

[54] **DEVICE FOR MAINTENANCE OF A DUSTFREE, BACTERIA-FREE ZONE IN A ROOM**

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[57] **ABSTRACT**

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A device for maintenance of a dust and bacterial free zone in a room by means of one or more nozzles having a number of preferably straight sides and meeting in a corresponding number of corners and placed one beside the other so as to produce a corresponding number of curtains surrounding the zone, w h e r e i n an impulse means is arranged to produce separately a preferably rather more powerful jet of air in each of said corners between the pairwise meeting exhaust nozzles for ensuring an unbroken air curtain around the zone also in the corners.

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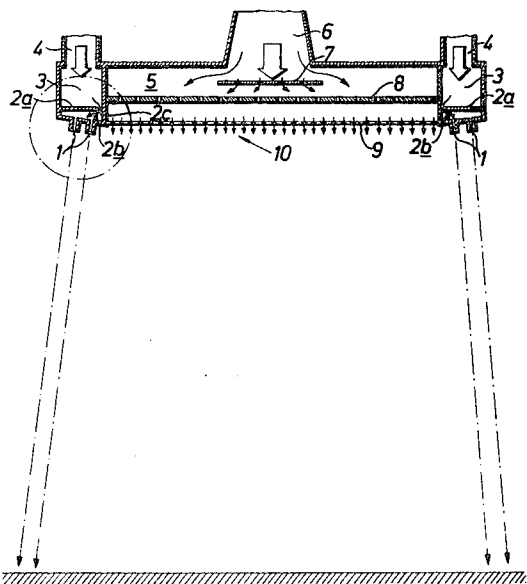
[58] Field of Search.....98/36, 33 R; 263/50; 55/DIG. 29, 473; 128/1 R

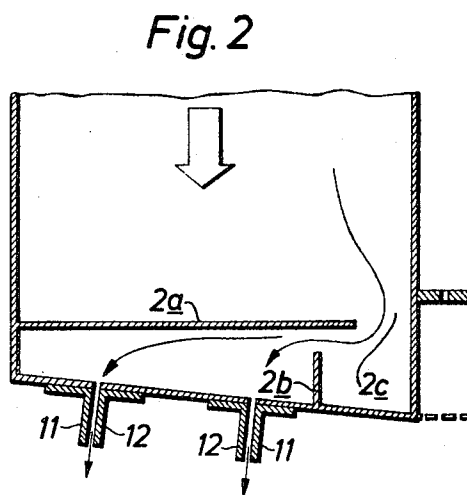
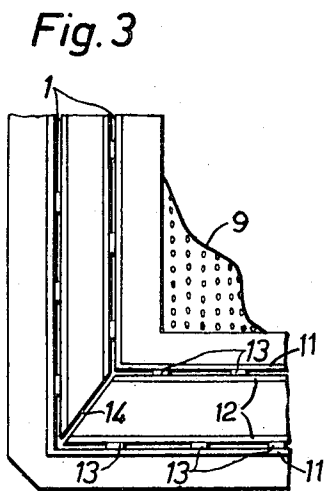
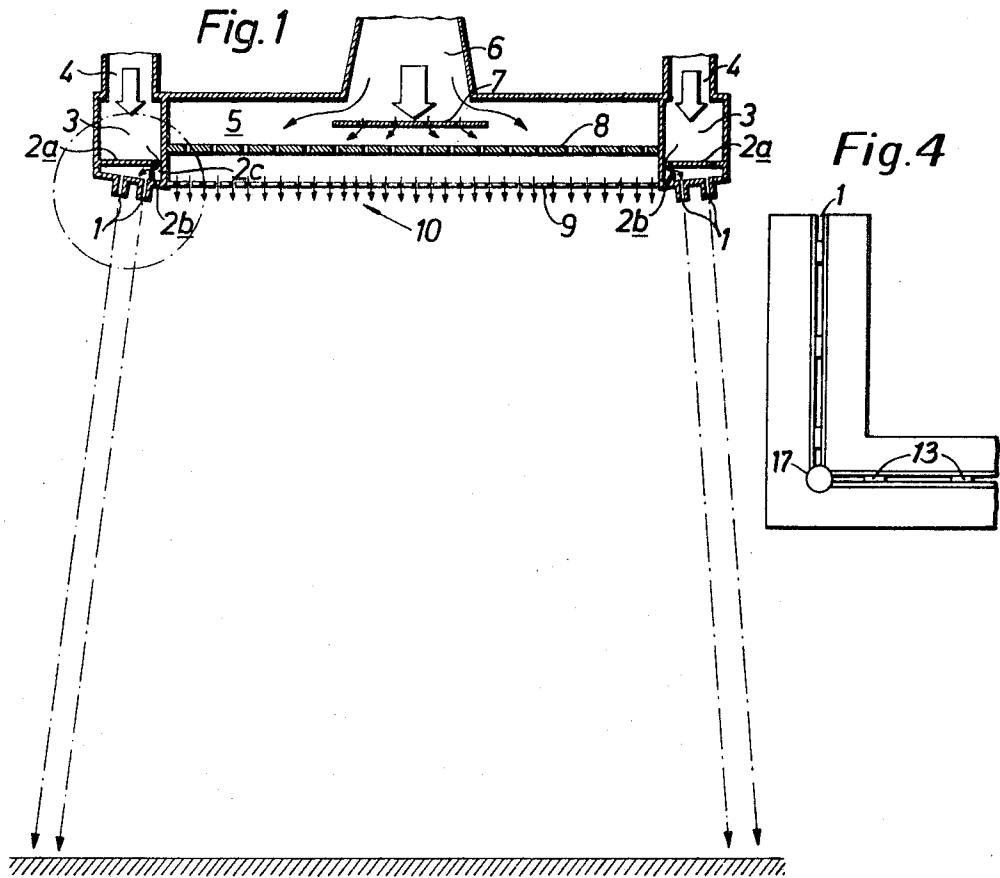
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**UNITED STATES PATENTS**

**7 Claims, 4 Drawing Figures**

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## DEVICE FOR MAINTENANCE OF A DUSTFREE, BACTERIA-FREE ZONE IN A ROOM

This invention relates to a device for maintenance of a dustfree, bacteriafree zone in a room by means of a number of air curtains surrounding the zone under simultaneous supply of ventilating air to the curtained-off zone, said device having means for uniform distribution of the ventilating air supplied within the zone, while the means for producing air curtains surrounding the zone consist of one or more exhaust nozzles situated one beside the other so as to produce a corresponding number of air curtains, the air of which is then discharged together with the ventilating air supplied to the zone, said exhaust nozzles being placed in a wall, facing the zone, of a distributing channel surrounding the zone and having a number of sides, preferably straight sides, delimiting the zone, the nozzles meeting in a corresponding number of corners.

The device according to the invention is intended especially for ventilation of rooms in which — for example owing the risk of infection — extremely high requirements must be placed on the purity of the air in the actual enclosed area. High requirements on the purity of the air are now often placed not only in operating-theatres in hospitals but also for certain locations in the food industry and the chemical industry. The chief problems for a satisfactory functioning of arrangements of such kinds are that the ventilating air supply must be very uniformly distributed and that the rate of air flow in the zone in which personnel work within the screened-off area must not be so high as to be troublesome for the personnel or affect sensitive instruments, other problems being to obtain a uniform and equally distributed air curtain and to avoid opening of the air curtain for the passage of contaminated air at any point on the periphery. This difficulty will be readily understood when it is remembered that the exhaust nozzles for the air curtain have slots only about 2 mm wide. The object of the present invention is to ensure that the air curtain does not break down at any point along the periphery so that a puncture occurs.

The device according to the invention is characterized in that an impulse means is arranged to separately produce a preferably rather more powerful jet of air in each corner between the pairwise meeting exhaust nozzles for balancing by ejector action of the forces of contraction of two adjacent sides of the air curtain and for ensuring an unbroken air curtain around the zone also in the corners.

An advantageous embodiment of the device according to the invention, having a multilateral inner zone surrounded by a distributing channel of corresponding extent, and with a single air seal, is characterized in that, at each corner of the exhaust nozzles, the impulse means consists of a circular hole for exhaust of a separate air jet keeping together two meeting air curtains and placed at each point of intersection between meeting exhaust nozzles.

Another expedient embodiment of the device according to the invention, having a multilateral inner zone surrounded by a distributing channel of corresponding extent and with double air curtains, is characterized in that the impulse means at each corner of the mutually parallel exhaust nozzles consists of diagonal slots extending between each two points of intersection between the inner and outer exhaust nozzles.

In accordance with a preferred embodiment the exhaust nozzles are formed as pairs of parallel strips of metal sections attached to one another at a number of points under accurately matched, equally thick, preferentially circular spacers.

The invention will now be described with reference to the attached drawing showing an exemplifying embodiment of a device according to the invention, in which

FIG. 1 shows a cross-section through the device;

FIG. 2 shows in enlargement a corner of the device within the dotted circle in the left-hand portion of FIG. 1;

FIG. 3 shows a corner of the device viewed from below; and

FIG. 4 is a view similar to FIG. 3 showing an alternate corner.

In FIG. 1 items 5, 6, 7, 8, 9 and 10 are different parts of the means of the device for ensuring a uniform distribution and supply in an essentially vertical direction, as shown in the drawing, of the ventilating air supplied within the zone at a moderate rate of air flow. 5 is a chamber or area essentially corresponding to that of the zone. The ventilating air is supplied to this chamber through the inlet air channel 6. 7 is a smaller perforated distributing screen situated in the vicinity of said inlet air channel 6. The chamber 5 contains also two perforated plates 8 and 9, each of an area corresponding to the area of the chamber. The plate 8 is comparatively thick and has a low degree of perforation, while plate 9 has a high degree of perforation and is comparatively thin. Through the combined effect of the perforated distributing screen 7 and the plates 8 and 9 the room is supplied with ventilating air in the desired manner. The function of the upper, thick plate 8 is, with its low degree of perforation, to produce a relatively large drop of pressure to ensure a very good distribution and, owing to its thickness, direct the air vertically downwards. The function of the lower perforated plate 9 is to produce moderate rates of air flow in the zone in which personnel work, as a result of its larger free area. The means of the device for producing the air curtains surrounding the zone consist of the elements 1, 2a, 2b, 2c, 3, 4 in combination. The distributing channel 3 extends around the aforesaid chamber 5 and is connected to a separate inlet air channel 4. In the surface of the distributing channel 3 facing the room there are one or more (in the case shown two) exhaust nozzles 1, situated side by side, designed to produce a corresponding number of air curtains. The distributing channel 3 has a strip 2a extending nearly across the part of the distributing channel facing the room and extending along the entire length of the channel. The strip forms a slot 2c with a side-wall of the distributing channel. Beside one of said nozzles 1, moreover, the distributing channel 3 can be provided with a longitudinal strip 2b of limited depth projecting into the channel and attached to the surface of the channel facing the room. In the embodiment here shown the two strips are situated at some distance from one another, so forming a longitudinal slot. 13 denotes a number of circular spacers placed at regular spaces round the periphery of the distributing channel 3 for assurance of an absolutely uniform slot of the nozzle 1. The circular shape of the spacers is well suited aerodynamically to prevent the air, after passing through them, from dividing and caus-

ing an opening in the air curtain. The use of spacers also permits rapid, simple and exact assembly of the arrangement of slots in the manufacture of the device. The function of the aforesaid longitudinal slot, formed by the projecting distributing plate 2a in the distributing chambers 3, is to distribute the air longitudinally over the plate 2a and divert it via the slot to the nozzle or nozzles 1. Owing to the distribution plate 2a and the diversion, the air, in passing through the nozzle or nozzles 1, obtains no speed component in the longitudinal direction of the nozzle and the air curtain will therefore be vertically directed and of uniform strength. In the case of this arrangement with two or more air curtains through nozzles 1 the spacers 13 must, of course, be staggered in relation to one another. When the device has a multilateral inner zone surrounded by a distributing channel of corresponding extent and has a single air curtain as shown in FIG. 4, the impulse means at each corner of the exhaust nozzles consists of a circular hole, designated 17, for evacuation of a separate air jet, holding together the air curtains, at each point of intersection between the meeting exhaust nozzles 1. In a corresponding embodiment with double air curtains — as shown in the drawing FIG. 3 — the corresponding impulse means consists of diagonal slots, designated 14, arranged in each corner of said distributing channel 3. To prevent the air curtains on the four sides from severally contracting and leaving an opening in the corners, a preferably rather more powerful air jet is supplied through the impulse means 17 and 14. The forces of contraction of two adjacent sides of the air curtain are in this way balanced through ejector effect, thus ensuring that the air curtain remains unbroken also in the corners.

What I claim is:

1. A device for the maintenance of a dustfree and bacteriafree zone in a room by forming a plurality of air curtains surrounding the zone and supplying ventilating air to the curtained-off zone, said device including means for uniformly distributing ventilating air to within the zone, and means for forming said air curtains around the zone comprising a distributing channel surrounding the zone and having a number of sides which meet at corners; nozzles opening out of said channel in each side, said nozzles being coextensive with said sides and adjoining one another in each of said corners to

produce an air curtain on each side to curtain off the zone, and impulse means at each corner to produce a more powerful jet of air along the junction of the curtains emanating from the adjoining sides of the distributing channel to balance by ejector action the forces of contraction of the adjacent air curtains and for insuring an unbroken air curtain around the zone including the corners.

2. Device according to claim 1 having a single nozzle extending along the length of each side of said distributing channel to provide a single air curtain therealong characterized in that, at each corner the impulse means consists of a circular hole for exhaust of a separate air jet, keeping together the adjoining air curtains, and placed at each point of intersection between the adjoining exhaust nozzles.

3. A device according to claim 1 wherein said sides are straight and said nozzles on opposite sides of said zone provide curtains which diverge away from said distributing channel.

4. Device according to claim 1 including inlet means for introducing air into said channel and a strip extending partially across the distributing channel intermediate said inlet and said nozzles to form a slot adjacent a side wall of the channel, said strip extending along the entire length of each side of said channel, said slot being wider than the width of said nozzles to insure flow of air from said inlet supply through the entire length of said nozzles.

5. Device according to claim 4 including a second strip disposed perpendicular to said first strip intermediate said slot and said nozzles forming a second longitudinal slot extending along the entire length of each side of said channel, said second slot being wider than the width of said nozzles.

6. Device according to claim 1 having a pair of laterally-spaced parallel inner and outer nozzles extending along each side of said distributing channel to provide a double air curtains therealong, characterized in that, at each corner the impulse means comprises a diagonal slot extending between the points of intersection of the inner and outer exhaust nozzles.

7. Device according to, claim 1 characterized in that the exhaust nozzles are formed as pairs of parallel strips attached to one another at a number of points with accurately matched, equally thick circular spacers.

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