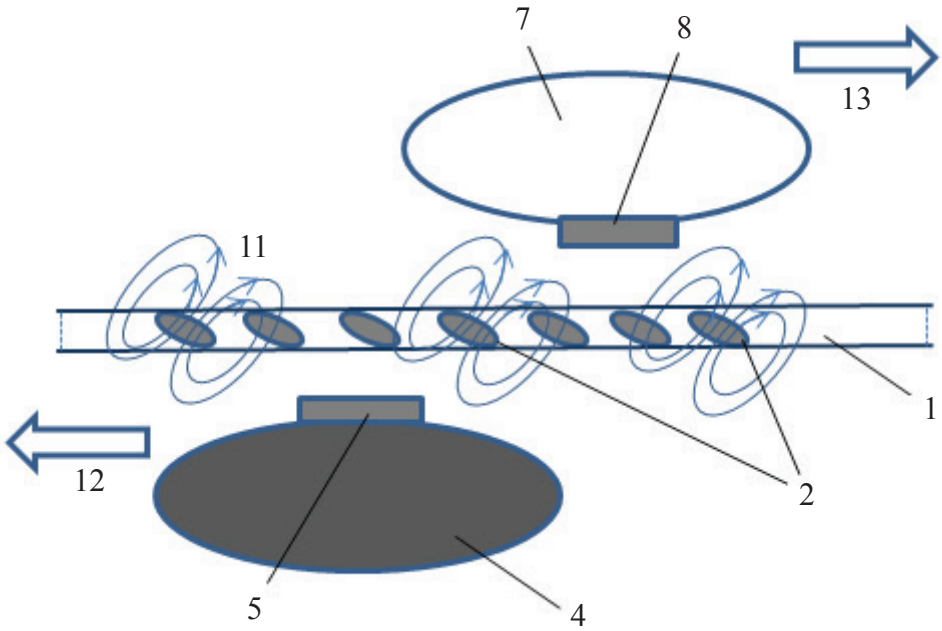

Fig. 3. The movement of containers concerning a trestle

In Fig. 4 it is shown that arch trestle 1 is combined with beam 12 which is established under trestle. Beam 12 has coil 2 for propulsion and coils 3 for levitation of ballons, for example, if oil or liquefied natural gas are transported.

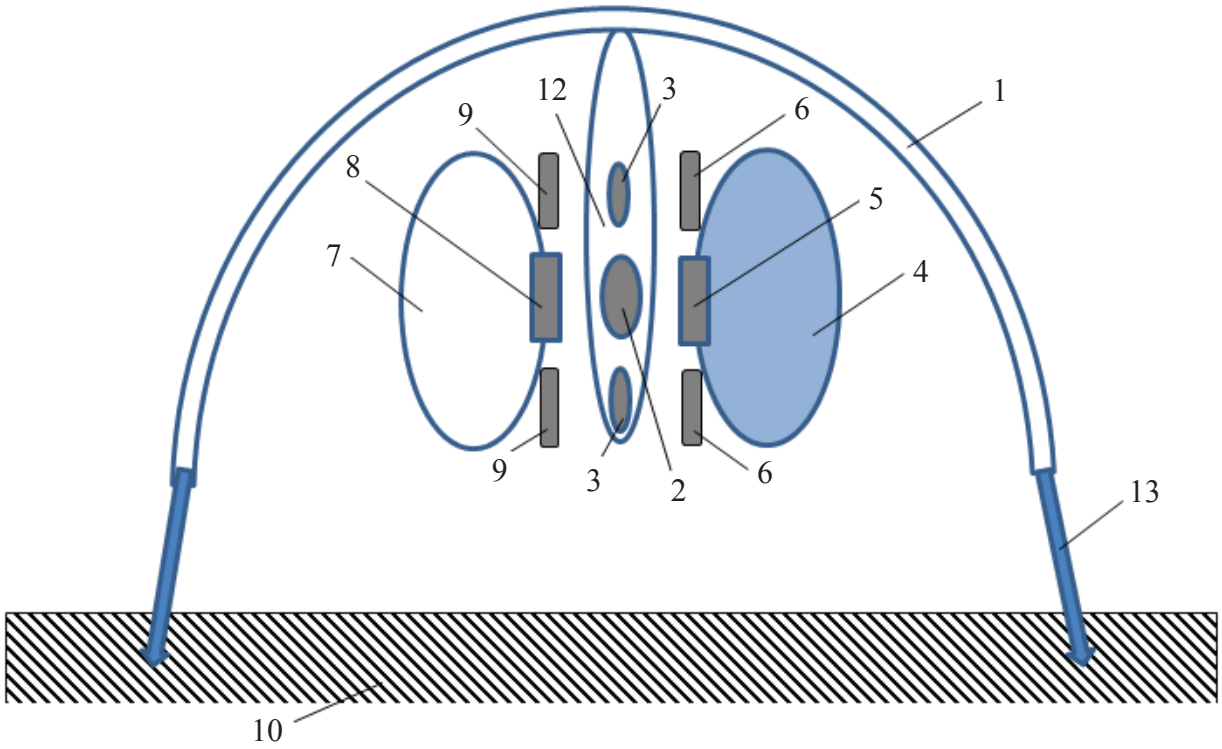

Fig. 4. An arch trestle, established on piles, with a beam

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Filled ballon 4 has magnetic sources 5 and 6. Cylinder 4 levitates concerning beam 12 (sideways from it) thanks to magnetic interaction of coils 3 with sources 6.

Empty ballon 7 has magnetic sources 8 and 9. It levitates on the other side of beam of 12 thanks to magnetic interaction of coils 3 with sources 9.

Ballons 4 and 7 can move in identical or opposite directions depending of polarity of sources 5 and 6, when an electric current feeds coil 2.

Arch trestle 1 may is established on piles 13.

THE ARCH TRESTLE FOR PASSENGER TRAFFIC

For passengers the main thing to ensure safety and comfort. Protection against electromagnetic radiations can be reached by an arrangement of a passenger cabin at a «safe distance» B from a stator winding of the guideway (Fig. 5). However, it will lead to increase of trestle height and cost of her construction.

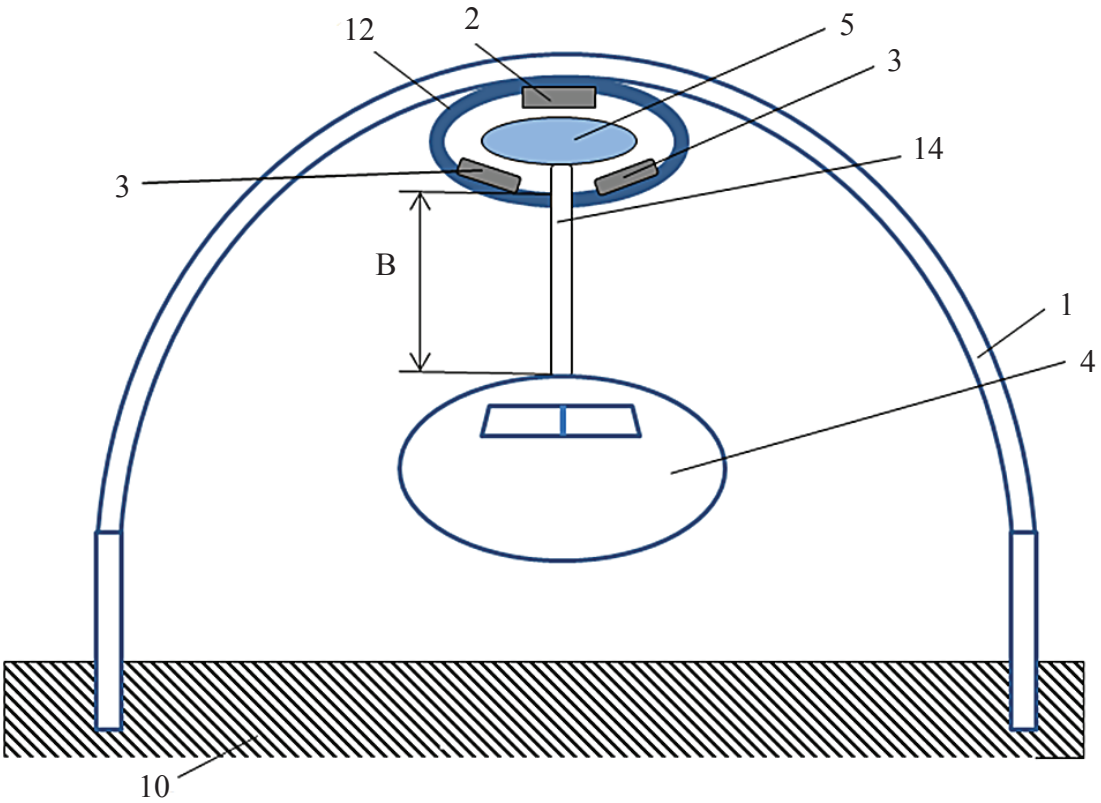

Fig. 5. The passenger maglev-system of arch type: 1 – the arch trestle; 2 – the coil of a step's electromagnetic engine; 3 – the coils for levitation of cabin; 4 – the passenger cabin; 5 – the magnetic source for levitation and propulsion of cabin; 10 – a supporting surface; 12 – a beam for coils of stator winding and magnetic source; B – «safe distance»

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Some actions, for example, installation of protective screen, allow to reduce a «safe distance». As the result the cost of construction of a trestle falls, but the cost of a vehicle increases.

In Fig. 6 the protective screen is designated by position 15, other designations same, as in Fig. 5.

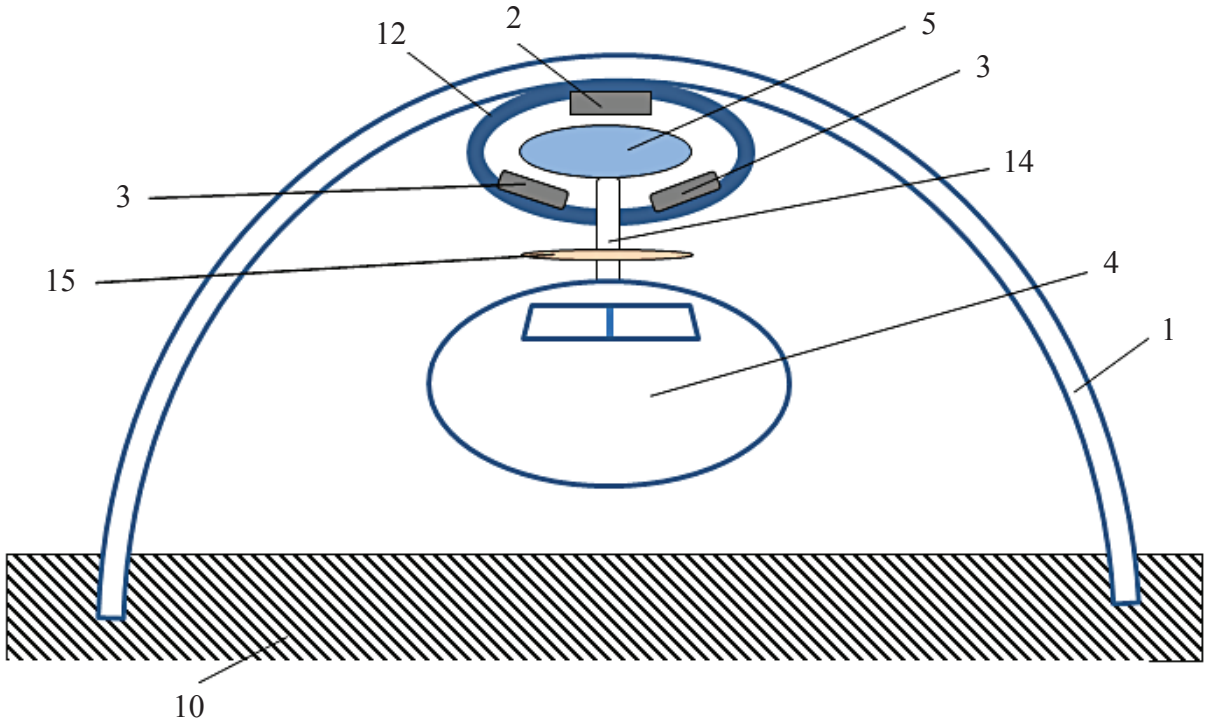

Fig. 6. The passenger maglev-system of arch type: 1 – the arch trestle; 2 – coil of a step's electromagnetic engine; 3 – the coils for levitation of cabin; 4 – the passenger cabin; 5 – the magnetic source for levitation and propulsion of cabin; 10 – a supporting surface; 12 - a beam for movement of a magnetic source; 14 – a frame; 15 – a protective screen

Movement of source 5 in beam 12 under influence of magnetic fields from rounds 2 and 3 can be described by means of the models presented in literature [3].

For the purpose of reduction of cost of a trestle not many-placed vehicles [4], but individual passenger cabins, calculated on three-four passengers, are offered.

This system has similarity to other maglev-systems [5, 6], they differ in engine type.

We suggest using for movement of vehicles the step's electromagnetic engine with the inclined rounds of a stator winding [6] that will allow to set various speeds of the movement of vehicles. At the same time there is no problem of increase in a gap of a levitation at an inclination of rounds. For secure wheel support can be used.

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CONCLUSION

The Maglev-systems on the basis of trestle of arch type can find application for transportation of goods and passengers.

In all cases it is necessary to look for a compromise between achievement of the goal of functioning of maglev-system and costs of its construction and service.

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Received: 15.06.2018. Revised: 20.07.2018. Accepted: 01.10.2018.
Transportation Systems and Technology. 2018;4(3):72-79

doi: 10.17816/transsyst20184372-79

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To cite this article:
Sundukov EY, Selivanov LF, Sundukova VE. The maglev-systems on the basis of trestle of arch type. *Transportation Systems and Technology.* 2018;4(3):72-79. doi: 10.17816/transsyst20184372-79

Цитировать:
Сундуков Е.Ю., Селиванов Л.Ф., Сундуков В.Е. Маглев-системы на основе эстакады арочного типа // Транспортные системы и технологии. – 2018. – Т. 4. – № 3. – С.72–79. doi: 10.17816/transsyst20184372-79