

(19)



(11)

**EP 4 139 619 B1**

(12)

**EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:  
**17.07.2024 Bulletin 2024/29**

(51) International Patent Classification (IPC):  
**F26B 11/16<sup>(2006.01)</sup> F26B 25/04<sup>(2006.01)</sup>**

(21) Application number: **21722320.5**

(52) Cooperative Patent Classification (CPC):  
**F26B 25/04; B01F 27/0726; B01F 27/70; B01F 35/184; F26B 11/16**

(22) Date of filing: **21.04.2021**

(86) International application number:  
**PCT/NL2021/050258**

(87) International publication number:  
**WO 2021/215918 (28.10.2021 Gazette 2021/43)**

**(54) PROCESSING DEVICE FOR PROCESSING ONE OR MORE FLOWABLE MATERIALS**

VERARBEITUNGSVORRICHTUNG ZUR VERARBEITUNG EINES ODER MEHRERER FLIESSFÄHIGER MATERIALIEN

DISPOSITIF DE TRAITEMENT D'UNE OU PLUSIEURS MATIÈRES COULANTES

(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 MK MT NL NO PL PT RO RS SE SI SK SM TR**

(72) Inventor: **VAN DER WEL, Peter Gerardus Josephus**  
**7005 BL Doetinchem (NL)**

(30) Priority: **22.04.2020 NL 2025396**

(74) Representative: **van Trier, Norbertus Henricus Gerardus**  
**Octrooibureau Vriesendorp & Gaade B.V.**  
**Koninginnegracht 19**  
**2514 AB Den Haag (NL)**

(43) Date of publication of application:  
**01.03.2023 Bulletin 2023/09**

(73) Proprietor: **Hosokawa Micron B.V.**  
**7005 BL Doetinchem (NL)**

(56) References cited:  
**EP-A1- 1 236 015 EP-A2- 0 105 436**  
**KR-A- 20110 061 820 US-A- 2 756 971**  
**US-A- 5 570 517 US-A1- 2015 298 095**

**EP 4 139 619 B1**

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

## Description

### BACKGROUND

**[0001]** The invention relates to a device for processing one or more flowable materials. Additionally, the invention relates to a system for processing one or more flowable materials, and to a method for processing one or more flowable materials.

**[0002]** Such a device for processing one or more flowable materials, for example, is known from US 3,425,135 relating to a rotary solids processing apparatus and method. US 3,425,135 describes that solids processing is carried out in an elongated vessel of substantially circular cross-section having an axially mounted rotatable shaft provided with paddle blades or vanes radially mounted and extending substantially to the inside wall of the vessel. The vessel is disposed generally horizontally, that is on either a horizontal or upwardly or downwardly inclined axis. Also US 5,570,517 A discloses a processing device and method according to the prior art.

### SUMMARY OF THE INVENTION

**[0003]** As described in US 3,425,135, the paddle bearing shaft is rotated at a speed high enough to cause the paddle blades or vanes to strike and agitate the particles of solids within the vessel to such an extent that the mass of solids is maintained as an annular fluidized bed. The shaft is rotated fast enough that the centrifugal forces on the particles are greater than the force of gravity so as to maintain the circulating annular bed, which on most materials has an observable inner boundary. A disadvantage of the known rotary solids processing apparatus is that during, for example, mixing of two or more particle materials a cloud of dust of at least one of the two or more particle materials is formed within the vessel. The cloud of dust moves along the paddle bearing shaft towards the outlet of the vessel, while being at a distance of the observable inner boundary of the circulating annular bed within the vessel. Therefore, the cloud of dust shortens the predetermined moving path of the two or more particle materials within the vessel. As a result, the cloud of dust disadvantageously exits the vessel at the outlet thereof, therewith leading to unknown composition of the mixture of the two or more particle materials exiting the vessel.

**[0004]** It is an object of the present invention to ameliorate or to eliminate one or more disadvantages of the known solids processing apparatus, to provide an improved solids processing apparatus or to at least provide an alternative solids processing apparatus.

**[0005]** According to a first aspect, the invention provides a processing device for processing one or more flowable materials, such as pharmaceuticals, according to claim 1.

**[0006]** As mentioned above, during processing the one or more flowable materials, such as mixing two flowable

materials, a cloud of dust is formed within the processing chamber, which cloud of dust floats within and through the processing chamber. By providing the dust directing member, the cloud of dust is prevented from reaching the outlet of the processing device, such that it is prevented that the cloud of dust exits the processing device via the outlet thereof. As a result, the part of the processing chamber downstream of the dust directing member is substantially free of dust. Therefore, the mixture of the two flowable materials mixed within the processing chamber exits the processing device via the outlet thereof while the mixture advantageously remains unaffected by any dust formed within the processing chamber.

**[0007]** According to the invention, the agitating rotor is configured to rotate to agitate the one or more flowable materials within the vessel to such an extent that the one or more flowable materials are maintained as an annular fluidized bed within the cylindrical processing chamber. Therefore, during use the agitating rotor may rotate to agitate the particles of solids within the vessel to such an extent that the mass of solids is maintained as an annular fluidized bed. The shaft may be rotated fast enough that the centrifugal forces on the particles are greater than the force of gravity so as to maintain the circulating annular bed, which on most materials has an observable inner boundary. The dust directing member, during use, may direct the cloud of dust towards the circulating annular bed comprising the one or more flowable materials, therewith introducing the cloud of dust into the circulating annular bed. As a result, the cloud of dust advantageously may be absorbed into the circulating annular bed, such that all material that is introduced into the processing device also exits the processing device.

**[0008]** In the context of the present application, a flowable material has to be understood as a solid, a slurry, a gel, a filter cake, a powder and/or any combination thereof.

**[0009]** According to the invention, the dust directing member is arranged at or near the outlet. By arranging the dust directing member close to the outlet of the processing chamber of the processing device, the part of the processing chamber downstream of the dust directing member is kept to a minimum. Advantageously, formation of another cloud of dust downstream of the dust directing member is kept to a minimum.

**[0010]** According to the invention, the dust directing member has a substantially circular directing body, wherein the substantially circular directing body extends substantially transverse to the longitudinal direction of the agitating rotor. According to the invention, the cylindrical processing chamber is a circular cylindrical processing chamber having a first diameter, wherein the substantially circular directing body has a second diameter, wherein the second diameter is smaller than the first diameter. An advantage of this is that the dust directing member forms a dam within the processing chamber in order to prevent the cloud of dust from reaching the outlet of the processing device.

**[0011]** According to the invention, the cylindrical processing chamber has a cylindrical inner surface and the substantially circular directing body has an outer circumference, wherein a distance between the cylindrical inner surface of the cylindrical processing chamber and the outer circumference of the substantially circular directing body is in the range between 2 and 20 mm, for example is 3 mm when the first diameter is approximately 134 mm, or in the range between 1% and 17%, preferably between 1.5% and 15%, of the first diameter. The distance between the cylindrical inner surface of the cylindrical processing chamber and the outer circumference of the substantially circular directing body may be chosen to correspond to a thickness of the circulating annular bed of the one or more flowable materials within the processing chamber. As a result, the circulating annular bed is able to pass between the cylindrical inner surface of the cylindrical processing chamber and the outer circumference of the substantially circular directing body, while substantially no or very little free space is left between the cylindrical inner surface and the outer circumference. The risk of the cloud of dust or a part thereof passing beyond the dust directing member, therefore, is reduced to a minimum.

**[0012]** In an embodiment, the dust directing member is removable arranged at the agitating rotor. According to this embodiment, the dust directing member can be removed from the agitating rotor when necessary or desired, for example, such that the processing device can be used for processing another one or more flowable materials. As a result, the usability of the processing device is increased advantageously. Furthermore, the dust directing member can be repositioned at the agitating rotor to a desired position, such that the position of the dust directing member can be adapted to a use of the processing device.

**[0013]** In an embodiment, the substantially circular directing body has a first semi-circular body portion and a second semi-circular body portion, wherein each of the first and second semi-circular body portions has a convex-shaped edge and a straight edge, preferably wherein the straight edges of the first and second semi-circular body portions are facing towards each other. In an embodiment thereof, each of the straight edges has a semi-circular recess at the center thereof, wherein the semi-circular recesses of the first and second body portions together define a passage for allowing the agitating rotor to pass therethrough. An advantage of this embodiment is that the substantially directing body can be arranged at the agitating rotor, while the agitating rotor remains in its position. Therefore, the dust directing member can be arranged advantageously at an agitating rotor retrospectively.

**[0014]** In an embodiment, the first and second semi-circular body portions are arranged to be secured to each other. In an embodiment thereof, each of the first and second semi-circular body portions comprises a securing member for securing the first and second semi-circular

body portions to each other. An advantage of this embodiment is that the dust directing member can be firmly attached to the agitating rotor.

**[0015]** In an embodiment, each securing member has a securing body with a first securing body end and a second securing body end, wherein, at the first end, each of the securing bodies is provided with a securing face and a receiving opening at the securing face configured to receive a securing part, wherein, at the second end, each of the securing bodies is provided with a securing extension extending away from the securing body and substantially parallel to the straight edge of the respective semi-circular body portion and configured to be arranged against the securing face of the other securing member, wherein each securing extension has an extension body with a receiving passage for allowing the securing part to pass therethrough. In an embodiment thereof, each securing member extends around the semi-circular recess of the respective semi-circular body portion, and wherein the securing body at the first semi-circular body portion has an opposite orientation to the securing body at the second semi-circular body portion. When the dust directing member is arranged at the agitating rotor, each of the securing members abuts against the agitating rotor in a clamping manner. As a result, the securing members fixate the dust directing member with respect to the agitating rotor.

**[0016]** In an embodiment, the agitating rotor comprises an agitating axle arranged concentric within the processing chamber, and a plurality of agitating members arranged at the agitating axle and extending therefrom in a radial outward direction. In an embodiment thereof, each of the agitating members comprises an agitating shaft arranged at the agitating axle at one end thereof, and an agitating vane arranged at the end of the respective agitating shaft facing away from the agitating axle. Using such an agitating rotor results in a good mixing result when two or more flowable materials are introduced into the processing chamber.

**[0017]** In an embodiment, when the substantially circular directing body has a first semi-circular body portion and a second semi-circular body portion, wherein each of the first and second semi-circular body portions has a convex-shaped edge and a straight edge, preferably wherein the straight edges of the first and second semi-circular body portions are facing towards each other, the straight edges of the first and second semi-circular body portions are provided with first and second deepenings configured for defining first and second receiving spaces for receiving a part of an agitating vane. When the dust directing member has received a part of an agitating vane of the agitating rotor, rotation of the agitating rotor causes rotation of the dust directing member. A result of the dust directing member being rotating during use is that dust colliding onto the dust directing member will be directed outwards due to a centrifugal force applied to the dust by the dust directing member.

**[0018]** In an embodiment, the processing device com-

prises two or more dust directing members. An advantage of this embodiment is that a dust directing member can be located directly downstream of an inlet, for example, when the processing device comprises two or more inlets for introducing flowable material into the processing chamber.

**[0019]** In an embodiment, the processing device is selected from a group comprising a mixer, preferably an annular mixer, an agitator and a dryer.

**[0020]** According to a second aspect, the invention provides a processing system for processing one or more flowable materials, such as pharmaceuticals, the system comprising:

- one or more feeders configured for feeding one or more flowable materials to the processing device; and
- a processing device for processing the one or more flowable materials, according to the first aspect of the invention.

**[0021]** The processing system according to the invention has at least the same advantages as described in relation to the processing device according to the first aspect of the invention.

**[0022]** According to a third aspect, the invention provides a processing method for processing one or more flowable materials, such as pharmaceuticals, by means of a processing device for processing one or more flowable materials, according to the first aspect of the invention, the method comprising:

- providing one or more flowable materials to be processed to the processing device for processing one or more flowable materials;
- processing the one or more flowable materials to be processed by the processing device; and
- discharging the processed one or more materials from the processing device.

**[0023]** The method according to the invention has at least the same advantages as described in relation to the processing device according to the first aspect of the invention.

**[0024]** In an embodiment, the step of providing one or more flowable materials to the processing device for processing one or more flowable materials comprises the step of providing one or more acceptable pharmaceutical ingredients (APIs) and/or one or more excipients.

**[0025]** In an embodiment, the step of providing one or more flowable materials to be processed to the processing device for processing one or more flowable materials comprises the step of providing two or more flowable materials to be processed to the processing device. In an embodiment thereof, the step of processing the one or more flowable materials to be processed by the processing device comprises the step of mixing two or more flowable materials.

**[0026]** The various aspects and features described and shown in the specification can be applied, individually, wherever possible. These individual aspects, in particular the aspects and features described in the attached dependent claims, can be made subject of divisional patent applications.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0027]** The invention will be elucidated on the basis of an exemplary embodiment shown in the attached drawings, in which:

Figure 1 shows an isometric view of a processing device having a housing and a dust disc according to an embodiment of the invention;

Figure 2 shows an isometric view of the processing device of figure 1 with a partially housing;

Figures 3A-3C show a cross-sectional view of the processing device of figure 1 along line IIIa-IIIa; a cross-sectional view of the processing device of figure 1 along line IIIb-IIIb; and a cross-sectional view of the processing device of figure 1 along line IIIc-IIIc, respectively;

Figures 4A-4B show an isometric view of the dust disc; and an exploded view of the dust disc of figure 4A, respectively;

Figure 5 shows an isometric view of a processing device according to a further embodiment of the invention; and

Figure 6 shows a cross-sectional view of a processing device according to a further embodiment of the invention.

#### DETAILED DESCRIPTION OF THE INVENTION

**[0028]** An isometric view of a processing device 1 for processing one or more flowable materials, such as pharmaceuticals, according to an embodiment of the invention is shown in figure 1. The processing device 1 comprises an elongated cylindrical housing 2 in which an internal cylindrical processing chamber 3 is defined. The cylindrical housing 2 has a first end 4 and a second end 5, in longitudinal direction opposite to the first end 4. At the first end 4, the cylindrical housing 2 is coupled to a non-shown driving unit, schematically represented by a driving axle 6. The non-shown driving unit bounds the processing chamber 3 at the first end 4 of the cylindrical housing 3. At the second end 5, the cylindrical housing 2 is provided with a closure plate 7 for bounding the processing chamber 3 at the second end 5 of the cylindrical housing 2.

**[0029]** The non-shown driving unit is provided with a partition disc 10 having a first side 11 and a second side 12, opposite to the first side 11. The driving axle 6 extends at the first side 11 from the partition disc 10 in a direction away therefrom. At the second side 12, the partition disc 10 is provided with a partition disc coupling flange 13.

**[0030]** As shown in figure 2, the cylindrical housing 2 has a circular cylindrical circumferential wall 20 with a horizontal centerline S. The circular cylindrical circumferential wall 20 defines at the inside thereof a circular cylindrical inner surface 21 of the processing chamber 3. The circular cylindrical circumferential wall 20 merges at the first end 4 thereof, which is the side facing the non-shown driving unit, into a first coupling flange 22, and merges at the second end 5 thereof, which is the side facing away from the non-shown driving unit, into a second coupling flange 23.

**[0031]** As shown in figure 1, the cylindrical housing 2 is provided with an inlet conduit 30 having a circular cylindrical inlet tube 31 with a vertical centerline K. The circular cylindrical inlet tube 31 is provided at or near the first end 4 of the cylindrical housing 2. As shown in figure 3B, the circular cylindrical inlet tube 31 is arranged at the top side of the circular cylindrical circumferential wall 20 and debouches tangentially into the processing chamber 3. Therefore, the circular cylindrical inlet tube 31 merges smoothly into the circular cylindrical inner surface 21 of the processing chamber 3 at a position remote from the horizontal centerline S.

**[0032]** The cylindrical housing 2 is further provided with an outlet conduit 35 having a circular cylindrical outlet tube 36 met a vertical centerline L. The circular cylindrical outlet tube 36 is provided at or near the second end 5 of the cylindrical housing 2. As shown in figure 3C, the circular cylindrical outlet tube 36 is arranged at the bottom side of the circular cylindrical wall 20 and debouches tangentially into the processing chamber 3. Thus, the circular cylindrical outlet tube 36 merges smoothly into the circular cylindrical inner surface 21 of the processing chamber 3 at a position remote from the horizontal centerline S. As is clear from figures 3B and 3C, the circular cylindrical outlet tube 36 is, in the circumferential direction around the horizontal centerline S, in line with the circular cylindrical inlet tube 31.

**[0033]** As shown in figure 3A, the first coupling flange 22 is placed against the partition disc coupling flange 13, wherein a first sealing ring 14 is placed therebetween. The first coupling flange 22 and the partition disc coupling flange 13 can be coupled by means of a non-shown first clamping ring. The closure plate 7 is placed against the second coupling flange 23 of the cylindrical housing 2, wherein a second sealing ring 15 is placed therebetween. The closure plate 7 and the second coupling flange 23 can be coupled by means of a non-shown second clamping ring.

**[0034]** The processing device 1 comprises a straight agitating rotor 40 arranged with the processing chamber 3. The agitating rotor 40 extends from a bearing 41 within the partition disc 10 through the first coupling flange 22 and through the processing chamber 3. The agitating rotor 40 is connected to the driving axle 6 in order to rotate the agitating rotor 40 in a rotating direction R. As shown in figure 3A, the agitating rotor 40 is arranged concentric within the processing chamber 3, such that the agitating

rotor centerline coincides with the horizontal centerline of the cylindrical housing 2.

**[0035]** The agitating rotor 40 comprises an agitating axle 42 arranged concentric within the processing chamber 3, and a plurality of agitating members 43 arranged at the agitating axle 42 and extending therefrom in a radial outward direction. As shown in figure 2, each of the agitating members 43 comprises an agitating shaft 44 arranged at the agitating axle 42 at one end thereof. Each agitating member 43 further comprises an agitating vane 45 at the end of the respective agitating shaft 44 facing away from the agitating axle 42. Each of the agitating vanes 45 defines a displacement plane or main plane extending parallel to the respective agitating shaft 44 and extending at an angle with respect to the horizontal centerline S.

**[0036]** At the first end 4 and at the second end 5 of the cylindrical housing 2, the agitating rotor 40 is further provided with scraping members 46. Each of the scraping members 46 is provided with a scraping shaft 47 arranged at the agitating axle 42 at one end thereof. Each scraping member 46 further comprises a scraping vane 48 having a scraping edge 49 for contacting and scraping over a surface of the partition disc 10 or the closure plate 7.

**[0037]** As shown in among others figure 2, the processing device 1 further comprises a dust directing member 50, also called a dust disc 50, removably arranged at the agitating rotor 40. The dust directing member 50 has a substantially circular directing body 51. As shown in figures 4A and 4B, the circular directing body 51 has a first semi-circular body portion 52 and a second semi-circular body portion 53. Each of the semi-circular body portions 52, 53 has a convex-shaped edge 54 and a straight edge 55, wherein the straight edges 55 of the first and second semi-circular body portions 52, 53 are facing towards each other. Each of the straight edges 55 has a semi-circular recess 56 at the center thereof, wherein the semi-circular recesses 56 of the first and second semi-circular body portions 52, 53 together define a passage 57 for allowing the agitating axle 42 to pass therethrough. Additionally, each of the straight edges 55 comprises a first deepening 58 at a first end thereof, and a second deepening 59 at a second end thereof. The first deepenings 58 of the first and second semi-circular body portions 52, 53 together define a first receiving space 60, and the second deepenings 59 of the first and second semi-circular body portions 52, 53 together define a second receiving space 61. The first and second receiving spaces 60, 61 are configured for receiving a part of the agitating vane 45 of one of the agitating members 43.

**[0038]** Each of the first and second semi-circular body portions 52, 53 comprises a securing member 65 provided at a side of the respective semi-circular body portion 52, 53. Each securing member 65 has a securing body 66, with a first securing body end 67 and a second securing body end 68, extending around the semi-circular recess 56 of the respective semi-circular body portions

52, 53. As shown in figure 4B, the securing body 66 at the first semi-circular body portion 52 has an opposite orientation to the securing body 66 at the second semi-circular body portion 53. At the first end 67, each of the securing bodies 66 is provided with a securing face 69, facing towards the other one of the first and second semi-circular body portions 52, 53, and a receiving opening 70 at the securing face 69 configured to receive a securing part 71, such as a screw or a bolt. At the second end 68, each of the securing bodies 66 is provided with a securing extension 72 extending away from the securing body 66 and substantially parallel to the straight edge 55 of the respective semi-circular body portion 52, 53. The securing extension 72 of the securing body 66 at one of the first and second semi-circular body portions 52, 53 is configured to be arranged against the securing face 69 of the other one of the first and second semi-circular body portion 52, 53. As shown in figure 4B, each securing extension 72 has an extension body with a receiving passage 74 for allowing the securing part 71 to pass therethrough, such that the dust directing member 50 can be removably arranged at the agitating axle 42.

**[0039]** As indicated in figure 3A, the processing chamber 3 has a first diameter D1 and the dust directing member 50 has a second diameter D2. The second diameter D2 is smaller than the first diameter D1 in order to realize a narrow passage between the outer circumference of the dust directing member 50 and the circular cylindrical inner surface 21 of the processing chamber 3. For example, the first diameter is 134 mm and the second diameter is 128 mm, such that the distance between the outer circumference of the dust directing member 50 and the circular cylindrical inner surface 21 of the processing chamber 3 is approximately 3 mm.

**[0040]** During use, the agitating rotor 40 is rotated at a rotation speed in the range between 400 and 1500 rpm. The agitating vanes 45, therefore, generate an under pressure within the inlet conduit 30 and an over pressure within the outlet conduit 35, such that an air flow from the inlet conduit 30 to the outlet conduit 35 is generated. A combination of two or more flowable materials to be mixed is introduced into the processing chamber 3 via the inlet conduit 30. The agitating vanes 45 apply due to the rotating motion a centrifugal force to the combination of two or more flowable materials, therewith forcing the two or more flowable materials towards the outside of the processing chamber 3. As a result, the combination of two or more flowable materials moves spirally close to the circular cylindrical inner surface 21 of the processing chamber 3 in a movement direction M, therewith forming an annular layer along the circular cylindrical inner surface 21.

**[0041]** The combination of two or more flowable materials moves through the processing chamber 3 towards the outlet conduit 35, while passing the dust disc 50. The dust disc 50 provides a barrier along which the annular layer of the combination of two or more flowable materials is forced to pass. Dust floating around and moving along

the agitating axle 42, therewith being remote from the annular layer of the combination of two or more flowable materials, is stopped by the dust disc 50 and forced towards the outside of the processing chamber 3, *i.e.* towards the annular layer of two or more flowable materials moving along the circular cylindrical inner surface 21 of the processing chamber 3. Therefore, the part of the processing chamber 3 beyond the dust disc 50, when viewed in the movement direction M, is substantially free of dust. Subsequently, the combination of two or more flowable materials, which are mixed at this stage, fall out of the processing chamber 3 through the outlet conduit 35 under influence of gravity.

**[0042]** An isometric view of a processing device 101 according to a further embodiment of the invention is shown in figure 5. The processing device 101 has substantially the same features as the processing device 1. Therefore, similar features are referred to with the same reference number increased with 100.

**[0043]** The processing device 101 differs from the processing device 1 as described in relation to figures 1-4, in that the processing device 101 comprises an additional inlet conduit 132 having an additional circular cylindrical inlet tube 133 with a vertical centerline T. The additional circular cylindrical inlet tube 133 is provided in front of the dust disc 150, when viewed in the movement direction M. Similar to the circular cylindrical inlet tube 131, the additional circular cylindrical inlet tube 133 is arranged at the top side of the circular cylindrical circumferential wall 120 and debouches tangentially into the processing chamber 103. Therefore, the additional circular cylindrical inlet tube 133 merges smoothly into the circular cylindrical inner surface 121 of the processing chamber 103 at a position remote from the horizontal centerline S.

**[0044]** This embodiment of the processing device 101 provides an additional inlet location, such that, for example, a first flowable material can be introduced into the processing chamber 103 via the inlet conduit 130, and a second flowable material can be introduced into the processing chamber 103 via the additional inlet conduit 132.

**[0045]** A cross-sectional view of a processing device 201 according to a further embodiment of the invention is shown in figure 6. The processing device 201 has substantially the same features as the processing device 1. Therefore, similar features are referred to with the same reference number increased with 200.

**[0046]** The processing device 201 differs from the processing device 1 as described in relation to figures 1-4, in that the processing device 201 comprises an additional dust directing member 280, also called additional dust disc 280, is arranged at the agitating axle 242 directly downstream of the inlet conduit 230.

**[0047]** It is to be understood that the above description is included to illustrate the operation of the preferred embodiments and is not meant to limit the scope of the invention.

**Claims**

1. Processing device (1, 101, 201) for processing one or more flowable materials, such as pharmaceuticals, the processing device (1, 101, 201) comprising:

a housing (2, 102) having a cylindrical processing chamber (3, 103), and having an inlet (30, 130, 230) in fluid communication with the processing chamber (3, 103), and an outlet (35, 135) in fluid communication with the processing chamber (3, 103) and at a distance from the inlet (30, 130, 230) in a direction along the longitudinal direction of the cylindrical processing chamber (3, 103); and

an agitating rotor (40, 240) arranged axially within the processing chamber (3, 103) and configured for agitating one or more flowable materials within the processing chamber (3, 103), wherein the agitating rotor (40, 240) is configured to rotate to agitate the one or more flowable materials within the vessel to such an extent that the one or more flowable materials are maintained as an annular fluidized bed within the cylindrical processing chamber (3, 103),

wherein the processing device (1, 101, 201) further comprises a dust directing member (50, 150, 250) arranged at the agitating rotor (40, 240) and at or near the outlet (35, 135), and configured for substantially preventing a cloud of dust within the processing chamber (3, 103) from reaching the outlet (35, 135) and for directing the cloud of dust towards the annular fluidized bed, therewith introducing the cloud of dust into the annular fluidized bed, wherein the dust directing member (50, 150, 250) has a substantially circular directing body (51) extending substantially transverse to the longitudinal direction of the agitating rotor (40, 240),

wherein the cylindrical processing chamber (3, 103) is a circular cylindrical processing chamber (3, 103) having a first diameter (D1), wherein the substantially circular directing body (51) has a second diameter (D2), wherein the second diameter (D2) is smaller than the first diameter (D1), and wherein the cylindrical processing chamber (3, 103) has a cylindrical inner surface (21, 121, 221) and the substantially circular directing body (51) has an outer circumference, wherein a distance between the cylindrical inner surface (21, 121, 221) of the cylindrical processing chamber (3, 103) and the outer circumference of the substantially circular directing body (51) is in the range between 2 and 20 mm, for example is 3 mm when the first diameter (D1) is approximately 134 mm, or in the range between 1% and 17%, preferably between 1.5% and 15%, of the first diameter (D1).

2. Processing device (1, 101, 201) according to claim 1, wherein the dust directing member (50, 150, 250) is removably arranged at the agitating rotor (40, 240).
3. Processing device (1, 101, 201) according to claim 1, wherein the substantially circular directing body (51) has a first semi-circular body portion (52) and a second semi-circular body portion (53), wherein each of the first and second semi-circular body portions (52, 53) has a convex-shaped edge (54) and a straight edge (55), preferably wherein the straight edges (55) of the first and second semi-circular body portions (52, 53) are facing towards each other.
4. Processing device (1, 101, 201) according to claim 3, wherein each of the straight edges (55) has a semi-circular recess (56) at the center thereof, wherein the semi-circular recesses (56) of the first and second body portions (52, 53) together define a passage (57) for allowing the agitating rotor (40, 240) to pass therethrough.
5. Processing device (1, 101, 201) according to claim 3 or claim 4, wherein the first and second semi-circular body portions (52, 53) are arranged to be secured to each other.
6. Processing device (1, 101, 201) according to any one of claims 3-5, wherein each of the first and second semi-circular body portions (52, 53) comprises a securing member (65) for securing the first and second semi-circular body portions (52, 53) to each other.
7. Processing device (1, 101, 201) according to claim 6, wherein each securing member (65) has a securing body (66) with a first securing body end (67) and a second securing body end (68), wherein, at the first end (67), each of the securing bodies (66) is provided with a securing face (69) and a receiving opening (70) at the securing face (69) configured to receive a securing part (71), wherein, at the second end (68), each of the securing bodies (66) is provided with a securing extension (72) extending away from the securing body (66) and substantially parallel to the straight edge (55) of the respective semi-circular body portion (52, 53) and configured to be arranged against the securing face (69) of the other securing member (65), wherein each securing extension (72) has an extension body (73) with a receiving passage (74) for allowing the securing part (71) to pass therethrough.
8. Processing device (1, 101, 201) according to claim 4 and claim 7, wherein each securing member (65) extends around the semi-circular recess (56) of the respective semi-circular body portion (52, 53), and

wherein the securing body (66) at the first semi-circular body portion (52) has an opposite orientation to the securing body (66) at the second semi-circular body portion (53).

9. Processing device (1, 101, 201) according to any one of the preceding claims, wherein the agitating rotor (40, 240) comprises an agitating axle (42, 242) arranged concentric within the processing chamber (3, 103), and a plurality of agitating members (43) arranged at the agitating axle (42, 242) and extending therefrom in a radial outward direction.

10. Processing device (1, 101, 201) according to any one of the preceding claims, wherein each of the agitating members (43) comprises an agitating shaft (44, 244) arranged at the agitating axle (42, 242) at one end thereof, and an agitating vane (45) arranged at the end of the respective agitating shaft (44, 244) facing away from the agitating axle (42, 242).

11. Processing device (1, 101, 201) according to claim 10, when dependent on claim 3, wherein the straight edges (55) of the first and second semi-circular body portions (52, 53) are provided with first and second deepening (59) configured for defining first and second receiving spaces (60, 61) for receiving a part of an agitating vane (45).

12. Processing device (1, 101, 201) according to any one of the preceding claims, wherein the processing device (1, 101, 201) comprises two or more dust directing members (50, 150, 250, 280); and/or wherein the processing device (1, 101, 201) is selected from a group comprising a mixer, preferably an annular mixer, an agitator and a dryer.

13. Processing system for processing one or more flowable materials, such as pharmaceuticals, the system comprising:

one or more feeders configured for feeding one or more flowable materials to the processing device (1, 101, 201); and  
a processing device (1, 101, 201) for processing the one or more flowable materials, according to any one of the preceding claims.

14. Processing method for processing one or more flowable materials, such as pharmaceuticals, by means of a processing device (1, 101, 201) for processing one or more flowable materials, according to any one of the claims 1-12, the method comprising:

providing one or more flowable materials to be processed to the processing device (1, 101, 201) for processing one or more flowable materials;  
processing the one or more flowable materials

to be processed by the processing device (1, 101, 201) by rotating the agitating rotor (40, 240) to agitate the one or more flowable materials within the vessel to such an extent that the one or more flowable materials are maintained as an annular fluidized bed within the cylindrical processing chamber (3, 103); and  
discharging the processed one or more materials from the processing device (1, 101, 201), wherein the method, during the step of processing the one or more flowable materials, further comprises the steps of, by means of the dust directing member (50, 150, 250), substantially preventing a cloud of dust within the processing chamber (3, 103) from reaching the outlet (35, 135), and of directing the cloud of dust towards the annular fluidized bed, therewith introducing the cloud of dust into the annular fluidized bed.

15. Method according to claim 14, wherein the step of providing one or more flowable materials to the processing device (1, 101, 201) for processing one or more flowable materials comprises the step of providing one or more acceptable pharmaceutical ingredients (APIs) and/or one or more excipients; and/or wherein the step of providing one or more flowable materials to be processed to the processing device (1, 101, 201) for processing one or more flowable materials comprises the step of providing two or more flowable materials to be processed to the processing device (1, 101, 201), preferably wherein the step of processing the one or more flowable materials to be processed by the processing device (1, 101, 201) comprises the step of mixing two or more flowable materials.

#### Patentansprüche

1. Verarbeitungsvorrichtung (1, 101, 201) zum Verarbeiten eines oder mehrerer fließfähiger Materialien, wie zum Beispiel Arzneimittel, wobei die Verarbeitungsvorrichtung (1, 101, 201) folgende Merkmale aufweist:

ein Gehäuse (2, 102), das eine zylindrische Verarbeitungskammer (3, 103) aufweist, und einen Einlass (30, 130, 230) in Fluidkommunikation mit der Verarbeitungskammer (3, 103) und einen Auslass (35, 135) in Fluidkommunikation mit der Verarbeitungskammer (3, 103) und in einem Abstand zu dem Einlass (30, 130, 230) in einer Richtung entlang der Längsrichtung der zylindrischen Verarbeitungskammer (3, 103) aufweist; und  
einen Rührrotor (40, 240), der in der Verarbeitungskammer (3, 103) axial angeordnet ist und

- konfiguriert ist zum Rühren eines oder mehrerer fließfähiger Materialien in der Verarbeitungskammer (3, 103), wobei der Rührrotor (40, 240) dazu konfiguriert ist, sich zu drehen, um das eine oder die mehreren fließfähigen Materialien in dem Gefäß derart zu rühren, dass das eine oder die mehreren fließfähigen Materialien in der zylindrischen Verarbeitungskammer (3, 103) als ein ringförmiges fluidisiertes Bett beibehalten werden, wobei die Verarbeitungsvorrichtung (1, 101, 201) ferner ein Staubleitbauglied (50, 150, 250) aufweist, das an dem Rührrotor (40, 240) und an oder nahe dem Auslass (35, 135) angeordnet ist, und konfiguriert ist, im Wesentlichen zu verhindern, dass eine Staubwolke in der Verarbeitungskammer (3, 103) den Auslass (35, 135) erreicht, und die Staubwolke zu dem ringförmigen fluidisierten Bett zu leiten, wodurch die Staubwolke in das ringförmige fluidisierte Bett eingebracht wird, wobei das Staubleitbauglied (50, 150, 250) einen im Wesentlichen kreisförmigen Leitkörper (51) aufweist, der sich im Wesentlichen quer zu der Längsrichtung des Rührrotors (40, 240) erstreckt, wobei die zylindrische Verarbeitungskammer (3, 103) eine kreisförmige zylindrische Verarbeitungskammer (3, 103) mit einem ersten Durchmesser (D1) ist, wobei der im Wesentlichen kreisförmige Leitkörper (51) einen zweiten Durchmesser (D2) aufweist, wobei der zweite Durchmesser (D2) kleiner ist als der erste Durchmesser (D1), und wobei die zylindrische Verarbeitungskammer (3, 103) eine zylindrische Innenoberfläche (21, 121, 221) aufweist und der im Wesentlichen kreisförmige Leitkörper (51) einen Außenumfang aufweist, wobei ein Abstand zwischen der zylindrischen Innenoberfläche (21, 121, 221) der zylindrischen Verarbeitungskammer (3, 103) und dem Außenumfang des im Wesentlichen kreisförmigen Leitkörpers (51) in dem Bereich zwischen 2 und 20 mm liegt, beispielsweise 3 mm, wenn der erste Durchmesser (D1) etwa 134 mm beträgt, oder in dem Bereich zwischen 1 % und 17 %, vorzugsweise zwischen 1,5 % und 15 % des ersten Durchmessers (D1).
2. Verarbeitungsvorrichtung (1, 101, 201) gemäß Anspruch 1, bei der das Staubleitbauglied (50, 150, 250) an dem Rührrotor (40, 240) herausnehmbar angeordnet ist.
  3. Verarbeitungsvorrichtung (1, 101, 201) gemäß Anspruch 1, bei der der im Wesentlichen kreisförmige Leitkörper (51) einen ersten halbkreisförmigen Körperabschnitt (52) und einen zweiten halbkreisförmigen Körperabschnitt (53) aufweist, wobei jeder des ersten und zweiten halbkreisförmigen Körperabschnitts (52, 53) einen konvexförmigen Rand (54) und einen geraden Rand (55) aufweist, wobei vorzugsweise die geraden Ränder (55) des ersten und zweiten halbkreisförmigen Körperabschnitts (52, 53) einander zugewandt sind.
  4. Verarbeitungsvorrichtung (1, 101, 201) gemäß Anspruch 3, bei der jeder der geraden Ränder (55) eine halbkreisförmige Ausnehmung (56) in der Mitte desselben aufweist, wobei die halbkreisförmigen Ausnehmungen (56) des ersten und zweiten Körperabschnitts (52, 53) zusammen einen Durchgang (57) definieren, um es dem Rührrotor (40, 240) zu ermöglichen, durch denselben zu verlaufen.
  5. Verarbeitungsvorrichtung (1, 101, 201) gemäß Anspruch 3 oder Anspruch 4, bei der der erste und zweite halbkreisförmige Körperabschnitt (52, 53) angeordnet sind, um aneinander befestigt zu sein.
  6. Verarbeitungsvorrichtung (1, 101, 201) gemäß einem der Ansprüche 3 bis 5, bei der jeder des ersten und zweiten halbkreisförmigen Körperabschnitts (52, 53) ein Befestigungsbauglied (65) zum Befestigen des ersten und zweiten halbkreisförmigen Körperabschnitts (52, 53) aneinander aufweist.
  7. Verarbeitungsvorrichtung (1, 101, 201) gemäß Anspruch 6, bei der jedes Befestigungsbauglied (65) einen Befestigungskörper (66) mit einem ersten Befestigungskörperende (67) und einem zweiten Befestigungskörperende (68) aufweist, wobei jeder der Befestigungskörper (66) an dem ersten Ende (67) mit einer Befestigungsfläche (69) und einer Aufnahmeöffnung (70) an der Befestigungsfläche (69) versehen ist, die dazu konfiguriert ist, ein Befestigungsteil (71) aufzunehmen, wobei jeder der Befestigungskörper (66) an dem zweiten Ende (68) mit einer Befestigungserstreckung (72) versehen ist, die sich weg von dem Befestigungskörper (66) und im Wesentlichen parallel zu dem geraden Rand (55) des jeweiligen kreisförmigen Körperabschnitts (52, 53) erstreckt und dazu konfiguriert ist, an der Befestigungsfläche (69) des anderen Befestigungsbauglieds (65) angeordnet zu sein, wobei jede Befestigungserstreckung (72) einen Erstreckungskörper (73) mit einem Aufnahmedurchgang (74) aufweist, um es dem Befestigungsteil (71) zu ermöglichen, durch denselben zu verlaufen.
  8. Verarbeitungsvorrichtung (1, 101, 201) gemäß Anspruch 4 und Anspruch 7, bei der jedes Befestigungsbauglied (65) sich um die halbkreisförmige Ausnehmung (56) des jeweiligen halbkreisförmigen Körperabschnitts (52, 53) erstreckt, und wobei der Befestigungskörper (66) an dem ersten halbkreisförmigen Körperabschnitt (52) eine entgegengesetzte

Ausrichtung zu dem Befestigungskörper (66) an dem zweiten halbkreisförmigen Körperabschnitt (53) aufweist.

9. Verarbeitungsvorrichtung (1, 101, 201) gemäß einem der vorhergehenden Ansprüche, bei der der Rührrotor (40, 240) eine Rührachse (42, 242), die in der Verarbeitungskammer (3, 103) konzentrisch angeordnet ist, und eine Mehrzahl von Rührbaugliedern (43) aufweist, die an der Rührachse (42, 242) angeordnet sind und sich von derselben in einer radialen Auswärtsrichtung erstrecken. 5
10. Verarbeitungsvorrichtung (1, 101, 201) gemäß einem der vorhergehenden Ansprüche, bei der jedes der Rührbauglieder (43) eine Rührwelle (44, 244), die an der Rührachse (42, 242) an einem Ende derselben angeordnet ist, und einen Rührflügel (45) aufweist, der an dem Ende der jeweiligen Rührwelle (44, 244) angeordnet ist, das von der Rührachse (42, 242) abgewandt ist. 10
11. Verarbeitungsvorrichtung (1, 101, 201) gemäß Anspruch 10, in Abhängigkeit von Anspruch 3, wobei die geraden Ränder (55) des ersten und zweiten halbkreisförmigen Körperabschnitts (52, 53) mit einer ersten und zweiten Vertiefung (59) versehen sind, die konfiguriert sind zum Definieren eines ersten und zweiten Aufnahme-raums (60, 61) zum Aufnehmen eines Teils eines Rührflügels (45). 20
12. Verarbeitungsvorrichtung (1, 101, 201) gemäß einem der vorhergehenden Ansprüche, wobei die Verarbeitungsvorrichtung (1, 101, 201) zwei oder mehr Staubleitbauglieder (50, 150, 250, 280) aufweist; und/oder wobei die Verarbeitungsvorrichtung (1, 101, 201) aus einer Gruppe ausgewählt ist, die einen Mischer, vorzugsweise einen ringförmigen Mischer, einen Rührer und einen Trockner aufweist. 30
13. Verarbeitungssystem zum Verarbeiten eines oder mehrerer fließfähiger Materialien, wie zum Beispiel Arzneimittel, wobei das System folgende Merkmale aufweist: 35
- eine oder mehrere Zuführeinrichtungen, die konfiguriert sind zum Zuführen eines oder mehrerer fließfähiger Materialien zu der Verarbeitungsvorrichtung (1, 101, 201); und 40
- eine Verarbeitungsvorrichtung (1, 101, 201) zum Verarbeiten des einen oder der mehreren fließfähigen Materialien gemäß einem der vorhergehenden Ansprüche. 45
14. Verarbeitungsverfahren zum Verarbeiten eines oder mehrerer fließfähiger Materialien, wie zum Beispiel Arzneimittel, durch eine Verarbeitungsvorrichtung 50

(1, 101, 201) zum Verarbeiten eines oder mehrerer fließfähiger Materialien gemäß einem der Ansprüche 1 bis 12, wobei das Verfahren folgende Schritte aufweist:

Bereitstellen eines oder mehrerer zu verarbeitender fließfähiger Materialien an die Verarbeitungsvorrichtung (1, 101, 201) zum Verarbeiten eines oder mehrerer fließfähiger Materialien; Verarbeiten des einen oder der mehreren zu verarbeitenden fließfähigen Materialien durch die Verarbeitungsvorrichtung (1, 101, 201) durch Drehen des Rührrotors (40, 240) zum Rühren des einen oder der mehreren fließfähigen Materialien in dem Gefäß, derart, dass das eine oder die mehreren fließfähigen Materialien in der zylindrischen Verarbeitungskammer (3, 103) als ein ringförmiges fluidisiertes Bett beibehalten werden; und

Ablassen des verarbeiteten einen oder der mehreren Materialien von der Verarbeitungsvorrichtung (1, 101, 201), wobei das Verfahren während des Schritts des Verarbeitens des einen oder der mehreren fließfähigen Materialien ferner die Schritte, durch das Staubleitbauglied (50, 150, 250), des im Wesentlichen Verhinderns, dass eine Staubwolke in der Verarbeitungskammer (3, 103) den Auslass (35, 135) erreicht, und des Leitens der Staubwolke zu dem ringförmigen fluidisierten Bett aufweist, wodurch die Staubwolke in das ringförmige fluidisierte Bett eingebracht wird.

15. Verfahren gemäß Anspruch 14, bei dem der Schritt des Bereitstellens eines oder mehrerer fließfähiger Materialien an die Verarbeitungsvorrichtung (1, 101, 201) zum Verarbeiten eines oder mehrerer fließfähiger Materialien den Schritt des Bereitstellens eines oder mehrerer zulässiger pharmazeutischer Wirkstoffe (API) und/oder eines oder mehrerer Trägerstoffe aufweist; und/oder wobei der Schritt des Bereitstellens eines oder mehrerer zu verarbeitender fließfähiger Materialien an die Verarbeitungsvorrichtung (1, 101, 201) zum Verarbeiten eines oder mehrerer fließfähiger Materialien den Schritt des Bereitstellens von zwei oder mehreren zu verarbeitenden fließfähigen Materialien an die Verarbeitungsvorrichtung (1, 101, 201) aufweist, wobei der Schritt des Verarbeitens des einen oder der mehreren zu verarbeitenden fließfähigen Materialien durch die Verarbeitungsvorrichtung (1, 101, 201) vorzugsweise den Schritt des Mischens von zwei oder mehreren fließfähigen Materialien aufweist. 55

## Revendications

1. Dispositif de traitement (1, 101, 201) pour le traitement d'une ou de plusieurs matières fluides, telles que des produits pharmaceutiques, le dispositif de traitement (1, 101, 201) comprenant:

un boîtier (2, 102) ayant une chambre de traitement cylindrique (3, 103), et ayant une entrée (30, 130, 230) en communication fluidique avec la chambre de traitement (3, 103), et une sortie (35, 135) en communication fluidique avec la chambre de traitement (3, 103) et à une distance de l'entrée (30, 130, 230) dans une direction le long de la direction longitudinale de la chambre de traitement cylindrique (3, 103); et

un rotor d'agitation (40, 240) agencé axialement à l'intérieur de la chambre de traitement (3, 103) et configuré pour agiter une ou plusieurs matières fluides à l'intérieur de la chambre de traitement (3, 103), dans lequel le rotor d'agitation (40, 240) est configuré pour tourner pour agiter la ou les matières fluides à l'intérieur du récipient dans une mesure telle que la ou les matières fluides sont maintenues comme un lit fluidisé annulaire à l'intérieur de la chambre de traitement cylindrique (3, 103),

dans lequel le dispositif de traitement (1, 101, 201) comprend en outre un élément d'orientation de poussière (50, 150, 250) agencé au niveau du rotor d'agitation (40, 240) et au niveau ou près de la sortie (35, 135), et configuré pour empêcher sensiblement un nuage de poussière à l'intérieur de la chambre de traitement (3, 103) d'atteindre la sortie (35, 135) et pour orienter le nuage de poussière en direction du lit fluidisé annulaire, introduisant avec celui-ci le nuage de poussière dans le lit annulaire fluidisé, dans lequel l'élément d'orientation de poussière (50, 150, 250) a un corps d'orientation sensiblement circulaire (51) s'étendant sensiblement transversal à la direction longitudinale du rotor d'agitation (40, 240),

dans lequel la chambre de traitement cylindrique (3, 103) est une chambre de traitement cylindrique circulaire (3, 103) ayant un premier diamètre (D1), dans lequel le corps d'orientation sensiblement circulaire (51) a un second diamètre (D2), dans lequel le second diamètre (D2) est plus petit que le premier diamètre (D1), et dans lequel la chambre de traitement cylindrique (3, 103) a une surface interne cylindrique (21, 121, 221) et le corps d'orientation sensiblement circulaire (51) a une circonférence externe, dans lequel une distance entre la surface interne cylindrique (21, 121, 221) de la chambre de traitement cylindrique (3, 103) et la circonférence externe du corps d'orientation sensible-

ment circulaire (51) est dans la plage entre 2 et 20 mm, est par exemple de 3 mm lorsque le premier diamètre (D1) est d'environ 134 mm, ou dans la plage entre 1% et 17%, de préférence entre 1,5% et 15%, du premier diamètre (D1).

2. Dispositif de traitement (1, 101, 201) selon la revendication 1, dans lequel l'élément d'orientation de poussière (50, 150, 250) est agencé de manière amovible au niveau du rotor d'agitation (40, 240).
3. Dispositif de traitement (1, 101, 201) selon la revendication 1, dans lequel le corps d'orientation sensiblement circulaire (51) a une première partie de corps semi-circulaire (52) et une seconde partie de corps semi-circulaire (53), dans lequel chacune des première et seconde parties de corps semi-circulaires (52, 53) a un bord de forme convexe (54) et un bord droit (55), de préférence dans lequel les bords droits (55) des première et seconde parties de corps semi-circulaires (52, 53) se font face.
4. Dispositif de traitement (1, 101, 201) selon la revendication 3, dans lequel chacun des bords droits (55) a un évidement semi-circulaire (56) au niveau de son centre, dans lequel les évidements semi-circulaires (56) des première et seconde parties de corps (52, 53) définissent ensemble un passage (57) destiné à permettre au rotor d'agitation (40, 240) de passer au travers.
5. Dispositif de traitement (1, 101, 201) selon la revendication 3 ou la revendication 4, dans lequel les première et seconde parties de corps semi-circulaires (52, 53) sont agencées pour être fixées l'une à l'autre.
6. Dispositif de traitement (1, 101, 201) selon l'une quelconque des revendications 3-5, dans lequel chacune des première et seconde parties de corps semi-circulaires (52, 53) comprend un élément de fixation (65) destiné à fixer les première et seconde parties de corps semi-circulaires (52, 53) l'une à l'autre.
7. Dispositif de traitement (1, 101, 201) selon la revendication 6, dans lequel chaque élément de fixation (65) a un corps de fixation (66) avec une première extrémité de corps de fixation (67) et une seconde extrémité de corps de fixation (68), dans lequel, au niveau de la première extrémité (67), chacun des corps de fixation (66) est doté d'une face de fixation (69) et d'une ouverture de réception (70) au niveau de la face de fixation (69) configurée pour recevoir une partie de fixation (71), dans lequel, au niveau de la seconde extrémité (68), chacun des corps de fixation (66) est doté d'une extension de fixation (72) s'étendant de manière à s'éloigner du corps de fixa-

- tion (66) et sensiblement parallèle au bord droit (55) de la partie de corps semi-circulaire (52, 53) respective et configurée pour être agencée contre la face de fixation (69) de l'autre élément de fixation (65), dans lequel chaque extension de fixation (72) a un corps d'extension (73) avec un passage de réception (74) destiné à permettre à la partie de fixation (71) de passer au travers.
8. Dispositif de traitement (1, 101, 201) selon la revendication 4 et la revendication 7, dans lequel chaque élément de fixation (65) s'étend autour de l'évidement semi-circulaire (56) de la partie de corps semi-circulaire (52, 53) respective, et dans lequel le corps de fixation (66) au niveau de la première partie de corps semi-circulaire (52) a une orientation opposée au corps de fixation (66) au niveau de la seconde partie de corps semi-circulaire (53).
9. Dispositif de traitement (1, 101, 201) selon l'une quelconque des revendications précédentes, dans lequel le rotor d'agitation (40, 240) comprend un essieu d'agitation (42, 242) agencé concentrique à l'intérieur de la chambre de traitement (3, 103), et une pluralité d'éléments d'agitation (43) agencés au niveau de l'essieu d'agitation (42, 242) et s'étendant depuis celui-ci dans une direction extérieure radiale.
10. Dispositif de traitement (1, 101, 201) selon l'une quelconque des revendications précédentes, dans lequel chacun des éléments d'agitation (43) comprend un arbre d'agitation (44, 244) agencé au niveau de l'essieu d'agitation (42, 242) au niveau d'une extrémité de celui-ci, et une aube d'agitation (45) agencée au niveau de l'autre extrémité de l'arbre d'agitation (44, 244) respectif dirigé à l'opposé de l'essieu d'agitation (42, 242).
11. Dispositif de traitement (1, 101, 201) selon la revendication 10, en fonction de la revendication 3, dans lequel les bords droits (55) des première et seconde parties de corps semi-circulaires (52, 53) sont dotés de premier et second approfondissements (59) configurés pour définir des premier et second espaces de réception (60, 61) destinés à recevoir une partie d'une aube d'agitation (45).
12. Dispositif de traitement (1, 101, 201) selon l'une quelconque des revendications précédentes, dans lequel le dispositif de traitement (1, 101, 201) comprend deux ou plus de deux éléments d'orientation de poussière (50, 150, 250, 280); et/ou dans lequel le dispositif de traitement (1, 101, 201) est sélectionné à partir d'un groupe comprenant un mélangeur, de préférence un mélangeur annulaire, un agitateur et un séchoir.
13. Système de traitement pour le traitement d'une ou de plusieurs matières fluides, telles que des produits pharmaceutiques, le système comprenant:
- un ou plusieurs dispositifs d'alimentation configurés pour alimenter une ou plusieurs matières fluides vers le dispositif de traitement (1, 101, 201); et
  - un dispositif de traitement (1, 101, 201) pour le traitement de la ou des matières fluides, selon l'une quelconque des revendications précédentes.
14. Procédé de traitement pour le traitement d'une ou de plusieurs matières fluides, telles que des produits pharmaceutiques, au moyen d'un dispositif de traitement (1, 101, 201) pour le traitement d'une ou de plusieurs matières fluides, selon l'une quelconque des revendications 1-12, le procédé comprenant:
- la fourniture d'une ou de plusieurs matières fluides devant être traitées au dispositif de traitement (1, 101, 201) pour le traitement d'une ou de plusieurs matières fluides ;
  - le traitement de la ou des matières fluides devant être traitées par le dispositif de traitement (1, 101, 201) par rotation du rotor d'agitation (40, 240) pour agiter la ou les matières fluides à l'intérieur du récipient dans une mesure telle que la ou les matières fluides sont maintenues comme un lit fluidisé annulaire à l'intérieur de la chambre de traitement cylindrique (3, 103); et
  - l'évacuation de la ou des matières traitées du dispositif de traitement (1, 101, 201), dans lequel le procédé, pendant l'étape de traitement de la ou des matières fluides, comprend en outre les étapes consistant, au moyen de l'élément d'orientation de poussière (50, 150, 250), à empêcher sensiblement un nuage de poussière à l'intérieur de la chambre de traitement (3, 103) d'atteindre la sortie (35, 135), et à orienter le nuage de poussière en direction du lit fluidisé annulaire, introduisant avec celui-ci le nuage de poussière dans le lit fluidisé annulaire.
15. Procédé selon la revendication 14, dans lequel l'étape de fourniture de la ou des matières fluides dans le dispositif de traitement (1, 101, 201) pour le traitement d'une ou de plusieurs matières fluides comprend l'étape de fourniture d'un ou de plusieurs ingrédients pharmaceutiquement acceptables (API) et/ou d'un ou de plusieurs excipients; et/ou dans lequel l'étape de fourniture d'une ou de plusieurs matières fluides devant être traitées au dispositif de traitement (1, 101, 201) pour le traitement d'une ou de plusieurs matières fluides comprend l'étape de fourniture de deux ou plus de deux matières fluides devant être traitées au dispositif de traitement (1, 101, 201), de préférence dans lequel l'étape

pe de traitement de la ou des matières fluides devant être traitées par le dispositif de traitement (1, 101, 201) comprend l'étape de mélange de deux ou plus de deux matières fluides.

5

10

15

20

25

30

35

40

45

50

55

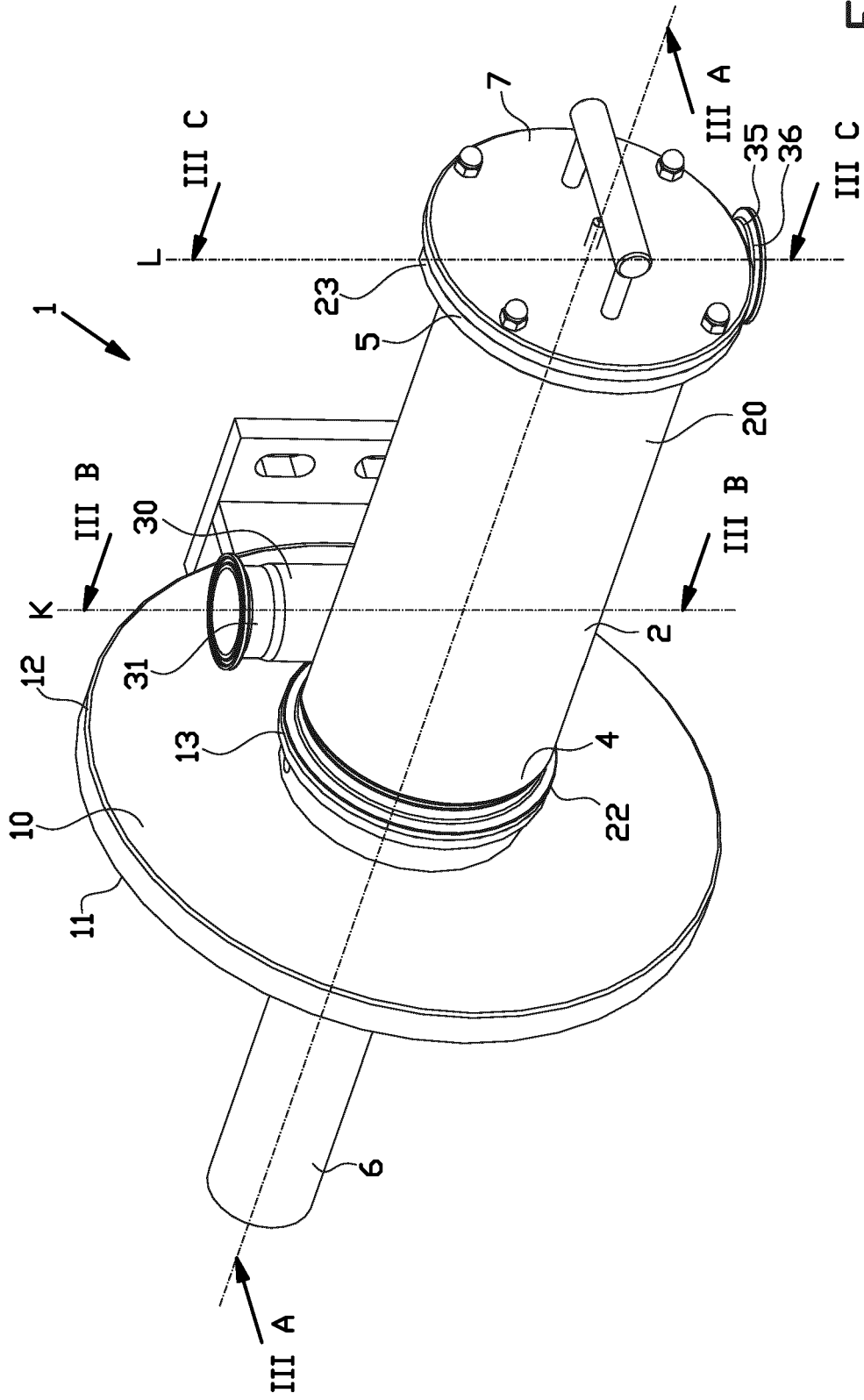


FIG. 1

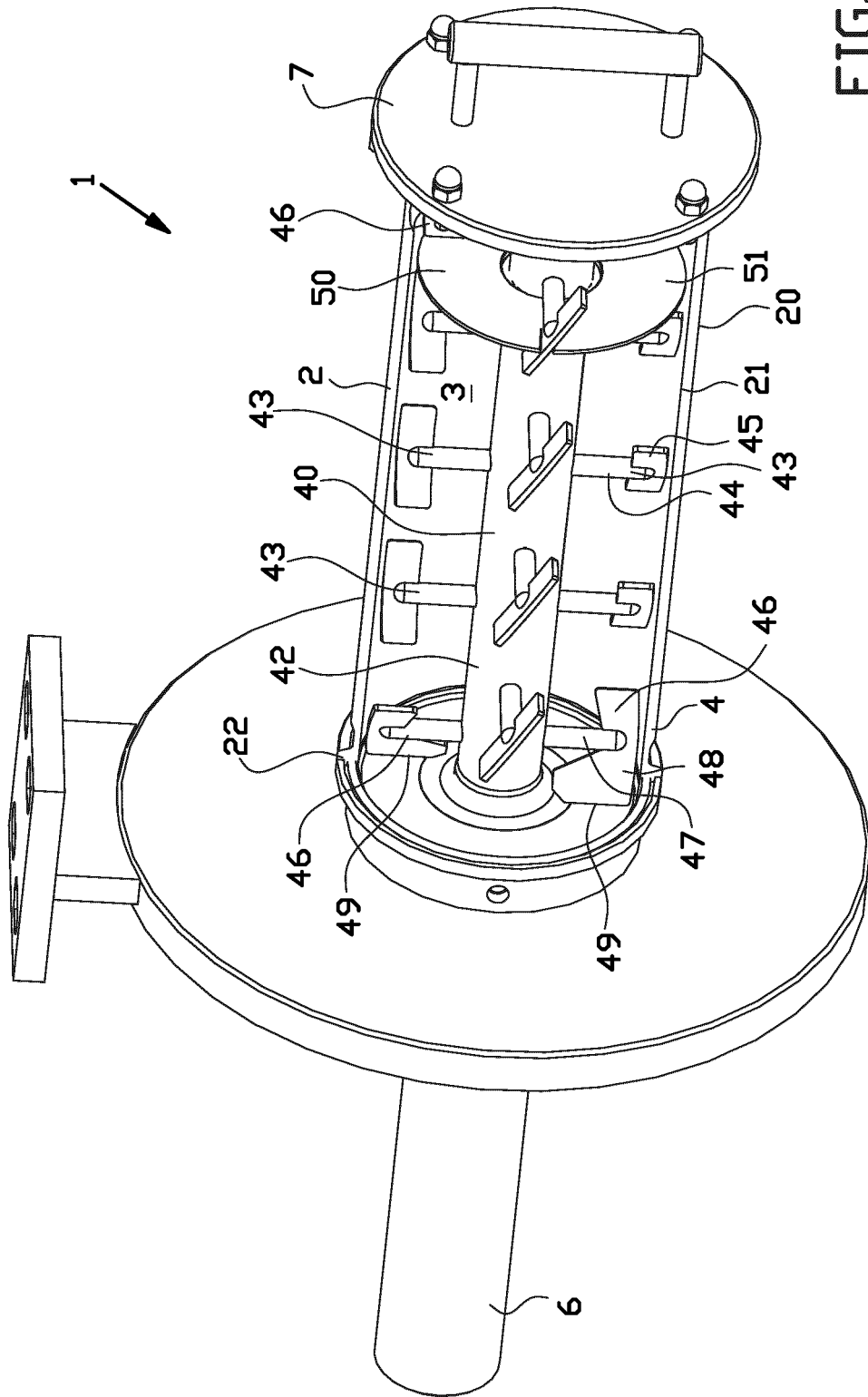


FIG. 2

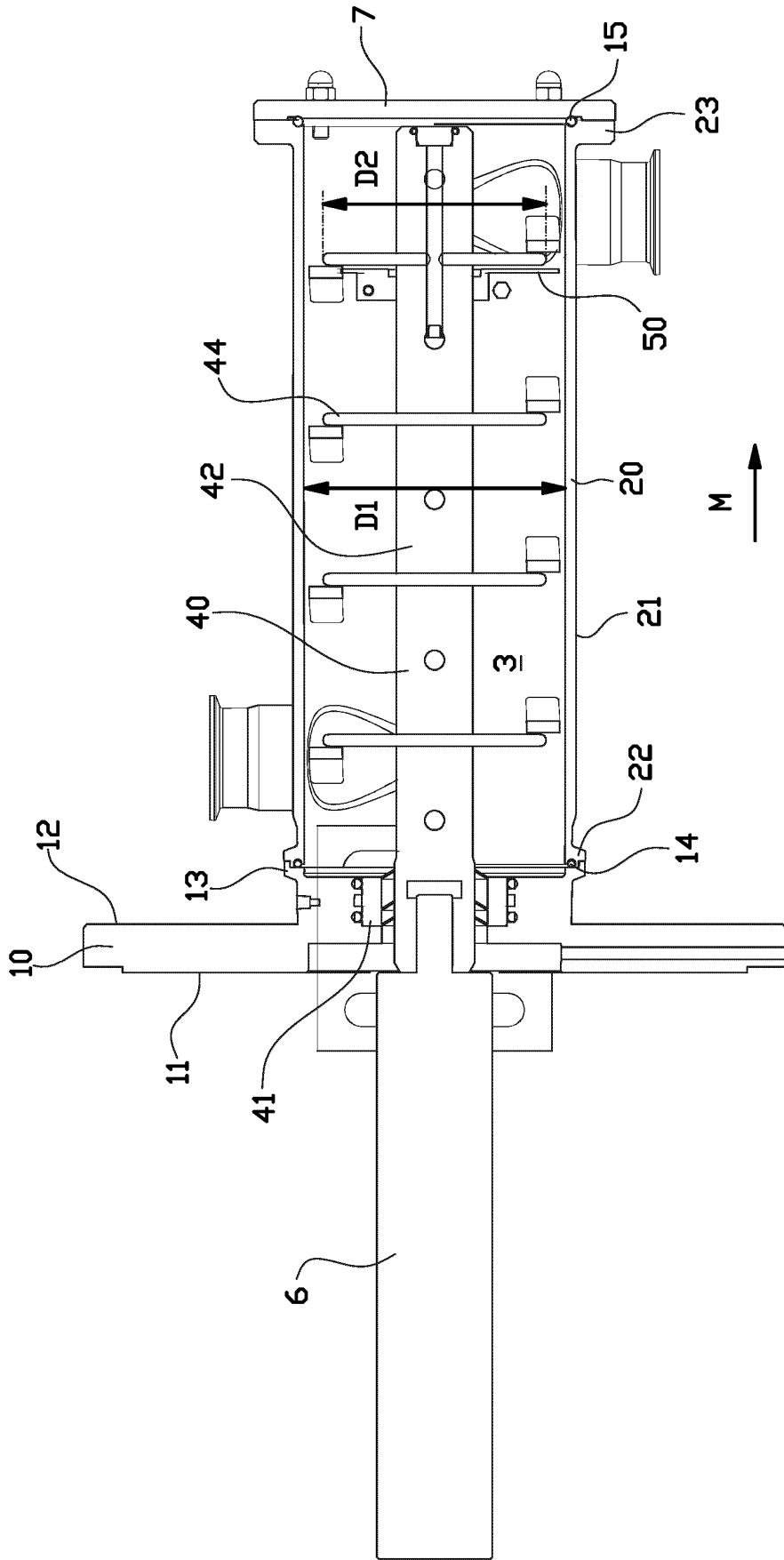


FIG. 3A

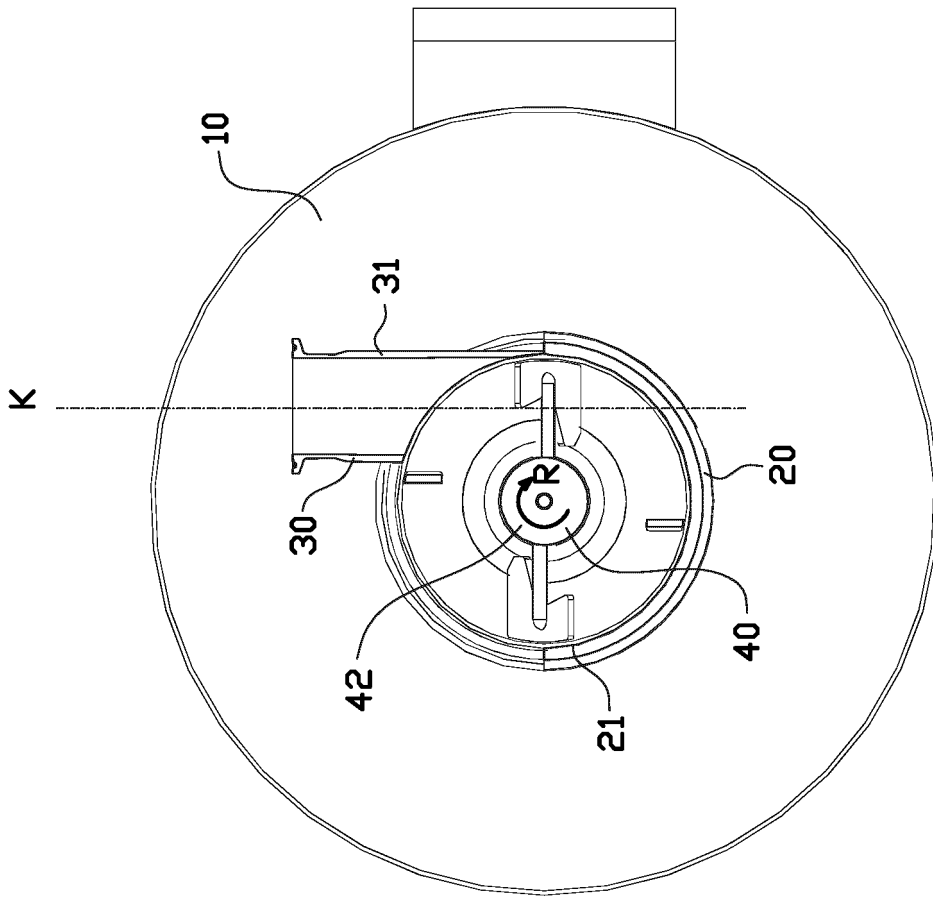


FIG. 3B

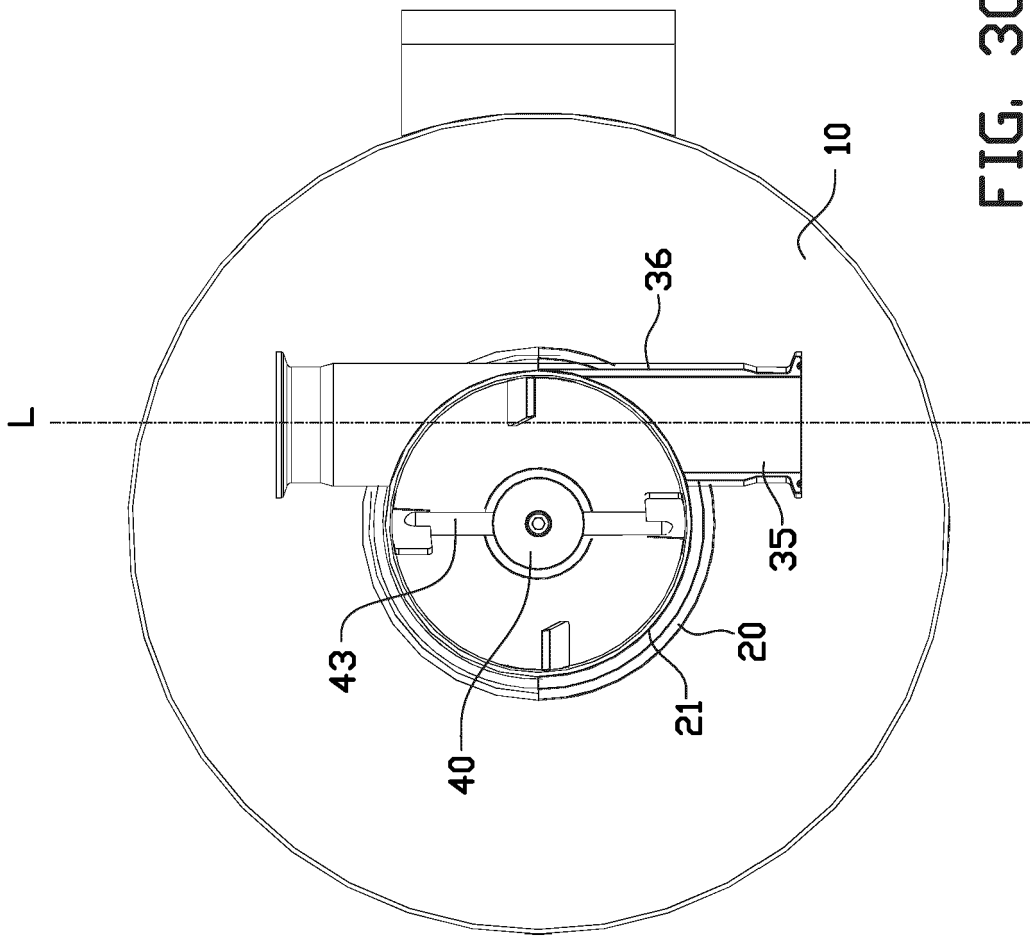
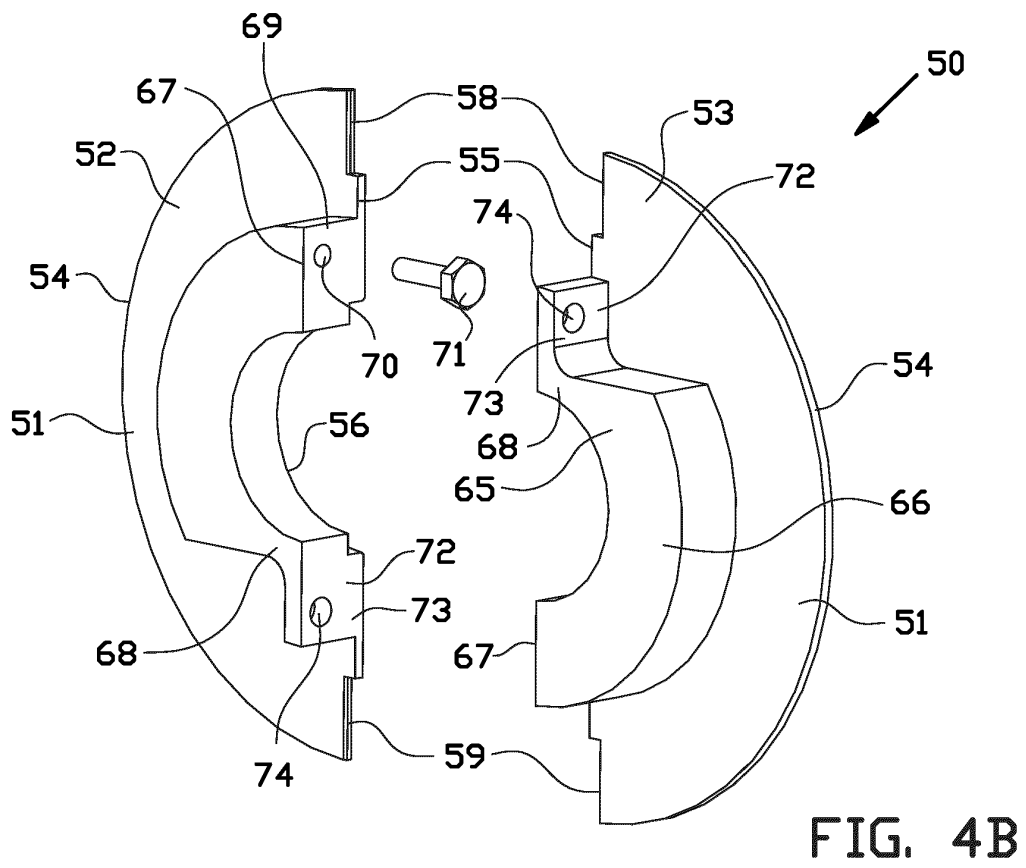
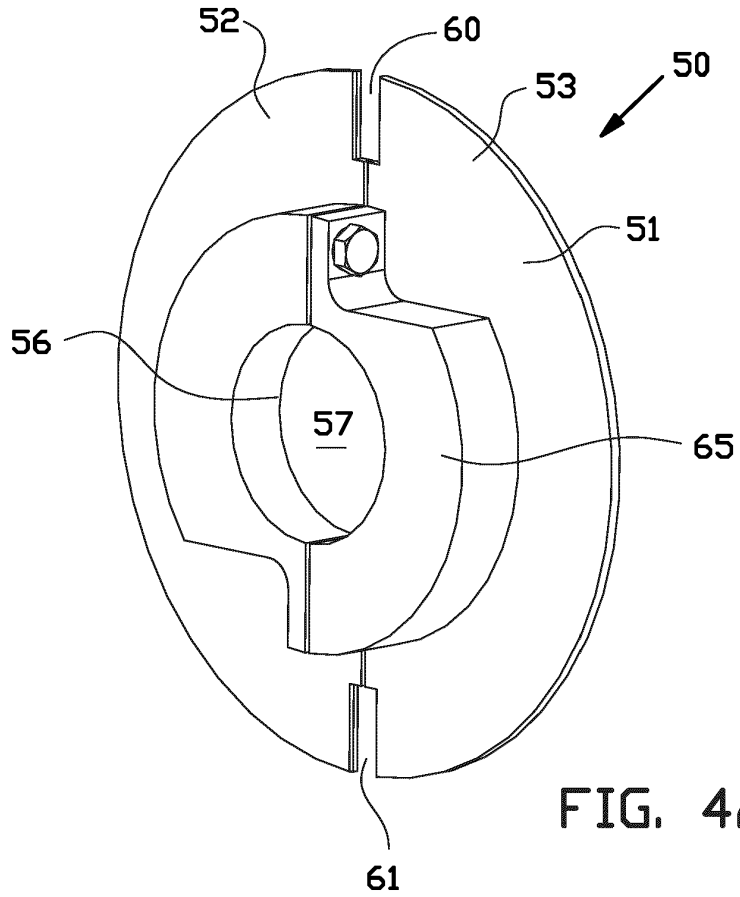


FIG. 3C



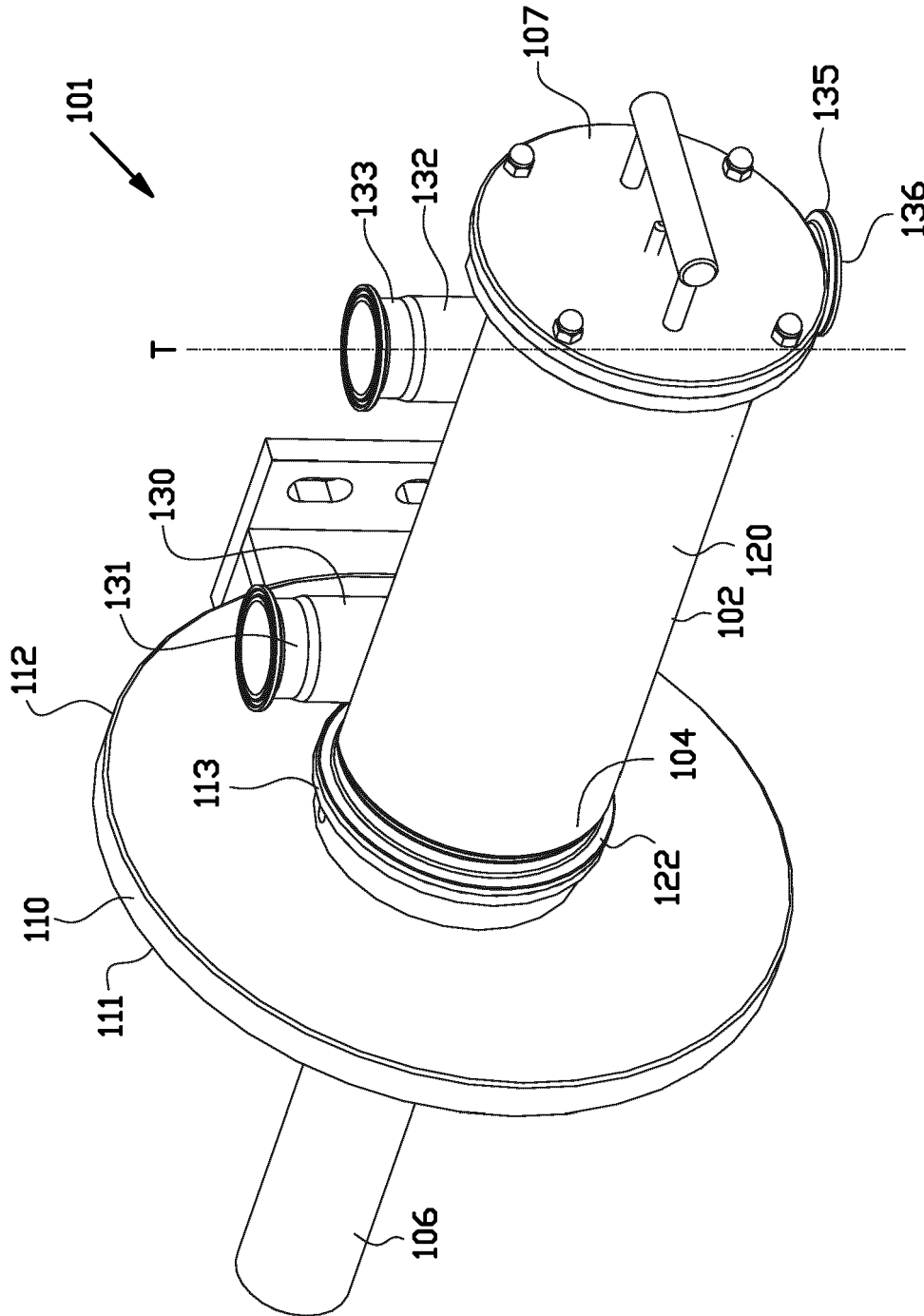


FIG. 5

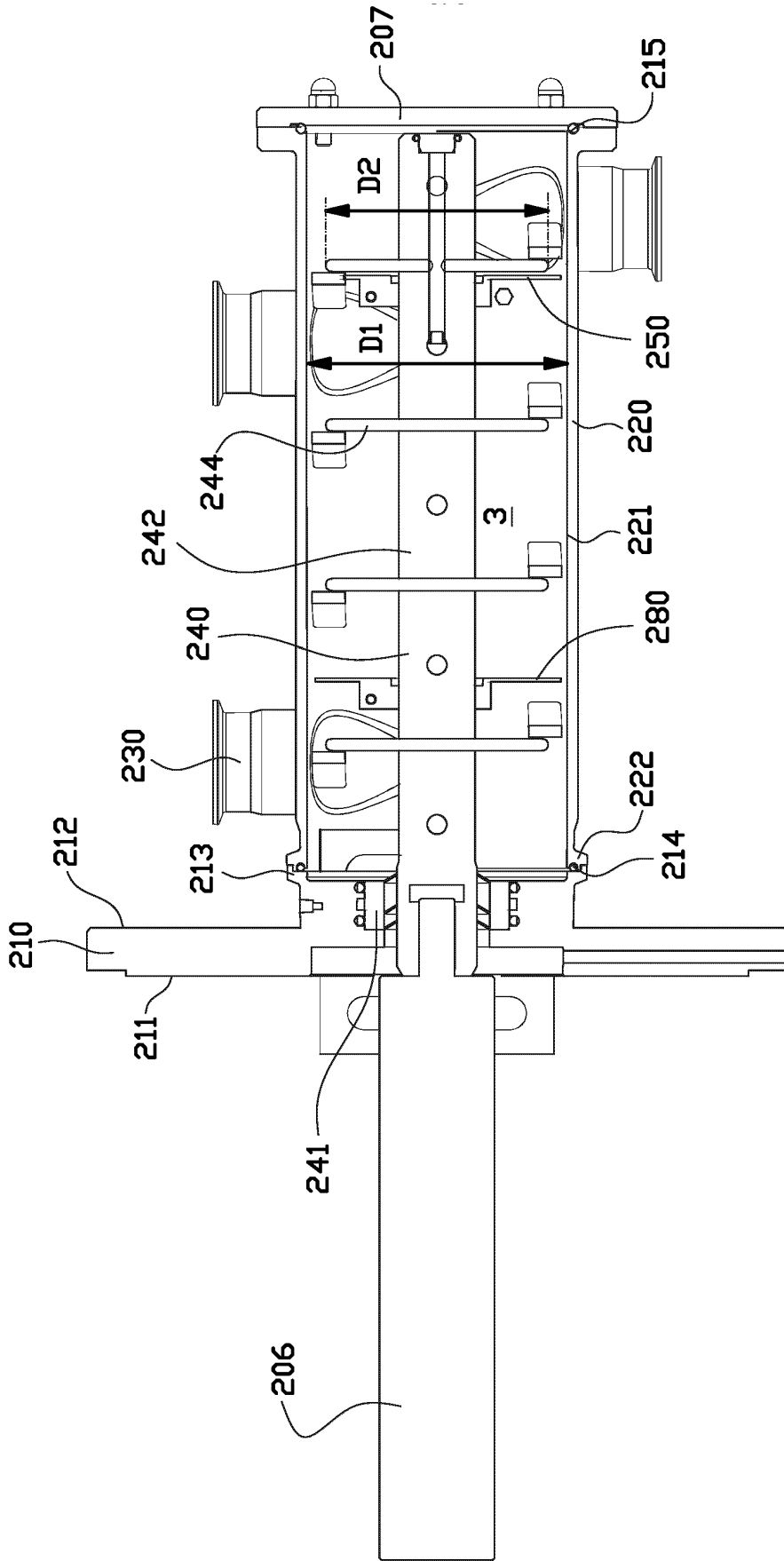


FIG. 6

**REFERENCES CITED IN THE DESCRIPTION**

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

**Patent documents cited in the description**

- US 3425135 A [0002] [0003]
- US 5570517 A [0002]