

CHEMICAL FILTER REPLACEMENT APPARATUS

BACKGROUND

1. Field of the Invention

5 The present invention relates to a chemical filter replacement apparatus for separating and coupling a filter housing from and to a cartridge of a chemical filter assembly which filters 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.

 When a chemical filter is replaced, a filter housing of a filter assembly and a filter head are separated, a cartridge is replaced, the filter housing is coupled to the filter head again, the filter housing and a coupling part of the filter head are clamped

using a clamping device to firmly couple the filter housing and the filter head, and thereby preventing leak of a chemical and fume in the filter assembly.

In the case in which the filter housing is coupled to the filter head, the filter housing may be coupled to the filter head in a state in which the filter head and a surface, which faces the filter housing, of the filter head are inclined with respect to each other. There are reasons why facing surfaces are inclined with respect to each other, and the reasons may include a flatness defect of the filter housing and a portion, which faces the filter housing, of the filter head, a tolerance occurring when a lifting drive part is assembled, a tolerance occurring at a portion, which is coupled to the lifting drive part, of the filter housing, an assembly tolerance of the filter head, and the like.

When the filter housing is coupled to the surface, which faces the filter housing, of the filter head in the state in which facing surfaces are inclined with respect to each other, since air tightness is not maintained due to small gaps between the filter housing and the filter head, there is a problem in that the chemical and fume leak.

As a related art for replacing a cartridge in a filter assembly, Korean Patent Registration No. 10-1921600 was disclosed.

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SUMMARY OF THE INVENTION

The present invention is directed to providing a chemical filter replacement apparatus in which a filter housing and a surface, which faces the filter housing, of a filter head are in a parallel state in a case in which the filter housing and the filter head are coupled.

According to an aspect of the present invention, there is provided a chemical filter replacement apparatus including a filter assembly fixing part which fixes a filter assembly including a filter housing, in which a cartridge for filtering a chemical is accommodated, and a filter head coupled to an open one side of the filter housing, and a filter housing detaching and attaching module which moves the filter housing in order to separate the filter housing from the filter assembly or couple the separated filter housing to the filter assembly, wherein the filter housing detaching and attaching module includes at least one elastic member to apply an elastic force to a close contact surface of the filter housing and the filter head in a case in which the filter housing is moved to and pressed against the filter head.

The filter housing detaching and attaching module includes: a housing transfer part which provides a driving force to move the filter housing; a first connection member which is connected to the housing transfer part and moved by a driving unit of the housing transfer part; and a housing grip member to which the filter housing is coupled and which is moved together with the first connection member by the driving unit, wherein the elastic member is provided to apply the elastic force between the first connection member and the housing grip member.

The filter housing detaching and attaching module includes: a connection shaft of which one end is connected to the first connection member and has a length in a movement direction due to the driving unit of the housing transfer part; and a second connection member coupled to the other end of the connection shaft, wherein the housing grip member is provided between the first connection member and the second connection member.

The filter housing detaching and attaching module includes: a connection shaft of which one end is coupled to the first connection member and which has a

length in a movement direction due to the driving unit of the housing transfer part;
and an intermediate connection member integrally provided with the housing grip
member, wherein the connection shaft passes through a shaft through hole formed in
the intermediate connection member in a direction in which the filter housing is
5 moved.

A ball bushing is provided between an outer circumferential surface of the
connection shaft and an inner side surface of the intermediate connection member in
which the shaft through hole is formed so that the intermediate connection member
and the connection shaft are relatively moved in a longitudinal direction of the
10 connection shaft.

In a case in which the filter housing and the filter head are pressed against
each other, the housing grip member is twistable with respect to a horizontal plane
due to a gap generated between an outer circumference of the connection shaft and
an inner circumference of the ball bushing.

15 In a case in which the filter housing and the filter head are pressed against
each other, the housing grip member is inclinable with respect to a horizontal plane
to correspond to an inclination angle of the close contact surface of the filter housing
and the filter head.

In a case in which the filter housing and the filter head are pressed against
20 each other, the elastic member is compressed.

The elastic member is formed as a coil spring.

The elastic member is provided as a plurality of elastic members.

The chemical filter replacement apparatus comprise a first clamp which
clamps an outer side surface of the filter head; and a second clamp which clamps an
25 outer side surface of the filter housing, wherein the filter assembly fixing part

includes a pressing member to press the first clamp or the second clamp in opposite directions in which the first clamp and the second clamp face each other so that the first clamp and a portion, which faces the first clamp, of the second clamp are pressed against each other in a case in which the filter head is coupled to the filter housing.

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 describing exemplary embodiments thereof in detail with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view illustrating a state in which a filter housing is separated from a filter head in a chemical filter replacement apparatus according to the present invention;

FIG. 2 is a perspective view illustrating a state in which the filter housing moves downward from the state of FIG. 1;

FIG. 3 is a cross-sectional view illustrating a state in which the filter housing and the filter head are clamped in a filter assembly fixing part of the present invention;

FIG. 4 is a cross-sectional view illustrating a state in which a first clamp and a second clamp are clamped in the filter assembly;

FIG. 5 is a perspective view illustrating a state in which the filter housing is clamped to a housing grip member of the present invention;

FIG. 6 is a cross-sectional view taken along line A-A of FIG. 5;

FIG. 7 is a cross-sectional view taken along line B-B of FIG. 5; and

FIG. 8 is a view illustrating a state in which an elastic member is compressed and a lower surface of an intermediate connection member and an upper surface of a second connection member are spaced apart from each other.

5 DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

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

A chemical filter replacement apparatus 1 of the present invention will be described with reference to FIGS. 1, 4, and 5 to 7.

10 The chemical filter replacement apparatus 1 includes a filter housing detaching and attaching module 100 on which a filter assembly 10 for filtering a chemical supplied to a process, in which the chemical is used, is seated and which replaces a cartridge 11 in the seated filter assembly 10 and a filter assembly fixing part 300.

15 The filter assembly 10 includes the cartridge 11 for filtering foreign matter contained in the chemical, a filter housing 12 which accommodates the cartridge 11 therein, and a filter head 13 coupled to an open one side of the filter housing 20.

The cartridge 11 may be formed, for example, in a cylindrical shape having a vertical length.

20 In order for the filter housing 12 to accommodate the cartridge 11 having the cylindrical shape therein, the filter housing 12 is formed in a cylindrical shape of which one side end is open and the cartridge 11 may enter and exit through the open one side end.

A plurality of connection parts are formed in the filter head 13. Through the
25 plurality of connection parts, a chemical supplied from a chemical supply part (not

shown) is introduced, the chemical passing through the cartridge 11 is discharged to be supplied to a processing apparatus, the chemical remaining in an inner space is discharged, and nitrogen gas is introduced or discharged. Pipes (not shown) for transferring the chemical or nitrogen are connected to the plurality of connection
5 parts.

An O-ring 14 may be interposed between portions at which the filter housing 12 and the filter head 13 are coupled so that air tightness can be maintained.

A filter head holder (not shown) for holding the filter head 13 may be provided. The filter head 13 may be seated on the filter head holder. In a state in
10 which an entirety of the filter assembly 10 is held on the filter head holder, the filter housing 12 is moved upward to be separated from the filter assembly 10, the cartridge 11 is replaced, and the filter housing 12 is moved downward and coupled to the filter head 13 seated on the filter head holder after the cartridge 11 is replaced so that the replacement of the cartridge 11 is performed.

15 In the present embodiment, it is illustrated that the filter head 13 is positioned at a lower portion, and the filter housing 12 is disposed at an upper portion, but the filter housing 12 may also be positioned at the lower portion, and the filter head 13 may also be positioned at the upper portion.

The filter housing detaching and attaching module 100 includes housing
20 fixing parts 120, 130, 140, 150, and 160 to which the filter housing 12 is fixed and a housing transfer part 110 which vertically moves the housing fixing parts 120, 130, 140, 150, and 160.

The housing transfer part 110 may include a driving unit (not shown) including a motor or cylinder to provide a driving force for vertically moving the
25 housing fixing parts 120, 130, 140, 150, and 160 and a movement guide (not shown)

having a vertical length to guide movement of the housing fixing parts 120, 130, 140, 150, and 160 using the driving unit.

Hereinafter, a vertical direction in which the housing fixing parts 120, 130, 140, 150, and 160 are moved by the housing transfer part 110 is defined as a movement direction due to the housing transfer part 110.

The housing fixing parts 120, 130, 140, 150, and 160 may include a first connection member 120 connected to the housing transfer part 110, a second connection member 130 provided at a position spaced downward from the first connection member 120, a pair of connection shafts 171 of which both ends are connected to the first connection member 120 and the second connection member 130, an intermediate connection member 140 through which the connection shafts 171 pass vertically, a housing grip member 160 which has a structure surrounding an outer side of a body of the filter housing 12 and to which the filter housing 12 is coupled and the intermediate connection member 140 is coupled, and a pair of elastic members 150 provided to apply an elastic force between the housing grip member 160 and the first connection member 120.

The first connection member 120 includes a driving connection part 121 which is formed in a standing quadrangular plate shape and connected to the housing transfer part 110 and a support part 122 of which one side is formed in a standing plate shape to be connected to the driving connection part 121 and the other side is formed in a flat plate shape so that first connection member 120 is formed in a “L” shape.

A pair of coupling holes 122a are formed to vertically pass through a portion formed in the flat plate shape of the other side of the support part 122.

An elastic member seating groove 122b concavely formed in a ring shape along a circumference of the coupling hole 122a is formed in a lower surface of the support part 122. An upper end of the elastic member 150 is seated on the elastic member seating groove 122b.

5 A connection shaft seating groove 122c, which is formed inside and concentric with the elastic member seating groove 122b and which is concavely formed in a ring shape along the circumference of the coupling hole 122a, is formed in the lower surface of the support part 122. An upper end of the connection shaft 171 is seated in the connection shaft seating groove 122c.

10 The second connection member 130 is formed in a flat plate shape and provided at a position spaced downward from the support part 122 of the first connection member 120. The second connection member 130 and the support part 122 may be provided to be parallel to the horizontal plane. A pair of coupling holes 130a are formed to pass through the second connection member 130 at positions
15 corresponding to coupling holes 122a of the support part 122.

A connection shaft seating groove 130b concavely formed in a ring shape along a circumference of the coupling hole 130a is formed in an upper surface of the second connection member 130. A lower end of the connection shaft 171 is seated in the connection shaft seating groove 130b.

20 The intermediate connection member 140 is formed in a substantially rectangular hexahedron shape, and a pair of shaft through holes 140a through which the pair of connection shafts 171 pass in the movement direction are formed in the intermediate connection member 140.

The intermediate connection member 140 may vertically move with respect
25 to the connection shaft 171.

An elastic member seating groove 141 concavely formed in a ring shape along a circumference of an upper end of the shaft through hole 140a is formed in an upper surface of the intermediate connection member 140. A lower end of the elastic member 150 is seated in the elastic member seating groove 141.

5 A first plug seating groove 142, which is formed inside and concentric with the elastic member seating groove 141 and which is concavely formed in a ring shape along the circumference of the upper end of the shaft through hole 140a, is formed in the upper surface of the intermediate connection member 140. A first plug 173 is inserted into the first plug seating groove 142.

10 A second plug seating groove 143 concavely formed in a ring shape along a circumference of a lower end of the shaft through hole 140a is formed in a lower surface of the intermediate connection member 140. A second plug 174 is inserted into the second plug seating groove 143.

The connection shaft 171 has a rod shape having a length in the movement
15 direction, a coupling groove 171a concavely formed downward from an upper surface thereof is formed in an upper portion of the connection shaft 171, and a coupling groove 171b concavely formed upward from a lower surface thereof is formed in a lower portion of the connection shaft 171.

The support part 122 is provided on the upper surface of the connection shaft
20 171, and the second connection member 130 is provided on the lower surface of the connection shaft 171. In this state, the coupling hole 122a of the support part 122 and the coupling groove 171a of the connection shaft 171 are coupled by a coupling member, and the coupling hole 130a of the second connection member 130 and the coupling groove 171b of the connection shaft 171 are coupled by a coupling member

so that the first connection member 120, the second connection member 130, and the connection shaft 171 are integrally coupled.

The elastic member 150 is formed as a coil spring, the upper end of the elastic member 150 is seated in the elastic member seating groove 122b of the first connection member 120 and supported by a lower surface of the first connection member 120, and the lower end of the elastic member 150 is seated in the elastic member seating groove 141 of the intermediate connection member 140 and supported by the upper surface of the intermediate connection member 140.

A ball bushing 172 is inserted between an outer side surface of the connection shaft 171 and an inner side surface of the shaft through hole 140a. The ball bushing 172 includes a plurality of balls in contact with the outer side surface of the connection shaft 171, and the plurality of balls are provided to be in contact with an outer side surface of the intermediate connection member 140.

A gap may be generated between an outer circumference of the connection shaft 171 and an inner circumference of the ball bushing 172. Due to the gap, the connection shaft 171 is separated from the ball bushing 172 in a lateral direction in a state in which the connection shaft 171 is inserted into and passes through the ball bushing 172 so that the connection shaft 171 can be twisted. When a size of the gap is adjusted, a twistable degree of the connection shaft 171 may be adjusted.

In a state in which the ball bushing 172 is inserted into the shaft through hole 140a, when the first plug 173 is inserted into the first plug seating groove 142, and the second plug 174 is inserted into the second plug seating groove 143, the ball bushing 172 is prevented from being separated from the shaft through hole 140a.

The housing grip member 160 includes a first grip part 161 of which one side is coupled to a side surface of the intermediate connection member 140 and

which surrounds an outer side surface of one side of the filter housing 12 and a second grip part 162 which surrounds an outer side surface of the other side of the filter housing 12 and is coupled to the first grip part 161.

The housing grip member 160 may be provided between the first connection
5 member 120 and the second connection member 130 based on the vertical direction.

Since each of a portion of the first grip part 161 and a portion of second grip part 162, which surround an outer side surface of the filter housing 12, is formed in a semicircular shape, when the first grip part 161 and the second grip part 162 are coupled by a coupling member (not shown), the first grip part 161 and the second
10 grip part 162 surround an entirety of a circumference of the outer side surface of the filter housing 12.

The second grip part 162 may include an upper grip part 162a positioned at an upper side and a lower grip part 162b positioned to be spaced downward from the upper grip part 162a.

15 In the present embodiment, it is illustrated that two elastic members 150 are provided, but the elastic member 150 is not limited thereto, and the number thereof may be changed. In this case, the connection shaft 171, the ball bushing 172, and the plugs 173 and 174 are provided to correspond to the number of the elastic members 150.

20 In addition, in the present embodiment, it is illustrated that the elastic member 150 is installed at one side of the filter housing 12 to be parallel thereto, but a plurality of elastic members 150 may be provided to surround a circumference of the filter housing 12. In this case, the first connection member 120 and the second connection member 130 may be symmetrically provided with respect to each other at
25 one side and the other side, which are opposite sides, based on the filter housing 12,

and the connection shaft 171, the ball bushing 172, and the plugs 173 and 174 are provided to correspond to the number of the elastic members 150.

As an example, one elastic member 150 may be provided or three elastic members 150 may also be provided. In the case in which one elastic member 150 is provided, the elastic member 150 may be provided to support a central portion of the support part 122 and a central portion of the intermediate connection member 140. In this case, the connection shaft 171 may also pass through the central portion of the intermediate connection member 140 to correspond to a position of the elastic member 150 and also be coupled to the central portion of the support part 122 and a central portion of the second connection member 130.

In addition, in the present embodiment, a case in which individual components of the intermediate connection member 140 and the first grip part 161 are coupled is illustrated, but the intermediate connection member 140 and the first grip part 161 may be one integrally coupled component.

When the driving unit of the housing transfer part 110 is driven, the first connection member 120, the second connection member 130, the intermediate connection member 140, the elastic member 150, and the housing grip member 160, which form the housing fixing parts 120, 130, 140, 150, and 160, integrally move in the vertical direction (movement direction), and thus, in a case in which the filter housing 12 is coupled to the housing grip member 160, the filter housing 12 also moves together with the housing fixing parts 120, 130, 140, 150, and 160 in the movement direction.

The chemical filter replacement apparatus 1 may include a first clamp 210 to which the filter head 13 is coupled and a second clamp 220 to which the filter housing 12 is coupled.

Each of the first clamp 210 and the second clamp 220 is formed in a substantial ring shape, the first clamp 210 is provided to surround a circumference of an outer side surface of an upper end of the filter head 13, and the second clamp 220 is provided to surround a circumference of an outer side surface of a lower end of the filter housing 12.

In a state in which the second clamp 220 is coupled to surround the circumference of the outer side surface of the filter housing 12, the second clamp 220 and the filter housing 12 are integrally moved by the filter housing detaching and attaching module 100 in the movement direction.

A protruding part 221 may be formed to protrude outward from an outer side surface, which has a ring shape, of the second clamp 220. In addition, a protruding part 211 may be formed to protrude outward from an outer side surface, which has a ring shape, of the first clamp 210 at a position corresponding to the protruding part 221. A first pressing member 330, which will be described below, presses an upper surface of the protruding part 221.

The first clamp 210 surrounds and is coupled to a circumference of an outer side surface of the filter head 13, and the filter head 13 to which the first clamp 210 is coupled is seated on the filter head holder.

As illustrated in FIG. 4, when the filter housing 12 is coupled to the filter head 13, an upper surface of the first clamp 210 is in contact with a lower surface of the second clamp 220.

The filter assembly fixing part 300 is for pressing an upper end portion of the filter head 13 against a portion, which faces the upper end portion, of a lower end portion of the filter housing 12. To this end, the filter assembly fixing part 300 includes a cylinder 310 which is hydraulically or pneumatically driven and pressing

members 330 and 340 which press the filter housing 12 in the movement direction when the cylinder 310 is driven.

The pressing members 330 and 340 include a first pressing member 330, of which one side surface presses the second clamp 220 in a downward direction which
5 is the movement direction in a state in which the upper surface of the first clamp 210 and the lower surface of the second clamp 220 are positioned to face each other, and a second pressing member 340 which presses the other side surface which is a surface opposite to the one side surface of the first pressing member 330.

The cylinder 310 includes a push rod 312, which is reciprocated when a
10 cylinder driving part (not shown) is driven, and a cylinder body 311 which supports the push rod 312.

In the cylinder 310, the push rod 312 is positioned in a direction in which the push rod 312 faces the filter assembly 10, and the cylinder body 311 is positioned in an opposite direction so that the push rod 312 can be provided to reciprocate in a
15 direction in which the push rod 312 moves toward or away from the filter assembly 10.

A fixing arm 320 for supporting lower portions of the cylinder 310 and the pressing members 330 and 340 are provided. The fixing arm 320 may include a fixing part 321 fixedly coupled to the first clamp 210 and a cylinder support part 322
20 coupled to the fixing part 321.

Each of the first pressing member 330 and the link member 350 is rotatably connected to the fixing part 321. The first pressing member 330 is rotatably coupled to each of the fixing part 321 and the second pressing member 340.

When the cylinder driving part is driven, the push rod 312 is elongated
25 toward the filter assembly 10, and the first pressing member 330 rotates about the

fixing part 321 due to the elongation of the push rod 312 to press an upper surface of the second clamp 220 in the downward direction. In this case, the second pressing member 340 presses an upper surface of the first pressing member 330 in the downward direction.

- 5 When the first pressing member 330 presses the second clamp 220 in the downward direction as described above, the filter housing 12 coupled to the second clamp 220 is also pressed in the downward direction, and the lower end of the filter housing 12 and the upper end of the filter head 13 are pressed against each other.

 The filter assembly fixing part 300 may include a pair of cylinders 310, a
10 pair of fixing arms 320, a pair of pressing members 330, and a pair of pressing members 340 in order to simultaneously press the second clamp 220 in the downward direction at the same time from both sides.

 In the present embodiment, it is illustrated that the filter assembly fixing part 300 includes the cylinder 310 and the pressing members 330 and 340, but any
15 different structure may be replaced as long as the filter housing 12 is pressed in the downward direction to press the filter housing 12 against a portion, which is in contact with the filter housing 12, of the filter head 13.

 In addition, in the present embodiment, a case in which the first clamp 210 and the second clamp 220 are provided is illustrated, but the first clamp 210 and the
20 second clamp 220 may also not be provided. That is, an edge of the upper end of the filter head 13 may be formed to protrude outward, an edge of the lower end of the filter housing 12 may be formed to protruded outward, and the filter housing 12 may be pressed using the pressing members 330 and 340 in the downward direction in a state in which protruding portions are in contact with each other.

An operation process of the chemical filter replacement apparatus 1 including the above-described components will be described.

FIG. 1 shows a state in which the filter housing 12 is moved upward by driving the housing transfer part 110 in a state in which the filter housing 12 is coupled to the housing fixing parts 120, 130, 140, and 150. FIG. 2 shows a state in which the filter housing 12 is moved downward by driving the housing transfer part 110 in the state in which the filter housing 12 is coupled to the housing fixing parts 120, 130, 140, and 150 from the state of FIG. 1. FIG. 3 shows a state in which the cylinder driving part of the filter assembly fixing part 300 is driven so that the first pressing member 330 presses the upper surface of the second clamp 220 in the downward direction, and the filter housing 12 and the filter head 13 are coupled from the state in which the filter housing 12 is moved downward.

The pipes for supplying and discharging the chemical are connected to the plurality of connection parts included in the filter head 13 in order to supply a chemical to a manufacturing process in the state in which the filter housing 12 and the filter head 13 are coupled as illustrated in FIG. 3. The chemical introduced into the filter assembly 10 through the filter head 13 is filtered by the cartridge 11 and supplied to the manufacturing process.

While the chemical is supplied, when it is time to replace the cartridge 11, all of the chemical in the filter assembly 10 is drained to the outside, the chemical is neutralized by cleaning the chemical with washing water, all of the neutralized chemical is drained to the outside, and the driving unit of the housing transfer part 110 is driven. The housing fixing parts 120, 130, 140, 150, and 160 and the filter housing 12 are integrally moved upward by driving the driving unit as illustrated in FIG. 1.

From this state, a waste cartridge coupled to the filter head 13 is removed from the filter head 13 using a cartridge transfer unit (not shown), and a new cartridge is coupled to the filter head 13.

When the new cartridge is coupled to the filter head 13, the housing fixing
5 parts 120, 130, 140, 150, and 160 and the filter housing 12 are integrally moved downward by driving the driving unit of the housing transfer part 110 as shown in FIG. 2.

The housing fixing parts 120, 130, 140, 150, and 160 and the filter housing
12 are moved downward, and the lower end portion of the filter housing 12 is
10 positioned to be in contact with the upper end portion of the filter head 13.

In this case, after the filter housing 12 and a portion, which faces the filter
housing 12, of the filter head 13 are in contact with each other, when the housing
fixing parts 120, 130, 140, 150, and 160 are further moved a predetermined distance
by driving the driving unit of the housing transfer part 110, the housing grip member
15 160 and the connection shaft 171 are relatively moved. That is, as shown in FIG. 8,
in a state in which vertical positions of the filter housing 12, the housing grip
member 160, and the intermediate connection member 140 are fixed, only the first
connection member 120, the connection shaft 171, and the second connection
member 130 may be moved downward. As a result, the elastic member 150 is
20 compressed, and a gap G may be generated between the lower surface of the
intermediate connection member 140 and the upper surface of the second connection
member 130.

Even when the filter housing 12 and the portion, which faces the filter
housing 12, of the filter head 13 are inclined with respect to each other, due to an
25 elastic force of the elastic member 150, the filter housing 12 and an entire close

contact surface of the portion, which faces the filter housing 12, of the filter head 13 are in contact with each other when provided as described above.

That is, the gap is formed between the outer circumference of the connection shaft 171 and the inner circumference of the ball bushing 172, and due to the gap, the connection shaft 171 and the ball bushing 172 are laterally separated from each other in a state in which the connection shaft 171 passes through and is inserted into the ball bushing 172 so that a twistable structure may be formed. Accordingly, in a case in which the filter housing 12 and the filter head 13 are pressed against each other, the housing grip member 160 is inclined with respect to the horizontal plane to correspond to an angle at which the close contact surface, which faces the filter housing 12, of the filter head 13 is inclined with respect to the filter housing 12. Accordingly, since the filter housing 12 and the portion, which faces the filter housing 12, of the filter head 13 are pressed against each other in a parallel state, air tightness is maintained, thereby preventing leak of the chemical and fume.

In addition, when the elastic member 150 is provided as a plurality of elastic members 150 or the plurality of elastic members 150 are provided along a circumference of the filter housing 12, the filter housing 12 and the portion, which faces filter housing 12, of the filter head 13 can be pressed against each other in a more stable state.

In the state in which the filter housing 12 and the portion, which faces the filter housing 12, of the filter head 13 are pressed against each other as described above, when the cylinder driving part of the filter assembly fixing part 300 is driven, the push rod 312 is elongated to rotate the link member 350, the second pressing members 340, and the first pressing member 330 so that the first pressing member 330 presses the upper surface of the second clamp 220 in the downward direction,

and the second pressing member 340 presses the upper surface of the first pressing member 330 so that a tight coupling state of the filter housing 12 and the filter head 13 can be maintained.

5 According to the present invention, in a case in which a filter housing and a filter head are coupled, since the filter housing and a surface, which faces the filter housing, of the filter head are in a parallel state, air tightness between the filter housing and the filter head is maintained, thereby preventing leak of a chemical and fume.

10 Although the present invention has been described with reference to the 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.

CLAIMS:

1. A chemical filter replacement apparatus comprising:

5 a filter assembly fixing part which fixes a filter assembly including a filter housing, in which a cartridge for filtering a chemical is accommodated, and a filter head coupled to an open one side of the filter housing; and

a filter housing detaching and attaching module which moves the filter housing in order to separate the filter housing from the filter assembly or couple the separated filter housing to the filter assembly,

10 wherein the filter housing detaching and attaching module includes a housing grip member which grips the filter housing and is moved together with the filter housing, and at least one elastic member to apply an elastic force to the housing grip member so that the elastic force acts on a close contact surface between the filter housing and the filter head when the filter housing is moved toward the filter head
15 and brought into close contact with the filter head.

2. The chemical filter replacement apparatus of claim 1, wherein the filter housing detaching and attaching module includes:

20 a housing transfer part which provides a driving force to move the filter housing; and

a first connection member which is connected to the housing transfer part and moved by a driving unit of the housing transfer part;

wherein the housing grip member is moved together with the first connection member by the driving unit,

the elastic member is provided to apply the elastic force between the first connection member and the housing grip member.

3. The chemical filter replacement apparatus of claim 2, wherein the filter
5 housing detaching and attaching module includes:

a connection shaft of which one end is connected to the first connection member and has a length in a movement direction due to the driving unit of the housing transfer part; and

a second connection member coupled to the other end of the connection shaft,
10 wherein the housing grip member is provided between the first connection member and the second connection member.

4. The chemical filter replacement apparatus of claim 2, wherein the filter housing detaching and attaching module includes:

15 a connection shaft of which one end is coupled to the first connection member and which has a length in a movement direction due to the driving unit of the housing transfer part; and

an intermediate connection member integrally provided with the housing grip member,

20 wherein the connection shaft passes through a shaft through hole formed in the intermediate connection member in a direction in which the filter housing is moved.

5. The chemical filter replacement apparatus of claim 4, wherein a ball
25 bushing is provided between an outer circumferential surface of the connection shaft

and an inner side surface of the intermediate connection member in which the shaft through hole is formed so that the intermediate connection member and the connection shaft are relatively moved in a longitudinal direction of the connection shaft.

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6. The chemical filter replacement apparatus of claim 5, wherein, in a case in which the filter housing and the filter head are pressed against each other, the housing grip member is twistable with respect to a horizontal plane due to a gap generated between an outer circumference of the connection shaft and an inner
10 circumference of the ball bushing.

7. The chemical filter replacement apparatus of claim 1, wherein, in a case in which the filter housing and the filter head are pressed against each other, the housing grip member is inclinable with respect to a horizontal plane to correspond to
15 an inclination angle of the close contact surface of the filter housing and the filter head.

8. The chemical filter replacement apparatus of claim 1, wherein, in a case in which the filter housing and the filter head are pressed against each other, the elastic
20 member is compressed.

9. The chemical filter replacement apparatus of claim 1, wherein the elastic member is formed as a coil spring.

10. The chemical filter replacement apparatus of claim 1, wherein the elastic member is provided as a plurality of elastic members.

11. The chemical filter replacement apparatus of claim 1, comprising:
5 a first clamp which clamps an outer side surface of the filter head; and
a second clamp which clamps an outer side surface of the filter housing,
wherein the filter assembly fixing part includes a pressing member to press
the first clamp or the second clamp in opposite directions in which the first clamp
and the second clamp face each other so that the first clamp and a portion, which
10 faces the first clamp, of the second clamp are pressed against each other in a case in
which the filter head is coupled to the filter housing.