

Novel Air Purification Warning Board

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Abstract

The new warning signs for air purification have a remarkable effect on avoiding secondary traffic accidents. The traditional triangular warning signs are combined with air purifiers and innovated. A variety of sensors and automatic lighting switching systems are designed, and technologies such as network connection module and network connection of network cloud server are combined. Based on this, this paper puts forward a novel portable structure, which can realize the remarkable characteristics of flexible and firm installation and air purification of the new air warning board, and has a good prospect.

Keywords

Warning signs; Air purifier system; Network; sensor.

1. Introduction

According to the Law of the People's Republic of China on Road Traffic Safety, warning signs should be placed at different intervals according to different road sections once a vehicle breaks down or has a traffic accident. Warning sign is an important safety tool for vehicle distribution when purchasing vehicles. Passive reflectors of reflective materials are used to remind other vehicles to avoid, so that subsequent vehicles can see more clearly at a distance of several hundred meters to avoid secondary accidents. Especially now, the global air quality is deteriorating, and the air quality in Melbourne has deteriorated to a "dangerous" level due to the smoke generated by mountain fires in Australia. Health officials say that it has reached the "worst" in the world.

2. Research Status

In the prior art, the warning signs cut corners by as much as 90%, and the warning signs need to be put on reflective clothing in accidents, which also has the risk of being easily blown down by the wind, and the warning signs can not be clearly seen in bad weather. At the same time, the air quality problem has not been paid enough attention in our country in the past, and professional ventilation devices are only available in some special places, such as laminar flow wards in hospitals. At present, there are no products to solve these two problems in the market. Therefore, it is imperative to study the warning device of air purification.

3. Research Principles

The luminous device of this warning sign is combined with air purification device, and this luminous device can be used at night and in all kinds of bad weather; This warning board has air purification function at the same time, and monitors the air composition around the vehicle all the time, which can not only see the air quality and composition near the rear-end collision or traffic accident, but also purify the air quality of the whole environment all the time, and provide accurate information for special vehicles (transporting flammable and explosive gases and liquids) or serious traffic accidents (causing fireworks leakage, etc.) to facilitate rescue, etc.

4. Research Direction

The purpose of this project is mainly to solve the problem that the common warning signs in the prior art may have low reflection rate of reflectors, that is, to fundamentally and directly improve the secondary accidents caused by the rear vehicles not being able to see the warning signs clearly during the day and night and under severe weather conditions such as foggy days, rainy days, gloomy days and sandstorms (as shown in Table 1). While solving the main problems, various auxiliary functions are added, such as magnet adsorption to prevent being blown down by the wind, waterproof with special materials, special LED lights to make warning signs visible at a distance of several hundred meters, and adjustment of the lighting intensity of warning signs according to the weather conditions at that time. Secondly, a new function is added: air purification function. Monitor the impurities in the purified air at all times. If there is excessive toxic and harmful gas around the vehicle, give an alarm to remind you, or leak when a traffic accident occurs, you can also judge the situation and provide accurate information to facilitate rescue; It is important that when the weather conditions are particularly bad (such as smog, rain, sandstorm, etc.), the brightness of warning signs placed on the roof or on the rear of the car will be affected by impurities in the air, and the rear vehicle personnel will not be able to see clearly, which will easily cause traffic congestion. At this time, the new air purifier perfectly solves this problem and purifies the air around the warning signs all the time.

Table 1. Traffic statistics of 24 hours a day

time slot	day	night
Traffic flow percentage	75%	25%
Accident rate	55%	45%

5. Technical Scheme

This project is realized by the following technical scheme: a warning sign with air purification includes a shell, an air purification device, an automatic lighting brightness switching system device (with LED strobe lights), various sensor devices, a main control circuit board, a liquid crystal display screen, a vehicle-mounted power cord, an air inlet and an air outlet. The internal structure is roughly as follows: several air inlets are arranged at the top of the shell, an air purifier is arranged in the shell, a main control circuit board is arranged below the air purifier, a light near-far automatic switching system device is arranged behind the display screen and connected with a power cord, a liquid crystal display is arranged on the shell, a sensor is arranged below the right side of the shell, a vehicle-mounted power cord is arranged on one side of the shell, and air outlets are arranged on both sides of the shell.

5.1. Air Purification Device

The air purification device comprises an active negative ion generator, an activated carbon filter, a grating and a fan, wherein the active negative ion generator is provided with an activated carbon filter on the left side and a fan on the right side, and a grating is arranged between the active negative ion generator and the fan. The active negative ion generator can continuously release ecological negative oxygen ions into the air. It has built-in air vitamin high-efficiency HEPA, and the filter material of superfine fiber can fully intercept the fine particles in the air, thus realizing the thorough purification of particulate pollutants below 0.05 microns. Negative ions can not only promote human body to synthesize and store vitamins, but also strengthen and activate human physiological activities, so it is also called "air vitamins". Air negative ions also have sedative and hypnotic effects. (Figure 1 is for reference)

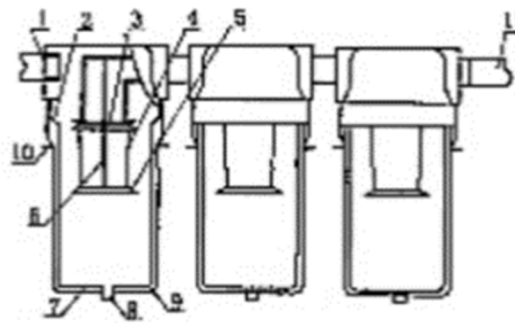


Figure 1. Multi-stage air purification device

5.2. Sensor Device

Sensors include temperature sensor, humidity sensor, VOC sensor, PM2.5 sensor, and human body sensor. There are humidity sensor, VOC sensor and PM2.5 sensor on the right side of temperature sensor. The human body sensor is located above the LCD screen. The main control circuit board is connected with temperature sensor, humidity sensor, VOC sensor, PM2.5 sensor and human body sensor. The VOA sensor detects the content of various gases in the air, and the network connection module on the main control circuit board is connected with the network cloud server.

5.3. Automatic Switching Device for Light Brightness

The light brightness automatic switching system device can automatically judge the visibility of the external air environment and then automatically adjust the brightness of the warning board. The system is mainly composed of light sensing part (photosensitive resistor), voltage divider, thyristor (thyristor), step-down chopper circuit and relaxation oscillator. The system can use the light sensing part to respond to the external light intensity and change its own resistance to adjust the brightness of LED warning light, so that the LED warning light can produce light brightness suitable for the surrounding environment and avoid the waste of electric energy caused by transitional lighting. The LED warning lights are stroboscopic LED warning lights.

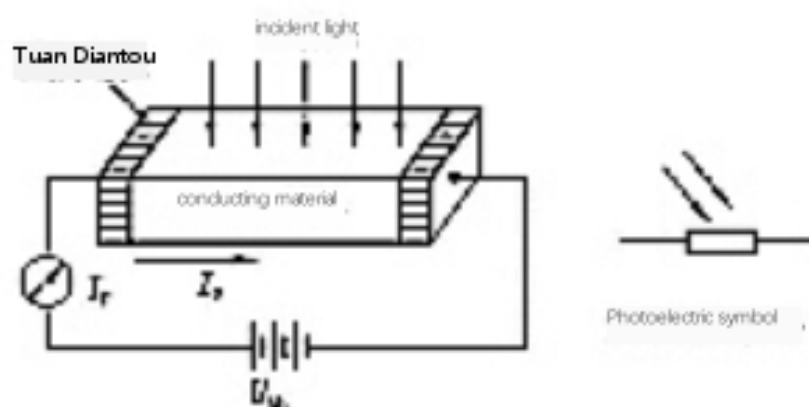


Figure 2. Principle of photoresistor

5.4. Network Connection Module

The main control circuit board is provided with a network connection module, and the left side of the network connection module is provided with a communication protocol sending module. The network connection module on the main control circuit board is connected with the network cloud server, and displays the multimedia information of the network cloud server,

the concentration of PM2.5 and the content of various gases in the air through the liquid crystal display screen.

5.5. Shell and Connecting Power Supply Device

The shell comprises a front cover plate and a rear cover plate, and the rear cover plate is arranged behind the front cover plate. There is a base at the bottom of the front cover plate, and a magnet is arranged below the base, which can be adsorbed on the top of the car roof or the tail of the car. The magnet is provided with a protective layer, which will not scratch the surface of the car body. Several LED warning lights are embedded on both sides of the front cover plate, and several buttons are arranged below the front cover plate, which are electrically connected with the main control circuit board.

The vehicle-mounted power cord is a DC vehicle-mounted power cord, the voltage of which is 24v. The DC vehicle-mounted power cord is connected to the vehicle cigarette lighter, which supplies power to the warning sign with air purification.

6. Innovation Points

The structure is simple, the magnet on the base is adsorbed on the roof or the back of the car, which is not easy to be blown by the wind, and has waterproof function, good warning effect, low cost and small volume. One side of the shell is provided with a vehicle-mounted power cord, which is connected to a cigarette lighter for vehicles, and the cigarette lighter supplies power to warning signs with air purification. LED warning lights display stroboscopic LED warning lights (brightness can be automatically adjusted with external visibility). When it rains, smog is serious and traffic accidents occur, LED warning signs can be directly displayed on the roof or the rear of the car, and the air can be purified. It is convenient for car owners to master the air quality in the environment at any time for portability. The network connection module on the main control circuit board is connected with the network cloud server, and displays the multimedia information of the network cloud server, the concentration value of PM2.5 and other concentrations in the air (detected gas components) through the LCD screen.

7. Promotion

Nowadays, on the road, we can always see some cars transporting inflammable and explosive objects. Even if there is no traffic accident, but flammable and explosive objects leak, the new air purification warning board can monitor the surrounding air composition, and transmit the information remotely through the network connection module and the network connection of the network cloud server.

8. Conclusion

Through research and design, based on the research of automatic control of warning sign strobe lights and air purifiers in harsh environment, aiming at visibility and weather conditions, the lighting technology of self-regulation is used to purify the air around warning signs as an auxiliary, which has obvious epoch-making significance. It not only improves the safety performance of automobiles during driving, avoids secondary traffic accidents, and achieves the accuracy, practicability and developability of lighting switching, but also can reduce the resource consumption to the maximum efficiency, which is in line with the mainstream trend of today's Internet age.

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