

AN AIR FILTERING APPARATUS

This invention relates to an air filtering apparatus for removing bacteria from air in a space that is unairconditioned or airconditioned by cooling, heating or mechanization ventilation system.

It is an aim of this invention to provide an air filtering apparatus which is suitable for use in operating theatres, pharmaceutical production areas, food processing areas, supermarkets, clinics, dispensaries, food outlets, food storage areas, offices, public areas such as crowded meeting rooms, toilets, etc., and generally in rooms where there is a requirement for low contents of micro-organisms such as bacteria moulds, yeasts and viruses.

According to the present invention, there is provided an air filtering apparatus comprising a housing having an air-permeable material disposed therein, the air-permeable material having a surface defining a major plane arranged for filtering micro-organisms and dust particles contained in air flowing therethrough, and elongate ultraviolet irradiation means comprising at least one irradiator disposed parallel with respect to the major plane and disposed within a chamber of the housing for irradiating the air downstream of the air-permeable material containing micro-organisms with ultraviolet radiation so as to kill the micro-organisms, which irradiation means is supported within the chamber

such as to directly confront the major plane of the air-permeable material, wherein the chamber is made of aluminium material or internal surfaces of the chamber not made of aluminium are coated with an aluminium paint for reflecting the ultraviolet radiation within the housing and directing the radiation onto the air-permeable material, thereby enhancing effectiveness of the radiation such that micro-organisms in the air-permeable material are killed, and wherein the longitudinal axis of the elongate ultraviolet irradiation means is disposed transversely with respect to the flow direction of the air.

In an embodiment of this invention, the air-permeable material is configured for filtering micro-organisms and dust particles from the air, the ultraviolet radiator being of 253.7 nanometer (nm) wavelength and is arranged for directing ultraviolet radiation towards the inner surface of the filter and surrounding chamber. A blower is provided to draw in air through the filter and ultraviolet radiation chamber.

By means of the design of this embodiment, it is possibly unlikely that micro-organisms be present in the air leaving the apparatus. This is because of the filtering process of the filter and mainly because of the irradiation by the ultraviolet radiators within an enclosed chamber, made of aluminium material and where other materials are used the

internal surfaces of the housing where the ultraviolet radiators are positioned, are painted with aluminium paint. Both aluminium and aluminium paint provide a high degree of reflectivity, hence increasing the intensity of ultraviolet radiation in this chamber. Thus, all micro-organisms which may possibly be present thereon, are destroyed.

The ultraviolet radiators may consist of at least two radiators mounted opposite each other but with their axes parallel to each other. In a preferred embodiment, the two ultraviolet radiators are close enough to each other to ensure that a radiation dose required for killing micro-organisms is provided for the airstream that flows through the filter and through the ultraviolet chamber. The configuration of the housing and the radiators is such that the airstream passes within close proximity to the ultraviolet radiators and as such, would receive the lethal dose of radiation to kill any micro-organism present.

The box housing comprising the apparatus may be adapted for suspended mounting from a ceiling, wherein air is drawn into the apparatus and purified air is thrown back to the room space from the apparatus.

In order that the invention may be clearly understood and readily carried into effect, reference will now be made, by way of example, to the accompanying drawings, wherein:

Figure 1 shows an isometric view of the apparatus as set forth hereinbefore, and

Figure 2 shows an isometric view of the apparatus with its bottom half opened hence exposing the filter, ultraviolet radiators and blower shown within, and

Figure 3 shows a horizontal section along its longitudinal axis of the apparatus of Figure 1, and Figure 3a shows the front face of the apparatus, and Figure 3b shows the plan view of the apparatus.

Referring to the drawings, a flow of air (1) to be purified enters the apparatus and the purified air flow (2) leaves the apparatus and re-enters into the room space. The apparatus is basically a metal box housing (4) constructed with an upper half (4a) and a lower half (4b). Both upper and lower halves are hinged at one end and clip-locked at the other end. Releasing the clip-locked button when opening the box housing (4) would automatically switch off the power supply required to provide electricity to operate the ultraviolet radiators (6a), control circuitry and blower (7). Air is drawn through the air inlet grille (3) installed at the front entry to the box housing (4). The inlet grille vanes are slanted downwards such that air is drawn into the box housing (4) at an angle from a space below the box housing (4). An air filter (5) is slotted into place after the inlet grille (3) within the box housing (4). The air filter (5) can be easily removed for cleaning or replacement. The type and thickness of air filter (5) used depends on the level of filtration required and the static pressure head to minimise pressure drop through the filter.

Within the box housing (4) downstream after the air filter (5) is the ultraviolet radiation chamber (6). Two elongated ultraviolet radiators (6a) are installed with their axes parallel to each other and within close distance of each other. The wall surfaces within the ultraviolet radiation chamber (6)

are made of aluminium or are painted with aluminium paint.

Further downstream in the direction of air flow is the blower (7) which is the prime mover to cause air to be drawn at the inlet grille (3) and exhaust air at outlet grille (8). Air exhausted at outlet (2) is purified as micro-organisms are destroyed in the ultraviolet radiation chamber (6). Micro-organisms are also destroyed within the filter itself due to the configuration of the filter, irradiation means and housing.

As illustrated in Figure 1, the clip-lock button is positioned near the outlet grille (8) of the upper half 4a.

As illustrated in Figure 3a, a bracket is provided for mounting the housing 4a, 4b to a ceiling. In this embodiment, the bracket comprises a "C" channel fastened on to a concrete ceiling slab. The bracket includes rods for enabling support of the housing beneath a suspended ceiling board. The housing is supported from the ends of the rods by means of interlocking "C" channels as illustrated in Figure 3a.

The blower 7 may comprise a centrifugal fan.

CLAIMS

1. An air filtering apparatus comprising a housing having an air-permeable material disposed therein, the air-permeable material having a surface defining a major plane arranged for filtering micro-organisms and dust particles contained in air flowing therethrough, and elongate ultraviolet irradiation means comprising at least one irradiator disposed parallel with respect to the major plane and disposed within a chamber of the housing for irradiating the air downstream of the air-permeable material containing micro-organisms with ultraviolet radiation so as to kill the micro-organisms, which irradiation means is supported within the chamber such as to directly confront the major plane of the air-permeable material, wherein the chamber is made of aluminium material or internal surfaces of the chamber not made of aluminium are coated with an aluminium paint for reflecting the ultraviolet radiation within the housing and directing the radiation onto the air-permeable material, thereby enhancing effectiveness of the radiation such that micro-organisms in the air-permeable material are killed, and wherein the longitudinal axis of the elongate ultraviolet irradiation means is disposed transversely with respect to the flow direction of the air.

2. An apparatus as claimed in claim 1 comprising a



bracket for enabling the apparatus to be suspended from a ceiling.

3. An apparatus as claimed in claim 1 or 2 wherein the housing comprises: upper and lower housing sections connected by means of hinges at one end, the upper and lower sections being clip-lockable at the other end so as to facilitate easy opening for checking maintenance and safety purposes; a prime mover for drawing air through the housing; and means for switching off the ultraviolet irradiation means and prime mover automatically whenever the housing is opened.

4. An apparatus as claimed in any preceding claim, further comprising an inlet grille positioned upstream of the chamber, and an outlet grille positioned downstream of the chamber.

5. An apparatus according to any of Claims 1 to 4, wherein the irradiation means comprises two irradiators disposed parallel with respect to one another.

6. An air filtering apparatus substantially as hereinbefore described with reference to figures 1 to 3, 3a and 3b of the accompanying drawings.

