(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 012 139 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
15.06.2022 Bulletin 2022/24

(21) Application number: **20851748.2**

(22) Date of filing: **24.07.2020**

(51) International Patent Classification (IPC):
E04H 5/02 *(2006.01)* ***F24F 3/16*** *(2021.01)*
F24F 13/00 *(2006.01)* ***F24F 11/89*** *(2018.01)*
F24F 7/10 *(2006.01)*

(86) International application number:
PCT/CN2020/104616

(87) International publication number:
WO 2021/027528 (18.02.2021 Gazette 2021/07)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **09.08.2019 CN 201910736090**

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(54) CLEAN ROOM CAPABLE OF INHIBITING GASEOUS MOLECULAR POLLUTANT FROM DIFFUSING

(57) The present application relates to the technical field of clean workshops. Disclosed is a clean room capable of inhibiting gaseous molecular pollutants from diffusing. The clean room comprises a pressure regulation device assembly for regulating the air pressure in an upper technical interlayer dual-wall lane, such that during normal production, the air pressure in the upper technical interlayer dual-wall lane is higher than the air pressure in an adjacent upper technical interlayer with a pollution source and the air pressure in an adjacent upper technical interlayer without the pollution source; and/or for regulating the air pressure in a lower technical interlayer dual-wall lane, such that during normal production, the air pressure in the lower technical interlayer dual-wall lane is higher than the air pressure in an adjacent lower technical interlayer with the pollution source and the air pressure in an adjacent lower technical interlayer without the pollution source, or during normal production, the air pressure in the lower technical interlayer dual-wall lane is lower than the air pressure in the adjacent lower technical interlayer with the pollution source and the air pressure in the lower technical interlayer without the pollution source. The clean room disclosed in the present application can reduce or avoid the situation where pollutants generated by a production area with a pollution source enter a production area without the pollution source, thereby improving the yield of products in the production area without the pollution source.

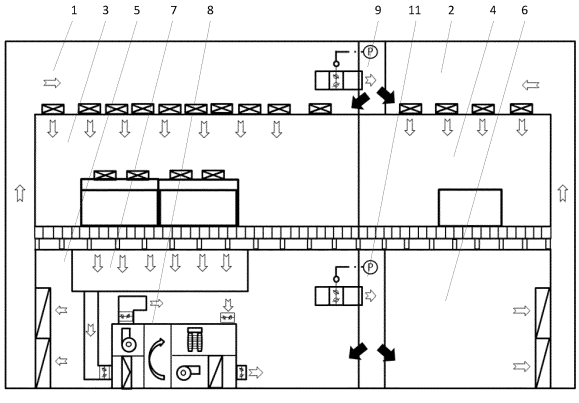

FIG. 5

Processed by Luminess, 75001 PARIS (FR)

Description

Cross Reference to Related Applications

[0001] The present application claims priority to Chinese Patent Application No. 201910736090.3, filed to the China National Intellectual Property Administration on August 9, 2019 and entitled "Clean Room", and the entire contents of which are incorporated herein by reference.

Field

[0002] The present application relates to the technical field of clean workshops, in particular to a clean room capable of inhibiting airborne molecular contaminant from diffusion.

Background

[0003] With the continuous increase of high-standard requirements for semiconductor IC and a thin-film-transistor liquid-crystal display (TFT-LCD) processes, in order to ensure the qualification rate of products, requirements for air quality of clean rooms are getting higher and higher. Cleanroom airborne molecular contaminants (AMC) will have a certain adverse effect on the process of each production procedure and affect the yield of the products.

[0004] For example: organic waste gas generated during an organic solvent cleaning process in TFT-LCD production workshop in gluing and baking production processes in the Array Photo are and color film (CF) Photo area, and polyimide (PI) coating, baking and PI heavy production processes in PI area, is transported to a roof zeolite runner unit and a regenerative combustion furnace through waste gas pipelines for centralized treatment. However, some volatile organic compounds (VOCs) are still left in the clean rooms of the above-mentioned VOC-generating production processes, which have a certain adverse effect on human bodies and a manufacturing environment, in particular, some production processes (such as a one drop filling (ODF) area) are sensitive to the VOCs, and when the concentration of the VOCs left in the VOC-generating production process areas is high and the VOCs are diffused to the ODF area through air flow, the yield of the products is seriously affected.

[0005] In order to reduce the concentration of the VOCs in VOC contamination source areas including Array Photo area, CF Photo area and PI area (hereinafter referred to as VOC-generating areas), the current effective measures are as follows: these areas of VOC contamination source are separately set as independent return air areas (rooms) to isolate the large-scale diffusion of the VOCs; and a removal method in which a zeolite runner unit is disposed in a lower technical interlayer of one clean room to perform continuous adsorption regeneration on the VOCs in air is adopted, and the concentrated and desorbed VOCs are discharged to a roof main organic waste gas treatment system. At present, although the VOC treatment efficiency of the zeolite runner unit can reach 95%, there is still a part of VOCs left in the clean rooms of these process areas.

[0006] However, as shown in FIG. 1 and FIG. 2, if the cleanliness level requirement of VOC sensitive areas is lower than that of the VOC-generating areas, rooms with a high cleanliness level should keep the positive pressure difference of not less than 5Pa relative to rooms with a low cleanliness level. As such, the air flow is biased from the VOC-generating areas to the VOC sensitive areas, which will cause the VOCs to diffuse to the adjacent VOC sensitive area and affect the production environment and product yield thereof.

Summary

[0007] The present application provides a clean room capable of inhibiting airborne molecular contaminants from diffusion, which can reduce or avoid the situation where contaminants generated in a production area with a contamination source enter a production area without the contamination source, thereby improving the yield of products in the production area without the contamination source.

[0008] In order to achieve the above objective, the present application provides a clean room capable of inhibiting airborne molecular contaminants from diffusion. The clean room capable of inhibiting the airborne molecular contaminants from diffusion includes an upper technical interlayer, a lower technical interlayer and a clean production area located between the upper technical interlayer and the lower technical interlayer. Technical lanes configured to communicate the upper technical interlayer and the lower technical interlayer are provided at two sides of the clean production area. The clean room further includes a pressure regulation device assembly. The upper technical interlayer, the lower technical interlayer and the clean production area are all internally provided with divider walls. The divider wall in the clean production area is configured to divide the clean production area into a production area with a contamination source and a production area without the contamination source, the divider wall in the upper technical interlayer is configured to divide the upper technical interlayer into an upper technical interlayer with the contamination source and an upper technical interlayer without the contamination source, and the divider wall in the lower technical interlayer is configured to divide the lower technical interlayer into a lower technical interlayer with the contamination source and a lower technical interlayer without the contamination source;

the divider wall in the upper technical interlayer is double-layered to form a double-skin lane in the upper technical interlayer, and the pressure regulation

device assembly is configured to regulate an air pressure in the double-skin lane in the upper technical interlayer, such that during normal production of the clean room, the air pressure in double-skin lane in the upper technical interlayer is higher than an air pressure in the adjacent upper technical interlayer with the contamination source and an air pressure in the adjacent upper technical interlayer without the contamination source;

and/or,

the divider wall in the lower technical interlayer is double-layered to form a double-skin lane in the lower technical interlayer, and the pressure regulation device assembly is configured to regulate an air pressure in the double-skin lane in the lower technical interlayer, such that during normal production of the clean room, the air pressure in the double-skin lane in the lower technical interlayer is higher than an air pressure in the adjacent lower technical interlayer with the contamination source and an air pressure in the adjacent lower technical interlayer without the contamination source, or during normal production of the clean room, the air pressure in the double-skin lane in the lower technical interlayer is lower than the air pressure in the adjacent lower technical interlayer with the contamination source and the air pressure in the lower technical interlayer without the contamination source.

[0009] In the clean room capable of inhibiting the airborne molecular contaminants from diffusion in the present application, the double-skin lane in the upper technical interlayer is disposed in the upper technical interlayer, and/or, the double-skin lane in the lower technical interlayer is disposed in the lower technical interlayer. When double-skin lane in the upper technical interlayer is provided in the upper technical interlayer, the pressure regulation device assembly regulates the air pressure in double-skin lane in the upper technical interlayer, such that the air pressure in double-skin lane in the upper technical interlayer is higher than the air pressure in the upper technical interlayer with the contamination source and the air pressure in the upper technical interlayer without the contamination source. Therefore, gas in the double-skin lane in the upper technical interlayer has a tendency to diffuse or diffuse into the upper technical interlayer with the contamination source and the upper technical interlayer without the contamination source, such that contamination gas in the upper technical interlayer with the contamination source cannot enter the upper technical interlayer without the contamination source through double-skin lane in the upper technical interlayer, thereby avoiding the contamination gas from entering the production area without the contamination source from the upper technical interlayer without the contamination source.

[0010] When the double-skin lane in the lower technical interlayer is provided in the lower technical interlayer, the pressure regulation device assembly is configured to regulate the air pressure in the double-skin lane in the lower technical interlayer, such that during normal production of the clean room, the air pressure in the double-skin lane in the lower technical interlayer is higher than the air pressure in the adjacent lower technical interlayer with the contamination source and the air pressure in the adjacent lower technical interlayer without the contamination source. Therefore, under the action of the atmospheric pressure, gas in the lower technical interlayer with the contamination source and the lower technical interlayer without the contamination source cannot enter the double-skin lane in the lower technical interlayer, and then the contamination source cannot enter the lower technical interlayer without the contamination source through the double-skin lane in the lower technical interlayer, so as to avoid the situation where the contamination gas enters the upper technical interlayer without the contamination source from the lower technical interlayer without the contamination source through the technical lanes and then enters the production area without the contamination source; or, during normal production of the clean room, the air pressure in the double-skin lane in the lower technical interlayer is lower than that the air pressure in the adjacent lower technical interlayer with the contamination source and the air pressure in the adjacent lower technical interlayer without the contamination source. In this way, the gas in the lower technical interlayer with the contamination source and the lower technical interlayer without the contamination source has a tendency to move to the double-skin lane in the lower technical interlayer or moves to the double-skin lane in the lower technical interlayer, such that the gas of the contamination sources in the technical interlayers with the contamination sources cannot enter the technical interlayers without the contamination sources.

[0011] Therefore, compared with the prior art, in the clean room in the present application, the double-skin lane in the upper technical interlayer is formed in the upper technical interlayer, and the air pressure in double-skin lane in the upper technical interlayer is regulated through the pressure regulation device assembly; and/or the double-skin lane in the lower technical interlayer is formed in the lower technical interlayer, and the air pressure in the double-skin lane in the lower technical interlayer is regulated through the pressure regulation device assembly, such that it is ensured that the gas with the contamination sources in the upper technical interlayer with the contamination source and/or the lower technical interlayer with the contamination source cannot enter the upper technical interlayer without the contamination source and/or the lower technical interlayer without the contamination source, thereby improving the yield of the products in the production area without the contamination source.

[0012] Preferably, the divider wall in the clean production area is double-layered to form a double-skin lane in the clean production area, and the pressure regulation

device assembly is configured to regulate an air pressure in the double-skin lane in the clean production area, such that the air pressure in the double-skin lane in the clean production area is higher than an air pressure in the production area with the contamination source and an air pressure in the production area without the contamination source.

[0013] Preferably, when the divider wall disposed in the lower technical interlayer is double-layered to form the double-skin lane in the lower technical interlayer, the double-skin lane in the clean production area communicates with the double-skin lane in the lower technical interlayer and is isolated from double-skin lane in the upper technical interlayer, and the pressure regulation device assembly includes a first pressure regulation device configured to simultaneously regulate the air pressure in the double-skin lane in the clean production area and the air pressure in the double-skin lane in the lower technical interlayer, and a second pressure regulation device configured to regulate the air pressure in double-skin lane in the upper technical interlayer.

[0014] Preferably, the first pressure regulation device includes a first air supply device configured to cooperate with a fresh air unit so as to supply clean fresh air to the double-skin lane in the lower technical interlayer and the double-skin lane in the clean production area; and the second pressure regulation device includes a second air supply device configured to cooperate with the fresh air unit so as to supply clean fresh air to double-skin lane in the upper technical interlayer.

[0015] Preferably, a first differential pressure sensor is provided in the double-skin lane in the lower technical interlayer or the double-skin lane in the clean production area, and an air outlet pipe of the first air supply device is provided with a first regulation valve configured to regulate an opening degree according to a difference value detected by the first differential pressure sensor; and
a second differential pressure sensor is provided in double-skin lane in the upper technical interlayer, and an air outlet pipe of the second air supply device is provided with a second regulation valve configured to regulate an opening degree according to a difference value detected by the second differential pressure sensor.

[0016] Preferably, when the divider wall disposed in the lower technical interlayer is double-layered to form the double-skin lane in the lower technical interlayer, the double-skin lane in the clean production area is isolated from the double-skin lane in the lower technical interlayer and double-skin lane in the upper technical interlayer, and the pressure regulation device assembly includes a first pressure regulation device configured to regulate the air pressure in double-skin lane in the upper technical interlayer, a second pressure regulation device configured to regulate the air pressure in the double-skin lane in the clean production area, and a third pressure regulation device configured to regulate the air pressure in the double-skin lane in the lower technical interlayer.

[0017] Preferably, the first pressure regulation device includes a first air supply device configured to cooperate with a fresh air unit so as to supply clean fresh air to double-skin lane in the upper technical interlayer;

the second pressure regulation device includes a second air supply device configured to cooperate with the fresh air unit so as to supply clean fresh air to the double-skin lane in the clean production area; and

the third pressure regulation device includes a first air exhaust device configured to exhaust gas in the double-skin lane in the lower technical interlayer.

[0018] Preferably, the clean room further includes a contamination source collection bellows and a zeolite runner unit communicating with the contamination source collection bellows; and the contamination source collection bellows is configured to collect contaminants generated in the production area with the contamination source, and make the collected contaminants enter the zeolite runner unit.

[0019] Preferably, widths of each of the double-skin lane in the upper technical interlayer, the double-skin lane in the lower technical interlayer and the double-skin lane in the clean production area is greater than or equal to 600 mm.

Brief Description of the Drawings

[0020]

FIG. 1 is a schematic diagram of an internal structure of a clean room in the prior art.

FIG. 2 is a schematic structural diagram of air flow deflection when an air pressure in an area with a contamination source is higher than an air pressure in an area without the contamination source in a clean room of the prior art.

FIG. 3 is a schematic structural diagram of air flow deflection when a double-skin lane in the clean production area communicates with a double-skin lane in the lower technical interlayer in a clean room according to an embodiment of the present application.

FIG. 4 is a schematic structural diagram of air flow deflection when a double-skin lane in the clean production area is isolated from a double-skin lane in the lower technical interlayer and a double-skin lane in the upper technical interlayer in a clean room according to an embodiment of the present application.

FIG. 5 is a schematic structural diagram of a first kind of air flow deflection when there is no double-skin lane in the clean production area in a clean room according to an embodiment of the present application.

FIG. 6 is a schematic structural diagram of a second kind of air flow deflection when there is no double-skin lane in the clean production area in a clean room according to an embodiment of the present applica-

tion.

Detailed Description

[0021] The technical solutions of embodiments of the present disclosure will be described clearly and completely with reference to the accompanying drawings of the embodiments of the present disclosure. Apparently, the described embodiments are only a part of, but not all of the embodiments of the present disclosure. Based on the embodiments of the present disclosure, all other embodiments attainable by those ordinarily skilled in the art without involving any inventive effort are within the protection scope of the present disclosure.

[0022] Referring to FIG. 5 and FIG. 6, an embodiment of the present application provides a clean room capable of inhibiting airborne molecular contaminants from diffusion. The clean room capable of inhibiting the airborne molecular contaminants from diffusion includes an upper technical interlayer, a lower technical interlayer and a clean production area between the upper technical interlayer and the lower technical interlayer. Technical lanes configured to communicate the upper technical interlayer and the lower technical interlayer are provided at two sides of the clean production area. The clean room further includes a pressure regulation device assembly; the upper technical interlayer, the lower technical interlayer and the clean production area are all internally provided with divider walls. The divider wall in the clean production area is configured to divide the clean production area into a production area 3 with a contamination source and a production area 4 without the contamination source. The divider wall in the upper technical interlayer is configured to divide the upper technical interlayer into an upper technical interlayer 1 with the contamination source and an upper technical interlayer 2 without the contamination source. The divider wall in the lower technical interlayer is configured to divide the lower technical interlayer into a lower technical interlayer 5 with the contamination source and a lower technical interlayer 6 without the contamination source.

[0023] The divider wall disposed in the upper technical interlayer is double-layered to form a double-skin lane 9 in the upper technical interlayer, and the pressure regulation device assembly is configured to regulate an air pressure in double-skin lane 9 in the upper technical interlayer, such that during normal production of the clean room, the air pressure in double-skin lane 9 in the upper technical interlayer is higher than an air pressure in the adjacent upper technical interlayer 1 with the contamination source and an air pressure in the adjacent upper technical interlayer 2 without the contamination source;

and/or,

the divider wall disposed in the lower technical interlayer is double-layered to form a double-skin lane 11 in the lower technical interlayer, and the pressure regulation device assembly is configured to regulate an air pressure in the double-skin lane 11 in the lower technical interlayer, such that during normal production of the clean room, the air pressure in the double-skin lane 11 in the lower technical interlayer is higher than an air pressure in the adjacent lower technical interlayer 5 with the contamination source and an air pressure in the adjacent lower technical interlayer 6 without the contamination source, or during normal production of the clean room, the air pressure in the double-skin lane 11 in the lower technical interlayer is lower than the air pressure in the adjacent lower technical interlayer 5 with the contamination source and the air pressure in the lower technical interlayer 6 without the contamination source.

[0024] In the clean room in the embodiment of the present application, the double-skin lane 9 in the upper technical interlayer is disposed in the upper technical interlayer, and/or, the double-skin lane 11 in the lower technical interlayer is disposed in the lower technical interlayer. When the double-skin lane 9 in the upper technical interlayer is disposed in the upper technical interlayer, the pressure regulation device assembly may regulate the air pressure in double-skin lane 9 in the upper technical interlayer, such that during normal production of the clean room, the air pressure in double-skin lane 9 in the upper technical interlayer is higher than the air pressure in the upper technical interlayer 1 with the contamination source and the air pressure in the upper technical interlayer 2 without the contamination source. Therefore, gas in double-skin lane 9 in the upper technical interlayer has a tendency to diffuse into the upper technical interlayer 1 with the contamination source and the upper technical interlayer 2 without the contamination source, such that gas with a contamination source in the upper technical interlayer 1 with the contamination source cannot enter the upper technical interlayer 2 without the contamination source through the double-skin lane 9 in the upper technical interlayer, thereby avoiding the contamination source from entering the production area 4 without the contamination source from the upper technical interlayer 2 without the contamination source.

[0025] When the divider wall disposed in the lower technical interlayer is double-layered to form the double-skin lane 11 in the lower technical interlayer, the pressure regulation device assembly is configured to regulate the air pressure in the double-skin lane 11 in the lower technical interlayer, such that during normal production of the clean room, the air pressure in the double-skin lane 11 in the lower technical interlayer is higher than the air pressure in the adjacent lower technical interlayer 5 with the contamination source and the air pressure in the adjacent lower technical interlayer 6 without the contamination source. Therefore, under the action of atmospheric pressure, gas in the lower technical interlayer 5 with the contamination source and the lower technical interlayer 6 without the contamination source cannot enter the double-skin lane 11 in the lower technical interlayer, and then

the contamination source cannot enter the lower technical interlayer 6 without the contamination source through the double-skin lane 11 in the lower technical interlayer, so as to avoid the situation where the contamination source enters the upper technical interlayer 2 without the contamination source from the lower technical interlayer 6 without the contamination source through the technical lanes and then enters the production area 4 without the contamination source. Or, during normal production of the clean room, the air pressure in the double-skin lane 11 in the lower technical interlayer is lower than that the air pressure in the adjacent lower technical interlayer 5 with the contamination source and the air pressure in the adjacent lower technical interlayer 6 without the contamination source. In this way, the gas in the lower technical interlayer 5 with the contamination source and the lower technical interlayer 6 without the contamination source has a tendency to move to the double-skin lane 11 in the lower technical interlayer or moves to the double-skin lane 11 in the lower technical interlayer, such that the gas with the contamination sources in the technical interlayers with the contamination sources cannot enter the technical interlayers without the contamination sources.

[0026] Therefore, compared with the prior art, in the clean room capable of inhibiting the airborne molecular contaminants from diffusion in some embodiments, double-skin lane 9 in the upper technical interlayer is formed in the upper technical interlayer, and the air pressure in double-skin lane in the upper technical interlayer is regulated through the pressure regulation device assembly; and/or the double-skin lane in the lower technical interlayer is formed in the lower technical interlayer, and the air pressure in the double-skin lane 11 in the lower technical interlayer is regulated through the pressure regulation device assembly, such that it is ensured that the gas with the contamination sources in the upper technical interlayer 1 with the contamination source and/or the lower technical interlayer 5 with the contamination source cannot enter the upper technical interlayer 2 without the contamination source and/or the lower technical interlayer 6 without the contamination source, thereby improving the yield of products in the production area 4 without the contamination source.

[0027] In a specific implementation, when double-skin lane 9 in the upper technical interlayer is formed in the upper technical interlayer, the double-skin lane 11 in the lower technical interlayer is formed in the lower technical interlayer, the air pressure in double-skin lane 9 in the upper technical interlayer is higher than the air pressure in the upper technical interlayer 1 with the contamination source and the air pressure in the upper technical interlayer 2 without the contamination source, and the air pressure in the double-skin lane 11 in the lower technical interlayer is higher than the air pressure in the lower technical interlayer 5 with the contamination source and the air pressure in the lower technical interlayer 6 without the contamination source. Values of the pressure differences between the respective areas are as follows: +30 Pa in the production area 3 with the contamination source, +25 Pa in the lower technical interlayer 5 with the contamination source, -5 Pa in the upper technical interlayer 1 with the contamination source, +25 Pa in the production area 4 without the contamination source, +15 Pa in the lower technical interlayer 6 without the contamination source, -10 Pa the upper technical interlayer 2 without the contamination source, and +5 Pa in the double-skin lane 9 in the upper technical interlayer.

[0028] When double-skin lane 9 in the upper technical interlayer is formed in the upper technical interlayer, the double-skin lane 11 in the lower technical interlayer is formed in the lower technical interlayer, the air pressure in double-skin lane 9 in the upper technical interlayer is higher than the air pressure in the upper technical interlayer 1 with the contamination source and the air pressure in the upper technical interlayer 2 without the contamination source, and the air pressure in the double-skin lane 11 in the lower technical interlayer is lower than the air pressure in the lower technical interlayer 5 with the contamination source and the air pressure in the lower technical interlayer 6 without the contamination source. Values of the pressure differences between the respective areas are as follows: +30 Pa in the production area 3 with the contamination source, +25 Pa in the lower technical interlayer 5 with the contamination source, -5 Pa in the upper technical interlayer 1 with the contamination source, +25 Pa in the production area 4 without the contamination source, +15 Pa in the lower technical interlayer 6 without the contamination source, -10 Pa in the upper technical interlayer 2 without the contamination source is, +5 Pa in the double-skin lane 9 in the upper technical interlayer, and 0 Pa in the double-skin lane 11 in the lower technical interlayer.

[0029] Optionally, when the divider wall disposed in the clean production area is double-layered to form a double-skin lane 10 in the clean production area, the pressure regulation device assembly is also configured to regulate an air pressure in the double-skin lane in the clean production area, such that the air pressure in the double-skin lane 10 in the clean production area is higher than an air pressure in the production area 3 with the contamination source and an air pressure in the production area 4 without the contamination source.

[0030] In some embodiments, the double-skin lane 10 in the clean production area isolates the production area 3 with the contamination source from the production area 4 without the contamination source to form a buffer part. In addition, the air pressure in the double-skin lane 10 in the clean production area is higher than the air pressure in the adjacent production area 3 with the contamination source and the air pressure in the production area 4 without the contamination source under regulation of the pressure regulation device assembly, such that the contamination gas in the production area 3 with the contamination source cannot enter the production area 4 without the contamination source under the action of the air pres-

sure.

[0031] Optionally, referring to FIG. 3, when the divider wall disposed in the lower technical interlayer is double-layered to form the double-skin lane 11 in the lower technical interlayer, the double-skin lane 10 in the clean production area communicates with the double-skin lane 11 in the lower technical interlayer and is isolated from double-skin lane 9 in the upper technical interlayer, and the pressure regulation device assembly includes a first pressure regulation device configured to simultaneously regulate the air pressure in the double-skin lane 10 in the clean production area and the air pressure in the double-skin lane 11 in the lower technical interlayer, and a second pressure regulation device configured to regulate the air pressure in double-skin lane 9 in the upper technical interlayer.

[0032] In some embodiments, the double-skin lane 11 in the lower technical interlayer communicates with the double-skin lane 10 in the clean production area, and the double-skin lane 10 in the clean production area is isolated from double-skin lane 9 in the upper technical interlayer, such that the air pressure in the double-skin lane 11 in the lower technical interlayer and the air pressure in the double-skin lane 10 in the clean production area are regulated through the first pressure regulation device, thereby improving the utilization rate of the first pressure regulation device, while double-skin lane 9 in the upper technical interlayer is regulated through the independent second pressure regulation device, such that the air pressure in double-skin lane 9 in the upper technical interlayer is different from the air pressure in the double-skin lane 10 in the clean production area.

[0033] In a specific implementation, when the double-skin lane 11 in the lower technical interlayer communicates with the double-skin lane 10 in the clean production area, values of the pressure differences between the respective areas are as follows: +30 Pa in the production area 3 with the contamination source, +25 Pa in the lower technical interlayer 5 with the contamination source, -5 Pa in the upper technical interlayer 1 with the contamination source, +25 Pa in the production area 4 without the pollution area, +15 Pa in the lower technical interlayer 6 without the contamination source, -10 Pa in the upper technical interlayer 2 without the contamination source, +5 Pa double-skin lane 9 in the upper technical interlayer, and +35 Pa in the double-skin lane 10 in the clean production area and the double-skin lane 11 in the lower technical interlayer.

[0034] Optionally, the first pressure regulation device includes a first air supply device configured to cooperate with a fresh air unit so as to supply clean fresh air to the double-skin lane 11 in the lower technical interlayer and the double-skin lane 10 in the clean production area; and the second pressure regulation device includes a second air supply device configured to cooperate with the fresh air unit so as to supply clean fresh air to the double-skin lane 9 in the upper technical interlayer.

[0035] In some embodiments, the first air supply device supplies air in the double-skin lane 11 in the lower technical interlayer and the double-skin lane 10 in the clean production area, thereby ensuring that the air pressure of the double-skin lane 11 in the lower technical interlayer is higher than the air pressure in the adjacent two areas, the air pressure of the double-skin lane 10 in the clean production area is higher than the air pressure in the adjacent two areas, and a pressure difference is not less than 5 Pa. The arrangement of the second air supply device may make the air pressure in the upper technical interlayer higher than the air pressure in the adjacent two areas, and a pressure difference is not less than 5 Pa.

[0036] Optionally, a first differential pressure sensor is provided in the double-skin lane 11 in the lower technical interlayer or the double-skin lane 10 in the clean production area, and an air outlet pipe of the first air supply device is provided with a first regulation valve configured to regulate an opening degree according to a difference value detected by the first differential pressure sensor; and

a second differential pressure sensor is provided in the double-skin lane 9 in the upper technical interlayer, and an air outlet pipe of the second air supply device is provided with a second regulation valve configured to regulate an opening degree according to a difference value detected by the second differential pressure sensor. In some embodiments, the first differential pressure sensor may detect air pressure difference values between the double-skin lane 11 in the lower technical interlayer and the outside as well as between the double-skin lane 10 in the clean production area and the outside, and the second differential pressure sensor may detect an air pressure difference value between the double-skin lane 9 in the upper technical interlayer and the outside, such that a controller can control the first regulation valve and the second regulation valve individually, and then control an amount of air intake in the double-skin lane 11 in the lower technical interlayer and the double-skin lane 10 in the clean production area and an amount of air intake in double-skin lane 9 in the upper technical interlayer, thereby ensuring that the air pressure in double-skin lane 9 in the upper technical interlayer, the air pressure in the double-skin lane 11 in the lower technical interlayer and the air pressure in the double-skin lane 10 in the clean production area are within a preset range.

[0037] Optionally, referring to FIG. 4, when the divider wall in the lower technical interlayer is double-layered to form the double-skin lane 11 in the lower technical interlayer, the double-skin lane 10 in the clean production area is isolated from the double-skin lane 11 in the lower technical interlayer and double-skin lane 9 in the upper technical interlayer, and the pressure regulation device assembly includes a first pressure regulation device configured to regulate the air pressure in double-skin lane 9 in the upper technical interlayer, a second pressure regulation device configured to regulate the air pressure in the double-skin lane 10 in the clean production area, and a third pressure regulation device configured to regulate

the air pressure in the double-skin lane 11 in the lower technical interlayer.

[0038] In some embodiments, the double-skin lane 10 in the clean production area does not communicate with the double-skin lane 11 in the lower technical interlayer and double-skin lane 9 in the upper technical interlayer, such that the divider walls can be deployed at different positions in each interlayer for separation according to the deployment of devices in the clean room, and the renovation of an old clean room is facilitated. Meanwhile, the first pressure regulation device, the second pressure regulation device and the third pressure regulation device are distributed in the double-skin lane 9 in the upper technical interlayer, the double-skin lane 10 in the clean production area and the double-skin lane 11 in the lower technical interlayer. In this way, the double-skin lane 9 in the upper technical interlayer, the double-skin lane 10 in the clean production area and the double-skin lane 11 in the lower technical interlayer may be controlled individually, such that the air pressure in double-skin lane 9 in the upper technical interlayer, the air pressure in the double-skin lane 10 in the clean production area and the air pressure in the double-skin lane 11 in the lower technical interlayer are more likely to reach a predetermined value.

[0039] In a specific implementation, when the double-skin lane 10 in the clean production area is isolated from the double-skin lane 11 in the lower technical interlayer and double-skin lane 9 in the upper technical interlayer. Values of the pressure differences between the respective areas are as follows: +30 Pa in the production area 3 with the pollution area, +25 Pa the lower technical interlayer 5 with the contamination source, -5 Pa in the upper technical interlayer 1 with the contamination source, +25 Pa in the production area 4 without the pollution area, +15 Pa in the lower technical interlayer 6 without the contamination source, -10 Pa in the upper technical interlayer 2 without the contamination source, +5 Pa in double-skin lane 9 in the upper technical interlayer, +35 Pa in the double-skin lane 10 in the clean production area, and 0 Pa in the double-skin lane 11 in the lower technical interlayer.

[0040] Optionally, the first pressure regulation device includes a first air supply device configured to cooperate with the fresh air unit so as to supply clean fresh air to the double-skin lane 9 in the upper technical interlayer;

the second pressure regulation device includes a second air supply device configured to cooperate with the fresh air unit so as to supply clean fresh air to the double-skin lane 10 in the clean production area; and

the third pressure regulation device includes a first air exhaust device configured to exhaust gas in the double-skin lane 11 in the lower technical interlayer.

[0041] The first air supply device and the second air supply device each may be connected with one fresh air unit separately, and the two fresh air units are utilized to provide fresh air for the first air supply device and the second air supply device. Or, the first air supply device and the second air supply device may be connected with one fresh air unit, the fresh air unit is connected with at least two branch pipes, the first air supply device and the second air supply device are connected with the branch pipes respectively, and fresh air is provided for the first air supply device and the second air supply device through the branch pipes.

[0042] In some embodiments, the first air supply device and the second air supply device provide clean fresh air for the double-skin lane 9 in the upper technical interlayer and the double-skin lane 10 in the clean production area, and make the air pressure in the double-skin lane 9 in the upper technical interlayer higher not less than 5 Pa than the air pressure in the upper technical interlayer 1 with the contamination source and the air pressure in the upper technical interlayer 2 without the contamination source, such that the air pressure in the double-skin lane 10 in the clean production area is higher not less than 5 Pa than the air pressure in the production area 3 with the contamination source and the air pressure in the production area 4 without the contamination source; and the third pressure regulation device regulates the air pressure in the double-skin lane 11 in the lower technical interlayer to 0 Pa, such that the air pressure in the double-skin lane 11 in the lower technical interlayer is lower than the air pressure in the lower technical interlayer 5 with the contamination source and the lower technical interlayer 6 without the contamination source. In this way, the contamination gas generated in the production area 3 with the contamination source will not enter the production area 4 without the contamination source through the double-skin lane 10 in the clean production area, and also will not enter the lower technical interlayer 6 without the contamination source and/or the upper technical interlayer 2 without the contamination source via the lower technical interlayer 5 with the contamination source and/or the upper technical interlayer 1 with the contamination source.

[0043] Optionally, the clean room further includes a contamination source collection bellows 7 and a zeolite runner unit 8 communicating with the contamination source collection bellows 7; and

the contamination source collection bellows 7 is configured to collect contaminants generated in the production area 3 with the contamination source, and make the collected contaminants enter the zeolite runner unit 8.

[0044] In some embodiments, the contamination source collection bellows 7 may collect the contamination gas generated in the production area 3 with the contamination source and make this part of gas enter in the zeolite runner unit 8, and the contamination gas is treated by the zeolite runner unit 8, such that an amount of the contamination gas in the lower technical interlayer 5 with the contamination source is reduced, and the probability of the gas with the contamination source entering the

production area 4 without the contamination source is reduced.

[0045] Optionally, widths of the double-skin lane 9 in the upper technical interlayer, the double-skin lane 11 in the lower technical interlayer and the double-skin lane 10 in the clean production area are greater than or equal to 600 mm.

[0046] In some embodiments, since fresh air enters through the double-skin lane 9 in the upper technical interlayer, the double-skin lane 11 in the lower technical interlayer and the double-skin lane 10 in the clean production area, and a speed of fresh air diffusion is generally 3-4 m/s, further preferably, the width of each double-skin lane is 600 mm in order to ensure that the effect of diffusing the fresh air in each double-skin lane is relatively good and the air pressure in each part of each double-skin lane is relatively uniform.

[0047] The above description only involves illustrative embodiments of the present application, which is not intended to limit the present application. Within the spirit and principle of the present application, any made modifications, equivalent replacements, improvements, etc., should be included within the protection scope of the present application.

Claims

1. A clean room capable of inhibiting airborne molecular contaminants from diffusion, comprising:

an upper technical interlayer;
a lower technical interlayer; and
a clean production area located between the upper technical interlayer and the lower technical interlayer;
wherein technical lanes for communicating the upper technical interlayer and the lower technical interlayer are provided at two sides of the clean production area;
the clean room further comprises a pressure regulation device assembly;
wherein the upper technical interlayer, the lower technical interlayer and the clean production area are all internally provided with divider walls;

wherein the divider wall in the clean production area is configured to divide the clean production area into a production area with a contamination source and a production area without the contamination source;
the divider wall in the upper technical interlayer is configured to divide the upper technical interlayer into an upper technical interlayer with the contamination source and an upper technical interlayer without the contamination source; and
the divider wall in the lower technical interlayer is configured to divide the lower technical interlayer into a lower technical interlayer with the contamination source and a lower technical interlayer without the contamination source;
wherein
the divider wall in the upper technical interlayer is double-layered to form a double-skin lane in the upper technical interlayer, and the pressure regulation device assembly is configured to regulate an air pressure in the double-skin lane in the upper technical interlayer, such that during normal production in the clean room, the air pressure in double-skin lane in the upper technical interlayer is higher than an air pressure in an adjacent upper technical interlayer with the contamination source and an air pressure in an adjacent upper technical interlayer without the contamination source;
and/or,
the divider wall in the lower technical interlayer is double-layered to form a double-skin lane in the lower technical interlayer, and the pressure regulation device assembly is configured to regulate an air pressure in the double-skin lane in the lower technical interlayer, such that during normal production in the clean room, the air pressure in the double-skin lane in the lower technical interlayer is higher than an air pressure in an adjacent lower technical interlayer with the contamination source and an air pressure in an adjacent lower technical interlayer without the contamination source, or during normal production in the clean room, the air pressure in the double-skin lane in the lower technical interlayer is lower than the air pressure in an adjacent lower technical interlayer with the contamination source and the air pressure in the lower technical interlayer without the contamination source.

2. The clean room capable of inhibiting the airborne molecular contaminants from diffusion according to claim 1, wherein the divider wall in the clean production area is double-layered to form a double-skin lane in the clean production area, and the pressure regulation device assembly is configured to regulate an air pressure in the double-skin lane in the clean production area, such that the air pressure in the double-skin lane in the clean production area is higher than an air pressure in the production area with the contamination source and an air pressure in the production area without the contamination source.

3. The clean room capable of inhibiting the airborne molecular contaminants from diffusion according to

claim 2, wherein when the divider wall in the lower technical interlayer is double-layered to form the double-skin lane in the lower technical interlayer, the double-skin lane in the clean production area communicates with the double-skin lane in the lower technical interlayer and is isolated from the double-skin lane in the upper technical interlayer; and
the pressure regulation device assembly comprises:

a first pressure regulation device configured to simultaneously regulate the air pressure in the double-skin lane in the clean production area and the air pressure in the double-skin lane in the lower technical interlayer; and
a second pressure regulation device configured to regulate the air pressure in the double-skin lane in the upper technical interlayer.

4. The clean room capable of inhibiting the airborne molecular contaminants from diffusion according to claim 3, wherein

the first pressure regulation device comprises a first air supply device configured to cooperate with a fresh air unit so as to supply clean fresh air to the double-skin lane in the lower technical interlayer and the double-skin lane in the clean production area; and
the second pressure regulation device comprises a second air supply device configured to cooperate with the fresh air unit so as to supply clean fresh air to the double-skin lane in the upper technical interlayer.

5. The clean room capable of inhibiting the airborne molecular contaminants from diffusion according to claim 4, wherein

a first differential pressure sensor is provided in the double-skin lane in the lower technical interlayer or the double-skin lane in the clean production area, and an air outlet pipe of the first air supply device is provided with a first regulation valve configured to regulate an opening degree according to a difference value detected by the first differential pressure sensor; and
a second differential pressure sensor is provided in the double-skin lane in the upper technical interlayer, and an air outlet pipe of the second air supply device is provided with a second regulation valve configured to regulate an opening degree according to a difference value detected by the second differential pressure sensor.

6. The clean room capable of inhibiting the airborne molecular contaminants from diffusion according to claim 2, wherein when the divider wall disposed in the lower technical interlayer is double-layered to form the double-skin lane in the lower technical interlayer, the double-skin lane in the clean production area is isolated from the double-skin lane in the lower technical interlayer and the double-skin lane in the upper technical interlayer; and
the pressure regulation device assembly comprises:

a first pressure regulation device configured to regulate the air pressure in the double-skin lane in the upper technical interlayer;
a second pressure regulation device configured to regulate the air pressure in the double-skin lane in the clean production area; and
a third pressure regulation device configured to regulate the air pressure in the double-skin lane in the lower technical interlayer.

7. The clean room capable of inhibiting the airborne molecular contaminants from diffusion according to claim 6, wherein

the first pressure regulation device comprises a first air supply device configured to cooperate with a fresh air unit so as to supply clean fresh air to the double-skin lane in the upper technical interlayer;
the second pressure regulation device comprises a second air supply device configured to cooperate with the fresh air unit so as to supply clean fresh air to the double-skin lane in the clean production area; and
the third pressure regulation device comprises a first air exhaust device configured to exhaust gas in the double-skin lane in the lower technical interlayer.

8. The clean room capable of inhibiting the airborne molecular contaminants from diffusion according to claim 2, further comprising:

a contamination source collection bellows and a zeolite runner unit communicating with the contamination source collection bellows; wherein
the contamination source collection bellows is configured to collect contaminants generated in the production area with the contamination source, and make the collected contaminants enter the zeolite runner unit.

9. The clean room capable of inhibiting the airborne molecular contaminants from diffusion according to claim 2, wherein a width of a respective one of the double-skin lane in the upper technical interlayer, the double-skin lane in the lower technical interlayer and the double-skin lane in the clean production area is greater than or equal to 600 mm.

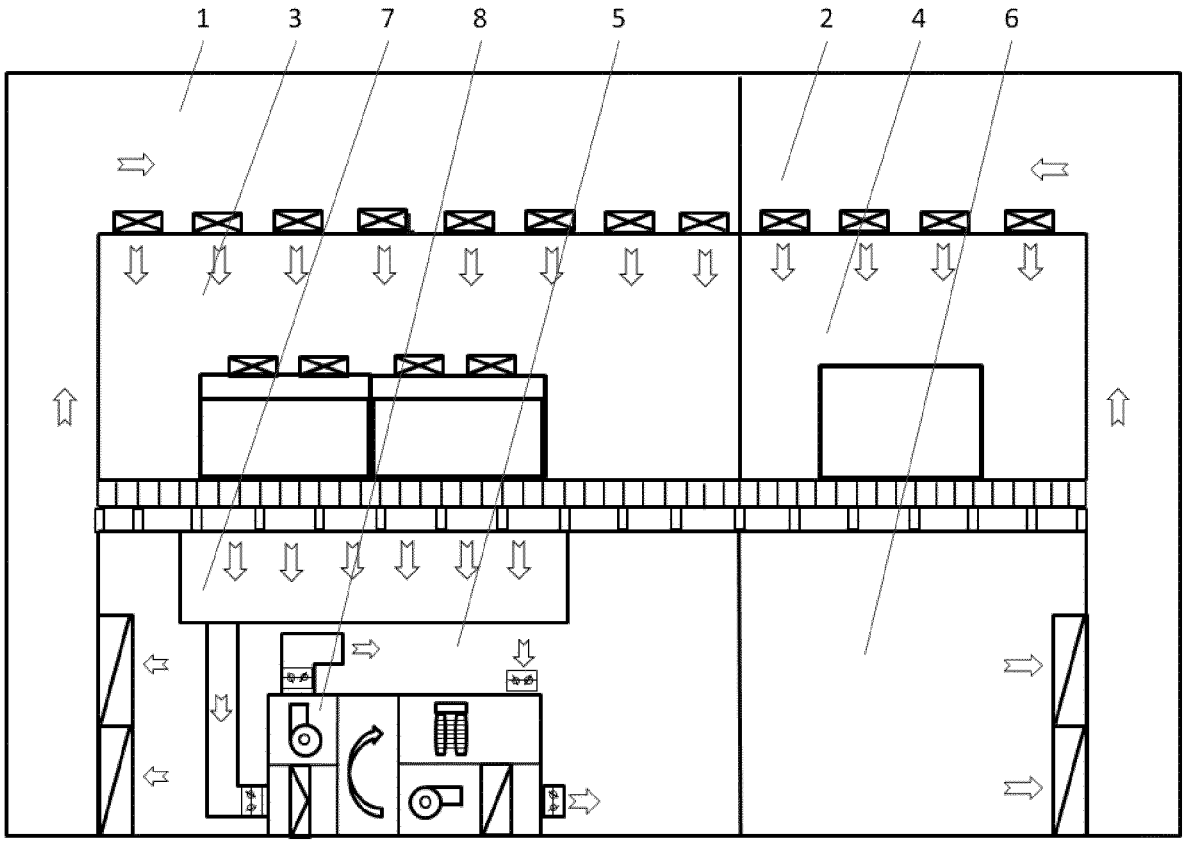

FIG. 1

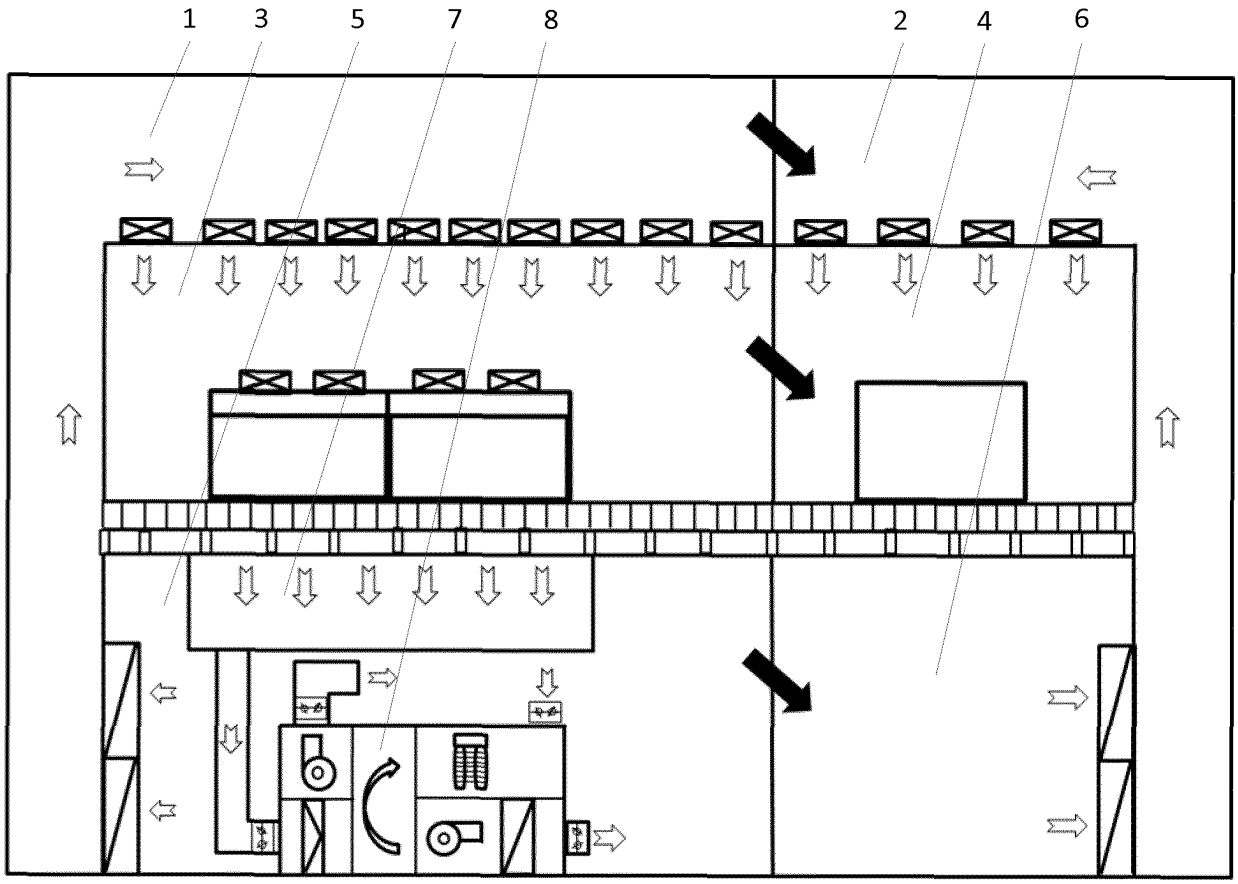

FIG. 2

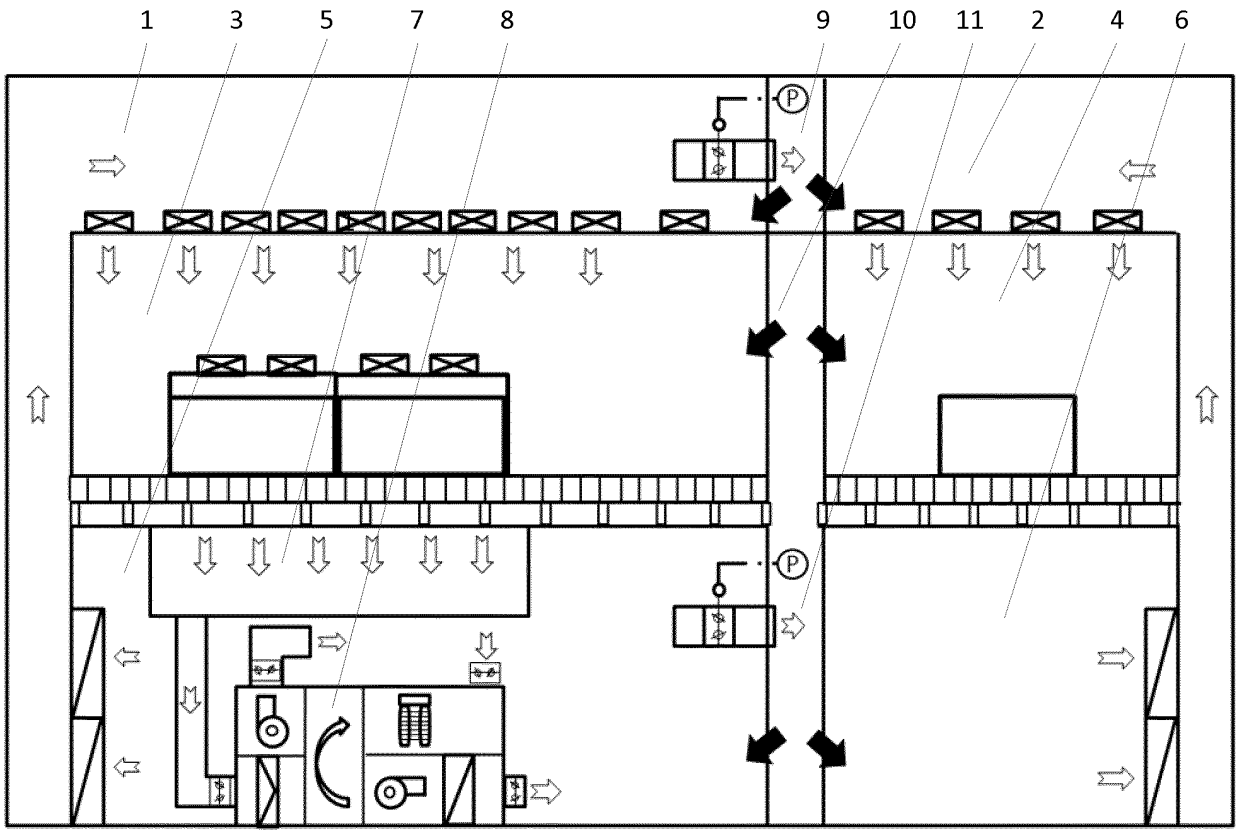

FIG. 3

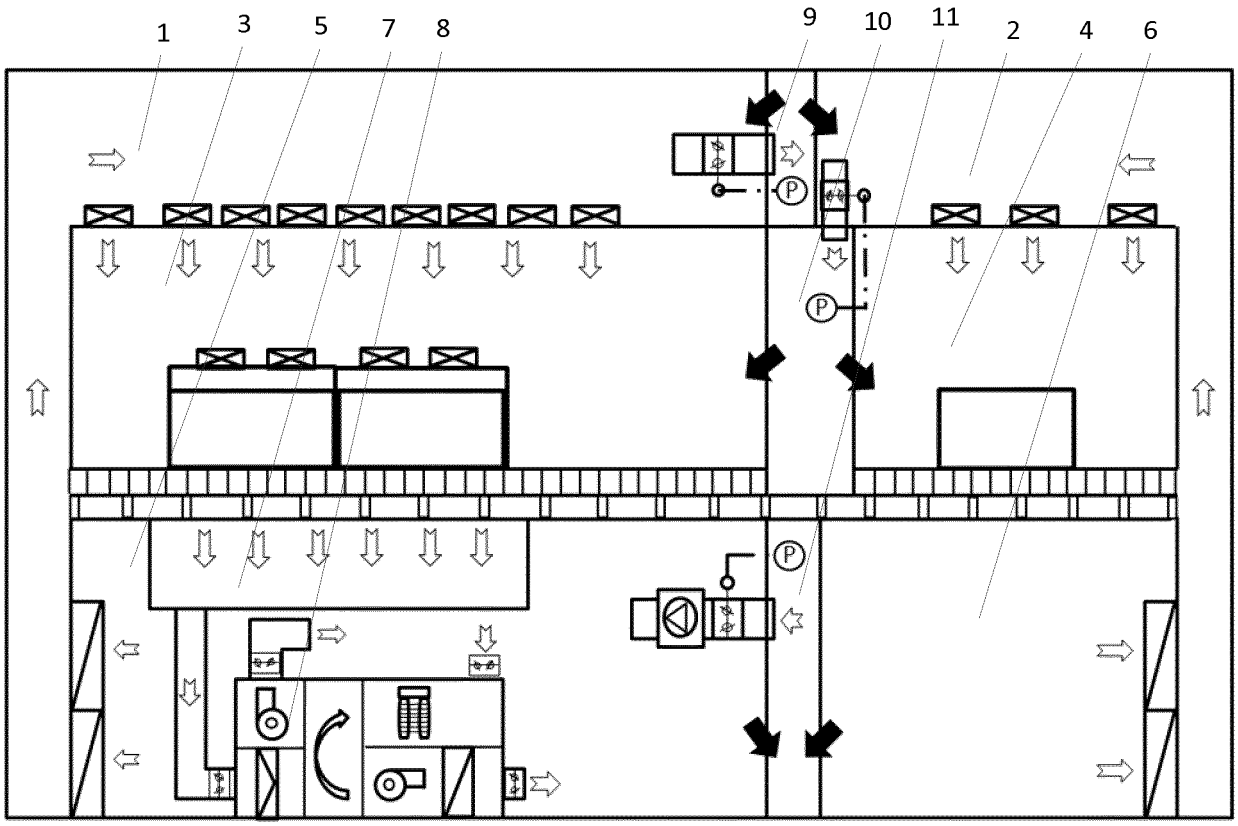

FIG. 4

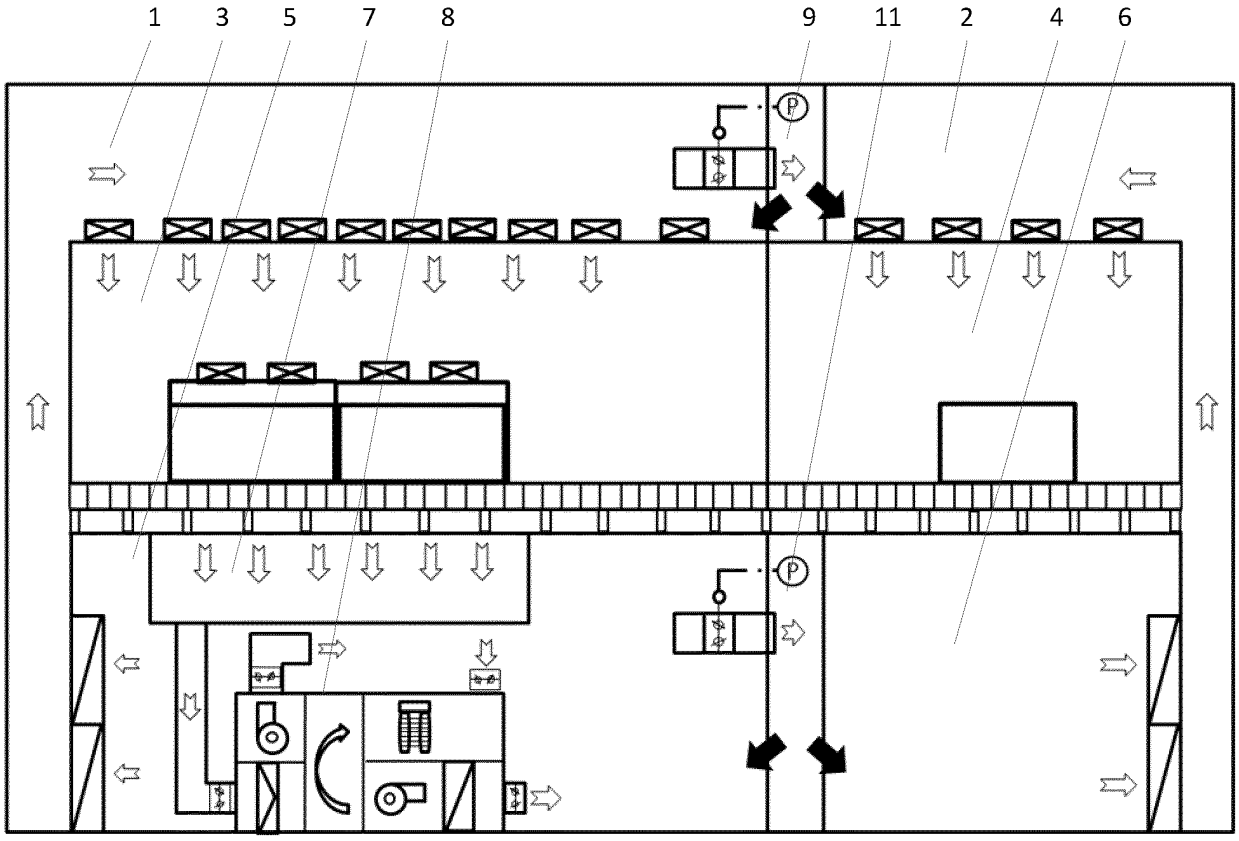

FIG. 5

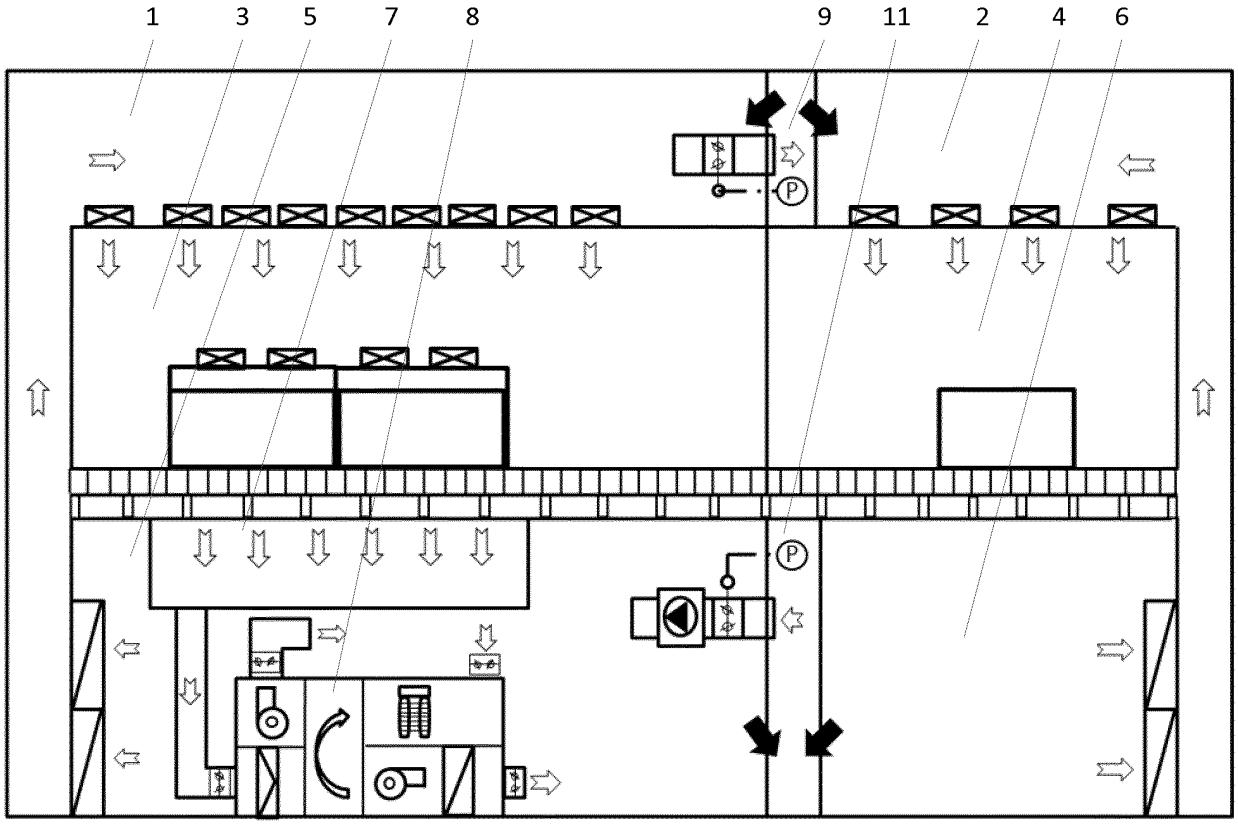

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2020/104616

A. CLASSIFICATION OF SUBJECT MATTER

E04H 5/02(2006.01)i; F24F 3/16(2006.01)i; F24F 13/00(2006.01)i; F24F 11/89(2018.01)i; F24F 7/10(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E04H 5, F24F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS, CNTXT, CNKI, VEN, DWPI, SIPOABS: 夹层, 墙, 双层, 污染, 洁净, 夹道, 气压, 压力, interlayer, entresol, mezzanine, double, wall, pollute, clean room, passageway, pressure

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 110439332 A (S.Y. TECHNOLOGY ENGINEERING & CONSTRUCTION CO., LTD. et al.) 12 November 2019 (2019-11-12) claims 1-9	1-9
PX	CN 210713992 U (S.Y. TECHNOLOGY ENGINEERING & CONSTRUCTION CO., LTD. et al.) 09 June 2020 (2020-06-09) claims 1-9	1-9
A	CN 204402090 U (SINOPHARM CHONGQING PHARMACEUTICAL AND MEDICAL INDUSTRY DESIGN INSTITUTE) 17 June 2015 (2015-06-17) description, paragraphs 33-63, figures 1-5	1-9
A	CN 105135566 A (TONGJI UNIVERSITY) 09 December 2015 (2015-12-09) entire document	1-9
A	US 2018142912 A1 (HARRIS ENV SYSTEMS INC) 24 May 2018 (2018-05-24) entire document	1-9
A	CN 206385856 U (GAO, Hai et al.) 08 August 2017 (2017-08-08) entire document	1-9
A	CN 101503916 A (YUNNAN BAIYAO GROUP CO., LTD.) 12 August 2009 (2009-08-12) entire document	1-9

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 October 2020	**29 October 2020**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China**	Authorized officer
Facsimile No. **(86-10)62019451**	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2020/104616

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	CN 106245944 A (GAO, Hai et al.) 21 December 2016 (2016-12-21) entire document	1-9

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2020/104616

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
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CN 204402090 U	17 June 2015	None	
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		US 10663189 B2	26 May 2020
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CN 1731032 A	08 February 2006	CN 1329696 C	01 August 2007
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Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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