

WIRELESS MONITORING AND CONTROLLING SYSTEM FOR A FAN FILTER UNIT OF A CLEAN ROOM

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates to a wireless monitoring and controlling system for a fan filter unit, and more especially to a wireless monitoring and controlling system for a fan filter unit of a clean room which can effectively monitor and control the operation status of a plurality of fan filter units, and reduce the amount of equipment required and wires used by means of wireless
10 RF transmission, thus substantially saving construction cost.

2. Description of Related Art

 Generally, high-tech factory buildings (for example, electronic factories), especially the buildings which need high recirculation filtration for air conditioners (for example clean rooms or other cleaning room etc.), have a
15 plurality of fan filter units (for example, AC or DC fan units) disposed in their ceilings for air recirculation and filtration, thereby meeting the requirement of high air quality within the buildings.

 In high-tech factory buildings or clean rooms, air is circulated constantly to remove dust particles, thereby maintaining the required grade of air purity.
20 The clean rooms can be divided into center systems and fan filter unit (FFU) systems in a classification according to the arrangement of blowers. Center systems supply air via a large size fan, while fan filter systems combine small size fans and filter screens, instead of a single large size fan. The fan filter system has a plurality of fan sets in a ceiling of a clean room or high-tech

building. The fan filter unit system has the advantages of high convenience, short construction period, simple pollution control and convenient balance adjustment for the whole system. Current clean rooms almost all adopt the fan filter unit type.

5 However, each fan filter unit system has too many fan filter units, so the field operation is inconvenient. Further, the current fan filter unit system is modularized, locally controlled and connected in a whole series or parallel mode. So when one or two fan filter units are in an abnormal work status during the operation of the fan filter unit system, it is difficult to find the fault
10 fan filter units so that the fan filter unit system cannot be repaired in time and recover its normal operation.

 Accordingly, a monitoring and controlling system for a fan of a clean room has been disclosed. Please refer to Fig. 1 illustrating a conventional monitoring and controlling system for a fan of a clean room. As shown in Fig.
15 1, the monitoring and controlling system 100a includes a plurality of fan filter units 10a, a plurality of programmable logic controllers (PLC) 20a, a plurality of line concentrators 30a, a monitor 40a and a computer 50a. Every plurality of fan filter units 10a are connected with one programmable logic controller 20a, each programmable logic controller 20a is connected with each line
20 concentrator 30a, the plurality of line concentrators 30a are respectively connected with the monitor 40a, and the monitor 40a is connected with the computer 50a, whereby the monitor 40a can monitor usage status (for example, switch status, whether the rotating speed is normal or not, etc) of the fan filter

units 10a and the computer 50a can control the operation of the fan filter units 10a.

However, for monitoring and controlling the operation of each fan filter unit 10a, the conventional monitoring and controlling system must have m
5 programmable logic controllers 20a, many line concentrators 30a and a lot of wires for connecting the programmable logic controllers 20a and the fan filter units 10a, so the amount of equipment and wires increases greatly, and the construction cost also increases.

Furthermore, when a factory building is enlarged and the number of the
10 fan filter units increases accordingly, the programmable logic controllers 20a, the line concentrators 30a and the wires must become more, so the cost of the components will increase greatly. Besides, the construction is also more difficult.

Accordingly, the conventional monitoring and controlling system for a fan
15 of a clean room described above has a lot of inconvenience and shortcomings in practice, so it needs to be improved.

Hence, for solving the problem that area expansion of factory buildings causes that the monitor points for the fan filter units increase and the cost increases, the inventors of the present invention suggest the present invention
20 which is of a reasonable design and is an effective improvement.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a wireless monitoring and controlling system for a fan filter unit of a clean room which is used in a factory building with clean rooms and solves the problem caused by the

enlargement of a clean room consisting in the increase the number of monitor points for the fan filter units. The wireless monitoring and controlling system for a fan filter unit of a clean room disposes a sense identification tag on each fan of a plurality of fan filter units (FFU) in the ceiling of the factory building
5 and applies a plurality of wireless reading units of a wireless reading unit to communicate with the plurality of sense identification tags via wireless radio frequency (RF) transmission, instead of a lots of equipment and wires.

Accordingly, the present invention can read the identification signals via wireless RF transmission thereby effectively monitoring and controlling each
10 fan filter unit, reducing the number of needed equipment and wires greatly, saving construction cost greatly and simplify the construction process.

To achieve the above-mentioned object, a wireless monitoring and controlling system for a fan filter unit of a clean room in accordance with the present invention is provided. The wireless monitoring and controlling system
15 for a fan filter unit of a clean room is used in a factory building with clean rooms and includes a plurality of fan filter units, a wireless reading unit and a real-time monitoring and controlling unit.

Each fan filter unit has a fan and a sense identification tag disposed on the fan for receiving an identification signal of the fan. The wireless reading
20 unit has a plurality of wireless readers each of which communicates with a predetermined amount of the sense identification tags for reading the identification signals of the sense identification tags via wireless RF transmission. The real-time monitoring and controlling unit is connected with the wireless reading unit for receiving the identification signals of the sense

identification tags read by the wireless reading unit.

Accordingly, based on the wireless RF transmission between the wireless reading unit and each sense identification tag, the present invention can effectively monitor and control the operation status of the plurality of fan filter units, reduce the number of needed equipment and wires greatly, save construction cost greatly, and simplify the construction process.

To further understand technologies, means and efficacy of the present invention, please refer to the following detailed description and drawings related the present invention. The objects, features and advantages of the present invention will become more readily appreciated. However, the drawings are only to be used as references and explanations, not to limit the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic view of a conventional monitoring and controlling system for a fan of a clean room;

Fig. 2 is a schematic top view of a wireless monitoring and controlling system for a fan filter unit of a clean room according to the present invention;

Fig. 3 is a schematic side view of the wireless monitoring and controlling system for a fan filter unit of a clean room according to the present invention; and

Fig. 4 is a flow chart of a method for applying the wireless monitoring and controlling system according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

To further understand technical features and contents of the present invention, please refer to the drawings and the following detailed description related to the present invention.

Fig. 2 and Fig. 3 are respectively a schematic top view and a schematic side view of a wireless monitoring and controlling system for a fan filter unit of a clean room 100 of the present invention. In the embodiment, the wireless monitoring and controlling system for a fan filter unit of a clean room 100 is used in a clean room (not shown) in a thin film transistor (TFT) factory building. The wireless monitoring and controlling system for a fan filter unit of a clean room 100 includes a plurality of fan filter units (FFU) 1, a wireless reading unit 2 and a real-time monitoring and controlling unit 3.

Each fan filter unit 1 includes a fan 12 and a sense identification tag 14 disposed on the fan 12 for receiving an identification signal from the fan 12. Each sense identification tag 14 may sense switch status, fault status, operation status and the like of each fan 12 and generate the identification signal. In the present invention, the sense identification tag 14 may be a sense identification card, a sense identifier or other related component. The same type of components or devices with the sense identification function is within the application scope of the present invention.

Furthermore, the wireless monitoring and controlling system for a fan filter unit of a clean room 100 of the present invention can be used not only in a clean room in a TFT factory building, which has an area of at least 200 meters×100 meters, but also in clean rooms of different areas according to any processing environment. That is, the application of the present invention isn't

limited in this type of factory buildings and their areas, and any electronic factory or related types of factory buildings which need clean rooms with air conditioners and filters are all within the application scope of the present invention.

5 Accordingly, the present invention can achieve the effects of filtering air in the clean room and adjusting temperature of the clean room via the fan 12, and sense switch status, fault status, operation status and the like of each fan 12 via each sense identification tag 14.

10 The wireless reading unit 2 has a plurality of wireless readers 22, each of which may communicate with a predetermined amount of sense identification tags 14 for reading the identification signals of the sense identification tags 14. The wireless reading unit 2 is disposed above the tops of the fan filter units 1 and receives the identification signals sensed by the sense identification tags 14 of the fans 12 via wireless RF transmission, so that each wireless reader 22 can
15 communicate with the predetermined amount of sense identification tags 14. In the present invention, that the wireless reading unit 2 is disposed above the tops of the fan filter units 1 only is one of embodiments of the present invention and cannot limit the relative position of the wireless reading unit 2 and the fan filter units, and users can dispose the wireless reading unit 2 on other positions
20 according to requirement, which can communicate with the sense identification tags 14 via wireless RF transmission.

 In the embodiment, each wireless reader 22 may communicate with at least (or more than) fifty sense identification tags 14. Each wireless reader 22 may be an infrared ray RF reader (IFR) or a radar RF reader (RFR). Besides

the two types of readers, the wireless readers 22 may also be other related wireless RF readers. Each wireless reader 22 may communicate with the sense identification tags 14 within the receiving range of at least 20 meters×20 meters, so as to wirelessly read a plurality of sense identification tags 14. Additionally, 5 users can change the receiving ranges of the plurality of wireless readers 22 according to environmental requirement.

The real-time monitoring and controlling unit 3 is connected with the wireless reading unit 2 for receiving the identification signals of the sense identification tags 14 which are received by the wireless reading unit 2. The 10 real-time monitoring and controlling unit 3 includes at least one monitor 32, a computer 34 and a human-mechanical interface (HMI) software 36. The monitor 32 is used for displaying the identification signals of the wireless readers 22; the computer 34 reads and controls the identification signals of the wireless readers 22 of the wireless reading unit 2 so as to control the switch 15 status of each fan 12, judge the fault status of each fan 12, remove the fault, and control the operation; and the human-mechanical interface software 36 is connected with the monitor 32 and the computer 34 for transforms the identification signals received by the wireless reading unit 2 into a predetermined signal format and then transmitting them to the monitor 32 and 20 the computer 34, respectively, so that the monitor 32 displays the identification signals on monitor pictures (not shown) thereof, and simultaneously, the computer 34 reads and controls the identification signals to perform the operations of switch control, fault judgment and remove, operation control and so on.

Further, the wireless readers 22 of the wireless reading unit 2 are electrically connected in series therebetween and connected with the real-time monitoring and controlling unit 3 for transmitting the identification signals to the real-time monitoring and controlling unit 3 synchronously, so that the monitor 32, the computer 34 and the human-mechanical interface software 36 of the monitoring and controlling unit 3 can receive the identification signal of the sense identification tag 14 disposed on each fan 12 via the wireless reading unit 2, thereby achieving the transformation of the identification signal, the picture display and the switch, fault and operation control.

Accordingly, based on the wireless RF transmission, the present invention can effectively monitor and control the operation status of the plurality of fan filter unit 1, reduce the number of needed equipment and wires greatly, and save construction cost greatly.

Please refer to Fig. 4 simultaneously, a flow chart of a method for applying the wireless monitoring and controlling system for a fan filter unit of a clean room 100 according to the present invention is shown. The method includes the steps of:

(1) the first step: at first, receiving one identification signal of each fan 12 via the sense identification tag 14 disposed on each fan 12 of the plurality of fan filter units (FFU) 1(S101);

(2). the second step: reading the identification signals of the sense identification tags 14 via each wireless reader 22 of the wireless reading unit 2 communicating with a predetermined amount of sense identification tags 14 via wireless RF communication (S103);

(3). the last step: receiving the identification signals read by the wireless readers 22, and displaying and controlling the identification signals via the real-time monitoring and controlling unit 3 connected with the wireless reading unit 2 (S105).

5 In the method of applying the wireless monitoring and controlling system, each wireless reader 22 of the wireless reading unit 2 and the plurality of the sense identification tags 14 transmit signals therebetween via the wireless RF reading, so the operation status of the plurality of fan filter unit 1 can be effectively monitored and controlled, the number of needed equipment and
10 wires and the construction cost can be reduced greatly, and further, the construction difficulty is reduced.

 Furthermore, the real-time monitoring and controlling unit 3 includes the monitor 32, the computer 34 and the human-mechanical interface software 36. The real-time monitoring and controlling unit 3 performs the steps of: (a)
15 transforming the identification signals received by the plurality of wireless readers 22 of the wireless reading unit 2 into the predetermined signal format and then transmitting them to the monitor 32 and the computer 34 respectively, via the human-mechanical interface software 36; (b) displaying the identification signal read by each wireless reader 22 on one monitor picture
20 (not shown) of the monitor 32; (c) reading and controlling the identification signal received by each wireless reader 22 to perform the operations of switch control, fault judgment and remove and operation control via the computer 34.

 Accordingly, the monitor 32, the computer 34 and the human-mechanical interface software 36 of the real-time monitoring and controlling unit 3 can

transform the identification signals of the sense identification tags 14 to display and monitor the usage status (such as switch status, fault status or operation status) of the fan 12 of each fan filter unit 1, and at the same time, perform the operations of switch control, fault judgment and remove and operation control
5 of each fan 12 effectively.

Consequently, the wireless monitoring and controlling system for a fan filter unit of a clean room disposes one sense identification tag 14 on each fan and applies the wireless reading unit 2 to read the plurality of sense identification tags 14 via wireless RF transmission, thereby performing related
10 operation. The present invention has the advantages as follows:

(1) The wireless readers read the sense identification tags via wireless RF transmission, thereby reducing wire and construction cost;

(2) The present invention can adapt for area expansion of the clean room and the increase of monitor points for the fan filter units, thereby achieving the
15 simple, convenient and rapid construction.

(3) The present invention can simply and conveniently achieve the effect of monitoring and controlling the fan filter units of the clean room via the engagement of the sense identification tags, the wireless readers and the real-time monitoring and controlling unit;

20 (4) The present invention can achieve the effect of singly monitoring and controlling the fan filter units effectively via the human-mechanical interface software 36 of the real-time monitoring and controlling unit 3.

What are disclosed above are only the specification and the drawings of one of the preferred embodiments of the present invention and it is therefore

not intended that the present invention be limited to the particular embodiment disclosed. It will be understood by those skilled in the art that various equivalent changes may be made depending on the specification and the drawings of the present invention without departing from the scope of the
5 present invention.

WHAT IS CLAIMED IS:

1. A wireless monitoring and controlling system for a fan filter unit of a clean room which is used in a factory building with clean rooms, the system comprising:
 - 5 a plurality of fan filter units, each having a fan and a sense identification tag disposed on the fan for receiving an identification signal of the fan;
a wireless reading unit having a plurality of wireless readers, each of which communicates with a predetermined amount of the sense identification tags for reading the identification signals of the sense identification tags via
10 wireless RF transmission; and
a real-time monitoring and controlling unit connected with the wireless reading unit for receiving the identification signals of the sense identification tags read by the wireless reading unit and displaying and controlling the identification signals.
- 15 2. The wireless monitoring and controlling system for a fan filter unit of a clean room as claimed in claim 1, wherein each sense identification tag senses switch status, fault status and operation status of each fan and generates the identification signal.
3. The wireless monitoring and controlling system for a fan filter unit of a clean
20 room as claimed in claim 1, wherein each sense identification tag is a sense identification card or a sense identifier.
4. The wireless monitoring and controlling system for a fan filter unit of a clean room as claimed in claim 1, wherein each wireless reader is a radar RF reader (RFR).

5. The wireless monitoring and controlling system for a fan filter unit of a clean room as claimed in claim 1, wherein each wireless reader is an infrared ray RF reader (IFR).
6. The wireless monitoring and controlling system for a fan filter unit of a clean room as claimed in claim 1, wherein the real-time monitoring and controlling unit includes at least one monitor and a computer, and the monitor displays the identification signals of the wireless readers and the computer reads and controls the identification signals received by the wireless reading unit.
7. The wireless monitoring and controlling system for a fan filter unit of a clean room as claimed in claim 6, wherein the real-time monitoring and controlling unit further includes a human-mechanical interface (HMI) software which transforms the identification signals received by the wireless reading unit 2 into a predetermined signal format and then transmits the identification signals to the monitor and the computer, respectively, to provide the identification signals for the monitor to show the identification signals and for the computer to read and control the identification signals.
8. The wireless monitoring and controlling system for a fan filter unit of a clean room as claimed in claim 1, wherein the wireless readers of the wireless reading unit are electrically connected in series therebetween and connected with the real-time monitoring and controlling unit for transmitting the identification signals to the real-time monitoring and controlling unit synchronously.
9. The wireless monitoring and controlling system for a fan filter unit of a clean room as claimed in claim 1, wherein the wireless reading unit is disposed

above tops of the fan filter units and each wireless reader communicates with the predetermined amount of the sense identification tags.

10. The wireless monitoring and controlling system for a fan filter unit of a clean room as claimed in claim 1, wherein each wireless reader
5 communicates with at least fifty sense identification tags.
11. The wireless monitoring and controlling system for a fan filter unit of a clean room as claimed in claim 1, wherein each wireless reader communicates with the sense identification tags within an area of at least 20 meters×20 meters.

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