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Original Contribution

A MODERN SOLUTION THAT HAS A POSITIVE IMPACT ON LOGISTICS SERVICES AND SIGNIFICANTLY REDUCES INTERSECTION FATALITIES

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ABSTRACT: *Year after year, the problems on the world's roads are getting worse. According to the UN Economic Commission for Europe (ECE) 2006 Report on the 1968 Geneva Convention "Road Signs and Signals", the rules are periodically updated to take into account the growing demands for human safety, environmental protection, and the rapid development of technological progress around the world (Report IEC UN, New York and Geneva, 2007). Unfortunately, for about a hundred years now, no drastic measures have been taken against the causes of road traffic accidents around the world. Our research is focused on reducing intersection congestion, traffic accidents, and related deaths. A new road sign and traffic light were invented. According to the conclusions of domestic and foreign scientists, the invented sign and traffic light should be a great success in practice.*

KEY WORDS: *A multifunctional traffic light, a multifunctional road sign, a main road, secondary road, a minor road, a pedestrian crossing, intersection center, a traffic light dial, a traffic light flange, lines dividing the main road into two, lines that divide the minor road into two, road traffic accidents.*

1. Introduction

According to the observations of the World Health Organization, strengthening legislation in the field of preventing road accidents, ensuring its compliance and improving road safety will prevent the premature death of many people and becoming disabled. But due to the fact that such work is not carried out regularly in accordance with the requirements of the time, very annoying accidents occur on the roads. [8, 24, 25, 16].

Every year, more than 1,250,000 people around the world die as a result of car accidents, and 30-40 million people become disabled to varying degrees. The fact that the average age of those killed and injured is 15-45 years old makes one wonder. The number of road traffic fatalities ranges from 9.3 to 26.6 per 100,000 people worldwide. [8]

Some infectious diseases (Ebola, etc.) kill about 10,000 people annually, and car accidents kill about 3,500 or more people a day worldwide. [8].

Of the 200,000 U.S. deaths during World War II, 400,000, twice as many, died in automobile accidents on U.S. highways during the same period. There are many such examples. [8].

The high level of road traffic injuries is directly related to the increase in the number of cars in cities and villages. According to the World Health Organization (WHO), 48,050 people died in road accidents in the United States, 13,904 in Japan, and 12,500 in France. The American Institute of Civil Engineers predicts that there will be 700,000 deaths and 25 million nonfatal accidents involving varying degrees of injury in the United States. [17, 24, 25].

According to the Russian State Traffic Inspectorate, the mortality rate in car accidents in 2012 increased by 5.2% compared to 2011. The mortality rate has increased over the past 5 years. [9].

Problems on the world's highways are also having a huge impact on the logistics sector. [5, 8, 10, 18, 19, 21, 22, 23].

According to the 2006 UN Economic Commission for Europe (ECE) report on the 1968 Geneva Convention on Road Signs and Signals and the Vienna Convention instruments, each member state of the convention has the right to develop and use symbols acceptable to its own country, in addition to the use of recognized symbols. For this reason, some countries (USA, Europe, Australia, etc.) use specific characters. For example, in the USA there are also different road signs. [4, 5, 7, 8].

The issue of road safety has become a pressing issue in our country, as in all countries. [1, 2, 3].

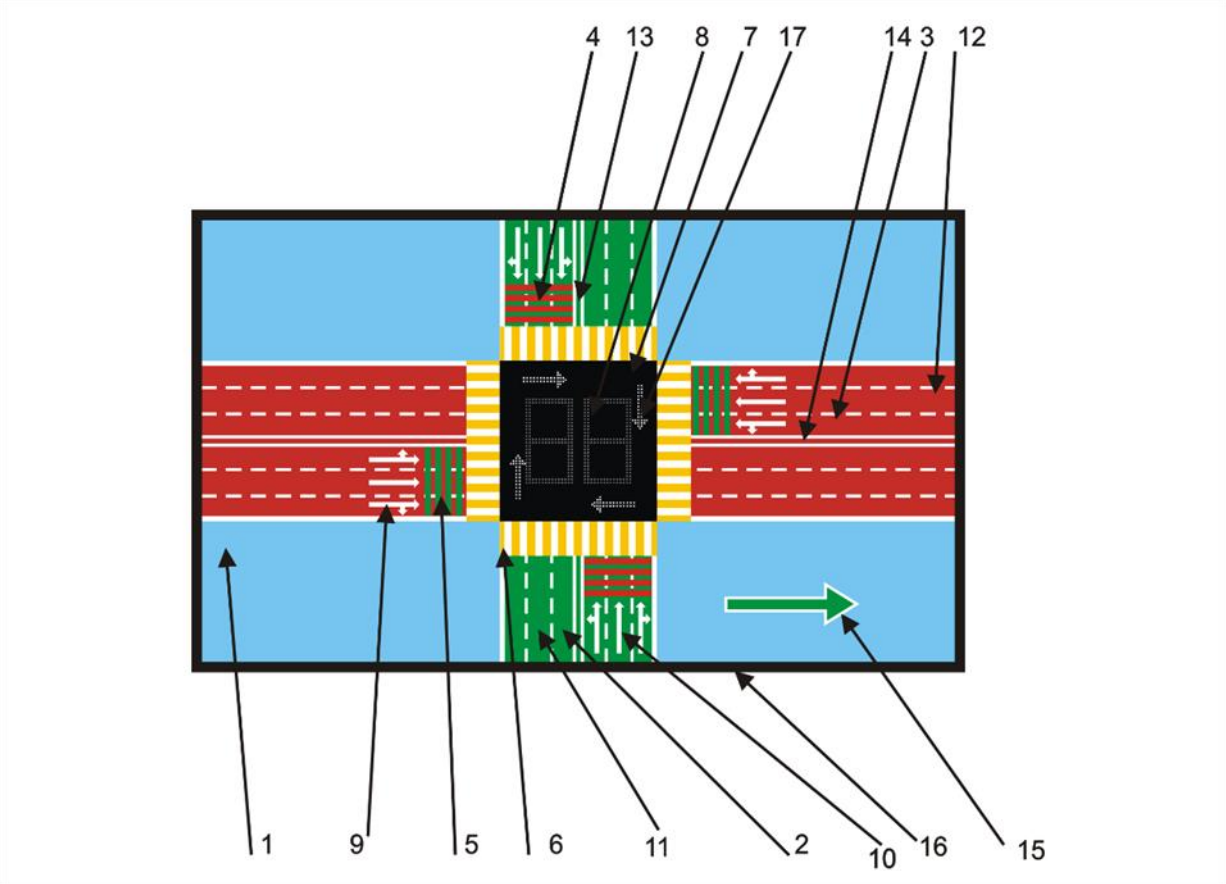

Fig. 1. One type of multifunctional traffic light

2. Purpose of the study

The main goal of this study is to regulate road signs and traffic lights, propose modern signs and traffic lights to replace outdated road signs, reduce the number of car accidents that sometimes cause deaths on the highways of the world, especially at intersections, traffic jams at intersections, aims to prevent damage to the ecology of the area, as well as preventing poisoning of traffic safety officers controlling traffic at the intersection in the event of traffic jams.

3. Research results

During the scientific work, road signs and traffic lights were analyzed. Their influence on road users and their role in ensuring road safety have been studied. The study revealed a number of shortcomings. The fact that road signs and traffic lights are not visible to road users from afar, and sometimes even close (due to tall vehicles), makes them more of a hindrance than a help. Such shortcomings are especially noticeable when there is no electricity at the intersection. Due to the large number of vehicles on highways in the modern

period of economic development, large traffic jams occur at intersections. To reduce these disadvantages, we were able to invent a multifunctional traffic light and road sign. For this purpose, the Geometric traffic light, Traffic light (variants) and LED traffic lights invented in the Russian Federation were carefully analyzed. [12, 13, 14]. Their shortcomings are revealed. As a result, a more advanced multifunctional traffic light was created from them. Its color scheme corresponds to the protocols of the Geneva Convention. [4, 5, 8, 15, 20] The design of the new traffic light is as follows:

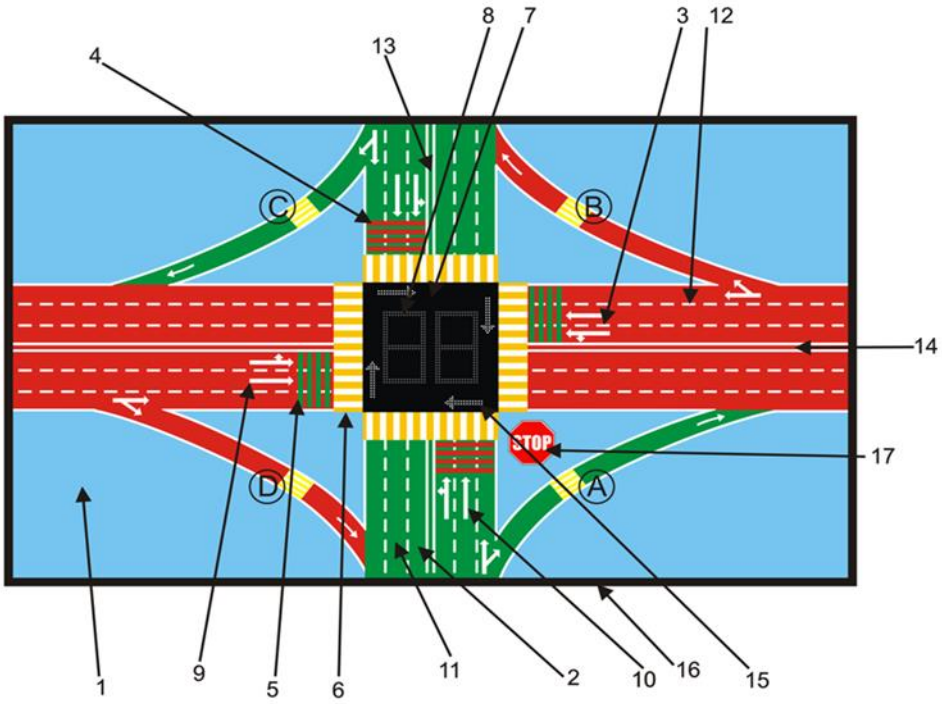

Fig. 2. One type of multifunctional traffic light.

The appearance of the multifunctional traffic light is rectangular, its width is longer than its height, and the base is painted in a light airy color. The main road is green, the secondary road is red. The direction of travel on the main and secondary roads is indicated by white lines painted on them.

There is a pedestrian crossing at the multifunctional traffic light at the intersection of roads. It is painted white and yellow.

There are four red lines painted on the main road and four green lines on the minor road indicating that vehicles entering the intersection must give way to each other when the traffic lights are not in operation.

In the area where the main and secondary roads connect, that is, in the center of the intersection, there is a dial. It flashes green, red and displays numbers about 50 cm in size. Surrounding the numbers are arrows glowing

green and red, indicating a left turn. Depending on the type of intersection, the appearance of the traffic light is adapted to it. For example, U-shaped, T-shaped.

A.B.C.D. – a lane and a pedestrian crossing that allow you to turn right from the main or secondary road before reaching the intersection and traffic lights.

1- The base of the traffic light is painted in a light color.

2- Main road. Painted green.

3- Secondary road. Painted red.

4- Red lines painted on the main road.

5- Green lines painted on a minor road.

6- Pedestrian crossing.

7- Center of road intersection (crossroads).

8- Traffic light dial.

9- White lines painted on a minor road indicate the direction of movement of vehicles on that road.

10- White lines painted on the main road indicate the direction of movement of vehicles on the main road.

eleven-. Main road lanes

12- Lanes of secondary road

13- Lines dividing the main road into two parts.

14- Lines dividing a minor road into two parts.

15- Arrow indicating left turn.

16- Traffic light flange.

17- Stop sign (stop).

4.The operating principle of a multifunctional traffic light

This traffic light is multifunctional and works like a real traffic light when there is electricity at the intersection. When the traffic light turns green, a green countdown timer starts at the center of the intersection and traffic on the main road flows through the intersection until it reaches zero. When the light is red, a

red countdown stopwatch starts at the center of the intersection and vehicles on the minor road cross the intersection until it reaches zero.

Surrounding the numbers on the dial are green and red flashing arrows indicating left turns. Turning left is allowed when the green arrow is on, turning is stopped when the red arrow is on.

Fig. 3. Options for installing a traffic light at an intersection

Fig. 4. Options for installing a traffic light at an intersection

If there is a power outage at an intersection and the traffic light does not work, then another function of the traffic light appears, i.e. eliminating traffic jams at intersections.

5. The implementation of this work consists of several stages:

1. Drivers wait until the intersection is clear in accordance with previously acquired knowledge;

2. Cars stop as close to the sidewalk as possible, but do not step on or run over the sidewalk;

3. If a person is moving along the sidewalk at this time, drivers must give way to him;

4. After this, vehicles located on the main road, that is, the green road, will start moving first;

5. The intersection is crossed by three cars from each lane of the main road. The number of cars depends on the number of lanes on the road. For example, if the number of lanes on the road is two, then the first six vehicles will cross the intersection on each side of the main road, if the number of lanes is three, then there will be nine on each side, etc.;

6. Until the empty spaces on the main road are filled by vehicles coming from behind, the intersection is crossed by vehicles of the secondary road, that is, on the red road, as indicated above;

7. These actions will continue until the traffic light starts working. Vehicles are prohibited from stopping in the center of the intersection.

6. Conclusion

Based on the work done, we came to the following conclusions about the multifunctional traffic light:

1. Multifunctional traffic light meets modern requirements.

2. A large number of traffic lights and road signs at some intersections can be replaced by four multifunctional traffic lights or road signs offered by us.

3. The multifunctional traffic light clearly indicates after what time vehicles on the secondary road must give way to vehicles on the main road, both with and without electricity.

4. Clearly defines when vehicles traveling on a secondary road can continue driving.

5. White arrows indicating the main and secondary roads on a multifunctional traffic light are convenient for drivers.

6. Multifunctional traffic light meets modern requirements.

7. The use of multifunctional traffic lights prevents large traffic jams.

8. Can also be used as a multifunctional sign at intersections with relatively little vehicle traffic. This will have a positive impact on energy and fuel savings, as well as on the quality of the local environment.

9. In the event of a power outage, traffic safety can be easily managed using signs on the multifunctional traffic lights.

10. There is no need to use the help of a road safety specialist to manage traffic safety during a power outage, as a result, damage to the health of workers is eliminated.

11. These traffic light signs are clearly visible to drivers from afar, and when there are traffic jams, drivers are confident that they will not remain stuck in a traffic jam for long. As a result, drivers are not nervous and the driving culture improves.

12. Reduces fuel consumption by quickly eliminating traffic jams.

13. Reduces environmental damage caused by excessive fuel consumption in long traffic jams.

14. A multifunctional traffic light signals that a vehicle moving on the main road at an intersection must give way to vehicles on a secondary road when approaching the intersection, as a result of which the vehicle owner is forced to

reduce speed at the intersection. This situation prevents possible accidents at the intersection.

15. Most importantly, the number of fatal accidents at intersections will sharply decrease.

16. As a result of the use of a multifunctional traffic light, there is no need to use the signs “Main Road”, “Direction of the Main Road”, “Give Way”, “Pedestrian Crossing”.

17. If necessary, the traffic light may be equipped with a sign for trucks, motorcycles, horse-drawn carriages or "Stop", cameras and other signs as necessary.

18. Training manuals on multifunctional traffic lights and signs will be created.

19. This traffic light and road sign are more economical than currently used traffic lights.

20. Launching the production of multifunctional traffic lights and selling them abroad will bring material benefits to the state.

21. The introduction of traffic lights and a new road sign will be a bold step in implementing the World Health Organization recommendations on road safety.

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