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

(11) **EP 4 295 965 A1**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
27.12.2023 Bulletin 2023/52

(21) Application number: **23181311.4**

(22) Date of filing: **23.06.2023**

(51) International Patent Classification (IPC):
B08B 5/04 *(2006.01)* ***B08B 15/04*** *(2006.01)*
B08B 15/00 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B08B 5/04; B08B 15/00; B08B 15/04

(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: **24.06.2022 IT 202200013408**

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(54) A SWINGING SUCTION ARM LAMP FOR THE LOCALIZED COLLECTION OF POLLUTANTS

(57) A swinging suction device for the localized collection of gaseous or airborne pollutants, of the type comprising a hinged tubular suction arm, provided with a lighting system (11) being orientable independently of the suction device itself.

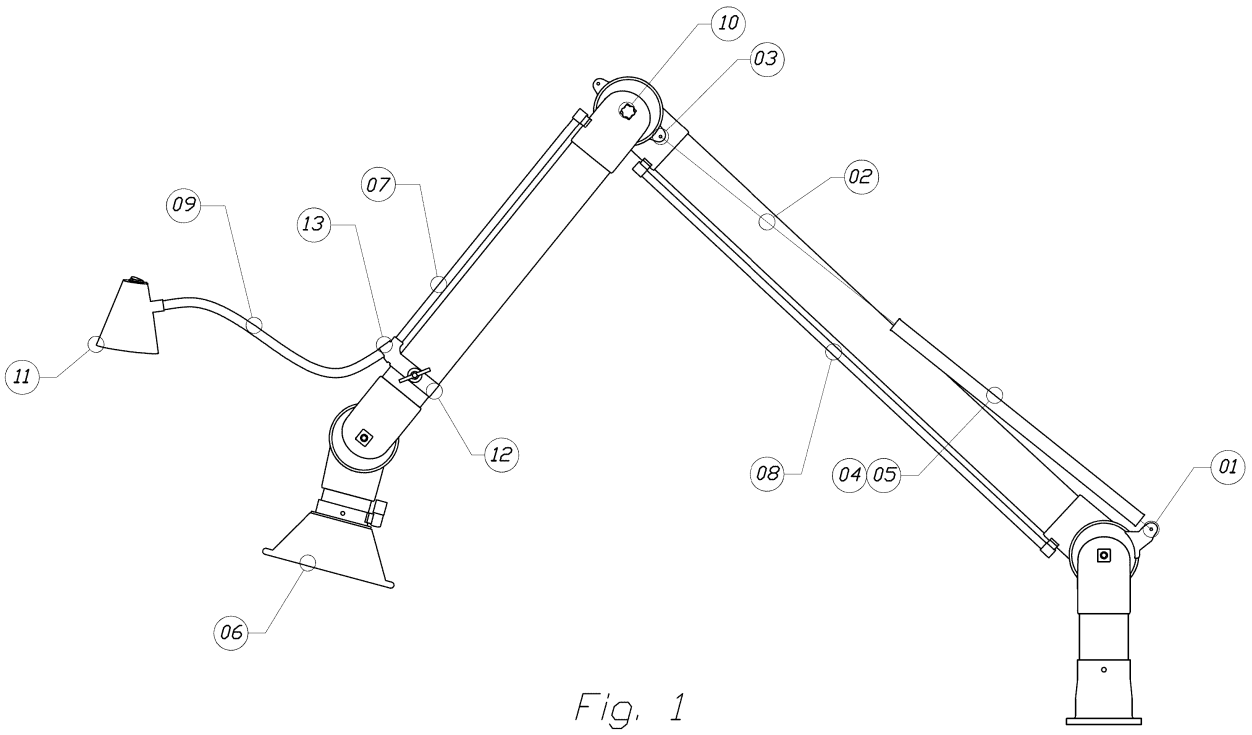

Fig. 1

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Description

[0001] The present invention relates to the field of air treatment and elimination of pollutants produced during processes carried out by operators in the context of workbench operations.

[0002] More specifically, it relates to an air suction and conveyance system comprising swinging localized collection means, preferably integrated with a lighting device on a flexible arm.

[0003] The need to locally suction the pollutants produced, in various forms, phases and physical states, during work activities in electronic, dental, analysis, handcraft, and research laboratories, etc., is well known.

[0004] Usually, these are processes mostly performed on equipped workbenches, provided with specific tools which depend on the pertaining field.

[0005] Currently, self-supporting hinged devices are commercially available, provided with localized collection elements with a small diameter and an overall length not exceeding 1.7m, which can be fixed directly to the workbench or to the wall (if available) or to the ceiling close to the workbench itself.

[0006] Such known hinged devices substantially share a series of disadvantageous characteristic elements:

1) The lighting system, when present, is integrated in the suction hood, which must thus be arranged for the installation of such a lighting system.
2) Such known lighting systems have the lighting body aligned with the suction direction.
3) Moreover, the electric power supply of the current lighting systems includes using a conductor which is hidden inside the air conveying system or visible outside the suction body.
4) Said hinged devices are movable by means of a handle placed directly on the front tube and/or suction hood.
5) For lighter models, the self-supporting system is obtained using friction rings placed at the joints and joint flexures.
6) For heavier models, the self-supporting system is obtained using torsion springs and bulky gas pistons placed in the lower quadrant of the air conveying tubes.

[0007] It is the main object of the present invention to overcome the aforesaid disadvantages by providing an innovative swinging suction device for the localized collection of pollutants, provided with a lighting system being orientable independently of the suction device itself.

[0008] This has been achieved, according to the finding, by providing a swinging suction device of the aforesaid type, consisting of a single hinged suction arm which is provided with a tubular body comprising:

- a rotation base;
- a rear part constrained to the base with a simple joint;
- a front part constrained to the previous one by means of a second self-supporting joint and, on the opposite side, provided with an articulated termination and capable of moving freely in all possible directions;
- a collection element placed at the free end;

where each of said parts is rotatably constrained to the adjacent one, to form a single tubular body for conveying air. Said parts, constrained to one another, are configured to be movable on parallel planes with respect to different axes and are provided with an elastic self-supporting system, while the base is configured to be rotatable with respect to a fixed horizontal support plane.

[0009] Where, said lighting system, being orientable independently of the device itself, is installed close to the front joint in which the collection element is placed, by means of a constraint also being orientable.

[0010] A better understanding of the finding will be achieved by means of the following detailed description and with reference to the accompanying drawings showing, merely by way of non-limiting example, a preferred embodiment.

[0011] In the drawings:

Figure 1 shows a side view of a preferred embodiment of the invention;
Figure 2 shows the ESD (ElectroStatic Discharge) configuration;
Figure 3 shows an overall axonometric view of the finding in Figure 1.

[0012] In the embodiment described without limitation, the lighting system preferably consists of a structure 09 which supports the lamp holder 11, independent and outside the suction system; such a structure is articulated, self-supporting and constrained to the arm by means of a rotating leg 13 fixed to the shutter-holder collar 12.

[0013] Said lamp holder 11 is provided with at least one lamp electrically powered by means of a power supply conductor crossing the flexible support 09, the handle-tie rod 07, and the rear through-tie rod 08.

[0014] The tubular suction arm described so far is thus movable and orientable by acting directly on the fixed front handle 07 which, according to the above description, can also perform the function of a cable-holder handle.

[0015] The innovative features of the present invention and the advantages deriving from the use thereof will become apparent from the following description comparing the finding and the prior art.

[0016] According to the present invention, the self-supporting system is preferably made by means of an "elastic matrix" (i.e., a coordinated system of elastic elements) using traction, torsion or compression or fluid compensation springs, and is always positioned outside (or inside, in the case of torsion springs only) the air conveying tubes.

[0017] Advantageously, the self-supporting springs 04 are cased within a protective casing and are preferably hidden from the visual target because they are placed in line with the conveying tube through the transmission of a tensioning cable.

[0018] The present invention includes a rear self-supporting system capable of balancing (by means of the constraint reactions, the resistant torques produced by the friction of the rear joint, and the elastic moment generated by the rear spring) the inertia moments of both the rear and front portions of the finding itself.

[0019] The front self-supporting system, consisting of the elastic spring alone and the friction of the intermediate joint, supports the front part only.

[0020] Unlike the prior art, the lighting system according to the present invention, with an articulated lamp-holder arm with position memory, makes the lamp an element which is in turn self-supporting and repositionable as desired by the user, completely independently of the positioning of the suction hood 06 and the geometric configuration taken by the hinged suction device.

[0021] It should be noted that since the lighting system described so far is independent of the hinged suction system, it can include particular lighting means, provided with any convex optical devices, such as illuminated lenses or toroidal lighting bodies, or the like, to be used in particular laboratories.

[0022] The lighting system described with respect to the prior art advantageously allows using the lamp even in aggressive atmospheres since the lighting body is not immersed in the suction flow.

[0023] The movement system described is innovative with respect to the prior art in that it includes a continuous cable-holder handle 07 (see Figures 4 and 1).

[0024] In environments with ESD or ATEX classification (in the latter case without lighting kit), the presence of a specific movement handle 07 allows creating a preferential dissipation line of the electrostatic charges from the operator without affecting the entire equipment, but simply connecting the handle to the same ground connection point of the bracelet-brace conventionally supplied in EPA-ESD areas, thus avoiding the otherwise necessary dissipative infrastructures.

[0025] The self-supporting system of the present invention, with respect to the known systems only provided with friction rings, allows moving the suction device by applying a minimum force and making the mobility more fluid in all the positions included in the range of action of the device itself on the vertical translation plane.

[0026] Advantageously, the rear self-supporting system placed outside the suction tube, with the cased traction springs, with respect to the prior art with the torsion springs inside the rear joint, makes the device usable even in atmospheres of the aggressive type, precisely due to the fact that the self-supporting active element is not immersed in the suction flow.

[0027] Moreover, the finding is more silent than the prior art, also due to the better aerodynamic efficiency caused by the absence of obstacles immersed in the suction flow.

[0028] It is also useful to note that this greater efficiency results in less energy to be supplied to the air for maintaining the desired speed, the conveying rate being the same. Such advantages are very important in silent and generally low-impact environments such as those for which the finding is intended.

Claims

1. A swinging suction device for the localized collection of gaseous or airborne pollutants, of the type comprising a hinged tubular suction arm, wherein said suction arm includes a tubular body comprising at least three parts connected one after the other:

   - a rotation base rotatably fixed to a support stand for the whole device;
   - a rear part constrained to said base with a simple joint;
   - a front part constrained to the previous one by means of a second self-supporting joint and, on the opposite side, provided with an articulated termination and capable of moving freely in all possible directions;
   - a collection element placed at the free end of the front part;

   wherein each of said parts is rotatably constrained to the adjacent one and the end part is constrained to the collection element, to form a single tubular suction body,
   said device being **characterized in that** it comprises a lighting system consisting of a structure (09) for supporting a lamp holder (11), being independent of and outside the suction system; wherein said structure (09) is articulated, self-supporting and constrained to the suction arm by means of a rotating leg (13) fixed to a shutter-holder collar (12).

2. A device according to the preceding claim, **characterized in that** said lamp holder (11) is provided with at least one lamp electrically powered by a power supply conductor which crosses said flexible structure (09), said handle (07) and a rear through-tie rod (08); wherein said fixed front handle (07) is also configured to perform the function of a cable-holder handle.

3. A device according to claim 1, **characterized in that** said elastic self-supporting system is provided with a plurality of elastic elements (04, 10) of mixed technique, consisting of traction and/or torsion or compression springs; wherein said parts, which rotate with respect to one another, are configured to be movable on parallel vertical planes and are provided

with an elastic self-supporting system configured to move the suction device by applying a minimum force, as well as to provide more fluid movement in all the positions included in the range of action of the device itself on the vertical plane of translation.

4. A device according to the preceding claim, **characterized in that** said elastic self-supporting system is positioned outside the tubular body for conveying the suctioned air; thus obtaining that the device itself is usable even in atmospheres of the aggressive type, by virtue of the fact that said elastic self-supporting system is not immersed in the suction flow.

5. A device according to the preceding claim, **characterized in that** said springs (04) of the self-supporting system are cased inside a protective casing.

6. A device according to one or more of the preceding claims, **characterized in that**, in the rear part thereof, it is free from obstacles immersed in the suction flow, so as to be silent and provided with an aerodynamic efficiency which results in less energy to be provided to the air for maintaining the desired speed, with the conveyance regime being the same.

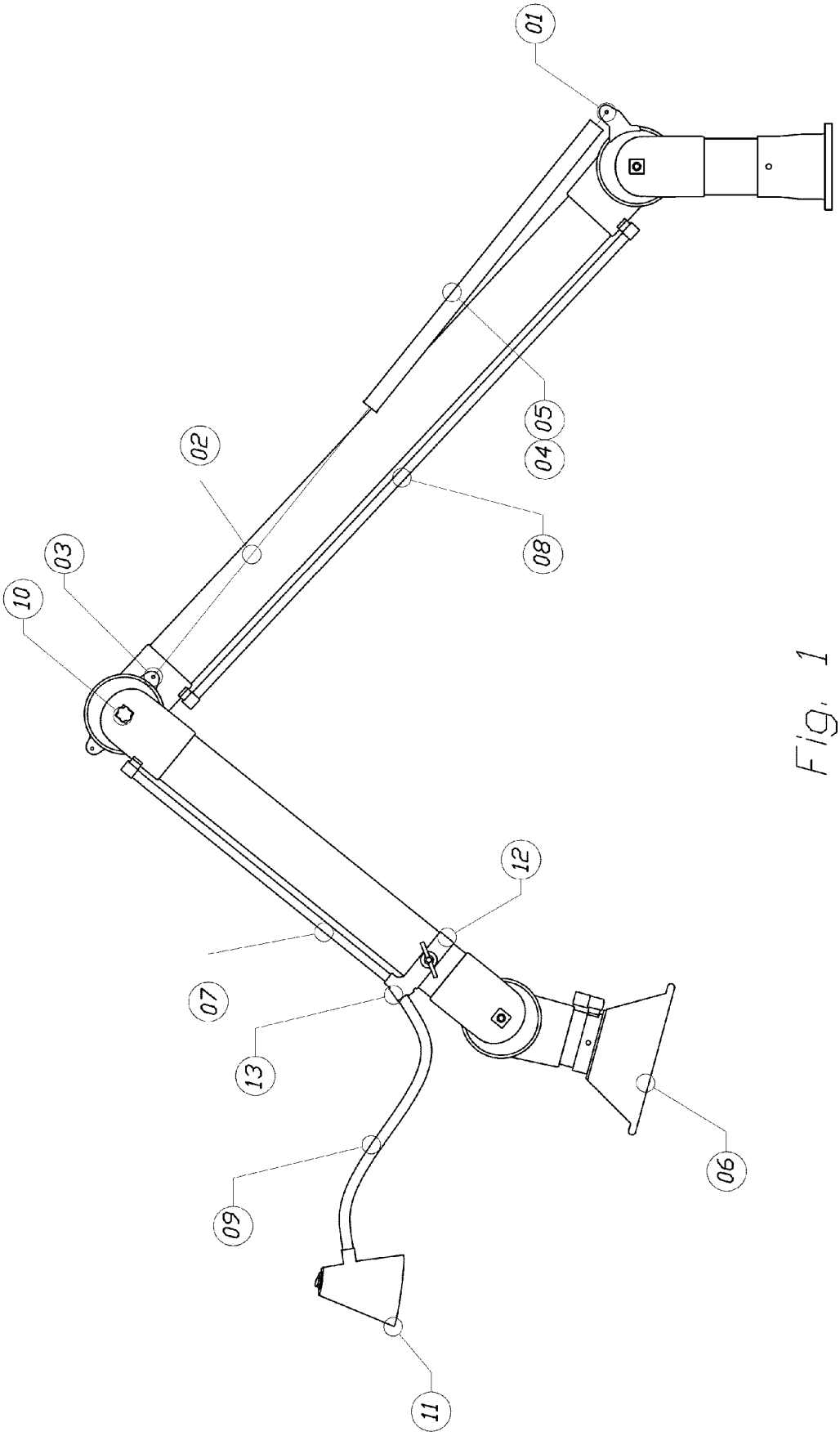

Fig. 1

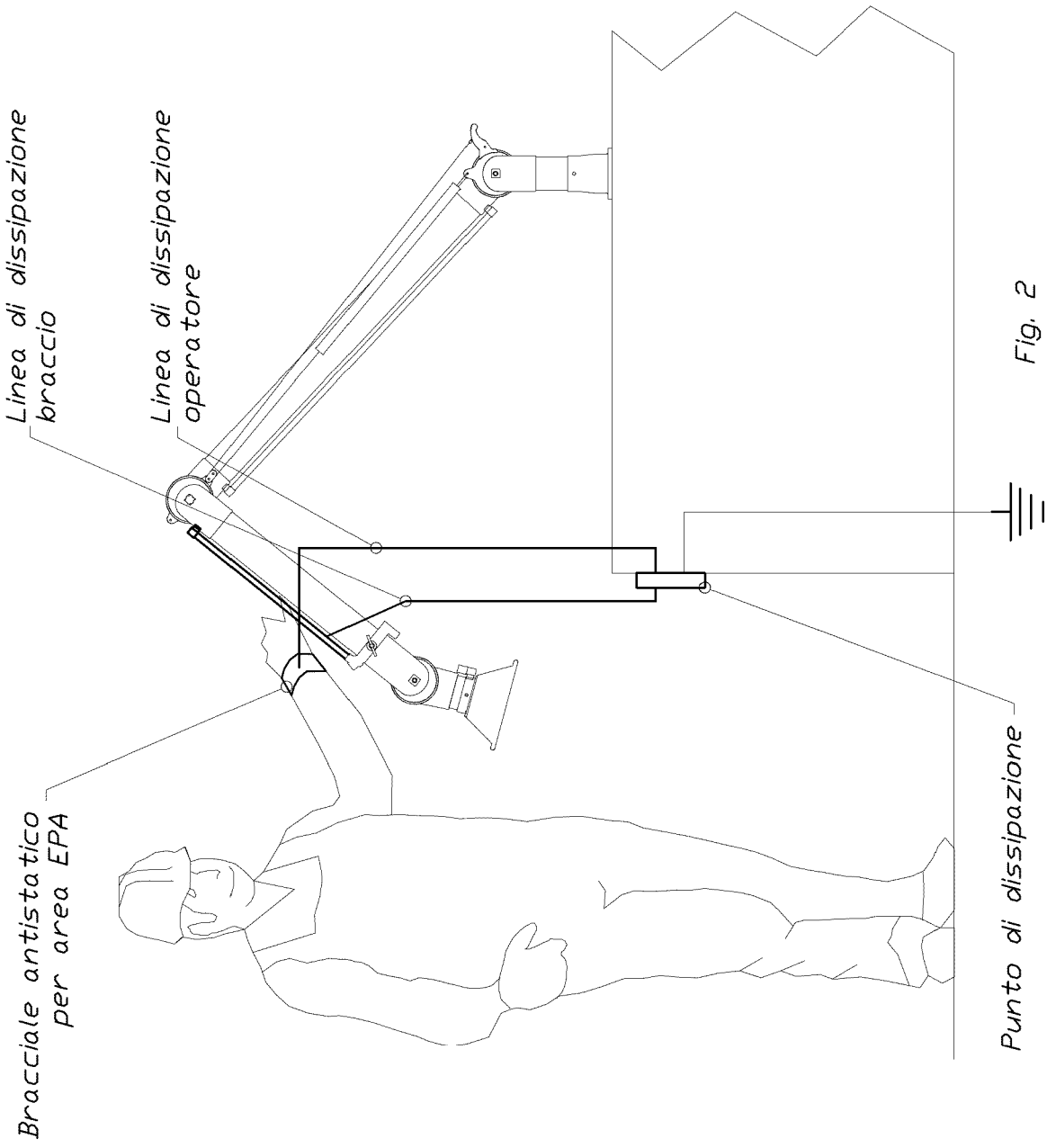
Linea di dissipazione braccio
Linea di dissipazione operatore
Bracciale antistatico per area EPA
Punto di dissipazione

Fig. 2

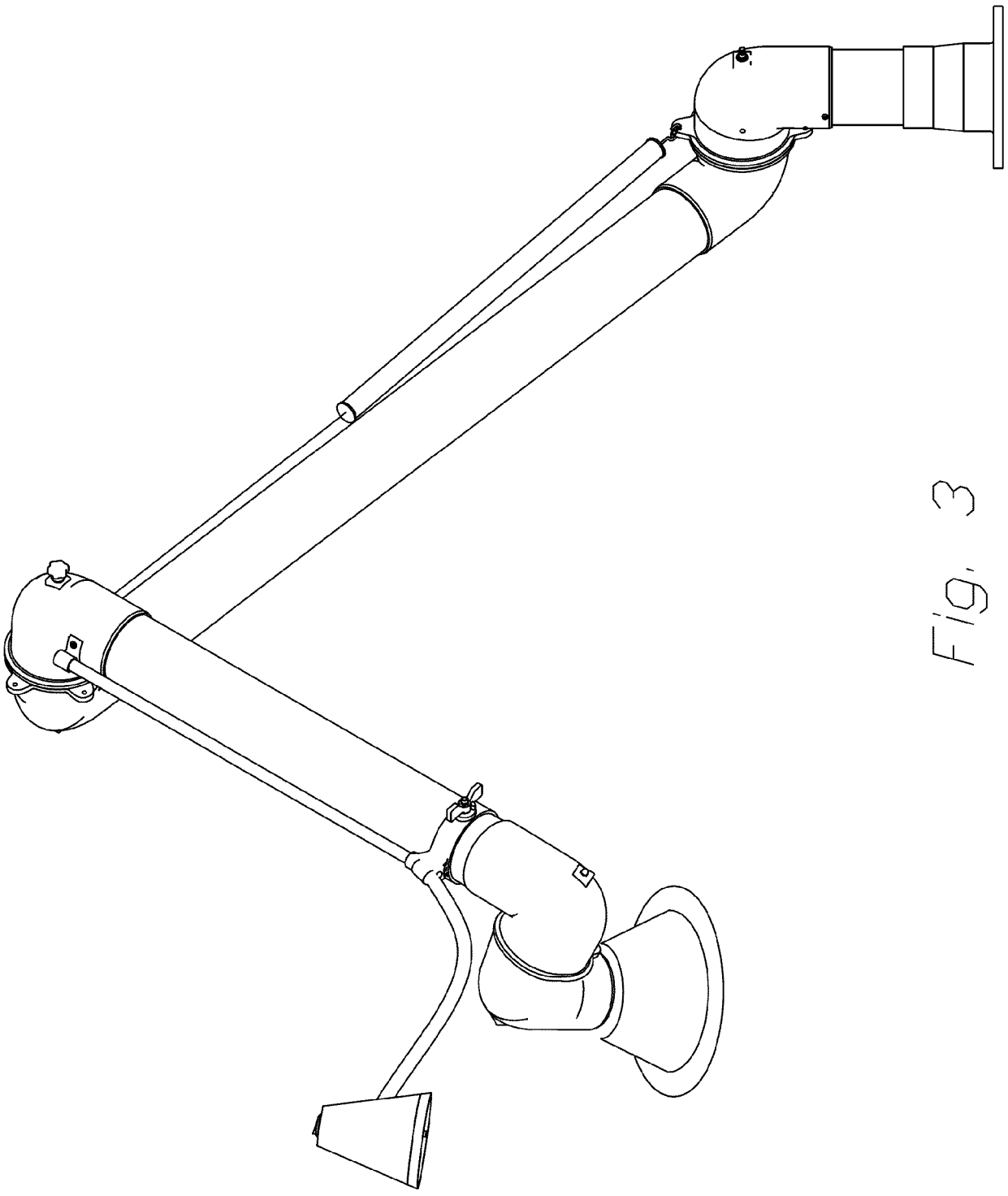

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 23 18 1311

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 Y	JP H08 103411 A (OSADA RES INST LTD) 23 April 1996 (1996-04-23) * paragraphs [0005] - [0011], [0015] - [0017], [0025]; figures 1,4 *	1,2,6 3-5	INV. B08B5/04 B08B15/04 B08B15/00
Y	WO 03/100313 A1 (CORAL SPA [IT]; CORAL LUCIANO [IT]; BAZZO PIETRO [IT]) 4 December 2003 (2003-12-04) * page 4, line 2 - page 13, line 16; claims 1-6; figures 1-10 *	3-5	
A	EP 1 570 923 A2 (AIRBOX SRL [IT]) 7 September 2005 (2005-09-07) * the whole document *	3,4	
A	WO 2022/049729 A1 (TAKARA BELMONT CORP [JP]) 10 March 2022 (2022-03-10) * the whole document *	1-6	
			TECHNICAL FIELDS SEARCHED (IPC) B08B A61C A61G F21V

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	30 October 2023	Léandre, Arnaud

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 18 1311

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30-10-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP H08103411 A	23-04-1996	JP 3143026 B2	07-03-2001
		JP H08103411 A	23-04-1996
WO 03100313 A1	04-12-2003	AU 2003234984 A1	12-12-2003
		IT TO20020437 A1	24-11-2003
		US 2005252336 A1	17-11-2005
		WO 03100313 A1	04-12-2003
EP 1570923 A2	07-09-2005	NONE	
WO 2022049729 A1	10-03-2022	JP 7175536 B2	21-11-2022
		JP WO2022049729 A1	10-03-2022
		WO 2022049729 A1	10-03-2022

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