

## CLEANING SYSTEM FOR VEHICLE WHEELS

### 5    **Technical Field**

The invention relates to a cleaning system, more specifically to a system and a method for cleaning vehicle wheels. The system and the method can be mainly used to clean wheels of the vehicles entering into a dusty or dirty site, such as a construction site, so  
10    as to prevent the surrounding region from being polluted by dust, dirt or the like.

### **Background**

Development of cities depends on construction projects. However, a huge amount of  
15    dust, dirt or the like inevitably exists in different building and construction sites. Therefore, a variety of engineering vehicles that frequently drive in and out of the construction site will take the dust and dirt therein to outside places. To maintain a clean environment in cities, governments will generally stipulate that wheels of the vehicle from a construction site have to be cleaned before the vehicle leaves the  
20    construction site. Currently, in some construction sites, the wheels are cleaned by a high pressure squirt gun operated by hand, without any dedicated devices. This method needs manpower and is also time consuming. Also, used water, always being dirty after cleaning, will be discharged out of the cleaning place freely, thus negatively influencing on the environment inside the construction sites. In some other  
25    construction sites, a cleaning system with rollers is used. However, this roller-type cleaning system needs a long cleaning time, and the vehicle to be cleaned has to be in an idle state during cleaning in order that the wheels and the rollers can be both freely rotary when cleaning. If the driver forgets to keep the vehicle into the idle state, the components of the cleaning system will be harmed. If so, the maintenance fee for the  
30    cleaning system will be increased, and the cleaning procedure will be also interrupted,

thus reducing the cleaning efficiency. Meanwhile, both of the above-mentioned methods need a large amount of water, which is disadvantageous in view of environmental protection.

5 Hence, the applicant proposes an automatic cleaning system for vehicle wheels in Chinese utility model patent CN202053989U. In said automatic cleaning system for vehicle wheels, an automatic control circuit is arranged, and the cleaning water is fed to a water circulating system. In this way, an automatic control cleaning with water saving can be achieved. However, the main body of said automatic cleaning system is  
10 made of concrete, and needs to be demolished when it is no longer used after the construction project is finished. This will consume huge manpower and natural resources, and moreover is disadvantageous in view of environmental protection.

### **Summary of the Invention**

15 To solve the defects in the prior arts, the invention aims to provide a cleaning system for vehicle wheels, wherein the structure of the cleaning system is simple, the main components thereof can be reused, and the amount of water used can be reduced.

20 According to the present invention, a cleaning system for vehicle wheels is provided, including a concave downwardly cleaning trough from which a vehicle to be cleaned can drive in and out, a plurality of high pressure water nozzles for cleaning vehicle wheels that are arranged at the left and right sides of said cleaning trough respectively, and an automatic cleaning control circuit. The cleaning system further includes two  
25 independent water storage tanks, which are arranged at the left and right sides of said cleaning trough respectively, and two independent water circulating systems, which are arranged in said water storage tanks respectively. A water discharging port is arranged on one side wall of said water storage tank facing toward said cleaning trough, wherein the bottom face of said water storage tank is lower than that of said  
30 cleaning trough. Said water circulating systems are connected with said water

discharging port, said water storage tank and high pressure water nozzles respectively. The water after cleaning the vehicle wheels is discharged from said water discharging port into the water storage tank via said water circulating systems, and then supplied to the high pressure water nozzles.

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Said water storage tank is divided into a sedimentation tank and a clear water tank.

Said water circulating system includes a drain pipe, a water pipe, a discharge pipe, and a small water pump and a large water pump both connected to the automatic  
10 cleaning control circuit. Said drain pipe is connected to the water discharging port and the sedimentation tank at both ends thereof respectively. Said small water pump is arranged above said sedimentation tank. Said water pipe is connected to said small water pump and said clear water tank at both ends thereof respectively. Said large water pump is arranged in said clear water tank and connected to said discharge pipe.  
15 And said high pressure water nozzles are connected to said discharge pipe.

Said high pressure water nozzles are arranged at one side wall of said water storage tank facing toward said cleaning trough.

20 Said water storage tank is made of steel, and closed by means of a plurality of cover plates on the top thereof.

Said automatic cleaning control circuit is provided with two pairs of the infrared transmitting assemblies located at the front side and the rear side of said cleaning  
25 trough respectively, wherein said infrared transmitting assembly includes an infrared transmitter and an infrared receiver that are cooperated with each other in use, and said infrared transmitter and the infrared receiver are arranged at both sides of the cleaning trough respectively in a manner of being opposite to each other.

30 The spraying angle of said high pressure water nozzles can be adjusted so as to obtain

an optimal cleaning angle. Two adjacent high pressure water nozzles are spaced from each other at a distance of 250-330 mm.

5 Said cleaning trough is cast in concrete with a longitudinal cross section of an inverted trapezoidal shape, the bottom face of which being 270-350 mm lower than said drain pipe. And said high pressure water nozzle has a distance of 550-650 mm from the inverted trapezoidal-shaped bottom face.

10 Compared with the prior arts, the cleaning system for vehicle wheels according to the present invention has the following advantages:

1) The main components of the cleaning system can be dismantled as a whole after use and then reinstalled in other places where necessary, which saves labor cost significantly and is more environmentally friendly;

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2) The whole cleaning system has a simple and durable structure, and thus the daily maintenance fee is reduced;

3) The cleaning water can be reused. Therefore, it can reduce the water cost and save water, which is environmentally friendly;

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4) The whole cleaning system detects the information about the vehicle to be cleaned drives in and out by means of an infrared transmitting assembly, and automatically switches on or off the water pumps and the high pressure water nozzles. Therefore, the whole procedure is an unmanned operation, thus significantly saving labor cost; and

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5) The cleaning time is short. For example, it costs only 2-3 minutes for cleaning one vehicle; thus the system has a high cleaning efficiency.

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## **Brief Description of Drawings**

Fig. 1 is the plan view showing the vehicle wheel cleaning system according to the present invention.

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Fig. 2 is the longitudinal cross-sectional view of the vehicle wheel cleaning system according to the present invention.

Fig. 3 is the cross-sectional view along line 1-1 of Fig. 1.

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Fig. 4 is the cross-sectional view along line 2-2 of Fig. 1.

## **Specific Embodiments of the Invention**

15 In the following the invention will be discussed in details with reference to embodiments and the attached drawings.

As shown in Figs. 1 and 2, the cleaning system for vehicle wheels according to the present invention mainly includes a cleaning trough 1 from which a vehicle to be  
20 cleaned can drive in and out, a plurality of high pressure water nozzles 2 for cleaning vehicle wheels, a water storage tank 3, a water circulating system and an automatic cleaning control circuit. The water after cleaning the vehicle wheels flows into the water storage tank 3 via said water circulating systems, and is supplied to said high pressure water nozzles 2. The automatic cleaning control circuit controls to switch on  
25 or off the cleaning operation.

As shown in Fig. 2, said cleaning trough 1 is cast in concrete with a thickness of 200 mm, wherein the middle part thereof is concave downwardly in order to collect and store a certain volume of water, and forms the area for vehicle in cleaning. The front  
30 side and rear side of said cleaning trough 1 are both provided with a slant surface

connected to the outside road, in order to facilitate the vehicle to drive in and out. Hence, the longitudinal cross section of said cleaning trough 1 forms an inverted trapezoidal shape.

5 In particular, in the present invention, two independent water storage tanks 3 are provided and arranged at both sides of said cleaning trough 1 respectively, and two independent water circulating systems also are provided and arranged in said two water storage tanks 3 respectively. With this design, when it is necessary to move the cleaning system to another place, the water storage tank 3 together with the water  
10 circulating system therein can be hoisted as a whole by a hoist, and then transported to the desirable place for use. Therefore, the labor and cost for demolishing on site are eliminated, and moreover, the water storage tanks 3 and water circulating systems can be reused for many times, which is very environmentally friendly and cost saving. In this embodiment, as shown in Figs. 1 and 3, said water storage tank 3 is shaped as a  
15 cuboid made of steel. The top of the water storage tank 3 is closed by means of a plurality of cover plates 36 arranged along the longitudinal direction, with which it is more convenient for operators who can simply open the corresponding cover plate 36 during maintenance and repair.

20 As shown in Figs. 2 and 4, the bottom face of said water storage tank 3 is lower than the bottom face 11 of said cleaning trough 1. A water discharging port 31 and a plurality of said high pressure water nozzles 2 are arranged at one side wall of each of said water storage tanks 3 facing toward the cleaning trough 1. The plurality of said high pressure water nozzles 2 are uniformly distributed along the lateral direction, and  
25 the spraying angle thereof can be adjusted so as to obtain an optimal cleaning angle. Two adjacent high pressure water nozzles 2 are spaced from each other at a distance of 250-330 mm, in particular 330mm in the embodiment. Said high pressure water nozzle 2 has a distance of 550-650 mm from the bottom face of cleaning trough 3, and in particular 600 mm in the embodiment, which is suitable for the vehicles commonly  
30 used in the construction site. Said water discharging port 31 is roughly 270-350 mm

higher than the bottom face 11 of said cleaning trough 1, in particular 300mm in the embodiment. Therefore, vehicle wheels can be immersed in a certain volume of water and cleaned therein, thus improving the cleaning efficiency. Said water storage tank 3 is divided into two sedimentation tanks 32 and a clear water tank 33, wherein said two  
5 sedimentation tanks 32 are adjacently arranged.

As shown in Figs. 1 and 4, each water circulating system includes a drain pipe 51, a water pipe 52, a discharge pipe 53, and a small water pump 54 and a large water pump 55 both connected to said automatic cleaning control circuit. The two ends of said  
10 drain pipe 51 are connected to the water discharging port 31 and the sedimentation tank 32 respectively. The water after cleaning the vehicle wheels is discharged from the water discharging port 31 into one of sedimentation tanks 32 via the drain pipe 51. After preliminary precipitation, the relatively clean water in the upper portion of the tank flows over a partition 34 located between two sedimentation tanks 32, and then  
15 flows into the other downstream sedimentation tank 32. Said small water pump 54 is arranged on the top part of said downstream sedimentation tank 32, and said water pipe 52 is connected to the small water pump 54 and the clean water tank 33 at both ends thereof respectively. Therefore, the water in the downstream sedimentation tank 32 can be pumped up into the clean water tank 33. Said large water pump 55 is  
20 arranged in said clear water tank 33 and connected to said discharge pipe 53, which is in turn connected to said high pressure water nozzles 2. Said large water pump 55 can be used to pump water out of the clean water tank 33, and spray it from high pressure water nozzles 2 via the discharge pipe 53.

25 As shown in Fig. 1, said automatic cleaning control circuit is provided with two pairs of infrared transmitting assemblies 6 located at the front side and the rear side of said cleaning trough 1 respectively. Said infrared transmitting assembly 6 includes an infrared transmitter and an infrared receiver that are cooperated with each other in use. Said infrared transmitter and infrared receiver are arranged respectively at both sides  
30 of the cleaning trough 1, in a manner of being opposite to each other. When a vehicle

drives in or out of a cleaning trough 1, infrared transmitted by the infrared transmitting assembly 6 is blocked, and thus the automatic cleaning control circuit will switch on or off said large water pump 55 and small water pump 54 in due time, so as to control the high pressure water nozzles 2 to spray water for cleaning or stop  
5 water spraying.

Thus it can be seen that, the cleaning system according to the present invention has a very simple structure, a small occupation area, and is very efficient. The cleaning water can be reused; therefore, it can save precious water resources. Most importantly,  
10 only by demolishing the simple connecting elements between the water storage tank 3 and the cleaning trough 1, the whole water storage tank 3 together with the water circulating systems therein can be hoisted and then transported to another construction site. Thus it can not only save labor and cost for demolishing, but be very environmentally friendly and cost saving.

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While the invention has been described in conjunction with the preferred embodiments outlined above, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art. Various changes may be made without departing from the spirit and scope of the invention as defined in the  
20 following claims.

## Claims

1. A cleaning system for vehicle wheels, including a downwardly concave cleaning trough (1) from which a vehicle to be cleaned can drive in and out, a plurality of high pressure water nozzles (2) for cleaning vehicle wheels that are arranged at both sides of said cleaning trough (1) respectively, and an automatic control circuit,

characterized in that, the cleaning system further includes two independent water storage tanks (3) which are arranged at the right and left sides of said cleaning trough (1) respectively, and two independent water circulating systems which are arranged in said two water storage tanks (3) respectively;

a water discharging port (31) is arranged on one side wall of said water storage tank (3) facing toward said cleaning trough (1), wherein the bottom face of said water storage tank (3) is lower than that of said cleaning trough (1);

said water circulating systems are connected with said water discharging port (31), said water storage tank (3) and the high pressure water nozzles (2) respectively; and

the water after cleaning the vehicle wheels is discharged from said water discharging port (31) into the water storage tank (3) via said water circulating systems, and then supplied to the high pressure water nozzles (2).

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2. The cleaning system for vehicle wheels according to claim 1, characterized in that, said water storage tank (3) is divided into a sedimentation tank (32) and a clear water tank (33).

3. The cleaning system for vehicle wheels according to claim 2, characterized in that, said water circulating system includes a drain pipe (51), a water pipe (52), a discharge pipe (53), and a small water pump (54) and a large water pump (55) both connected to the automatic cleaning control circuit;

said drain pipe (51) is connected to the water discharging port (31) and the sedimentation tank (32) at both ends thereof respectively;

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said small water pump (54) is arranged above said sedimentation tank (32);

said water pipe (52) is connected to said small water pump (54) and said clear water tank (33) at both ends thereof respectively;

said large water pump (55) is arranged in said clear water tank (33) and  
5 connected to said discharge pipe (53); and

said high pressure water nozzles (2) are connected to said discharge pipe (53).

4. The cleaning system for vehicle wheels according to any one of claims 1, 2 and 3, characterized in that, said high pressure water nozzles (2) are arranged at one side  
10 wall of said water storage tank (3) facing toward said cleaning trough (1).

5. The cleaning system for vehicle wheels according to any one of claims 1, 2 and 3, characterized in that, said water storage tank (3) is made of steel, and closed by means of a plurality of cover plates (36) on the top thereof.  
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6. The cleaning system for vehicle wheels according to any one of claims 1, 2 and 3, characterized in that, said automatic cleaning control circuit is provided with two pairs of infrared transmitting assemblies (6) located at the front side and the rear side of said cleaning trough (1) respectively, wherein said infrared transmitting assembly  
20 (6) includes an infrared transmitter and an infrared receiver that are cooperated with each other in use, and said infrared transmitter and said infrared receiver are arranged at both sides of the cleaning trough (1) respectively in a manner of being opposite to each other.

25 7. The cleaning system for vehicle wheels according to any one of claims 1, 2 and 3, characterized in that, the spraying angle of said high pressure water nozzles (2) can be adjusted so as to obtain an optimal cleaning angle; and

two adjacent high pressure water nozzles (2) are spaced from each other at a distance of 250-330 mm.

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8. The cleaning system for vehicle wheels according to any one of claims 1, 2 and 3, characterized in that, said cleaning trough (1) is cast in concrete with a longitudinal cross section of an inverted trapezoidal shape, the bottom face (11) of which being 270-350 mm lower than said drain pipe (31); and
- 5        said high pressure water nozzle (2) has a distance of 550-650 mm from the inverted trapezoidal-shaped bottom face (11).