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(54) **DEVICE FOR DISINFECTING THE AIR IN UNDERGROUND RAILWAY CARRIAGES**

(57) The device is intended for disinfecting the air in underground railway passenger carriages with the aid of bactericidal UV radiation. A bactericidal lamp is fixed in an upwardly open body of the device by means of vibration-damping elements, the lamp being arranged in a recess in the body with a gap between the body and lamp. A detachable cover is fixed on the body from below under the lamp such that air passes freely between the body and cover. Furthermore, the body recess and the cover serve as means for protecting against the escape of UV

radiation into the passenger saloon and air conditioner. In order to reduce vibration and aerodynamic noise, a layer of vibration-damping material is applied to the lower surface of the body, and a sound-absorbing layer is applied to the upper surface of said body - and is fixed thereto with the aid of a lattice. The edge of the body is inclined downwards, which makes it possible to smoothly increase the cross section of the duct for the passage of air through the device and reduce pressure losses.

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Description

TECHNICAL FIELD

[0001] The invention relates to the means for passenger railcar air disinfection with the help of bactericidal ultraviolet (UV) radiation and may be used for ground and underground transport, mainly for subway trains.

PRIOR ART

[0002] Known is a passenger railcar air conditioning device, which consists of a compression type chilling machine, air purification filters, outside and recirculation air input devices, adjusting chokes, outside and recirculation air mixing chamber, devices for air distribution from delivery air ducts throughout the passenger space, devices for air elimination from the railcar, electric power supply. In the channels of the air path of the ventilation system are installed disinfecting ultraviolet (UV) radiation devices, which are connected to the electric power supply. The disinfecting devices may be installed in the recirculation air flow behind the purification filter before the air entry into the air cooler or fan, or in the outside air flow behind the purification filter before the air entry into the air cooler or fan, or installed in the flow of the mixture of outside and recirculation air behind the purification filter before the air entry into the air cooler or fan, or installed in the delivery air duct before the devices for air distribution throughout the passenger space, or in all the above places simultaneously. However, disinfection of the entire air flow is irrational and requires high energy costs for providing the required UV radiation dose (RU No 2278794, B61D27/00, 2004).

[0003] Known is an device for air disinfection by UV radiation in the railway transport ventilation and conditioning systems, taken as a prototype of the useful model. The device consists of a body with inlet and outlet windows for air, inside which, via impact dampers, is installed a bactericidal UV lamp. The inlet window is closed by a grid assembled from profile elements covered with a photocatalyst layer. The grid prevents the UV radiation escape outside and additionally purifies the air in the photocatalysis process. The device is built into the recirculation channel of the passenger railcar ventilation and conditioning system. In the passenger railcar air supply system, provision is made for the fresh air to be taken to the railcar air distribution system from the outside, and then it is distributed throughout the compartment. After contact with people, the flow of the air infected with microorganisms goes from the railcar through the inlet window into the UV radiation zone, where, after interaction with photocatalyst and under the influence of the bactericidal radiation of the UV lamps, it is disinfected and purified for recirculation and reuse. The disinfected air is then eliminated through the outlet window and, with the help of the conditioner fan, is supplied to the railcar compartment again. As a source of bactericidal UV radiation

are used powerful low pressure gas discharge amalgam lamps (RU U No 78074, A61L2/10).

[0004] A drawback of the known device is that the field of its application is limited by the sanitary requirements to the air supply of the passenger railway transport, which air supply system is based on the fact that pure outside air enters it initially and usually there is a recirculation channel, which allows just disinfecting the recirculation air only.

DISCLOSURE OF THE INVENTION

[0005] The basis of the present invention is the task to create device for efficient disinfection in the ventilation and conditioning systems of such transport facilities where the inflow of the pure air is realized from a limited space - for example, for subway railroads located in a tunnel.

[0006] The technical result achieved when implementing the invention consists in implementing the possibility of disinfecting the air in the subway railroads, as well as in reducing the disinfection process energy costs.

[0007] The said technical result is achieved due to the fact that in the air disinfection device, containing a body, in which, via impact dampers, a bactericidal UV lamp is fixed, and a means of protection against UV radiation escape, according to the invention, the body is made open from the top with a recess, the bactericidal UV lamp is positioned in the recess so that between the body and the lamp there is a gap, and under the lamp at the bottom on the body a removable cover is fixed, installed with a possibility of the air passing between the cover and the body, which, along with the recess, is used as a means of protection against UV radiation escape.

[0008] On the top surface of the body is applied a sound-absorbing layer fixed on the body with the help of a grid, and on the bottom surface is applied a layer of the vibration-absorbing material. The edge of the body has a downward incline.

BRIEF DESCRIPTION OF DRAWINGS

[0009] In fig. 1 and 2 are shown the views of the subway railcar air disinfection device, top and side (in section), and in fig. 3 - bottom view. Body 1 of the device is made open from the top and has recess 2 formed by the bend of the body wall throughout its width. Bactericidal UV lamp 3, fixed on impact dampers 4, is positioned in the body recess, which prevents UV radiation escape to the passenger compartment and conditioner. Between the lamp and the body there is gap 5 for passing of the air flow under the lamp. One of the body edges 6 has partial incline 7 downwards for ensuring smooth expansion of the air channel. At the bottom, the lamp is covered with removable cover 8 fixed to the body so that air flow can pass between the body and the cover.

[0010] At the top, on the body is applied sound-absorbing layer 9, pressed to the body with protective grid 10.

The layer is made from a UV radiation resistant material. At the bottom, on the body is applied layer 11 of vibration-damping material.

BEST MODE FOR CARRYING OUT THE INVENTION

[0011] The device operates as follows. The device is built into the air channel in the near-roof space of a subway railcar at the outlet of the conditioner in such a manner that the UV lamp is oriented perpendicularly to the flow of the treated air, and the edge of the body, having a downward incline, is distant along the flow from the inlet of the treated air. The UV lamp operation is controlled by a separate starting controller (SC), connected with it by cable. The external dimensions of the device are approximately 600x900x120 mm, SC - 270x105x62 mm.

[0012] As a source of bactericidal radiation is used a 170 W low pressure gas discharge amalgam lamp. The air flow passing through the air duct is subjected to the bactericidal radiation with a wavelength of 254 nm, and is disinfected. Due to the fact that the lamp is positioned in the recess, it is not overcooled by the passing air flow, the intensity of its radiation does not reduce and constantly ensures the UV radiation dose required for efficient disinfection. Moreover, such position of the lamp protects from UV radiation escape into the compartment and conditioner.

[0013] The gap between the lamp and the body, as well as between the cover and the body, allows the air flow to freely pass under the device, which ensures uniform distribution of the disinfected air in all zones of the passenger compartment.

[0014] Making the edge of the body with an incline allows smooth increasing of the channel section for air passing through the device, due to which the pressure loss and aerodynamic noise level are substantially reduced. At the bottom, the lamp is covered with a cover fixed on the body, which prevents UV radiation from passing into the passenger compartment and conditioner. The cover is installed in such a manner that there is a possibility for air passing between the body and the cover, which ensures uniform radiation and disinfection of the treated air flow both above and under the lamp.

[0015] Then, through the ventilation holes, the disinfected air goes to the passenger compartment, from which, during movement, it is moved to the tunnel and mixes with the ambient air. Then the fans supply air from the tunnel to the conditioner, creating partial recirculation of the air.

[0016] The presence of the vibration-absorbing layer (for example, vibration-damping fireproof materials VDF with aluminum foil coating) and fixing of the lamp on the impact dampers allows reducing vibration that occurs during movement of the train and the air along the channel and is transmitted to the device's elements down to the acceptable values, and the sound-absorbing material (Supersilika-M2) along with the structural elements (body edge downward incline) reduces the pressure loss and

the aerodynamic noise level of the air flow, which increases the comfort of the device's operation. The device is conveniently positioned in the under-roof space of the railcar, while the removable cover ensures easy access to the lamp for maintenance and replacement of the lamp.

[0017] The present invention allows maintaining the epidemiologically safe for the passengers level of insemination of the air with microorganisms in accordance with the sanitary and hygienic norms of the subway with low energy costs for its disinfection.

Claims

1. Device for disinfection of railcar air, containing a body, in which, via impact dampers, a bactericidal UV lamp is fixed, and a means of protection against UV radiation escape, **characterized in that** the body is made open from the top with a recess, the bactericidal UV lamp is positioned in the recess so that between the body and the lamp there is a gap, and under the lamp at the bottom on the body a removable cover is fixed, installed with a possibility of the air passing between the cover and the body, which, along with the recess, is used as a means of protection against UV radiation escape.
2. Device according to claim 1 **characterized in that** at the top, on the body, is applied a layer of sound-absorbing material resistant to UV radiation.
3. Device according to claim 2 **characterized in that** on the sound-absorbing material resistant to UV radiation a grid is fixed.
4. Device according to claim 1 **characterized in that** at the bottom, on the body, is applied a layer of vibration-absorbing material.

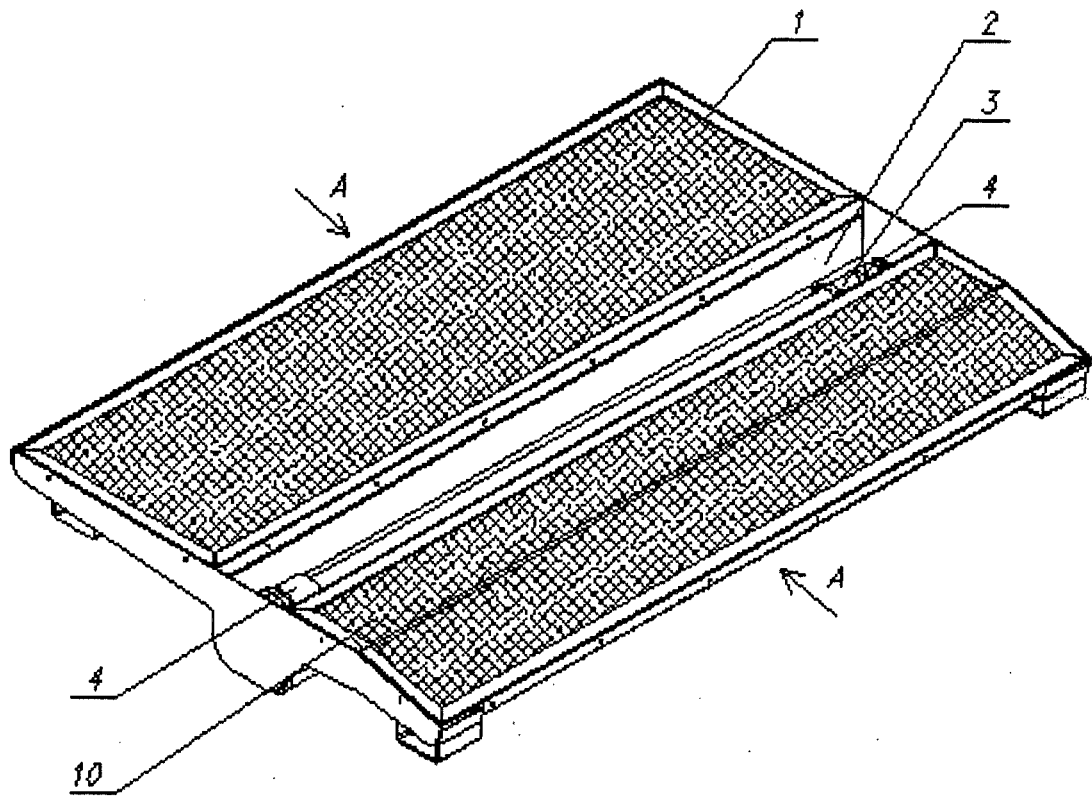


FIG 1.

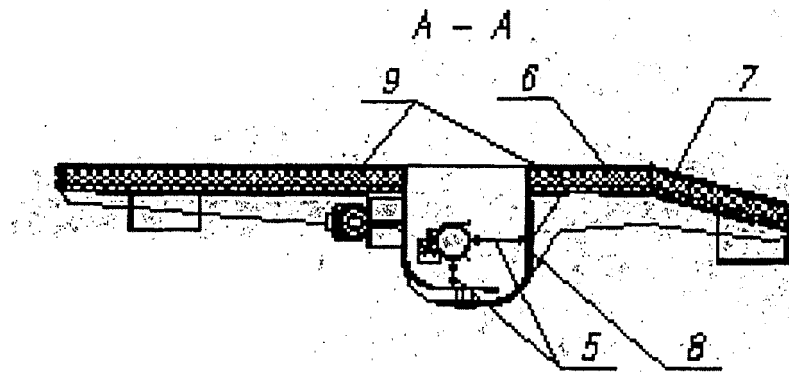


Fig 2.

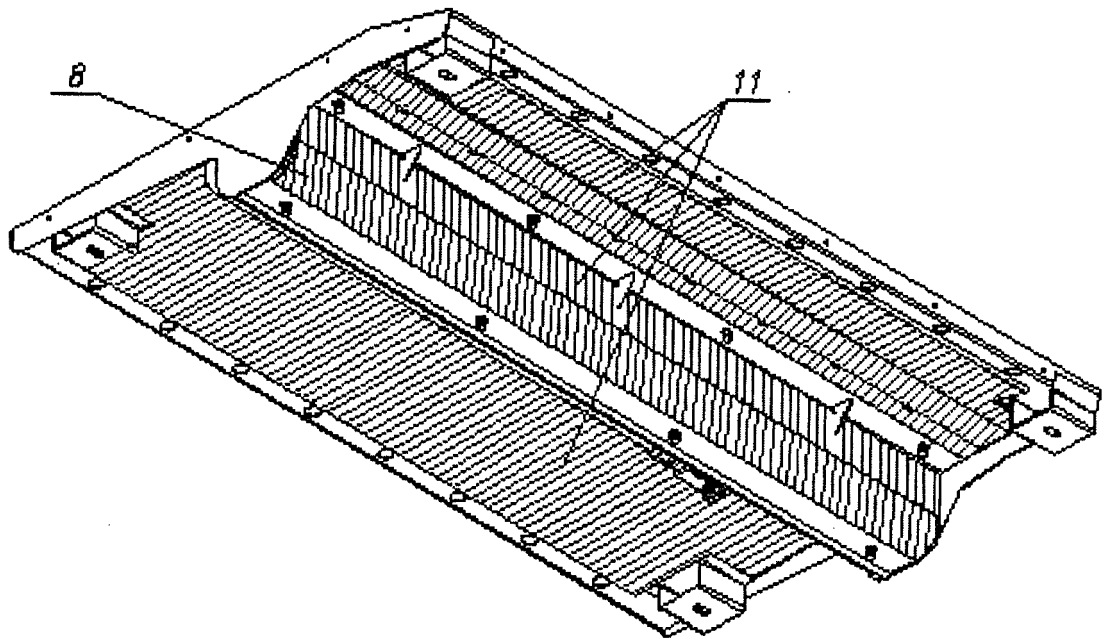


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- RU 2278794 [0002]
- RU 78074 U [0003]