(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 252 906 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.10.2023 Bulletin 2023/40

(21) Application number: **23164569.8**

(22) Date of filing: **28.03.2023**

(51) International Patent Classification (IPC):
B01L 1/02 *(2006.01)* ***B08B 13/00*** *(2006.01)*
C12M 1/00 *(2006.01)* ***C12Q 1/22*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B01L 1/025; B01L 2200/082

(84) Designated Contracting States:
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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **28.03.2022 ES 202230281**

(71) Applicant: **Garcia-Gallardo Sanz, Prospero**
09004 Burgos (ES)

(72) Inventor: **Garcia-Gallardo Sanz, Prospero**
09004 Burgos (ES)

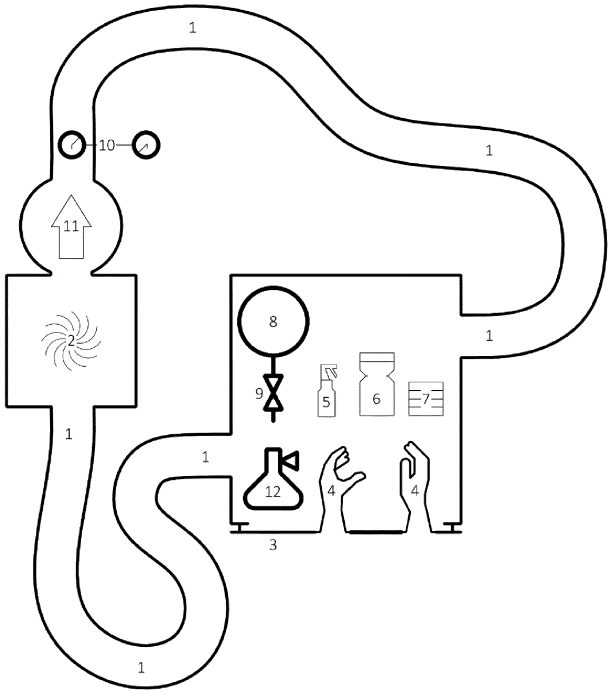
(54) **LOW-PRESSURE CHAMBER FOR TESTING AN AEROSOL TREATMENT DEVICE**

(57) Low-pressure chamber for testing an aerosol treatment device.

A chamber for testing the effectiveness of an aerosol treatment device, minimising the risk of contamination of the external environment by aerosols.

The chamber is connected to the device under test as a sealed assembly, inside which aerosol samples are released and collected. It is equipped with a vacuum capsule to operate at a pressure lower than that of the external environment. Both pressures are monitored to detect leakage, in which case an aerosol-inactivating agent is dispersed inside the chamber. The same inactivating agent is used prior to the removal of the samples from the chamber, which are placed in airtight capsules not to be affected.

Figure-2



EP 4 252 906 A1

Description

Object of the invention and prior art:

[0001] Aerosols are tiny particles of solids or liquids suspended in air or other gas; they can be dispersed and spread over large distances, and depending on their specific nature, they can disrupt industrial processes or cause disease. Aerosol treatment devices have been developed to address this problem, but their effectiveness needs to be tested.

[0002] Given the ability of aerosols to disperse and spread through the air, there is an obvious risk in testing these devices with the active target aerosols; therefore, different aerosols that are considered similar are often used. While this method may be valid for mechanical particle retention treatment devices; HEPA or MERV type filters, there are new technologies that use physical systems, such as UVC radiation; or chemical; ozone, ions, etc., where the similar particle method may give incorrect results. The optimal test should be done with the same aerosols to be neutralised but minimising the risk of contamination of the outside environment by these aerosols.

Utility of the Invention:

[0003] It is a chamber for testing the effectiveness of an aerosol treatment device, which minimises the risk of contamination of the external environment by tested aerosols.

[0004] The chamber is connected to the device under test as a sealed assembly, inside which aerosol samples are released and collected. It is equipped with a vacuum capsule to operate at a pressure lower than that of the external environment. Both pressures are monitored to detect leakage, in which case an aerosol-inactivating agent is dispersed inside the chamber.

[0005] The same aerosol-inactivating agent is used to safely open the chamber prior for the removal of the samples from the chamber, The samples are placed in airtight capsules not to be affected by the aerosol-inactivating agent.

Description of the Invention:

[0006] It is a chamber for testing the effectiveness of an aerosol treatment device, which minimises the risk of contamination of the external environment by tested aerosols.

[0007] It consists of a housing which rounds the chamber with ducts (1) that connect the chamber to the aerosol treatment device (2), windows which can be opened and closed for introducing objects into the chamber when it is not in operation (3), a system for handling the objects inside the chamber (4); all of which form a closed compartment sealed off from the outside environment, one a diffuser for the aerosols to be tested (5), one aerosol sampler (6) -which may be a simple capture sampler or include a recording of environmental parameters- and airtight capsules (7) to store the aerosol samples.

[0008] It is characterized by a vacuum capsule (8) inside the chamber with an opening and closing valve (9), an internal and external differential pressure gauge (10), an optional fan (11) that moves the air through the chamber through the treatment device (11) and an aerosol-inactivating agent diffuser for aerosols dispersed inside the chamber (12).

[0009] The procedure of use can be carried out manually or mechanically. It starts by opening the valve of the vacuum capsule to reduce the internal pressure below atmospheric pressure and its control by the differential pressure gauge so that if a pre-set minimum value is reached, the diffusion of the aerosol inactivating agent is used.

[0010] This aerosol inactivating agent is used at the end of the test to safely remove the samples from the chamber, which are placed in hermetically sealed capsules to avoid being affected.

Operation:

[0011] The chamber is connected to the device under test as a sealed assembly. When the valve of the vacuum enclosure is opened, a quantity of air from the chamber enters, and since the enclosure is sealed, the air inside the chamber expands, and the pressure inside is reduced.

[0012] This pressure difference to the outside is monitored by the inside/outside differential pressure gauge; it provides information about the chamber's tightness throughout the process and prevents aerosols from going outside as they move from higher pressure to lower pressure.

[0013] Thus, the dispersed aerosols are circulated inside the treatment device under test by a gas propellant, usually a fan; and collected by the sampler; minimising the risk of contamination of the external environment.

[0014] The extraction of the samples for observation requires the opening of the chamber, so it is necessary to neutralise any aerosols that may have been dispersed inside the chamber beforehand. This is done by diffusing a proven inactivating agent, usually a gaseous chemical. The action time can be reduced with the help of the gas propellant, which contributes to the dispersion.

[0015] Finally, in the event of a leak in the chamber, air from the outside environment would enter the chamber, reduce the outside internal-pressure differential and be detected by the pressure gauge, which would trigger the inactivating agent diffuser, avoiding the risk of aerosols spreading to the outside.

[0016] According to the above, it is possible to test the effectiveness of an aerosol treatment device, minimising the risk of contamination of the external environment by aerosols.

Description of a practical embodiment of the invention:

[0017] It is proposed to test the effectiveness of a device using ultraviolet radiation to inactivate the aerosols of Salmonella Typhimurium.

[0018] A cube-shaped chamber is manufactured, which is connected to the treatment device by means of inlet and outlet ducts, making it watertight with respect to the outside environment.

[0019] One pressure gauge is provided inside and one inside so that both are visible to the operator. Devices for measuring relative humidity and temperature are also provided.

[0020] One side is detachable as an opening and has flexible gloves, which allow the following objects to be handled:

- A vacuum capsule with a valve, removable for emptying and cleaning.
- A hand-held, removable atomiser for charging and cleaning, including aqueous Salmonella Typhimurium solution.
- An aerosol sampler with a built-in battery, removable for charging and cleaning, and using Petri dishes with lids that allow hermetically sealed.
- A pressurised isopropyl alcohol spray as an isopropyl alcohol spray inactivating agent for Salmonella Typhimurium aerosols.

BRIEF EXPLANATION OF THE DRAWINGS

[0021]

Figure 1 Schematic plan view of a possible compact embodiment of the invention.

Figure 2 Schematic plan view of a possible embodiment of the invention, non-compact and using flexible ducts.

LEGEND

[0022]

1 Housing which rounds the chamber with ducts that connect to the aerosol treatment device.
2 Aerosol treatment device.
3 Windows which can be opened and closed for introducing objects into the chamber.
4 Object handling system inside the chamber.
5 Aerosol diffuser.
6 Aerosol sampler.
7 Airtight sample capsules.
8 Vacuum capsule.
9 Vacuum capsule release valve 10 Inner differential pressure gauge.
10 Inner and outer differential pressure gauge.
11 Fan for moving aerosols through the tested aerosol treatment device.
12 Diffuser to distribute the aerosol-inactivating agent.

Claims

1. It consists of a housing which rounds the chamber with ducts that connect the chamber to the aerosol treatment device, windows which can be opened and closed for introducing objects into the chamber when it is not in operation and a system for handling the objects inside the chamber; all of which form a closed compartment sealed off from the outside environment; one a diffuser for the aerosols to be tested, one aerosol sampler -which may be a simple capture sampler or include a recording of environmental parameters- and airtight capsules to store the aerosol samples.
It is **characterized by** a vacuum capsule inside the chamber with an opening and closing valve, an internal and external differential pressure gauge, and an aerosol-inactivating agent diffuser for aerosols dispersed inside the chamber. Using the valve, it operates with an internal pressure lower than the external pressure.

2. Low-pressure chamber for testing an aerosol treatment device according to claim_1 **characterized by** having a fan inside the chamber that moves the gas from the chamber through the treatment device.

3. Low-pressure chamber for testing an aerosol treatment device according to claim_1 **characterized by** a manual operation procedure starting by opening the valve of the vacuum capsule to reduce the internal pressure below atmospheric pressure and its control by the differential pressure gauge so that if a pre-set minimum value is reached, the diffusion of the aerosol inactivating agent is used.
The test of the aerosol treatment device continues using the aerosol diffuser, then the aerosol sampler and continues by depositing the samples into the airtight capsules. It continues using the aerosol inactivating agent, and then the airtight capsules with the samples inside can be safely removed.

4. Low-pressure chamber for testing an aerosol treatment device according to claim_1, **characterized by** its use procedure according to claim 3, which is carried out mechanically.

5. Low-pressure chamber for testing of an aerosol treatment device according to claim_2, **characterized in that** its use procedure can be carried out according to claim_3.

6. Low-pressure chamber for testing an aerosol treatment device according to claim-2, **characterized in that** its use procedure can be carried out according to claim_4.

Figure-1

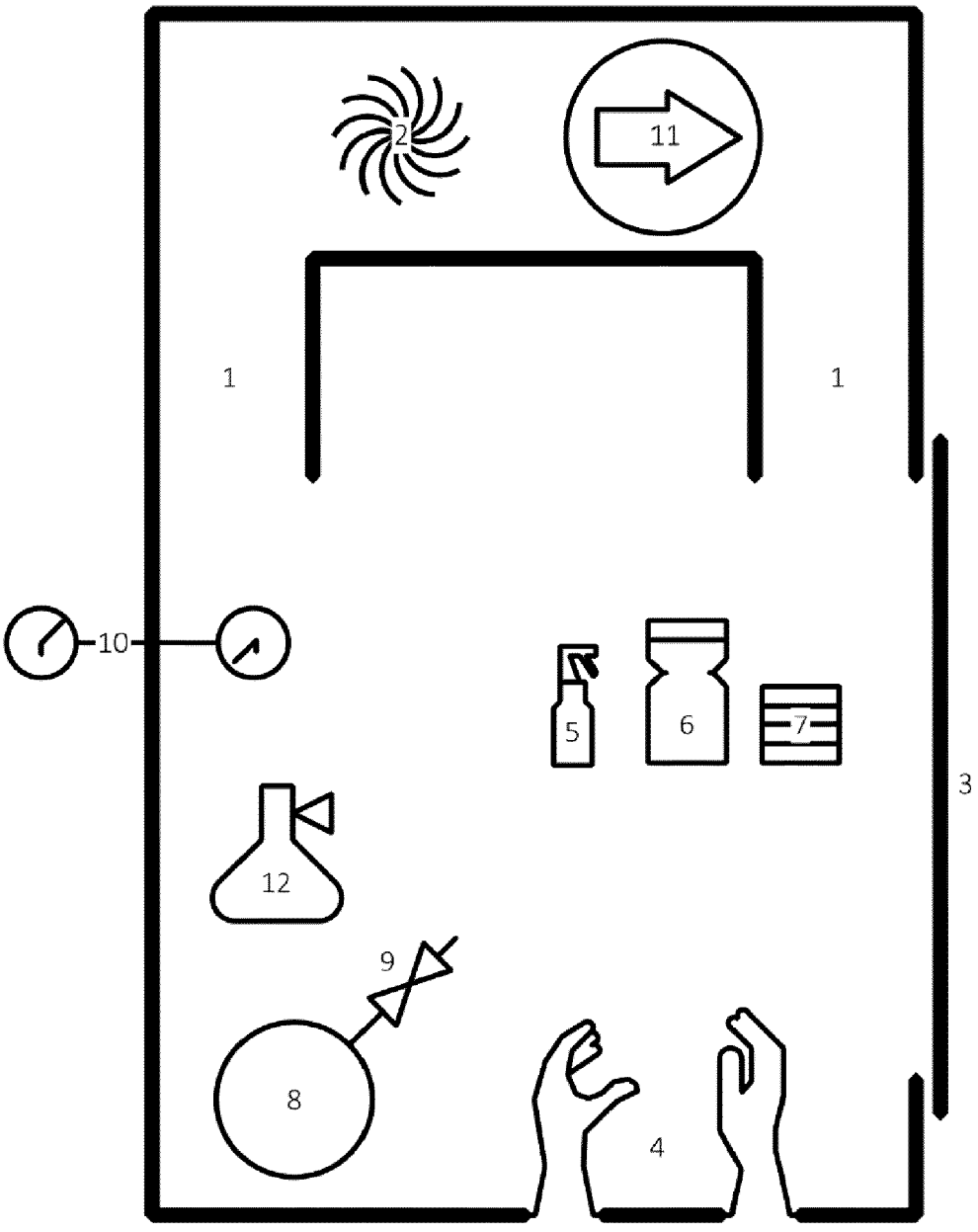
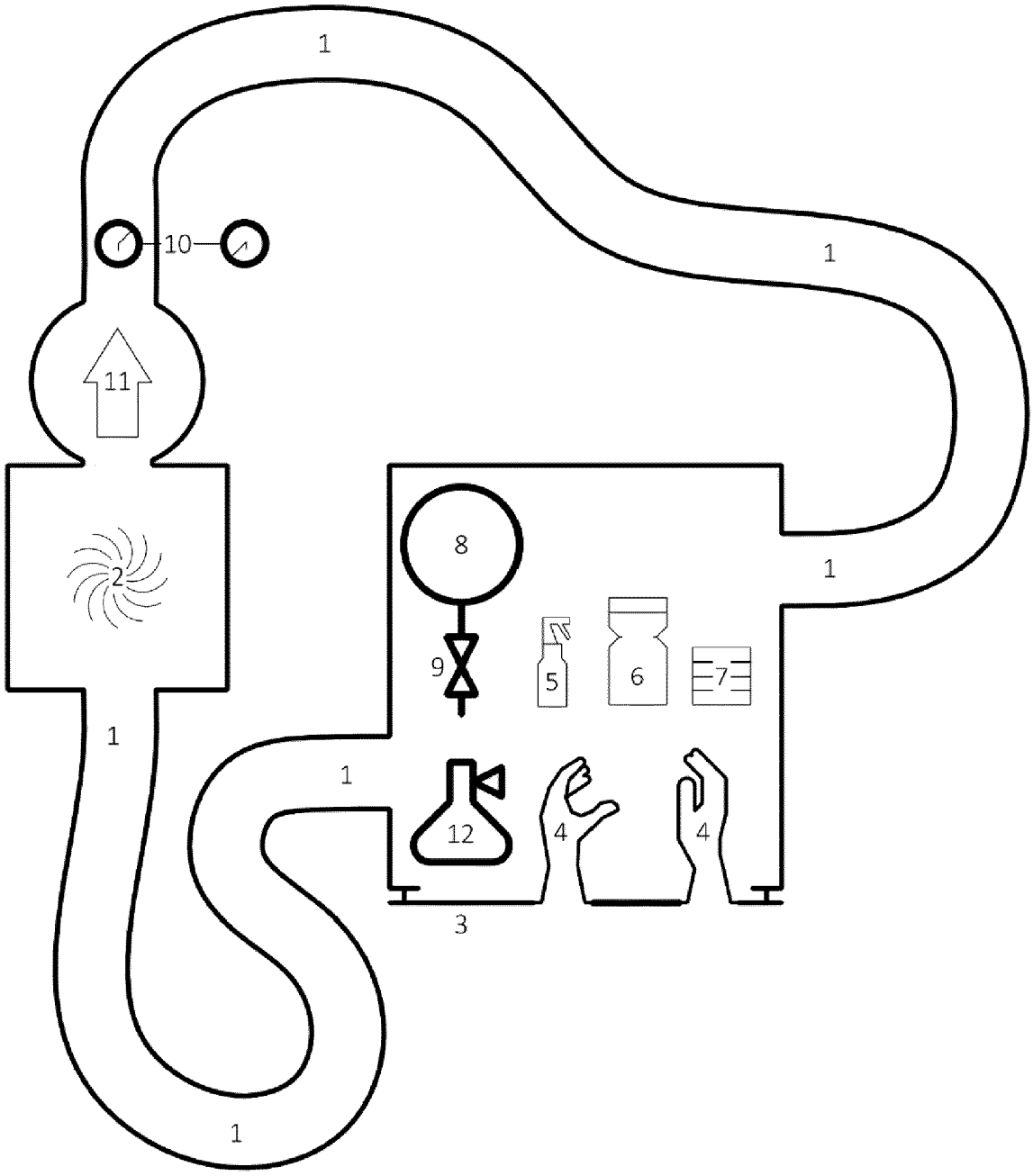


Figure-2



Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 23 16 4569

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 105 651 944 B (QINGDAO ZHONGRUI INTELLIGENT INSTR CO LTD) 8 December 2017 (2017-12-08)	1,2	INV. B01L1/02 B08B13/00
A	* the whole document *	3-6	C12M1/00 C12Q1/22
A	CN 202 011 880 U (SHINVA MEDICAL INSTR CO LTD) 19 October 2011 (2011-10-19) * the whole document *	1-6	

TECHNICAL FIELDS SEARCHED (IPC)

B01L
B08B
C12M
G01N
C12Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	17 August 2023	Vlassis, Maria

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 16 4569

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-08-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 105651944 B	08-12-2017	NONE	
CN 202011880 U	19-10-2011	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82