

AN AIR SHOWER FOR PERSONNEL

The present invention relates to air showers for personnel.

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The air shower is an important piece of equipment in a "clean room" installation as found, for example, in the semi-conductor industry. It is the interface between the clean room and the external environment, facilitating the movement of clean room workers in and out of the installation. It reduces the level of contamination present in the workers' apparel before their entry into the clean room.

Over the years, many designs of air shower have been introduced, varying in size, configuration and types of nozzles used. However, the design on the working principles of these air showers have not undergone significant changes since the days of their introduction. They consist mainly of arrays of air nozzles, either or circular or slotted type, which blow clean air at high speed (typically 20 to 25 m/s) on the apparel of the user to remove contaminant present in their apparel.

While such systems have sufficed for most applications, they suffer some disadvantages. The main ones are as follows:-

(a) The air jets are impacting on the bodies at a constant velocity. Unless the velocity are very high to create a very significant fluttering effect, contaminant is not readily removed. Furthermore, areas that are perpendicular to the impacting jets do not normally get their contaminants released easily.

(b) The present method of exhausting air from the air-shower is through the suction effect of blowers. There is hence a high tendency for the removed contaminants to settle back onto the user's body once the air jets are

stopped.

In one known system, a series of nozzles has been used to create a 3-dimensional vortex to help to prevent contaminant from settling back onto the user's garment. However, it still
5 suffers from the problem highlighted in (a).

According to the present invention, there is provided an air shower for cleaning a person and having a plurality of air nozzles for directing jets of air at said person, said nozzles being adapted to pulse the air jets at a rate in the range of
10 from 1 to 4 Hz.

The present invention thus provides, inter alia, an air-shower which overcomes some of the disadvantages of previous air-showers, through the use of pulsating air jets, directed through a series of nozzles. The air is pulsed at a frequency
15 of 1 to 4, preferably 1 to 3 hertz, and at a velocity at the nozzle of 20 to 28 m/s. Additional air jets may be provided in order to create a three-dimensional vortex within the air shower.

The invention may be used to clean users by
20 placing the users in an air shower, and directing pulsating air jets at the user in order to dislodge contaminants, eg, dust particles, from the surface, eg, clothing of the users'. In a preferred embodiment, the particles are prevented from settling back onto the user by the creation of a
25 three-dimensional vortex around the user which forces contaminants dislodged by the air jets to the outer edge of the air shower due to centripetal force.

The invention will be further described by way of non-limitative examples with reference to the accompanying
30 drawings, in which:-

Figure 1 is a schematic front elevation showing the location of the nozzles on one side of the air shower.

Figure 2 is the schematic plan showing the

orientation of the nozzles with respect to the side of the air shower.

Figure 3 is a plan view of cascaded air showers embodying the present invention.

5 Figure 4 is a perspective view illustrating a pass-box air shower embodying the present invention.

The shower 1 comprises a vertical compartment with separate entry and exit ports 5, 7 (see figure 3). Disposed to each side of the path between the entry and exit
10 ports are a plurality (eg, 5) of vertical rows of nozzles 7a, 7b, 9a, 9b, 11 suitably spaced vertically and horizontally to give good coverage. The nozzles 9-11 are provided with flap valves such as 15 for providing air jets pulsed at the required rate (say 1-4 Hz); the pulsation rate
15 may be controlled by controlling the speed of an electric motor used to drive a suitable mechanism to operate the flap valves - any other suitable arrangement to control the pulsation rate may be used instead, however, as shown, the central nozzles 11 are directed perpendicularly across the
20 compartment while the outer nozzles 7a, 7b and the nozzles 9a, 9b are inclined relative to that direction.

In the illustrated embodiment there are ten vertical rows of nozzles, five on each side of the air shower compartment. Each row consists of three or four
25 nozzles, although more may be used. The orientation of the nozzles are pre-selected and fixed in order to provide coverage over the body of a user of the shower.

In a typical cleaning operation, jets of air directed through the nozzles in rows 9a, 9b and 11 are
30 directed onto the body being cleaned by the air shower. The timing of the jets of air pulsating in rows 9a, 9b and 11 may be controlled in order to give two or three alternating jets, ensuring that at any one time there will be at least one jet of air impacting on the user or body in the shower.
35 This phase of the operation, the cleaning phase, typically

lasts about 15 seconds, after which the jets of air coming from the nozzles in rows 9a, 9b and 11 are shut off.

In a preferred embodiment of the invention, jets of air directed through nozzles in rows 7a, 7b are used in order to create a circulating flow of air within the air-shower compartment. The nozzles in rows 7a, 7b are preferably opened in order to allow jets of air to be directed into the cubicle about 1 second before the cleaning phase ends. The nozzles direct the jets of air in order to create a circulating flow within the air-shower compartment. The air shower may also contain an exhaust system, which can be located either on the ceiling or on the floor of the shower. When such an exhaust system is used in conjunction with the jets of air as described, a three-dimensional vortex is produced in the shower compartment. Particulate particles floating in the compartment will be entrained in the circulating air stream due to centripetal force, thus substantially reducing the resettlement of particles on the object or user being cleaned. This phase, the purging phase, also lasts about 15 seconds.

The illustrated air shower may also be adapted for multiple users and cascaded. A series of adjacent showers' is illustrated in figure 3. The nozzle configurations of the adjacent air showers are selected in order to obtain alternate clockwise and anticlockwise vortices, in order to minimise the turbulence created by interaction of adjacent vortices. In such a cascade, one or more of the showers may be constructed in accordance with the invention, or one or more showers in accordance with the invention may be intermixed with conventional air showers.

Ionizers may be fitted to the mouths of the nozzles in order to produce ionized air streams. When such a feature is used in conjunction with an electrostatic exhaust system, a further enhancement of the cleaning efficiency of the air-shower may be obtained.

CLAIMS

1. An air shower for cleaning a person and having a plurality of air nozzles for directing jets of air at said person, said nozzles being adapted to pulse the air jets at a rate in the range of from 1 to 4 Hz.
2. A shower according to claim 1 and wherein the rate of pulsation is adjustable.
3. A shower according to claim 1 or 2 wherein the nozzles have individual flow valves associated with them to effect pulsing of the air therefrom.
4. A shower according to any one of the preceding claims wherein the nozzles are arranged in vertical rows, with individual nozzles being so directed as to direct their jets of air at the person or to create a vortex around the person in which vortex the flows in a sense tending to remove material shaken or blown from the person
5. An air shower according to any one of the preceding claims, wherein additional nozzles are provided, and/or selected ones of the first mentioned nozzles are selectively operable, to provide non-pulsed jets of air.
6. A shower according to any one of the preceding claims, and including means for ionizing air supplied to the nozzles.
7. An air shower constructed and arranged to operate substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.
8. An air shower installation comprising a plurality of cascaded air showers, at least one of the air showers being in accordance with any one of the preceding claims.
9. Use of an air shower according to any one of claims 1 to 7 or of an installation according to claim 8 to clean persons.

