A duster and a dusting apparatus using the same are provided. The duster is used for removing a particle. The duster includes a body and at least one detachable member. The body includes at least one connecting member. One end of the detachable member is detachably coupled to the connecting member, and the other end of the detachable member has a colloid part. The colloid part having adhesiveness is used for adhering the particle thereto.
DUSTER AND DUSTING APPARATUS USING THE SAME

[0001] This application claims the benefit of Taiwan application Serial No. 97128420, filed Jul. 25, 2008, the subject matter of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The invention relates in general to a duster and a dusting apparatus using the same, and more particularly to a duster for removing a particle and a dusting apparatus using the same.

[0004] 2. Description of the Related Art

[0005] Particles in the environment have been an annoying problem for a long time. Some particles cause irritation to respiratory tract while some others seriously affect the operation or quality of machines. For example, when particles, such as dust, are attached to a display device during the manufacturing process, the dust is usually shown in the image displayed by the display device, so that the display quality of the display device is deteriorated. Therefore, it is always a concern to remove the particles in the environment.

[0006] A duster is usually used for removing the particles. However, most of the conventional dusters remove the particles by the roller moving flat. Under the limitation of certain space or area, such as the particle located at a place smaller than the duster (such as a groove or a slit) or on a rough surface, the conventional duster can not function well as the particle is located in the dead area. Although the particle located in the dead area can be removed by another duster with particular size, preparing several dusters to remove the particles in all environments is really inconvenient.

[0007] Therefore, it is an important subject to provide a duster which can be widely applied to different environments.

SUMMARY OF THE INVENTION

[0008] The invention is directed to a duster and a dusting apparatus using the same. A connecting member and a detachable member having adhesiveness are detachably coupled to each other. Therefore, the duster of the present invention is capable of adhering a particle thereto. In addition, as the detachable member and the connecting member are detachable from each other, a user can select a detachable member with adequate properties (such as size or adhesiveness) according to the needs, so that the particles at different environment (such as a groove, a slit or a rough surface) can be removed.

[0009] According to the present invention, a duster used for removing a particle is provided. The duster includes a body and at least one detachable member. The body includes at least one connecting member. One end of the detachable member is detachably coupled to the connecting member. The other end of the detachable member includes a colloid part. The colloid part having adhesiveness is used for adhering the particle thereto.

[0010] According to the present invention, a dusting apparatus including a duster and an air extractor is further provided. The duster includes a body, at least one detachable member, a main pipe and a pipe. The duster is used for removing a particle. The body includes at least one connecting member. One end of the detachable member is detachably coupled to the connecting member. The other end of the detachable member includes a colloid part. The colloid part having adhesiveness is used for adhering the particle thereto.

The main pipe is disposed in the body. The pipe is disposed in the detachable member. One end of the pipe is connected to the main pipe. The other end of the pipe has an opening exposed from the colloid part. The air extractor is used for being connected to the main pipe and providing adsorbing gas. After the adsorbing gas adsorbs the particle, the particle is removed sequentially through the opening, the pipe and the main pipe.

[0011] The invention will become apparent from the following detailed description of the preferred but non-limiting embodiments. The following description is made with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 illustrates a dusting apparatus according to a first embodiment of the present invention.

[0013] FIG. 2 illustrates a duster according to a second embodiment of the present invention.

[0014] FIG. 3 illustrates a dusting apparatus according to a third embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0015] The present invention relates to a duster used for moving a particle and a dusting apparatus using the same. The duster includes a body and at least one detachable member. The body includes at least one connecting member. One end of the detachable member is detachably coupled to the connecting member, and the other end of the detachable member has a colloid part. The colloid part having adhesiveness is used for adhering the particle thereto. The following embodiments are used for illustrating the duster and the dusting apparatus using the same according to the present invention. However, the present invention is not limited thereto. The scope of the present invention is defined by the appended claims.

First Embodiment

[0016] Referring to FIG. 1, a dusting apparatus according to a first embodiment of the present invention is illustrated. The dusting apparatus 10 includes a duster 100 and an air extractor 200. The dusting apparatus 10 removes a particle (not shown in the drawings) in two ways including adhesion and adsorption by the cooperation of the duster 100 and the air extractor 200. The design of the dusting apparatus 10 to remove the particle by adhering is described as follows. The duster 100 includes a body 110 and a detachable member 130. The body 110 includes a connecting member 111. One end of the detachable member 130 is detachably coupled to the connecting member 111. The other end of the detachable member 130 has a colloid part 131. The colloid part 131 is used for adhering the particle thereto. As the detachable member 130 and the connecting member 111 are detachably coupled to each other, the detachable member 130 of the duster 100 can be replaced rapidly according to the different needs.

[0017] Furthermore, the colloid part 131 of the duster 100 has adhesiveness. Particles are adhered to the colloid part 131 by the adhesiveness thereof, so that the particles are removed for dusting. When the detachable member 130 is not suitable due to the limitation of the environment, such as the place where the colloid part 131 cannot reach, the original detachable member 130 can be detached from the connecting member 111 and be replaced by another detachable member having a colloid part 131 in another shape for removing the
particle. For example, the colloid part 131 with a pointed end is suitable for removing the particle at a slit or a corner. On the contrary, the colloid part 131 with a non-pointed end is suitable for removing the particle on a larger surface. Alternatively, the adhesiveness or the size of the detachable members can be the same or different. As the detachable members with different properties can be coupled to the duster 100 through the connecting member 111, the duster 100 is suitable for all kinds of environments or different users’ needs.

Moreover, the colloid of the colloid part 131 is, for example, reusable, and the operation temperature thereof can substantially reach 300°C. When the colloid part 131 is full of particles, the colloid part 131 can be cleared by water or alcohol, so that the colloid part 131 can be reused for adhering particles thereto continuously. Furthermore, the colloid part 131 has the same material properties at 300°C. For example, the adhesiveness of the colloid part 131 does not change, and the colloid part 131 does not melt at 300°C. Therefore, the duster 100 can be used at a high temperature. For example, the duster 100 can be used for adhering particles on an electronic device at a high temperature. Compared to a device which can only be used for removing particles after the temperature of the electronic device is lowered down, the colloid of the colloid part 131 can be used at a high temperature without changing the material properties. Therefore, even when a particle is found on an electronic device at 300°C, the colloid of the colloid part 131 still can be used to remove the particle. As a result, the particle on the electronic device is removed without changing the material properties during the temperature drop, so that the quality of the electronic device is not deteriorated.

The above illustration is the design of the dusting apparatus 10 to remove a particle by adhering. The design of the dusting apparatus 10 to remove a particle by adsorbing is described as follows. As shown in FIG. 1, the duster 100 further includes a main pipe 113 and a pipe 133. The main pipe 113 is disposed in the body 110. The pipe 133 is disposed in the detachable member 130. One end 133e of the pipe 133 is connected to the main pipe 113. The other end of the pipe 133 has an opening 133b, and the opening 133b is exposed from the colloid part 131. The air extractor 200 is connected to the main pipe 113 and generates adsorbing gas. After the adsorbing gas adsorbs a particle, the particle is removed through the opening 133b, the pipe 133 and the main pipe 113 sequentially.

In addition, the duster 100 further includes a controller 115 disposed at the main pipe 110. The controller 115 is used for adjusting the flow rate of the adsorbing gas so as to further change the adsorbability of the adsorbing gas. Through the disposition of the controller 115, the adsorbability of the adsorbing gas at the opening 133b can be adjusted for increasing the practicability of the dusting apparatus 10. The controller 115 can be used as a control switch to decide whether the adsorbing gas can pass through or not. Accordingly, it is decided by a user if the dusting apparatus 10 removes the particle by the adsorbability of the adsorbing gas provided at the opening 133b or by the adhesiveness of the colloid of the colloid part 131. Alternatively, the particle can be removed by both ways (the adsorbability of the adsorbing gas and the adhesiveness of the colloid of the colloid part 131).

The connecting member 111 of the present embodiment can be in different forms. For example, the connecting member 111 includes a screw, and the end 133e of the detachable member 130 includes a nut. The connecting member 111 and the detachable member 130 are detachably coupled to each other through the cooperation of the screw and the nut. Furthermore, the connecting member 111 can be a quick coupling to be coupled to the detachable member 130. Any one who has ordinary skill in the field of the present invention can understand that the connecting member 111 of the present embodiment can be any mechanism which can be detachably coupled to the detachable member 130 so as to make the detachable member 130 be connected to and detached from the body 130.

According to the duster 100 and the dusting apparatus 10 using the same disclosed in the first embodiment of the present invention, the colloid part 131 of the detachable member 130 is used for adhering a particle thereto. In addition, when the adsorbing gas is provided to the opening 133b of the detachable member 130 by the air extractor 200, the particle can be removed by the duster 100 by way of adsorbing. Moreover, when the detachable member 130 cannot remove the particle in an environment, such as a groove, the detachable member 130 can be replaced by another detachable member which is more suitable for the size of the groove. As stated above, the duster 100 and the dusting apparatus 10 provides selectivity and convenience.

Second Embodiment

Compared to the previous embodiment, a duster of the second embodiment of the present invention includes two detachable members disposed on the body thereof.

Referring to FIG. 2, a duster according to a second embodiment of the present invention is illustrated. The duster 300 includes a body 310 and two detachable members 230 and 330. The body 310 includes two connecting members 211 and 311. The body 310 is bar-shaped. However, the shape of the body 310 is not limited thereto. The connecting members 211 and 311 are at both ends of the body 310, respectively. The detachable members 230 and 330 are detachably coupled to the connecting members 211 and 311. The detachable members 230 and 330 have the colloid parts 231 and 331, respectively. The colloid parts 231 and 331 are used for adhering particles thereto. According to the above arrangement, either one of the colloid parts of the duster 300 can be used for adhering particles thereto so as to increase the operating convenience and elasticity.

Furthermore, the adhesiveness of the colloid parts 231 and 331 respectively corresponding to the detachable members 230 and 330 can be the same or different. When the colloid parts 231 and 331 have different adhesiveness, one of the detachable members 230 and 330 with adequate adhesiveness can be selected according to different properties of the particle, such as the size of the particle.

Moreover, the sizes of the colloid parts 231 and 331 respectively corresponding to the detachable members 230 and 330 can be the same or different. When a user needs to remove a particle on the surface of a machine, the larger colloid part 231 can be used for adhering the particle thereto so as to increase the efficiency. In addition, when the user needs to remove a particle in a slit of a machine, the smaller colloid part 331 of the duster 300 can be used for adhering the particle in the slit thereto. Another example is illustrated as follows. When a particle is at a corner and the particle is small, the colloid part 231 with a round end may not reach the particle for removing the particle. At this time, the colloid part 331 with a pointed end can reach the particle easily and remove the particle. Therefore, the detachable members of the duster 300 can be used in different environments without being replaced. Alternatively, the detachable members 231 and 331 can be replaced through the detachable connection between the detachable member and the connecting member.


[0027] The duster 300 of the second embodiment of the present invention includes two detachable members 230 and 330 disposed at both ends of the body 313. The different detachable member 230 or 330 can be selected according to the area to be cleaned or the size of the particle. As a result, the time to replace different dusters according to different needs can be saved.

Third Embodiment

[0028] Compared to the first embodiment, a dusting apparatus of the third embodiment of the present invention further includes a switching member and two detachable members. The other components marked with the same reference numbers are the same as those of the first embodiment and therefore not described repeatedly.

[0029] Referring to FIG. 3, a dusting apparatus according to a third embodiment of the present invention is illustrated. The dusting apparatus 20 includes a duster 500 and an air extractor 200. The duster 500 includes a body 510 and two detachable members 130 and 530. The body 510 is, for example, substantially U-shaped and includes two connecting members 511 and 511. The connecting members 111 and 511 are disposed at both ends of the body 510, respectively. The detachable members 130 and 530 are detachably coupled to the connecting members 111 and 511, respectively. The detachable members 130 and 530 respectively include colloid parts 131 and 531 for adhering particles thereto.

[0030] Moreover, the duster 500 further includes a first main pipe 513, a second main pipe 515, and two pipes 133 and 533. The first main pipe 513 and the second main pipe 515 are disposed in the body 510. The pipe 133 is disposed in the detachable member 130. One end of the pipe 133 is used for being connected to the first main pipe 513. An opening 133b is formed at the other end of the pipe 133 and exposed from the colloid part 131 of the detachable member 130.

[0031] Furthermore, the pipe 533 is disposed in the detachable member 530. One end 533a of the pipe 533 is used for being connected to the second main pipe 515. The other end of the pipe 533 has an opening 533b, and the opening 533b is exposed from the colloid part 531 of the detachable member 530. The switching member 550 is coupled to the body 510 for selecting the air extractor 200 to the first main pipe 513 or the second main pipe 515. Accordingly, after the adsorbing gas generated by the air extractor 200 adsorbs the particle, the particle is removed through the opening 133b, the pipe 133 and the first main pipe 513 or through the opening 533b, the pipe 533 and the second main pipe 515. The cross-sectional area of the opening 133b and that of the opening 533b can be the same or different. When the cross-sectional area of the opening 133b and that of the opening 533b are different, the duster 500 of the present embodiment is able to adsorb particles with different sizes through the opening 133b and 533b with different sizes.

[0032] In addition, the design of the switching member 550 is, for example, as shown in FIG. 3. However, the present invention is not limited thereto. As shown in FIG. 3, the switching member 550 has a switching hole 551. The switching hole 551 is connected to the air extractor 200 and can be connected to one end 513a of the first main pipe 513 or one end 515a of the second main pipe 515. When the user needs to adsorb the particle through the first main pipe 513, the pipe 133 and the opening 133b, the switching member 550 is rotated so as to align the switching hole 551 with the end 513a of the first main pipe 513. As a result, the air extractor 200 is able to use the adsorbing gas to adsorb the particle through the first main pipe 513, the pipe 133 and the opening 133b. When the user needs to adsorb the particle through the second main pipe 515, the pipe 533 and the opening 533b, the switching member 550 is rotated so as to align the switching hole 551 with the end 515a of the second main pipe 515. As a result, the air extractor 200 is able to use the adsorbing gas to adsorb the particle through the second main pipe 515, the pipe 533 and the opening 533b.

[0033] As shown in FIG. 3, the duster 500 further includes controllers 517 and 519. The controller 517 is disposed at the first main pipe 513 for adjusting the flow rate of the adsorbing gas in the pipe 513. The controller 519 is disposed at the second main pipe 515 for adjusting the flow rate of the adsorbing gas in the pipe 533. Through the disposition of the controllers 517 and 519, the adsorbability of the adsorbing gas at the openings 133b and 533b can be adjusted so as to increase the practicability of the duster 500.

[0034] Although the switching member 550 and the controllers 517 and 519 of the duster 500 of the present embodiment are used to control the flow rate of the adsorbing gas generated by the air extractor 200, other devices capable of controlling the flow rate of the adsorbing gas can be applied in the present invention. For example, the rotating-type switching member 550 can be replaced by a pneumatic valve. When the pneumatic valve is switched, the air extractor 200 provides the adsorbing gas to the opening 133b of the pipe 133 or the opening 533b of the pipe 533. As long as the mechanism capable of enabling the air extractor 200 to provide adsorbing gas to the opening 133b or the opening 533b, the mechanism can be used as the switching member 550. In addition, the controllers can be disposed at the pipe 133 or 533 correspondingly. Or, the controllers can be disposed on the air extractor 200.

[0035] The duster 500 of the third embodiment of the present invention includes two detachable members 130 and 530, the first main pipe 513 and the second main pipe 515. Therefore, the duster 500 can provide the detachable members with different adhesiveness, cross-sectional areas for adhering, adsorbability and cross-sectional areas for adsorbing. Accordingly, the duster 500 is able to remove a particle according to the character of the environment or the properties of the particle and provides the user with more choices.

[0036] As stated above, according to the duster and the dusting apparatus disclosed in the embodiments of the present invention, at least one connecting member is provided, so that the detachable member of the duster is detachably coupled to the body and is detached from the body. Accordingly, the needed detachable member can be selected to be coupled to the body without preparing several dusters for particles with different properties. Furthermore, the dusters revealed by the embodiments of the present invention provide different adhesiveness, vacuum adsorption or areas for adhering and adsorbing by having several detachable members and using the pipe together with the air extractor. Through the above disposition, the duster and the dusting apparatus disclosed in the above embodiments of the present invention is suitable for removing particles with different properties in all kinds of environment. In addition, the duster provides the user with multiple choices and convenience.

[0037] Although the above dusters according to the embodiments of the present invention include one or two detachable members, the present invention is not limited thereto. The body of the duster can be coupled to several detachable members through the shape design of the body. For example, the body can be radial type or fan-shaped. The present invention encompasses such modification. Furthermore, even the body of the duster includes the main pipe, the
detachable member without the pipe still can be coupled to
the connecting member of the body to remove the particle by
adhesion.

While the invention has been described by way of
example and in terms of a preferred embodiment, it is to be
understood that the invention is not limited thereto. On the
contrary, it is intended to cover various modifications and
similar arrangements and procedures, and the scope of the
 appended claims therefore should be accorded the broadest
interpretation so as to encompass all such modifications and
similar arrangements and procedures.

What is claimed is:

1. A duster used for removing a particle, the duster comprising:
   a body comprising at least one connecting member; and
   at least one detachable member, wherein one end of the
detachable member is detachably coupled to the connect-
ing member, the other end of the detachable member
comprising a colloid part, and the colloid part having
adhesiveness is used for adhering the particle.

2. The duster according to claim 1, wherein the duster
comprises two detachable members, the body comprises two
connecting members, the body is bar-shaped, and the con-
necting members are located at two ends of the body, re-
spectively.

3. The duster according to claim 1, wherein the duster
comprises two detachable members, the body comprises two
connecting members, the body is substantially U-shaped,
and the connecting members are disposed at two ends of the body,
respectively.

4. The duster according to claim 1, wherein the duster
comprises two detachable members, the body comprises two
connecting members, and the duster further comprises:
   a first pipe disposed in one of the detachable members,
   wherein one end of the first pipe is connected to the first
main pipe, the other end of the first pipe having a first
opening, and the first opening is exposed from the col-
loid part of the one of the detachable members;
   wherein, after adsorbing gas adsorbs the particle, the par-
ticle is removed sequentially through the first opening,
the first pipe and the first main pipe.

5. The duster according to claim 4, further comprising:
   a controller disposed at the first main pipe for adjusting the
flow rate of the adsorbing gas.

6. The duster according to claim 4, further comprising:
   a second main pipe disposed in the body; and
   a second pipe disposed in the other one of the detachable
members, wherein one end of the second pipe is used for
being connected to the second main pipe, the other end
of the second pipe having a second opening, and the
second opening is exposed from the colloid part of the
other one of the detachable members;
wherein, after adsorbing gas adsorbs the particle, the
particle is removed sequentially through the second
opening, the second pipe and the second main pipe.

7. The duster according to claim 6, further comprising:
   a controller disposed at the second main pipe for adjusting
the flow rate of the adsorbing gas.

8. The duster according to claim 6, further comprising:
   a switching member coupled to the body for removing the
unadhered particle either through the first opening, the first pipe
and the first main pipe or through the second opening, the
second pipe and the second main pipe after the adsorb-
ing gas adsorbs the particle.

9. The duster according to claim 1, wherein the colloid part
comprises a reusable colloid.

10. The duster according to claim 9, wherein the colloid has
the same material properties at 300° C.

11. The duster according to claim 1, further comprising:
   a main pipe disposed in the body; and
   a pipe disposed in the detachable member, wherein one end
of the pipe connecting to the main pipe, the other end
of the pipe having an opening, the opening is exposed from
the colloid part, and adsorbing gas adsorbs the particle
through the main pipe, the pipe and the opening.

12. The duster according to claim 11, further comprising:
   a controller disposed at the main pipe for adjusting the flow
rate of the adsorbing gas.

13. A dusting apparatus, comprising:
   a duster used for removing a particle, the duster compris-
ing:
   a body comprising at least one connecting member;
   at least one detachable member, wherein one end of the
detachable member is detachably coupled to the connect-
ing member, the other end of the detachable member
comprising a colloid part, and the colloid part having
adhesiveness is used for adhering the particle thereto;
   a main pipe disposed in the body; and
   a pipe disposed in the detachable member, wherein one end
of the pipe is connected to the main pipe, the other end
of the pipe having an opening, and the opening is ex-
posed from the colloid part; and
   an air extractor used for being connected to the main pipe
and providing adsorbing gas, wherein after the adsor-
bing gas adsorbs the particle, the particle is removed
sequentially through the opening, the pipe and the main
pipe.

14. The dusting apparatus according to claim 13, wherein
the duster comprises two detachable members, the body
comprises two connecting members, the body is bar-shaped,
and the connecting members are located at two ends of the body,
respectively.

15. The dusting apparatus according to claim 13, wherein
the duster comprises two detachable members, the body
comprises two connecting members, the body is substantially
U-shaped, and the connecting members are disposed at two
ends of the body, respectively.

16. The dusting apparatus according to claim 13, wherein
the duster further comprises:
   a controller disposed at the main pipe for adjusting the flow
rate of the adsorbing gas.

17. The dusting apparatus according to claim 13, wherein
the duster comprises two detachable members, two main
pipes and two pipes, the body comprises two connecting
members, and the duster further comprises:
   a switching member coupled to the body and connected to
the air extractor, wherein the switching member having a
switching hole is used for aligning the switching hole
with one of the main pipes.

18. The dusting apparatus according to claim 13, wherein
the colloid part comprises a reusable colloid.

19. The dusting apparatus according to claim 18, wherein
the colloid has the same material properties at 300° C.