

CHEMICAL FILTER REPLACEMENT APPARATUS

BACKGROUND

1. Field of the Invention

5 The present invention relates to a chemical filter replacement apparatus capable of replacing a cartridge of a filter assembly for filtering foreign matter contained in a chemical.

2. Discussion of Related Art

10 Generally, all companies, such as companies for manufacturing semiconductors, semiconductor apparatuses, liquid crystal displays (LCDs), and organic light-emitting diodes (OLEDs), pharmaceutical companies, and paint companies which use hazardous chemicals, use various kinds of chemicals, and methods of safely supplying the chemicals are also diversified.

15 Such a chemical is supplied through a chemical filter in order to be used in a high purity state, in which foreign matter is minimized, according to characteristics of a manufacturing process.

 Shapes and replacing methods of chemical filters are different from each other according to types thereof, and replacement periods of the chemical filters are
20 different from each other according to the types and necessary high purity maintenance criteria of the chemicals.

 Conventionally, in order to minimize damage from chemicals, workers wear chemical-resistant clothing and safety gear such as a gas mask and manually replace chemical filters one by one. However, in a case in which a worker manually
25 replaces a chemical filter, a chemical and a fume can leak to the outside, pollution,

damage, and destruction of the surrounding environment including manufacturing facilities can occur, and other people therearound in addition to the worker can also be exposed to danger during a chemical filter replacing operation.

In addition, in a case in which a worker makes a mistake in manipulating a valve, an accident can occur in which various toxic chemicals contained in the filter leak to the outside.

In addition, since a chemical filter is manually replaced, there is a problem in that the number of man-hours required for replacing the filter increases.

As the related art to solve the problem of manually replacing the chemical filter, Korean Patent Registration No. 10-1921600 is disclosed.

The related art relates to an automatic chemical filter replacement apparatus capable of automatically replacing a chemical filter and includes a storage part in which a new cartridge to be used to filter a chemical is stored. In the storage part, only one type of cartridge is stored.

In order to supply a chemical required in a process manufacturing of a semiconductor or the like, the chemical is stored in a chemical storage tank. In a case in which a prefilter for filtering the chemical introduced into the chemical storage tank is provided and a final filter for filtering the chemical before the chemical is discharged from the chemical storage tank and supplied for the manufacturing process is provided, the chemical filters having different pore sizes may be provided. That is, the prefilter having a large pore size and the final filter having a small pore size may be provided.

A need for a chemical filter replacement apparatus for automatically replacing cartridges of a plurality of types of filters is emerging.

SUMMARY OF THE INVENTION

The present invention is directed to providing a chemical filter replacement apparatus capable of storing a plurality of types of cartridges before transferring the cartridges to a filter fixing part.

5 According to an aspect of the present invention, there is provided a chemical filter replacement apparatus in which a new cartridge input to a cartridge storage part is transferred to a filter fixing part by a cartridge transfer part and coupled to a filter assembly, wherein the cartridge storage part includes a plurality of storage spaces which are separate from each other and to which a plurality of types of cartridges are
10 input, and the cartridge transfer part transfers each of the plurality of types of the cartridges to the filter fixing part.

 The cartridge storage part includes: a plurality of doors which open or close entrances of the plurality of storage spaces; and a locking part which allows each of the plurality of doors to be in a locked state or unlocked state, wherein, when
15 cartridge information about the plurality of types of the cartridges is received by a controller, the controller controls the locking part so that only the door, which opens or closes the storage space to which the cartridge corresponding to the received information is input, is in the unlocked state and the remaining doors are maintained in the locked state.

20 Cartridge seating parts on which the cartridges are seated are provided in the plurality of storage spaces; and a seating base transfer driving part is provided to transfer the cartridge in a direction in which the cartridge transfer part is positioned in a state in which the cartridge is seated on the cartridge seating part.

 The plurality of cartridges are seated on the cartridge seating parts to be
25 spaced apart from each other in a direction perpendicular to a transfer direction of the

cartridge transfer part; and when the cartridge at a position which is closest to the cartridge transfer part is transferred to the filter fixing part by the cartridge transfer part, the seating base transfer driving part is driven to move the cartridge seated at a next position to the position which is closest to the cartridge transfer part.

5 The plurality of cartridges are provided on the cartridge seating part to rotate in a state in which the plurality of cartridges are spaced apart from each other and seated on the cartridge seating part; and when the cartridge at a position which is closest to the cartridge transfer part is transferred to the filter fixing part by the cartridge transfer part, the seating base transfer driving part is driven to move the
10 cartridge seated at a next position to the position which is closest to the cartridge transfer part.

 The seating base transfer driving part linearly moves a cartridge seating base, on which the cartridge is seated, in a direction perpendicular to a transfer direction of the cartridge transfer part.

15 The seating base transfer driving part linearly moves a cartridge seating base, on which the cartridge is seated, in a direction perpendicular to a transfer direction of the cartridge transfer part; and when the cartridge seating base is continuously moved, the cartridge seating base is moved to a different level in a vertical direction.

 The seating base transfer driving part linearly moves the cartridge seating
20 base, on which the cartridge is seated, in a direction perpendicular to a transfer direction of the cartridge transfer part; and when the cartridge seating base is continuously moved, the cartridge seating base is circulated to be returned to an initial position.

 The cartridge seating base is coupled to a circulating conveyer belt.

The cartridge storage part includes a plurality of doors which open or close entrances of the plurality of storage spaces; and the door is integrally coupled to a seating part housing to which a cartridge seating part, on which the cartridge is seated, is coupled so that the door, the seating part housing, and cartridge seating part
5 are integrally withdrawn from the storage space.

The cartridge transfer part is provided to hold the cartridge of the cartridge storage part and move linearly; and a position of the cartridge which is seated on the cartridge storage part and held by the cartridge transfer part and a position of the cartridge seated on the filter fixing part are positioned on a straight line parallel to a
10 straight line along which the cartridge is moved by the cartridge transfer part.

The plurality of types of the cartridges include a plurality of types of cartridges having different pore sizes, different outer shapes, or different sizes.

The plurality of storage spaces are positioned adjacent to each other on a straight line parallel to a straight direction in which the cartridge transfer part
15 transfers the cartridge.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present invention will become more apparent to those of ordinary skill in the art by
20 describing exemplary embodiments thereof in detail with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view illustrating a chemical filter replacement apparatus according to the present invention;

FIG. 2 is a perspective view illustrating the chemical filter replacement apparatus, from which a door is removed so that an interior of a storage part is viewed, illustrated in FIG. 1;

FIG. 3 is a perspective view illustrating the chemical filter replacement apparatus, of which an entire interior is viewed, illustrated in FIG. 1;

FIG. 4 is a plan cross-sectional view illustrating the chemical filter replacement apparatus illustrated in FIG. 3;

FIG. 5 is a perspective view illustrating a state in which a cartridge seating part provided in a first storage space are coupled to a seating part housing and the door;

FIG. 6 is a perspective view illustrating a state in which a first cartridge is seated on a first cartridge seating part;

FIG. 7 is a perspective view illustrating a state in which a cartridge seating part provided in a second storage space are coupled to a seating part housing and a door;

FIG. 8 is a perspective view illustrating a state in which a second cartridge is seated on a second cartridge seating part;

FIG. 9 is a side view illustrating an operation state in which a second seating base transfer driving part is driven in a state in which the second cartridge is seated on the second cartridge seating part illustrated in FIG. 8;

FIG. 10 is a plan view illustrating another example of a first cartridge seating part; and

FIG. 11 is a plan view illustrating another example of a second cartridge seating part.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Hereinafter, embodiments of the present invention will be described in detail with reference to the accompanying drawings.

Referring to FIGS. 1 to 4, a chemical filter replacement apparatus 1 according to one embodiment of the present invention includes a cartridge storage part 100, a cartridge transfer part 200, a filter fixing part 300, and a cartridge collection part 400.

The chemical filter replacement apparatus 1 includes an outer housing 2 which surrounds an outer side of an entirety of the apparatus and a controller (not shown) for controlling the entirety of the chemical filter replacement apparatus 1.

New cartridges to be replaced are input to and seated on the cartridge storage part 100, and the seated new cartridges are temporarily stored in the cartridge storage part 100 before transferred to the filter fixing part 300 by the cartridge transfer part 200.

Filter assemblies 10 and 20 are fixed to the filter fixing part 300. The filter assemblies 10 and 20 may include prefilters 10 for filtering a chemical introduced into a chemical storage tank (not shown) and final filters 20 for filtering the chemical before the chemical is discharged from the chemical storage tank and supplied to a manufacturing process.

The filter fixing part 300 may include a first filter fixing part 300-1 to which the prefilters 10 are fixed and a second filter fixing part 300-2 and a third filter fixing part 300-3 to which the final filters 20 are fixed. The first to third filter fixing parts 300-1, 300-2, and 300-3 are provided to be spaced apart from each other from left to right in FIG. 4.

The prefilter 10 may include a first cartridge 11 for filtering foreign matter contained in the chemical, a filter housing 12 which accommodates the first cartridge 11 therein, and a filter head 13 which is coupled to one open side of the filter housing 12.

5 The final filter 20 may include a second cartridge 21 for filtering foreign matter contained in the chemical, a filter housing 22 which accommodates the second cartridge 21 therein, and a filter head 23 which is coupled to one open side of the filter housing 22.

As an example, two prefilters 10 of the first filter fixing part 300-1 may be
10 provided, and four final filters 20 of the second filter fixing part 300-2 and the third filter fixing part 300-3 may be provided. However, the numbers of the prefilters 10 and the final filters 20 are not limited thereto, and the numbers of the prefilters 10 and the final filters 20 may be the same, e.g., three, and the numbers may vary according to a structure of the apparatus. The chemical introduced into the
15 chemical storage tank passes through the pair of prefilters 10 connected in parallel, and the chemical stored in the chemical storage tank passes through four final filters 20 and is supplied to the manufacturing process.

Since the plurality of the prefilters 10 and the final filters 20 are provided, when one cartridge provided in any one filter is replaced, the chemical can be
20 continuously supplied through another filter without stopping the supply of the chemical.

In the first to third filter fixing parts 300-1, 300-2, and 300-3, filter housing detaching and attaching modules 310-1, 310-2, and 310-3 capable of holding and vertically moving outer circumferential surfaces of the filter housings 12 and 22 to
25 move the filter housings 12 and 22 are provided, respectively.

In a case in which the chemical is supplied through the prefilter 10 and the final filter 20, the filter housings 12 and 22 are coupled to the filter heads 13 and 23 to form filter assemblies 10 and 20 in a state in which the cartridges 11 and 21 are provided in the filter housings 12 and 22, respectively. In a case in which the
5 cartridges 11 and 21 are replaced with new cartridges, as illustrated in FIGS. 1 to 3, when the filter housing detaching and attaching modules 310-1, 310-2, and 310-3 hold the filter housings 12 and 22 and move upward, the filter housings 12 and 22 are separate from the filter heads 13 and 23 and moved upward. Then, waste cartridges seated on the filter heads 13 and 23 are transferred to the cartridge collection part 400,
10 and new cartridges stored in the cartridge storage part 100 are seated on the filter heads 13 and 23. In the state in which the new cartridges are seated on the filter heads 13 and 23, the filter housing detaching and attaching modules 310-1, 310-2, and 310-3 which are holding the filter housings 12 and 22 move downward, and the filter housings 12 and 22 are coupled to the filter heads 13 and 23 so that the
15 cartridge replacement is completed.

The cartridge transfer part 200 is for transferring the waste cartridges fixed to the filter fixing part 300 to the cartridge collection part 400 to collect the waste cartridges and transferring the new cartridges stored in the cartridge storage part 100 to the filter fixing part 300 from which the waste cartridges are removed.

20 The cartridge transfer part 200 is provided to hold the new cartridges or waste cartridge and linearly move in a lateral direction (a transfer direction of the cartridge transfer part). To this end, the cartridge transfer part 200 includes a transfer rail 210 having a linear shape formed to extend in the lateral direction.

The cartridge transfer part 200 includes a first holding part 220 which holds
25 the new cartridge stored in the cartridge storage part 100 to transfer the new cartridge

to the filter fixing part 300 and a second holding part 230 which holds the waste cartridge present on the filter fixing part 300 to transfer the waste cartridge to the cartridge collection part 400.

A structure of the cartridge storage part 100 will be described.

5 In the cartridge storage part 100, a plurality of storage spaces 110 and 120, which are separate from each other and to which a plurality of types of cartridges may be input, are provided.

The plurality of types of the cartridges may include the plurality of types of cartridges 11 and 12 having different pore sizes. The plurality of types of the
10 cartridges 11 and 12 may include the first cartridge 11 having a large pore size and the second cartridge 21 having a smaller pore size than the first cartridge 11. In addition, the plurality of types of the cartridges 11 and 12 may be provided to have the same pore size. In addition, the plurality of types of the cartridges may include different types of cartridges having different sizes because diameters or heights
15 thereof are different and may include cartridges having outer shapes different from each other.

In the present embodiment, the plurality of storage spaces 110 and 120 may include the first storage space 110 for storing the first cartridge 11 and the second storage space 120 for storing the second cartridge 21.

20 The first storage space 110 and the second storage space 120 are separated by a partition wall 113.

A first door 111 which opens or closes the first storage space 110 is provided at a front entrance of the first storage space 110, and a second door 121 which opens or closes the second storage space 120 is provided at a front entrance of the second
25 storage space 120.

A first rear door 170 which opens or closes the first storage space 110 is provided at a rear entrance of the first storage space 110, and a second rear door 180 which opens or closes the second storage space 120 is provided at a rear entrance of the second storage space 120. The first rear door 170 is opened in a case in which
5 the cartridge transfer part 200 transfers the first cartridge 11 of the first storage space 110, and the second rear door 180 is opened in a case in which the cartridge transfer part 200 transfers the second cartridge 21 of the second storage space 120.

A first locking part 150 for opening and closing the first door 111 and a second locking part 160 for closing and opening the second door 121 are provided.

10 When the first locking part 150 and the second locking part 160 are in a locked state, in a case in which the first cartridge 11 is input to the first storage space 110 or the second cartridge 21 is input to the second storage space 120, the locked state is released so that the first door 111 or the second door 121 may be opened.

In this case, in order to prevent the cartridges from being input in a mixed
15 way in which the second cartridge 21 is input to the first storage space 110 or the first cartridge 11 is input to the second storage space 120, cartridge information may be checked, the locked state of the locking part of the storage space to which the checked cartridge is input may be released, and the locked state of the remaining cartridge may be maintained.

20 The cartridge information may be displayed on an identification part (not shown) displayed on an outer side surface of each of the cartridges. The identification part may be provided as a bar code, a radio-frequency identification (RFID), or a quick response (QR) code. The cartridge information may include information about a type of a cartridge. The identification part may be scanned by a
25 scanner (not shown), and the controller may determine the cartridge information

from the scanned information. In addition, the identifications, which are marked on side surfaces or upper portions of the cartridges, of the cartridge information and the identification part may also be recognized using a vision camera or the like, and the cartridge information and the identification part may be provided using one of
5 various methods in addition to the above-described example.

The plurality of storage spaces 110 and 120 may be provided at positions adjacent to each other on a straight line parallel to a straight direction which is the transfer direction of the cartridge transfer part 200. That is, as illustrated in FIG. 4, the plurality of storage spaces 110 and 120 may be provided on the straight line
10 parallel to the transfer rail 210.

In the first storage space 110, a first cartridge seating part 130 on which the first cartridge 11 is seated is provided, and in the second storage space 120, the second cartridge seating part 140 on which the second cartridge 21 is seated is provided.

15 The first cartridge seating part 130 and the second cartridge seating part 140 will be described in detail with reference to FIGS. 5 to 9.

As illustrated in FIGS. 5 and 6, the first cartridge seating part 130 includes first cartridge seating bases 131a and 131b, a first seating base support member 132, and a first seating base transfer driving part 133.

20 The first cartridge seating bases 131a and 131b each have a substantially quadrangular box shape, and seating grooves 131e of which upper portions are open and into which first cartridges 11a and 11b are vertically inserted are formed in central portions of the first cartridge seating bases 131a and 131b.

The plurality of first cartridge seating bases 131a and 131b and the plurality
25 of first cartridges 11a and 11b are provided, and the first cartridges 11a and 11b may

be seated on the first cartridge seating bases 131a and 131b. The plurality of first cartridge seating bases 131a and 131b are provided to be spaced apart from each other in a direction perpendicular to the transfer direction of the cartridge transfer part 200. That is, the plurality of first cartridge seating bases 131a and 131b may be provided serially in the direction perpendicular to the transfer rail 210 illustrated in FIG. 4. In the present embodiment, it is illustrated that two first cartridges 11a and 11b and two first cartridge seating bases 131a and 131b are provided.

The first seating base support member 132 is formed in a flat plate shape, and lower portions of the first cartridge seating bases 131a and 131b are fixed to the first seating base support member 132.

The first seating base transfer driving part 133 supports a lower portion of the first seating base support member 132 and is driven to linearly move the first cartridge seating bases 131a and 131b together on which the first cartridges 11a and 11b are seated and the first seating base support member 132 in a direction in which the cartridge transfer part 200 is positioned (that is, the direction perpendicular to the transfer direction of the cartridge transfer part 200).

The first seating base transfer driving part 133 may include a linear transfer guide (linear motion (LM) guide) for linear movement and a drive source including an air cylinder or hydraulic cylinder. However, the first seating base transfer driving part 133 may include a motor instead of the cylinder.

A first seating part housing 112 may be formed in a quadrangular box shape of which an upper portion is open, and the first cartridge seating part 130 may be integrally coupled to the first seating part housing 112.

The first door 111 is integrally coupled to a front side of the first seating part housing 112 so that the entirety of the first seating part housing 112 is formed in a

drawer shape. In a state in which locking of the first locking part 150 is released, the first door 111, the first seating part housing 112, and the first cartridge seating part 130 may be integrally withdrawn from the first storage space 110.

Among the plurality of first cartridges 11a and 11b, when the first cartridge
5 11a seated on the first cartridge seating base 131a at a position (first position) which is closest to the cartridge transfer part 200 is transferred to the filter fixing part 300 by the cartridge transfer part 200, the first seating base transfer driving part 133 is driven so that the first cartridge seating base 131b present at a next position (second position) moves to the first position with the first cartridge 11b. The first cartridge
10 11b moved to the first position is transferred to the filter fixing part 300 by the cartridge transfer part 200 when a next cartridge replacement is performed.

As illustrated in FIGS. 7 to 9, the second cartridge seating part 140 includes second cartridge seating bases 141a, 141b, 141c, and 141d, a second seating base support member 142, and a second seating base transfer driving part 143.

15 The second cartridge seating bases 141a, 141b, 141c, and 141d each have a substantially quadrangular box shape which is the same as the shape of each of the first cartridge seating bases 131a and 131b, and seating grooves 141e of which upper portions are open and into which second cartridges 21a, 21b, 21c, and 21d are vertically inserted are formed in the central portions of the first cartridge seating
20 bases 131a and 131b.

The plurality of second cartridge seating bases 141a, 141b, 141c, and 141d and the plurality of second cartridges 21a, 21b, 21c, and 21d are provided, and the second cartridges 21a, 21b, 21c, and 21d may be seated on the second cartridge seating bases 141a, 141b, 141c, and 141d. The plurality of second cartridge seating
25 bases 141a, 141b, 141c, and 141d are provided serially in the direction perpendicular

to the transfer direction of the cartridge transfer part 200. In the present embodiment, it is illustrated that four second cartridges 21a, 21b, 21c, and 21d and four second cartridge seating bases 141a, 141b, 141c, and 141d are provided.

5 A portion, which supports lower surfaces of the second cartridge seating bases 141a, 141b, 141c, and 141d, of the second seating base support member 142 may be formed in a flat plate shape, and lower portions of the second cartridge seating bases 141a, 141b, 141c, and 141d are fixed to the portion.

The second seating base transfer driving part 143 is provided at one side of the second seating base support member 142.

10 The second seating base transfer driving part 143 is driven to linearly move the second cartridge seating bases 141a, 141b, 141c, and 141d all together on which the second cartridges 21a, 21b, 21c, and 21d are seated and the second seating base support member 142 in the direction in which the cartridge transfer part 200 is positioned (that is, the direction perpendicular to the transfer direction of the
15 cartridge transfer part 200).

In this case, the second seating base support member 142 may be formed as a conveyer belt, and the second seating base transfer driving part 143 may be formed as a motor for rotating the conveyer belt.

The second seating part housing 122 is formed in a quadrangular box shape
20 of which an upper portion is open and which is the same as the shape of the first seating part housing 112, and the second cartridge seating part 140 is integrally coupled to the second seating part housing 122.

Since the second door 121 is integrally coupled to a front side of the second seating part housing 122, the entirety of the second seating part housing 122 is
25 formed in a drawer shape. In a state in which locking of the second locking part

160 is released, the second door 121, the second seating part housing 122, and the second cartridge seating part 140 may be integrally withdrawn from the second storage space 120.

Among the plurality of second cartridges 21a, 21b, 21c, and 21d, when the
5 second cartridge 21a seated on the second cartridge seating base 141a at a position (first position) which is closest to the cartridge transfer part 200 is transferred to the filter fixing part 300 by the cartridge transfer part 200, the second seating base transfer driving part 143 is driven to transfer the second cartridge seating base 141b present at a next position (second position) to the first position with the second
10 cartridge 21b. The second cartridge 21b moved to the first position is transferred to the filter fixing part 300 by the cartridge transfer part 200 when a next cartridge replacement is performed.

As illustrated in FIG. 9, when the second seating base transfer driving part 143 is driven, the second seating base support member 142 formed as the conveyer
15 belt rotates in a counterclockwise direction. In this case, the plurality of second cartridge seating bases 141a, 141b, 141c, and 141d also move in the counterclockwise direction and linearly move within a horizontal section.

In this case, a transfer direction of the second cartridge seating base 141a present at the first position is changed at a position which is closest to the cartridge
20 transfer part 200, and the second cartridge seating base 141a is moved under the second seating base support member 142. That is, when the second cartridge seating base 141a is continuously moved from the first position, the second cartridge seating base 141a is moved to a different level in a vertical direction.

In addition, when the second cartridge seating base 141a moved under the
25 second seating base support member 142 is continuously moved, the second

cartridge seating base 141a is moved on the second seating base support member 142 after being moved under the other side of the second seating base support member 142 to be returned to an initial position so that a circulating structure can be formed.

In the present embodiment, although a case in which the second cartridge seating base 141a is moved to the different level in the vertical direction in the circulating structure is illustrated, a structure in which the second cartridge seating base 141a is moved to a different level in the vertical direction without circulation may be implemented.

As described above, since the cartridge seating base is moved to a position of a level different from a level at the first position, or the circulating structure is formed, a large number of cartridges can be stored in the storage space having a small size.

Another embodiment of the first cartridge seating part and the second cartridge seating part will be described with reference to FIGS. 10 and 11.

In FIG. 10, a first cartridge seating part 130-1, which is formed in a rotary type, and first cartridges 11a and 11b seated on the first cartridge seating part 130-1 are illustrated.

The first cartridge seating part 130-1 may include first cartridge seating bases 131a and 131b described with reference to FIG. 5, and the first cartridges 11a and 11b may be seated on the first cartridge seating bases 131a and 131b. In addition, a first seating base support member which supports lower portions of the first cartridge seating bases 131a and 131b may be provided, and a first seating base transfer driving part which integrally rotates the first seating base support member and the first cartridge seating bases 131a and 131b may be further provided.

Among the first cartridges 11a and 11b, when the first cartridge 11a present at a position (first position) which is closest to a cartridge transfer part 200 is transferred to a filter fixing part 300 by the cartridge transfer part 200, the first cartridge 11b present at a next position (second position) is transferred to the first position by driving of the first seating base transfer driving part. The first cartridge 11b moved to the first position is transferred to the filter fixing part 300 by the cartridge transfer part 200 when a next cartridge replacement is performed.

In FIG. 11, a second cartridge seating part 140-1, which is formed in a rotary type, and second cartridges 21a, 21b, 21c, and 21d seated on the second cartridge seating part 140-1 are illustrated. The second cartridge seating part 140-1 may also include second cartridge seating bases 141a, 141b, 141c, and 141d, on which the second cartridges 21a, 21b, 21c, and 21d are seated, and a second seating base support member, which supports lower portions of the second cartridge seating bases 141a, 141b, 141c, and 141d, and may further include a second seating base transfer driving part which integrally rotates the second seating base support member and the second cartridge seating bases 141a, 141b, 141c, and 141d.

Among the second cartridges 21a, 21b, 21c, and 21d, the second cartridge 21a present at a position (first position) which is closest to the cartridge transfer part 200 is moved to the filter fixing part 300 by the cartridge transfer part 200, the second cartridges 21b, 21c, and 21d present next positions (second positions) are sequentially moved to the first position and are sequentially transferred to the filter fixing part 300 by the cartridge transfer part 200 when a next cartridge replacement is performed.

Meanwhile, in FIG. 4, a first holding position P1 at which the first cartridge 11a is held by the cartridge transfer part 200, a second holding position P2 at which

the second cartridge 21a is held by the cartridge transfer part 200, a first fixing position P3 at which the first cartridge 11a transferred by the cartridge transfer part 200 is seated on the first filter fixing part 300-1, and a second fixing position P4 at which the second cartridge 21a transferred by the cartridge transfer part 200 is seated
5 on the second filter fixing part 300-2 are illustrated.

The first holding position P1 corresponds to the first position of the first cartridge 11a described above, and the second holding position P2 corresponds to the first position of the second cartridge 21a described above.

The cartridge transfer part 200 holds the first cartridge 11a or 11b or the
10 second cartridge 21a, 21b, 21c, or 21d of the cartridge storage part 100, linearly moves along the transfer rail 210, and moves the first cartridge 11a or 11b or the second cartridge 21a, 21b, 21c, or 21d to the first fixing position P3 of the first filter fixing part 300-1 or to the second fixing position P4 of the second filter fixing part 300-2.

15 The first holding position P1, the second holding position P2, the first fixing position P3, and the second fixing position P4 are positioned on a straight line L parallel to a straight line along which the cartridge is moved by the cartridge transfer part 200.

In order for the cartridge transfer part 200 to hold the first cartridge 11a or
20 the second cartridge 21a at the first holding position P1 or the second holding position P2, the first holding part 220 should vertically move downward from a position on the straight line, on which transfer is performed, along the transfer rail 210 to the first holding position P1 or the second holding position P2 based on FIG. 4.

In addition, in order for the first holding part 220 of the cartridge transfer
25 part 200 to hold the first cartridge 11a or the second cartridge 21a at the first holding

position P1 or the second holding position P2, to linearly move along the transfer rail 210, and to seat the first cartridge 11a or the second cartridge 21a at the first fixing position P3 or the second fixing position P4, the first holding part 220 should vertically move downward from a position on the straight line on which the transfer is performed along the transfer rail 210 to the first fixing position P3 or the second fixing position P4 based on FIG. 4.

In a case in which control is performed in the above-described manner, when the first holding position P1, the second holding position P2, the first fixing position P3, and the second fixing position P4 are positioned on the same straight line L, since position control for vertical downward movement of the first holding part 220 is simplified, a transfer action of the first holding part 220 can be minimized, and control of the chemical filter replacement apparatus 1 can be efficiently performed.

According to the present invention, since a storage part capable of storing a plurality of types of cartridges is provided, the cartridge which satisfies filtering performance required in a manufacturing process can be automatically replaced, thereby preventing a worker from being exposed to risk and minimizing man-hours required for replacing the cartridge when the cartridge is replaced.

In addition, since a door of the storage part is opened after cartridge information about the plurality of types of cartridges is checked, cartridges for different uses are prevented from being input in a mixed way.

In addition, since a transfer action of the cartridge performed by a cartridge transfer part is minimized, control of a chemical filter replacement apparatus can be efficiently performed.

In addition, since a cartridge seating base on which the cartridge is seated is moved to a position, at which a level is different, or is circulated, a large number of the cartridges can be stored in a storage space having a small size.

Although the present invention has been described with reference to the
5 exemplary embodiments as described above, the present invention is not limited to the above-described embodiments and may be variously modified and made within the scope of the claims, the detailed description of the present invention, and the accompanying drawings, and the modifications will also fall within the present invention.

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CLAIMS:

1. A chemical filter replacement apparatus comprising a cartridge storage part, a cartridge transfer part and a filter fixing part,

5 wherein a new cartridge input to the cartridge storage part is transferred to the filter fixing part by the cartridge transfer part and coupled to a filter assembly,

 the cartridge storage part includes a plurality of storage spaces which are separate from each other,

 new cartridges of any one type among a plurality of types of new cartridges
10 are input in each of the plurality of storage spaces; and

 the cartridge transfer part transfers each of the plurality of types of the new cartridges to the filter fixing part,

 wherein the cartridge storage part includes:

 a plurality of doors which open or close front entrances of the plurality of
15 storage spaces; and

 a locking part which allows each of the plurality of doors to be in a locked state or unlocked state,

 wherein, when cartridge information about the plurality of types of the new cartridges is received by a controller, the controller controls the locking part so that
20 only the door, which opens or closes the storage space to which the new cartridges corresponding to the received information is input, is in the unlocked state and the remaining doors are maintained in the locked state.

2. The chemical filter replacement apparatus of claim 1, wherein:

cartridge seating part on which the new cartridges of any one type among the plurality of types of new cartridges are seated is provided in each of the plurality of storage spaces; and

5 a seating base transfer driving part is provided to transfer the new cartridges of any one type among the plurality of types of new cartridges in a direction in which the cartridge transfer part is positioned in a state in which the new cartridges of any one type among the plurality of types of new cartridges is seated on the cartridge seating part.

10 3. The chemical filter replacement apparatus of claim 2, wherein:

the new cartridges of any one type among the plurality of types of new cartridges are seated on the cartridge seating part to be spaced apart from each other in a direction perpendicular to a transfer direction of the cartridge transfer part; and

15 when a cartridge at a position which is closest to the cartridge transfer part among the new cartridges seated on the cartridge seating part is transferred to the filter fixing part by the cartridge transfer part, the seating base transfer driving part is driven to move the cartridge seated at a next position among the new cartridges seated on the cartridge seating part to the position which is closest to the cartridge transfer part.

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4. The chemical filter replacement apparatus of claim 2, wherein:

the new cartridges seated on the cartridge seating part are provided on the cartridge seating part to rotate in a state in which the new cartridges seated on the cartridge seating part are spaced apart from each other; and

when a cartridge at a position which is closest to the cartridge transfer part among the new cartridges seated on the cartridge seating part is transferred to the filter fixing part by the cartridge transfer part, the seating base transfer driving part is driven to move the cartridge seated at a next position among the new cartridges seated on the cartridge seating part to the position which is closest to the cartridge transfer part.

5. The chemical filter replacement apparatus of claim 2, wherein the seating base transfer driving part linearly moves a cartridge seating base, on which the new cartridges of any one type among the plurality of types of new cartridges are seated, in a direction perpendicular to a transfer direction of the cartridge transfer part.

6. The chemical filter replacement apparatus of claim 2, wherein:
the seating base transfer driving part linearly moves a cartridge seating base, on which the new cartridges of any one type among the plurality of types of new cartridges are seated, in a direction perpendicular to a transfer direction of the cartridge transfer part; and

when the cartridge seating base is continuously moved, the cartridge seating base is moved to a different level in a vertical direction.

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7. The chemical filter replacement apparatus of claim 2, wherein:
the seating base transfer driving part linearly moves the cartridge seating base, on which the new cartridges of any one type among the plurality of types of new cartridges are seated, in a direction perpendicular to a transfer direction of the cartridge transfer part; and

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when the cartridge seating base is continuously moved, the cartridge seating base is circulated to be returned to an initial position.

8. The chemical filter replacement apparatus of claim 7, wherein the
5 cartridge seating base is coupled to a circulating conveyer belt.

9. The chemical filter replacement apparatus of claim 1, wherein:
the cartridge storage part includes a plurality of doors which open or close front entrances of the plurality of storage spaces; and
10 the door is integrally coupled to a seating part housing to which a cartridge seating part, on which the new cartridges of any one type among the plurality of types of new cartridges are seated, is coupled so that the door, the seating part housing, and cartridge seating part are integrally withdrawn from the storage space.

15 10. The chemical filter replacement apparatus of claim 1, wherein:
the cartridge transfer part is provided to hold the new cartridge input to the cartridge storage part and move linearly; and
a position of the new cartridge which is seated on the cartridge storage part and held by the cartridge transfer part and a position of the new cartridge seated on
20 the filter fixing part are positioned on a straight line parallel to a straight line along which the new cartridge is moved by the cartridge transfer part.

11. The chemical filter replacement apparatus of claim 1, wherein the plurality of types of the new cartridges include a plurality of types of cartridges
25 having different pore sizes, different outer shapes, or different sizes.

12. The chemical filter replacement apparatus of claim 1, wherein the plurality of storage spaces are positioned adjacent to each other on a straight line parallel to a straight direction in which the cartridge transfer part transfers the
5 cartridge.