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(73) Haltija - Innehavare

**1 • Outotec Oyj**, Riihitonttie 7, 02200 ESPOO, SUOMI - FINLAND, (FI)

(72) Keksijä - Uppfinnare

**1 • Laaninen, Aki**, ESPOO, SUOMI - FINLAND, (FI)  
**2 • MIETTINEN, Elli**, ESPOO, SUOMI - FINLAND, (FI)  
**3 • BJÖRKLUND, Peter**, ESPOO, SUOMI - FINLAND, (FI)

(74) Asiamies - Ombud

**Boco IP Oy Ab**, Itämerenkatu 5, 00180 Helsinki

(54) Keksinnön nimitys - Uppfinningens benämning

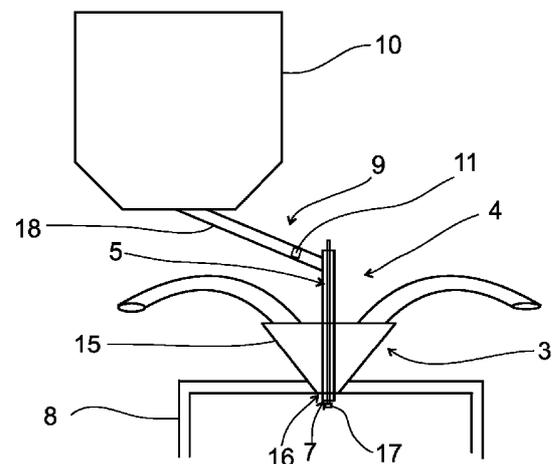
**MENETELMÄ JA JÄRJESTELY SYÖTTÖAINEEN SYÖTTÄMISEKSI SYÖTEAINEEN SÄILIÖSTÄ UUNIN UUNITILAAN**  
**FÖRFARANDE OCH ARRANGEMANG FÖR ATT MATA RÅMATERIAL FRÅN EN BEHÅLLARE FÖR RÅMATERIAL IN EN UGNS**  
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The invention relates to a method and to an arrangement for feeding feed material from a bin (10) for feed material into a furnace space of a smelting furnace. The method comprises a first providing step for providing a feed material feeding arrangement (9) for feeding feed material from the bin (10) for feed material into the furnace space of the smelting furnace (1), and a feeding step for feeding feed material from the bin (10) for feed material into the furnace space of the smelting furnace. The method comprises additionally a second providing step for providing at least one sensor (11) for measuring flow of feed material at a position between the bin (10) for feed material and the furnace space of the smelting furnace (1), and a measuring step for measuring flow of feed material by means of said at least one sensor (11) at said position.



Keksintö koskee menetelmää ja järjestelyä syöttömateriaalin syöttämiseksi syöttömateriaalisäiliöstä (10) sulatusuunin uunitilaan. Menetelmä käsittää ensimmäisen aikaansaamisvaiheen syöttömateriaalin syöttämisjärjestelyn (9) aikaansaamiseksi syöttömateriaalin syöttämiseen syöttömateriaalisäiliöstä (10) sulatusuunin (1) uunitilaan, ja syöttämisvaiheen syöttömateriaalin syöttämiseksi syöttömateriaalisäiliöstä (10) sulatusuunin uunitilaan. Menetelmä käsittää lisäksi toisen aikaansaamisvaiheen ainakin yhden anturin (11) aikaansaamiseksi mittaamaan syöttömateriaalin virtauksen syöttömateriaalisäiliön (10) ja sulatusuunin (1) uunitilan välissä olevalta kohdalta, ja mittaamisvaiheen syöttömateriaalin virtauksen mittaamiseksi mainitussa kohdassa sijaitsevan mainitun ainakin yhden anturin (11) avulla.

## **METHOD AND ARRANGEMENT FOR FEEDING FEED MATERIAL FROM A BIN FOR FEED MATERIAL INTO A FURNACE SPACE OF A SMELTING FURNACE**

### 5 **Field of the invention**

The invention relates to a method for feeding feed material into a furnace space of a smelting furnace as defined in the preamble of independent claim 1.

The invention also relates to an arrangement for feeding feed material into a furnace space of a smelting furnace as defined in the preamble of independent claim 11.

10 The method and the arrangement relates also for example to feeding of fine-grained matter such as copper sulfide concentrate or copper matte and possible flux to into a reaction shaft of a suspension smelting furnace such as a flash smelting furnace or a direct-to-blister furnace. Publication WO 2005/067366 presents a supply system for a suspension smelting furnace.

15 Publication JP 2003013152 A presents a method for feeding ore to a flash furnace.

### **Objective of the invention**

The object of the invention is to provide an improved method and an improved arrangement for feeding feed material into a furnace space of a smelting furnace.

### 20 **Short description of the invention**

The method for feeding feed material from a bin for feed material into a furnace space of a smelting furnace of the invention is characterized by the definitions of independent claim 1.

Preferred embodiments of the method are defined in the dependent claims 2 to 10.

25 The arrangement for feeding feed material from a bin for feed material into a furnace space of a smelting furnace of the invention is correspondingly characterized by the definitions of independent claim 11.

Preferred embodiments of the arrangement are defined in the dependent claims 12 to 20.

30 The method and arrangement makes possible online visualization of the feed of feed material. This gives the operator online information about any feed disturbances and online information about the feed distribution mass ratios.

The method and arrangement makes possible online measurement of moisture of the feed of feed material. This can be used for online moisture control of a dryer for regulating the moisture rate of feed material to be fed into the smelting furnace.

35 The method and arrangement makes possible online velocity measurement of the feed of feed material by arranging a first sensor (or a first set of first sensors) and a second sensor (or a second set of second sensors) in the feed material feeding arrangement and by arranging the first sensor (or the first set of first sensors) upstream of the second sensor (or the second set of second sensors) in the feed material feeding arrangement. This can be used for online feed rate control

of feed material and for online feed distribution control.

### List of figures

5 In the following the invention will be described in more detail by referring to the figures, of which

Figure 1 shows a suspension smelting furnace provided with a concentrate or matte burner,

10 Figure 2 shows an arrangement for feeding feed material in the form of fine-grained matter from a bin for feed material into a reaction shaft of a suspension smelting furnace according to a first embodiment,

Figure 3 shows an arrangement for feeding feed material in the form of fine-grained matter from a bin for feed material into a reaction shaft of a suspension smelting furnace according to a second embodiment,

15 Figure 4 shows an arrangement for feeding feed material in the form of fine-grained matter from a bin for feed material into a reaction shaft of a suspension smelting furnace according to a third embodiment,

Figure 5 shows an arrangement for feeding feed material in the form of fine-grained matter from a bin for feed material into a reaction shaft of a suspension smelting furnace according to a fourth embodiment,

20 Figure 6 shows an arrangement for feeding feed material in the form of fine-grained matter from a bin for feed material into a reaction shaft of a suspension smelting furnace according to a fifth embodiment,

25 Figure 7 shows an arrangement for feeding feed material in the form of fine-grained matter from a bin for feed material into a reaction shaft of a suspension smelting furnace according to a sixth embodiment,

Figure 8 shows an arrangement for feeding feed material in the form of fine-grained matter from a bin for feed material into a reaction shaft of a suspension smelting furnace according to a sixth embodiment,

30 Figure 9 shows an arrangement where a closed air slide conveyor for feeding feed material in the form of fine-grained matter into a concentrate or matte burner is provided with sensors,

Figure 10 shows a concentrate or matte burner that is provided with sensors,

35 Figure 11 shows an arrangement where the downstream end of a closed air slide conveyor of a feed material feeding arrangement is divided into feed channels each of which is provided with sensors and where a feed pipe of a fine-grained matter feeding means of a concentrate or matte burner is divided into sectors each of which is provided with adjustable damper means,

Figure 12 shows an arrangement where the downstream end of a closed air slide

conveyor of a feed material feeding arrangement is divided into feed channels each of which is provided with adjustable damper means and where a feed pipe of a fine-grained matter feeding means of a concentrate or matte burner is divided into sectors each of which is provided with sensors,

5 Figure 13 shows a concentrate or matte burner having a feed pipe of the fine-grained feeding means divided into sectors and where each sector is provided with sensors for independently measuring the flow of feed material in the form of fine-grained matter within each sector, and

10 Figure 14 shows the concentrate or matte burner shown in figure 11 cut along line A-A in figure 13.

### Detailed description of the invention

The invention relates to a method and to an arrangement for feeding feed material from a bin 10 for feed material into a furnace space (not marked with a reference numeral) of a smelting furnace.

A purpose of the method and the arrangement can be to feed feed material in the form of fine-grained matter such as concentrate or matte from a bin 10 for feed material into a reaction shaft of a suspension smelting furnace 1 as is illustrated in figures 2 to 14.

20 First the method and some preferred embodiments and variants thereof will be described in greater detail.

The method comprises a first providing step for providing a feed material feeding arrangement 9 for feeding feed material from the bin 10 for feed material into the furnace space of the smelting furnace 1.

25 The method comprises additionally a feeding step for feeding feed material from the bin 10 for feed material into the furnace space of the smelting furnace 1.

The method comprises additionally a second providing step for providing at least one sensor 11 for measuring flow of feed material at a position between the bin 10 for feed material and the furnace space of the smelting furnace 1.

30 The method comprises additionally a measuring step for measuring flow of feed material by means of said at least one sensor 11 at said position.

35 In some embodiments of the method the feed material is in the form of fine-grained matter such as concentrate or matte. In such embodiments of the method, the smelting furnace is a suspension smelting furnace 1 comprising a concentrate or matte burner 2 having reaction gas feeding means 3 and fine-grained matter feeding means 4. The fine-grained matter feeding means 4 of the concentrate or matte burner 2 comprises a fine-grained matter feed pipe 12 having a perimeter 5 and having a discharge opening 7 that opens into a reaction shaft 8 of the suspension smelting furnace 1. In such embodiments the first providing step for providing a feed material feeding arrangement 9 for feeding feed material from the bin 10 for feed material into

the furnace space of the smelting furnace 1 is a step for providing a feed material feeding arrangement 9 for feeding fine-grained matter from the bin 10 for feed material into the fine-grained matter feeding means 4 of the concentrate or matte burner 2. In such embodiments the feeding step for feeding feed material from the bin 10 for feed material into the furnace space the smelting furnace is a step for feeding fine-grained matter from the bin 10 for feed material into the fine-grained matter feeding means 4 of the concentrate or matte burner 2 and for feeding fine-grained matter by means of the fine-grained matter feeding means 4 of the concentrate or matte burner 2 into the reaction shaft 8 of the suspension smelting furnace 1 i.e. into a furnace space of the suspension smelting furnace 1. In such embodiments the second providing step for providing at least one sensor 11 for measuring flow of feed material at a position between the bin 10 for feed material and the furnace space of the smelting furnace 1 is a step for providing at least one sensor 11 for measuring flow of fine-grained matter at a position between the bin 10 for feed matter and the discharge opening 7 of the fine-grained matter feed pipe 12 of the fine-grained matter feeding means 4 of the concentrate or matte burner 2. In such embodiments the measuring step for measuring flow of feed material by means of said at least one sensor 11 at said position is a step for measuring flow of feed material by means of said at least one sensor 11 at said position between the bin 10 for feed matter and the discharge opening 7 of the fine-grained matter feed pipe 12 of the fine-grained matter feeding means 4 of the concentrate or matte burner 2.

If the smelting furnace is a suspension smelting furnace as described earlier, the second providing step of the method may comprise providing the perimeter 5 of the fine-grained matter feed pipe 12 of the fine-grained matter feeding means 4 of the concentrate or matte burner 2 with at least one sensor 11 for measuring flow of fine-grained matter in the fine-grained matter feed pipe 12 of the fine-grained matter feeding means 4 of the concentrate or matte burner 2. It is for example possible in the embodiments shown in figures 2 to 8, to provide the perimeter 5 of the fine-grained matter feed pipe 12 of the fine-grained matter feeding means 4 of the concentrate or matte burner 2 with at least one sensor 11 for measuring flow of fine-grained matter in the fine-grained matter feed pipe 12 of the fine-grained matter feeding means 4 of the concentrate or matte burner 2.

If the smelting furnace is a suspension smelting furnace as described earlier, the suspension smelting furnace 1 may in some embodiments comprise a concentrate or matte burner 2, where the feed pipe 12 of the fine-grained matter feeding means 4 of the concentrate or matte burner 2 is divided into sectors 13. In such embodiment of the method the second providing step may comprise providing each sector 13 with at least one sensor 11 for independently measuring flow within each sector 13. Such an embodiment is shown in figures 12 and 13. The method may in some embodiments comprise providing a suspension smelting furnace 1 comprising a concentrate or matte burner 2 having the feed pipe 12 of the fine-grained matter feeding means 4 divided into sectors 13. In a such embodiment the second providing step includes providing each

sector 13 of the feed pipe 12 with at least one sensor 11 for independently measuring flow of fine-grained matter within each sector 13 of the feed pipe 12. In a such embodiment the method includes providing each sector 13 of the feed pipe 12 with an adjustable damper means 27 for independently adjusting the flow of fine-grained matter within each sector 13 of the feed pipe 12.

5 In a such embodiment the feeding step includes independently adjusting the flow of fine-grained matter within each sector 13 of the feed pipe 12 by means of the adjustable damper means 27 provided in each sector 13 of the feed pipe 12 based on the flow of fine-grained matter independently measured within in each sector 13 of the feed pipe 12 by means of said at least one sensor 11 provided in each sector 13 of the feed pipe 12 in said measuring step. Such  
10 adjustable damper means 27 may be used for adjusting the distribution of the fine-grained matter in the concentrate or matte burner 2 and how the fine-grained matter is fed by means the concentrate or matte burner 2 into the reaction shaft 8 of the suspension smelting furnace.

The method may in some embodiments comprise providing a suspension smelting furnace 1 comprising a concentrate or matte burner 2 having the feed pipe 12 of the fine-grained  
15 matter feeding means 4 divided into sectors. In a such embodiment the second providing step includes providing each sector 13 of the feed pipe 12 with at least one sensor 11 for independently measuring flow of fine-grained matter within each sector 13 of the feed pipe 12. In a such embodiment the first providing step includes providing a feed material feeding arrangement 9 having a downstream end in communication with the fine-grained matter feeding  
20 means 4 of the concentrate or matte burner 2, which downstream end is provided with partition means 28 for dividing the downstream end of the feed material feeding arrangement 9 into several feed channels 29 each feed channel 29 ending into a sector 13 of the feed pipe 12 of the fine-grained matter feeding means 4 of the concentrate or matte burner 2. A such embodiment includes providing each feed channel 29 of the feed material feeding arrangement 9 with an  
25 adjustable damper means 27 for independently adjusting the flow of fine-grained matter within each feed channel 29 of the feed material feeding arrangement 9. In a such embodiment the feeding step includes independently adjusting the flow of fine-grained matter within each feed channel 29 of the feed material feeding arrangement 9 by means of the adjustable damper means 27 provided in each feed channel 29 of the feed material feeding arrangement 9 based on the  
30 flow of fine-grained matter independently measured within each sector 13 of the feed pipe 12 by means of said at least one sensor 11 provided in each sector 13 of the feed pipe 12 in said measuring step. A such embodiment is shown in figure 12. In figure 12 the downstream end of the feed material feeding arrangement 9 is formed by a closed air slide conveyor 18 so that the downstream end of the closed air slide conveyor 18 is divided by partition means 28 into several  
35 feed channels 29. Such adjustable damper means 27 may be used for adjusting the distribution of the fine-grained matter in the concentrate or matte burner 2 and how the fine-grained matter is fed by means the concentrate or matte burner 2 into the reaction shaft 8 of the suspension smelting furnace.

The method may in some embodiments comprise providing a suspension smelting furnace 1 comprising a concentrate or matte burner 2 having the feed pipe 12 of the fine-grained matter feeding means 4 divided into sectors. In a such embodiment the first providing step includes providing a feed material feeding arrangement 9 having a downstream end in communication with the fine-grained matter feeding means 4 of the concentrate or matte burner 2, which downstream end is provided with partition means 28 for dividing the downstream end of the feed material feeding arrangement 9 into several feed channels 29 each feed channel 29 ending into a sector 13 of the feed pipe 12 of the fine-grained matter feeding means 4 of the concentrate or matte burner 2. In a such embodiment the second providing step includes providing each feed channel 29 of the feed material feeding arrangement 9 with at least one sensor 11 for independently measuring flow of fine-grained matter within each feed channel 29 of the feed material feeding arrangement 9. A such embodiment includes providing each sector 13 of the feed pipe 12 with an adjustable damper means 27 for independently adjusting the flow of fine-grained matter within each sector 13 of the feed pipe 12. In a such embodiment the feeding step includes independently adjusting the flow of fine-grained matter within each sector 13 of the feed pipe 12 by means of the adjustable damper means 27 provided in each sector 13 of the feed pipe 12 based on the flow of fine-grained matter independently measured within each feed channel 29 of the feed material feeding arrangement 9 by means of said at least one sensor 11 provided in each feed channel 29 of the feed material feeding arrangement 9 in said measuring step. A such embodiment is shown in figure 11. In figure 11 the downstream end of the feed material feeding arrangement 9 is formed by a closed air slide conveyor 18 so that the downstream end of the closed air slide conveyor 18 is divided by partition means 28 into several feed channels 29. Such adjustable damper means 27 may be used for adjusting the distribution of the fine-grained matter in the concentrate or matte burner 2 and how the fine-grained matter is fed by means the concentrate or matte burner 2 into the reaction shaft 8 of the suspension smelting furnace.

If the smelting furnace is a suspension smelting furnace as described earlier, the suspension smelting furnace may, as shown in figures 2 to 14, comprise a concentrate or matte burner 2 having reaction gas feeding means 3 comprising an annular gas feeding channel 15 that surrounds the solid matter feed pipe 12 and having an annular gas discharge opening 16 opening into the reaction shaft 8 of the suspension smelting furnace 1.

If the smelting furnace is a suspension smelting furnace as described earlier, the suspension smelting furnace may, as shown in figures 2 to 14, comprise a concentrate or matte burner 2 comprising a concentrate distributor 17 extending out from the discharge opening 7 of the solid matter feed pipe 12 and into the reaction shaft 8 of the suspension smelting furnace 1.

If the smelting furnace is a suspension smelting furnace as described earlier, the first providing step may in some embodiments of the method, as in the embodiments shown in figures 4 to 8, comprise providing a feed material feeding arrangement 9 comprising a closed air slide

conveyor 18 in communication with the fine-grained matter feeding means 4 of the concentrate or matte burner 2. In such embodiments, the feeding step of the method comprises feeding the fine-grained matter into the fine-grained matter feeding means 4 of the concentrate or matte burner 2 by means of the closed air slide conveyor 18. In such embodiments the second providing step may comprise providing at least one sensor 11 for measuring flow of fine-grained matter in closed air slide conveyor 18 of the feed material feeding arrangement 9. It is for example possible that in the embodiments shown in figures 4 to 8, to provide the closed air slide conveyor 18 with at least one sensor 11 for measuring flow of fine-grained matter in the closed air slide conveyor 18.

In an embodiment of the method, such as in the first embodiment shown in figure 2, the first providing step comprises providing a feed material feeding arrangement 9, where the bin 10 for fine grained-matter is configured for feeding the fine-grained matter into a closed air slide conveyor 18 and where the closed air slide conveyor 18 is configured for feeding the fine-grained matter into the fine-grained matter feeding means 4 of the concentrate or matte burner 2. In this embodiment of the method the feeding step comprises feeding fine-grained matter into the closed air slide conveyor 18 from the bin 10 for fine grained-matter and feeding fine-grained matter from the closed air slide conveyor 18 into the fine-grained matter feeding means 4 of the concentrate or matte burner 2.

In an embodiment of the method, such as in the second embodiment shown in figure 3, the first providing step comprises providing a feed material feeding arrangement 9, where the bin 10 for fine grained-matter is configured for feeding the fine-grained matter into a conveyor 26 for feeding fine-grained matter into a closed air slide conveyor 18 and where the closed air slide conveyor 18 is configured for feeding the fine-grained matter into the fine-grained matter feeding means 4 of the concentrate or matte burner 2. In this embodiment of the method the feeding step comprises feeding fine-grained matter into the conveyor 26 from the bin 10 for fine grained-matter and feeding fine-grained matter from the conveyor 26 into closed air slide conveyor 18 and feeding fine-grained matter from the closed air slide conveyor 18 into the fine-grained matter feeding means 4 of the concentrate or matte burner 2.

The first providing step may in some embodiments of the method comprise providing a feed material feeding arrangement 9 comprising a controlling means 19, such as a screw conveyor (as in the embodiment shown in figures 4 to 8), a hose valve or a rotary valve or a multiple of these, in communication with the closed air slide conveyor 18. In such embodiments the feeding step comprises feeding fine-grained matter into the closed air slide conveyor 18 from the controlling means 19. In these embodiments it is beneficial, but not necessary, that the first providing step comprises providing a fine-grained matter feeding means 4 comprising an additional fine-grained matter feeding arrangement 25 for feeding additional fine-grained matter into the fine-grained matter feeding means 4 downstream of the at least one sensor 11 and that the method consequently comprises a second feeding step for feeding additional fine-grained

matter into the fine-grained matter feeding means 4 by means of said additional fine-grained feeding arrangement 25. A such embodiment is shown in figure 4. Such additional fine-grained matter may comprise at least one of the following: Silica, lime, limestone, reverts (i.e. ground mixture of recycled products and slag mixture), dust, electronic scrap, and solid coolant.

5 In an embodiment of the method, such as in the third embodiment shown in figure 4, the first providing step comprises providing a feed material feeding arrangement 9 where the bin 10 for fine grained-matter is configured for feeding the fine-grained matter into the controlling means 19 and where the controlling means 19 is configured for controlling the fine-grained matter into a closed air slide conveyor 18 and where the closed air slide conveyor 18 is configured for feeding fine-grained matter into the fine-grained matter feeding means 4 of the concentrate or matte burner 2. In this embodiment of the method the feeding step comprises feeding fine-grained matter into the controlling means 19 from the bin 10 for fine grained-matter and feeding fine-grained matter from the controlling means 19 into the closed air slide conveyor 18. In this embodiment of the method the feeding step comprises additionally feeding fine-grained matter from the closed air slide conveyor 18 into the fine-grained matter feeding means 4 of the concentrate or matte burner 2.

In embodiments, where the bin 10 for fine grained-matter is configured for feeding the fine-grained matter using a controlling means 19 such as a screw conveyor (as in the second embodiment shown in figure 3), hose valve or rotary valve or multiples of these, the first providing step may comprise providing a loss-in-weight controller 20 between the bin 10 for fine grained-matter and the controlling means 19, for controlling feed of fine-grained matter from the bin 10 for fine grained-matter into the air slide conveyor 18. In such case, the method comprises additionally a controlling step for controlling feed of fine-grained matter from the bin 10 for fine grained-matter through controlling means 19 by means of the loss-in-weight controller 20.

25 The first providing step may in some embodiments of the method, as in the fourth embodiment shown in figure 5, comprise providing a feed material feeding arrangement 9, where the bin 10 for fine grained-matter is configured for feeding the fine-grained matter into a dosing bin 21, and where a valve means 22 is provided between the bin 10 for fine grained-matter and the dosing bin 21 for opening and closing the communication between the bin 10 for fine grained-matter and the dosing bin 21. In such embodiments the feeding step comprises opening the valve means 22 before feeding fine-grained matter from the bin 10 for fine grained-matter into the dosing bin 21 and at least during but not restricted to this step the controlling means 19 can be regulated using the information from the sensor 11.

35 The first providing step may in some embodiments of the method, as in the sixth embodiment shown in figure 7, comprise providing a feed material feeding arrangement 9 comprising a dryer 23 between the bin 10 for fine grained-matter and the dosing bin 21, which the dryer 23 is configured for regulating the moisture rate of fine-grained matter. In such embodiments the method the feeding step comprises feeding fine-grained matter into the dryer

23 from the bin 10 for fine grained-matter, and feeding fine-grained matter from the dryer 23 into the dosing bin 21. Such embodiments of the method comprises additionally a regulating step for regulating the moisture rate of fine-grained matter by means of the dryer 23

5 The first providing step may in some embodiments of the method, as in the fifth embodiment shown in figure 6, comprise providing a feed material feeding arrangement 9 comprising a fluidization means 24 between the bin 10 for fine grained-matter and the dosing bin 21, and a filing valve 22 between the fluidization means 24 and the dosing bin 21 for opening and closing the communication between the fluidization means 24 and the dosing bin 21. In such  
10 embodiments the method the feeding step comprises feeding fine-grained matter into the fluidization means 24 from the bin 10 for fine grained-matter, and feeding fine-grained matter from the fluidization means 24 into the dosing bin 21. Such embodiments of the method comprises additionally a fluidization step for fluidizing fine-grained matter in the fluidization means 24.

15 The first providing step may in some embodiments of the method, as in the seventh embodiment shown in figure 8, comprise providing a feed material feeding arrangement 9 comprising both a dryer 23 and a fluidization means 24 between the bin 10 for fine grained-matter and the dosing bin 21, and a first filling valve between the fluidization means 24 and the dosing bin 21 for opening and closing the communication between the fluidization means 24 and the dosing bin 21. In such embodiments the method the feeding step comprises feeding fine-  
20 grained matter into the dryer 23 from the bin 10 for fine grained-matter, feeding fine-grained matter from the dryer 23 into the fluidization means 24, and feeding fine-grained matter from the fluidization means 24 into the dosing bin 21. Such embodiments of the method comprises additionally a regulating step for regulating the moisture rate of fine-grained matter by means of the dryer 23. Such embodiments of the method comprises additionally a fluidization step for  
25 fluidizing fine-grained matter in the fluidization means 24.

If the first providing step comprises providing a feed material feeding arrangement 9 comprising a dryer 23, the second providing step comprises preferably, but not necessarily, functionally connecting at least one sensor 11 and the dryer 23, and the method comprises a regulating step for regulating the dryer 23 on the basis of the flow of fine-grained matter measured by said sensor 11 functionally connected to the dryer 23.  
30

The second providing step comprises preferably, but not necessarily, providing a sensor 11 comprising at least one of the following: a tomography sensor such as an electrical capacitance tomography measuring sensor, an ultrasonic tomography measuring sensor, a radiometric sensor, and a microwave sensor.

35 Next the arrangement and some preferred embodiments and variants thereof will be described in greater detail.

The arrangement comprises a feed material feeding arrangement 9 for feeding feed material from the bin 10 for feed material into the furnace space of the smelting furnace 1.

The arrangement comprises at least one sensor 11 for measuring flow of feed material being arranged between the bin 10 for feed material and the furnace space of the smelting furnace 1.

In some embodiments of the arrangement the feed material is in the form of fine-grained matter such as concentrate or matte and the smelting furnace is in the form of a suspension smelting furnace comprising a reaction shaft 8 and a concentrate or matte burner 2 having reaction gas feeding means 3 and fine-grained matter feeding means 4. In such embodiments the fine-grained matter feeding means 4 of the concentrate or matte burner 2 comprises a fine-grained matter feed pipe 12 having a perimeter 5 and having a discharge opening 7 that opens into the reaction shaft 8 of the suspension smelting furnace 1 i.e. into a furnace space of the suspension smelting furnace. In such embodiments the feed material feeding arrangement 9 for feeding feed material from the bin 10 for feed material into the furnace space of the smelting furnace 1 are configured for feeding fine-grained matter from the bin 10 for feed material into the fine-grained matter feeding means 4 of the concentrate or matte burner 2 for further feeding into the reaction shaft 8 of the suspension smelting furnace 1. In such embodiments said at least one sensor 11 for measuring flow of feed material between the bin 10 for feed material and the furnace space of the smelting furnace 1 is arranged between the bin 10 for fine-grained matter and the discharge opening 7 of the fine-grained matter feed pipe 12 of the fine-grained matter feeding means 4 of the concentrate or matte burner 2.

If the smelting furnace is in the form of a suspension smelting furnace as described earlier, the perimeter 5 of the solid matter feed pipe 12 may be provided with at least one sensor 11 for measuring flow of fine-grained matter in the solid matter feed pipe 12. It is for example possible that in the embodiments shown in figures 2 to 8, the perimeter 5 of the fine-grained matter feed pipe 12 of the fine-grained matter feeding means 4 of the concentrate or matte burner 2 is provided with at least one sensor 11 for measuring flow of fine-grained matter in the fine-grained matter feed pipe 12 of the fine-grained matter feeding means 4 of the concentrate or matte burner 2.

If the smelting furnace is in the form of a suspension smelting furnace as described earlier, the feed pipe 12 of the concentrate or matte burner 2 may be divided into sectors 12 and each sector 13 may be provided with at least one sensor 11 for independently measuring flow within each sector 13. Such an embodiment is shown in figures 13 and 14.

In an embodiment of the arrangement the suspension smelting furnace 1 comprises a concentrate or matte burner 2 having the feed pipe 12 of the fine-grained matter feeding means 4 divided into sectors 13. In this embodiment of the arrangement each sector 13 of the feed pipe 12 is provided with at least one sensor 11 for independently measuring flow of fine-grained matter within each sector 13 of the feed pipe 12. In this embodiment of the arrangement each sector 13 of the feed pipe 12 is provided with an adjustable damper means 27 for independently adjusting the flow of fine-grained matter within each sector 13 of the feed pipe 12. In this embodiment of

the arrangement each sensor 11 of each sector 13 of the feed pipe 12 may be functionally connected to at least one adjustable damper means 27 in a sector 13 of the feed pipe 12. Such adjustable damper means 27 may be used for adjusting the distribution of the fine-grained matter in the concentrate or matte burner 2 and how the fine-grained matter is fed by means the concentrate or matte burner 2 into the reaction shaft 8 of the suspension smelting furnace.

In an embodiment of the arrangement the suspension smelting furnace 1 comprises a concentrate or matte burner 2 having the feed pipe 12 of the fine-grained matter feeding means 4 divided into sectors 13. In this embodiment of the arrangement each sector 13 of the feed pipe 12 is provided with at least one sensor 11 for independently measuring flow of fine-grained matter within each sector 13 of the feed pipe 12. In this embodiment of the arrangement the feed material feeding arrangement 9 has a downstream end in communication with the fine-grained matter feeding means 4 of the concentrate or matte burner 2, which downstream end is provided with partition means 28 for dividing the downstream end of the feed material feeding arrangement 9 into several feed channels 29 each feed channel 29 ending into a sector 13 of the feed pipe 12 of the fine-grained matter feeding means 4 of the concentrate or matte burner 2. In this embodiment of the arrangement each feed channel 29 of the feed material feeding arrangement 9 is provided with an adjustable damper means 27 for independently adjusting the flow of fine-grained matter within each feed channel 29 of the feed material feeding arrangement 9. A such embodiment is shown in figure 12. In figure 12 the downstream end of the feed material feeding arrangement 9 is formed by a closed air slide conveyor 18 so that the downstream end of the closed air slide conveyor 18 is divided by partition means 28 into several feed channels 29. In this embodiment of the arrangement each adjustable damper means 27 in each feed channel 29 may be functionally connected to at least sensor 11 of a sector 13 of the feed pipe 12. Such adjustable damper means 27 may be used for adjusting the distribution of the fine-grained matter in the concentrate or matte burner 2 and how the fine-grained matter is fed by means the concentrate or matte burner 2 into the reaction shaft 8 of the suspension smelting furnace.

In an embodiment of the arrangement the suspension smelting furnace 1 comprises a concentrate or matte burner 2 having the feed pipe 12 of the fine-grained matter feeding means 4 divided into sectors 13. In this embodiment of the arrangement the feed material feeding arrangement 9 has a downstream end in communication with the fine-grained matter feeding means 4 of the concentrate or matte burner 2, which downstream end is provided with partition means 28 for dividing the downstream end of the feed material feeding arrangement 9 into several feed channels 29 each feed channel 29 ending into a sector 13 of the feed pipe 12 of the fine-grained matter feeding means 4 of the concentrate or matte burner 2. In this embodiment of the arrangement each feed channel 29 of the feed material feeding arrangement 9 is provided with at least one sensor 11 for independently measuring flow of fine-grained matter within each feed channel 29 of the feed material feeding arrangement 9. In this embodiment of the

arrangement each sector 13 of the feed pipe 12 is provided with an adjustable damper means 27 for independently adjusting the flow of fine-grained matter within each sector 13 of the feed pipe 12. A such embodiment is shown in figure 11. In figure 11 the downstream end of the feed material feeding arrangement 9 is formed by a closed air slide conveyor 18 so that the downstream end of the closed air slide conveyor 18 is divided by partition means 28 into several feed channels 29. In this embodiment of the arrangement each adjustable damper means 27 in each sector 13 of the feed pipe 12 may be functionally connected to at least sensor 11 in each feed channel 29. Such adjustable damper means 27 may be used for adjusting the distribution of the fine-grained matter in the concentrate or matte burner 2 and how the fine-grained matter is fed by means the concentrate or matte burner 2 into the reaction shaft 8 of the suspension smelting furnace.

If the smelting furnace is in the form of a suspension smelting furnace as described earlier, the reaction gas feeding means 3 of the concentrate or matte burner 2 may comprise an annular gas feeding channel 15 that surrounds the solid matter feed pipe 12 and having an annular gas discharge opening 16 opening into the reaction shaft 8 of the suspension smelting furnace 1.

If the smelting furnace is in the form of a suspension smelting furnace as described earlier, the concentrate or matte burner 2 may comprise a concentrate distributor 17 extending out from the discharge opening 7 of the solid matter feed pipe 12 and into the reaction shaft 8 of the suspension smelting furnace 1.

If the smelting furnace is in the form of a suspension smelting furnace as described earlier, the feed material feeding arrangement 9 may, as is shown in the embodiments shown in figures 2 to 8, comprise an closed air slide conveyor 18 in communication with the fine-grained matter feeding means 4 of the concentrate or matte burner 2 so that the closed air slide conveyor 18 is configured for feeding the fine-grained matter into the fine-grained matter feeding means 4 of the concentrate or matte burner 2. If the feed material feeding arrangement 9 comprises such closed air slide conveyor 18, the closed air slide conveyor 18 may be provided with at least one sensor 11 for measuring flow of fine-grained matter in the closed air slide conveyor 18. It is for example possible that in the embodiments shown in figures 2 to 8, the air slide is provided with at least one sensor 11 for measuring flow of fine-grained matter in the closed air slide conveyor 18.

In these embodiment it is beneficial, but not necessary, that the arrangement comprises an additional fine-grained matter feeding arrangement 25 for feeding additional fine-grained matter into the fine-grained matter feeding means 4 downstream of the at least one sensor 11. Such embodiment is shown in figure 4. Such additional fine-grained matter may comprise at least one of the following: Silica, lime, limestone, reverts (i.e. ground mixture of recycled products and slag mixture), dust, electronic scrap, and solid coolant.

If the smelting furnace is in the form of a suspension smelting furnace as described

earlier, the feed material feeding arrangement 9 may, as is shown in the first embodiment shown in figure 2, comprise an closed air slide conveyor 18 in communication with the bin 10 for fine-grained matter and in communication the fine-grained matter feeding means 4 of the concentrate or matte burner 2 so that the closed air slide conveyor 18 is configured for receiving fine-grained matter from the bin 10 for fine-grained matter and configured for feeding fine-grained matter into the fine-grained matter feeding means 4 of the concentrate or matte burner 2.

If the smelting furnace is in the form of a suspension smelting furnace as described earlier, the feed material feeding arrangement 9 may, as is shown in the second embodiment shown in figure 3, comprise conveyor 26 that is in communication with the bin 10 for fine-grained matter and that is in communication with a closed air slide conveyor 18 that in turn is in communication with the fine-grained matter feeding means 4 of the concentrate or matte burner 2 so that the conveyor 26 is configured for receiving fine-grained matter from the bin 10 for feed material, the closed air slide conveyor 18 is configured for receiving fine-grained matter from the conveyor 26 and the fine-grained matter feeding means 4 of the concentrate or matte burner 2 is configured for receiving feed material from the closed air slide conveyor 18.

In this second embodiment it is beneficial, but not necessary, that the arrangement comprises an additional fine-grained matter feeding arrangement 25 for feeding additional fine-grained matter into the fine-grained matter feeding means 4 downstream of the at least one sensor 11.

The second embodiment of the arrangement shown in figure 3 comprises preferably, but not necessarily, a loss-in-weight controller 20 between the conveyor 26 for fine-grained matter and the controlling means 19 for controlling feed of fine-grained matter from the bin 10 for fine grained-matter into the controlling means 19.

If the smelting furnace is in the form of a suspension smelting furnace as described earlier, the feed material feeding arrangement 9 may, as is shown in the third embodiment shown in figure 4, comprise a controlling means 19 that is in communication with a closed air slide conveyor 18. The closed air slide conveyor 18 is in communication the fine-grained matter feeding means 4 of the concentrate or matte burner 2. In the third embodiment shown in figure 4 the controlling means 19 is configured for receiving fine-grained matter from the bin 10 for feed material, the closed air slide conveyor 18 is configured for receiving fine-grained matter from the controlling means 19, and the fine-grained matter feeding means 4 of the concentrate or matte burner 2 is configured for receiving feed material from the closed air slide conveyor 10.

In this third embodiment it is beneficial, but not necessary, that the arrangement comprises an additional fine-grained matter feeding arrangement 25 for feeding additional fine-grained matter into the fine-grained matter feeding means 4 downstream of the at least one sensor 11. Such additional fine-grained matter may comprise at least one of the following: Silica, lime, limestone, reverts (i.e. ground mixture of recycled products and slag mixture), dust, electronic scrap, and solid coolant.

If the smelting furnace is in the form of a suspension smelting furnace as described earlier, the feed material feeding arrangement 9 may, as is shown in the fourth embodiment shown in figure 5, comprise a dosing bin 21 that is in communication with the bin 10 for feed material and with a controlling means 19. The controlling means 19 is in communication with a closed air slide conveyor 18. The closed air slide conveyor 18 is in communication the fine-grained matter feeding means 4 of the concentrate or matte burner 2. In the fourth embodiment shown in figure 5 the dosing bin 21 is configured for receiving fine-grained matter from the bin 10 for feed material, the controlling means 19 is configured for receiving fine-grained matter from the controlling means 19, the closed air slide conveyor 18 is configured for receiving fine-grained matter from the controlling means 19, and the fine-grained matter feeding means 4 of the concentrate or matte burner 2 is configured for receiving feed material from the closed air slide conveyor 18.

In this fourth embodiment it is beneficial, but not necessary, that the arrangement comprises an additional fine-grained matter feeding arrangement 25 for feeding additional fine-grained matter into the fine-grained matter feeding means 4 downstream of the at least one sensor 11.

The feed material feeding arrangement 9 may, as is shown in the fifth embodiment of the arrangement shown in figure 6, comprise a fluidization means 24 in communication with the bin 10 for fine-grained matter and in communication with a dosing bin 21. The dosing bin 21 is in communication with a controlling means 19 that is in communication with a closed air slide conveyor 18 that in turn is in communication the fine-grained matter feeding means 4 of the concentrate or matte burner 2.

In this fourth embodiment it is beneficial, but not necessary, that the arrangement comprises an additional fine-grained matter feeding arrangement 25 for feeding additional fine-grained matter into the fine-grained matter feeding means 4 downstream of the at least one sensor 11. Such additional fine-grained matter may comprise at least one of the following: Silica, lime, limestone, reverts (i.e. ground mixture of recycled products and slag mixture), dust, electronic scrap, and solid coolant.

If the smelting furnace is in the form of a suspension smelting furnace as described earlier, the feed material feeding arrangement 9 may, as is shown in the fifth embodiment shown in figure 6, comprise a fluidization means 24 in communication with the bin 10 for fine-grained matter, a dosing bin 21 that is in communication with the fluidization means 24 and with a controlling means 19. The controlling means 19 is in communication with a closed air slide conveyor 18. The closed air slide conveyor 18 is in communication the fine-grained matter feeding means 4 of the concentrate or matte burner 2. In the fifth embodiment shown in figure 6 the fluidization means 24 is configured for receiving fine-grained matter from the bin 10 for feed material, the dosing bin 21 is configured for receiving fine-grained matter from the fluidization means 24, the controlling means 19 is configured for receiving fine-grained matter from the

controlling means 19, the closed air slide conveyor 18 is configured for receiving fine-grained matter from the controlling means 19, and the fine-grained matter feeding means 4 of the concentrate or matte burner 2 is configured for receiving feed material from the closed air slide conveyor 18.

5 In this fifth embodiment it is beneficial, but not necessary, that the arrangement comprises an additional fine-grained matter feeding arrangement 25 for feeding additional fine-grained matter into the fine-grained matter feeding means 4 downstream of the at least one sensor 11.

10 The fifth embodiment comprises preferably, but not necessarily, a valve means 22 between the bin 10 for fine grained-matter and the fluidization means 24. The fifth embodiment comprises preferably, but not necessarily, a valve means 22 between the fluidization means 24 and the dosing bin 21. The fifth embodiment comprises preferably, but not necessarily, a loss-in-weight controller 20 between the dosing bin 21 and the controlling means 19 for controlling feed of fine-grained matter from the dosing bin 21 into the controlling means 19. In this fifth  
15 embodiment, the arrangement comprises preferably, but not necessarily, an additional fine-grained matter feeding arrangement 25 for feeding additional fine-grained matter into the fine-grained matter feeding means 4 downstream of the at least one sensor 11. Such additional fine-grained matter may comprise at least one of the following: Silica, lime, limestone, reverts (i.e. ground mixture of recycled products and slag mixture), dust, electronic scrap, and solid coolant.

20 The feed material feeding arrangement 9 may, as is shown in the sixth embodiment of the arrangement shown in figure 7, comprise a dryer 23 in communication with the bin 10 for fine-grained matter and in communication with a dosing bin 21. The dosing bin 21 is in communication with a controlling means 19 that is in communication with a closed air slide conveyor 18 that in turn is in communication the fine-grained matter feeding means 4 of the  
25 concentrate or matte burner 2.

If the smelting furnace is in the form of a suspension smelting furnace as described earlier, the feed material feeding arrangement 9 may, as is shown in the sixth embodiment shown in figure 7, comprise a dryer 23 in communication with the bin 10 for fine-grained matter, a dosing bin 21 that is in communication with the dryer 23 and with a controlling means 19. The  
30 controlling means 19 is in communication with a closed air slide conveyor 18. The closed air slide conveyor 18 is in communication the fine-grained matter feeding means 4 of the concentrate or matte burner 2. In the sixth embodiment shown in figure 7 the dryer 23 is configured for receiving fine-grained matter from the bin 10 for feed material, the dosing bin 21 is configured for receiving fine-grained matter from the dryer 23, the controlling means 19 is  
35 configured for receiving fine-grained matter from the controlling means 19, the closed air slide conveyor 18 is configured for receiving fine-grained matter from the controlling means 19, and the fine-grained matter feeding means 4 of the concentrate or matte burner 2 is configured for receiving feed material from the closed air slide conveyor 18.

In this sixth embodiment it is beneficial, but not necessary, that the arrangement comprises an additional fine-grained matter feeding arrangement 25 for feeding additional fine-grained matter into the fine-grained matter feeding means 4 downstream of the at least one sensor 11.

5 The feed material feeding arrangement 9 may, as is shown in the seventh embodiment of the arrangement shown in figure 8, comprise a dryer 23 in communication with the bin 10 for fine-grained matter and in communication with a fluidization means 24. The fluidization means 24 is in communication with a dosing bin 21. The dosing bin 21 is in communication with a controlling mean 19. The controlling mean 19 is in communication with a closed air slide  
10 conveyor 18. The closed air slide conveyor 18 is in communication the fine-grained matter feeding means 4 of the concentrate or matte burner 2.

If the smelting furnace is in the form of a suspension smelting furnace as described earlier, the feed material feeding arrangement 9 may, as is shown in the seventh embodiment shown in figure 8, comprise a dryer 23 in communication with the bin 10 for fine-grained matter,  
15 a fluidization means 24 in communication with the dryer 23 and with a dosing bin 21, and a controlling means 19 in communication with the dosing bin 21 and a closed air slide conveyor 18. The closed air slide conveyor 18 is in communication the fine-grained matter feeding means 4 of the concentrate or matte burner 2. In the seventh embodiment shown in figure 8 the dryer 23 is configured for receiving fine-grained matter from the bin 10 for feed material, the fluidization  
20 means 24 is configured for receiving fine-grained matter from the dryer 23, the dosing bin 21 is configured for receiving fine-grained matter from the fluidization means 23, the controlling means 19 is configured for receiving fine-grained matter from the controlling means 19, the closed air slide conveyor 18 is configured for receiving fine-grained matter from the controlling means 19, and the fine-grained matter feeding means 4 of the concentrate or matte burner 2 is  
25 configured for receiving feed material from the closed air slide conveyor 18.

In this seventh embodiment it is beneficial, but not necessary, that the arrangement comprises an additional fine-grained matter feeding arrangement 25 for feeding additional fine-grained matter into the fine-grained matter feeding means 4 downstream of the at least one  
30 sensor 11. Such additional fine-grained matter may comprise at least one of the following: Silica, lime, limestone, reverts (i.e. ground mixture of recycled products and slag mixture), dust, electronic scrap, and solid coolant.

If the arrangement comprises a dryer 23 as is the case in the sixth embodiment shown in figure 7 and in the seventh embodiment shown in figure 8, the arrangement comprises preferably, but not necessarily, a sensor 11 for measuring flow of fine grained matter, which  
35 sensor 11 is functionally connected to the dryer 23 for controlling the dryer 23 based on the measured flow of fine grained-matter.

The arrangement comprises preferably, but not necessarily, a sensor 11 comprises at least one of the following: a tomography sensor such as an electrical capacitance tomography

measuring sensor, an ultrasonic tomography measuring sensor, a radiometric sensor, and a microwave sensor.

It is apparent to a person skilled in the art that as technology advanced, the basic idea of the invention can be implemented in various ways. The invention and its embodiments are therefore not restricted to the above examples, but they may vary within the scope of the claims.

**Claims**

1. A method for feeding feed material from a bin (10) for feed material into a furnace space of a smelting furnace, wherein the method comprises

5 a first providing step for providing a feed material feeding arrangement (9) for feeding feed material from the bin (10) for feed material into the furnace space of the smelting furnace (1),

a feeding step for feeding feed material from the bin (10) for feed material into the furnace space of the smelting furnace,

10 a second providing step for providing at least one sensor (11) for measuring flow of feed material at a position between the bin (10) for feed material and the furnace space of the smelting furnace (1), and

a measuring step for measuring flow of feed material by means of said at least one sensor (11) at said position.

wherein the feed material being fine-grained matter such as concentrate or matte, and

15 wherein the smelting furnace (1) being a suspension smelting furnace comprising a concentrate or matte burner (2) having reaction gas feeding means (3) and fine-grained matter feeding means (4), wherein the fine-grained matter feeding means (4) of the concentrate or matte burner (2) comprises a fine-grained matter feed pipe (12) having a perimeter (5) and having a discharge opening (7) that opens into a reaction shaft (8) of the suspension smelting furnace (1),

20 wherein the first providing step for providing a feed material feeding arrangement (9) for feeding feed material from the bin (10) for feed material into the furnace space of the smelting furnace (1) is a step for providing a feed material feeding arrangement (9) for feeding fine-grained matter from the bin (10) for feed material into the fine-grained matter feeding means (4) of the concentrate or matte burner (2),

25 wherein the feeding step for feeding feed material from the bin (10) for feed material into the furnace space of the smelting furnace is a step for feeding fine-grained matter from the bin (10) for feed material into the fine-grained matter feeding means (4) of the concentrate or matte burner (2) and for feeding fine-grained matter by means of the fine-grained matter feeding means (4) of the concentrate or matte burner (2) into the reaction shaft (8) of the suspension smelting furnace (1),

30 wherein the second providing step for providing at least one sensor (11) for measuring flow of feed material at a position between the bin (10) for feed material and the smelting furnace (1) is a step for providing at least one sensor (11) for measuring flow of fine-grained matter at a position between the bin (10) for feed matter and the discharge opening (7) of the fine-grained matter feed pipe (12) of the fine-grained matter feeding means (4) of the concentrate or matte burner (2), and

35 wherein the measuring step for measuring flow of fine-grained-matter by means of said at least one sensor (11) at said position is a step for measuring flow of feed material by means of

said at least one sensor (11) at said position between the bin (10) for feed matter and the discharge opening (7) of the fine-grained matter feed pipe (12) of the fine-grained matter feeding means (4) of the concentrate or matte burner (2),

**characterized**

5 by the first providing step includes providing a feed material feeding arrangement (9) comprising a closed air slide conveyor (18) in communication with the fine-grained matter feeding means (4) of the concentrate or matte burner (2), and

10 by the first providing step includes providing a feed material feeding arrangement (9) comprising a dryer (23) for regulating the moisture rate of fine-grained matter, by the feeding step includes feeding the fine-grained matter into the fine-grained matter feeding means (4) of the concentrate or matte burner (2) by means of the closed air slide conveyor (18),

by the second providing step includes providing at least one sensor (11) for measuring flow of fine-grained matter in the closed air slide conveyor (18) of the feed material feeding arrangement (9), and

15 by the measuring step includes measuring flow of fine-grained matter within the closed air slide conveyor (18) within said at least one sensor (11) provided for the closed air slide conveyor (18).

2. The method according to claim 1, **characterized**

20 by the second providing step includes providing the perimeter (5) of the solid matter feed pipe (12) of the fine-grained matter feeding means (4) of the concentrate or matte burner (2) with at least one sensor (11) for measuring flow of fine-grained matter in the solid matter feed pipe (12) of the fine-grained matter feeding means (4) of the concentrate or matte burner (2) by means of said at least one sensor (11).

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3. The method according to claim 1 or 2, **characterized**

by providing a suspension smelting furnace (1) comprising a concentrate or matte burner (2) having the feed pipe (12) of the fine-grained matter feeding means (4) divided into sectors (13),

30 by the second providing step includes providing each sector (13) of the feed pipe (12) with at least one sensor (11) for independently measuring flow of fine-grained matter within each sector (13) of the feed pipe (12), and

by the measuring step includes independently measuring flow of fine-grained matter within each sector (13) of the feed pipe (12) by means of said at least one sensor (11).

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4. The method according to claim 1 or 2, **characterized**

by providing a suspension smelting furnace (1) comprising a concentrate or matte burner (2) having the feed pipe (12) of the fine-grained matter feeding means (4) divided into sectors

(13),

by the second providing step includes providing each sector (13) of the feed pipe (12) with at least one sensor (11) for independently measuring flow of fine-grained matter within each sector (13) of the feed pipe (12),

5 by providing each sector (13) of the feed pipe (12) with an adjustable damper means (27) for independently adjusting the flow of fine-grained matter within each sector (13) of the feed pipe (12), and

10 by the feeding step includes independently adjusting the flow of fine-grained matter within each sector (13) of the feed pipe (12) by means of the adjustable damper means (27) provided in each sector (13) of the feed pipe (12) based on the flow of fine-grained matter independently measured within in each sector (13) of the feed pipe (12) by means of said at least one sensor (11) provided in each sector (13) of the feed pipe (12) in said measuring step.

5. The method according to claim 1 or 2, **characterized**

15 by providing a suspension smelting furnace (1) comprising a concentrate or matte burner (2) having the feed pipe (12) of the fine-grained matter feeding means (4) divided into sectors (13),

20 by the second providing step includes providing each sector (13) of the feed pipe (12) with at least one sensor (11) for independently measuring flow of fine-grained matter within each sector (13) of the feed pipe (12),

25 by the first providing step includes providing a feed material feeding arrangement (9) having a downstream end in communication with the fine-grained matter feeding means (4) of the concentrate or matte burner (2), which downstream end is provided with partition means (28) for dividing the downstream end of the feed material feeding arrangement (9) into several feed channels (29) each feed channel (29) ending into a sector (13) of the feed pipe (12) of the fine-grained matter feeding means (4) of the concentrate or matte burner (2),

30 by providing each feed channel (29) of the feed material feeding arrangement (9) with an adjustable damper means (27) for independently adjusting the flow of fine-grained matter within each feed channel (29) of the feed material feeding arrangement (9), and

35 by the feeding step includes independently adjusting the flow of fine-grained matter within each feed channel (29) of the feed material feeding arrangement (9) by means of the adjustable damper means (27) provided in each feed channel (29) of the feed material feeding arrangement (9) based on the flow of fine-grained matter independently measured within each sector (13) of the feed pipe (12) by means of said at least one sensor (11) provided in each sector (13) of the feed pipe (12) in said measuring step.

6. The method according to claim 1 or 2, **characterized**

by providing a suspension smelting furnace (1) comprising a concentrate or matte burner

(2) having the feed pipe (12) of the fine-grained matter feeding means (4) divided into sectors (13),

by the first providing step includes providing a feed material feeding arrangement (9) having a downstream end in communication with the fine-grained matter feeding means (4) of the concentrate or matte burner (2), which downstream end is provided with partition means (28) for dividing the downstream end of the feed material feeding arrangement (9) into several feed channels (29) each feed channel (29) ending into a sector (13) of the feed pipe (12) of the fine-grained matter feeding means (4) of the concentrate or matte burner (2),

by the second providing step includes providing each feed channel (29) of the feed material feeding arrangement (9) with at least one sensor (11) for independently measuring flow of fine-grained matter within each feed channel (29) of the feed material feeding arrangement (9),

by providing each sector (13) of the feed pipe (12) with an adjustable damper means (27) for independently adjusting the flow of fine-grained matter within each sector (13) of the feed pipe (12), and

by the feeding step includes independently adjusting the flow of fine-grained matter within each sector (13) of the feed pipe (12) by means of the adjustable damper means (27) provided in each sector (13) of the feed pipe (12) based on the flow of fine-grained matter independently measured within each feed channel (29) of the feed material feeding arrangement (9) by means of said at least one sensor (11) provided in each feed channel (29) of the feed material feeding arrangement (9) in said measuring step.

7. The method according to any of the claims 1 to 6, **characterized**

by the second providing step includes establishing a functional connection between at least one sensor (11) and the dryer (23), and

by the method includes a regulating step for regulating the dryer (23) based on the flow of fine-grained matter measured in said measuring step with said at least one sensor (11) functionally connected with the dryer (23).

8. The method according to any of the claims 1 to 7 **characterized**

by a third providing step for providing an additional fine-grained matter feeding means (25) for feeding additional fine-grained matter into the fine-grained matter feeding means (4) downstream of said at least one sensor (11), and

a second feeding step for feeding additional fine-grained matter into the fine-grained matter feeding means (4) by means of said additional fine-grained matter feeding means (25).

9. The method according to any of the claims 1 to 8, **characterized**

by the second providing step includes providing at least one sensor (11) in the form of the

following: a tomography sensor such as an electrical capacitance tomography measuring sensor, an ultrasonic tomography measuring sensor, a radiometric sensor, and a microwave sensor.

10. The method according to any of the claims 1 to 9, **characterized**

5 by the second providing step comprises providing at least one first sensor at a first position in the feed material feeding arrangement and providing at least one second sensor at a second position in the feed material feeding arrangement (9), which second position is situated downstream of the first position, and

10 by the measuring step includes measuring velocity of the flow of feed material based on measurement made by said at least one first sensor and said at least one second sensor.

11. An arrangement for feeding feed material from a bin (10) for feed material into a furnace space of a smelting furnace (1)

15 wherein the arrangement comprises a feed material feeding arrangement (9) for feeding feed material from the bin (10) for feed material into the furnace space of the smelting furnace (1),

by at least one sensor (11) for measuring flow of feed material being arranged between the bin (10) for feed material and the furnace space of the smelting furnace (1).

by the feed material being fine-grained matter such as concentrate or matte,

20 by the smelting furnace being an suspension smelting furnace comprising a reaction shaft (8) and a concentrate or matte burner (2) having reaction gas feeding means (3) and fine-grained matter feeding means (4),

25 by the fine-grained matter feeding means (4) of the concentrate or matte burner (2) comprising a fine-grained matter feed pipe (12) having a perimeter (5) and having a discharge opening (7) that opens into the reaction shaft (8) of the suspension smelting furnace (1), and

wherein the feed material feeding arrangement (9) for feeding feed material from the bin (10) for feed material into the furnace space of the smelting furnace (1) being configured for feeding fine-grained matter from the bin (10) for feed material into the fine-grained matter feeding means (4) of the concentrate or matte burner (2), and

30 by said at least one sensor (11) for measuring flow of feed material between the bin (10) for feed material and the furnace space of the smelting furnace (1) being arranged between the bin (10) for fine-grained matter and the discharge opening (7) of the fine-grained matter feed pipe (12) of the fine-grained matter feeding means (4) of the concentrate or matte burner (2).

**characterized**

35 by the feed material feeding arrangement (9) comprises an closed air slide conveyor (18) in communication with the fine-grained matter feeding means (4) of the concentrate or matte burner (2),

by the feed material feeding arrangement (9) comprises a dryer (23) for regulating the

moisture rate of fine-grained matter to be fed from the bin (10) for fine-grained matter into the reaction shaft (8) of the suspension smelting furnace (1),

by the closed air slide conveyor (18) being configured for feeding the fine-grained matter into the fine-grained matter feeding means (4) of the concentrate or matte burner (2), and

5 by the closed air slide conveyor (18) of the fine-grained matter feeding arrangement (9) being provided with a sensor (11) for measuring flow of fine-grained matter in the closed air slide conveyor (18).

12. The arrangement according to claim 11, **characterized**

10 by the perimeter (5) of the solid matter feed pipe (12) being provided with at least one sensor (11) for measuring flow of fine-grained matter in the solid matter feed pipe (12).

13. The arrangement according to claim 11 or 12, **characterized**

15 by the feed pipe (12) of the concentrate or matte burner (2) being divided into sectors (13), and

by each sector (13) being provided with at least one sensor (11) for independently measuring flow within each sector (13).

14. The arrangement according to claim 11 or 12, **characterized**

20 by the suspension smelting furnace (1) comprising a concentrate or matte burner (2) having the feed pipe (12) of the fine-grained matter feeding means (4) divided into sectors (13),

by the each sector (13) of the feed pipe (12) being provided with at least one sensor (11) for independently measuring flow of fine-grained matter within each sector (13) of the feed pipe (12),

25 by each sector (13) of the feed pipe (12) being provided with an adjustable damper means (27) for independently adjusting the flow of fine-grained matter within each sector (13) of the feed pipe (12).

15. The arrangement according to claim 11 or 12, **characterized**

30 by the suspension smelting furnace (1) comprising a concentrate or matte burner (2) having the feed pipe (12) of the fine-grained matter feeding means (4) divided into sectors (13),

by each sector (13) of the feed pipe (12) being provided with at least one sensor (11) for independently measuring flow of fine-grained matter within each sector (13) of the feed pipe (12),

35 by the feed material feeding arrangement (9) having a downstream end in communication with the fine-grained matter feeding means (4) of the concentrate or matte burner (2), which downstream end is provided with partition means (28) for dividing the downstream end of the feed material feeding arrangement (9) into several feed channels (29) each feed channel (29)

ending into a sector (13) of the feed pipe (12) of the fine-grained matter feeding means (4) of the concentrate or matte burner (2), and

by each feed channel (29) of the feed material feeding arrangement (9) being provided with an adjustable damper means (27) for independently adjusting the flow of fine-grained matter within each feed channel (29) of the feed material feeding arrangement (9).

16. The arrangement according to claim 11 or 12, **characterized**

by the suspension smelting furnace (1) comprising a concentrate or matte burner (2) having the feed pipe (12) of the fine-grained matter feeding means (4) divided into sectors (13),

by the feed material feeding arrangement (9) having a downstream end in communication with the fine-grained matter feeding means (4) of the concentrate or matte burner (2), which downstream end is provided with partition means (28) for dividing the downstream end of the feed material feeding arrangement (9) into several feed channels (29) each feed channel (29) ending into a sector (13) of the feed pipe (12) of the fine-grained matter feeding means (4) of the concentrate or matte burner (2),

by each feed channel (29) of the feed material feeding arrangement (9) being provided with at least one sensor (11) for independently measuring flow of fine-grained matter within each feed channel (29) of the feed material feeding arrangement (9), and

by each sector (13) of the feed pipe (12) being provided with an adjustable damper means (27) for independently adjusting the flow of fine-grained matter within each sector (13) of the feed pipe (12).

17. The arrangement according to any of the claims 11 to 16, **characterized**

by a functional connection between at least one sensor (11) and the dryer (23) for regulating the dryer (23) based on the flow of fine-grained matter measured with said at least one sensor (11) functionally connected with the dryer (23)

18. The arrangement according to any of the claims 11 to 17, **characterized**

by an additional fine-grained matter feeding means (25) for feeding additional fine-grained matter into the fine-grained matter feeding means (4) downstream of said at least one sensor (11).

19. The arrangement according to any of the claims 11 to 18, **characterized**

by the sensor (11) comprising at least one of the following: a tomography sensor such as an electrical capacitance tomography measuring sensor, an ultrasonic tomography measuring sensor, a radiometric sensor, and a microwave sensor.

20. The arrangement according to any of the claims 11 to 19, **characterized** by at least one first sensor at a first position in the feed material feeding arrangement and by at least one second sensor at a second position in the feed material feeding arrangement (9), which second position is situated downstream of the first position.

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## Patenttivaatimukset

1. Menetelmä syöttömateriaalin syöttämiseksi syöttömateriaalisäiliöstä (10) sulatusuunin uunitilaan menetelmän käsittäessä

5 ensimmäisen aikaansaamisvaiheen syöttömateriaalin syöttämisjärjestelyn (9) aikaansaamiseksi syöttömateriaalin syöttämiseen syöttömateriaalisäiliöstä (10) sulatusuunin (1) uunitilaan,

syöttämisvaiheen syöttömateriaalin syöttämiseksi syöttömateriaalisäiliöstä (10) sulatusuunin uunitilaan,

10 toisen aikaansaamisvaiheen ainakin yhden anturin (11) aikaansaamiseksi syöttömateriaalin virtauksen mittaamiseen syöttömateriaalisäiliön (10) ja sulatusuunin (1) uunitilan välissä olevalta kohdalta, ja

mittaamisvaiheen syöttömateriaalin virtauksen mittaamiseksi mainitulta kohdalta mainitun ainakin yhden anturin (11) avulla,

15 syöttömateriaalin ollessa hienorakeista ainetta kuten rikastetta tai metallikiveä, ja

sulatusuunin (1) ollessa suspensiosulatusuuni, joka käsittää rikaste- tai metallikivipolttimen (2), jossa on reaktiokaasunsyöttövälineet (3) ja hienorakeisen aineen syöttövälineet (4), rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineiden (4) käsittäessä hienorakeisen aineen syöttöputken (12), jolla on kehä (5) ja jossa on poistoaukko (7)

20 joka aukeaa suspensiosulatusuunin (1) reaktiokuiluun (8),

ensimmäisen aikaansaamisvaiheen syöttömateriaalin syöttämisjärjestelyn (9) aikaansaamiseksi syöttömateriaalin syöttämiseen syöttömateriaalisäiliöstä (10) sulatusuunin (1) uunitilaan ollessa vaihe syöttömateriaalin syöttämisjärjestelyn (9) aikaansaamiseksi hienorakeisen aineen syöttämiseen syöttömateriaalisäiliöstä (10) rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineisiin (4),

25 syöttämisvaiheen syöttömateriaalin syöttämiseksi syöttömateriaalisäiliöstä (10) sulatusuunin uunitilaan ollessa vaihe hienorakeisen aineen syöttämiseksi syöttömateriaalisäiliöstä (10) rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineisiin (4) ja hienorakeisen aineen syöttämiseksi rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineiden (4) avulla suspensiosulatusuunin (1) reaktiokuiluun (8),

30 toisen aikaansaamisvaiheen ainakin yhden anturin (11) aikaansaamiseksi syöttömateriaalin virtauksen mittaamiseen syöttömateriaalisäiliön (10) ja sulatusuunin (1) uunitilan välissä olevalta kohdalta ollessa vaihe ainakin yhden anturin (11) aikaansaamiseksi hienorakeisen aineen virtauksen mittaamiseen syöttömateriaalisäiliön (10) ja rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineiden (4) hienorakeisen aineen syöttöputken (12) poistoaukon (7) välissä olevalta kohdalta, ja

35 mittaamisvaiheen syöttömateriaalin virtauksen mittaamiseksi mainitulta kohdalta mainitun ainakin yhden anturin (11) avulla ollessa vaihe syöttömateriaalin virtauksen

mittaamiseksi mainitun ainakin yhden anturin (11) avulla mainitulta syöttömateriaalisäiliön (10) ja rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineiden (4) hienorakeisen aineen syöttöputken (12) poistoaukon (7) välissä olevalta kohdalta,

**tunnettu** siitä,

5 että ensimmäinen aikaansaamisvaihe sisältää sen, että aikaansaadaan syöttömateriaalin syöttämisjärjestely (9), joka käsittää suljetun pneumaattisen kuljettimen (18) joka on yhteydessä rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineiden (4) kanssa,

10 että ensimmäinen aikaansaamisvaihe sisältää sen, että aikaansaadaan syöttömateriaalin syöttämisjärjestely (9), joka käsittää kuivaimen (23) säätämään hienorakeisen aineen kosteussuhdetta,

että syöttämisvaihe sisältää sen, että syötetään hienorakeista ainetta rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineisiin (4) suljetun pneumaattisen kuljettimen (18) avulla,

15 että toinen aikaansaamisvaihe sisältää sen, että aikaansaadaan ainakin yksi anturi (11) ensimmäisen syöttömateriaalin syöttämisjärjestelyn (9) suljetussa pneumaattisessa kuljettimessa (18) olevan hienorakeisen aineen virtauksen mittaamiseen, ja

että mittaamisvaihe sisältää suljetussa pneumaattisessa kuljettimessa (18) tapahtuvan hienorakeisen aineen virtauksen mittaamisen mainitussa suljettua pneumaattista kuljetinta (18) varten aikaansaadussa ainakin yhdessä anturissa (11).

20

2. Patenttivaatimuksen 1 mukainen menetelmä, **tunnettu** siitä, että

25 toinen aikaansaamisvaihe sisältää sen, että rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineiden (4) kiinteän aineen syöttöputken (12) kehä (5) varustetaan ainakin yhdellä anturilla (11) mittaamaan hienorakeisen aineen virtaus mainitussa rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineiden (4) kiinteän aineen syöttöputkessa (12) mainitun ainakin yhden anturin (11) avulla.

3. Patenttivaatimuksen 1 tai 2 mukainen menetelmä, **tunnettu** siitä,

30 että aikaansaadaan suspensiosulatusuuni (1), joka käsittää rikaste- tai metallikivipolttimen (2), jossa hienorakeisen aineen syöttövälineiden (4) syöttöputki (12) on jaettu sektoreihin (13),

että toinen aikaansaamisvaihe sisältää sen, että syöttöputken (12) jokainen sektori (13) varustetaan ainakin yhdellä anturilla (11) hienorakeisen aineen virtauksen mittaamiseksi riippumattomasti syöttöputken (12) jokaisessa sektorissa (13), ja

35 että mittaamisvaihe sisältää sen, että riippumattomasti mitataan hienorakeisen aineen virtaus syöttöputken (12) jokaisessa sektorissa (13) mainitun ainakin yhden anturin (11) avulla.

4. Patenttivaatimuksen 1 tai 2 mukainen menetelmä, **tunnettu** siitä,

että aikaansaadaan suspensiosulatusuuni (1), joka käsittää rikaste- tai metallikivipolttimen (2), jossa hienorakeisen aineen syöttövälineiden (4) syöttöputki (12) on jaettu sektoreihin (13),

5 että toinen aikaansaamisvaihe sisältää sen, että syöttöputken (12) jokainen sektori (13) varustetaan ainakin yhdellä anturilla (11) riippumattomasti mittaamaan hienorakeisen aineen virtaus syöttöputken (12) jokaisessa sektorissa (13),

että syöttöputken (12) jokainen sektori (13) varustetaan säädettävällä vaimennusvälineellä (27) riippumattomasti säätämään hienorakeisen aineen virtaus syöttöputken (12) jokaisessa sektorissa (13), ja

10 että syöttämisen vaihe sisältää sen, että riippumattomasti säädetään hienorakeisen aineen virtaus syöttöputken (12) jokaisessa sektorissa (13) syöttöputken (12) jokaiseen sektoriin (13) aikaansaadun säädettävän vaimennusvälineen (27) avulla hienorakeisen aineen virtauksen perusteella, joka virtaus on mainitussa mittaamisvaiheessa mitattu riippumattomasti syöttöputken (12) jokaisessa sektorissa (13) syöttöputken (12) jokaiseen sektoriin (13) aikaansaadun mainitun  
15 ainakin yhden anturin (11) avulla.

5. Patenttivaatimuksen 1 tai 2 mukainen menetelmä, **tunnettu** siitä,

että aikaansaadaan suspensiosulatusuuni (1), joka käsittää rikaste- tai metallikivipolttimen (2), jossa hienorakeisen aineen syöttövälineiden (4) syöttöputki (12) on  
20 jaettu sektoreihin (13),

että toinen aikaansaamisvaihe sisältää sen, että syöttöputken (12) jokainen sektori (13) varustetaan ainakin yhdellä anturilla (11) riippumattomasti mittaamaan hienorakeisen aineen virtaus syöttöputken (12) jokaisessa sektorissa (13),

25 että ensimmäinen aikaansaamisvaihe sisältää sen, että aikaansaadaan syöttömateriaalin syöttämisen järjestely (9) jossa on rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineisiin (4) yhteydessä oleva alavirtapää, joka alavirtapää on varustettu jakovälineillä (28) syöttömateriaalin syöttämisen järjestelyn (9) alavirtapään jakamiseen lukuisiin syöttökanaviin (29) jokaisen syöttökanavan (29) päättyessä rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineiden (4) syöttöputken (12) sektoriin (13),

30 että syöttömateriaalin syöttämisen järjestelyn (9) jokainen syöttökanava (29) varustetaan säädettävällä vaimennusvälineellä (27) riippumattomasti säätämään hienorakeisen aineen virtaus syöttömateriaalin syöttämisen järjestelyn (9) jokaisessa syöttökanavassa (29), ja

35 että syöttämisen vaihe sisältää sen, että riippumattomasti säädetään hienorakeisen aineen virtaus syöttömateriaalin syöttämisen järjestelyn (9) jokaisessa syöttökanavassa (29) syöttömateriaalin syöttämisen järjestelyn (9) jokaiseen syöttökanavaan (29) aikaansaadun säädettävän vaimennusvälineen (27) avulla hienorakeisen aineen virtauksen perusteella, joka virtaus on mainitussa mittaamisvaiheessa mitattu riippumattomasti syöttöputken (12) jokaisessa sektorissa (13) syöttöputken (12) jokaiseen sektoriin (13) aikaansaadun mainitun ainakin yhden

anturin (11) avulla.

6. Patenttivaatimuksen 1 tai 2 mukainen menetelmä, **tunnettu** siitä,

5 että aikaansaadaan suspensiosulatusuuni (1), joka käsittää rikaste- tai metallikivipolttimen (2), jossa hienorakeisen aineen syöttövälineiden (4) syöttöputki (12) on jaettu sektoreihin (13),

10 että ensimmäinen aikaansaamisvaihe sisältää sen, että aikaansaadaan syöttömateriaalin syöttämisjärjestely (9) jossa on rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineisiin (4) yhteydessä oleva alavirtapää, joka alavirtapää on varustettu jakovälineillä (28) syöttömateriaalin syöttämisjärjestelyn (9) alavirtapään jakamiseen likuisiin syöttökanaviin (29) jokaisen syöttökanavan (29) päättyessä rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineiden (4) syöttöputken (12) yhteen sektoriin (13),

15 että toinen aikaansaamisvaihe sisältää sen, että syöttömateriaalin syöttämisjärjestelyn (9) jokainen syöttökanava (29) varustetaan ainakin yhdellä anturilla (11) riippumattomasti mittaamaan hienorakeisen aineen virtaus syöttömateriaalin syöttämisjärjestelyn (9) jokaisessa syöttökanavassa (29),

20 että syöttöputken (12) jokainen sektori (13) varustetaan säädettävällä vaimennusvälineellä (27) riippumattomasti säätämään hienorakeisen aineen virtaus syöttöputken (12) jokaisessa sektorissa (13), ja

25 että syöttämisvaihe sisältää sen, että riippumattomasti säädetään hienorakeisen aineen virtaus syöttöputken (12) jokaisessa sektorissa (13) syöttöputken (12) jokaiseen sektoriin (13) aikaansaadun säädettävän vaimennusvälineen (27) avulla hienorakeisen aineen virtauksen perusteella, joka virtaus on mainitussa mittausvaiheessa mitattu riippumattomasti syöttömateriaalin syöttämisjärjestelyn (9) jokaisessa syöttökanavassa (29) syöttömateriaalin syöttämisjärjestelyn (9) jokaiseen syöttökanavaan (29) aikaansaadun mainitun ainakin yhden anturin (11) avulla.

7. Jonkin patenttivaatimuksista 1 - 6 mukainen menetelmä, **tunnettu** siitä,

30 että toinen aikaansaamisvaihe sisältää sen, että perustetaan ainakin yhden anturin (11) ja kuivaimen (23) välinen toiminnallinen yhteys, ja

menetelmä sisältää säätämisvaiheen kuivaimen (23) säätämiseksi perustuen kuivaimen (23) toiminnallisesti kytketyn ainakin yhden anturin (11) avulla mainitussa mittaamisvaiheessa mitattuun hienorakeisen aineen virtaukseen.

35 8. Jonkin patenttivaatimuksista 1 – 7 mukainen menetelmä, **tunnettu** siitä,

että siinä on kolmas aikaansaamisvaihe ylimääräisen hienorakeisen aineen syöttövälineen (25) aikaansaamiseksi ylimääräisen hienorakeisen aineen syöttämiseen mainitun ainakin yhden anturin (11) suhteen alavirtaan sijaitseviin hienorakeisen aineen syöttövälineisiin (4), ja

että siinä on toinen syöttämisvaihe ylimääräisen hienorakeisen aineen syöttämiseksi hienorakeisen aineen syöttövälineisiin (4) mainitun ylimääräisen hienorakeisen aineen syöttövälineen (25) avulla.

5 9. Jonkin patenttivaatimuksista 1 – 8 mukainen menetelmä, **tunnettu** siitä, että toinen syöttämisvaihe sisältää sen, että aikaansaadaan ainakin yksi seuraavassa muodossa oleva anturi (11): tomografia-anturi, esim. sähkökapasitanssitomografiamittausanturi, ultra-äänitomografiamittausanturi, radiometrinen anturi ja mikroaaltoanturi.

10 10. Jonkin patenttivaatimuksista 1 – 9 mukainen menetelmä, **tunnettu** siitä, että toinen aikaansaamisvaihe käsittää sen, että aikaansaadaan ainakin yksi ensimmäinen anturi syöttömateriaalin syöttämisjärjestelyn erääseen ensimmäiseen kohtaan ja aikaansaadaan ainakin yksi toinen anturi syöttömateriaalin syöttämisjärjestelyn (9) erääseen toiseen kohtaan, joka toinen kohta sijaitsee alavirtaan ensimmäisen kohdan suhteen, ja

15 että mittaamisvaihe sisältää syöttömateriaalin virtauksen nopeuden mittaamisen perustuen mainitun ainakin yhden ensimmäisen anturin ja mainitun ainakin yhden toisen anturin avulla tehtyihin mittauksiin.

11. Järjestely syöttömateriaalin syöttämiseksi syöttömateriaalisäiliöstä (10) sulatusuunin (1) uunitilaan

20 järjestelyn käsittäessä syöttömateriaalin syöttämisjärjestelyn (9) syöttömateriaalin syöttämiseen syöttömateriaalisäiliöstä (10) sulatusuunin (1) uunitilaan,

ainakin yhden anturin (11) syöttömateriaalin virtauksen mittaamiseen ollessa järjestetty syöttömateriaalisäiliön (10) ja sulatusuunin (1) uunitilan väliin,

25 syöttömateriaalin ollessa hienorakeista ainetta kuten rikastetta tai metallikiveä,

sulatusuunin ollessa suspensiosulatusuuni, joka käsittää reaktiokuilun (8) ja rikaste- tai metallikivipolttimen (2), jossa on reaktiokaasunsyöttövälineet (3) ja hienorakeisen aineen syöttövälineet (4),

30 rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineiden (4) käsittäessä hienorakeisen aineen syöttöputken (12), jolla on kehä (5) ja jossa on poistoaukko (7) joka aukeaa suspensiosulatusuunin (1) reaktiokuiluun (8), ja

35 jossa syöttömateriaalin syöttämisjärjestely (9) syöttömateriaalin syöttämiseen syöttömateriaalisäiliöstä (10) sulatusuunin (1) uunitilaan on konfiguroitu syöttämään hienorakeista ainetta syöttömateriaalisäiliöstä (10) rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineisiin (4), ja

mainitun ainakin yhden anturin (11) syöttömateriaalisäiliön (10) ja sulatusuunin (1) uunitilan välisen syöttömateriaalin virtauksen mittaamiseen ollessa järjestetty hienorakeisen aineen säiliön (10) ja rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineiden

(4) hienorakeisen aineen syöttöputken (12) poistoaukon (7) väliin,

**tunnettu** siitä, että

syöttömateriaalin syöttämisjärjestely (9) käsittää suljetun pneumaattisen kuljettimen (18) joka on yhteydessä rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineisiin (4),

syöttömateriaalin syöttämisjärjestely (9) käsittää kuivaimen (23) säätämään hienorakeisen aineen säiliöstä (10) suspensiosulatusuunin (1) reaktiokuiluun (8) syötettävän hienorakeisen aineen kosteussuhdetta,

suljettu pneumaattinen kuljetin (18) on konfiguroitu syöttämään hienorakeista ainetta rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineisiin (4), ja

ensimmäisen hienorakeisen aineen syöttämisjärjestelyn (9) suljettu pneumaattinen kuljetin (18) on varustettu anturilla (11) mittaamaan hienorakeisen aineen virtaus suljetussa pneumaattisessa kuljettimessa (18).

12. Patenttivaatimuksen 11 mukainen järjestely, **tunnettu** siitä, että

kiinteän aineen syöttöputken (12) kehä (5) on varustettu ainakin yhdellä anturilla (11) mittaamaan hienorakeisen aineen virtaus kiinteän aineen syöttöputkessa (12).

13. Patenttivaatimuksen 11 tai 12 mukainen järjestely, **tunnettu** siitä, että

rikaste- tai metallikivipolttimen (2) syöttöputki (12) on jaettu sektoreihin (13), ja jokainen sektori (13) on varustettu ainakin yhdellä anturilla (11) riippumattomasti mittaamaan virtaus jokaisessa sektorissa (13).

14. Patenttivaatimuksen 11 tai 12 mukainen järjestely, **tunnettu** siitä, että

suspensiosulatusuuni (1) käsittää rikaste- tai metallikivipolttimen (2), jonka hienorakeisen aineen syöttövälineiden (4) syöttöputki (12) on jaettu sektoreihin (13),

syöttöputken (12) jokainen sektori (13) on varustettu ainakin yhdellä anturilla (11) riippumattomasti mittaamaan hienorakeisen aineen virtaus syöttöputken (12) jokaisessa sektorissa (13),

syöttöputken (12) jokainen sektori (13) on varustettu säädettävällä vaimennusvälineellä (27) riippumattomasti säätämään hienorakeisen aineen virtaus syöttöputken (12) jokaisessa sektorissa (13).

15. Patenttivaatimuksen 11 tai 12 mukainen järjestely, **tunnettu** siitä, että

suspensiosulatusuuni (1) käsittää rikaste- tai metallikivipolttimen (2), jonka hienorakeisen aineen syöttövälineiden (4) syöttöputki (12) on jaettu sektoreihin (13),

syöttöputken (12) jokainen sektori (13) on varustettu ainakin yhdellä anturilla (11) riippumattomasti mittaamaan hienorakeisen aineen virtaus syöttöputken (12) jokaisessa

sektorissa (13),

syöttömateriaalin syöttämisyjärjestelyssä (9) on rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineisiin (4) yhteydessä oleva alavirtapää, joka alavirtapää on varustettu jakovälineillä (28) syöttömateriaalin syöttämisyjärjestelyn (9) alavirtapään jakamiseen  
5 lukuisiin syöttökanaviin (29) jokaisen syöttökanavan (29) päättyessä rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineiden (4) syöttöputken (12) sektoriin (13), ja

10 syöttömateriaalin syöttämisyjärjestelyn (9) jokainen syöttökanava (29) on varustettu säädettävällä vaimennusvälineellä (27) riippumattomasti säätämään hienorakeisen aineen virtaus syöttömateriaalin syöttämisyjärjestelyn (9) jokaisessa syöttökanavassa (29).

16. Patenttivaatimuksen 11 tai 12 mukainen järjestely, **tunnettu** siitä, että suspensiosulatusuuni (1) käsittää rikaste- tai metallikivipolttimen (2), jonka hienorakeisen aineen syöttövälineiden (4) syöttöputki (12) on jaettu sektoreihin (13),

15 syöttömateriaalin syöttämisyjärjestelyssä (9) on rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineisiin (4) yhteydessä oleva alavirtapää, joka alavirtapää on varustettu jakovälineellä (28) syöttömateriaalin syöttämisyjärjestelyn (9) alavirtapään jakamiseen lukuisiin syöttökanaviin (29) jokaisen syöttökanavan (29) päättyessä rikaste- tai metallikivipolttimen (2) hienorakeisen aineen syöttövälineiden (4) syöttöputken (12) sektoriin  
20 (13),

syöttömateriaalin syöttämisyjärjestelyn (9) jokainen syöttökanava (29) on varustettu ainakin yhdellä anturilla (11) riippumattomasti mittaamaan hienorakeisen aineen virtaus syöttömateriaalin syöttämisyjärjestelyn (9) jokaisessa syöttökanavassa (29), ja

25 syöttöputken (12) jokainen sektori (13) on varustettu säädettävällä vaimennusvälineellä (27) riippumattomasti säätämään hienorakeisen aineen virtaus syöttöputken (12) jokaisessa sektorissa (13).

30 17. Jonkin patenttivaatimuksista 11 - 16 mukainen järjestely, **tunnettu** siitä, että siinä on toiminnallinen yhteys ainakin yhden anturin (11) ja kuivaimen (23) välillä säätämään kuivainta (23) perustuen kuivaimen (23) toiminnallisesti kytketyn mainitun ainakin yhden anturin (11) avulla mitattuun hienorakeisen aineen virtaukseen.

35 18. Jonkin patenttivaatimuksista 11 - 17 mukainen järjestely, **tunnettu** siitä, että siinä on ylimääräisen hienorakeisen aineen syöttöväline (25) syöttämään ylimääräistä hienorakeista ainetta mainitun ainakin yhden anturin (11) suhteen alavirtaan sijaitseviin hienorakeisen aineen syöttövälineisiin (4).

19. Jonkin patenttivaatimuksista 11 – 18 mukainen järjestely, **tunnettu** siitä, että anturi (11) käsittää ainakin yhden seuraavista: tomografia-anturi, esim. sähkökapasitanssitomografiamittausanturi, ultra-äänitomografiamittausanturi, radiometrinen anturi ja mikroaaltoanturi.
- 5
20. Jonkin patenttivaatimuksista 11 – 19 mukainen järjestely, **tunnettu** siitä, että siinä on ainakin yksi ensimmäinen anturi syöttömateriaalin syöttämisjärjestelyn eräässä ensimmäisessä kohdassa ja ainakin yksi toinen anturi syöttömateriaalin syöttämisjärjestelyn (9) eräässä toisessa kohdassa, joka toinen kohta sijaitsee alavirtaan ensimmäiseen kohtaan nähden.
- 10

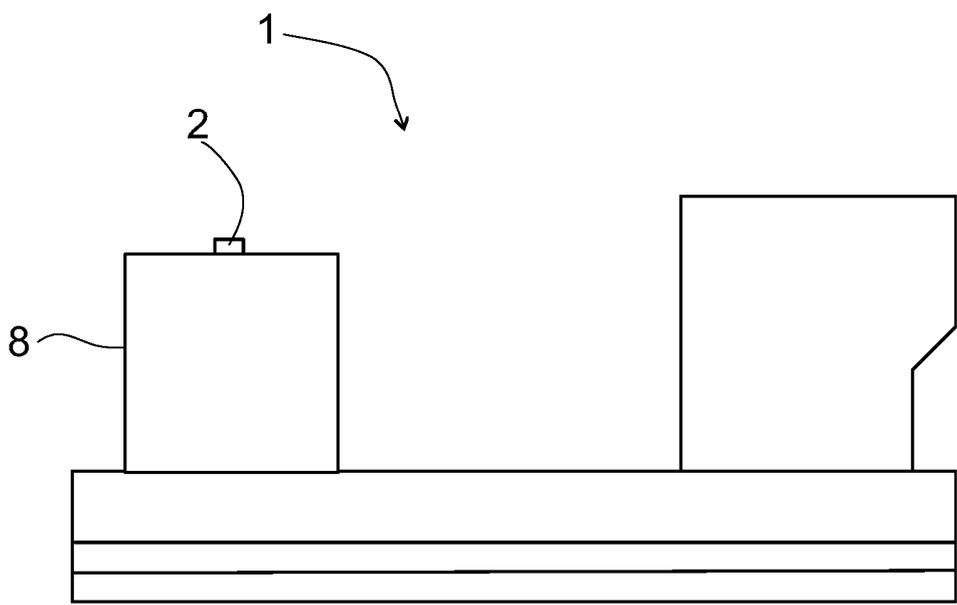


FIG 1

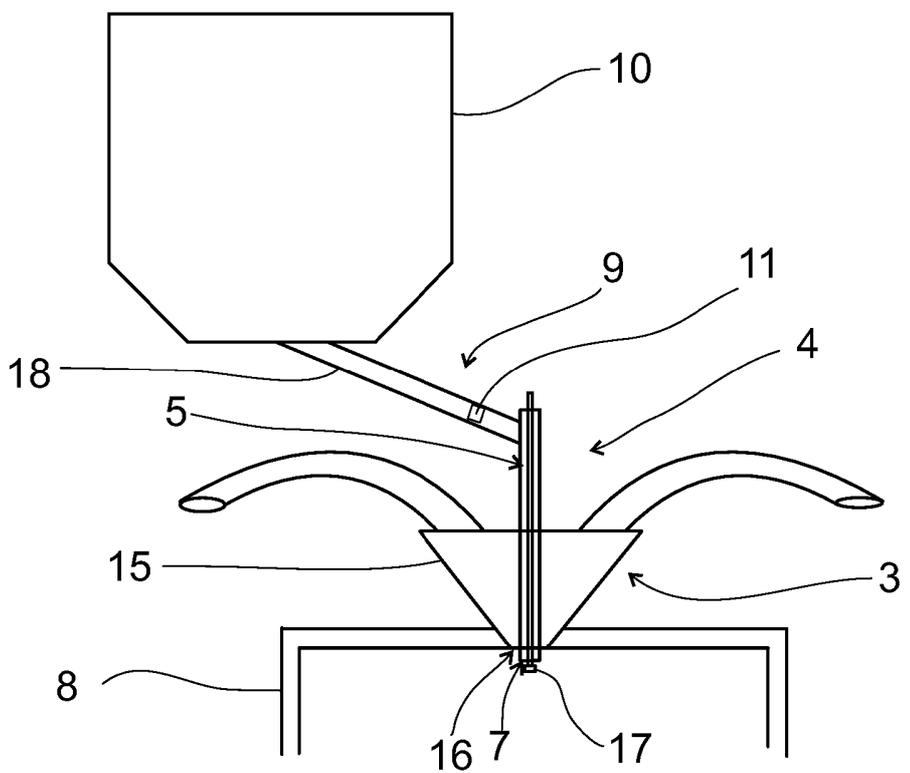


FIG 2

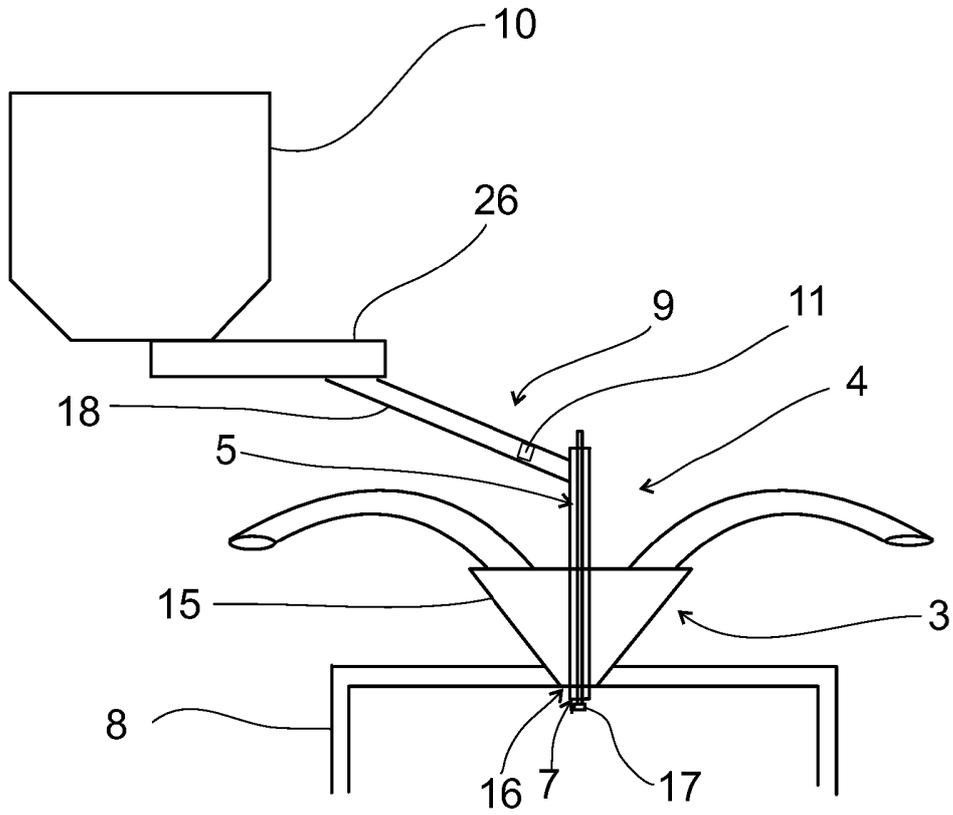


FIG 3

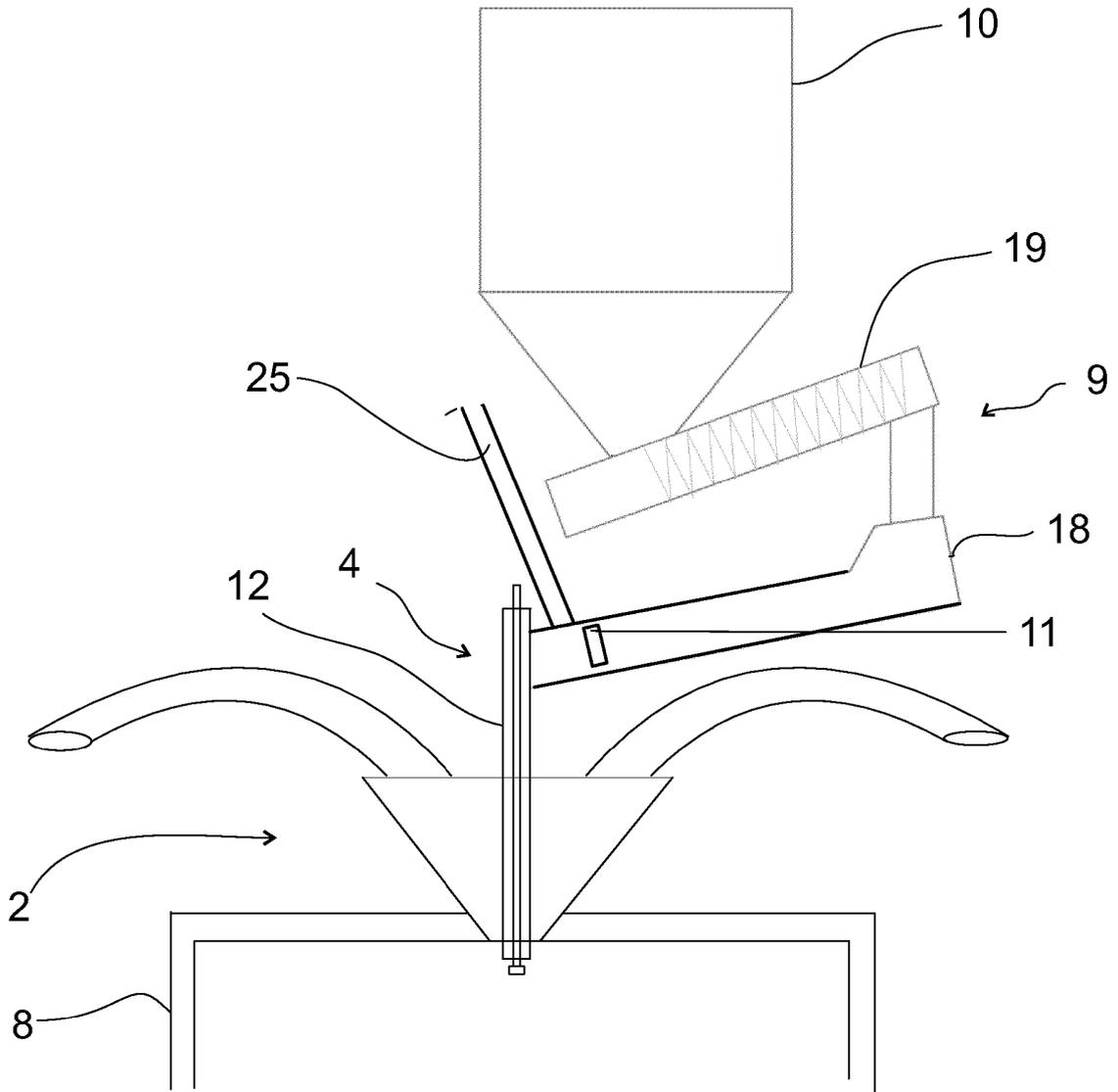


FIG 4

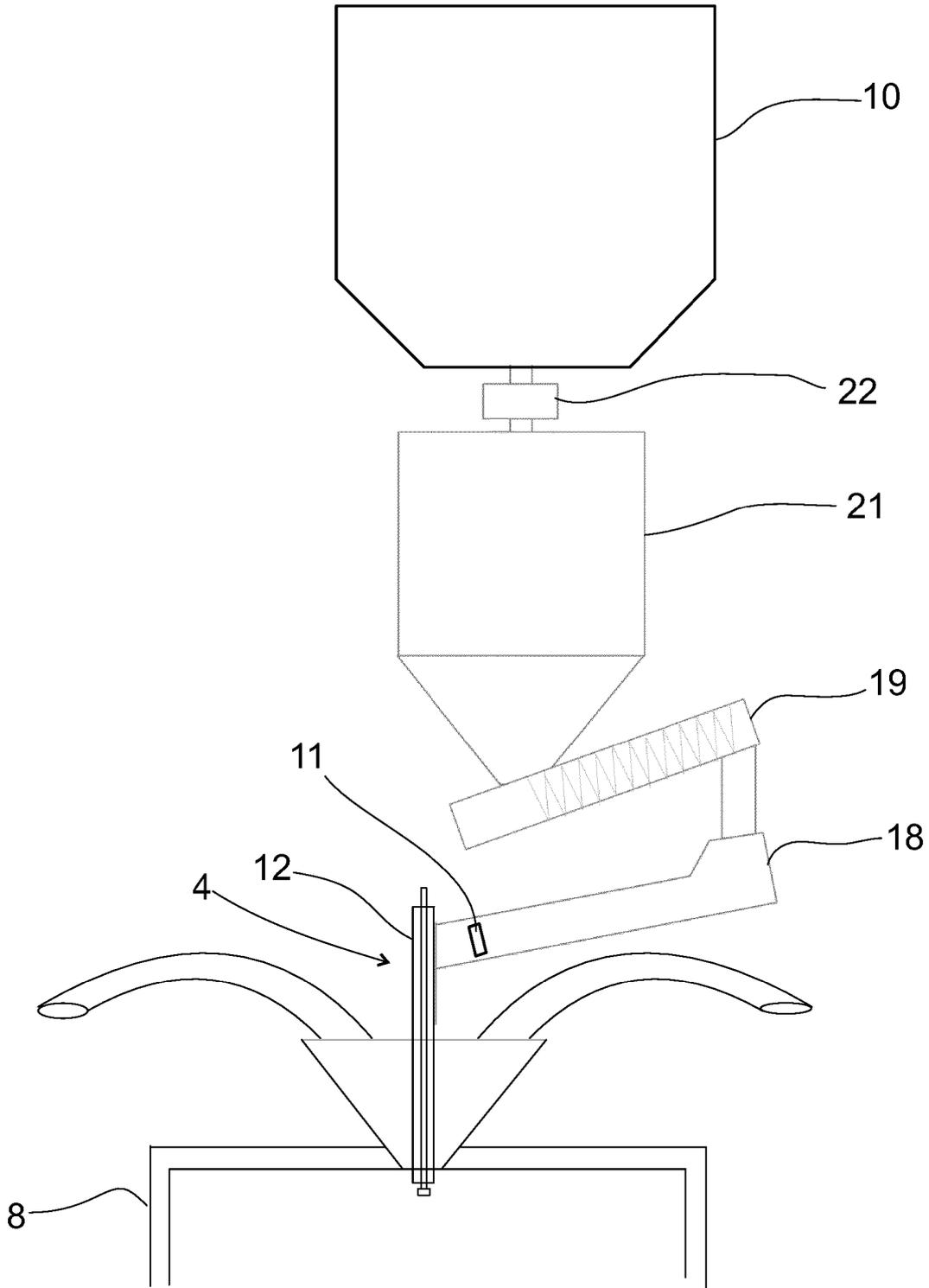


FIG 5

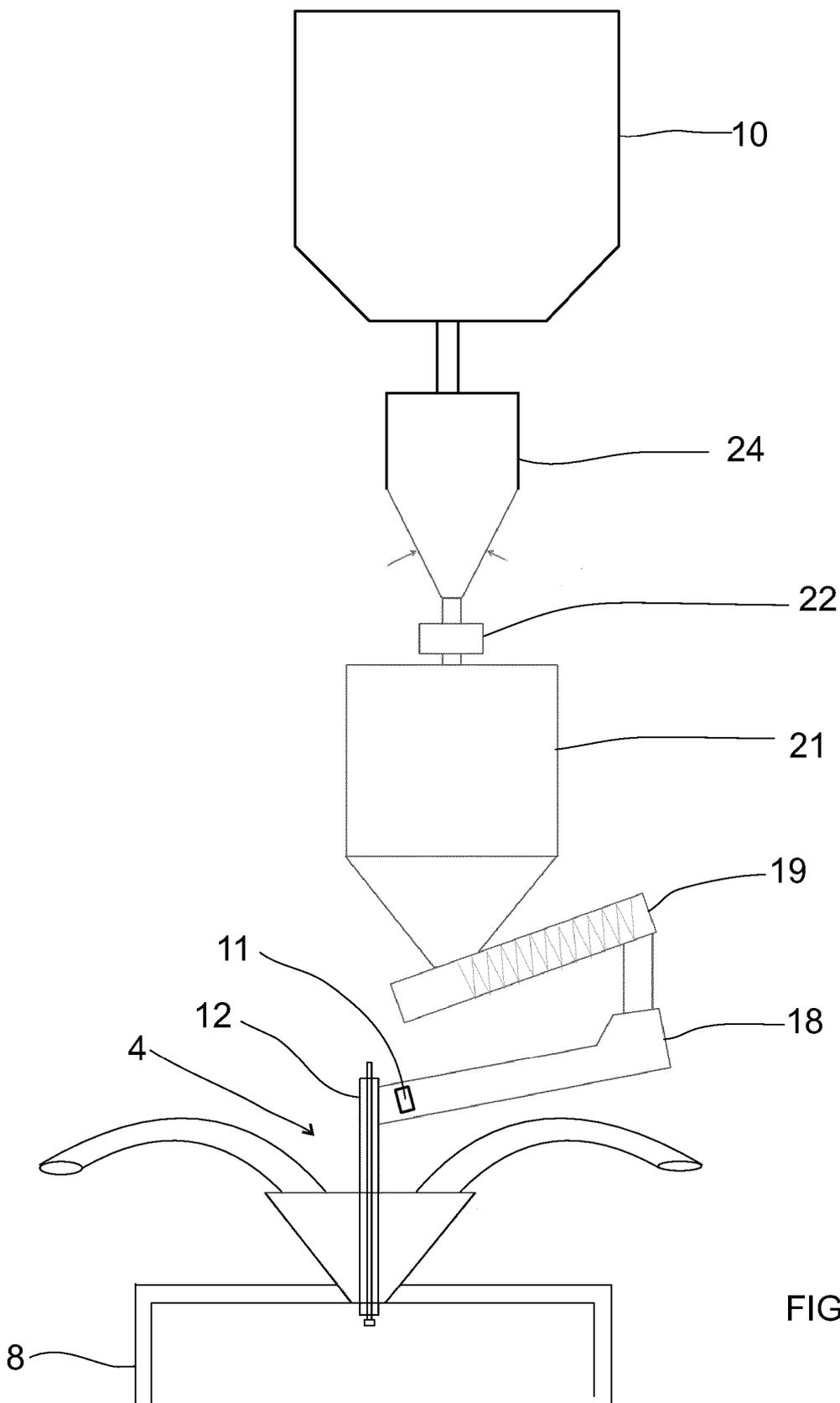


FIG 6

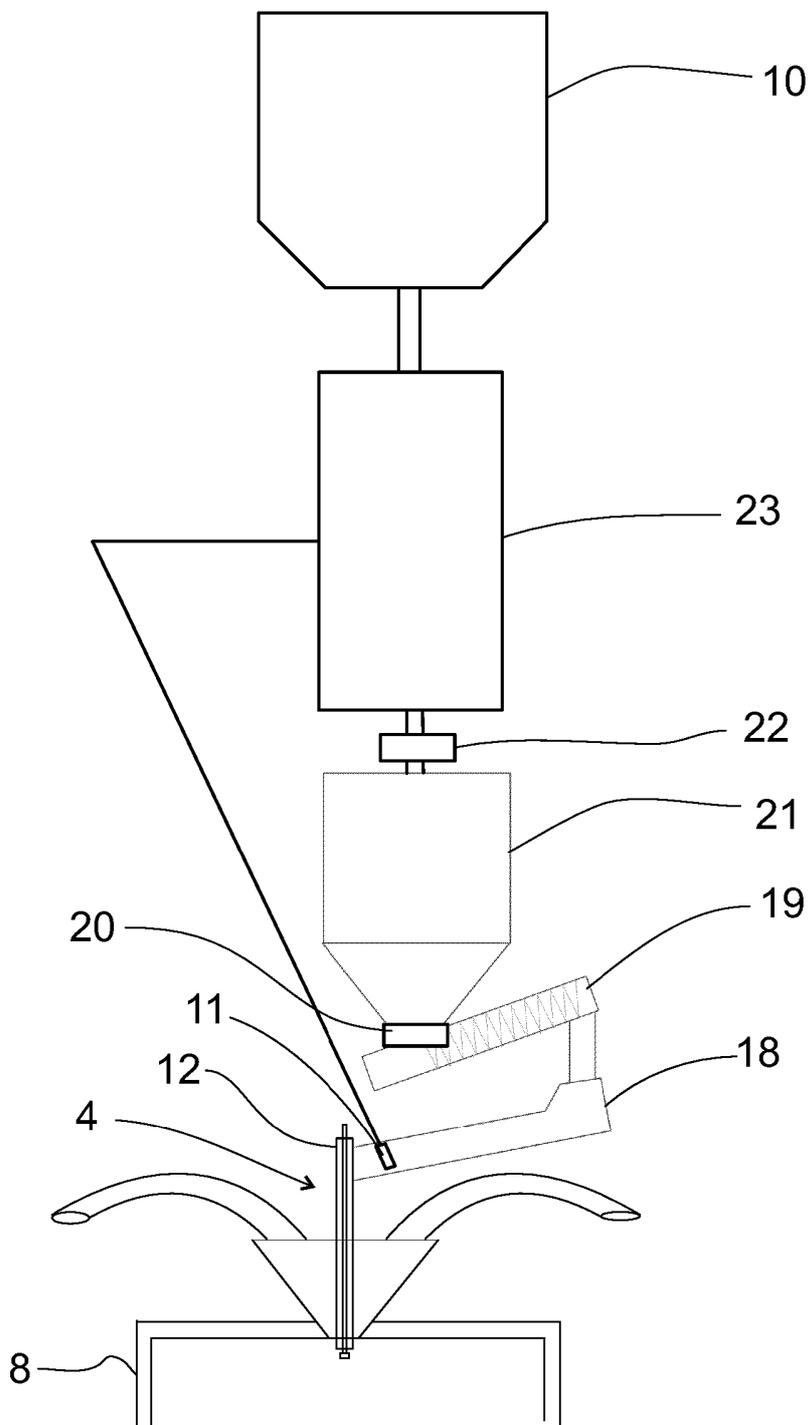


FIG 7

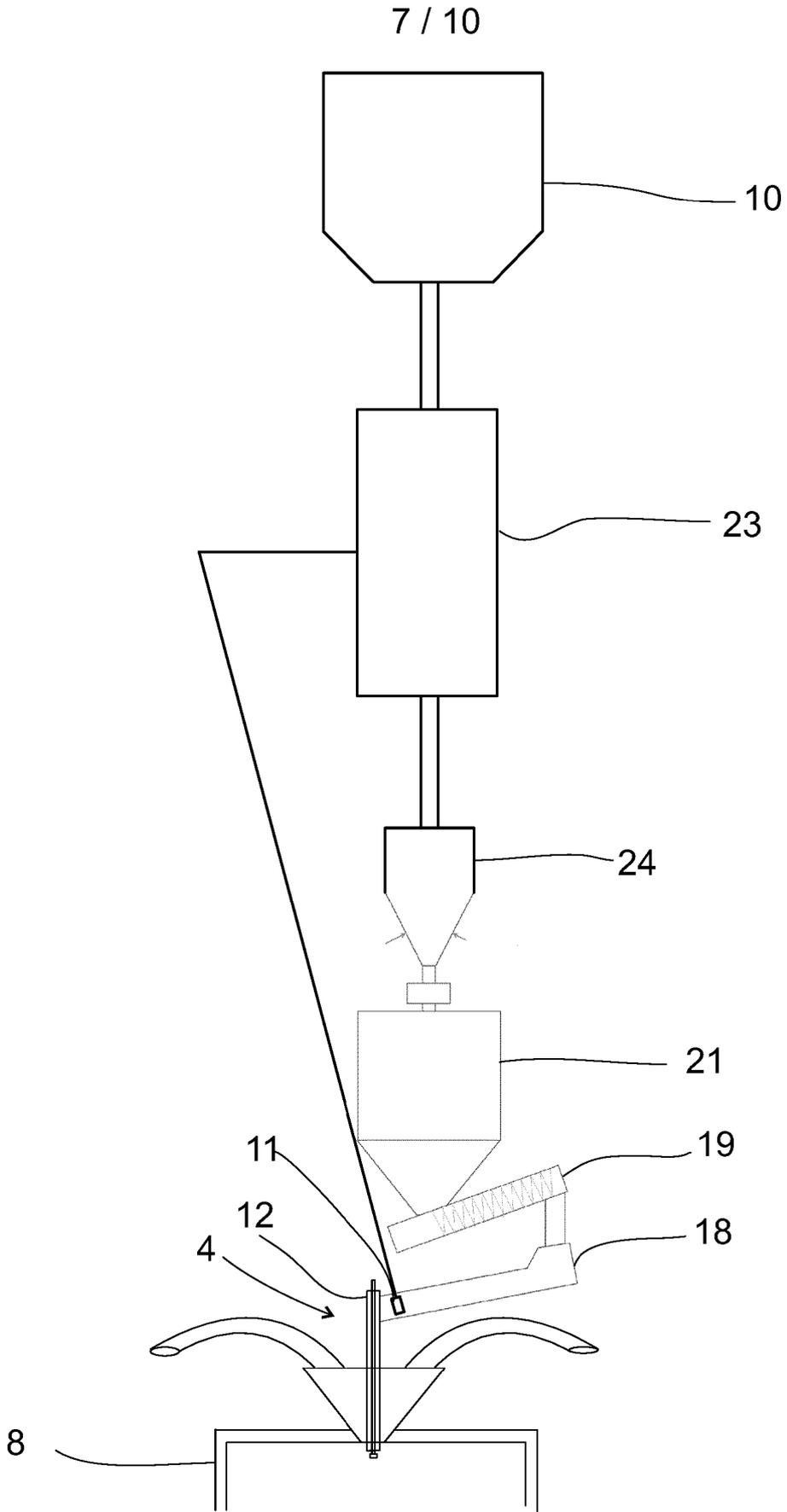


FIG 8

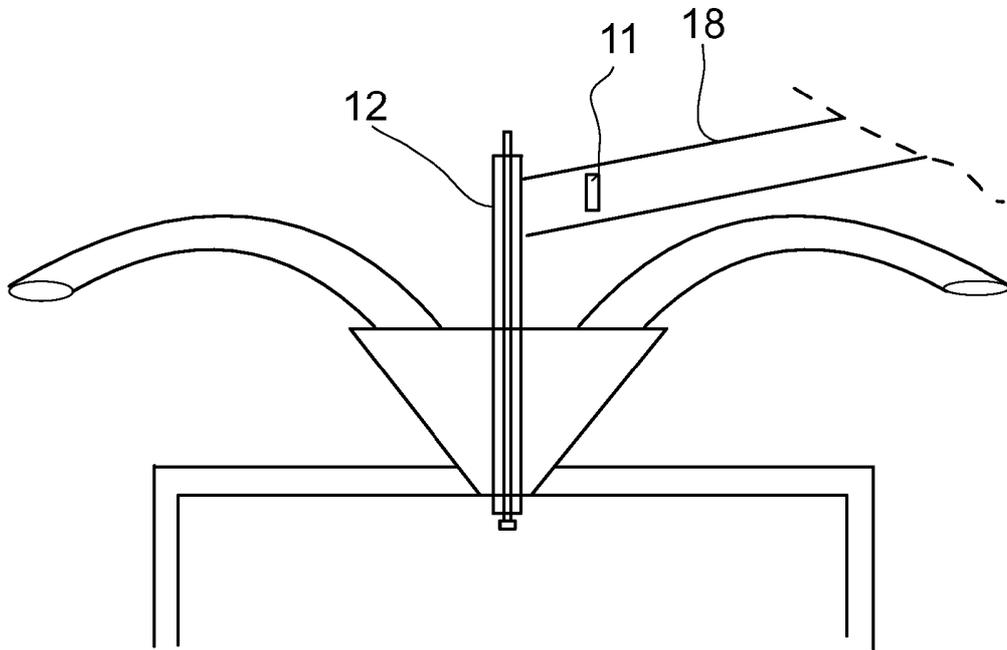


FIG 9

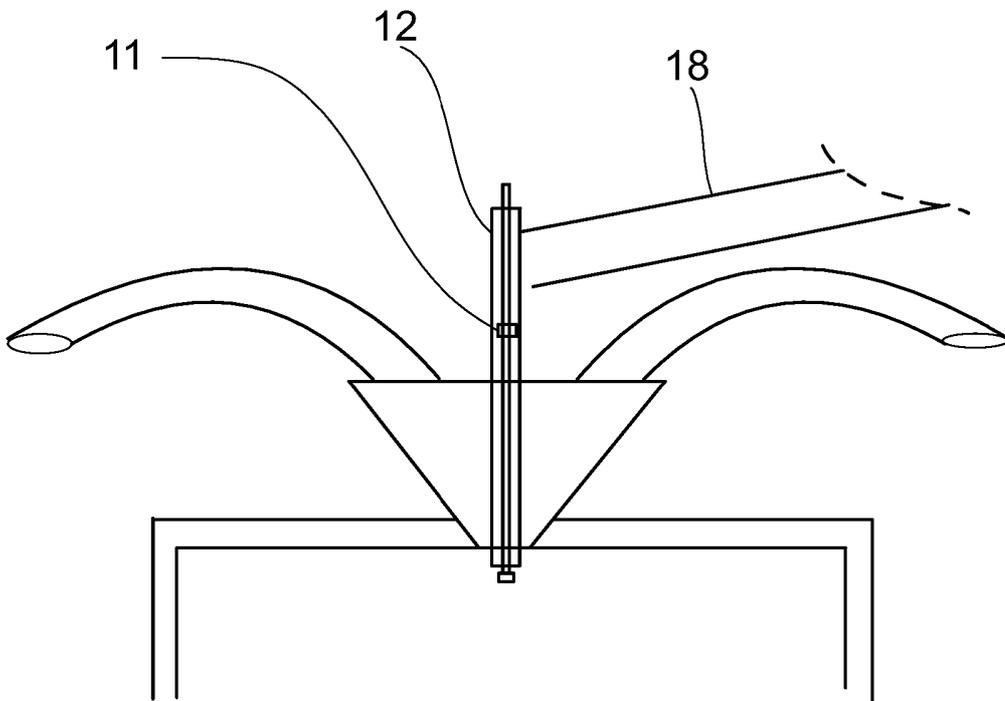


FIG 10

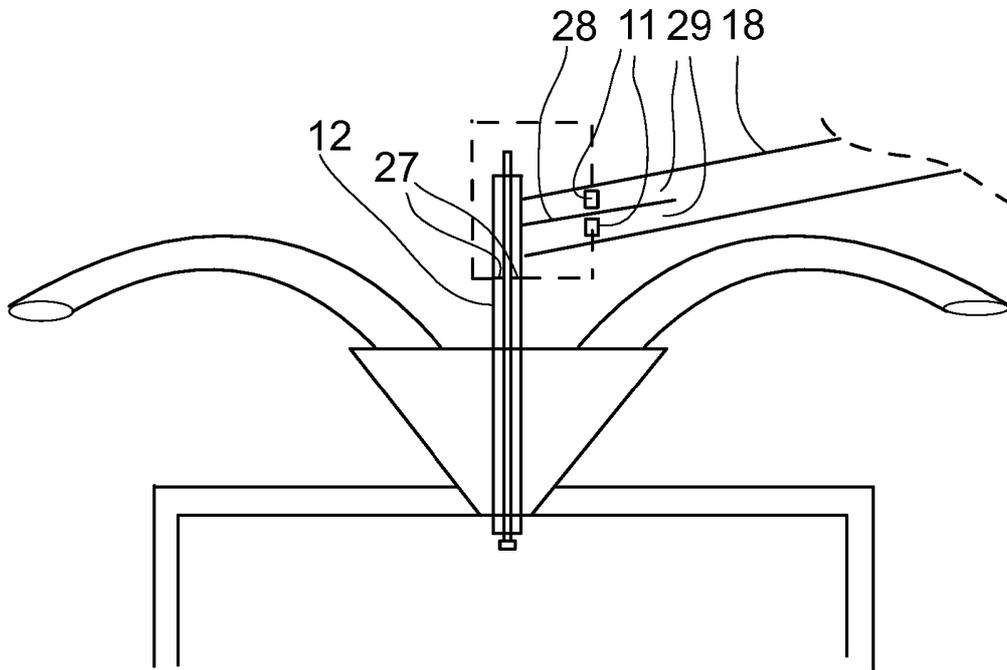


FIG 11

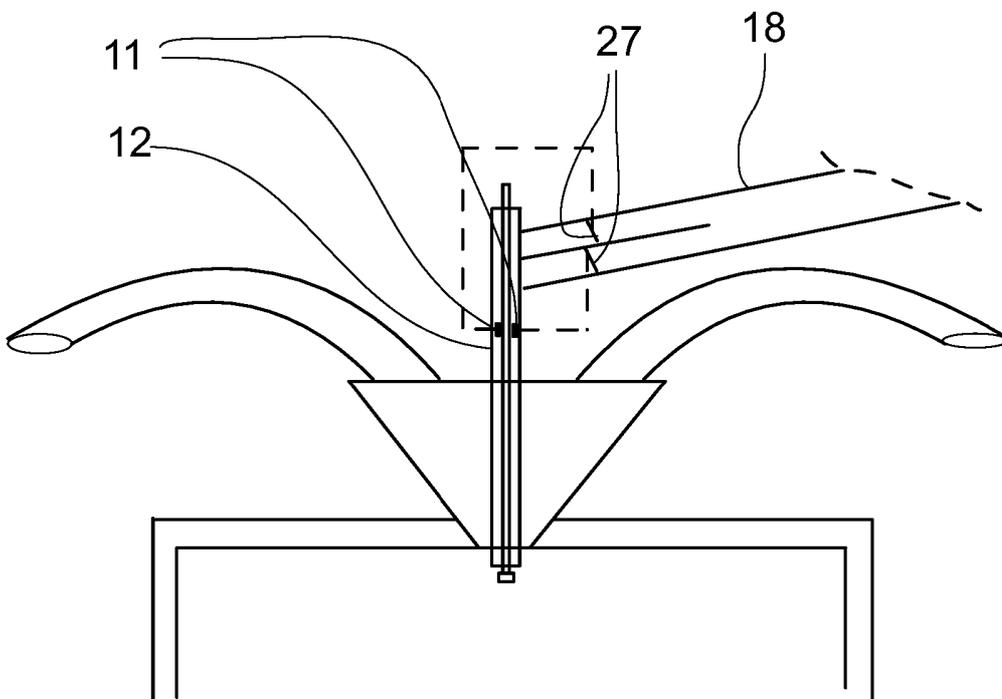


FIG 12

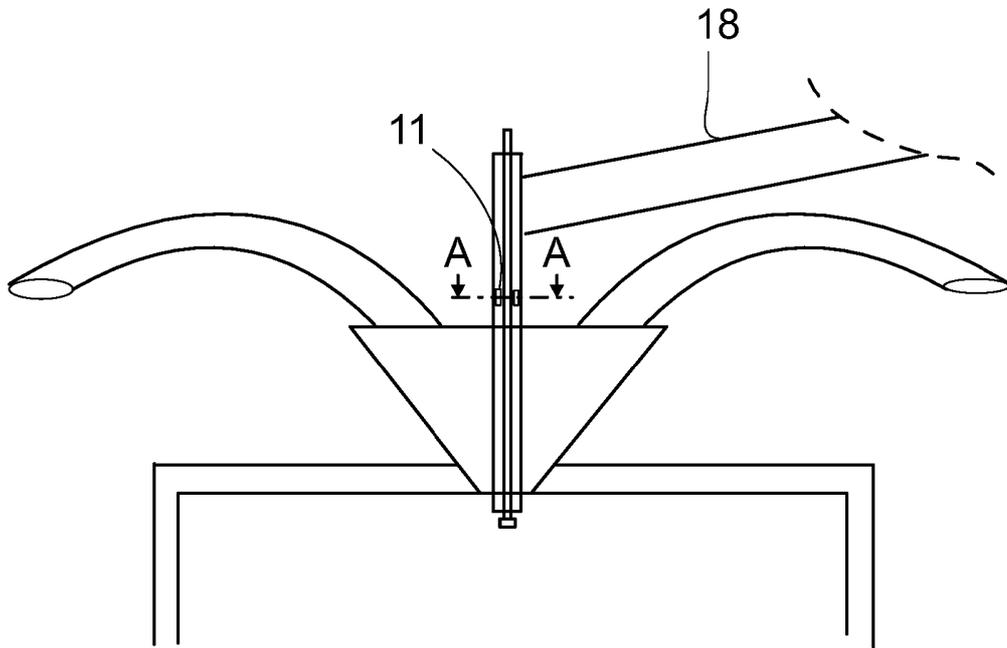


FIG 13

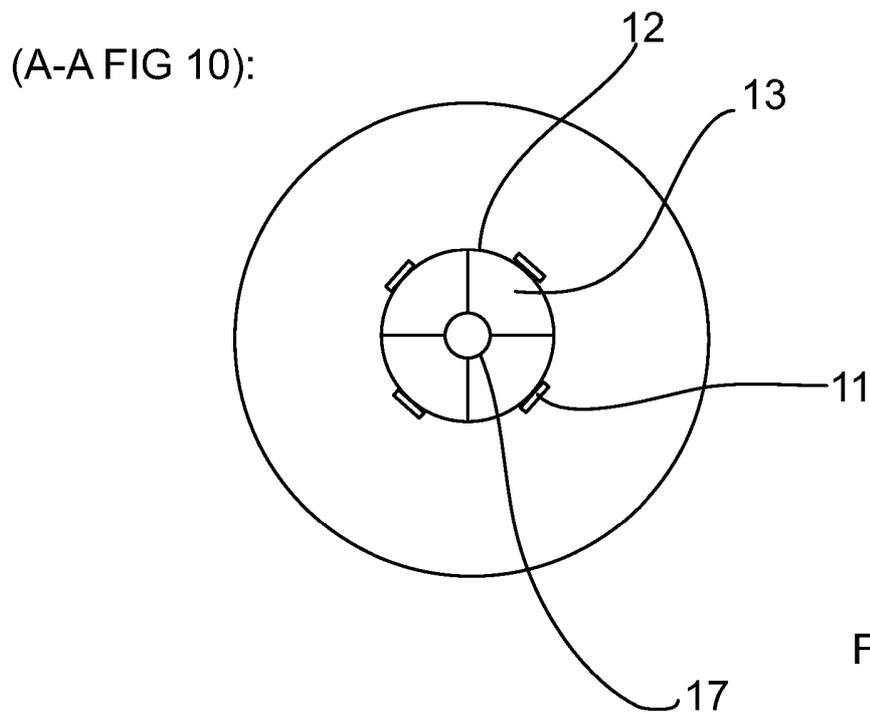


FIG 14