

# Design and Application of Vehicle Interior Environment Regulating Device

Chicheng Ma, Jinjin Dang

Luo Yang Polytechnic, Henan, Luoyang, 471000, China

## Abstract

With the progress of the times, vehicles appear more and more frequently in people's lives. Therefore, based on the safety problems caused by the interior environment, this paper analyzes the characteristics of the interior environment, and designs a simple interior environment regulating device to ensure a good and comfortable driving environment for passengers.

## Keywords

Driving environment; Harmful pollutants; Regulating device.

## 1. Introduction

In recent years, with the continuous development of the national economy and the continuous improvement of people's consumption ability, China's vehicle consumer market has gradually become the largest market in the world. By 2022, China's vehicle ownership has surpassed the United States to become the world's first.

According to the data in recent years, although the problem of vehicle accidents has improved, with the continuous rise of vehicle ownership, various problems in the use of vehicles are still prominent. In particular, the safety problems caused by the change of the environment inside the vehicle, such as the suffocation of the living things in the vehicle and the spontaneous combustion of the vehicle, are emerging in endlessly all over the world. At present, there is no targeted solution or prevention plan for such phenomena, and even little attention has been paid to such incidents.

As for such accidents, most of the public opinion in the society attributed the causes of the problems to the vehicle users themselves. However, this statement does not help to reduce the accident rate. As a common means of transportation, the vehicle should be operated correctly by the owner as much as possible without too many additional means, which can ensure the service life of the vehicle and the safety of property and personnel on the vehicle.

## 2. Strategies for Improving the Interior Environment

Because of the improvement of people's requirements for vehicle performance, a variety of new technologies, new materials and new processes are increasingly put into the production of vehicles. This leads to the accumulation of harmful pollutants in the vehicle during the manufacturing process. The dissipation of these harmful pollutants will also be accompanied by the whole use process of the vehicle, which will cause long-term damage to the human body. At the same time, in the process of using the vehicle, in addition to the harmful pollutants in the vehicle, the external environment will also affect the environment in the vehicle. The specific influence parameters are shown in Table 1.

Table 1: Impact of interior environment on human body

Num.	Main harmful substances in the vehicle	Impact on human body
1	Toxic and harmful pollutants, such as formaldehyde, acetaldehyde, Sox, NOx, etc	Directly cause serious injury to human body
2	Harmless substances, such as CO2	Harm to human body when reaching a certain concentration
3	Interior environment, such as humidity, temperature, etc	Damage to the human body when it exceeds the human body's capacity

In modern vehicles, in order to improve the comfort of the interior environment, some environmental regulating devices are usually installed in the vehicle, such as air conditioning system, which can adjust the temperature and humidity of the interior environment of the vehicle and ensure a comfortable interior environment. However, in the actual use process, the air conditioning system can not filter or remove toxic and harmful substances in the vehicle. Therefore, it is necessary to place some air filtration and purification devices in the vehicle to further purify the air in the vehicle. At the same time, these devices will also bring other pollution problems.

The design idea of this paper is based on the impact of the interior environment on the human body, and based on the interior air conditioning control system, we designed an interior environment regulating device, which can improve the interior environment, improve the active comprehensive safety factor of the vehicle, and reduce the loss of personnel and property [1-2].

### 3. Design and application of interior environment regulating device

The device in this design is based on the original air-conditioning device in the vehicle, and a control groove, an annular plate and an annular groove are designed and added to match. In the actual use process, we can place materials into the annular groove according to the needs. For example, filter and purify materials can be added according to the environmental detection in the vehicle. When the air conditioner is used, the circulating air in the vehicle is introduced into the device and filtered and purified by pre stored materials, so as to improve the internal environment of the vehicle.

#### 3.1. Structure diagram of interior environment regulating device

As shown in Figure 1, the device includes a cylinder with an opening upward. The threaded sleeve on the upper side of the cylinder is provided with a cylinder cover, and the lower side of the cylinder cover is fixedly connected with the control center. The lower side of the control center is fixedly connected with the water inlet pipe, and the lower side of the water inlet pipe is fixedly connected with the water inlet pipe. The lower side of the water inlet pipe is in contact with the lower side of the cylinder. The upper side of the cylinder cover is provided with a control groove, which is connected with the control center through a plurality of through holes. There is an annular plate in the control groove, an annular groove on the upper side of the annular plate, a plurality of ventilation holes on the side wall of the annular groove, and two working holes symmetrically on both sides of the control groove. The working holes are matched with the annular plate. A plurality of threaded rods are symmetrically fixed and connected to the upper side of the cylinder cover.

As shown in Figure 2 below, there is a baffle in the control groove. The baffle is located on the upper side of the annular plate and is in contact with the annular plate. There are through slots in the baffle plate. The through slots are arranged through. There are two moving rods

symmetrically in the through slots. The moving plates are connected by springs. The inner wall of the control slot is symmetrically provided with a plurality of moving slots. The moving plates pass through the moving slots and are matched and connected with the moving slots.

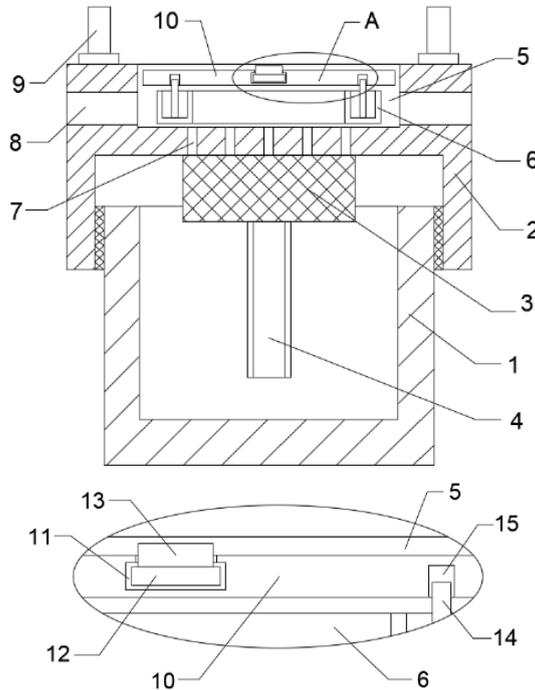


Figure 1: Structural diagram of regulating device

(1-cylinder; 2-cylinder cover; 3 - control center; 4-water inlet pipe; 5-control slot; 6-annular plate; 7-through hole; 8-working hole; 9-threaded rod; 10 - baffle; 11 through groove; 12 mobile board, 13 control board; 14 - limit rod; 15 - limit groove)

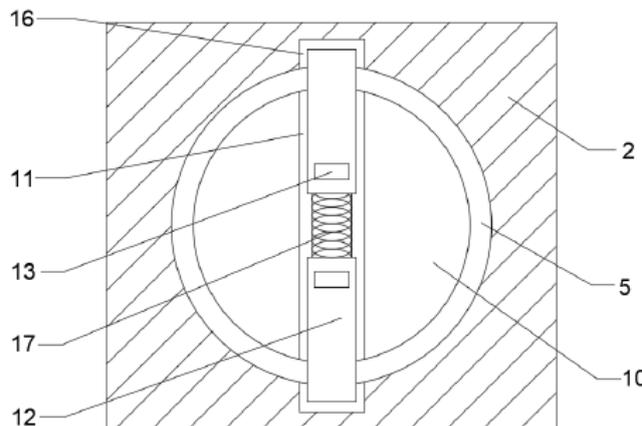


Figure 2: structural diagram of control slot

(2-cylinder cover; 5-control slot; 10 - baffle; 11 through groove; 12 mobile board, 13 control board; 16 mobile slot; 17 - spring)

### 3.2. Working process of interior environmental conditioning device

Before adjusting, put the corresponding materials or other auxiliary materials into the annular plate. Move the two control boards at the same time, and the control board can drive the two moving boards to move. The moving plate compresses the spring until the two moving plates completely enter the through groove. Adjust the baffle so that the position of the limit groove on the lower side of the baffle is relative to that of the limit rod. Move the baffle downward to make the baffle contact with the annular plate. At this time, the positions of the moving plate and the moving groove are relative, and the control plate is released. Under the action of the

spring, the moving plate moves away from the other side. The moving plate enters the corresponding moving groove, and the screw rod is used to install the device in the corresponding position in the vehicle as a whole. After the installation is completed, start the air conditioning system to start the corresponding indoor environment adjustment [3-4].

#### 4. Summary

The interior environment of the vehicles is a narrow and closed mobile space, which has gradually become the space with the most residence time except for family and work. The interior environment itself is a complex problem, this paper can effectively improve the interior environment by adding a regulating device. But it can't fundamentally solve the problem of environmental pollution inside the vehicle. In the future, with the continuous development of intelligent technology, a series of intelligent designs can be carried out in combination with the relevant control systems in the existing vehicle, and a new intelligent control system can be established to completely improve the interior environment, so as to improve the active comprehensive safety factor of the vehicle and reduce the loss of personnel and property.

#### References

- [1] Xu Min, Ni Jia. Risk analysis of air quality safety in vehicles.[J] China Quality Certification, 2019(02):88-90.
- [2] Zhu ZhaoYan. Analysis of the Environmental Pollution in vehicles and Improvement Measures[J].Tropical Agricultural Engineering, 2014,38(02):31-34
- [3] Qian Chen, Li Qipeng, Yukaiyuan. Discussion on air pollution and fresh air system in vehicle[J]. Automobile Applied Technology , 2020 (01): 74-76.
- [4] Lin Wei. Research and design of intelligent monitoring and controlling instrument for air quality in vehicle[J]. Journal of Changchun Normal University, 2021,40(02):64-69.

Author introduction: Chicheng, Ma(1987- ), male, Luoyang, Henan Province, master of engineering, lecturer, working in LUO YANG POLYTECHNIC. Research direction: machinery manufacturing and automation.