ABSTRACT

A device for handling volatile particles, during emptying of vessels containing the particles, includes an opening for emptying the particles, a collection vessel for emptied particles, placed mainly vertically below the opening in order to catch particles that fall down by gravitation, an airflow creating element, at least one filter, whereby the airflow creating element is capable of creating an airflow through the opening towards the collection vessel, as well as an airflow guiding element arranged such that the direction of the airflow is altered towards the filter in order to catch particles that are brought with the airflow.
DEVICE FOR HANDLING OF TONER POWDER

TECHNICAL AREA

[0001] The present invention relates to a device for handling and collection of toner powder at a filling station for filling of toner cassettes.

[0002] There is a large market for recycling and refilling of toner cassettes. Partly it is more environmentally friendly to recycle and reuse of toner cassettes when these have been emptied and moreover they are in most cases somewhat cheaper to purchase than original cassettes.

[0003] The applicant for the present invention has developed and patented a method and device for refilling of toner powder in a toner cassette comprising a device for creating a passage into the toner cassette and a filling device of new powder comprising an entry means and feeding means for feeding in of the powder through the entry means and into the toner cassette. After this the passage is closed.

[0004] In order to refill toner powder in a toner cassette this has to be cleaned before it is possible to change components and to refill with new toner. The toner powder has a very small particle size such as fine dust with sizes of 0.5 to 15 microns and is therefore very easily airborne and may cause problem for the person that is to clean the cassette. Further toner powder does easily pollute the surrounding environment.

BRIEF DESCRIPTION OF THE INVENTION

[0005] It is an aim with the present invention to provide a device that can handle airborne dust such as for example toner powder.

[0006] This aim is obtained by a device that is characterised by the features of the independent patent claim 1. Preferable embodiments of the invention are apparent from the dependent claims.

[0007] According to a main aspect of the invention it is characterized by a device for handling volatile particles, during emptying of vessels containing said particles, a collection vessel for emptied particles, placed mainly vertically below the opening in order to catch particles that fall down by gravitation, an airflow creating means, at least one filter, whereby the airflow creating means is capable of create an airflow through the opening towards the said collection vessel, as well as an airflow guiding means arranged such that the direction of the airflow is altered towards the filter in order to catch particles that are brought with the airflow.

[0008] According to another aspect of the invention the said filter is placed in the vicinity of said opening, that said air flow guiding means is capable of changing the direction of the airflow such that it passes through said opening.

[0009] According to a further aspect of the invention, the said air flow guiding means comprises a plate placed in said opening in a mainly vertical position, whereby said opening is divided into two part-openings where the air flow is going down in one part-opening and the other in the second part-opening.

[0010] According to another aspect of the invention said air flow guiding means further comprises a pipe that extends between the opening and the collection vessel.

[0011] Preferably the said filter is arranged with a certain angle over the second part-opening. Further the filter also preferably comprises an absolute filter. The airflow creating means is suitably a fan.

[0012] The advantages with the present invention are several. The device ascertains that particles that are emptied through the opening falls down towards the collection vessel and are brought by the air stream. However, because the air flow guiding means is capable of deflecting the air stream towards the filter, very volatile particles are caught by the filter, which volatile particles otherwise would be brought into the environment because they are so small and light that they are affected more by air movements than the gravitational force.

[0013] Preferably the air stream is guided both down and up through the opening and that the filter is placed in the air stream, whereby the filter can take care of particles in the air flow according to above, but also particles that can be present above the opening, for example during careless emptying.

[0014] A preferable air guide means is a plate placed generally vertically in the opening, whereby two part-openings are created. Further the air guide means comprises a pipe that extends between the opening and the collection vessel. This design provides the advantage that the speed of the downwardly directed air stream is reduced when it has passed the plate because the volume increases. Therefore the main part of the toner particles will fall down into the collection vessel. The very small and volatile particles continue in the air stream and are caught by the filter.

[0015] In order to really ascertain that no particles enter the environment the filter consists of two parts, a pre-filter that catches the main part of the particles and a subsequent absolute filter that catches the remaining particles.

[0016] These and other aspects and advantages with the present invention will become apparent from the following detailed description and from the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] In the following detailed description of the invention, reference will be made to the accompanying drawings, of which

[0018] FIG. 1 shows an example of a work station for filling of toner powder in toner cassettes where the present invention may be used,

[0019] FIG. 2 shows a view in perspective of the present invention, and

[0020] FIG. 3 shows a side view of the device of FIG. 2.

DETAILED DESCRIPTION OF THE INVENTION

[0021] FIG. 1 shows an example of a work station 10 for filling of toner cassettes where the present invention may be comprised. The work station comprises a work bench 12, a passage-making device 14 for creating a passage in the toner cassette, through which toner powder may be filled. There is also a filling device 16 comprising an entry means that is placed in the passage of the cassette as well as feeding means for feeding toner powder from a container 17 through the entry means and into the toner cassette.

[0022] As mentioned above a cleaning of the toner cassette is needed before it can be filled with toner powder. In order to do this the work bench has been arranged with a hole or opening 20. FIG. 2, that in the shown embodiment is rectangular. Below the opening a rectangular pipe-shaped structure
22 with four walls is arranged. A sack 24 may be attached around the pipe. In the opening a plate 26 is arranged in a generally vertical position and parallel with the front edge of the table so that a rear 20a and a front 20b opening are formed in the opening. In the front opening a grid 27 is arranged. Behind the rear opening a filter 28 is arranged, hereafter named pre-filter, generally standing but with a certain inclination towards the rear opening. A suitable angle is between 13-15 degrees from the vertical. The pre-filter is releasably attached with suitable holders (not shown) in order to be cleaned. The pre-filter may be made of polyester material. Behind the pre-filter a suction fan 30 is arranged, preferably a centrifugal fan. Between the pre-filter and the fan a very fine filter 32 is arranged, an absolute filter, also named HEPA-filter.

The device is intended to be used as follows. The cassette that is to be cleaned is shaken against the grid 27 in the front opening whereby the remaining toner powder in the cassette falls down in the sack 24 by gravitation. The grid prevents that tools and other things on the work table fall through the opening.

In order to take care of the very small airborne toner particles the fan 30 is operating during use. The fan creates a flow that flows through the front opening 20b, around the lower edge of the plate 26, up through the rear opening 20a and through first the pre-filter 28 and then the absolute filter 32. This flow also makes the heavier particles to be drawn down towards the sack. When the air has passed the plate 26, the volume and the air speed decreases and the majority of the toner particles fall down in the sack.

The very light and small particles follow however the air stream up towards the rear opening and the majority of the particles are caught in the pre-filter 28. By static charge of the particles, they are drawn to each other and create large groups of particles, which may be easily removed and then fall down in the sack. Particles that are spread in the air above the opening, due to careless cleaning, will be sucked directly to the pre-filter. The very small amounts of small particles that pass the pre-filter will be caught by the absolute filter. After a certain use the sack with the collected dust may be easily replaced, without any dust entering the surrounding air.

It is to be understood that the invention described above and shown in the drawings only is to be regarded as non-limiting example of the invention and that it may be modified in many ways within the scope of the patent claims.