(19) DANMARK

(10) DK/EP 2335542 T3

Patent- og Varemærkestyrelsen

(12) Oversættelse af europæisk patentskrift

(51) Int.Cl.: *A 47 L 7/00 (2006.01)* *A 47 L 9/12 (2006.01)* *B 01 D 50/00 (2006.01)* *B 08 B 5/04 (2006.01)* *B 65 G 53/60 (2006.01)*

(45) Oversættelsen bekendtgjort den: **2020-06-02**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2020-03-18**

(86) Europæisk ansøgning nr.: **10195428.7**

(86) Europæisk indleveringsdag: **2010-12-16**

(87) Den europæiske ansøgnings publiceringsdag: **2011-06-22**

(30) Prioritet: **2009-12-21 DE 102009055090**

(84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

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(54) Benævnelse: **Indretning til udsugning af pulver- eller støvformet materiale**

(56) Fremdragne publikationer:
DE-U1- 9 210 965
US-A- 3 189 179

DEVICE FOR EXTRACTING POWDER OR PARTICULATE MATERIAL BY SUCTION

The invention relates to a device for extracting powder or particulate material, in particular substances hazardous to health, according to the type defined in the preamble of claim 1.

Generic suction devices are known for example from DE 30 07 345 A1, DE 103 08 349 B4 or DE 92 10 965 U1. If such suction devices are used for extracting substances which are hazardous to health or even classified as carcinogenic, there is a problem in that during emptying of the collecting container and/or during changing of the filter body connected therewith and of a fine filter adjoining the filter body, great care must be taken in order to prevent the previously suctioned-in material escaping from the collecting container or the filter body and the operator possibly being able to come into contact with the substances hazardous to health. The solutions known from the prior art offer no guarantee for this, which is why protective suits and protective masks sometimes have to be worn when emptying the collecting container or when changing the filter body of these suction devices.

From EP 1 495 708 A2, a filter arrangement for a suction device is known, which has a filter body with a fine filter arranged inside the same.

US 3,189,179 describes a two-stage filter cartridge for a suction device, in which two filter inserts are arranged one inside the other.

It is therefore an object of the present invention to provide a device for extracting powder or particulate material, in particular substances which are hazardous to health, in which contact with the extracted medium is avoided when changing the filter body and the fine filter.

According to the invention, this object is achieved by the features mentioned in claim 1.

According to the invention, the suction line thus opens into the filter body in such a way that the extracted material enters the filter body directly, so that when the powder or

particulate material is extracted, it is ensured that this material gets completely into the filter body. In this case, the extracted material is prevented from escaping from the filter body, or from the fine filter adjoining it in the direction of suction, by the cover of the fine filter according to the invention, so that the extracted material can never escape from the collecting container. This effectively prevents a person replacing the collecting container of the device according to the invention from coming into contact with the materials extracted, which are possibly hazardous to health.

The fact that the filter body and the fine filter according to the present invention are arranged one inside the other results in a considerable space saving compared to known solutions, and it is also possible that the cover of the fine filter also simultaneously seals the filter body within the collecting container and thus prevents escape of the material contained in the filter body from the collection container.

A particularly simple arrangement of the fine filter with respect to the filter body is obtained if the fine filter is arranged within the filter body. As a result, the filter body can be flowed against from the outside, i.e. from the peripheral wall of the collecting container, and the suction leaving the filter body can enter the fine filter from the outside.

In order to be able to carry out this arrangement in a simple manner, it can also be provided that the filter body is essentially tubular.

A simple sealing of the cover with the material of the fine filter can result if the cover is cast or glued to the fine filter.

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In order to further improve this seal between the collecting container and the cover, it can be provided in a further advantageous embodiment of the invention that the collecting container and the cover have mutually corresponding sealing surfaces.

Further advantageous embodiments and developments of the invention result from the remaining dependent claims. An exemplary embodiment of the invention is shown in principle with reference to the drawing.

In the figures:

Fig. 1 a side view of a device according to the present invention for extracting powder or particulate material;

Fig. 2 a plan view of the device according to arrow II of Fig. 1;

Fig. 3 a perspective view of the collecting container of the device of Fig. 1 and Fig. 2;

Fig. 4 a section through the collecting container of Fig. 3; and

Fig. 5 a perspective view of the collecting container according to Fig. 3 and the components contained therein.

Figs. 1 and 2 show a side view and a plan view of a device 1 for extracting powder or particulate material, not shown, in particular substances which are hazardous to health. The extraction device 1 is particularly suitable for use in the pharmaceutical industry, since the contact of a person operating the extraction device 1 with these substances which are hazardous to health or even classified as carcinogenic is to be prevented under all circumstances. However, the extraction device 1 is also suitable for extracting other materials.

The extraction device 1 has a housing 2, in which a collecting container 3 is arranged. A suction line 4 leads to the collecting container 3 which can be removed from the housing 2 and can be brought to the respective extracting point by the operator in a manner known per se or can be arranged accordingly. Furthermore, the extraction device 1 has a suction unit 5, indicated by a dashed line, which, for example, can be designed as an electric motor or can have an electric motor, and produces a suction in the suction line 4 in a manner known per se. The negative pressure generated by the suction unit 5

propagates into the housing 2 and from there into the collecting container 3 and finally into the suction line 4, so that the powder or particulate material can be extracted with this negative pressure. In the present case, the suction unit 5 and the housing 2 are arranged on a chassis 7 having a plurality of wheels 6. Of course, the extraction device 1 could also be designed to be stationary, i.e. without a chassis.

The collecting container 3 can be raised relative to the housing 2 by means of a lifting device, of which only an operating lever 8 is shown, so that the collecting container 3 has no contact with the ground when in use. In other words, wheels 9 attached to the collecting container 3 are lifted off the ground in this state. In order to seal the collecting container 3 with respect to the housing 2, a seal (not shown) can be provided in the region of the housing 2, against which the collecting container 3 is pressed with respect to the housing 2 when it is lifted by means of the lifting device, so that the aforementioned sealing results.

In Fig. 3, the collecting container 3 is shown, and it can be seen that it has a cylindrical shape and is closed on its top with a cover 10 which has a centrally arranged opening 11 in the present case, from which the suctioned air can escape in the direction of the suction unit 5. The outer wall of the collecting container 3 can for example consist of stainless steel, but it is also possible to use a suitable plastic material for this.

Fig. 4 shows the collecting container 3 and it can be seen that within the collecting container 3 there is one filter body 12 acting as a coarse filter, and one fine filter 13 arranged in the direction of the suction between the filter body 12 and the suction unit 5, i.e. in the direction of the suction after the filter body 12. In this case, the suction line 4 opens into the filter body 12 in such a way that the extracted material enters the filter body 12 directly. It is therefore not possible for the suctioned material to be distributed arbitrarily in the collecting container. Possibly very fine material leaving the filter body 12 then gets into the fine filter 13 and is so finely filtered there that only filtered clean air emerges from the fine filter 13. The clean air escaping from the fine filter 13 leaves the collecting container 3 through the opening 11 in the cover 10. The course of the suction within the collecting container 3 is shown in Fig. 4 with corresponding arrows. Both the

filter body 12 and the fine filter 13 are flowed through from the outside to the inside, wherein the fine filter 13 is flowed through from below as well as from the side.

The filter body 12 and the fine filter 13 are arranged one inside the other, which is realised in the present case in that the filter body 12 is essentially tubular and the fine filter 13 is arranged inside the filter body 12. If necessary, it would also be possible to arrange the fine filter 13 outside the filter body 12, in which case, however, the filter body 12 would have to be flowed through from below via the suction line, since it is necessary that the air entering the collecting container 3 via the suction line 4 always first enters the filter body 12 and only then reaches the fine filter 13. The cover 10 would also be formed differently in this case and would have, for example, a slot running around in the region of its outer circumference.

It can be seen in Fig. 4 and in the perspective view of Fig. 5 that the cover 10 is attached to the fine filter 13 or that the fine filter 13 has the cover 10. The cover 10 is connected to the collecting container 3 in a sealing manner such that the air entering the collecting container 3 via the suction line 4 can only leave the collecting container 3 through the opening 11 in the cover 10. This ensures that the extracted material remains inside the filter body 12 or the fine filter 13 and cannot be distributed further in the housing 2. The cover 10 is preferably cast or glued to the fine filter 13. The cover 10 can consist, for example, of a rubber or plastic material which is already cast with the fine filter 13 during manufacture. Another possibility for the tight connection of the cover 10 to the fine filter 13 is to use a suitable casting compound. The cover 10 can also be glued or cast to the collecting container 3 in order to create a correspondingly tight connection and to prevent the material from escaping from the collecting container 3 under all circumstances. In this context, the collecting container 3 and the cover 10 can have mutually corresponding sealing surfaces, but these are not shown. These sealing surfaces can, for example, be designed as corresponding convex and concave radii.

While the filter body 12 preferably consists of a paper-like material and, as already mentioned above, is essentially tubular, the fine filter 13 preferably has open-pore filter mats, which are surrounded on their outside and/or inside by respective perforated

plates, grids or the like (not shown). The very fine particles which can still leave the filter body 12 are then taken up in the filter mats.

If the filter body 12 or the fine filter 13 have been filled with the extracted material in such a way that it is necessary to replace one or both of these elements, the entire collecting container 3 is removed from the housing 2 and disposed of completely, i.e. together with the filter body 12 and the fine filter 13 located therein. This results in a very simple disposal of the filter body 12 and the fine filter 13, which do not have to be removed from the collecting container 3. If necessary, the opening 11 of the cover 10 can be closed with a closure cover (not shown) during disposal, but this is not absolutely necessary, since, as already mentioned above, only cleaned air can escape from the opening 11. To remove the collecting container 3 from the housing 2, the lifting device described above can be used to lower the collecting container 3 downwards. The filling state of the filter body 12 and/or of the fine filter 13 can be determined with corresponding sensors which measure the counterpressure generated through the device 1 in a manner known per se.

In an embodiment of the device 1, not shown, the collecting container 3 could also be arranged outside the housing 2. In this case, the material to be extracted could be suctioned into the collecting container 3 via the suction line 4 as described above. The opening 11 could be connected to the suction unit 5 via a suitable line, so that nothing would change in the principle described above, with the exception that the collecting container 3 would not be arranged in the same housing as the suction unit 5 and would be executed practically as a stand-alone device. In such an embodiment, for example, a commercially available suction device could be used, in which the suction unit 5 would be arranged and connected to the collecting container 3 via the line.

Patentkrav

1. Indretning (1) til udsugning af pulver- eller støvformet materiale, især af sundhedsskadelige stoffer, med et hus (2), med en opsamlingsbeholder (3) til modtagelse af det udsugede materiale, med en til opsamlingsbeholderen (3) førende udsugningsledning, med sugeenhed (5), som generer et sugetræk i udsugningsledningen (4), og et filterlegeme (12), som er indrettet mellem udsugningsledningen (4) og sugeenheden (5) i sugetrækretningen, **kendetegnet ved, at** et fint filter (13) er indrettet mellem filterlegemet (12) og sugeenheden (5) i sugetrækretningen, at udsugningsledningen (4) munder ud i filterlegemet (12), således at det udsugede materiale trænger direkte ind i filterlegemet (12), at filterlegemet (12) og det fine filter (13) er indrettet med den ene inde i den anden, og at det fine filter (13) har et låg (10), som er tætnende forbundet med opsamlingsbeholderen (3), således at der kun er en åbning (11) tilbage for filtreret luft, der kommer ud af det fine filter (13).

2. Indretning ifølge krav 1,
kendetegnet ved, at
det fine filter (13) er indrettet inden i filterlegemet (12).

3. Indretning ifølge krav 2,
kendetegnet ved, at
filterlegemet (12) i alt væsentligt er rørformet.

4. Indretning ifølge krav 1, 2 eller 3,
kendetegnet ved, at
låget (10) er støbt eller limet på det fine filter (13).

5. Indretning ifølge et af kravene 1 til 4,
kendetegnet ved, at
låget (10) er støbt eller limet på opsamlingsbeholderen (3).

6. Indretning ifølge krav 5,
kendetegnet ved, at

opsamlingsbeholderen (3) og låget (10) har tætningsflader svarende til hinanden.

7. Indretning ifølge et af kravene 1 til 6,
kendetegnet ved, at
låget (10) består af et gummi- eller plastmateriale.

8. Indretning ifølge et af kravene 1 til 7,
kendetegnet ved, at
åbningen (11) i låget (10) af det fine filter (13) kan lukkes med et aflåsningslåg.

9. Indretning ifølge et af kravene 1 til 8,
kendetegnet ved, at
det fine filter (13) har filtermåtter med åbne porer, hvilke filtermåtter er omgivet på deres yder- og/eller inderside af respektive perforerede plader eller gitre.

10. Indretning ifølge et af kravene 1 til 9,
kendetegnet ved, at
opsamlingsbeholderen (3) ved hjælp af en løfteindretning kan løftes i forhold til huset (2), idet huset (2) har en tætning, og idet opsamlingsbeholderen (3) presses mod tætningen, når den løftes.

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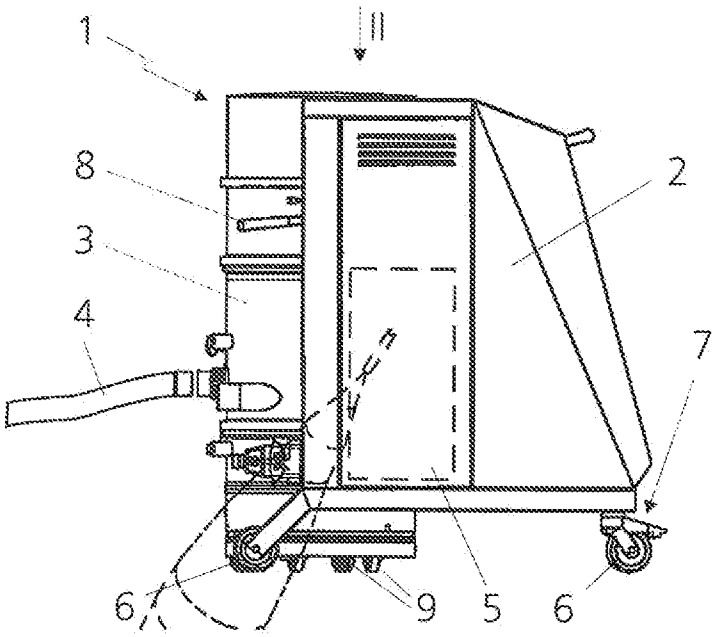

Fig. 1

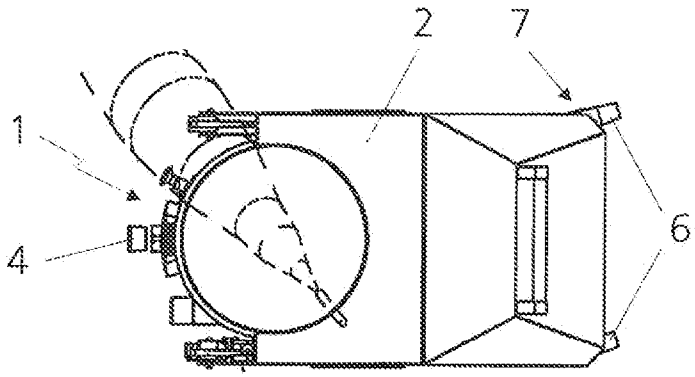

Fig. 2

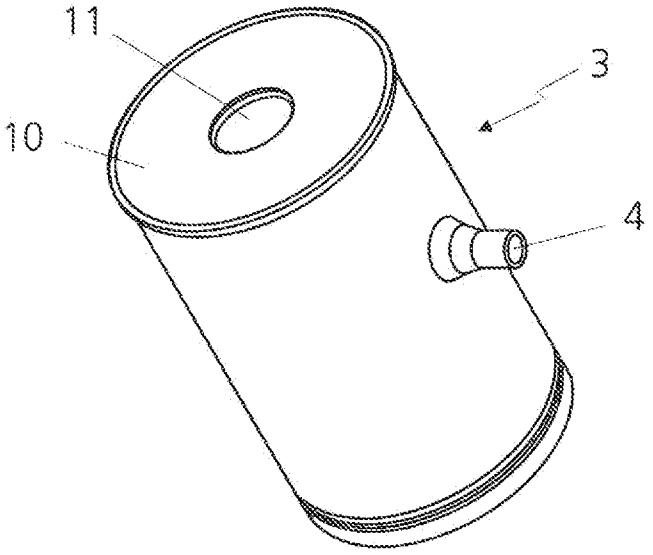

Fig. 3

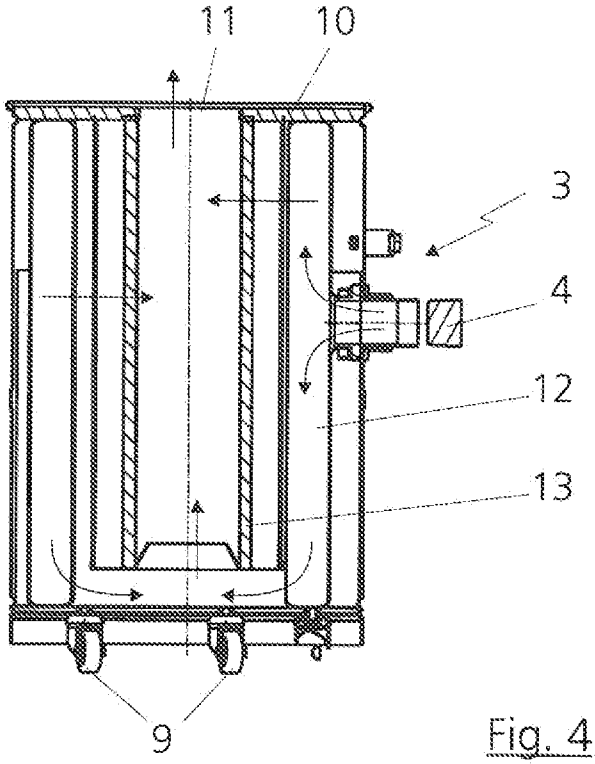

Fig. 4

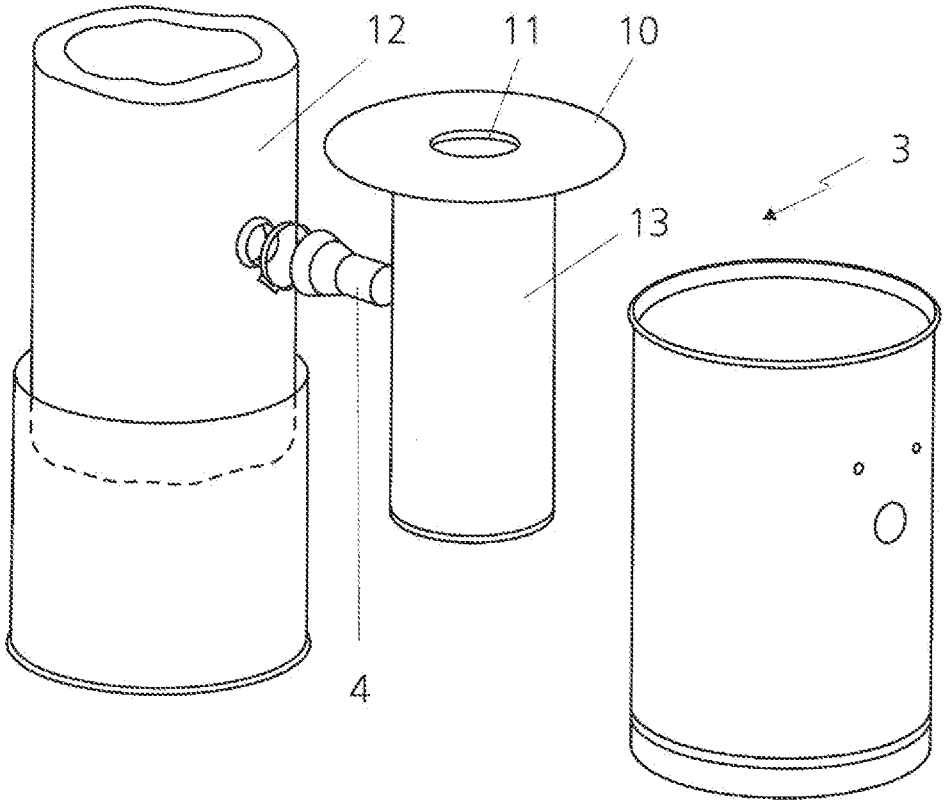

Fig. 5