



(22) Date de dépôt/Filing Date: 1994/08/18

(41) Mise à la disp. pub./Open to Public Insp.: 1995/02/20

(45) Date de délivrance/Issue Date: 2003/04/01

(30) Priorité/Priority: 1993/08/19 (P 43 27 927.9) DE

(51) Cl.Int.⁵/Int.Cl.⁵ B07B 11/04, B07B 4/02

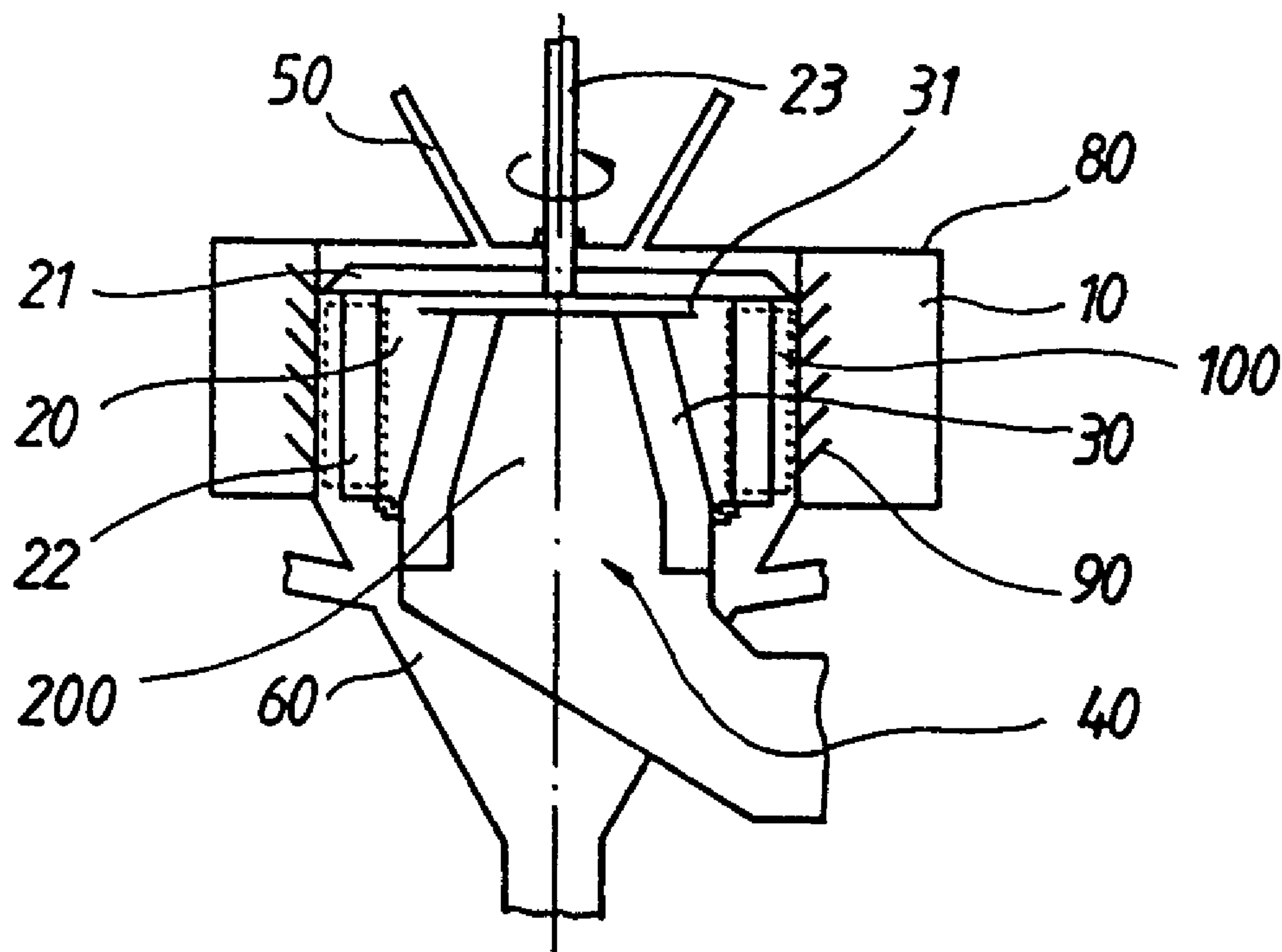
(72) Inventeur/Inventor:
KEUSCHNIGG, JOSEF, AT

(73) Propriétaire/Owner:
KEUSCHNIGG, JOSEF, AT

(74) Agent: FETHERSTONHAUGH & CO.

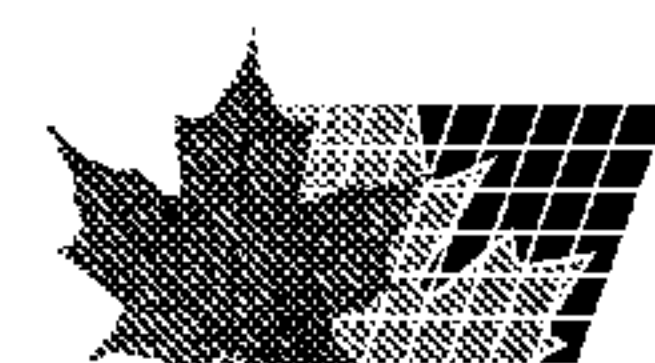
(54) Titre : CRIBLE PNEUMATIQUE

(54) Title: PNEUMATIC SIFTER



(57) Abrégé/Abstract:

Pneumatic sifter having a device (50) for supplying sift material, where appropriate in common with sifting air, to a rotationally symmetrical sifting chamber (100) enclosing a centrally disposed air-outflow chamber, and having a coarse-grain drain (60). In order, inter alia, to keep the flow resistances low as the air enters into the air-outflow chamber (200), it is envisaged that in the air-outflow chamber (40), along its radial, outer limit, there are disposed at uniform reciprocal angular intervals guide vanes reaching into the air-outflow chamber (40), these guide vanes (30) reaching roughly over the axial extent of the sifting chamber (100).



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Fig. 1

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Description:

The invention relates to a pneumatic sifter having a device for supplying sift material, where appropriate in common with sifting air, to a rotationally symmetrical sifting chamber enclosing a centrally disposed air-outflow chamber, and having a coarse-grain drain.

A pneumatic sifter has been disclosed, for example, by Austrian Patent No. 397051.

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In this known solution, the material to be sifted is supplied from above, via a vertical pipe, onto a distributing plate, which is connected to a sifter wheel having vanes distributed along its periphery, the air, with the fine particles of the material, being drawn off via a central, down-running pipe. Here, the pipe is configured similarly to a telescope, the individual parts of the pipe being held by means of arms distanced apart in the peripheral direction, thereby enabling the air plus fine grain to enter the down-running pipe at different heights.

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In this solution there is the drawback, however, that the air which is swirled by the vanes of the rotating sifter wheel has to be diverted into the vertical pipe, thereby giving rise to high flow resistance. This results in a correspondingly high energy requirement. Moreover, in known sifters of this kind, the finest separation boundary which is attainable is shifted into the coarser region, since coarser material is carried along into the air outlet precisely as a result of the turbulences. This effect also comes about where, in order to reduce flow losses, the diameter of the sifting chamber is enlarged.

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The separation result in the cylindrical sifting chamber is essentially dictated by the fact that the radial flow velocities close to the lead-in periphery of the central air outlet are up to ten times higher than at an axially greater distance from the central air outlet, thereby producing indistinct sifting.

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Furthermore, from German Patent Specification 551 764, published in June of 1932, a pneumatic sifter of the type stated in the introduction is known, in which guide vanes, which between them limit pass-through slots, are
5 disposed in the sifting chamber. The sifting-air guidance is thus realized in the sifting chamber by means of the guide vanes acting as flow brakes, thereby producing a throttling effect upon the sifting-air current and hence resulting in high flow losses.

10 The known sifters are therefore generally configured in such a way that the axial extent of the sifting chamber is chosen precisely to be of such a size that the drawbacks depicted in relation to the sifting are just about tolerable. For this reason, the majority of
15 pneumatic sifters exhibit a flatly cylindrical sifting chamber, the axial extent of which is considerably smaller than its diameter.

The object of the invention is to avoid these drawbacks and to propose a pneumatic sifter of the type
20 mentioned in the introduction, in which the air plus fine grain can be evacuated with low flow resistances.

According to the invention, there is provided a pneumatic sifter, comprising: a casing having a sifting chamber defined by an axial extension and receiving material
25 to be separated, a coarse particle outlet and air outlet means for discharge of air with fines, said air outlet means including an air outlet chamber surrounded by said sifting chamber and a discharge pipe in prolongation of said air outlet chamber and; baffle means arranged about the outer
30 perimeter of said air outlet chamber and projecting into said discharge pipe for guiding air with fines in an axial direction, said baffle means including guide vanes spaced

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from each other at uniform angular distances and extending approximately over the axial extension of said sifting chamber.

The effect of the guide vanes is that swirls are
5 reduced and the flow is appropriately directed. Thus the guide vanes, which are provided in the region of the radial outer limit of the air-outflow chamber and are disposed directly before the air outlet, serve to ensure that the air in the region of the guide vanes passes largely undisturbed
10 into an axial direction, since there is ample flow space present in the centre of the air-outflow chamber. A largely uniform flow is herein produced here, especially in the sifting chamber preceding the deflector according to the invention, in which case the flow running in the peripheral
15 direction, as a result of the guide vanes, rapidly assumes an axial direction. Consequently, the flow resistances which are

generated upon entry of the air plus fine grain into the air-outflow chamber are reduced. In this case, the reduction in flow resistances produces an increase in sifter throughput, assuming that energy consumption, compared with the known solutions, remains the same. As a result of the proposed measures, moreover, an improvement in separating performance is obtained.

In this case, the guide vanes can be held fixedly or even adjustably.

10 The fact that the guide vanes, in a refinement of the invention, are disposed at an angle to the radial direction related to the sifting chamber, all guide vanes preferably exhibiting the same angle to the radial direction, has the effect that the air plus fine grain flows into the air-outflow chamber, avoiding any torsional motion. Correspondingly low flow losses are thereby obtained.

20 The fact that the guide vanes, viewed in cross-section, can exhibit a curvature produces a reduction in flow resistances in the region of the guide vanes and hence a further increase in sifting throughput or a fall in pressure losses compared with the swirl-afflicted outflow.

25 The fact that, according to yet another embodiment of the invention, the guide vanes are held against the inner side of the air outlet, yields the benefit of a simple solution in design terms.

30 In a pneumatic sifter according to the invention, having a sifter wheel which is provided with vanes distributed at regular intervals on its periphery, the fact that the sifter wheel (20) encloses the air-outflow chamber (200) and hence the guide vanes (30) disposed therein produces a particularly far-reaching reduction in flow resistances upon entry into the air outlet, the height of the guide vanes (30) corresponding roughly to the height of the sifter wheel (20).

The fact that outside the guide vanes and/or the sifter wheel or sifting chamber there are disposed further fixed deflecting baffles gives rise to

particularly favourable conditions in terms of the tangential unidirectional guidance of the flow.

The invention is now explained in greater detail, by way of example, with reference to the drawing, in which:

Fig. 1 shows a radial section through a pneumatic sifter according to the invention,

Fig. 2a shows an axial section through the pneumatic sifter according to Fig. 1, exhibiting a downwardly directed air outlet,

Fig. 2b shows an axial section through the pneumatic sifter according to Fig. 1, exhibiting an upwardly directed air outlet,

Fig. 3 shows a radial section through further embodiments of a pneumatic sifter according to the invention, and

Fig. 4 shows an axial section through further illustrative embodiments of a pneumatic sifter according to the invention,

Figs. 5 and 6 show axial sections through further illustrative embodiments of pneumatic sifters according to the invention, and

Fig. 7 shows a detail of a distributing plate, structural parts which match in the drawings respectively being provided with the same reference symbols.

In the embodiment of a pneumatic sifter according to the invention, as represented in Figs. 1 and 2, a helical sifting-air inlet 10 is provided, which surrounds a sifter wheel 20 provided with vanes 22 distributed over its periphery, which vanes extend essentially in the axial direction. In this case, the sifter wheel 20 is connected to a distributing plate 21, which can also be configured in one piece with the sifter wheel 20.

The drive of the sifter wheel 20 and of the distributing plate 21, which drive is indicated with an arrow, is realized via the shaft 23.

The space which is swept over by the rotating vanes 22 corresponds roughly to the rotationally

symmetrical sifting chamber 100 enclosing an air-outflow chamber 200, which opens out into an air outlet 40. In the air-outflow chamber 200 along its radial, outer limit, i.e. that facing the sifting chamber 100, there are disposed guide vanes 30 reaching into the air-outflow chamber 200. The said guide vanes, as shown for example by Fig. 1, are disposed at uniform reciprocal angular intervals. These guide vanes 30 reach roughly over the axial extent of the sifting chamber 100.

10 The guide vanes 30 exhibit a curved-running cross-section and form an angle with the radial direction related to the sifting chamber 100, all guide vanes 30 preferably forming the same angle. Here, the vanes 30 are fastened to the inner side of the air outlet 40 and extend essentially in the axial direction of the sifting chamber 100 or air-outflow chamber 200. The proposed deflector 30 in the central air-outflow chamber 200 is designed, where appropriate, such that the free entry-gap faces 110, at a sifting chamber height equal to the outlet diameter, correspond roughly to the face of the central air outlet 40.

In order to prevent the coarse material from being flung out of the sifting chamber, annular, conically running faces 90 can be provided.

25 Beneath the sifter wheel 20 there is disposed an essentially funnel-shaped coarse-grain delivery chute 60, via which the coarse grain can be drawn off.

For the feed of the material to be sifted, on the top side of a housing 80 surrounding the distributing plate 21 and the sifter wheel 20, which housing also encloses the air inlet 10, there are disposed feed hoppers 50, via which the material to be sifted trickles onto the distributing plate 21 and is flung from this into a rotating veil of material against the radially inward-flowing sifting air or outer deflector 70 and drops downwards. The veil of material is in this case forced, by the air flowing via the air inlet tangentially into the region of the sifter wheel 20, against the sifter wheel 20, whereupon the coarser grains, due to the

higher centrifugal force in the radially outer region of the sifter wheel 20, drop downwards into the coarse-grain delivery chute 60.

5 The air, which is extracted via the air outlet 40, makes its way, together with the finer particles of the material to be sifted, between vanes 22 of the rotating sifter wheel 20 through into the region of the guide vanes 30, between which the flow direction of the radially inflowing air changes to an axial flow
10 direction, turbulences which would lead to an increase in flow resistance being largely suppressed by virtue of the guide vanes 30.

In the left-hand half of Figs. 3 and 4, an embodiment is represented in which radially outside the
15 sifter wheel 20 there are disposed further deflecting baffles 70, which correspondingly direct the air flowing to the sifter wheel and help to prevent the sifting chamber 100 from being subjected to different flows.

In the upper right-hand half of Fig. 3, a
20 pneumatic sifter according to the invention, having a sifter wheel, is represented and, in the lower right-hand half of Fig. 3, there is the same without a sifter wheel. In these embodiments also, fixed deflecting baffles 70, limiting the air inlet 10, can be provided, which
25 deflecting baffles extend essentially over the entire height of the housing. Here, the deflecting baffles 70 direct the air current flowing to the air outlet 40, which air current also carries fine particles of the material to be sifted to the guide vanes 30.

30 From Fig. 4 it can be seen that the air-outflow chamber 200 can also be introduced into the housing 80 from below. The air-outflow chamber 200 passes in this case through the funnel-shaped coarse-grain delivery chute 60.

35 In this case, in the left-hand half of Fig. 4 there is represented an illustrative embodiment having a sifter wheel 20 and an outer deflector 70, in contrast to which, in the right-hand half of Fig. 4, there is represented an illustrative embodiment without a sifter wheel

20 and without an outer deflector 70.

Fig. 5 shows an illustrative embodiment in which a helical air inlet has been dispensed with and an annular air inlet 10' is provided. In this case, the air inlet 10' surrounds the coarse-grain delivery chute 60. In the right-hand half of Fig. 5 there is represented an embodiment without outer deflecting baffles 70. This embodiment can be further simplified for simple applications by also dispensing with the sifter wheel 20. If the material feed is already realized with the sifting air, as is the case, for example, in milling plants, the distributing plate 21 can also be omitted. This constitutes the simplest illustrative embodiment of the pneumatic sifter according to the invention.

A cover plate, by means of which the guide vanes 30 are joined together, is denoted by 31.

Fig. 6 shows an illustrative embodiment having two air-outflow chambers 40, which evacuate the air plus fine particles of sift material in the upward and downward directions. In this case, in both air-outflow chambers there are disposed guide vanes 30. The supply of material is in this case realized from above via the feed hoppers 50.

Fig. 7 shows the distributing plate 21 exhibiting ribs 25, between which the sift material is flung outwards. In a refinement of the invention, there is provided on the periphery of the distributing plate 21 a ring 24, which is open-facing in an obliquely downward direction and which causes the radial velocity, upon exit from the distributing plate 21, to be reduced and hence enables a rotating, vertical veil of material to be generated.

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CLAIMS:

1. A pneumatic sifter, comprising:

a casing having a sifting chamber defined by an axial extension and receiving material to be separated, a coarse particle outlet and air outlet means for discharge of air with fines, said air outlet means including an air outlet chamber surrounded by said sifting chamber and a discharge pipe in prolongation of said air outlet chamber and;

10 baffle means arranged about the outer perimeter of said air outlet chamber and projecting into said discharge pipe for guiding air with fines in an axial direction, said baffle means including guide vanes spaced from each other at uniform angular distances and extending approximately over
15 the axial extension of said sifting chamber.

2. The pneumatic sifter of claim 1 wherein said guide vanes are arranged in radial direction at an angle in said sifting chamber.

3. The pneumatic sifter of claim 2 wherein said guide
20 vanes are arranged at a same angle in radial direction.

4. The pneumatic sifter of claim 1 wherein said guide vanes have a curved cross section.

5. The pneumatic sifter of claim 1 wherein said guide vanes are held on the inside of said air outlet chamber.

25 6. The pneumatic sifter of claim 1, further comprising a rotor in said sifting chamber and including a plurality of blades evenly spaced about the circumference thereof, said rotor being defined by a height and surrounding said air outlet chamber and said guide vanes,

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said guide vanes being defined by a height which is equal or greater than the height of said rotor.

7. The pneumatic sifter of claim 1, further comprising stationary baffle plates outside of said guide
5 vanes.

8. The pneumatic sifter of claim 1, further comprising stationary baffle plates outside of said rotor.

9. The pneumatic sifter of claim 1 wherein said baffle means includes a cover plate for joining together
10 said guide vanes at their ends facing away from said air outlet chamber.

10. The pneumatic sifter of claim 1, further comprising an sifting air inlet configured in form of a spiral path outside said guide vanes.

15 11. The pneumatic sifter of claim 1, further comprising a distributing plate operatively connected to a drive and arranged above said sifting chamber.

12. The pneumatic sifter of claim 11 wherein said distributing plate is provided about its circumference with
20 a ring extending slantingly downwards.

13. A baffle arrangement for use in a pneumatic sifter of a type including a casing having a sifting chamber, a coarse particle outlet and an air outlet means for discharge of air with fines, said air outlet means including an air
25 outlet chamber surrounded by said sifting chamber and a discharge pipe in prolongation of said air outlet chamber, said baffle arrangement including guide vanes arranged about the outer perimeter of and projecting into said discharge pipe for guiding air with fines in an axial direction, said
30 guide vanes being spaced from each other at uniform angular

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distances and extending approximately over an axial extension of said sifting chamber.

14. The baffle arrangement of claim 13 wherein said guide vanes are arranged in radial direction at an angle in
5 the sifting chamber.

15. The baffle arrangement of claim 14 wherein said guide vanes are arranged at a same angle in radial direction.

16. The baffle arrangement of claim 13 wherein said
10 guide vanes have a curved cross section.

17. The baffle arrangement of claim 13 wherein said guide vanes are mounted on the inside of the air outlet chamber.

18. The baffle arrangement of claim 13 wherein said
15 guide vanes have a height which is equal or greater than the height of a rotor placed in the sifting chamber and surrounding the air outlet chamber.

19. The baffle arrangement of claim 13, further comprising stationary baffle plates outside of said guide
20 vanes.

20. The baffle arrangement of claim 18, further comprising stationary baffle plates outside of the rotor.

21. The baffle arrangement of claim 13, further comprising a cover plate for joining together said guide
25 vanes at their ends facing away from the air outlet chamber.

FETHERSTONHAUGH & CO.
OTTAWA, CANADA

PATENT AGENTS

Fig.1

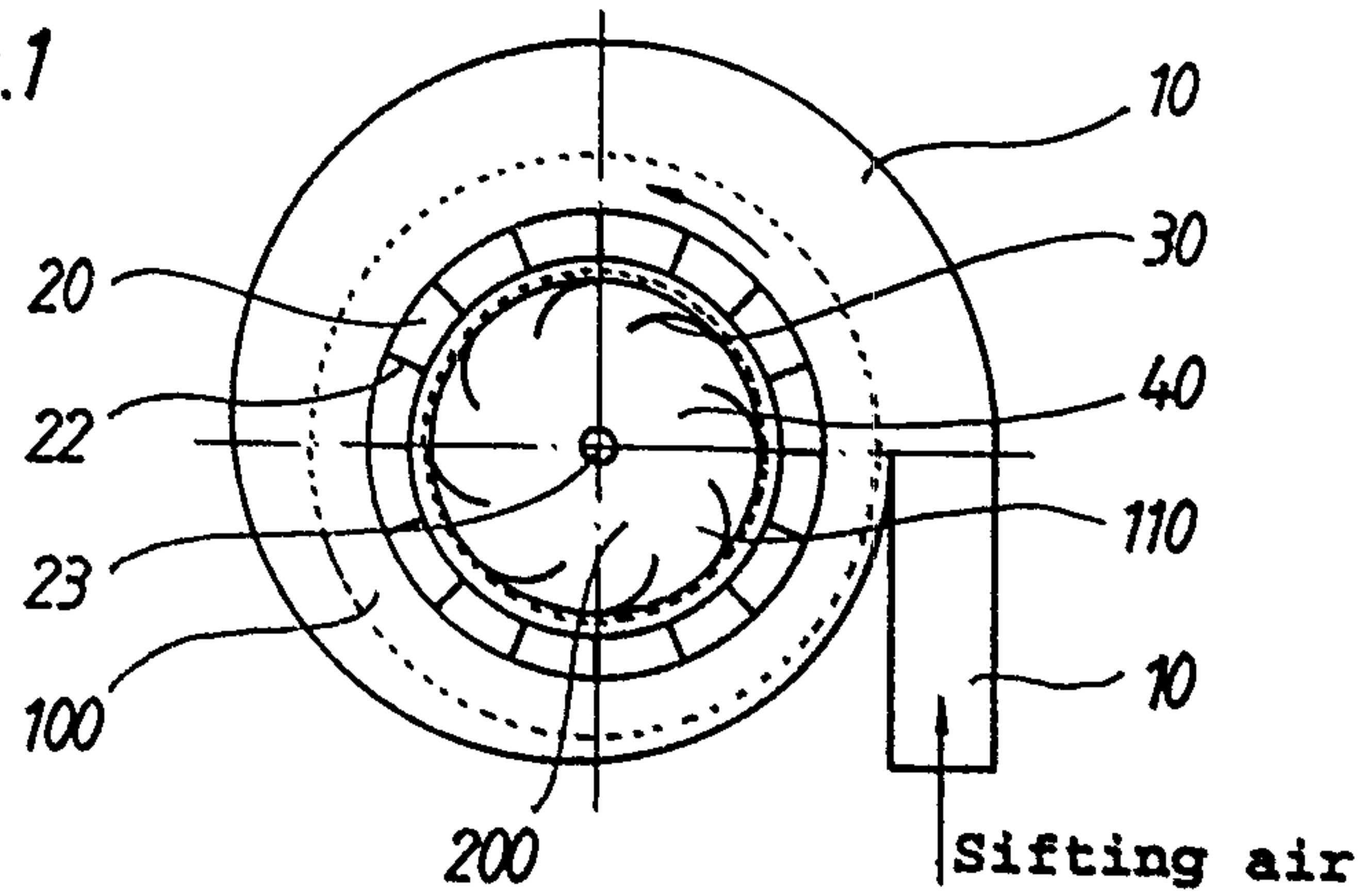


Fig.2a

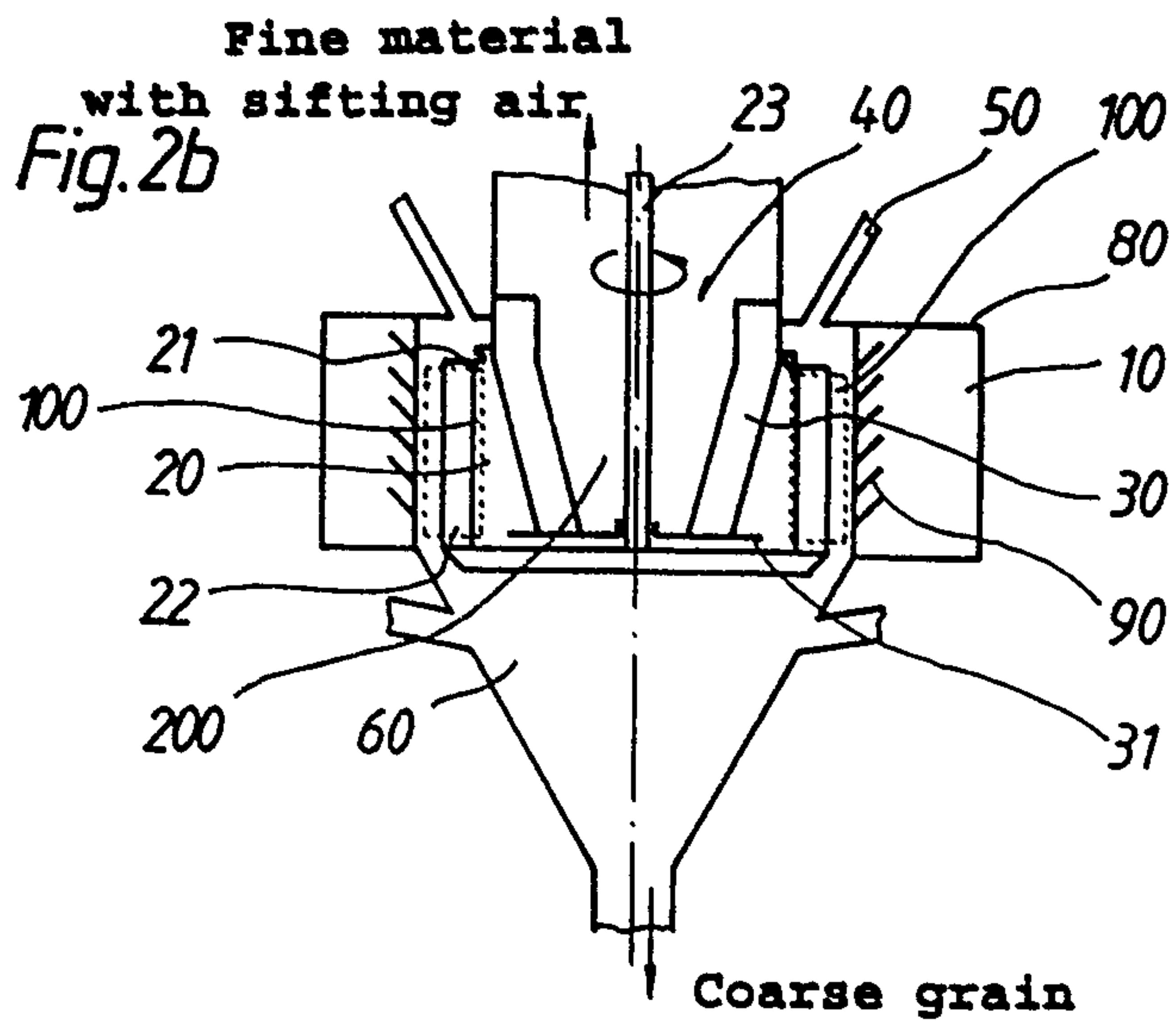
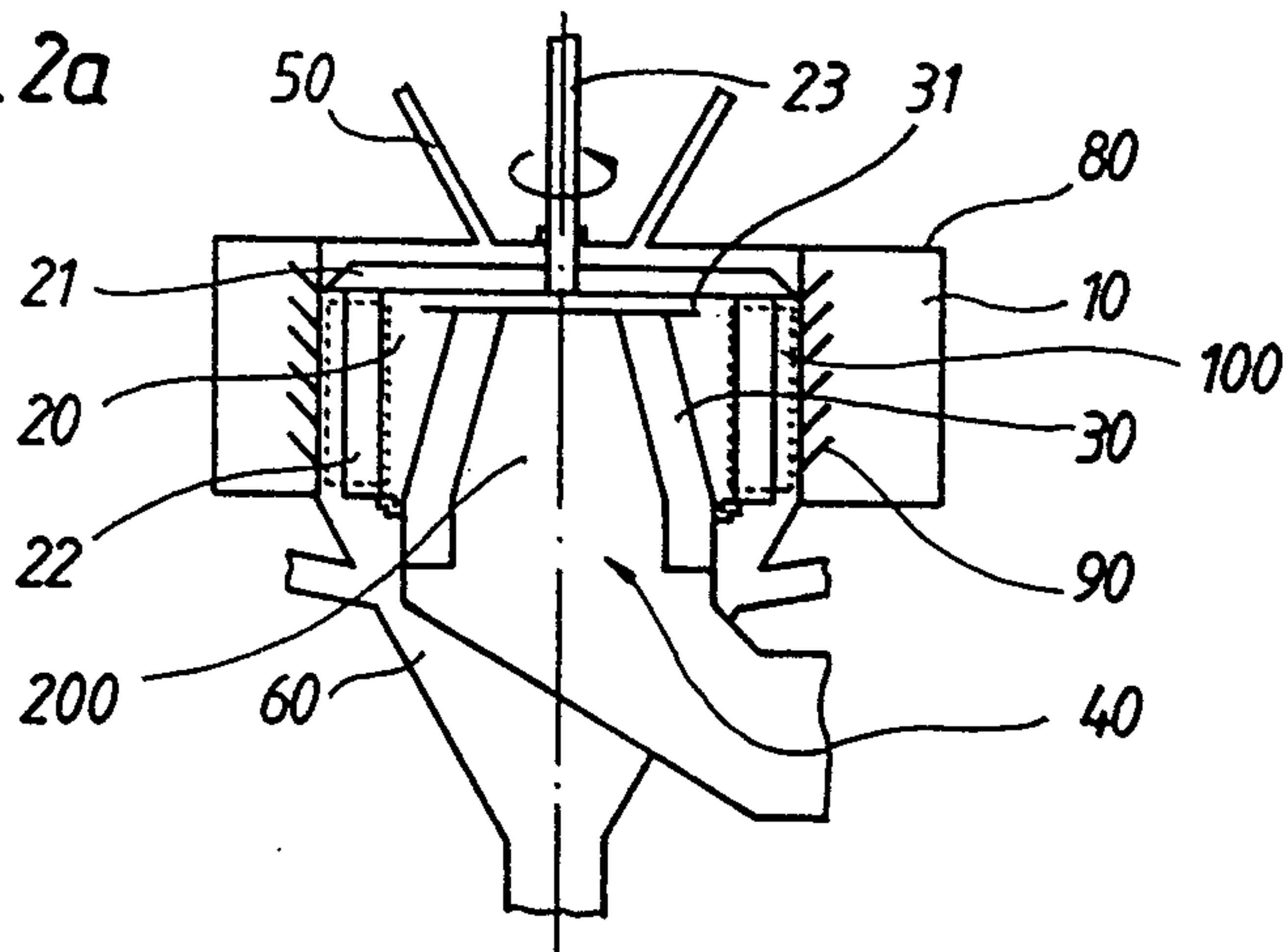


Fig.3

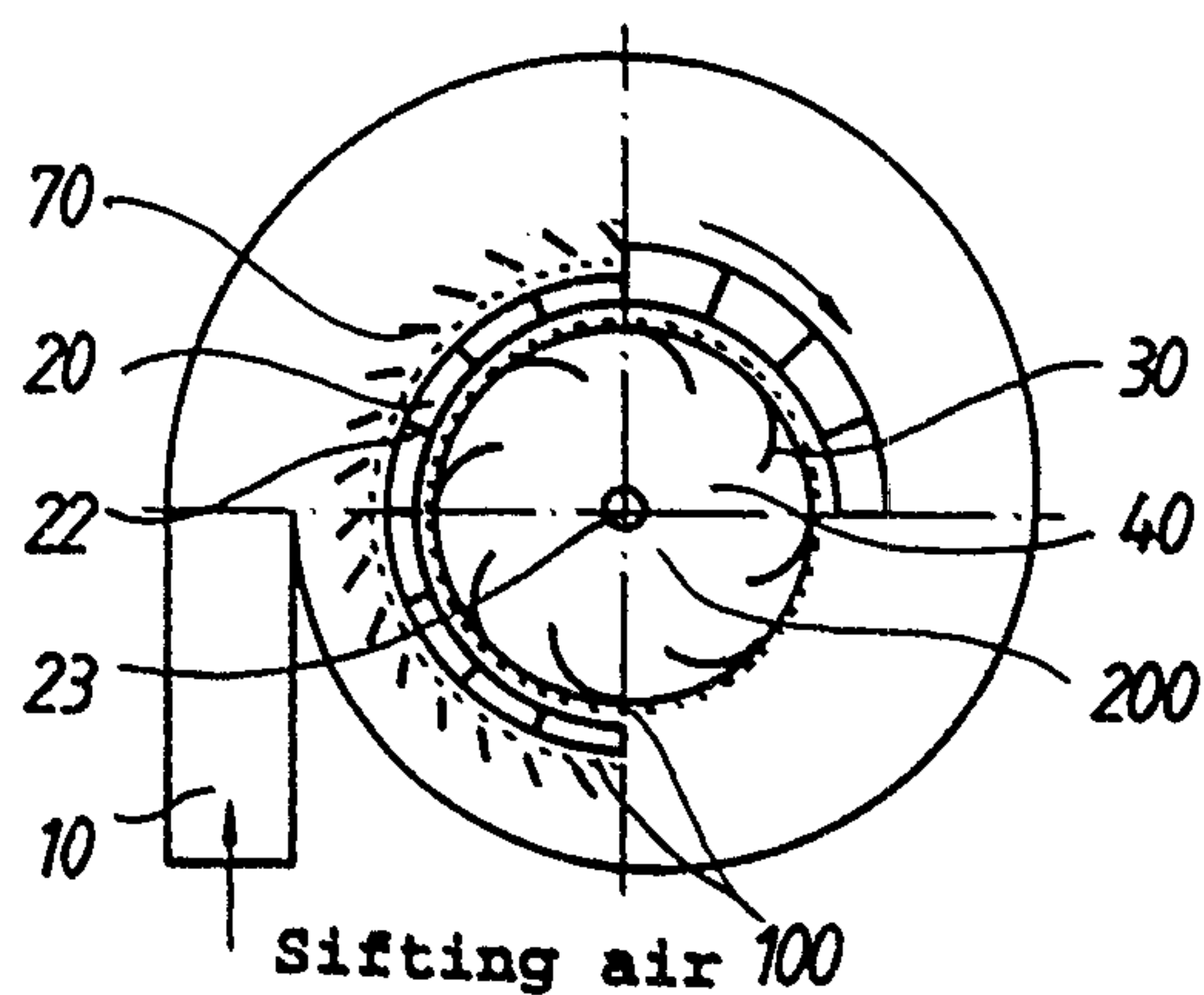


Fig.4

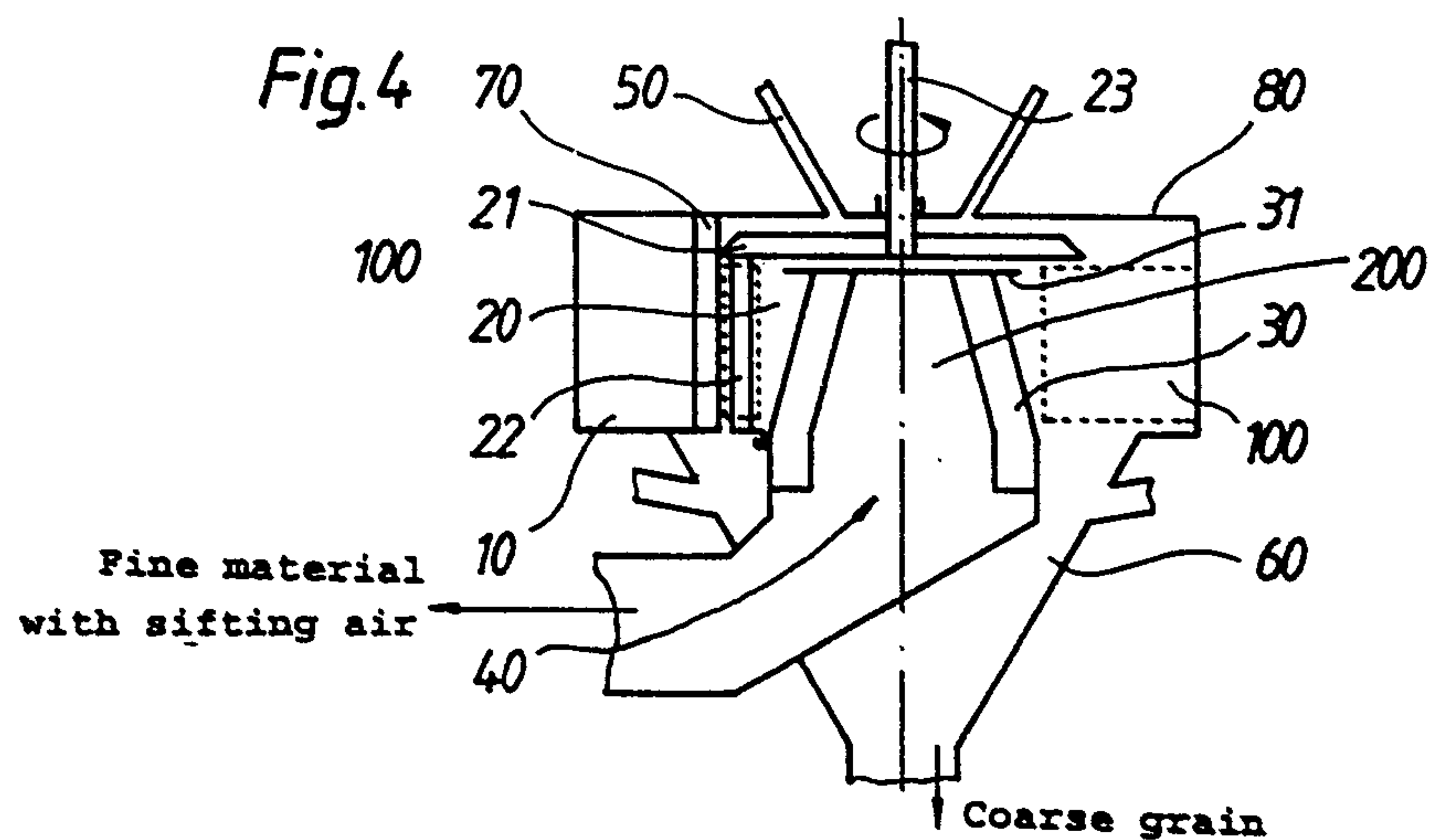


Fig.5

