Automated Clean Stock Room

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Abstract

An automated clean stock room employs an external air supply system having a plurality of fan filter units for supplying filtered clean air into the stock room, and an internal air circulation system having fans cooperating with air ducts and a plurality of filter screens to circulate and repeatedly remove pollution particles from the air supplied into the stock room. The fans of the internal air circulation system increase the speed of air flowing into a plurality of storage shelves provided by storage racks in the stock room, so that pollution particles in the air may be more quickly removed to upgrade the air cleanliness in the stock room.
AUTOMATED CLEAN STOCK ROOM

FIELD OF THE INVENTION

[0001] The present invention relates to a stock room, and more particularly to an automated clean stock room that is configured to increase the cleanliness of storage shelves in the stock room.

BACKGROUND OF THE INVENTION

[0002] Currently, there are two types of stock room that are commonly adopted by pharmaceutical industry and manufacturers of wafer, thin-film transistor (TFT), and liquid crystal display (LCD). In the first type of stock room, clean air is supplied via an external air supply system located above a ceiling of a clean room, and the supplied clean air is guided by air ducts to side walls of the stock room and released, as shown in FIG. 1. The first type of stock room includes two rows of air ducts 204 located at two opposite sides of the stock room, first and second storage racks 201, 202 providing a plurality of storage shelves 203 for holding stored items, and an crane unit 30 for moving items stored or to be stored in the stock room. This first type of stock room has simple structure. The external air supply system 10 includes a plurality of fan filter units (FFU) 101, which blow the clean air through the air ducts 204 located at two opposite side walls of the stock room and the storage shelves 203, and then discharge the air out of the stock room. The fan filter units 101 have large impedance at an outlet thereof, resulting in a relatively slow speed of the air flowing through the storage shelves 203. Therefore, pollution particles in the storage shelves 203 are not effectively removed therefrom by airflows.

[0003] To provide the stock room with enhanced abilities of moving and blocking pollution particles, the second type of stock room as shown in FIG. 2 is developed. In the second type of stock room, a plurality of fan filter unit 101 are further mounted in the side wall at two opposite side walls of the stock room to produce sideward moved horizontal airflows, so as to increase the speed of horizontal airflows flown through the storage shelves 203 on the first and the second storage rack 201, 202. However, this type of stock room requires a large quantity of slim type fan filter units 101 to thereby increase the manufacturing and maintenance costs of the stock room.

[0004] Both of the above-mentioned first and second types of stock room employ an external air supply system 10 to supply and discharge air into and from the stock room without any internal air circulation mechanism. And, for the purpose of increasing the cleanliness of the stock room, a large quantity of fan filter units 101 are mounted in the side wall to provide and speed horizontal airflows that sidewardly flow into the storage shelves 203 to enhance the removal of pollution particles from the stock room. While the additional fan filter units 101 increase the cleanliness of the stock room, they inevitably increase the manufacturing and maintenance costs of the stock room.

[0005] Therefore, it is desirable to develop a new type of stock room that takes the cleanliness and the cost of the stock room into consideration at the same time to overcome the drawbacks existed in the conventional stock room designs.

SUMMARY OF THE INVENTION

[0006] A primary object of the present invention is to provide an automated clean stock room that is capable of enhancing the air circulation in the stock room to increase the cleanliness of storage shelves thereof.

[0007] To achieve the above and other objects, the automated clean stock room according to the present invention includes an external air supply system for supplying filtered clean air into the stock room, and an internal air circulation system having fans cooperating with air ducts and a plurality of filter screens to circulate the clean air supplied into the stock room. The fans of the internal air circulation system draw in the clean air supplied by the external air supply system, and deliver the clean air to air ducts, so that the clean air is further filtered by the filter screens provided between the air ducts and a plurality of storage shelves in the stock room to remove pollution particles from the air. The filtered clean air entered the storage shelves then flows back to an inlet of the fans to complete one cycle of air circulation in the stock room. The stock room so configured is able to increase the volume and speed of air flowing into the storage shelves, so as to more quickly remove the pollution particles from the air, and effectively prevent the pollution particles from entering into the storage shelves to thereby upgrade the cleanliness of items stored on the storage shelves in the stock room. Moreover, the automated clean stock room may be constructed and maintained at reduced costs without sacrificing the air cleanliness in the stock room.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The structure and the technical means adopted by the present invention to achieve the above and other objects can be best understood by referring to the following detailed description of the preferred embodiments and the accompanying drawings, wherein

[0009] FIG. 1 is a schematic view of a first conventional stock room structure;

[0010] FIG. 2 is a schematic view of a second conventional stock room structure; and

[0011] FIG. 3 is a schematic view of an automated clean stock room according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] Please refer to FIG. 3 that is a schematic view of an automated clean stock room according to an embodiment of the present invention. As shown, the automated clean stock room of the present invention includes an external air supply system 10, an internal air circulation system 20, and an crane unit 30.

[0013] The external air supply system 10 includes a plurality of fan filter units 101 for filtering and sending the filtered air into the stock room.

[0014] The internal air circulation system 20 includes a first storage rack 201, a second storage rack 202, two rows of air ducts 204, a plurality of filter screens 205, and two rows of fans 206. The first and the second storage rack 201, 202 are mounted in the stock room and provide a plurality of storage shelves 203 each for holding stored materials and products. An environmental space for the storage shelves
must be highly clean to hold the stored items. The two rows of air ducts 204 are separately located between inner wall surfaces of the stock room and outer sides of the first and second storage racks 201, 202, and are communicating with the storage shelves 203. A filter screen 205 is provided at a communicating position between each storage shelf 203 and the air duct 204, so that air is filtered to remove pollution particles thereof before the air flows into each of the storage shelves 203. The filter screens 205 also function to allow the air to flow into the storage shelves 203 at a uniform rate. The fans 206 are mounted in the stock room. Preferably, the two rows of fans 206 are separately mounted at two lower lateral corners of the stock room to communicate with the two rows of air ducts 204. That is, each of the fans 206 has an inlet for drawing in the clean air supplied into the stock room by the external air supply system 10 and part of the air inside the stock room, and an outlet communicating with one of the air ducts 204.

The crane unit 30 is provided in the stock room between the first and the second storage rack 201, 202, and includes at least one access tool, such as a mechanical arm, to manipulate and transfer the items stored or to be stored on the storage shelves 203.

In practical operation of the automated clean stock room of the present invention, the fan filter units 101 of the external air supply system 10 filter external air flowing therethrough, so as to remove pollution particles from the external air. The filtered clean airflow is concentrated in a large central air inlet of the stock room and then enters the stock room for use as an external air source of the stock room to maintain the stock room in a positive internal pressure state, and carry away accumulated heat and pollution particles existing in the stock room. When the clean air flows to the inlets of the fans 206, two rows of filter screens 205 mounted at the fan inlets further filter the air to remove the pollution particles from the air. The filtered air is then distributed to the storage shelves 203 via the filter screens 205 thereat and filtered again. The air flown into the storage shelves 203 therefore has been filtered several times to reach a predetermined degree of cleanliness. The clean air finally flows from the storage shelves 203 into the stock room again to complete one cycle of internal circulation.

To more effectively increase the air cleanliness at the storage shelves 203 in the stock room, it is preferable to select fans and motors of suitable types for mounting in the stock room at proper positions. The fans may have increased rotating speed to produce increased amount of circulating air through changing the motor rotating speed. In this manner, the air may flow into the storage shelves 203 at increased speed to effectively prevent the pollution particles from entering and staying in the storage shelves 203. With the filter screens 205, the pollution particles in the air may be more quickly removed from the stock room.

In brief, the automated clean stock room of the present invention not only employs the external air supply system 10 and the internal air circulation system 20 to filter air in the stock room more than one time to remove the possible pollution particles from the air, but also utilizes fans 206 to enhance the speed of air flowing into the storage shelves 203. The fans 206 cooperate with the filter screens 205 to more quickly filter off the pollution particles in the stock room and effectively prevent the pollution particles from entering into the storage shelves 203, so as to upgrade the air cleanliness in the stock room.

What is claimed is:
1. An automated clean stock room, comprising:
an external air supply system, which includes a plurality of fan filter units to supply filtered clean air into the stock room; and
an internal air circulation system, which includes:
a first storage rack providing a plurality of storage shelves;
a second storage rack providing a plurality of storage shelves;
two rows of air ducts provided at inner side walls of the stock room to communicate with said storage shelves of said first and second storage racks;
a plurality of filter screens mounted between every one of said storage shelves and said air ducts; and
two rows of fans mounted at two lower lateral corners in the stock room to communicate with said air ducts.
2. The automated clean stock room as claimed in claim 1, wherein the filtered clean air supplied by said external air supply system is concentrated in a large upper central air inlet of the stock room and then enters the stock room for use.
3. The automated clean stock room as claimed in claim 1, further comprising an crane unit provided between said first and said second storage rack.
4. The automated clean stock room as claimed in claim 3, wherein said crane unit comprises a mechanical arm.

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