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(54) EXPOSURE UNIT FOR THE EXPOSURE OF ZIPPER TEETH TO A TREATMENT OF DEPOSITING A SURFACE COATING FILM

(57) The exposure unit (1) for exposing zipper teeth (2) to a treatment of depositing a surface coating film comprises a vertical cylindrical framework (3), a plurality of mixing blades (7), a plurality of metal mesh annular channels (4) vertically spaced apart and rigidly supported in cantilever fashion from the vertical cylindrical framework (3) coaxially with the vertical axis of the vertical cylindrical framework (3), wherein said annular channels (4) have a bottom (5) and a lateral containment edge (6) which in cooperation delimit a volume, open at the top, for collecting the teeth (2), wherein each mixing blade (7) projects from above into the volume for collecting the teeth (2) of a corresponding annular channel (4), and wherein there is provided a movement means configured to make the mixing blades (7) sweep the entire volume for collecting the teeth (2).

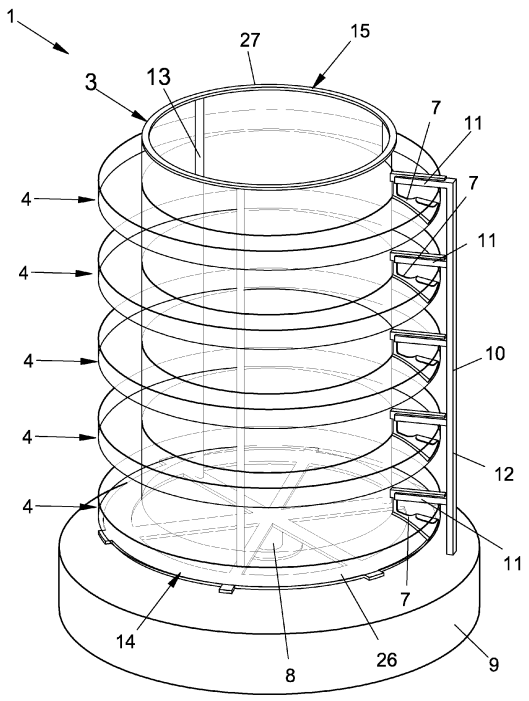

FIG.1

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Description

DESCRIPTION

[0001] The present invention relates to an exposure unit for exposing zipper teeth to a surface coating film deposition treatment.

[0002] As is well known, there are surface coating processes traditionally used in various sectors as a quality alternative to common surface finishing techniques (e.g. electroplating, painting, etc.), compared to which they have much higher physical and aesthetic characteristics.

[0003] However, it is well known that such processes are generally not used for the coating of small bulk products, such as zipper teeth, which are traditionally treated by painting or galvanic plants, but which, in addition to having a reduced production capacity in the face of a significant encumbrance, result in coatings with mechanical, physical and chemical properties that are not always adequate.

[0004] The technical task which the present invention proposes is, therefore, to realise an exposure unit for exposing zipper teeth to a surface coating film deposition treatment which eliminates the complained of technical drawbacks of the known technique.

[0005] In the context of this technical task, one aim of the invention is to realise an exposure unit that allows an amount of loose teeth to be uniformly exposed to treatment in the smallest possible space.

[0006] Another purpose of the invention is to create a compact, manageable, inexpensive exposure unit that is easy to build, inspect and maintain.

[0007] Last but not least, the aim of the invention is to realise an exposure unit that makes it possible to uniformly coat an amount of loose teeth in the smallest possible space and in the shortest possible time.

[0008] The technical task, as well as these and other purposes, according to the present invention are achieved by realizing an exposure unit for exposing zipper teeth to a treatment of depositing a surface coating film, characterised in that it comprises a vertical cylindrical framework, a plurality of mixing blades, a plurality of metal mesh annular channels vertically spaced apart and rigidly supported in cantilever fashion from said vertical cylindrical framework coaxially with the vertical axis of said vertical cylindrical framework, wherein said annular channels have a bottom and a lateral containment edge which in cooperation delimit a volume, open at the top, for collecting the teeth, wherein each mixing blade projects from above into the volume for collecting the teeth of a corresponding annular channel, and wherein there is provided a movement means configured to make said mixing blades sweep the entire volume for collecting the teeth.

[0009] In a preferred embodiment of the invention said metal mesh of the channels has a maximum mesh size of no more than 1 mm.

[0010] In a preferred mode of embodiment of the invention said mixing blades extend flush to the bottom of the channels.

[0011] In a preferred mode of embodiment of the invention, the bottom of the annular channels is inclined. In a preferred mode of embodiment of the invention said means of movement comprise a motorised shaft rigidly supporting said framework.

[0012] In a preferred embodiment of the invention said motorised shaft has a vertical axis of rotation coaxial with the axis of said framework.

[0013] In a preferred embodiment of the invention said vertical cylindrical framework comprises a series of uprights connected to the bases of said vertical cylindrical framework by a lower horizontal rim and an upper horizontal rim.

[0014] In a preferred embodiment of the invention, said framework comprises metal mesh infill panels arranged between the uprights along the outer cylindrical generatrices of said framework.

[0015] In a preferred embodiment of the invention, said metal mesh of the infill panels has meshes of a maximum size not exceeding 1 mm.

[0016] Further features and advantages of the invention will become more apparent from the description of a preferred but non-exclusive embodiment of an exposure unit for exposing zipper teeth to a surface coating film deposition treatment according to the invention, illustrated by way of illustration and not limitation in the accompanying drawings, wherein:

Figure 1 shows a perspective view of the exposure unit;
Figure 2 shows a plan view of the exposure unit from above;
Figures 3 a and 3b show a side elevation and perspective view of an exposure unit detail at a mixing blade;
Figure 4 shows a portion of metal mesh forming the channel with some zipper teeth on it;
Figure 5 shows schematically a reactor housing the exposure unit.

[0017] With reference to the above-mentioned figures, an exposure unit 1 is shown for the exposure of zipper teeth 2 to a surface coating film deposition treatment.

[0018] Exposure unit 1 comprises a vertical cylindrical framework 3 and a plurality of annular metal mesh channels 4 rigidly supported cantilevered from the vertical cylindrical framework 3.

[0019] The annular channels 4 are arranged coaxially to the vertical axis V of the vertical cylindrical framework 3 and have a pitch P of vertical spacing from each other.

[0020] Preferably the spacing step P is constant.

[0021] The annular channels 4 have an inclined bottom 5 and a lateral containment edge 6, which in cooperation delimit a volume, open at the top, for the collection of the teeth 2.

[0022] The lateral containment edge 6 extends from

the radially outer perimeter edge of the inclined bottom 5 of the annular channels 4.

[0023] The bottom 5 of the annular channels 4 has a radially inner perimeter edge and a radially outer perimeter edge and is inclined downwards in a radial direction towards its radially outer perimeter edge.

[0024] Exposure unit 1 provides a plurality of mixing blades 7 and special movement means configured to make the mixing blades 7 sweep the entire volume for collecting the teeth 2.

[0025] Each mixing blade 7 projects from above into the volume for collecting the teeth 2 of a corresponding annular channel 4.

[0026] The mixing blades 7 have a height that gradually increases in a radial direction towards the radially outer perimeter edge of the bottom 5 of the annular channels 4.

[0027] The mixing blades 7 extend flush with the bottom 5 of the annular channels 4.

[0028] A sliding contact between the mixing blades 7 and the bottom 5 of the annular channels 4 can therefore be provided to prevent the teeth 2 from getting stuck.

[0029] The mixing blades 7 can therefore be configured to scrape the bottom 5 of the annular channels 4 and for this reason can be made of material with a low coefficient of friction.

[0030] The mixing blades 7 preferably have a curl 7a apically, which favours the tilting of the teeth 2.

[0031] In practice, the movement means are configured to generate a relative sliding movement of the mixing blade 7 in the annular channel 4 along the circumferential length of the annular channel 4 in such a way as to ensure that all the teeth 2 in the annular channel 4 are stirred.

[0032] The means of movement may include a motorised shaft 8 rigidly supporting the framework 3.

[0033] The motorised shaft 8 in particular can rotate on itself around a vertical axis of rotation coaxial to the V-axis of the framework 3.

[0034] The motorised shaft is supported in rotation at the centre of a fixed pedestal 9 which serves as the fixing base for a rigid support frame 10 for the mixing blades 7.

[0035] The frame 10 is shaped like a vertical comb and therefore has a vertical rod 12 attached peripherally to the pedestal 9 and equidistant horizontal prongs 11 extending from the vertical rod 12 into the gap between the annular channels 4.

[0036] Below each prong 11 is a corresponding mixing blade 7 rigidly attached in overhead fashion, said mixing blade 7 projecting from above, as mentioned, into the corresponding channel 4.

[0037] The framework 3 and the rigid support frame 10 for the mixing blades 7 can be formed from modules that can be combined in height so that the number of channels 4 and corresponding mixing blades 7 can be varied as desired.

[0038] It is not excluded that more than one vertical row of mixing blades 7 may be provided, for example two diametrically opposed vertical rows of mixing blades 7, in order to limit the number of complete revolutions that the framework 3 must perform in order to correctly complete the treatment of the bulk mass of teeth 2.

[0039] The cylindrical framework 3 comprises a lower horizontal base 14, an upper horizontal base 15 and a set of uprights 13.

[0040] The lower base 14 has an outer ring 26, a central hub 24 rigidly engaged with the motirised shaft 8, and spokes 16 connecting the outer ring 26 to the central hub 24.

[0041] The upper base 15 is formed by a ring 27 coaxial to ring 26.

[0042] The uprights 13 connect the bases 14, 15.

[0043] The motorised shaft 8 therefore drives the cylindrical framework 3 in rotation from below.

[0044] The framework 3 also comprises metal mesh infill panels 17 that run between the uprights 13 along the outer cylindrical generatrices of the framework 3 that coincide with the cylindrical generatrices of the radially inner perimeter edge of the bottom 5 of the annular channels 4.

[0045] The metal mesh of the annular channel 4 has meshes 4a with a maximum mesh size of no more than 1 mm.

[0046] The metal mesh of the infill panels 17 has meshes with a maximum mesh size of no more than 1 mm.

[0047] In this way, the teeth 2, although very small in size, can be retained within the annular channels 4 and at the same time the meshes 4a of the metal mesh of the annular channels 4 and the meshes of the infill panels 17 allow a considerable exposure of the surface of the teeth 2 to the treatment.

[0048] Reactor 18 for deposition of a surface coating film on zipper teeth can utilise different technologies for coating with a surface film.

[0049] Reactor 18 comprises a treatment chamber 19 inside which exposure unit 1 is located.

[0050] During treatment, the annular channels 4 rotate so that the mixing blades 7 sweep the entire volume of collection of the teeth 2 to ensure uniform treatment of the teeth.

[0051] The exposing unit for exposing zipper teeth to a surface coating film deposition treatment thus conceived is susceptible to numerous modifications and variants, all of which fall within the scope of the inventive concept; moreover, all details are replaceable by technically equivalent elements. In practice, the materials used, as well as the dimensions, can be any according to requirements and the state of the art.

Claims

1. An exposure unit (1) for exposing zipper teeth (2) to a treatment of depositing a surface coating film, **characterised in that** it comprises a vertical cylindrical framework (3), a plurality of mixing blades (7), a plurality of metal mesh annular channels (4) vertically spaced apart and rigidly supported in cantilever

fashion from said vertical cylindrical framework (3) coaxially with the vertical axis of said vertical cylindrical framework (3), wherein said annular channels (4) have a bottom (5) and a lateral containment edge (6) which in cooperation delimit a volume, open at the top, for collecting the teeth (2), wherein each mixing blade (7) projects from above into the volume for collecting the teeth (2) of a corresponding annular channel (4), and wherein there is provided a movement means configured to make said mixing blades (7) sweep the entire volume for collecting the teeth (2).

2. The exposure unit (1) according to the preceding claim, **characterised in that** said metal mesh of the annular channels (4) has meshes (4a) of a maximum size not exceeding 1 mm.

3. The exposure unit (1) according to any preceding claim, **characterised in that** said mixing blades (7) extend down to the level of the bottom (5) of the annular channels (4).

4. The exposure unit (1) according to any preceding claim, **characterised in that** the bottom (5) of the annular channels (4) is inclined.

5. The exposure unit (1) according to any preceding claim, **characterised in that** said movement means comprises a motorised shaft (8) rigidly supporting said framework (3).

6. The exposure unit (1) according to the preceding claim, **characterised in that** said motorised shaft (8) has an axis of vertical rotation that is coaxial with the axis of said framework (3).

7. The exposure unit (1) according to any preceding claim, **characterised in that** said vertical cylindrical framework (3) comprises a series of uprights (13) connected to the bases (14, 15) of said vertical cylindrical framework (3).

8. The exposure unit (1) according to the preceding claim, **characterised in that** said framework comprises metal mesh infill panels (17) disposed between the uprights (13) along the outer cylindrical generatrices of said vertical cylindrical framework (3).

9. The exposure unit (1) according to the preceding claim, **characterised in that** said metal mesh of the infill panels (17) has meshes of a maximum size not exceeding 1 mm.

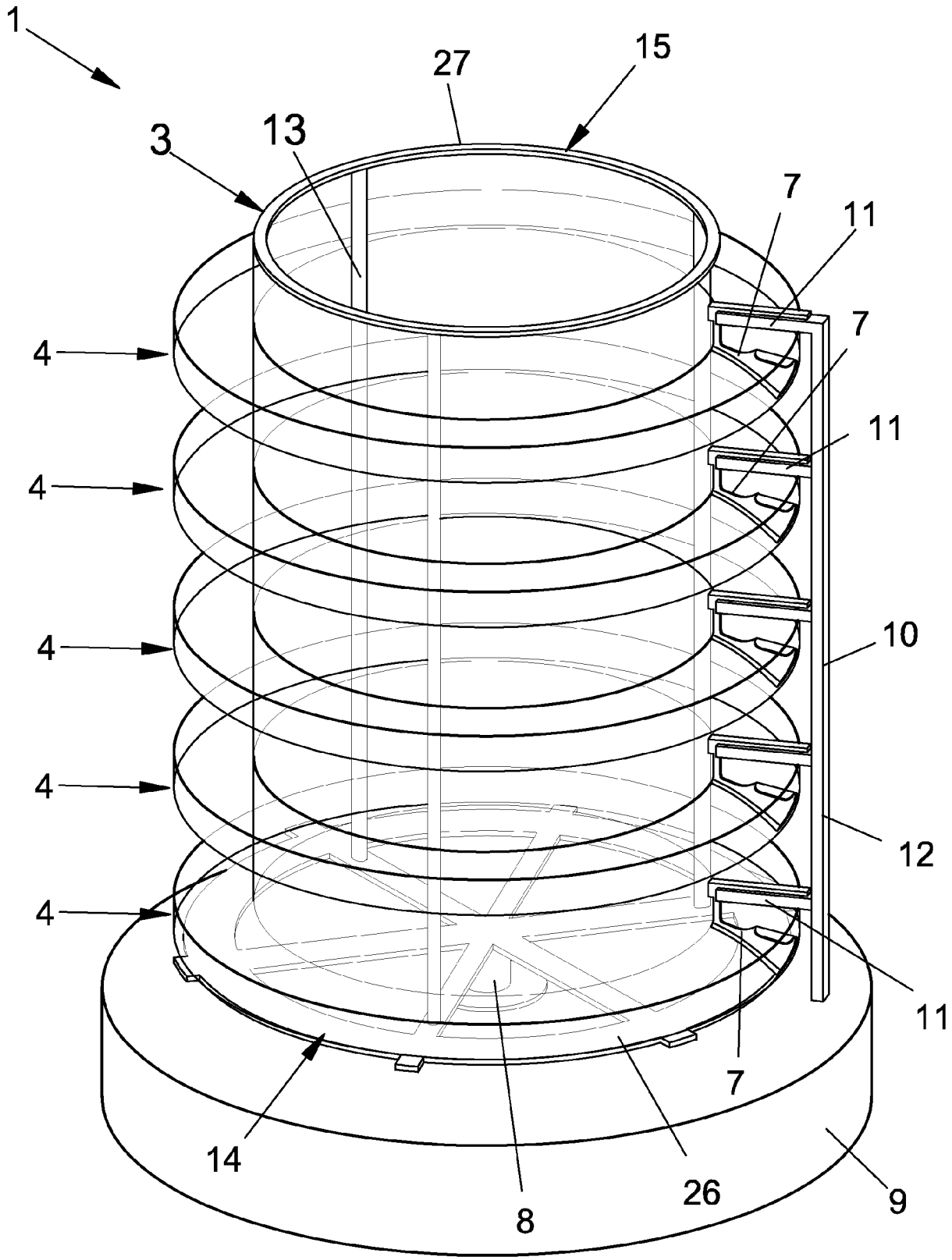

FIG.1

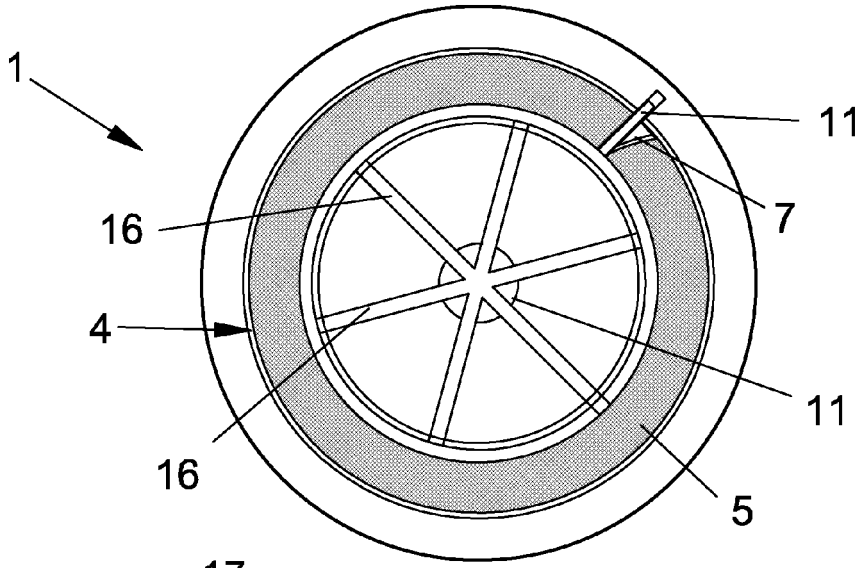

FIG.2

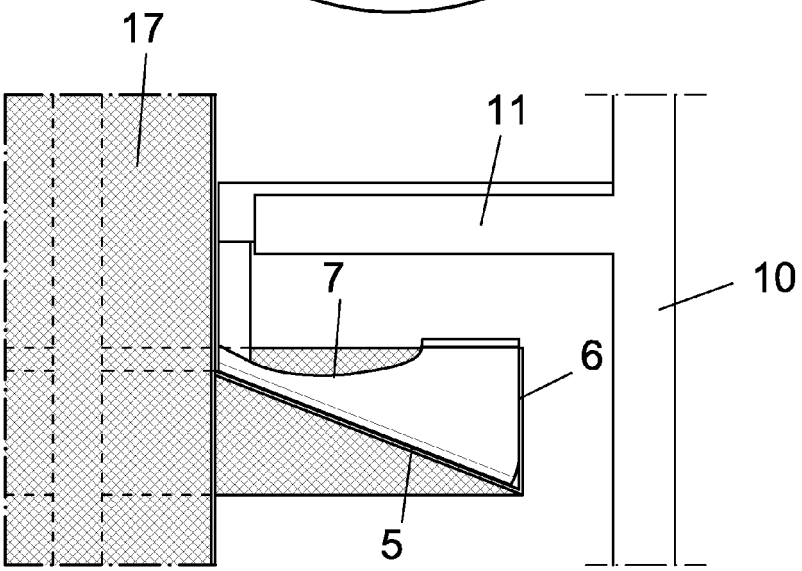

FIG.3a

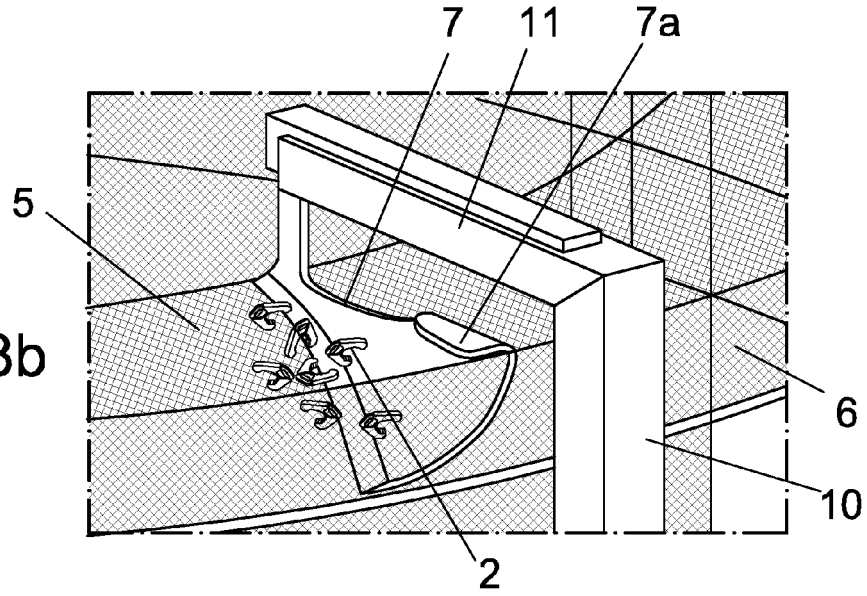

FIG.3b

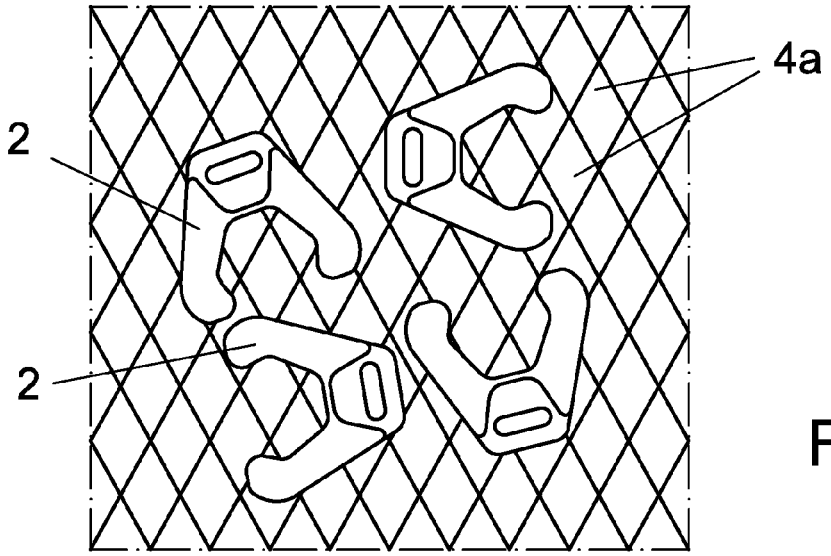

FIG.4

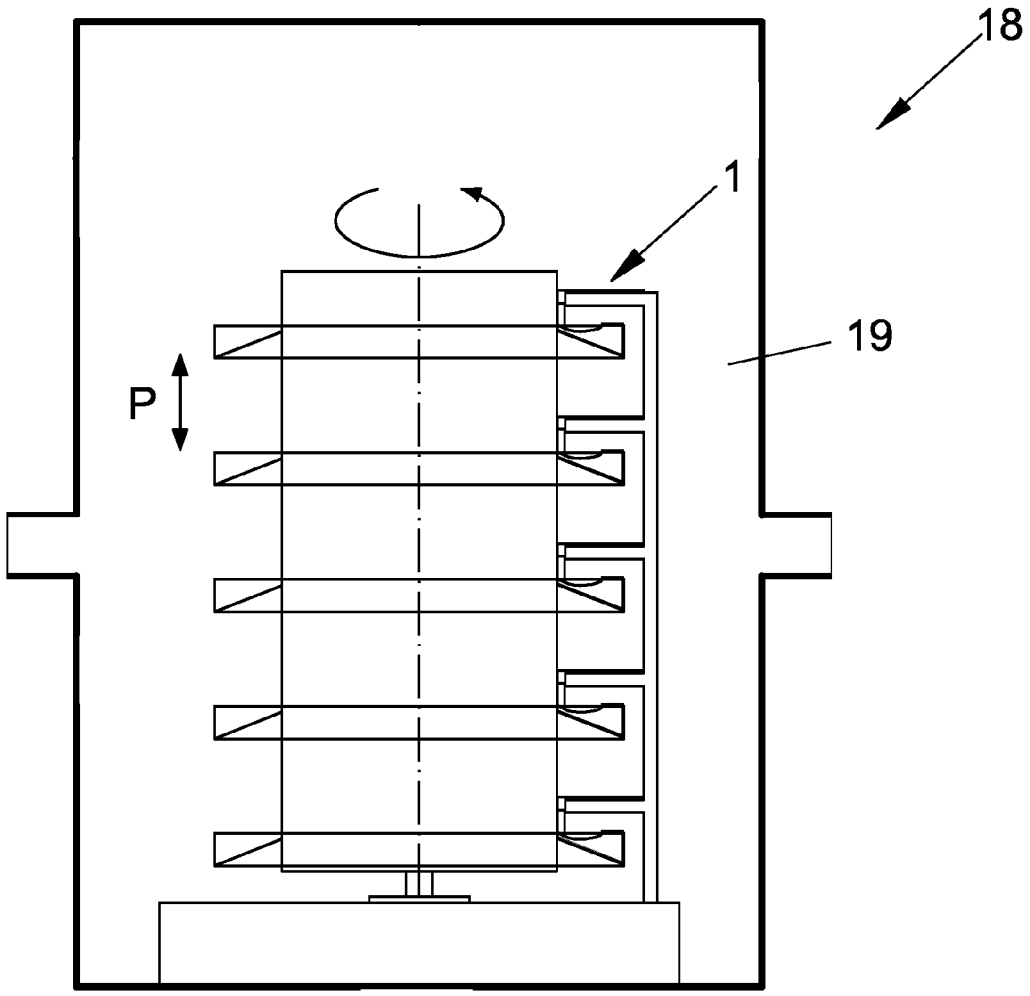

FIG.5

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EUROPEAN SEARCH REPORT

Application Number
EP 24 15 5933

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	CN 114 472 088 A (TURNIP LAKE ZHENYUAN COMPOSITE NEW MAT CO LTD) 13 May 2022 (2022-05-13) * figures 1,3,4 *	1-9	INV. B05C3/10
A	KR 2011 0067188 A (JUNG MYUNG SIK [KR]) 22 June 2011 (2011-06-22) * figures 1-5 *	1-9	
A	CN 211 854 636 U (FUJIAN BAICHANG CONSTRUCTION CO LTD) 3 November 2020 (2020-11-03) * figure 1 *	1-9	
			TECHNICAL FIELDS SEARCHED (IPC)
			B05C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 February 2024	Székely, Zsolt

CATEGORY OF CITED DOCUMENTS

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26-02-2024

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KR 20110067188 A	22-06-2011	NONE	
CN 211854636 U	03-11-2020	NONE	

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