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(54) **Wind separation and classification equipment for tobacco leaves and the like.**

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Description

This invention relates to a wind separation and classification equipment for tobacco leaves and the like.

For example, since tobacco leaves are supplied to a separation equipment inherently in a mass form or intertwined form, several separation equipments are required to be interconnected in the prior art separation process in order to obtain the sharpness of separation.

In a conventional equipment, as disclosed in Japanese Patent Publication No. 58-5655 and corresponding to the preamble of claim 1, in order to increase the capacity of separation process, make compact the equipment and increase the sharpness of separation, the whole process from the supply process of tobacco leaves to the discharge process thereof is carried out in a vertically hollow cylindrical separation chamber.

The present invention intends to improve such prior art.

The object of the present invention, therefore is to increase the sharpness of separation of a wind separation and classification equipment and decrease the number of separation equipments interconnected each other in the prior art.

Another object of the present invention is to decrease the amount of wind to be used for classification per a certain amount of to-be-processed raw material.

To achieve the above mentioned objects and others, there is provided a wind separation and classification equipment for tobacco leaves and the like comprising a vertically cylindrical shell defining a separation chamber therein and having an air outlet formed on its upper portion; a supply cylinder having a raw material supply port on a part of its upper end portion accommodated within said vertically cylindrical shell and attached to the top portion thereof at its one end, the other end thereof being extended halfway downward in said separation chamber; a swollen portion of an abacus bead configuration connected to the extended lower end portion of said supply cylinder and forming substantially a part thereof; a rotary shaft rotatably mounted on the top portion of said vertically cylindrical shell at its one end, the other end thereof being extended downward through the inside of said supply cylinder as well as said swollen portion, a dispersion board mounted on the lower end portion of said rotary shaft, said dispersion board being positioned under said swollen portion in such a manner as that the upper surface of the former is spacedly adjacent to the lowest portion of the latter; a discharge cylinder mounted on the bottom of said vertically cylindrical shell, said discharge cylinder being positioned under said dispersion board in such a manner as that the top portion of the former is spacedly adjacent to the under surface of the latter, a ventilation means provided on a lower portion of said separation chamber in such a manner as to surround the outer periphery of said discharge cylinder in order

to introduce an even air flow; and a separation area, an acceleration area and a drop area defined in the sequential order from the top in said separation chamber; characterised in that a plurality of secondary air intakes are provided at the lower portion on the cylindrical shell around said separation area in the separation chamber, said secondary air intakes being positioned above said ventilation means.

Fig. 1 is a vertically sectional view of the equipment embodying the present invention;

Fig. 2 is a sectional view taken on line II—II of Fig. 1;

Fig. 3 is a sectional view taken on line III—III of Fig. 1; and

Fig. 4 is a flow chart of a ventilation system.

Preferred embodiment of the present invention will be described with reference to the accompanying drawings wherein like numerals denote like or corresponding parts throughout the several sheets.

As shown in Fig. 1, a supply cylinder 2 is vertically provided at the center of the upper portion of a cylindrical separation chamber 1. A rotary shaft 4 is rotatably supported by a support member 3 at the center of said supply cylinder 2. Said rotary shaft 4 is driven by a variable speed electric motor or all speed motor 5 positioned in the upper portion of said supply cylinder 2. A preliminary dispersion board 6 is provided within said supply cylinder 2, and a dispersion board 8 is provided in a position under said supply cylinder 2 and above a discharge cylinder 7 for remainder after completion of wind classification as will be described hereunder.

Said preliminary dispersion board 6 is in a conical configuration (the vertical angle is 90° in this embodiment) and an ejector plate 9 is provided on its declined surface radially and in parallel with the generatrix. Said dispersion board 8 is in a conical configuration with an umbrella shape at its center. On the contrary, the end portion 10 of said dispersion board 8 is raised upward outwardly (30° to 45° with respect to the horizontal line in this embodiment), and an ejector 11 is provided on its declined surface of the central portion thereof radially and in parallel with the generatrix. A vane 12 is provided at the under surface of the end portion 10 around its periphery in such a manner as to extend downward therefrom.

Said supply cylinder 2 forms a supply port 13 for raw material at a part of its upper end portion, and is formed with an annularly swollen portion or abacus bead shaped annularly swollen portion 14 having tapered over and under surfaces 14a and 14b at its lower portion in such a manner as that after the diameter thereof once becomes large around said preliminary dispersion board 6, it becomes smaller again as it goes downward. The separation chamber 1 is defined as an acceleration area 16 around the area where said supply cylinder 2 becomes large in its diameter to form said abacus bead shaped swollen portion 14. The upper area of said swollen portion 14 is defined as

a separation area 15 and the lower area but above a ventilation member 18 is defined as a drop area 17.

An air outlet 19 is provided at the upper portion of the separation area 15 of said separation chamber 1 and connected to an intake of a fan 22 by way of a tangential separator 21 through a duct 20. The discharge cylinder 7 for remainder after completion of wind classification is disposed generally in the vertical direction so that the upper end portion thereof is positioned under said dispersion board 8. The ventilation member 18 is interposed between said discharge cylinder 7 for remainder after completion of wind classification and the side wall 24 of the separation chamber 1. The upper end surface of the ventilation member 18 is extended downward (30° to 40° with respect to the horizontal line in this embodiment) gradually and inwardly between the side wall 24 of the separation chamber 1 and the upper end portion of said discharge cylinder 7 for remainder after completion of wind classification. The opened area of the ventilation member 18 is limited to a few percent of the total area of the ventilation member 18 in order to obtain an even speed of air flow.

A chamber 25 is defined between the side wall 24 of separation chamber 1 at the lower portion of the ventilation member 18 and the side wall 23 of the discharge cylinder 7 for remainder after completion of wind classification. An annular chamber 28 having an air inlet 27 connecting to a duct 26 of the outlet of the fan 22 is provided on the periphery of said chamber 25. A plurality of ducts 29 are inserted from said annular chamber 28 into the inside of said chamber 25 toward the vicinity of the side wall 23 of said discharge cylinder 7 for remainder after completion of said wind classification for intercommunication. The total opened area of said ducts 29 is kept less than a half of the area of said air inlet 27, and a damper 30 for controlling air amount is disposed within the duct 29 in order to obtain an even air flow from the annular chamber 28 to the chamber 25. Furthermore, a rectification plate 31 which is annularly apertured is provided intermediate between the upper surface of the duct 29 of the chamber 25 and the ventilation member 18 in order to equalize the wind speed distribution both in the axial and peripheral directions. Dampers 32 and 33 are provided at the inlet and outlet of the fan 22 in order to balance the wind amount and the air resistance of the air circulation system for wind classification.

The abacus bead shaped swollen portion 14 of the raw material supply cylinder 2 in the separation chamber 1 is vertically movably arranged in order to obtain the best separation condition according to the characteristic of the raw material in such a manner as that the distance between the abacus bead shaped swollen portion 14 and the dispersion board 8 is adjusted to shift the position of the acceleration area 16. Also, in order to change the height of the separation area 15, an annularly protruded partition panel 34 adapted to

define the air outlet 19 on the side wall of the separation chamber 1 is vertically adjustably disposed. Furthermore, the mounting position of the dispersion board 8 is vertically shiftable to a suitable position with respect to the acceleration area 16 and not to disturb the smooth flow of the raw material from the ventilation member 8 to the discharge cylinder 7 for remainder after completion of wind classification.

The rotary shaft 4 on which the dispersion board 8 and the preliminary dispersion board 6 is mounted is made speed-variable in order to obtain desirable dispersion and spread of the raw material supplied into the separation chamber 1 from the supply cylinder 2. The vane, which is mounted on the under surface of the peripheral end portion 10 of said dispersion board 8, has such a configuration and number of blades as to compensate the scattering of the wind speed in the peripheral direction in the separation chamber 1 and maintain the floating time of the raw material adequately in the separation chamber 1, and also to circulate slightly the air in the separation chamber 1 to enhance the smooth flow of the raw material toward the discharge cylinder 7 for remainder after completion of wind classification from the above area of the ventilation member 18 without stagnancy.

The air outlet 19 provided at the upper portion of the separation area 15 within the separation chamber 1 is divided into several portions (divided into 4 portions in this embodiment) in order to discharge the air without disturbing the distribution of the wind speed in the cylindrical separation chamber 1 and each of them is provided with a damper 3 for controlling the air amount. A plurality of secondary air intakes 36 are provided at the lower portion of the side wall 24 of the separation area 15 in the separation chamber 1 and each of them is provided with a damper for controlling the secondary air amount. The duct 26 of the outlet of the fan 22 is provided with an exhaust duct 37 in order to purify the circulation air within the ventilation system and enhance the smooth introduction of the secondary air into the separation chamber 1 and the air amount of exhaust air is controlled by a damper 38. The ventilation system is supported by the circulation system, and a balance of the air resistance and the wind amount is maintained so that no air-locker is required to shut out the flowing in-and-out of the air at the supply cylinder 2 of the separation chamber 1 and the discharge port 7 for remainder after completion of wind classification.

In the above constitution, the tobacco leaves (hereinafter referred to as the "raw material") supplied from the supply port 2 is unfastened and dispersed by means of the preliminary dispersion board 6 which is rotated by means of the rotary shaft 4. Said ejector plate 9 is useful for said unfastening and dispersion. Next, the raw material is dropped toward the center of the dispersion board 8 along the side wall 23 of the supply cylinder 2 and evenly dispersed all over the periphery in the separation chamber 1 by the

centrifugal force of said dispersion board 8. The ejector plate 11 and the raised up peripheral end portion 10 are useful for said dispersion. Particularly, the peripheral end portion 10 renders a component force to the raw material in the upward direction. The air flow for separating and classifying the raw material dispersed within the separation chamber 1 is blown out by means of the ventilation member 18 to regulate the wind speed such that it is lower along the side wall 24 of the separation chamber 1 and the side wall 23 of the supply cylinder 2 than intermediate 24 of the separation chamber 1 and the side wall of the area.

The raw material once blown up passing the acceleration area 16 is gradually reduced its speed in the separation area 15. Although the light weight raw material continues to climb upward, the heavy weight raw material starts dropping along the side wall 24 of the separation chamber 1 and the side wall 23 of the supply cylinder 2, and is dropped into the discharge cylinder 7 for remainder after completion of wind classification for separation.

The configuration of the abacus bead shaped swollen portion 14 of the supply cylinder 2 forming the acceleration area 16 and the separation area 15 as well as the relationship of the portions between the abacus bead shaped swollen portion 14 and the dispersion board 8 and the positions between the dispersion board 8 and the ventilation member 18 are useful for said separation.

Secondary air introduced from the secondary air intakes 36 formed on the side wall 24 of the separation chamber 1 affects the raw material dropping along the side wall 24 and blows up once again the light weight raw material accompanied by the heavy weight raw material. The slight air circulation within the separation chamber 1 by means of the vane 12 of the dispersion board 8 is useful for said separation because it improves the floating condition of the raw material. The light weight raw material climbed up the separation area 15 of the separation chamber 1 is guided to said tangential separator 21 through the upper air outlet 19 for collection.

Since the present invention is constituted as mentioned in the foregoing, a comparatively light weight material to be separated, which is once blown up to the separation chamber by a wind speed and is dropped downward accompanied by a comparatively heavy weight material to be separated, is once again returned to the separation chamber by secondary air for re-classification. In this way, the present invention enables to improve the sharpness of separation considerably when compared with the prior art.

Furthermore, according to the present invention, since the width of the separation area and that of the acceleration area are adjustably constituted, the best separation condition can be created depending on the characteristic of particular material to be separated.

Claims

1. A wind separation and classification equipment for tobacco leaves and the like comprising:
a vertically cylindrical shell defining a separation chamber (1) therein and having an air outlet (19) formed on its upper portion;

a supply cylinder (2) having a raw material supply port (13) on a part of its upper end portion accommodated within said vertically cylindrical shell and attached to the top portion thereof at its one end, the other end thereof being extended halfway downward in said separation chamber (1);

a swollen portion (14) of an abacus bead configuration connected to the extended lower end portion of said supply cylinder (2) and forming substantially a part thereof;

a rotary shaft (4) rotatably mounted on the top portion of said vertically cylindrical shell at its one end, the other end thereof being extended downward through the inside of said supply cylinder (2) as well as said swollen portion (14);

a dispersion board (8) mounted on the lower end portion of said rotary shaft, said dispersion board being positioned under said swollen portion (14) in such a manner as that the upper surface of the former is spacedly adjacent to the lowest portion of the latter;

a discharge cylinder (7) mounted on the bottom of said vertically cylindrical shell, said discharge cylinder being positioned under said dispersion board (8) in such a manner as that the top portion of the former is spacedly adjacent to the under surface of the latter;

a ventilation means (18, 22, 26, 27) provided on a lower portion of said separation chamber in such a manner as to surround the outer periphery of said discharge cylinder in order to introduce an even air flow; and

a separation area (15), an acceleration area (16) and a drop area (17) defined in the sequential order from the top in said separation chamber (1); characterised in that

a plurality of secondary air intakes (36) are provided at the lower portion on the cylindrical shell around said separation area (15) in the separation chamber, said secondary air intakes being positioned above said ventilation means.

2. A wind separation and classification equipment according to claim 1 which includes means for adjusting the vertical width of said separation area (15).

3. A wind separation and classification equipment according to claim 2, wherein said means for adjusting the vertical width of said separation area is a partition panel (14) vertically adjustably disposed and annularly protruded inwardly from the upper portion of the cylindrical shell around said separation area.

4. A wind separation and classification equipment according to claim 2, wherein said means for adjusting the vertical width of said separation area is the vertically adjustable swollen portion (14) of an abacus bead configuration.

5. A wind separation and classification equipment according to claim 1 which includes means for adjusting the vertical width of said acceleration area.

6. A wind separation and classification equipment according to claim 5, wherein said means for adjusting the vertical width of said acceleration area is the vertically adjustable dispersion board (8).

7. A wind separation and classification equipment according to claim 1 which further includes a preliminary dispersion board (6) mounted on said rotary shaft within said swollen portion of the supply cylinder.

8. A wind separation and classification equipment according to claim 7, wherein said preliminary dispersion board (6) is in a conical configuration and an ejector plate (9) is provided on its declined surface radially and in parallel with the generatrix.

9. A wind separation and classification equipment according to claim 1, wherein said dispersion board (8) is in a conical configuration with an umbrella shape at its center, while the end portion thereof is raised upwardly and outwardly.

10. A wind separation and classification equipment according to claim 9, wherein said dispersion board (8) is provided with an ejector plate (11) on its declined surface radially and in parallel with the generatrix.

11. A wind separation and classification equipment according to claim 1, wherein said swollen portion (14) of the supply cylinder has tapered over and under surfaces.

Patentansprüche

1. Pneumatische Einrichtung zum Trennen und Klassifizieren von Tabakblättern und dergleichen, mit einer vertikalen zylindrischen Hülle, die in sich eine Trennkammer (1) bildet und an ihrem oberen Abschnitt einen Luftauslass (19) aufweist; einem Versorgungszylinder (2) mit einer Rohmaterial-Zuführöffnung (13) an einem Teil von dessen oberem Endabschnitt, der von der vertikalen zylindrischen Hülle aufgenommen wird und an deren oberem Abschnitt mit einem Ende befestigt ist, wobei das andere Ende zur Hälfte nach unten in die Trennkammer (1) ragt; einem erweiterten Abschnitt (14) einer Abacus-Wulstkonfiguration, verbunden mit dem verlängerten unteren Endabschnitt des Versorgungszylinders (2) und im wesentlichen einen Teil desselben bildend; einer Drehachse (4), die drehbar am oberen Abschnitt der vertikalen zylindrischen Hülle mit einem Ende angebracht ist, wobei das andere Ende derselben durch die Innenseite des Versorgungszylinders (2) sowie den erweiterten Abschnitt (14) nach unten verläuft; einer Dispersionstafel (8), die am unteren Endabschnitt der Drehachse befestigt ist und so unter dem erweiterten Abschnitt (14) positioniert ist, dass die Oberseite der Dispersionstafel im Abstand benachbart zum unteren Abschnitt des erweiterten Abschnittes sich befindet; einem Abgabezylinder (7), der im Bodenbereich der

vertikalen zylindrischen Hülle angebracht ist und so unter der Dispersionstafel (8) angeordnet ist, dass der obere Abschnitt des Abgabezylinders beabstandet neben der Unterseite der Dispersionstafel sich befindet; Ventilationsmitteln (18, 22, 26, 27), die am unteren Abschnitt der Trennkammer derart angeordnet sind, dass sie den Aussenumfang des Abgabezylinders umgeben, um einen gleichmässigen Luftstrom einzuführen; und einem Trennbereich (15), einem Beschleunigungsbereich (16) und einem Fallbereich (17), die in dieser Reihenfolge von der Oberseite her in der Trennkammer (1) angeordnet sind, dadurch gekennzeichnet, dass eine Vielzahl von sekundären Lufterlässen (36) am unteren Abschnitt der zylindrischen Hülle um den genannten Trennbereich (15) in der Trennkammer vorgesehen sind, und dass die sekundären Lufterlässe oberhalb der Ventilationsmittel vorgesehen sind.

2. Pneumatische Einrichtung zum Trennen und Klassifizieren nach Anspruch 1, die Mittel zum Einstellen der vertikalen Breite des Trennbereiches (15) umfasst.

3. Pneumatische Einrichtung zum Trennen und Klassifizieren nach Anspruch 2, bei der die Mittel zum Einstellen der vertikalen Breite des Trennbereiches von einer Trenntafel (14) gebildet sind, die vertikal einstellbar angeordnet ist und ringförmig vom oberen Abschnitt der zylindrischen Hülle um den Trennbereich nach innen vorsteht.

4. Pneumatische Einrichtung zum Trennen und Klassifizieren nach Anspruch 2, bei der die Mittel zum Einstellen der vertikalen Breite des Trennbereiches von dem vertikal einstellbaren, erweiterten Abschnitt (14) einer Abacus-Wulstkonfiguration gebildet sind.

5. Pneumatische Einrichtung zum Trennen und Klassifizieren nach Anspruch 1, die Mittel zum Einstellen der vertikalen Breite des Beschleunigungsbereiches umfasst.

6. Pneumatische Einrichtung zum Trennen und Klassifizieren nach Anspruch 5, bei der die Mittel zum Einstellen der vertikalen Breite des Beschleunigungsbereiches von der vertikal einstellbaren Dispersionstafel (8) gebildet werden.

7. Pneumatische Einrichtung zum Trennen und Klassifizieren nach Anspruch 1, die weiterhin ein vorläufige Dispersionstafel (6) umfasst, die an der Drehachse innerhalb des erweiterten Abschnittes des Versorgungszylinders befestigt ist.

8. Pneumatische Einrichtung zum Trennen und Klassifizieren nach Anspruch 7, bei der die vorläufige Dispersionstafel (6) eine konische Gestalt hat und bei der eine Ejektorplatte (9) auf ihrer geneigten Oberfläche vorgesehen ist und zwar radial und parallel mit der Erzeugenden.

9. Pneumatische Einrichtung zum Trennen und Klassifizieren nach Anspruch 1, bei der die Dispersionstafel (8) eine konische Gestalt hat, und zwar mit einer Schirmform in ihrer Mitte, während der Endabschnitt derselben nach aussen und nach oben angehoben ist.

10. Pneumatische Einrichtung zum Trennen und Klassifizieren nach Anspruch 9, bei der die Dispersionstafel (8) an ihrer geneigten Fläche

radial und parallel zur Erzeugenden mit einer Ejektorplatte (11) versehen ist.

11. Pneumatische Einrichtung zum Trennen und Klassifizieren nach Anspruch 1, bei der der erweiterte Abschnitt (14) des Versorgungszylinders konisch verlaufende Ober- und Unterseiten aufweist.

Revendications

1. Installation pneumatique de séparation et de classification pour feuilles de tabac ou analogues, comprenant:

un carter verticalement cylindrique définissant à l'intérieur une chambre de séparation (1) et muni d'un passage de sortie d'air (19) formée sur sa partie supérieure;

un cylindre d'alimentation (2) muni d'un orifice d'alimentation (13) en matériau brut sur une partie de sa partie finale supérieure, reçu à l'intérieur dudit carter verticalement cylindrique et fixé à une de ses extrémités à la partie supérieure de ce dernier, l'autre extrémité du cylindre s'étendant à mi-chemin vers le bas dans ladite chambre de séparation (1);

une partie renflée (14) en forme de bordure d'abaque, assemblée à l'extrémité inférieure dudit cylindre d'alimentation (2), et constituant sensiblement une partie de ce dernier;

un arbre (4) monté rotatif à une de ses extrémités sur la partie supérieure dudit carter verticalement cylindrique, l'autre extrémité de l'arbre s'étendant vers le bas dans ledit cylindre d'alimentation (2) ainsi que dans la partie renflée (14);

un panneau de dispersion (8) monté sur la partie finale inférieure dudit arbre rotatif, ledit panneau de dispersion étant positionné en dessous de ladite partie renflée (14) de telle sorte que la surface supérieure dudit panneau est voisine à distance de la partie inférieure de ladite partie renflée;

un cylindre d'évacuation (7) monté sur le fond dudit carter verticalement cylindrique, ledit cylindre d'évacuation étant positionné en dessous dudit panneau de dispersion (8) de telle sorte que la partie supérieure dudit cylindre d'évacuation est voisine à distance de la surface inférieure dudit panneau;

un moyen de ventilation (18, 22, 26, 27) prévu sur une partie inférieure de ladite chambre de séparation de manière à entourer la périphérie extérieure dudit cylindre d'évacuation afin d'introduire un flux d'air régulier; et

une zone de séparation (15), une zone d'accélération (16) et une zone de chute (17) définies dans cet ordre à partir du dessus de ladite chambre de séparation;

caractérisé en ce qu'il est prévu un certain nombre de prises d'air d'appoint (36) sur la partie inférieure du carter cylindrique autour de ladite zone de séparation (15) prévue dans la chambre

de séparation, lesdites prises d'air d'appoint étant positionnées au-dessus dudit moyen de ventilation.

2. Installation pneumatique de séparation et de classification selon la revendication 1, laquelle comprend un moyen pour régler la largeur verticale de ladite zone de séparation (15).

3. Installation pneumatique de séparation et de classification selon la revendication 2, dans laquelle ledit moyen pour régler la largeur verticale de ladite zone de séparation est un panneau de séparation (14), verticalement réglable, qui fait saillie annulairement vers l'intérieur depuis la partie supérieure de carter cylindrique autour de ladite zone de séparation.

4. Installation pneumatique de séparation et de classification selon la revendication 2, dans laquelle ledit moyen pour régler la largeur verticale de ladite zone de séparation est la partie renflée (14) verticalement réglable en forme de bordure d'abaque.

5. Installation pneumatique de séparation et de classification selon la revendication 1, laquelle comprend un moyen pour régler la largeur verticale de ladite zone d'accélération.

6. Installation pneumatique de séparation et de classification selon la revendication 5, dans laquelle ledit moyen pour régler la largeur verticale de ladite zone d'accélération est le panneau de dispersion (8) verticalement réglable.

7. Installation pneumatique de séparation et de classification selon la revendication 1, laquelle comprend en outre un panneau de dispersion préalable (6) monté sur ledit arbre rotatif à l'intérieur de la dite partie renflée du cylindre d'alimentation.

8. Installation pneumatique de séparation et de classification selon la revendication 7, dans laquelle ledit panneau de dispersion préalable (6) présente une configuration conique, et une plaque d'éjection (9) est prévue sur sa surface en déclivité, radialement et parallèlement à la ligne génératrice.

9. Installation pneumatique de séparation et de classification selon la revendication 1, dans laquelle ledit panneau de dispersion (8) présente une configuration conique en forme d'ombrelle en son centre, tandis que la partie finale est relevée vers le haut et vers l'extérieur.

10. Installation pneumatique de séparation et de classification selon la revendication 9, dans laquelle ledit panneau de dispersion (8) est muni d'une plaque d'éjection (11) sur sa surface en déclivité, radialement et parallèlement la ligne génératrice.

11. Installation pneumatique de séparation et de classification selon la revendication 1, dans laquelle ladite partie renflée (14) du cylindre d'alimentation présente des surfaces de dessus et de dessous coniques.

FIG. 1

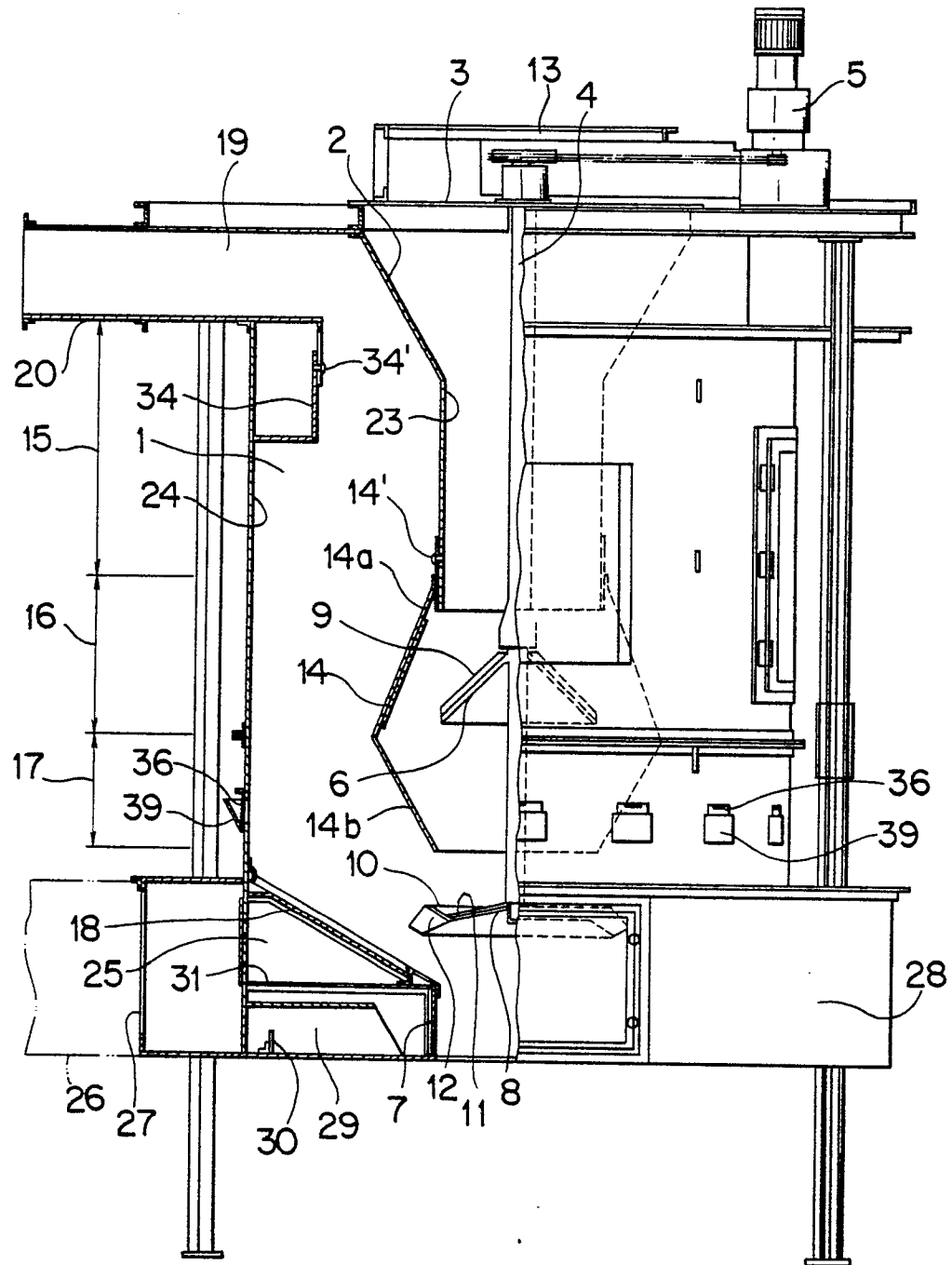


FIG. 2

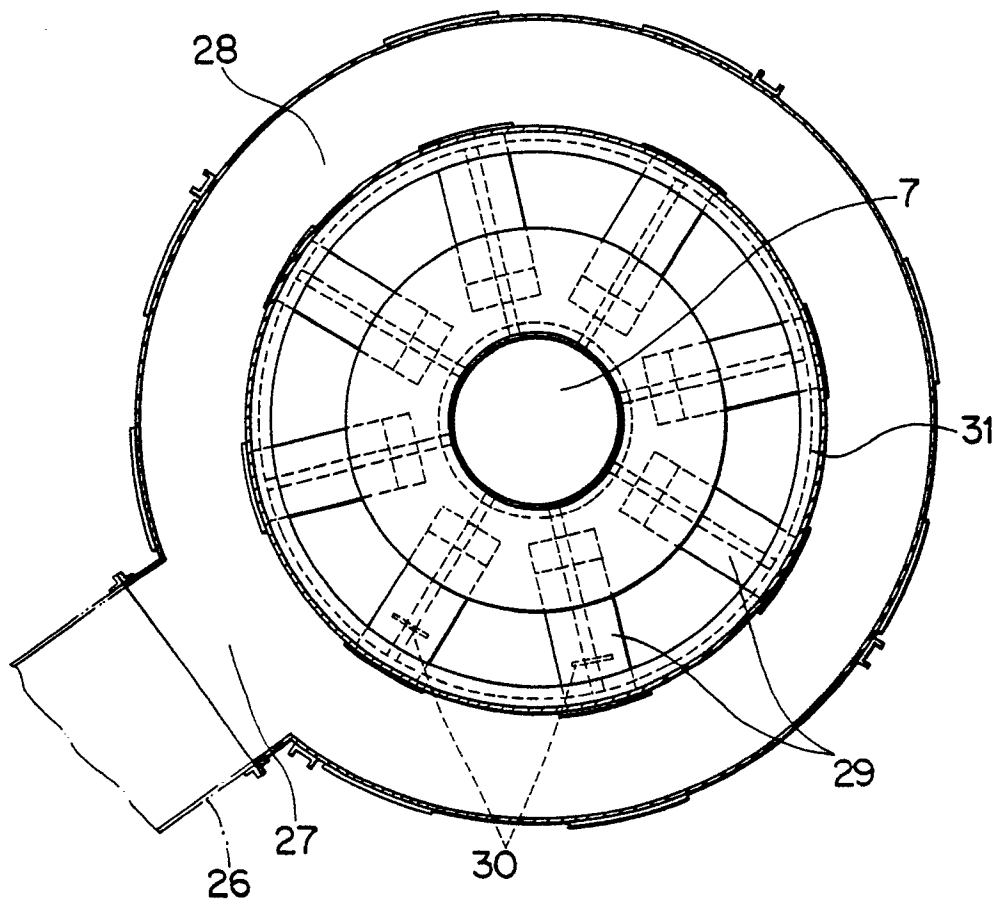


FIG. 3

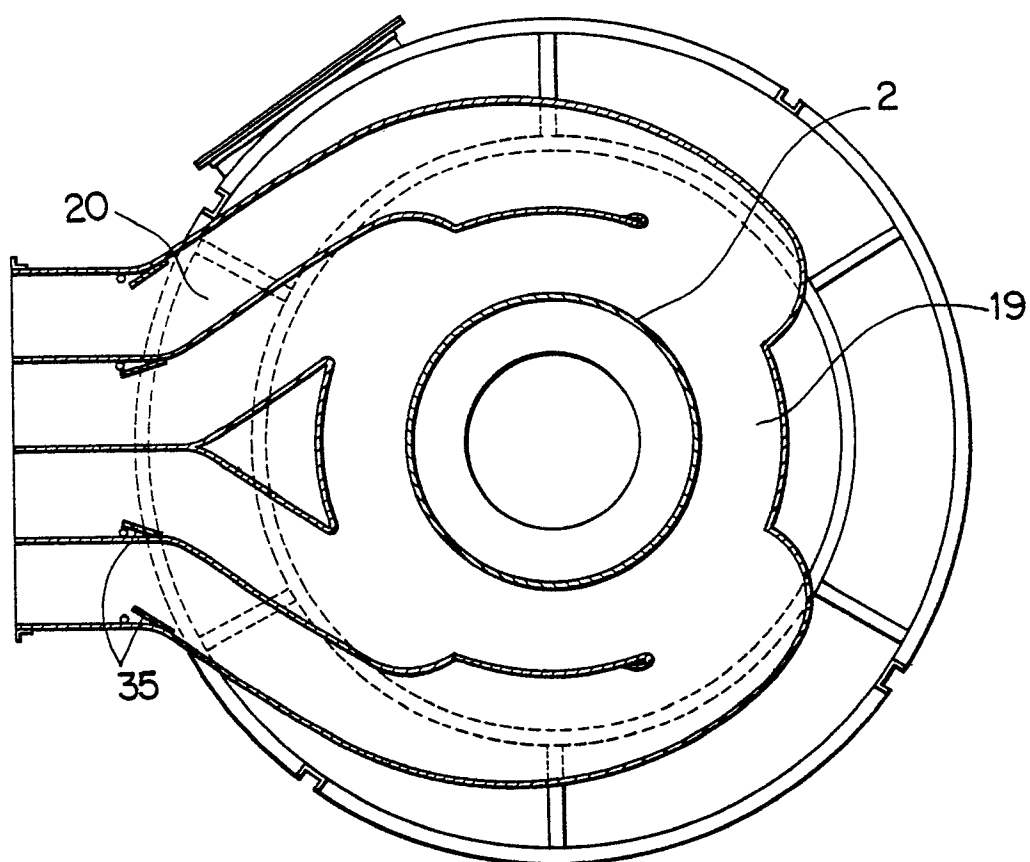


FIG. 4

