The increasing of the electric vehicle maneuverability, excluding disconnecting of the survey from the contact network

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Abstract. A technical solution is proposed that allows to increase the maneuverability of an electric vehicle without reducing the speed of movement, excluding the arbitrary disengagement of the current collector from the contact network at road junctions and turns.

1. Introduction

The proposed technical solution relates to the field of the electrical engineering, in particular to the electric vehicles that can be used to transport passengers along the city route. It is known [1-4] an electric vehicle, in particular a trolleybus for transporting passengers around the city. This electric vehicle contains from an electric drive with a speed control system and two rods with current collectors.

The disadvantage of [1-4] is that this vehicle is limited in maneuverability, has a lower speed at the road junctions and the intersections. In addition, the rod with the current collector, as a rule, is randomly disconnected from the contact network. These vehicle flaws can be the cause of the congestion on the roads and slow down the total flow along the route [5].

The closest technical solution in essence is [6]. The power supply system of the trolleybus has a traction device and a contact network, which carries a positive potential and is connected to an electric drive. The device for removing of the electric current is made in the form of a single rod current collector.

The disadvantage of the prototype [6] is that the rod collector can unauthorized disconnect from the contact network at transport interchanges, turns. The trolleybus slows down at the above-mentioned places of the route, which causes traffic jams.

2. Problem Statement

The aim of this work is to increase the maneuverability of an electric vehicle, without reducing the speed of the movement and the exclusion of the arbitrary disengagement of the current collector from the contact network.

3. Technical Solution

The current collector in the form of a bar (1) is mounted perpendicular to the contact network pivotally on the first and the second current conductors (2 and 3) in the form of two rods (Fig. 2). This current...
collector provides a sliding connection to the contact network (4), and is attached to the insulating
platform (5) from below (Fig. 1a). The first and the second current conductors also have springs (11)
extending the rods from the platform.

The mentioned bars are interconnected by an insulator (12), and both of the bars and the insulator do
not have protrusions, and the free ends of the beam are bent down. A video camera (6) is installed on
the roof of the electric vehicle aimed at the upper mark of the rhombuses. The picture from the video
camera is transmitted online to the monitor (7) installed in the cockpit in front of the driver (Fig. 1a).
On the bottom, in the outer front of the electric vehicle, there is an induction sensor for metal (8) that
monitors the metal linear conductor (9) provided under the road surface in the axis of movement (Fig.
1a, b). It is assumed that the metal linear conductor will be laid at the entrance and exit of the
intersection, or the road junction. The length of the metal linear conductor with a length of at least 50
meters is laid on some complex sections of the traffic path (Fig. 3). The electric vehicle contains a
high-capacity Li-ion maintenance-free battery in a sealed design.

![Figure 1 a and b. The scheme and devices of an electric vehicle a - side view; b - front view.](image)

2, 3 - conductors in the form of a rhombus of rods; 4 - contact network; 5 - an isolated platform; 6 -
video surveillance camera; 7 - video surveillance screen; 8 - induction sensor for metal; 9 - metal
linear conductor; 11 - expanding spring; 12 - insulator.

![Figure 2. The connection diagram of the current collector and the conductors on the roof of
the electric vehicle. 1 - current collector in the form of a bar; 2,3 - conductors in the form of a](image)

![Figure 3. Layout of metal linear conductors provided under the road surface in the axis of
movement.](image)
rhombus of rods; 5 - an isolated platform; 10 - hinges, fastening the faces of the rhombus of conductors and current collector.

4. The principle of operation of an electric vehicle is illustrated in figures 1, 2 and 3, which depicts circuits and devices of an electric vehicle.

The electric vehicle, approaching the intersection or the road junction with the absence of the contact network in these sections, continues to move due to the energy of pre-charged batteries. Driving out of the intersection or the road junction, a traffic route is automatically selected using an induction sensor on the metal to search for a metal conductor in the road surface. In this case, the poles of the current collector are again in contact with the conductors of the contact network and the driver is made sure using video surveillance. Shorting the two wires of the contact network by the current collector is impossible, because the length of one pole of the current collector is less than the distance between the conductors of the contact network. When moving on the straight sections of the route, the batteries of the electric vehicle are charged from the contact network.

In case of unauthorized disconnection of the current collector from the contact network when approaching the intersection or the road junction and when leaving them, the driver does not need to leave the cab to connect the current collector pole to the contact network. This becomes possible due to tensile springs and the properties of hinged fastening (10) of the faces of the current collector rhombuses at its vertices (Fig. 2), and due to the fact that the ends of the contact network in these areas have a rigid mount and are bent down.

5. Conclusions

This technical solution ensures the implementation of the goal to increase the maneuverability of the electric vehicle, without reducing the speed and eliminating the arbitrary disengagement of the current collector from the contact network. This technical solution is protected by the utility model patent [7] and can be implemented in the electric transport industry.

References

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