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(54) **DUST REMOVAL APPARATUS**

ENTSTAUBUNGSVORRICHTUNG

APPAREIL ELIMINANT LES POUSSIÈRES

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EP 0 912 802 B1

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Description

[0001] The present invention relates to an apparatus for removing dust released during treatment of a moving web of fibre material, particularly cellulosic fibre material, such as in machines for cutting and rewinding paper webs, in printing machines and in the dry end of paper machines, e.g. in the production of a soft creping paper web which is creped off a Yankee cylinder by means of a creping doctor and spread by means of one or more spreading means comprising a first dust suction box including an elongated housing having an inner suction chamber in communication with a vacuum source, said housing having a first inlet in the form of a suction gap communicating with the suction chamber, and said housing also including a main part and first and second parts which define said suction gap between them.

[0002] Dust in the form of fibres and other particles are released from the web when creping off a soft crepe paper web, e.g. a tissue web, from a Yankee cylinder. To remove this dust it has been proposed in US patent No. 4,019,953 (SE-381 899) to arrange a collection container below the area where the dust is produced. A compressed air pipe and a suction pipe are connected to this in order to remove dusty air drawn across the direction of transport of the web by jets of compressed air. Compressed air must be blown on since merely drawing off the dust by means of ventilation has little effect in view of poor distance action. Such a device is cumbersome, bulky and relatively inefficient since it only takes care of some of the dust falling down below the dust-producing area. The high speeds of modern tissue machines, namely in the region of near 25 m/s, contribute to the unsatisfactory result since dusty air is entrained along on both sides of the fast-moving tissue web which is delicate due to its low grammage.

[0003] The release of dust from the surface of a paper web is a problem when cutting and rewinding the paper web, for instance. US patent No. 3,775,806 (SE-319 969) proposes an apparatus for dust-suction of the surface of a paper web. To avoid the web being drawn in towards the suction device and coming into contact with this, thus causing damage to the web, air is blown on at the same time as the suction. The proposed dust-suction device therefore comprises a horizontal sheet-metal channel, open at the top, which surrounds a rectangular blowing pipe and extends transversely across the web. The side of the blowing pipe facing the web has openings facing away from each other in order to direct air jets substantially parallel to the web both with and against the direction of transport of the web, thus fixing the distance between web and dust suction device. Intermediate openings of the same type may be arranged to direct air jets towards the surface of the web to achieve a better dust suction effect by blowing dust off the surface. The air supplied and the dust entrained are withdrawn perpendicularly to the web, through the two gaps formed upstream and downstream of the blowing

pipe, between it and the surrounding sheet-metal channel, to which a means for drawing off air is connected. The wall parts of the sheet-metal channel located nearest the web may be vertically movable up and down enabling them to be set in such a manner that the dust-carrying air blown on does not flow past the suction gaps, neither does the web scrape against said wall parts and become damaged. The dust-suction effect achieved with the arrangement according to US-3,775,806 does not, however, fulfil modern requirements with regard to also taking care of the dust that accompanies the air around a fast-moving paper web. Furthermore, the arrangement is both bulky and expensive to purchase and to operate due to the air flows required by the blow-on technique.

[0004] US-4,906,333 (SE-B 459 105) proposes an apparatus for removing dust in the boundary layer of a creped web. This apparatus comprises a web-wide hood and a flat cover plate that closes the hood while defining a space in which subatmospheric pressure prevails, and forming a suction gap between the cover plate and an angled strip at the front side edge of the hood. The cover plate is located immediately next to the creped web so that, during transport, it is held close to the cover plate and said suction gap will be located in the dust-containing boundary layer. A lower part of the angled strip faces towards the space and lies parallel with the cover plate in order to define the suction gap, thereby ensuring that its width remains constant in the direction of flow of the air. A suction gap formed in this way easily becomes clogged with dust after a relatively short time in operation and must therefore be cleaned at regular intervals. Another problem is that the web may be damaged by the front edge and flat cover plate, causing a break in the web. The problem is aggravated since the web is drawn by the air flow up towards the front edge of the cover plate. Said space in the hood is irregular in shape, with several corners and edges that detrimentally affect that air flow so that local whirls of air containing dust occur, the flow of the air towards the outlet gradually deteriorates and dust collects along the walls near said corners and edges, which in turn results in poorer suction effect so that the suction gap becomes more easily clogged by dust particles for this reason as well.

[0005] However, the problem of suction inlets and channels becoming clogged is general to all known apparatus for removing dust released during treatment of a moving web of fibre material. Installing nozzles inside the actual suction channel has been suggested so that air can be blown in the opposite direction through the gap at regular intervals, in order to remove collections of dust when the suction source has been disconnected. Such interruptions in operation are undesirable since dust is produced continuously and will be blown out into the surroundings, causing further deterioration of the working environment.

[0006] US-5,466,298 discloses a dust suction system

with upstream and downstream curved surfaces in a suction inlet opening which is directed vertically downwards. Pressurized air is directed to the web and flows along the curved downstream wall of the suction inlet opening by the Coanda effect.

[0007] The object of the invention is to provide an improved apparatus for taking care of and removing the dust released during treatment of a moving web of fibre material, thereby achieving improved working environment for the operating personnel.

[0008] The apparatus according to the invention is characterized in that the main part is shaped as or substantially as part of a cylinder to provide a corresponding curved inner side in the suction chamber; that the suction gap comprises an inwardly converging outer section that defines a gradual throttling, and an inwardly diverging inner section that defines a gradual enlargement, said sections merging at a transition where the throttling is maximal, said transition having a minimal extension seen in the flow direction of the air through the suction gap; that the first inlet forming part comprises a flat surface that defines the whole or most of its side of said enlargement; and that the second inlet forming part comprises both a curved surface having predetermined radius and such an arc length that it defines the whole of its side of the throttling and an initial part of the enlargement section, and also an inner, flat surface extending at a tangent from the curved surface and forming an acute angle α with a tangent to the curved surface at said transition.

[0009] The invention will be described in more detail with reference to the accompanying drawings.

[0010] Figure 1 is a schematic side view of a section between a Yankee cylinder and a reel-up in a soft crepe paper machine, said section being provided with a plurality of dust removal apparatus according to the invention.

[0011] Figure 2 is a side view of an apparatus according to a first preferred embodiment of the invention.

[0012] Figure 3 is a cross section along the line III-III in Figure 2.

[0013] Figure 4 is a side view of an apparatus according to a second preferred embodiment of the invention.

[0014] Figure 5 is a cross section along the line V-V in Figure 4.

[0015] Figure 6 is a side view of an apparatus according to a third preferred embodiment of the invention.

[0016] Figure 7 is a cross section along the line VII-VII in Figure 6.

[0017] Figure 8 is a through-section of an apparatus according to a fourth preferred embodiment of the invention.

[0018] At the dry end of a soft crepe paper machine shown schematically in Figure 1, a paper web 1 adhering to the envelope surface of a Yankee cylinder 2, rotating counter-clockwise, is lead downwards to a creping doctor 3. There the paper web 1 is creped off the Yankee cylinder 2 by a creping blade 4 mounted in a

holder 5 that extends substantially vertically up from a doctor beam 6. From the creping blade 4 the creped paper web 1 runs obliquely downwards and passes a first spreading means 7 in the form of a bow-shaped curved beam, and a second spreading means 8 which will be explained below in more detail, a calender 9, a grammage scanner 10 and a deflection roll 11 before arriving at a reel-up 12. In the embodiment shown the reel-up 12 comprises a drum reel-up with a supporting cylinder 13. An empty reeling drum 14 has just been lowered to abutment with the supporting cylinder 13, beside which a recently finished reel 15 of soft crepe paper is shown.

[0019] Dust is liberated from the paper web 1 during creping, and some of this dust will be entrained in a boundary layer on each side of the creped paper web 1 which is moving at high speed, while almost all the remaining dust will fall down towards the doctor beam 6. Dusty air will also flow out of the hood covering the Yankee cylinder when the paper web 1 runs out of the hood, this dust then falling down to the paper web. In order to take care of and remove at least a considerable part of the dust content in the boundary air layers and in the air in the spaces on both sides of the paper web 1, a plurality of dust removal apparatus are applied between the creping doctor and the grammage scanner 10. For the sake of clarity these dust removal apparatus are shown with the front end piece removed.

[0020] Figure 2 shows from the side an apparatus according to a first embodiment of the invention comprising a dust suction box 18 and attachment elements 19 for mounting the apparatus on the lower side of the doctor beam 6 of the creping doctor 3 to remove dust released when the soft crepe paper web 1 is creped off the Yankee cylinder 2. The dust suction box 18 comprises an elongated housing 20 having an inner suction chamber 21, see Figure 3, closed at one end by an inspection hatch 22 and at the other end being in communication with a suction source (not shown) via a coaxial pipe socket 23 and a hose (not shown). The housing 20 has a web-wide inlet 24 in the form of a suction gap communicating directly with the suction chamber 21. The wall of the housing 20 includes a main part 25 in the form of a part of a cylinder, and first and second parts 26, 27, tangentially joining each end of the main part 25 and defining said inlet 24 in form of a suction gap between them. A curved or cylinder arc formed surface 34 is defined within the area for the main part 25 on its inner side, i.e. in the suction chamber 21. An inspection hatch 28 is arranged on the lower side of the housing in the vicinity of the outlet end.

[0021] The suction gap 24 comprises an inwardly converging outer section 29 that defines a gradual throttling, and an inwardly diverging inner section 30 that defines a gradual enlargement, said sections 29, 30 merging at a transition 31 where the throttling is maximal and the extension minimal seen in the flow direction of the air through the suction gap 24.

[0022] The first inlet forming part 26 has an outer

curved or cylinder arc formed surface 32 with predetermined radius, and an inner flat surface 33 merging tangentially into both the inner curved surface 34 of the main part 25 and the outer curved surface 32, the point of tangent in the latter case being located in the vicinity of the transition 31 to the enlargement 30.

[0023] The second inlet forming part 27 has an outer flat surface 35 which is located in a plane that is a tangent to the outer curved surface 32 of the first inlet forming part 26, and a curved or cylinder arc formed surface 36 with predetermined radius, the outer flat surface 35 is a tangent to the curved surface 36. The curved surface 36 has such an arc length that it defines its side of the throttling 29 and an initial part of the enlargement 30, as well as the actual transition 31 therebetween. The second inlet forming part 27 also has an inner, flat surface 37 extending at a tangent from the curved surface 36 and forming an acute angle α with a tangent 38 to the curved surface 36 at said transition 31. Said angle α is 20-50°, preferably 30-40°. In order to achieve the best function it is important that the radius of the curved surface 36 of the second inlet part 27 is as large as or larger than the width of the suction gap 24 at said transition 31 (maximum throttling).

[0024] In Figure 4 an apparatus according to a second embodiment of the invention is shown from the side. This apparatus comprises said second spreading means 8 and a dust suction box 118 for removing dust present in the air whirling in the spaces before and after the web spreading means 8. The apparatus comprises journalling means (not shown) by means of which it is pivotable and vertically adjustable so that the spreading means 8 can be adjusted in relation to the paper web. The dust suction box 118 comprises an elongated housing 120 having an inner suction chamber 121 provided at one end with a pipe socket 123 communicating with a suction source (not shown) via a hose (not shown). The housing 120 is closed at the ends by end pieces 140, 141. The housing 120 has a first web-wide inlet 124, see Figure 5, in the form of a suction gap communicating directly with the suction chamber 121. The housing 120 includes a main part 125 having the form of a part of a cylinder, and first and second parts 126, 127, tangentially joining each end of the main part 125 and defining said suction gap formed inlet 124 between them. A curved or cylinder arc formed surface 134 is formed within the area for the main part 125 on its inner side, i.e. in the suction chamber 121.

[0025] The suction gap 124 comprises an inwardly converging outer section 129 that defines a gradual throttling, and an inwardly diverging inner section 130 that defines a gradual enlargement, said sections 129, 130 merging at a transition 131 where the throttling is maximal, said transition having a minimal extension seen in the flow direction of the air through the suction gap 124.

[0026] The first inlet forming part 126 comprises a flat surface 133 that merges tangentially with the internal

curved surface 134 of the main part 125.

[0027] The second inlet forming part 127 has an outer flat surface 135 and a curved or cylinder arc formed surface 136 having predetermined radius, the outer flat surface 135 being a tangent to the curved surface 136. The curved surface 136 has such an arc length that it defines its side of the throttling 129 and an initial part of the enlargement 130 as well as the actual transition 131 therebetween. Furthermore, the second inlet forming part 127 has an inner flat surface 137 extending at a tangent from the curved surface 136 and forming an acute angle α with a tangent 138 to the curved surface 136 at said transition 131. Said angle α is 20-50°, preferably 30-40°. To achieve the best function it is important that the radius of the curved surface 136 of the second inlet part 127 is as large as or larger than the width of the suction gap 124 at the transition 131 (maximum throttling).

[0028] The housing 120 is also provided with a second inlet 224 divided into several parts separated by partitions 253 in the wall of the housing. Each such part of the inlet has first and second inlet parts 226, 227 defining the inlet 224 between them in the form of a suction gap. The second inlet part 227 is supported by a wall 240 in the shape of a cylinder arc hinged to the main part 125 and situated outside the circle arc described by the main part 125.

[0029] The suction gap 224 comprises an inwardly converging outer section 229 that defines a gradual throttling, and an inwardly diverging inner section 230 that defines a gradual enlargement, said sections 229, 230 merging at a transition 231 where the throttling is maximal, said transition having a minimal extension seen in the flow direction of the air through the suction gap 224. The first inlet forming part 226 has a flat surface 233 directed radially in relation to the inner curved surface 134 of the main part 125.

[0030] The second inlet forming part 227 has an outer flat surface 235 and a curved or cylinder arc formed surface 236 with predetermined radius, the outer flat surface 235 is a tangent to the curved surface 236. The curved surface 236 has such an arc length that it defines its side of the throttling 229 and also the whole of the enlargement 230, as well as the actual transition 231 therebetween. To achieve the best function it is important that the radius of the curved surface 236 of the second inlet part 227 is as large as or larger than the width of the suction gap 224 at the transition 231 (maximum throttling).

[0031] Following the enlargement 230 is an inlet channel 241 of constant cross section, which opens in an opening 242 in the main part 125, said opening being defined in axial direction by said partitions 253. The inlet channel 241 is defined by inner surfaces 243, 244 of the inlet parts 226, 227.

[0032] Said spreading means 8, termed as a shoe, comprises a tube 245 situated upstream and a tube 246 situated downstream. The tubes are curved in a bow-shape in the same way as the conventional spreading

bar 7 and face away from each other so that the greatest distance between them is at the middle and the shortest distance at their ends. The tubes are also oriented in relation to each other so that a flat plane 249 intersecting the curved centre line of the one tube 245 also intersects the curved centre line of the other tube 246. The two tubes are supported by a common, flat, stable bottom plate 247 that is a tangent to the main part 125 of the dust suction box and welded thereto. The spreading shoe 8, which is symmetrical, also comprises an upper arched support plate 248 welded to the tubes 245, 246, the support plate 248 thus being in connection tangentially with the tubes, seen in each cross section thereof. The arched support plate comprises an inclined part 250 located upstream and an inclined part 251 located downstream and a top transition 252 between them, which is curved. Since the tubes 245, 246 are situated in one and the same plane 249 with regard to their centre lines, as described above, the parts 250, 251 sloping in the direction of travel of the web will also slope from the middle out towards the edges, i.e. transversely to the direction of travel of the web, depending on the curvature of the tubes 245, 246, the transverse slope being greatest at the tubes 245, 246 and decreasing gradually to zero in the direction of the top transition 252. The inclination is suitably such that the support parts 250, 251 encompass an obtuse angle in the range of 150-170°. The upper side of the support plate forms a sliding surface for the paper web 1 to run over. The paper web is effectively spread since the spreading occurs during a long distance in the direction of travel of the web corresponding to the width of the spreading shoe 8.

[0033] As can be seen in Figure 5, part of the bottom plate 247 forms the first inlet part 126 of the housing 120, the inlet part thus being extended to the tube 246, the curved surface of which has a favourable effect on the process of flow of air towards the suction gap 124. At the second inlet gap 224, the first inlet part 226 extends from the bottom plate 247 at an angle of 45°.

[0034] Figure 6 is a view from the side of an apparatus according to a third embodiment of the invention comprising journalling means 340 and a dust suction box 318 for removing dust from the air whirling in the spaces before and after the conventional spreading bar 7 above which this apparatus is mounted, as can be seen in Figure 1. The dust suction box 318 comprises an elongated housing 320 having an inner suction chamber 321, see Figure 7, that communicates with a suction source (not shown) via a coaxial pipe socket 323. The housing is otherwise closed at the ends by end pieces 350, 351. The housing 320 has a first web-wide inlet 324, in the form of a suction gap communicating with the suction chamber 321. The housing 320 includes a main part 325 substantially in the form of a part of a cylinder, and first and second parts 326, 327 defining said suction gap inlet 324 between them. Curved or cylinder arc formed surfaces 334a, 334b, are formed within the area for the main part 325 on its inner side, i.e. in the suction cham-

ber 321.

[0035] The suction gap 324 comprises an inwardly converging outer section 329 that defines a gradual throttling, and an inwardly diverging inner section 330 that defines a gradual enlargement, said sections 329, 330 merging at a transition 331 where the throttling is maximal, said transition having a minimal extension seen in the flow direction of the air through the suction gap 334.

[0036] The first inlet forming part 326 comprises a reinforcing pipe 342 and a separate inner plate 343 having a free inner edge 344. The inlet part 326 has an outer surface 332, curved or in the form of a cylinder arc with predetermined radius, and an inner flat surface 333 that merges tangentially with the coaxial pipe socket 323 and the outer curved surface 332.

[0037] The second inlet forming part 327 has a part 341 hinged to the main part 325 which enables the inlet part 327 to also function as an inspection hatch, thereby allowing access to the suction chamber 321 in open position. As can be seen in Figure 7, the inlet part 327 has an outer flat surface 335 and a curved or cylinder arc formed surface 336 having predetermined radius, the outer flat surface 335 being tangent to the curved surface 336. The curved surface 336 has such an arc length that it defines its side of the throttling 329 and an initial part of the enlargement 330 as well as the actual transition 331 therebetween. Furthermore, the second inlet part 327 has an inner flat surface 337 extending at a tangent from the curved surface 336 and forming an acute angle α with a tangent 338 to the curved surface 336 at said transition 331. Said angle α is 20-50°, preferably 30-40°. To achieve the best function it is important that the radius of the curved surface 336 of the second inlet part 327 is as large as or larger than the width of the suction gap 324 at the transition 331 (maximum throttling).

[0038] The housing 320 is also provided with a second inlet 424. For this purpose the housing is provided with an additional set of first and second parts 426, 427 defining the inlet 424 between them in the form of a suction gap. The first inlet part 426 is formed by a profile plate 440 secured to the above-mentioned inner plate 343 at its inner edge 344 and to the above-mentioned reinforcing pipe 342. The second inlet part 427 comprises a part 441 hinged to the main part 325 enabling the inlet part 427 to function also as an inspection hatch providing access to the suction chamber 321 when in open position.

[0039] The suction gap 424 comprises an inwardly converging outer section 429 that defines a gradual throttling, and an inwardly diverging inner section 430 that defines a gradual enlargement, said sections 429, 430 merging at a transition 431 where the throttling is maximal, said transition having a minimal extension seen in the flow direction of the air through the suction gap 424.

[0040] The first inlet forming part 426 has a surface

432, curved or in the shape of a cylinder arc with predetermined radius, and an inner flat surface 433 directed substantially radially in relation to the inner curved surface 334 of the main part 325 and merging tangentially into the outer curved surface 432, the point of tangent being situated at the transition 431 to the enlargement 430.

[0041] The second inlet forming part 427 has an outer flat surface 435 and a curved or cylinder arc formed surface 436 with predetermined radius, the outer flat surface 435 being a tangent to the curved surface 436. The curved surface 436 has such an arc length that it defines its side of the throttling 429 and also a part of the enlargement 430, as well as the actual transition 431 between them. Furthermore, the second inlet part 427 has an inner, flat surface 437 extending at a tangent from the curved surface 436 and forming an acute angle α with a tangent 438 to the curved surface 436 at said transition 431. Said angle α is 20-50°, preferably 30-40°. To achieve the best function it is important that the radius of the curved surface 436 of the second inlet part 427 is as large as or larger than the width of the suction gap 424 at the transition 431 (maximum throttling).

[0042] Said journalling means comprise a shaft extension 345 and said pipe socket 323, which also functions as a shaft extension. The shaft extensions 345, 323 rest on stands 346 via holders 347. The apparatus is fixed in a desired operating position with regard to the angle of the inlets 224 and 324 in relation to the spreading bar 7 by means of first screw elements 348. The apparatus is set in a desired operating position with regard to its level above the spreading bar 7 by means of second screw elements 349.

[0043] Figure 8 shows a through-section of an apparatus according to a fourth embodiment of the invention comprising two suction boxes 18', 18" of substantially the same design as that according to Figure 2 with the exception of the design of the first inlet part 26', 26", in that the outer curved surface 32 and the inner flat surface 33 are replaced by a flat surface 60 and 61, respectively, merging tangentially into the internal curved surface 134', 134" of the main part 125', 125" and defining its side of the throttling 29', 29" and enlargement 30', 30". The apparatus also comprises an unperforated web-wide cover plate 62 to which the dust suction boxes are secured at a distance from each other and mirrored so that the inlets 24', 24" face away from each other. Inclined reinforcement plates 63, 64 are secured to respective dust suction boxes and the cover plate 62. The cover plate 62 is flat except at its end parts 65, 66 situated downstream and upstream, these being bent away from the paper web 1 and located outside each inlet. The part of the cover plate 62 inside each end part 65, 66 forms the first inlet part 26', 26" of the housing 20', 20" which, on its inner side has said flat surfaces 60, 61. Each dust suction box has two pipe sockets 67, 68 arranged on the main part of the housing at a distance from the inlet and communicating with a suction source

(not shown). The pipe sockets 67, 68 replace the end outlet 23 according to Figure 2. Arranging bent end parts 65, 66 situated downstream and upstream prevents the paper web from coming into contact with the edges of the cover plate 62. This is particularly important if the paper web arrives at the apparatus and leaves it in a run that in both cases forms a small angle with the plane of the cover plate 62. 59 denotes an end plate which closes one of the ends of each suction chamber 21', 21".

[0044] The inlet parts are preferably arranged at any of the described inlets, movable in relation to each other in order to control the size of the maximum throttling at said transition depending on each particular operation, suitably within the interval 10-30 mm, preferably 0.5-1 inch (12.7-25.4 mm). The suction gap 324 situated downstream in the embodiment according to Figure 7 may also be arranged to be completely closed. In all cases it is preferably the second inlet part 27, etc., that can be displaced and locked in the desired position, while the first inlet part 26, etc., is stationary.

[0045] Designing the dust suction box in accordance with the present invention enables the dust to be efficiently removed with increased operating reliability and improved working environment. The proposed geometry of the passages through which the dust-carrying air passes results in considerably less risk of dust adhering to the walls than with known constructions. The valuable improvement of removing the dust from the areas surrounding the paper web is achieved by several cooperating, thoroughly thought-through features. One feature resides in the design of the suction gap with an initial throttling to cause gradually increasing speed that culminates in the short transition to the subsequent expansion of the air with maximum throttling so that the dust is entrained with the increasing speed of the air flow, through the suction gap. The dust does not therefore have sufficient time to become adhered to the walls. Another feature is the curved surfaces of the throttling. The air endeavours to follow these curved surfaces while forming a thin layer of air resulting in a higher speed than the air outside said layer of air, so that the dust particles have even less time to become adhered to the curved surfaces. A further feature is the cylindrical inner surface of the suction chamber which causes the air to be guided toward this and round in a spiral or rotary process towards the outlet or outlets, without disturbing local whirl formations which might allow the dust particles time to become adhered to the walls.

[0046] It is also a considerable advantage that the principle according to the invention for designing the dust suction box can be used for all dust suction boxes installed at various points between Yankee cylinder and reel-up.

[0047] The invention is described in connection with the removal of dust released during the manufacture of a soft crepe paper web which is creped off a Yankee cylinder, but may of course be used for other moving webs of fibre material where dust is released during var-

ious types of treatment, such as in machines for cutting and re-winding paper webs, in printing machines and in the dry end of paper machines of types other than those specifically described above.

Claims

1. An apparatus for removing dust released during treatment of a moving web of fibre material, particularly cellulosic fibre material, such as in machines for cutting and rewinding paper webs, in printing machines and in the dry end of paper machines, e. g. in the production of a soft crepe paper web (1) which is creped off a Yankee cylinder (2) by means of a creping doctor (3) and spread by means of one or more spreading means (7, 8), comprising a first dust suction box (18) including an elongated housing (20) having an inner suction chamber (21) in communication with a suction source, said housing (20) having a first inlet (24) in the form of a suction gap communicating with the suction chamber (21), and said housing (20) also including a main part (25) and first and second parts (26, 27) which define said suction gap (24) between them, **characterized in that** the main part (25) is shaped as or substantially as part of a cylinder to provide a corresponding curved inner side (34) in the suction chamber (21); that the suction gap (24) comprises an inwardly converging outer section (29) that defines a gradual throttling, and an inwardly diverging inner section (30) that defines a gradual enlargement, said sections (29, 30) merging at a transition (31) where the throttling is maximal, said transition having a minimal extension seen in the flow direction of the air through the suction gap (24); that the first inlet forming part (26) comprises a flat surface that defines the whole or most of its side of said enlargement (30); and that the second inlet forming part (27) comprises both a curved surface (36) having predetermined radius and such an arc length that it defines the whole of its side of the throttling (29) and an initial part of the enlargement (30), and also an inner, flat surface (37) extending at a tangent from the curved surface (36) and forming an acute angle α with a tangent (38) to the curved surface (36) at said transition (31).
2. An apparatus as claimed in claim 1, **characterized in that** said angle α is 20-50°, preferably 30-40°.
3. An apparatus as claimed in claim 1 or 2, **characterized in that** the radius of the curved surface (36) of the second inlet part (27) is as large as or larger than the width of the suction gap (24) at said transition (31).
4. An apparatus as claimed in any of claims 1-3, **char-**

acterized in that the flat surface (33) of the first inlet part (26) merges tangentially into the curved surface (34) of the main part (25).

5. An apparatus as claimed in any of claims 1-4, **characterized in that** said flat surface (33) is parallel to or forms an acute angle α with said tangent (38) to the curved surface (36) of the second inlet part (27) at said transition (31).
6. An apparatus as claimed in any of claims 1-5, **characterized in that** the first inlet part (26) has an outer curved surface (32) extending to the transition (31) or past it to define, as well as the throttling section, an initial part of the enlargement, the flat surface (33) merging tangentially into the outer curved surface (32).
7. An apparatus as claimed in any of claims 1-5, **characterized in that** the flat surface (133) of the first inlet part (126) also defines its side of the throttling (129).
8. An apparatus as claimed in any of claims 1-7, **characterized in that** it comprises attachment elements (19) for mounting the apparatus to a doctor beam (6) in the creping doctor (3), whereby the dust suction box (18) is arranged to remove dust falling down in the space between the paper web (1) creped off and the creping doctor (3).
9. An apparatus as claimed in any of claims 1-7, **characterized in that** it comprises a cover plate (62) having a flat surface along which the web (1) is intended to travel, and end parts (65, 66) situated upstream and downstream, said end parts being bent away from said flat surface so that the web (1) runs free from the upstream and downstream edges of the cover plate (62), said dust suction box (18') being secured to the cover plate (62), its inlet being located beside it in order to draw in dusty air from the space outside the inlet (24').
10. An apparatus as claimed in claim 9, **characterized in that** it comprises a second dust suction box (18'') corresponding to the first dust suction box (18') and secured to the cover plate (62) in a mirror relationship to the first dust suction box (18') so that their inlets (24', 24'') face away from and towards, respectively, the direction of travel of the web (1).
11. An apparatus as claimed in any of claims 9 and 10, **characterized in that** the cover plate (62) forms said first inlet part (26', 26'') of the housing.
12. An apparatus as claimed in any of claims 1-7, **characterized in that** it comprises a web spreading means in the form of a symmetrical shoe (8) to

which the dust suction box (218) is secured and which comprises a bent upstream tube (245); a curved downstream tube (246), said tubes being bent away from each other at the middle in the same plane; a bottom plate (247) supporting the tubes (245, 246) and at its mid-point encountering the main part (125) of the dust suction box at a tangent; and an arched support plate (248) secured to the outsides of the tubes (245, 246) and having an outer surface over which the web (1) is intended to slide, the support plate comprising an inclined upstream part (250), an inclined downstream part (251) and a curved top transition (252) therebetween, and the tubes being so bent and turned in relation to the support plate (248) that the upstream and downstream parts also slope laterally from the middle with the greatest lateral inclination in connection to the bent tubes (245, 246).

13. An apparatus as claimed in claim 11, **characterized in that** the inclined upstream and downstream parts (250, 251) encompass an obtuse angle of 150-170°.

14. An apparatus as claimed in any of claims 12 and 13, **characterized in that** a part of the bottom plate (247) forms the first inlet part (126) of the housing (120).

15. An apparatus as claimed in any of claims 12-14, **characterized in that** it is pivotably and vertically movably journaled for adjustment of the spreading shoe (8) in relation to the web.

16. An apparatus as claimed in any of claims 12-15, **characterized in that** the dust suction box comprises a second inlet (224) in the form of a suction gap, which is arranged in the vicinity of the bottom plate (247) on the opposite side of the housing in relation to the first inlet (124), said second inlet (224) being divided into several parts, each having first and second inlet parts (226, 227) defining a suction gap (224) between them, that the suction gap (224) comprises an outer, inwardly converging outer section (229) that defines a gradual throttling, and an inwardly diverging inner section (230) that defines a gradual enlargement, said sections (229, 230) merging at a transition (231) where the throttling is maximal, said transition having a minimal extension seen in the flow direction of the air through the suction gap (224); that the first inlet forming part (226) comprises a flat surface (233) that defines the whole or most of its side of said enlargement (230); and that the second inlet forming part (227) comprises a curved surface (236) having predetermined radius and such an arc length that it defines its side of the throttling (229) and the enlargement (230).

17. An apparatus as claimed in claim 16, **characterized in that** the radius of the curved surface (236) of the second inlet part (227) is as large as or larger than the width of the suction gap (224) at said transition (231).

18. An apparatus as claimed in any of claims 1-7, **characterized in that** it comprises means (340) for pivotable and vertically movable journaled of the dust removal apparatus in the vicinity of a spreading bar (7), that the dust suction box (318) comprises a second gap-shaped inlet (424) arranged at a predetermined distance from the first inlet (324), the first inlet (324) being oriented to draw in dusty air from the space downstream of the spreading bar (7) and the second inlet (424) being oriented to draw in dusty air from the space upstream of the spreading bar (7), said second inlet (424) having first and second parts (426, 427) that define a suction gap (424) between them, and that the suction gap (424) comprises an inwardly converging outer section (429) that defines a gradual throttling, and an inwardly diverging inner section (430) that defines a gradual enlargement, said sections (429, 430) merging at a transition (431) where the throttling is maximal, said transition having a minimal extension seen in the flow direction of the air through the suction gap (424); that the first inlet forming part (426) comprises a flat surface (433) that defines the whole or most of its side of said enlargement (430); and that the second inlet forming part (427) comprises both a curved surface (436) having predetermined radius and such an arc length that it defines the whole of its side of the throttling (429) and an initial part of the enlargement (430), and also an inner, flat surface (437) extending at a tangent from the curved surface (436) and forming an acute angle α with a tangent (438) to the curved surface (436) at said transition (431).

19. An apparatus as claimed in claim 18, **characterized in that** said angle α is 20-50°, preferably 30-40°.

20. An apparatus as claimed in claim 18 or 19, **characterized in that** the radius of the curved surface (436) of the second inlet part (427) is as large as or larger than the width of the suction gap (424) at said transition (431).

21. An apparatus as claimed in any of claims 1-20, **characterized in that** said inlet parts of each inlet are movable in relation to each other to allow control of the size of the maximal throttling at said transition.

22. An apparatus as claimed in claim 21, **characterized in that** the size of the maximal throttling is ad-

justable to a value within the interval 10-30 mm, preferably 0.5-1 inch (12.7-25.4 mm).

23. An apparatus as claimed in claims 18 and 21, **characterized in that** the size of the maximal throttling of the first inlet (324) is adjustable to a value within the interval 0-30 mm, preferably 0-1 inch (0-25.4 mm), while the size of the maximal throttling of the second inlet (424) is adjustable to a value within the interval 10-30 mm, preferably 0.5-1 inch (12.7-25.4 mm).

Patentansprüche

1. Vorrichtung zur Entfernung von Staub, der während der Behandlung einer sich bewegenden Bahn aus Fasermaterial, insbesondere Zellulosefasermaterial, freigegeben wird, wie etwa in Maschinen zum Schneiden und erneuten Aufwickeln von Papierbahnen, in Druckmaschinen und in dem Trockenende von Papiermaschinen, beispielsweise in der Herstellung einer Weichkrepp-Papierbahn (1), die mit Hilfe eines Kreppschabers (3) von einem Glätzzylinder (2) abgekreppt und mit Hilfe eines oder mehrerer Ausbreiteinrichtungen (7, 8) ausgebreitet wird, mit einem ersten Staubsaugkasten (18) einschließlich einem langgestreckten Gehäuse (20) mit einer inneren Saugkammer (21) in Verbindung mit einer Saugquelle, wobei das Gehäuse (20) einen ersten Einlaß (24) in der Form eines mit der Saugkammer (21) in Verbindung stehenden Saugspalts hat, und das Gehäuse (20) ebenso ein Hauptteil (25) und erste und zweite Teile (26, 27) einschließt, die dazwischen den Saugspalt (24) definieren, **dadurch gekennzeichnet, daß** das Hauptteil (25) als ein oder im wesentlichen als ein Teil eines Zylinders geformt ist, um in der Saugkammer (21) eine entsprechende gekrümmte Innenseite (34) vorzusehen; daß der Saugspalt (24) einen nach innen konvergierenden Außenabschnitt (29) aufweist, der eine allmähliche Drosselung bestimmt, und einen nach innen divergierenden Innenabschnitt (30) aufweist, der eine allmähliche Ausweitung bestimmt, wobei die Abschnitte (29, 30) an einem Übergang (31) ineinander übergehen, an dem die Drosselung maximal ist, und der Übergang in der Strömungsrichtung der Luft durch den Saugspalt (24) eine minimale Erstreckung hat; daß das erste Einlaßbildungsteil (26) eine ebene Oberfläche hat, die die gesamte oder einen Großteil seiner Seite der Ausweitung (30) definiert; und daß das zweite Einlaßbildungsteil (27) sowohl eine gekrümmte Oberfläche (36) mit einem vorbestimmten Radius und einer solchen Bogenlänge, daß diese seine gesamte Seite der Drosseleinrichtung (29) und ein Initialteil der Ausweitung (30) definiert, als auch eine innere ebene Oberfläche (37) aufweist,

die sich in einer Tangente von der gekrümmten Oberfläche (36) erstreckt und am Übergang (31) mit einer Tangente (38) zur gekrümmten Oberfläche (36) einen Spitzwinkel α einschließt.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, daß** der Winkel α 20° bis 50°, vorzugsweise 30° bis 40° ist.
3. Vorrichtung nach Anspruch 1 oder 2, **dadurch gekennzeichnet, daß** der Radius der gekrümmten Oberfläche (36) des zweiten Einlaßteils (27) so groß ist wie oder größer ist als die Breite des Saugspalts (24) am Übergang (31).
4. Vorrichtung nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, daß** die ebene Oberfläche (33) des ersten Einlaßteils (26) tangential in die gekrümmte Oberfläche (34) des Hauptteiles (25) übergeht.
5. Vorrichtung nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, daß** die ebene Oberfläche (33) am Übergang (31) parallel zu der Tangente (38) zur gekrümmten Oberfläche (36) des zweiten Einlaßteils (27) ist oder dazu einen Spitzwinkel α einschließt.
6. Vorrichtung nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, daß** das erste Einlaßteil (26) eine äußere gekrümmte Oberfläche (32) hat, die sich zu dem Übergang (31) erstreckt oder sich über diesen hinweg erstreckt, um, wie auch für den Drosselungsabschnitt, ein Initialteil der Ausweitung zu definieren, wobei die ebene Oberfläche (33) tangential in die äußere gekrümmte Oberfläche (32) übergeht.
7. Vorrichtung nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, daß** die ebene Oberfläche (133) des ersten Einlaßteils (126) auch seine Seite der Drosselung (129) definiert.
8. Vorrichtung nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, daß** sie Anbringungselemente (19) zur Montage der Vorrichtung an einen Schaberbalken (6) in dem Kreppschaber (3) aufweist, wobei der Staubsaugkasten (18) eingerichtet ist, um Staub zu entfernen, der in den Raum zwischen der abgekreppten Papierbahn (1) und dem Kreppschaber (3) nach unten fällt.
9. Vorrichtung nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, daß** sie eine Abdeckplatte (62) aufweist, die eine ebene Oberfläche, entlang der sich die Bahn (1) bewegen soll, und stromauf und stromab angeordnete Endteile (65, 66) hat, wobei die Endteile von der ebenen Oberfläche derart

weggebogen sind, daß die Bahn (1) frei von den stromaufwärtigen und stromabwärtigen Rändern der Abdeckplatte (62) verläuft, wobei der Staubsaugkasten (18') an der Abdeckplatte (62) gesichert ist, und sein Einlaß neben ihr angeordnet ist, um staubige Luft von dem Raum außerhalb des Einlasses (24') einzusaugen.

10. Vorrichtung nach Anspruch 9, **dadurch gekennzeichnet, daß** sie einen zweiten Staubsaugkasten (18'') aufweist, der dem ersten Staubsaugkasten (18') entspricht und an der Abdeckplatte (62) in einer Spiegelbeziehung zum ersten Staubsaugkasten (18') gesichert ist, so daß deren Einlässe (24', 24'') jeweils von der Bewegungsrichtung der Bahn (1) weggewandt oder dieser zugewandt sind.
11. Vorrichtung nach einem der Ansprüche 9 und 10, **dadurch gekennzeichnet, daß** die Abdeckplatte (62) das erste Einlaßteil (26', 26'') des Gehäuses bildet.
12. Vorrichtung nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, daß** sie eine Bahnausbreiteinrichtung in der Form eines symmetrischen Schuhs (8) aufweist, an dem der Staubsaugkasten (218) gesichert ist und der ein gebogenes stromaufwärtiges Rohr (245); ein gekrümmtes stromabwärtiges Rohr (246), wobei die Rohre in der Mitte in der gleichen Ebene voneinander weggebogen sind; eine Bodenplatte (247), die die Rohre (245, 246) stützt und an ihrem Mittelpunkt in einer Tangente auf das Hauptteil (125) des Staubsaugkastens trifft; und eine gewölbte Stützplatte (248) hat, die an die Außenseiten der Rohre (245, 246) gesichert ist und eine Außenoberfläche hat, über der die Bahn (1) gleiten soll, wobei die Stützplatte ein geneigtes stromaufwärtiges Teil (250), ein geneigtes stromabwärtiges Teil (251) und dazwischen einen gekrümmten oberen Übergang (252) aufweist und die Rohre derart gebogen und relativ zu der Stützplatte (248) geschwenkt sind, daß die stromaufwärtigen und stromabwärtigen Teile auch seitlich von der Mitte schrägt verlaufen, so daß die größte seitliche Neigung in Verbindung mit den gebogenen Rohren (245, 246) vorhanden ist.
13. Vorrichtung nach Anspruch 11, **dadurch gekennzeichnet, daß** die geneigten stromaufwärtigen und stromabwärtigen Teile (250, 251) einen stumpfen Winkel von 150° bis 170° einschließen.
14. Vorrichtung nach einem der Ansprüche 12 und 13, **dadurch gekennzeichnet, daß** ein Teil der Bodenplatte (247) das erste Einlaßteil (126) des Gehäuses (120) bildet.
15. Vorrichtung nach einem der Ansprüche 12 bis 14,

dadurch gekennzeichnet, daß sie schwenkbar und vertikal bewegbar gelagert ist zur Einstellung des Ausbreitschuhs (8) relativ zu der Bahn.

16. Vorrichtung nach einem der Ansprüche 12 bis 15, **dadurch gekennzeichnet, daß** der Staubsaugkasten einen zweiten Einlaß (224) in der Form eines Saugspalts aufweist, der in der Umgebung der Bodenplatte (247) an der gegenüberliegenden Seite des Gehäuses relativ zu dem ersten Einlaß (124) eingerichtet ist, wobei der zweite Einlaß (224) in mehrere Teile aufgeteilt ist, von denen jedes erste und zweite Einlaßteile (226, 227) aufweist, die dazwischen einen Saugspalt (224) definieren, daß der Saugspalt (224) einen äußeren, nach innen konvergierenden Außenabschnitt (229) aufweist, der eine allmähliche Drosselung bestimmt, und einen nach innen divergierenden inneren Abschnitt (230) aufweist, der eine allmähliche Ausweitung bestimmt, wobei die Abschnitte (229, 230) an einem Übergang (231) ineinander übergehen, an dem die Drosselung maximal ist, und der Übergang in der Strömungsrichtung der Luft durch den Saugspalt (224) eine minimale Erstreckung hat; daß das erste Einlaßbildungsteil (226) eine ebene Oberfläche (233) hat, die die gesamte oder einen Großteil seiner Seite der Ausweitung (230) definiert; und daß das zweite Einlaßbildungsteil (227) eine gekrümmte Oberfläche (236) mit einem vorbestimmten Radius und einer solchen Bogenlänge hat, daß sie seine Seite der Drosselung (229) und der Ausweitung (230) definiert.
17. Vorrichtung nach Anspruch 16, **dadurch gekennzeichnet, daß** der Radius der gekrümmten Oberfläche (236) des zweiten Einlaßteils (227) so groß ist wie oder größer ist als die Breite des Saugspaltes (224) am Übergang (231).
18. Vorrichtung nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, daß** sie eine Einrichtung (340) zum schwenkbaren und vertikal bewegbaren Lagern der Staubentfernungsvorrichtung in der Umgebung einer Ausbreitstange (7) aufweist, daß der Staubsaugkasten (318) einen zweiten spaltartigen Einlaß (424) hat, der in einem vorbestimmten Abstand von dem ersten Einlaß (324) eingerichtet ist, wobei der erste Einlaß (324) ausgerichtet ist, um staubige Luft von dem Raum stromab der Ausbreitstange (7) einzuziehen, und der zweite Einlaß (424) ausgerichtet ist, um staubige Luft von dem Raum stromauf der Ausbreitstange (7) einzuziehen, und der zweite Einlaß (424) erste und zweite Teile (426, 427) hat, die dazwischen einen Saugspalt (424) definieren, und daß der Saugspalt (424) einen nach innen konvergierenden Außenabschnitt (429) hat, der eine allmähliche Drosselung bestimmt, und einen nach innen divergierenden Innenabschnitt

(430) hat, der eine allmähliche Ausweitung bestimmt, wobei die Abschnitte (429, 430) an einem Übergang (431) ineinander übergehen, an dem die Drosselung maximal ist, wobei der Übergang in der Strömungsrichtung der Luft durch den Saugspalt (424) eine minimale Erstreckung hat; daß das erste Einlaßbildungsteil (426) eine ebene Oberfläche (433) aufweist, die die gesamte oder einen Großteil seiner Seite der Ausweitung (430) definiert; und daß das zweite Einlaßbildungsteil (427) sowohl eine gekrümmte Oberfläche (436) mit einem vorbestimmten Radius und einer solchen Bogenlänge, daß sie seine gesamte Seite der Drosselung (429) definiert, als auch ein Initialteil der Ausweitung (430) und auch eine innere ebene Oberfläche (437) aufweist, die sich in einer Tangente der gekrümmten Oberfläche (436) erstreckt und am Übergang (431) einen Spitzwinkel α mit einer Tangente (438) zur gekrümmten Oberfläche (436) einschließt.

19. Vorrichtung nach Anspruch 18, **dadurch gekennzeichnet, daß** der Winkel α 20° bis 50°, vorzugsweise 30° bis 40° beträgt.
20. Vorrichtung nach Anspruch 18 oder 19, **dadurch gekennzeichnet, daß** der Radius der gekrümmten Oberfläche (436) des zweiten Einlaßteils (427) so groß ist wie oder größer ist als die Breite des Saugspalts (424) am Übergang (431).
21. Vorrichtung nach einem der Ansprüche 1 bis 20, **dadurch gekennzeichnet, daß** die Einlaßteile jedes Einlasses relativ zueinander beweglich sind, um am Übergang eine Steuerung der Größe der maximalen Drosselung zu gestatten.
22. Vorrichtung nach Anspruch 21, **dadurch gekennzeichnet, daß** die Größe der maximalen Drosselung auf einen Wert innerhalb des Intervalls 10 bis 30 mm, vorzugsweise 0,5 bis 1 Inch (12,7 bis 25,4 mm) einstellbar ist.
23. Vorrichtung nach einem der Ansprüche 18 und 21, **dadurch gekennzeichnet, daß** die Größe der maximalen Drosselung des ersten Einlasses (324) auf einen Wert innerhalb des Intervalls von 0 bis 30 mm, vorzugsweise 0 bis 1 Inch (0 bis 25,4 mm) einstellbar ist, während die Größe der maximalen Drosselung des zweiten Einlasses (424) auf einen Wert innerhalb des Intervalls von 10 bis 30 mm, vorzugsweise 0,5 bis 1 Inch (12,7 bis 25,4 mm) einstellbar ist.

Revendications

1. Appareil d'extraction de poussière libérée lors du traitement d'une bande mobile d'un matériau de fi-

bres, notamment d'un matériau de fibres celluloseuses, par exemple dans les machines de coupe et de réenroulement de bandes de papier, dans les presses d'impression et à l'extrémité sèche des machines de fabrication de papier, par exemple lors de la production d'une bande de papier crêpe souple (1) qui est crêpée à la sortie d'un cylindre frictionneur (Yankee) (2) à l'aide d'un docteur crêpeur (3) et étalée par un ou plusieurs dispositifs d'étalement (7, 8), comprenant un premier caisson (18) d'aspiration de poussière qui comporte un boîtier allongé (20) ayant une chambre interne d'aspiration (21) qui communique avec une source d'aspiration, le boîtier (20) ayant une première entrée (24) sous forme d'un espace d'aspiration qui communique avec la chambre d'aspiration (21), le boîtier (20) comprenant aussi une partie principale (25) et des première et seconde parties (26, 27) qui délimitent entre elles l'espace d'aspiration (24), **caractérisé en ce que** la partie principale (25) a la forme d'un cylindre ou pratiquement d'une partie de cylindre destiné à former un côté interne courbe correspondant (34) dans la chambre d'aspiration (21), **en ce que** l'espace d'aspiration (24) comporte un tronçon externe (29) qui converge vers l'intérieur et délimite un étranglement progressif, et un tronçon interne (30) qui diverge vers l'intérieur et qui délimite un élargissement progressif, les tronçons (29, 30) se rejoignant à une transition (31) à laquelle l'étranglement est maximal, la transition ayant un prolongement minimal, vu dans la direction d'écoulement de l'air dans l'espace d'aspiration (24), **en ce que** la première partie (26) formant l'entrée comprend une surface plate qui délimite la totalité ou la plus grande partie de son côté de l'élargissement (30), et **en ce que** la seconde partie (27) qui forme l'entrée comprend à la fois une surface courbe (36) de rayon prédéterminé et une longueur d'arc telle qu'elle délimite la totalité de son côté de l'étranglement (29) et une partie initiale de l'élargissement (30), et aussi une surface interne plate (37) qui s'étend suivant une tangente à la surface courbe (36) et formant un angle aigu α avec une tangente (38) à la surface courbe (36) à la transition (31).

2. Appareil selon la revendication 1, **caractérisé en ce que** l'angle α est compris entre 20 et 50° et de préférence entre 30 et 40°.
3. Appareil selon la revendication 1 ou 2, **caractérisé en ce que** le rayon de la surface courbe (36) de la seconde partie d'entrée (27) est aussi grand ou plus grand que la largeur de l'espace d'aspiration (24) à la transition (31).
4. Appareil selon l'une des revendications 1 à 3, **caractérisé en ce que** la surface plate (33) de la première partie d'entrée (26) se raccorde tangentielle-

ment à la surface courbe (34) de la partie principale (25).

5. Appareil selon l'une quelconque des revendications 1 à 4, **caractérisé en ce que** la surface plate (33) est parallèle à la tangente (38) à la surface courbe (36) de la seconde partie d'entrée (27) au niveau de la transition (31) ou forme un angle aigu α avec cette tangente. 5
6. Appareil selon l'une quelconque des revendications 1 à 5, **caractérisé en ce que** la première partie d'entrée (26) a une surface externe courbe (32) qui s'étend vers la transition (31) ou au-delà de celle-ci pour délimiter, avec le tronçon d'étranglement, une partis initiale de l'élargissement, la surface plate (33) se raccordant tangentiellement à la surface externe courbe (32). 10
7. Appareil selon l'une quelconque des revendications 1 à 5, **caractérisé en ce que** la surface plate (133) de la première partie d'entrée (126) délimite aussi son côté de l'étranglement (129). 15
8. Appareil selon l'une des revendications 1 à 7, **caractérisé en ce qu'il** comprend des éléments de fixation (19) destinés au montage de l'appareil sur une poutre de docteur (6) dans le docteur crêpeur (3), si bien que le caisson (18) d'aspiration de poussière est destiné à retirer la poussière qui tombe dans l'espace compris entre la bande de papier (1) qui est crêpée et le docteur crêpeur (3). 20
9. Appareil selon l'une quelconque des revendications 1 à 7, **caractérisé en ce qu'il** comprend une plaque de couverture (62) ayant une surface plate le long de laquelle la bande (1) est destinée à se déplacer, et des parties d'extrémité (65, 66) placées en amont et en aval, ces parties d'extrémité étant recourbées depuis la surface plate afin que la bande (1) se déplace à distance des bords amont et aval de la plaque de couverture (62), le caisson (18') d'aspiration de poussière étant fixé à la plaque de couvercle (62), son entrée étant placée sur le côté afin que de l'air contenant de la poussière soit aspiré depuis l'espace qui se trouve à l'extérieur de l'entrée (24'). 25
10. Appareil selon la revendication 9, **caractérisé en ce qu'il** comprend un second caisson (18'') d'aspiration de poussière correspondant au premier caisson (18') d'aspiration de poussière et fixé à la plaque de couvercle (62) sous forme symétrique du premier caisson (18') d'aspiration de poussière afin que leurs entrées (24', 24'') soient disposées respectivement du côté opposé à la direction de déplacement de la bande (1) et vers cette direction. 30
11. Appareil selon l'une des revendications 9 et 10, **ca-** 35

ractérisé en ce que la plaque de couvercle (62) forme la première partie d'entrée (26', 26'') du boîtier.

12. Appareil selon l'une des revendications 1 à 7, **caractérisé en ce qu'il** comprend un dispositif d'étalement de bande sous forme d'un patin symétrique (8) auquel est fixé le caisson (218) d'aspiration de poussière et qui comprend un tube amont courbé (245), un tube aval courbé (246), les tubes étant courbés en sens opposés au milieu du même plan, une plaque inférieure (247) qui supporte les tubes (245, 246) et qui a son point médian qui rejoint la partie principale (125) du caisson d'aspiration de poussière suivant une tangente, et une plaque bombée de support (248) fixée à l'extérieur des tubes (245, 246) et ayant une surface externe sur laquelle est destinée à glisser la bande (1), la plaque de support comprenant une partie amont inclinée (250), une partie aval inclinée (251) et une transition supérieure courbe (252) entre les deux, et les tubes étant courbés et tournés par rapport à la plaque de support (248) d'une manière telle que les parties amont et aval sont aussi inclinées latéralement depuis le milieu avec la plus grande inclinaison latérale au niveau des tubes courbés (245, 246). 40
13. Appareil selon la revendication 11, **caractérisé en ce que** les parties amont et aval inclinées (250, 251) couvrent un angle obtus compris entre 150 et 170°. 45
14. Appareil selon l'une des revendications 12 et 13, **caractérisé en ce qu'une** partie de la plaque inférieure (247) forme la première partie d'entrée (126) du boîtier (120). 50
15. Appareil selon l'une quelconque des revendications 12 à 14, **caractérisé en ce qu'il** peut tourner afin qu'il se déplace par pivotement et en translation verticale pour l'ajustement du patin d'étalement (8) par rapport à la bande. 55
16. Appareil selon l'une quelconque des revendications 12 à 15, **caractérisé en ce que** le caisson d'aspiration de poussière comporte une seconde entrée (224) sous forme d'un espace d'aspiration qui est placé au voisinage de la plaque inférieure (247) du côté du boîtier opposé à la première entrée (124), la seconde entrée (224) étant divisée en plusieurs parties, chacune ayant une première et une seconde partie d'entrée (226, 227) délimitant entre elles un espace d'aspiration (224), **en ce que** l'espace d'aspiration (224) comprend un tronçon externe (229) qui converge vers l'intérieur et qui délimite un étranglement progressif, et un tronçon interne (230) qui diverge vers l'intérieur et qui délimite un élargissement progressif, les tronçons (229, 230) se rac-

cordant à une transition (231) à laquelle l'étranglement est maximal, la transition ayant un allongement minimal vu dans la direction d'écoulement de l'air dans l'espace d'aspiration (224), **en ce que** la partie formant la première entrée (226) comporte une surface plate (233) qui délimite la totalité ou la plus grande partie de son côté de l'élargissement (230), et la seconde partie formant l'entrée (227) comporte une surface courbe (236) ayant un rayon et une longueur d'arc prédéterminés tels qu'elle délimite son côté de l'étranglement (229) et l'élargissement (230).

17. Appareil selon la revendication 16, **caractérisé en ce que** le rayon de la surface courbe (236) de la seconde partie d'entrée (227) est supérieur ou égal à la largeur de l'espace d'aspiration (224) à la transition (231).
18. Appareil selon l'une quelconque des revendications 1 à 7, **caractérisé en ce qu'il** comprend un dispositif (340) destiné à assurer le tourbillonnement qui permet le pivotement et un déplacement vertical de l'appareil d'extraction de poussière au voisinage d'une barre d'étalement (7), **en ce que** le caisson d'aspiration de poussière (318) comporte une seconde entrée (424) en forme de col de cygne disposée à une distance prédéterminée de la première entrée (324), la première entrée (324) étant orientée afin qu'elle aspire de l'air contenant de la poussière depuis l'espace qui est en aval de la barre d'étalement (7), et la seconde entrée (424) étant orientée afin qu'elle aspire l'air chargé de poussière depuis l'espace qui se trouve en amont de la barre d'étalement (7), la seconde entrée (424) ayant une première et une seconde partie (426, 427) qui délimitent un espace d'aspiration (424) entre elles, et **en ce que** l'espace d'aspiration (424) comporte un tronçon externe (429) qui converge vers l'intérieur et qui délimite un étranglement progressif, et un tronçon interne (430) qui diverge vers l'intérieur et qui délimite un élargissement progressif, les tronçons (429, 430) se raccordant à une transition (431) à laquelle l'étranglement est maximal, la transition ayant une étendue minimale vue dans la direction d'écoulement de l'air dans l'espace d'aspiration (424), **en ce que** la première partie (426) formant une entrée comprend une surface plate (433) qui délimite la totalité ou la plus grande partie de son côté de l'élargissement (430), et **en ce que** la seconde partie (427) formant une entrée comprend à la fois une surface courbe (436) ayant un rayon et une longueur d'arc prédéterminés tels qu'elle délimite la totalité de son côté de l'étranglement (429) et une partie initiale de l'élargissement (430), et aussi une surface interne plate (437) qui s'étend sous forme d'une tangente à la surface courbe (436) et formant un angle aigu α avec une tangente

(438) à la surface courbe (436) à la transition (431).

19. Appareil selon la revendication 18, **caractérisé en ce que** l'angle α est compris entre 20 et 50° et de préférence entre 30 et 40°.
20. Appareil selon la revendication 18 ou 19, **caractérisé en ce que** le rayon de la surface courbe (436) de la seconde partie d'entrée (427) est supérieur ou égal à la largeur de l'espace d'aspiration (424) à la transition (431).
21. Appareil selon l'une des revendications 1 à 20, **caractérisé en ce que** les parties d'entrée de chaque entrée sont mobiles l'une par rapport à l'autre afin qu'elles permettent le réglage de la dimension de l'étranglement maximal à la transition.
22. Appareil selon la revendication 21, **caractérisé en ce que** la dimension de l'étranglement maximal est réglable à une valeur comprise dans l'intervalle de 10 à 30 mm et de préférence de 0,5 à 1 pouce (12,7 à 25,4 mm).
23. Appareil selon les revendications 18 et 21, **caractérisé en ce que** la dimension de l'étranglement maximal de la première entrée (324) est réglable à une valeur comprise dans l'intervalle de 0 à 30 mm et de préférence de 0 à 1 pouce (0 à 25,4 mm), alors que la dimension de l'étranglement maximal de la seconde entrée (424) est réglable à une valeur comprise dans l'intervalle de 10 à 30 mm et de préférence de 0,5 à 1 pouce (12,7 à 25,4 mm).

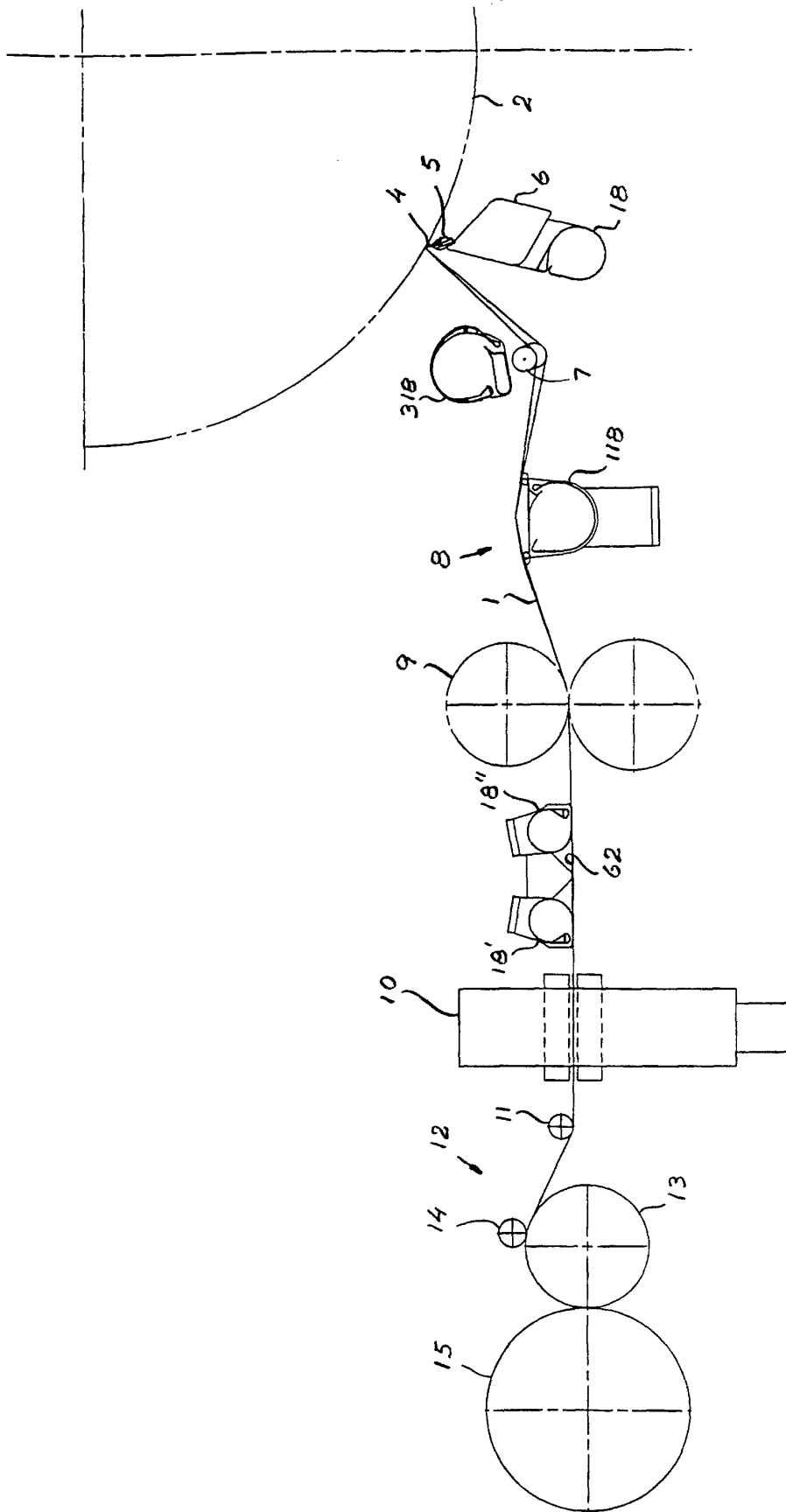


Fig. 1

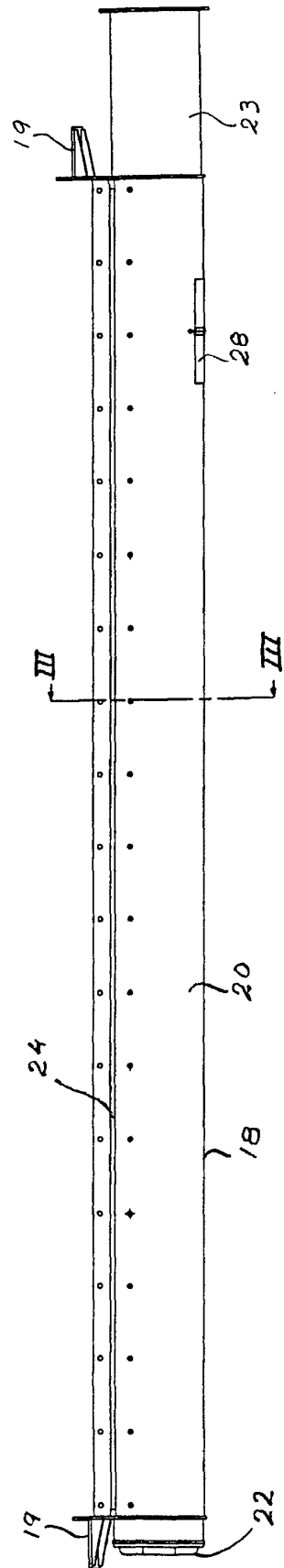


Fig. 2

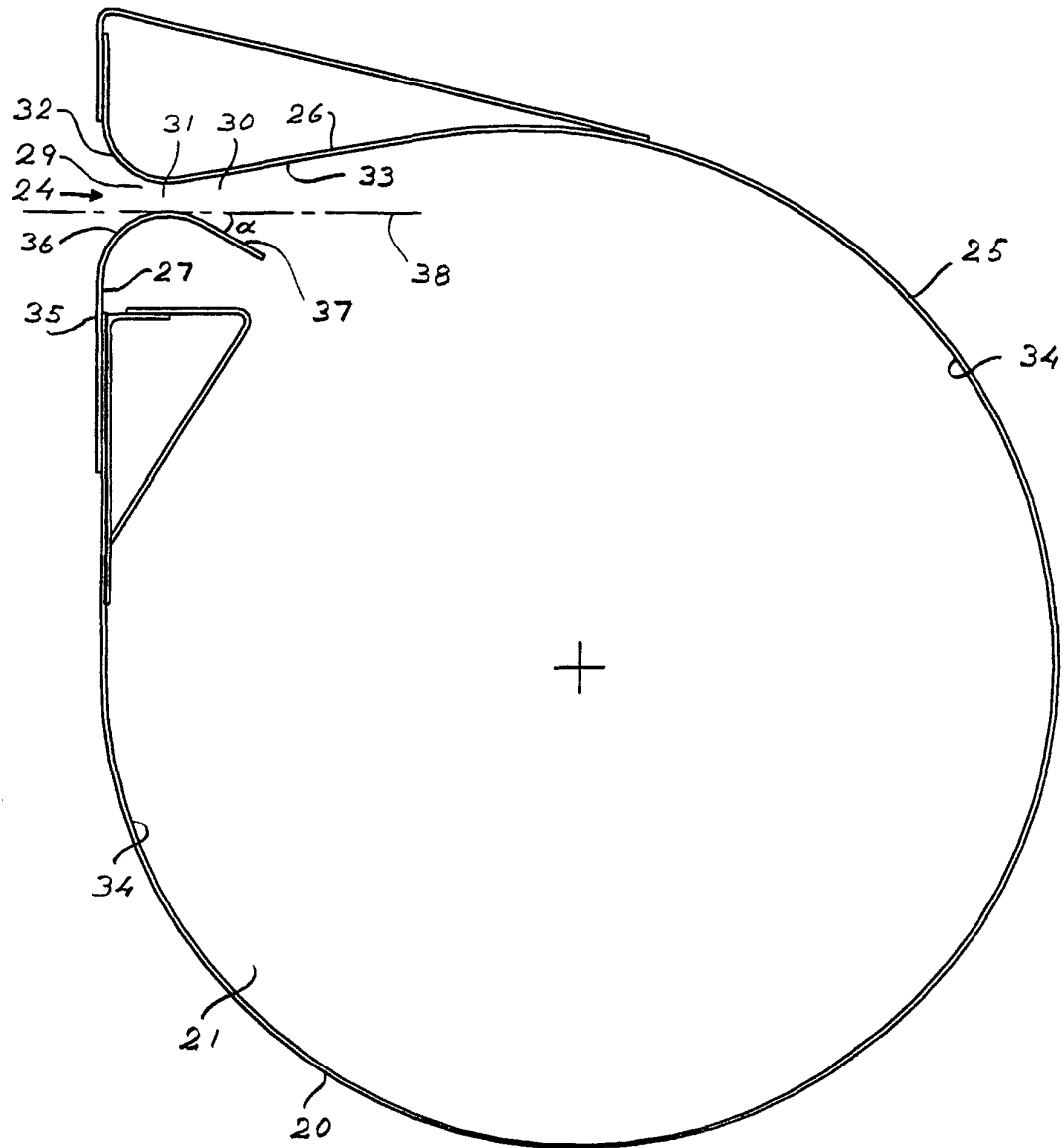


Fig. 3

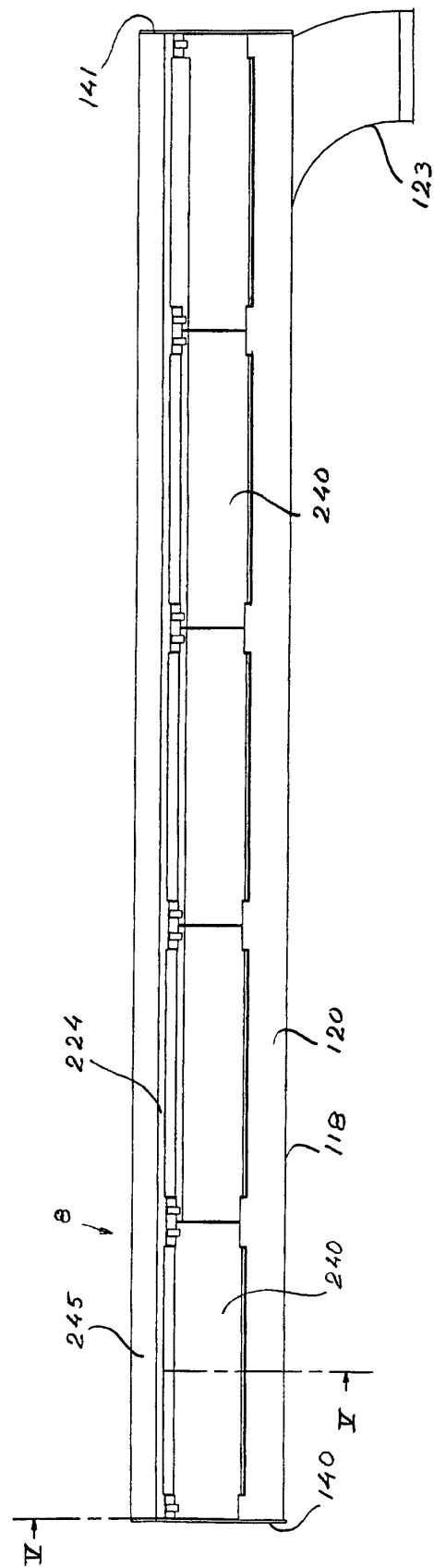


Fig. 4

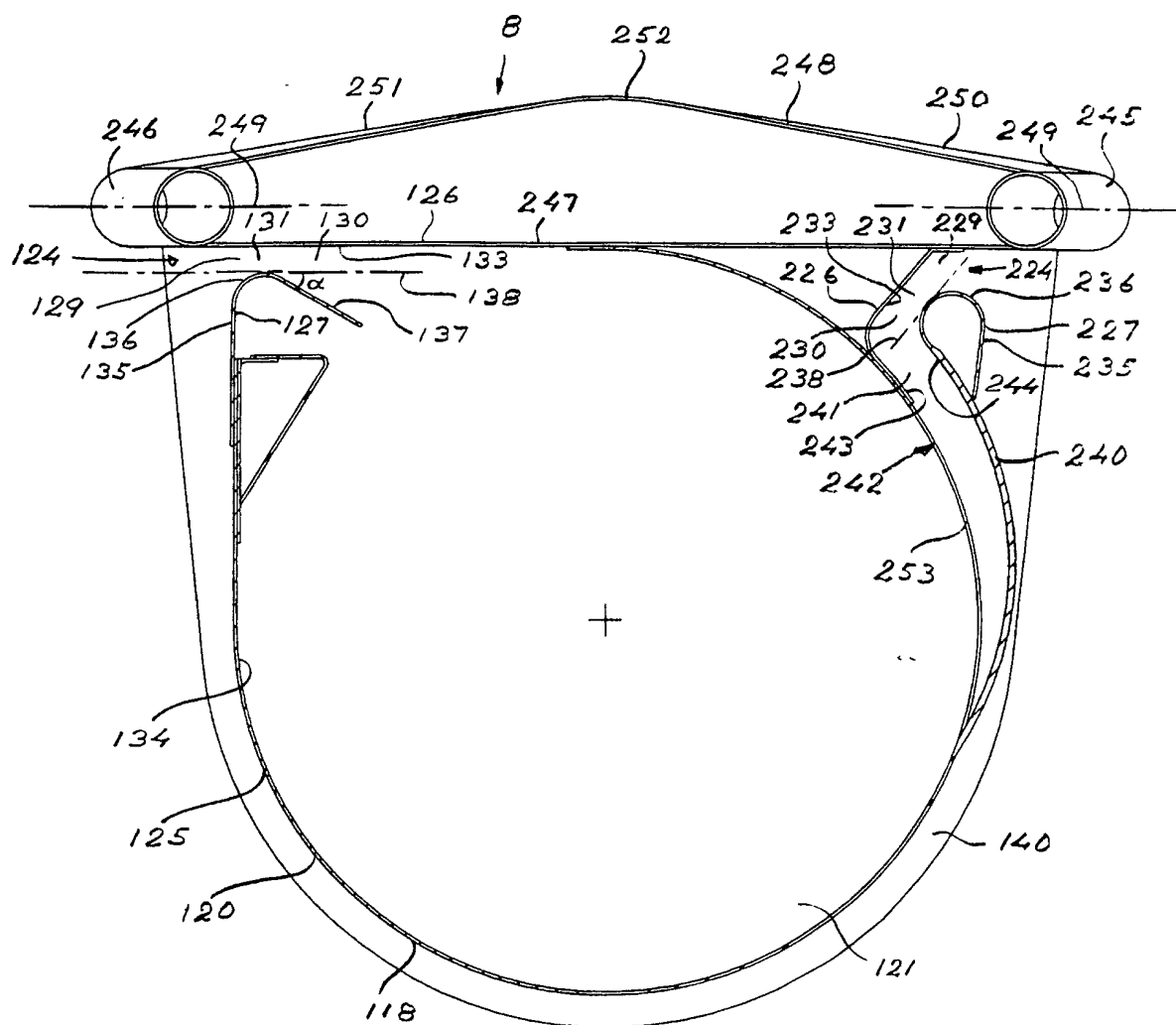


Fig. 5

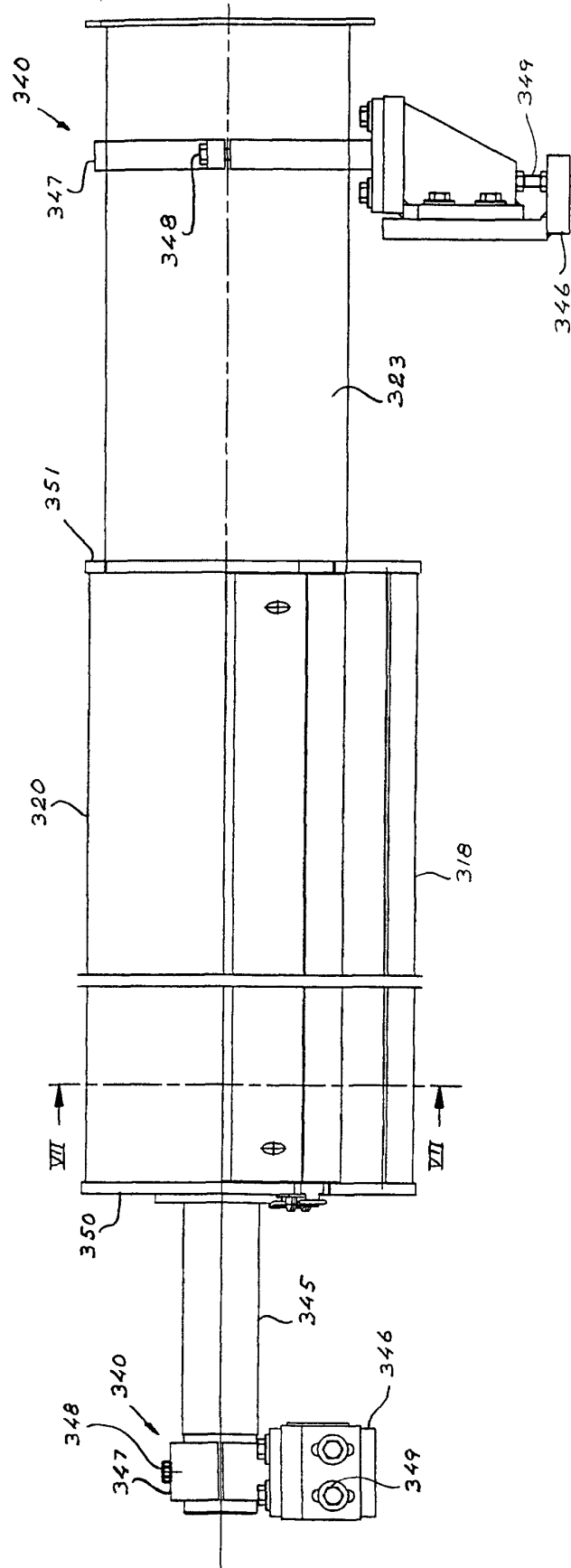


Fig. 6

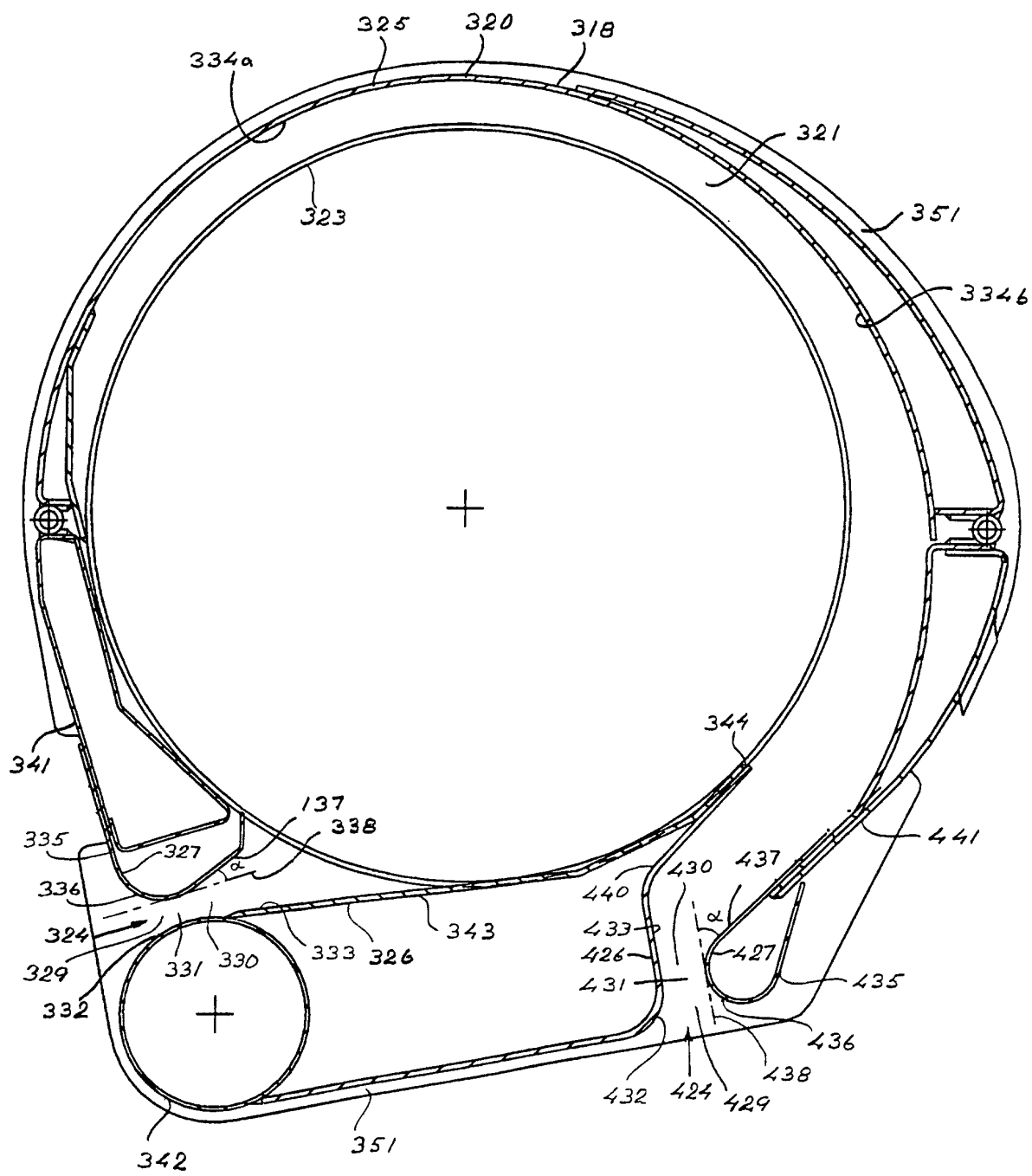


Fig. 7

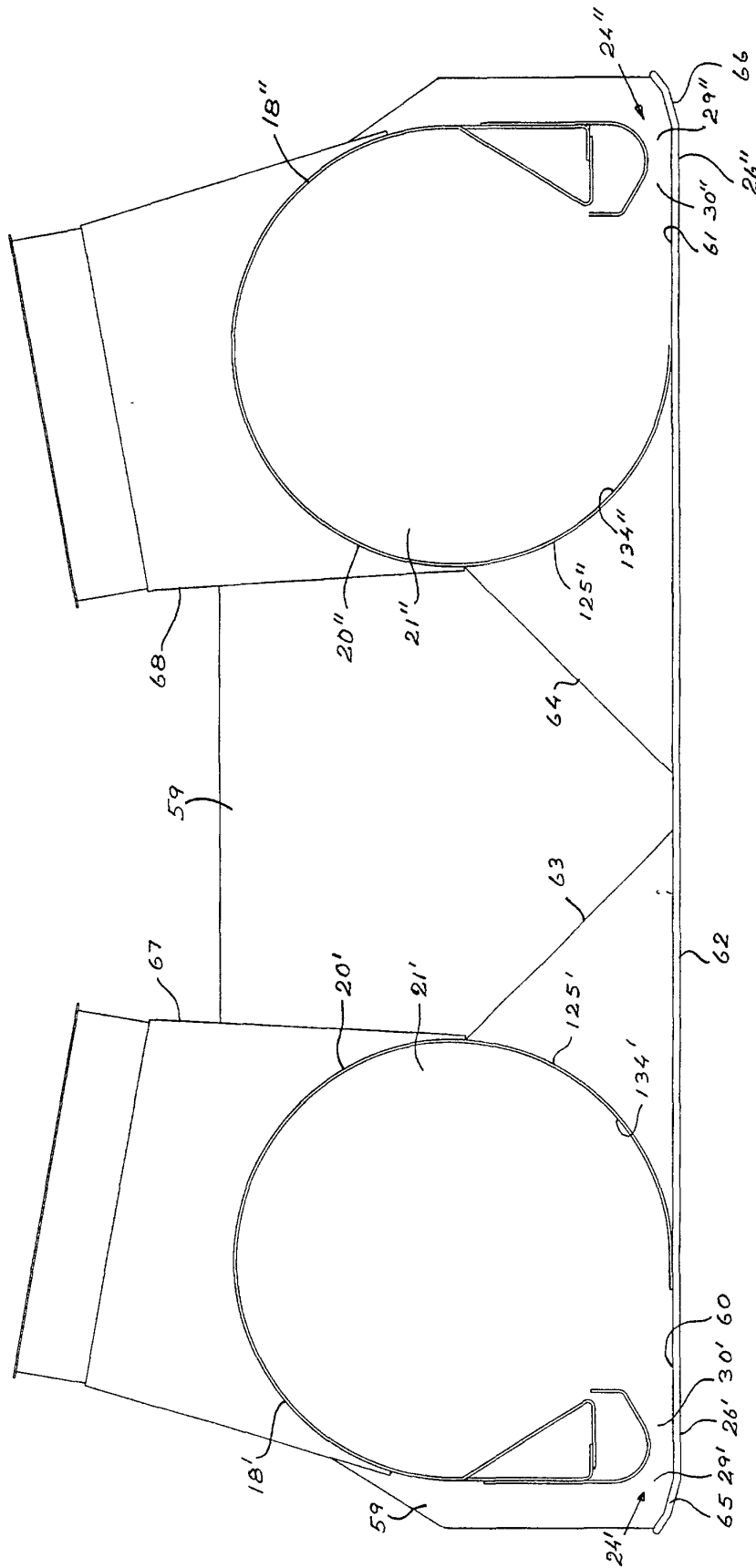


Fig. 8