

ELECTROSTATIC AIR WASHER

BACKGROUND OF THE INVENTION

1. Field of the invention

The present invention relates to an electrostatic air washer, and particularly to an electrostatic air washer for washing air by using anions generated by corona discharge to capture dust contained in the air, to remove smoke, smell or the like caused by cigarettes, and so on.

2. Description of the related art

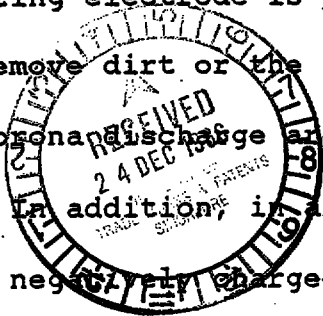
Recently, air washers have a tendency to be widespread for obtaining comfort ability to cope with aerial pollution, or smell, dust and so on generated in living spaces.

Among air washers now available on the market, most of them do not have satisfactory safety to give anxiety in use to users.

With respect to an air washer which is used in a room, there has been a proposal of an air washer having means for protecting an electrode portion so as not to be touched, for example, in Japanese Utility Model Unexamined Publication No. Hei-5-51458.

In such a conventional air washer, however, although an ionizing electrode is protected by a band plate, it is impossible to remove dirt or the like on a tip of a style, and characteristics of corona discharge are not taken into consideration.

In addition, in an air washer, corona discharge is used so that negatively charged dust is attracted to a positive electrode



so as to be adsorbed onto dust collector paper provided on the surface of the positive electrode.

Being polluted by dust in use, the dust collector paper is required to be replaced by a new one. A number of pressing means for pressing such dust collector paper have been proposed (for example, Japanese Utility Model Unexamined Publications No. Hei-2-100659, and No. Hei-5-51458).

In conventional air washers, dust collector paper is fixed while being pressed and fixed at its edges at one or two points in most cases so that looseness may be caused at an intermediate position between the points.

In addition, although a dust collecting electrode portion is covered with a body cover in order to ensure the safety in use, it is necessary to make it easy to remove the body cover for inspection of the inside, for replacement of the dust collector paper, and so on. A cover is therefore required to have a mechanism which is strong enough and which is easy in attachment/removal, but few air washers have such a satisfactory function.

SUMMARY OF THE INVENTION

As described above, in conventional air washers, although an ionizing electrode is protected by a band plate, it is impossible to remove dirt or the like on a tip of a style, and characteristics of corona discharge are not taken into consideration.

It is therefore necessary to clean a style in use without preventing generation of corona discharge, and there is requested a safety mechanism by which a user is prevented from touching the style directly by a screwdriver or the like even if the user inserts the screwdriver or the like by mistake.

It is therefore an object of the present invention to improve the safety of an electrode portion and to prevent deterioration of the characteristics of discharge. To this end, an ionizing electrode is mounted on a protective body which is removably provided on a base so as to clean and remove dust adhering on the electrode.

In addition, in conventional air washers, in most cases, dust collector paper is caught and pressed at one or two points so that looseness is apt to be generated in an intermediate position between the points.

It is therefore another object of the present invention to press dust collector paper linearly in the longitudinal direction thereof on its edge so as to prevent looseness from occurring.

Further in addition, since an electric dust collector has an electrode portion in its inside, safety is required, and it is necessary to prevent problems on performance from being caused by touching or hanging the electrode portion by a body cover at the above-mentioned operation.

It is therefore a further object of the present invention to

make it possible to easily attach/remove the body cover while ensuring the safety of the electrode portion.

In order to attain the foregoing objects, an electrostatic air washer according to the present invention comprises: a base; a dust collecting electrode holder disposed on the base; an ionizing electrode provided on the base; a dust collecting electrode wound on the dust collecting electrode holder; dust collector paper provided on the dust collecting electrode holder so as to cover the dust collecting electrode; a dust collector paper pressing means for pressing the dust collector paper onto the dust collecting electrode holder to attach the dust collector paper to the dust collecting electrode holder; and a body cover covering the dust collector paper at a distance from the dust collector paper provided on the dust collecting electrode holder; wherein the base has an acceptor with an electrode terminal, and electrical connection between the ionizing electrode and a power supply portion in the base is performed by coupling an insertion body of the ionizing electrode holder having the ionizing electrode with the acceptor; wherein one end of the dust collector paper pressing means is pivotally supported by the dust collecting electrode holder so that the dust collector paper pressing means is attached to the dust collecting electrode holder, and the other end of the dust collector paper pressing member is engaged with the dust collecting electrode holder so that the dust collector paper is

pressed onto the dust collecting electrode holder; and wherein the body cover is shaped into a cylinder having a number of slit holes, and has engagement mechanisms formed in opposite positions on the lower circumferential edge portion, the engagement mechanisms being locked in engagement acceptors provided in the base so that the body cover is fixed to the base.

According to the air washer configured thus, the ionizing electrode is stored in the ionizing electrode protective body and provided on the base removably and electrically connectably, so that it is made possible to remove dirt or the like on the ionizing electrode.

In addition, there are provided the dust collecting electrode and the dust collector paper wound on the dust collecting electrode holder disposed on the base are provided in a manner so that the dust collector paper is pressed onto the holder and held in a stationary position by the dust collector paper pressing means one end of which is supported on the holder pivotally.

In addition, since the engagement mechanisms provided on the body cover are coupled and locked with the engagement acceptors of the base, it is possible to lock cover to the body only by putting the cover from above and pressing the cover downward.

Preferably, the ionizing electrode is an annular belt-like body, and styles upward sharpened like needles are formed circumferentially separated at intervals from each other.

Preferably, the ionizing electrode holder has an annular groove formed between its inner and outer walls, and the ionizing electrode is received in the annular groove. Further, the ionizing electrode holder is configured so that its outer wall is higher than its inner wall and outside the ionizing electrode, and the ionizing electrode holder has a height which is the same or substantially the same as that of tips of the styles so as to protect the ionizing electrode from an outer circumference of the ionizing electrode.

With such a configuration, the ionizing electrode is protected from the surroundings by the ionizing electrode holder, and the outer wall is as high as or almost as high as the styles of the ionizing electrode and higher than the inner wall, so that corona discharge is generated effectively and accelerated.

In addition, preferably, the ionizing electrode holder has notch portions formed by cutting its outer wall downward at circumferential intervals. Further, the notch portions provided in the outer wall of the ionizing electrode holder are respectively disposed in opposition to the styles of the ionizing electrode.

With the notch portions being provided in the outer wall of the ionizing electrode holder thus, it is possible to prevent danger generated from the surroundings without blocking corona discharge.

In addition, preferably, the dust collector paper pressing

means is bent and bowed in its longitudinal direction so that an arched and curved surface is formed inside.

Since the pressing means is bent and bowed in the longitudinal direction and the arched and curved surface is inside, the dust collector paper is pressed by a uniform pressing force in the longitudinal direction by extending this curve.

In addition, projections are formed in the longitudinal direction inside the pressing means. With such a configuration where the projections are formed in the longitudinal direction inside the pressing means so as to press the dust collector paper, the projections break through the dust collector paper so as to prevent the dust collector paper from being removed downward.

In addition, preferably, the dust collector paper pressing means is extended in the up/down direction, divided into two and constituted by two plate-like bodies moving separately from each other.

If the pressing means is elongated in the up/down direction, and divided into two so as to move separately from each other, it is possible to press the opposite ends of the dust collector paper separately from each other.

In addition, preferably, each of the engagement mechanisms has a presser disposed elastically, and an engagement nail moved by the presser.

When the presser disposed elastically is pressed, the

engagement nail moves so that the engagement mechanisms release the engagement state. Further, preferably, the engagement mechanisms are inserted into and fixed to the body cover. The engagement mechanisms are inserted into and fixed to the groove extended upward from the lower edge portion of the body cover.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an exploded perspective view of an electrostatic air washer according to the present invention;

Fig. 2 is a perspective view where a body cover is removed;

Fig. 3 is a perspective view of an ionizing electrode holder;

Fig. 4 is a sectional view of the ionizing electrode holder taken on line A-A in Fig. 3;

Fig. 5 is a perspective view of an acceptor;

Fig. 6 is a perspective view for explaining winding of dust collector paper in the state where the body cover is removed;

Fig. 7 is an exploded perspective view of a dust collector paper pressing means;

Fig. 8 is a sectional view illustrating the pressing state of the dust collector paper;

Fig. 9 is a cross-sectional view corresponding to Fig. 8;

Fig. 10 is a front view illustrating an electrostatic air washer according to the present invention, and sectioning its main portion;

Fig. 11 is a main portion perspective view of a body cover

with a engagement mechanism; and

Fig. 12 is a sectional view taken on line B-B in Fig. 11.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the present invention will be described with reference to the drawings.

As shown in Figs. 1 and 2, an electric dust collector is constituted by a circular trapezoidal base 1, an annular ionizing electrode holder 2 disposed on the base 1, a cylindrical dust collecting electrode holder 3 fixed to the base 1 so as to stand up therefrom and disposed inside the holder 2 at a distance, and a body cover 4 covering the dust collecting electrode holder 3 and the ionizing electrode holder 2 at a distance respectively in the same manner and removably provided on the base 1.

The base 1 has circuit members in its inner space, and the circuit members are configured as electronic circuit portions such as a power supply portion connected to a power supply plug 5, an electrostatic voltage portion for generating electrostatic voltage, a high voltage portion for generating a high voltage, and so on. Those are operated by means of an operating portion 6 provided on the front of the base 1.

Next, the base 1 has a cylindrical acceptor 7 opened in the upper portion and in the vicinity of the operating portion 6, and a terminal portion 8 provided in the acceptor 7 so as to extend from the above-mentioned electric circuit portion.

Further, an attachment base 9 which is annular and like a comb is fixed to the base 1. The ionizing electrode holder 2 is held, at its circumference, by means of the attachment base 9, and the body cover 4 is locked within the holder 2.

The attachment base 9 is shaped like a comb so as to have a plurality of comb-like pieces 10 which make the upper and lower portions communicate with each other, a plurality of holding rods 11 while elastically contact at their tips with the outer circumference of the ionizing electrode holder 2 to thereby hold the holder 2, and engagement acceptors 13 for elastically engaging with engagement members 12 provided on the lower end portion of the body cover 4.

In the ionizing electrode holder 2, as shown in Figs. 3 and 4, an annular groove 16 is formed between an inner wall 14 and an outer wall 15. The outer wall 15 is formed so as to be higher than the inner wall 14, and is cut downward at suitable circumferential intervals so as to have notch portions 17.

Further, an ionizing electrode 18 received in the annular groove 16 so as to be in contact with the outer surface of the inner wall 14.

In addition, an insertion body 25 is provided on the outer wall 15 of the ionizing electrode holder 2. When the insertion body 25 is inserted into and coupled with the acceptor 7, the ionizing electrode 18 is electrically connected to the power supply

portion of the base 1.

The ionizing electrode 18 has a number of triangular styles 19 disposed along the upper edge of the belt-like base, and a negative high voltage is applied to the styles 19 from the electronic circuit portion. Thus, an ionizing phenomenon is caused by corona discharge between first and second dust collecting electrodes 20 and 21 which will be described later.

The notch portions 17 are disposed in opposition to the styles 19 respectively.

The dust collecting electrode holder 3 is cylindrical. The lower end of the holder 3 is fixed to the base 1, and the belt-like first and second dust collecting electrodes 20 and 21 are wound on the holder 3 separately from each other at a distance in the up/down direction. A high positive voltage is applied to these dust collecting electrodes 20 and 21 from the electronic circuit portion.

Dust collector paper 22 is wound on the dust collecting electrode holder 3 so as to surround and cover also the dust collecting electrodes 20 and 21 as shown in Figs. 2 and 6.

As the dust collector paper 22, it is preferable to use belt-like paper which is called paper-towel having a good air permeability and electrical insulating property. The belt-like paper is cut in a length which is enough to go round the outer circumference of the dust collecting electrode holder 3 once, and

the cut piece of paper is wound on the holder 3. The opposite end portions of the paper are pressed into a predetermined position by a dust collector paper pressing plate (dust collector paper pressing means) 23 which is extended in the up/down direction and the upper end portion of which is pivotally attached to the dust collecting electrode holder 3.

Dust negatively charged by the ionizing electrode 18 is captured by the dust collector paper 22 wound on the surface of the first and second dust collecting electrodes 20 and 21, and if the degree of dirty of this dust collector paper 22 becomes large, the paper 22 is replaced by new one.

The dust collector paper pressing means 23 is, as shown in Figs. 6 to 9, constituted by: a first plate body 31 being bowed and extended in the up/down direction, and having, at its upper end portion, a hinge body 27 and a hinge acceptor hole 28, and further having, at its lower end portion, a pressure locking piece 29 which is provided inwardly; and a second plate body 36 being bowed and extended in the up/down direction and formed symmetrically with the first plate body 31 and having, at its upper end portion, a hinge projection 32 and a hinge body 33 which is rotatably inserted into the hinge acceptor hole 28, and further having a pressure locking piece 34 provided inwardly at a lower end portion of the second plate portion. The hinge bodies 27 and 33 on the upper ends of the first and second plate bodies 31 and 36 are respectively inserted

into hinge holes 37 provided in the dust collecting electrode holder 3 so as to form a pivotal portion.

The pressure locking pieces 29 and 34 are freely engageable with and disengageable from a lock hole 39 provided in the dust collecting electrode holder 3.

Further, each of the first and second plate bodies 31 and 36 has projections 40 at several places separated from each other at intervals in the longitudinal direction on the inner surface. The projections 40 are long enough to break through the dust collector paper 22 when the dust collector paper 22 is pressed by these plate bodies 31 and 36.

On the other hand, as shown in Figs. 10 to 12, the body cover 4 is shaped like a cylinder having an upper surface closed, a number of slit holes 42 formed in its circumference, and a lower surface opened, and the above-mentioned engagement members (engagement mechanisms) 12 formed in opposite positions at its lower end. This body cover 4 encloses and covers the dust collecting electrode holder 3 and the ionizing electrode holder 2 at a distance from these holders 3 and 2.

Each of the engagement mechanisms 12 is constituted by: a base plate 45 which is provided integrally with an engagement member cover plate 44 projected so as to form a space inside and opened downward; a pressing member 48 which is disposed between this base plate 45 and the cover plate 44, and which has a collar 46

contacting with the inner surface of the base plate 45, and a spring 47 disposed between the pressing member 48 and the cover plate 44; and an engagement piece 49 which is extended inside and under the collar 46. The engagement piece 49 has a nail piece 51 the tip of which is sharpened with a tapered face 50.

The engagement mechanism 12 configured thus is inserted into and attached to a guide groove 53 formed on the lower end side of the body cover 4 so as to be engaged and locked with the base 1.

The circumferential edge of the base plate 45 is inserted into the guide groove 53 which is provided in the lower end edge of the body cover 4 and extended upward therefrom, and two engagement member lock pieces 55 provided integrally with the base plate 45 are locked in slit holes 42 of the body cover 4, so that the engagement mechanisms 12 thus configured separately in advance are fixed to the body cover 4. At that time, the lower side of the base plate 45 becomes one and the same plane as the lower side of the body cover 4 and the pressing member 48 is pressed outward by means of the spring 47.

In addition, to mount the body cover 4 on the base 1 from above, the engagement piece 49 is slid on the tapered face 50 so that the nail piece 51 is locked with the engagement acceptor 13 provided in the base 1 as shown in Fig. 12. To release this lock, the pressing member 48 is pressed against the elastic force of the spring 47 so that the nail piece 51 is separated from the

engagement acceptor 13 to enable the body cover 4 to be lifted upward.

As described above, in an electrostatic air washer according to Claim 1, an ionizing electrode is received in advance in an ionizing electrode holder so as to be attached to an acceptor of a base to thereby make it possible to perform electrical connection and attachment of the ionizing electrode at the same time. Therefore, without any special fitting means, it is possible to simplify the mechanism, to improve the convenience, and to facilitate removal of dirt from the ionizing electrode.

In addition, it is possible to press and fix dust collector paper onto a dust collecting electrode holder by a dust collector paper pressing means one end of which is pivotally supported by the dust collecting electrode holder, and the dust collector paper is disposed in a wide space and fixed by pressure, so that the dust collector paper can be attached in a regular position accurately with easy operation.

Further, the body cover is disposed to cover the dust collecting electrode holder which is disposed on the base and the dust collector paper which is wound on the holder. Engagement mechanisms provided in opposite positions of the lower circumferential edge portion of the body cover are locked in engagement acceptors of the base. As a result, a lock operation safe and easy in attachment and removable can be performed without

causing any break of the dust collecting electrode, the dust collector paper, and so on, by the body cover.

In addition, according to Claim 2, the ionizing electrode is formed into an annular belt-like body with styles sharpened like needles upward circumferentially separated at intervals from each other, and dirt on the styles can be removed easily in the state where the ionizing electrode is received in the ionizing electrode holder.

According to Claim 3, the ionizing electrode holder forms an annular groove, and the ionizing electrode is received in this annular groove, so that safely is ensured with no fear that a worker touches the ionizing electrode at the time of assembling, attaching or removing, and so that there is no case where the ionizing electrode is broken.

According to Claim 4, the outer wall of the ionizing electrode holder is higher than the inner wall to protect the ionizing electrode from the surroundings. Accordingly, even if a user inserts a foreign matter by mistake, the foreign matter is prevented from touching the ionizing electrode directly. As a result, it is possible to prevent an electric shock or the like, and it is possible to prevent an accident caused by contact.

According to Claims 5 and 6, the ionizing electrode holder has notch portions provided in its outer wall, and these notch portions are disposed in opposition to the styles of the ionizing electrode.

Consequently, it is possible to improve the corona discharge properties, and it is possible to increase the dust collecting performance conspicuously.

According to Claim 7, a dust collector paper pressing means is bowed and bent in the longitudinal direction, and the arched curve thereof is extended by a reverse force. Accordingly, it is possible to press the dust collector paper with a uniform pressing force in the longitudinal direction, and it is possible to prevent removal caused by looseness.

According to Claim 8, the dust collector paper pressing means has projections arranged inside and in the longitudinal direction. Accordingly, it is possible to break through and fix the dust collector paper, and it is possible to prevent the dust collector paper from being removed downward.

According to Claim 9, the dust collector paper pressing means is divided into two so as to press and fix the end portions of the dust collector paper from the respective sides. Accordingly, it is possible to keep the dust collector paper in a stable state at the time of operation and it is possible to fix the dust collector paper in a proper state.

Further, according to Claims 10 and 11, a pressing member is disposed elastically in the engagement mechanisms. Accordingly, it is possible to release engagement simply by the pressing operation of the pressing member, and it is possible to easily perform

attachment by sliding and inserting the engagement mechanisms to the body cover.



What is claimed is:

1. An electrostatic air washer comprising:

a base;

a dust collecting electrode holder disposed on said base;

an ionizing electrode provided on said base;

a dust collecting electrode wound on said dust collecting electrode holder;

dust collector paper provided on said dust collecting electrode holder so as to cover said dust collecting electrode;

a dust collector paper pressing means for pressing said dust collector paper onto said dust collecting electrode holder to attach said dust collector paper to said dust collecting electrode holder; and

a body cover covering said dust collector paper at a distance from said dust collector paper provided on said dust collecting electrode holder;

wherein said base has an acceptor with an electrode terminal, and electrical connection between said ionizing electrode and a power supply portion in said base is performed by coupling an insertion body of said ionizing electrode holder having said ionizing electrode with said acceptor;

wherein one end of said dust collector paper pressing means is pivotally supported by said dust collecting electrode holder so that said dust collector paper pressing means is attached to said



dust collecting electrode holder, and the other end of said dust collector paper pressing member is engaged with said dust collecting electrode holder so that said dust collector paper is pressed onto said dust collecting electrode holder; and

wherein said body cover is shaped into a cylinder having a number of slit holes, and has engagement mechanisms formed in opposite positions on the lower circumferential edge portion, said engagement mechanisms being locked in engagement acceptors provided in said base so that said body cover is fixed to said base.

2. An electrostatic air washer according to Claim 1, wherein said ionizing electrode is an annular belt-like body, and styles upward sharpened like needles are formed circumferentially separated at intervals from each other.

3. An electrostatic air washer according to Claim 1 or 2, wherein said ionizing electrode holder has an annular groove formed between its inner and outer walls, and said ionizing electrode is received in said annular groove.

4. An electrostatic air washer according to any of Claims 1 to 3, wherein said ionizing electrode holder is configured so that its outer wall is higher than its inner wall and outside said ionizing electrode, and said ionizing electrode holder has a height which is the same or substantially the same as that of tips of the styles so as to protect said ionizing electrode from an outer circumference of said ionizing electrode.



5. An electrostatic air washer according to any of Claims 1 to 4, wherein said ionizing electrode holder has notch portions formed by cutting its outer wall downward at circumferential intervals.
6. An electrostatic air washer according to Claim 5, wherein said notch portions provided in the outer wall of said ionizing electrode holder are respectively disposed in opposition to said styles of said ionizing electrode.
7. An electrostatic air washer according to Claim 1, wherein said dust collector paper pressing means is bent and bowed in its longitudinal direction so that an arched and curved surface is formed inside.
8. An electrostatic air washer according to any of Claims 1 to 7, wherein projections are formed at intervals along in the longitudinal direction and on the inside of said dust collector paper pressing means.
9. An electrostatic air washer according to any of Claims 1 to 8, wherein said dust collector paper pressing means is extended in the up/down direction, divided into two and constituted by two plate-like bodies moving separately from each other.
10. An electrostatic air washer according to Claim 1, wherein each of said engagement mechanisms has a presser disposed elastically, and an engagement nail moved by said presser.
11. An electrostatic air washer according to any of Claims 1 to 10, wherein said engagement mechanisms are inserted into and fixed



to said body cover.