

# One Way Travel Restriction Device

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**Abstract**—A one-way travel restriction device is proposed. This device can be used on the road to limit the one-way traffic of vehicles, avoid retrograde, private car parking space will be occupied sometimes, and the unsafe factors such as occupying the road at the construction site or road in dangerous state. At present, the one-way traffic restriction on the road mainly depends on the use of traffic police, which is not only inefficient, but also wastes a lot of human resources. One way travel restriction device can solve the above problems. The one-way travel restriction device has complete functions and works efficiently, quickly and conveniently, which conforms to the requirements of the times. So how to meet the needs of modern people in the development of intelligence, mechanical and electronic information integration of the control operation structure provides the possibility of practicality, has a very large development value and broad market prospects.

**Keywords**—One Way; Restricted; Device; Traffic

## I. BACKGROUND OF THE IDEA

In today's society, with the gradual improvement of material living standards, cars have been popularized. According to statistics, as of May 3, 2020, the number of motor vehicles in Xi'an has exceeded 3 million, even 764 circles around the city wall, ranking among the top ten in China. In recent years, although the traffic road has been improving in a good direction, road construction is also being implemented, but the

speed is far less than the growth rate of motor vehicles. Traffic safety is also a very important issue. Because of traffic jams, small electric vehicles and motorcycles are often retrograde on the street, which is very dangerous. However, the retrograde of small vehicles is not well contained. At this stage, a large number of traffic police are required to intercept the traffic on the roadside, which is undoubtedly very troublesome. Therefore, we hope to design a one-way travel restriction device.

## II. CONTENTS AND KEY PROBLEMS

### A. Function description of the project

The device provides a one-way traffic restriction device for vehicles, which can carry out traffic restriction management. It solves the problem that sometimes private cars will be occupied, and when the construction site occupies the road or the road is in a dangerous state, the danger can be avoided through the one-way traffic restriction device of vehicles.

### B. Current status of the project

#### 1) Domestic situation

Domestic common warning signs, road signs, road condition reminders, etc. It is used to park cars in the garage or parking space, and in case of

emergency. The one-way travel restriction device has complete functions and works efficiently, quickly and conveniently, which conforms to the requirements of the times. So how to meet the needs of modern people in the development of intelligence, mechanical and electronic information integration of the control operation structure provides the possibility of practicality, has a very large development value and broad market prospects.

## 2) *Current situation abroad*

Nowadays, many foreign countries adopt one-way traffic, but in China, because of the large number of vehicles and people, two-way traffic is adopted.

Foreign single traffic can be divided into three types. The first is Manhattan style: long distance, wide range regional one-way traffic mode. The second is the London model, which is mainly based on the one-way road within the plot. The third mode is Singapore mode: the combination of trunk road and branch road.

### *C. The key problems to be solved in realizing the function of the project*

Key problem 1: there will be vehicle retrograde phenomenon: I think the project can play a good role in one-way traffic restriction. We think that solving the retrograde problem has always been a problem. This device can change the retrograde problem from telling people "can't do" to "can't do". The problem of mandatory change.

Key problem 2: unidirectional device can also be used in other aspects. Such as construction restrictions, parking lot entrance, crossroads and other places. It can solve the problem of hidden danger caused by nonstandard driving to a great extent.

## III. SPECIFIC SCHEME OF PROJECT IMPLEMENTATION

### *A. Preliminary planning*

At first, we put forward three plans

One is through the transformation of parallelogram mechanism. When the bevel of a

parallelogram is tilted, the height of its upper and lower sides will decrease. When the parallelogram is vertical, the height of the upper and lower sides is the maximum. Based on this, when the left and right sides of the quadrilateral tilt, the height can not make the vehicle pass, but the vertical height can pass. According to this principle, the model is put forward. The change of controlling parallelogram mechanism is through the thrust force of bar pair and mechanism. Using the lever principle, when there is no vehicle passing on one side, the parallelogram mechanism is in a non rectangular state because there is no force on one side of the lever, and the height is not enough to make the vehicle pass. When a vehicle passes by, one end of the lever is pressed down and the other end is lifted up. The action of the connecting rod receiving the force and the specific trajectory of the given plane makes the parallelogram receive the right force, the parallelogram deforms into a rectangular state, the height becomes higher, and the vehicle can pass through. If you go retrograde, you can't get through because there is no lever. This scheme can realize the original expectation and can be made into a single line device. However, compared with other schemes, this scheme has the following problems: compared with other schemes, the mechanism is too complex and inefficient, which may restrict some higher vehicles from passing through, and there are too many restrictions, so it is not adopted.

The second scheme: when the vehicle passes through the unidirectional driving device from the reverse direction, the pressure block above the device is pressed down by the wheel, the spring is compressed due to the gravity action of the vehicle, the rod connected with the pressure block is lowered, and the middle of the rod is connected with the frame through the low pair hinge. Therefore, the other end of the rod will be lifted, and the baffle connected with the rod through the hinge will also be lifted, So as to restrict the passing of vehicles. The other end is provided with the same rod assembly. When the vehicle is passing in the positive direction, the lifting of the rod will make the baffle lower, so the vehicle can pass through.

The third scheme: a varistor is set on one side of the road to connect with the gear lever. When the car is passing in the positive direction, the resistance of the varistor decreases due to the increase of pressure, and the gear lever rises, and the car passes. The reverse vehicle cannot lift the lever through the varistor.

*B. Determination of final scheme*

After discussion, we think that the structure of scheme 1 is more complex, and there are great limitations for the height of the vehicle. However, there is no specific implementation agency to explain his plan. Finally, it was decided to use scheme 2.

IV. SCHEME DESCRIPTION

The device provides a one-way traffic restriction device for vehicles, which can carry out traffic restriction management. It solves the problem that sometimes private cars will be occupied, and when the construction site occupies the road or the road is in a dangerous state, the danger can be avoided through the one-way traffic restriction device of vehicles.

As shown in Figure 1 and Figure 2, the following conclusions can be obtained:the product comprises upward convex pressing blocks 12 and 13, which are respectively connected with the support plate 1 and the support plate 11 through springs. The support plates 1, 2, 10 and 11 are rigidly connected with the shell, and are fixed in the axial direction and transverse direction. The connection among the rods 3, 4, 5, 6, 7, 8 and 9 is hinge connection. Among them, shaft 14, shaft 15 and shell are rigidly connected. When the vehicle enters the device from the right side, the gravity of the vehicle causes the pressure block 13 to move down, and the shaft 3 to move down makes the rod 4 rotate clockwise around the shaft 14, so that the rod 5 moves up, the rod 7 moves down, and the rod 6 rotates counterclockwise, and the vehicle can pass through. When the vehicle enters the device from the left side, the gravity of the vehicle causes the pressure block 12 to move down, the rod 9 to move down causes the rod 8 to rotate anticlockwise, thus the rod 7 to move up, and the rod 6 to rotate clockwise, so the vehicle cannot pass.

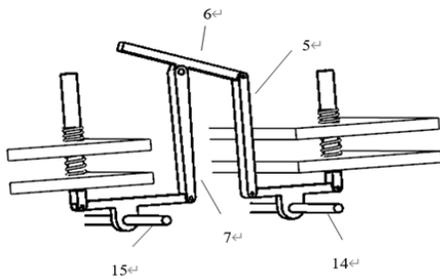


Figure 1. Schematic diagram of the device

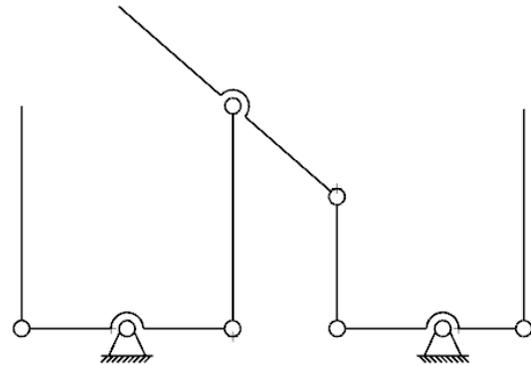


Figure 3. Structure diagram of the device

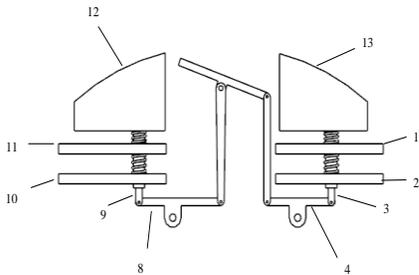


Figure 2. Schematic diagram of the device (main view)

According to Figure 3, we can know that is the structure diagram of the device. It can be seen from the structure diagram that the main principle of the device is the lever principle. Lever principle is also called "lever balance condition". In order to balance the lever, the two moments (the product of force and arm) acting on the lever must be equal. That is:  $power \times Power\ arm = resistance \times The\ resistance\ arm$  is expressed as  $F1 \cdot L1 = F2 \cdot L2$ .

Where  $F_1$  is power,  $L_1$  is power arm,  $F_2$  is resistance and  $L_2$  is resistance arm.

$$F_1 \times L_1 = F_2 \times L_2 \quad (1)$$

Through (1), we can get the following conclusion: when the right side of the bar moves downward under pressure, the left side of the bar will lift up to form a small slope, which can make the vehicle pass. But the gravity of the car can't act on the left bar directly, so it can't pass from the left. It can be seen from the above formula that in order to balance the lever, the power arm is several times of the resistance arm, and the power is a fraction of the resistance.

When the vehicle passes through the unidirectional driving device from the reverse direction, the pressure block above the device is pressed down by the wheel, the spring is compressed due to the gravity action of the vehicle, the rod connected with the pressure block is lowered, and the middle of the rod is connected with the frame through the low pair hinge. Therefore, the other end of the rod will be lifted, and the baffle connected with the rod through the hinge will also be lifted, So as to restrict the passing of vehicles. The other end is provided with the same rod assembly. When the vehicle is passing in the positive direction, the lifting of the rod will make the baffle lower, so the vehicle can pass through.

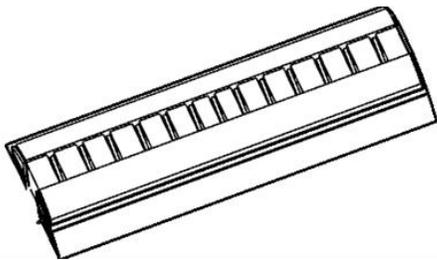


Figure 4. Appearance of one way travel restriction device

As shown in Figure 4 is the appearance of one way travel restriction device. We designed the appearance of the device like this, referring to the appearance of the speed bump on the highway. This device can be more convenient to install on the road, at the same time, the device can also play

the role of deceleration belt, can replace the deceleration belt, to achieve double effect.

## V. MARKET RESEARCH AND COMPETITION ANALYSIS

### A. Market Research and analysis

Domestic common warning signs, road signs, road condition reminders, etc. It is used to park cars in the garage or parking space, and in case of emergency. The one-way travel restriction device has complete functions and works efficiently, quickly and conveniently, which conforms to the requirements of the times. So how to meet the needs of modern people in the development of intelligence, mechanical and electronic information integration of the control operation structure provides the possibility of practicality, has a very large development value and broad market prospects.

### B. Competition analysis

PEST analysis is the analysis of macro environment. Macro environment, also known as general environment, refers to the main social forces that bring opportunities or threats to enterprises. They directly or indirectly affect the strategic management of enterprises. An important tool to analyze the macro environment is PEST analysis model, which analyzes the impact of environmental changes on enterprises from the political, economic, social and technological perspectives.

Politics: in 2006, the outline of the national medium and long term science and technology development plan (2006-2020) was published, and the 18th National Congress of the Communist Party of China made the strategic deployment of innovation driven development. In 2015, the opinions of the CPC Central Committee and the State Council on deepening the reform of system and mechanism and accelerating the implementation of innovation driven development strategy were published, In the same year, the implementation plan for deepening the reform of science and technology system was also issued.

Economy: closely linked to development. We should adhere to problem orientation, face the

forefront of world science and technology, face the major national needs, and face the main battlefield of the national economy, clarify the main direction of China's innovation and development, make breakthroughs in key areas as soon as possible, and strive to form more competitive advantages.

Deepen reform. We should keep pace with the reform of the science and technology system and the reform of the economic and social fields, strengthen the connection between science and technology and the economy, follow the laws of the socialist market economy and science and technology innovation, get rid of all ideological barriers and institutional barriers that restrict innovation, and build a good environment that supports innovation driven development.

Strengthen incentives. The essence of innovation driven is talent driven. We should put people first, respect the value of innovation and creation, stimulate the enthusiasm and creativity of all kinds of talents, and speed up the gathering of a large-scale, reasonable structure and high-quality innovative talent team.

Open wider to the outside world. We should persist in planning and promoting innovation from a global perspective, make the best use of global innovation resources, comprehensively enhance China's position in the global innovation pattern, and strive to become a leader in several important fields and a participant in important rule making.

Society: develop smart city and digital social technology, and promote the people-oriented new urbanization. Rely on new technology and management innovation to support new urbanization, modern urban development and public services, innovate social governance methods and means, accelerate the informatization process of comprehensive governance of social security, and promote the construction of a safe China. Develop standardized, digital and intelligent technologies for municipal infrastructure such as transportation, electric power, communication and underground pipe network, and promote the large-scale application of key technologies in green building, smart city, ecological city and other fields. We will strengthen

key technologies and products in major disaster and public security emergency areas.

Technology: China's innovation driven development has the foundation to accelerate. After years of efforts, the development of science and technology is entering a leap period from quantitative growth to qualitative improvement, the scientific research system is increasingly complete, the talent team is growing, and the independent innovation ability of science, technology, engineering and industry is rapidly improving. Economic transformation and upgrading, continuous improvement of people's livelihood and national defense modernization put forward a huge demand for innovation. The combination of huge market scale, complete industrial system, diversified consumer demand and the improvement of innovation efficiency in the Internet era provides a broad space for innovation. The system of socialism with Chinese characteristics can effectively combine the advantages of concentrating on major affairs and market allocation of resources, which provides a fundamental guarantee for innovation driven development.

## VI. CONCLUSIONS

The device provides a one-way traffic restriction device for vehicles, which can carry out traffic restriction management. It solves the problem that sometimes private cars will be occupied, and when the construction site occupies the road or the road is in a dangerous state, the danger can be avoided through the one-way traffic restriction device of vehicles. The utility model relates to a one-way limiting device used for private parking space management, which can control the movement of the support plate through a simple structural design, drive the rod to move up and down, and then control the rotation of the panel, so as to achieve the purpose of one-way limiting. The one-way limiting device of the utility model can be used for the use and management of private parking space, Prevent private cars from going in and out in opposite directions, causing congestion.

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