

(19)



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11)

EP 0 875 159 A1

(12)

**EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**04.11.1998 Bulletin 1998/45**

(51) Int Cl.<sup>6</sup>: **A24C 5/39**

(21) Application number: **98303333.3**

(22) Date of filing: **29.04.1998**

(84) Designated Contracting States:  
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE**  
Designated Extension States:  
**AL LT LV MK RO SI**

(72) Inventors:  
• **Forsyth, Richard John**  
**Andover, Hampshire, SP10 4LW (GB)**  
• **White, Victor Albert Montgomery**  
**Finmere, Buckinghamshire MK18 4AR (GB)**

(30) Priority: **29.04.1997 GB 9708717**

(74) Representative: **BROOKES & MARTIN**  
**High Holborn House**  
**52/54 High Holborn**  
**London, WC1V 6SE (GB)**

(71) Applicant: **GBE INTERNATIONAL PLC**  
**Andover, Hampshire SP10 4DW (GB)**

(54) **Regulatory opening device**

(57) Apparatus for opening tangled tobacco comprising one pair (12,13) of rotating rolls positioned across a flow path for tobacco, means to drive a one roll of the pair to convey the tobacco at a greater rate than the other roll, and the speed of the rolls being variable so as to regulate flow of the tobacco through the apparatus, a further pair (14,15) of rotating rolls, means to drive a one roll of the further pair to convey the tobacco at a greater rate than the other roll to thereby open the tangled tobacco, the arrangement being such that, in use, said tobacco passes from one pair of rolls to the other pair of rolls.

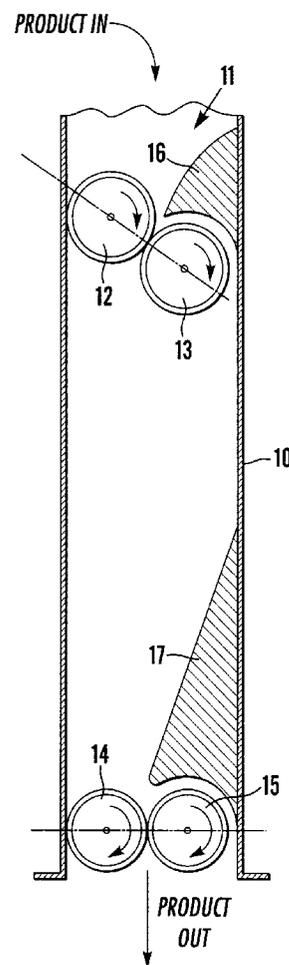


Fig. 1

EP 0 875 159 A1

## Description

Tobacco leaf comprises a mid-rib or stem and thinner section of leaf known as lamina. From the mid-rib, smaller stem and veins run through the lamina section. In processing the tobacco leaf a threshing process is used to remove as much as is practicable of the stem and vein. However some stem and vein will remain with threshed lamina. and hence exist with that threshed lamina as residual stem.

Typically stem residual in threshed tobacco lamina ranges from about 1 to 4 % with the target level being set by the user of the threshed tobacco lamina. The lower the target figure of residual stem, the more aggressively the leaf must be threshed. This aggressive threshing results in a product in which there is an unacceptably high percentage of threshed lamina which is of small particle size which reduces the yield of the usable product. Hence there is more waste and the tobacco is of lower final filling power.

After threshing, the tobacco is cut. The residual stem remaining in the threshed lamina will be cut with the lamina and become entangled within the cut lamina. Some of these larger particles can be removed by a winnower. However the smaller pieces remain as needles or slithers, which, as well as reducing the filling power of the lamina are objectionable to the smoker, and can cause holes or tears in the cigarette paper thus reducing cigarette making efficiency.

Before being passed to the cigarette maker, the cut lamina is combined with cut tobacco in a number of different processes. When combining the tobaccos, further residual objectionable tobaccos may become entangled in the strands of cut lamina.

The higher the permitted levels of residual stem, the more gentle can be the threshing process. Whilst this results in a higher level of potentially objectionable residues, the gentler threshing process produces larger pieces and fewer smaller pieces of detached lamina. This results in less wastage and more economic use of the lamina.

In some parts of the world it is customary not to thresh the tobacco leaf and not to detach the lamina from the stem. Consequently the whole leaf is cut. Cut whole leaf will contain an increased level of objectionable tobacco particles because the stem has been cut with the lamina. Moreover, the cut lamina strands will be longer and more entangled than those produced from threshed lamina.

It is therefore desirable to remove "objectionables" (ie residual stem) from cut lamina and cut whole leaf more effectively, and the potential benefits are:

- a. a relaxation of the threshing stem residual criteria, giving more economic use of threshing systems and of detached lamina.
- b. an improvement in finished cigarette quality.
- c. an improvement in cigarette manufacturing effi-

ciency and costs.

d. potential recovery of objectionable tobaccos that can be reprocessed into a non-objectionable form and re-used in a manner which contributes rather than detracts from final cigarette quality and manufacturing costs.

Reducing the severity of the threshing process and then attempting to pneumatically separate the objectionable tobaccos from the entangled cut lamina has been tried but has generally not been successful. This is because the entangled strands of good cut lamina are in pneumatic terms similar to winnows and that a large proportion of the "objectionables" are trapped in the tangled strands of cut lamina. Consequently most of the objectionable produce is accepted and some acceptable product is rejected. Pneumatic separation would be more effective if these problems can be overcome.

Pneumatic separation such as that in EP-A-91902269.9 and 88910091.3 and GB-A-2157411, is achieved by lifting and removing good product and permitting objectionable product to drop out to a reject location. For illustrative purposes, it is assumed that a pneumatic separator consists of a chamber in which there is an air stream directed vertically upwards and that product to be separated is introduced into a chamber in a substantially horizontal direction part way up the vertical chamber. When a mixture of good and objectionable product is presented into a moving air stream, those particles having a terminal velocity greater than the velocity of the air stream will not be supported by the air stream and will drop downwards. Those particles having a terminal velocity less than the air stream will pass upwards with the air stream.

The terminal velocity of a particle is dependent on its mass, shape, size and orientation to the air stream. The greater the difference in terminal velocity between the product to be accepted (good product) and to be rejected (objectionable) the easier it is to pneumatically separate the particles.

Tobacco is normally transported in compressed bales and hence the tobacco is tangled. in order to create the situation where objectionable stem can be separated we must first untangle/open the tobacco. By opening, each particle and strand of tobacco exists as a separate item. In this form the air stream in the separator has access to, and can act upon each individual particle. However the untangling/opening must be achieved without damage to the good tobacco. The untangling is preferably achieved by conveying a mass of tangled product in such a way that the leading portion of the mass is advanced at a higher rate than the trailing portion. In this way the distance between the leading and trailing portions is increased in the desired direction. As a result of the stretching, the tangled strands forming the bunches become straighter and more separated. A combination of the rate of extension and the distance between the two surfaces stretching the mass of tobac-

co will cause excessively long strands to be severed to a length below a predetermined length.

An apparatus for stretching the mass of tobacco in this way may consist of sequentially adjacent surfaces spaced in the direction of travel. Each surface has a plurality of teeth for engaging the tangled strands of cut lamina. The downstream surface conveys the cut lamina at a greater rate than the upstream surface, the distance between the surfaces being such that the downstream surface engages the product before it leaves the upstream surface.

As already stated the surfaces have a plurality of teeth, these teeth mesh in the gap between the surfaces, whereby in use, a leading portion of the mass of tobacco in contact with a set of teeth on the first surface is moved into the gap between the surfaces and comes into contact with a set of teeth on the second surface. The relative speeds of the sequentially adjacent surfaces stretch and loosen the mass of strands until a trailing portion of the tangled mass is advanced out of engagement with the teeth on its first surface.

These surfaces advantageously comprise the circumferential surfaces of a sequence of rolls, with the speed of rotation progressively higher in the direction of travel.

As a result of the stretching, the tangled strands forming the bunches become straighter and more separated. In a preferred embodiment, the stretching of the tangled bunch is sufficient to sever excessively long strands of cut lamina so that only strands having a length below a predetermined upper limit are fed to the subsequent device.

An apparatus of this type is described in our PCT Patent Application No: PCT/GB96/00851. This discloses a multi-rolls opening device designed for specific use with a pneumatic separator, receiving its tobacco from a horizontal or near horizontal conveyor. There is however with the above device no method of regulating the flow through the rolls which thus relies on the preceding equipment in the line to provide uniformity of flow.

The present application provides apparatus whereby both flow regulation and opening occur simultaneously.

Accordingly, the present invention provides apparatus for opening tangled tobacco comprising one pair of rotating rolls positioned across a flow path for tobacco, means to drive a downstream roll of the pair to convey the tobacco at a greater rate than the upstream roll, and the speed of the rolls being variable so as to regulate flow of the tobacco through the apparatus, a further pair of rotating rolls, means to drive a downstream roll of the further pair to convey the tobacco at a greater rate than the upstream roll to thereby open the tangled tobacco, the arrangement being such that, in use, said tobacco passes from one pair of rolls to the other pair of rolls.

In a preferred arrangement, said one pair of rolls is disposed upstream of said further pair of rolls, and said one pair of rolls, in addition to regulating flow, at least

partially opens the tangled tobacco.

Two preferred embodiments of the invention will now be described, by way of example only, and with reference to the drawings in which:

5 Figure 1 is a diagrammatic vertical section of a tobacco opener according to a first embodiment of the invention,

10 Figure 2 is a diagrammatic vertical section of a tobacco opener according to a second embodiment of the invention,

15 Figure 3 is a diagrammatic vertical section of a tobacco opener according to a third embodiment of the invention, and,

20 Figure 4 is a diagrammatic vertical section of a tobacco opener according to a fourth embodiment of the invention.

The tobacco opener of the present invention controls the flow and provides a directional discharge of the tobacco.

25 Referring to Figure 1 and 3, an opening apparatus in accordance with a preferred embodiment of the invention comprises a rectangular tube 10 which is mounted in a vertical or near vertical direction, the top 11 of which is open for the receipt of a tangled mass of tobacco fed from a transporter device such as a conveyor (not shown). Situated in the tube 10 are two sets of opposed, rolls (12, 13 and 14, 15) positioned across a flow path for the tobacco. In figure 1, rolls 12, 13, 14, 15 all rotate in a clockwise direction, whereas in Figure 3, rolls 12 and 13 are counter rotating, roll 12 rotating clockwise and roll 13 anticlockwise, and similarly rolls 14, 15 are also counter rotating with roll 14 rotating clockwise and roll 15 rotating anticlockwise. The upper roll set (12, 13) is for regulation of the flow of material through the apparatus whilst performing moderate opening. The second lower set of rolls (14, 15) fully open the tobacco whilst imparting a desired directional path to the product leaving the apparatus. All of the rolls are driven in the directions indicated by arrows in the Figure, downstream roll 13 at higher speed than upstream roll 12 and downstream roll 14 at a higher speed than upstream roll 15.

35 The regulatory rolls (12, 13) are located a distance below the top of the tube (10) thus allowing guidance of the tobacco by a curved guide 16 onto the leading roll (12). The circumferential surface of all rolls (12, 13, 14, 15) are covered in a plurality of pins (not shown). These pins can be normal to the surface though more preferably can be inclined, ideally forwards relative to the direction of the rotation. The exact arrangement of pins depends on the product to be processed.

40 The leading roll (12) advances the tangled product towards the second roll (13) in the pair. The second roll has a plurality of pins arranged on its surface, although the density and pattern will differ from roll (12).

45 The arrangement of the rolls (12, 13) is such that the distance between the rolls is adjustable, depending on the material and the extent of aggressive processing

required. At the closest adjustment, the pins of the adjacent rollers will mesh.

The action of the two rolls (12, 13) and their respective sets of pins at the interface open the tangled tobacco. The motor means (not shown) which rotates the rolls (12, 13) is a variable speed motor means and control of the speed of the rolls (in which a drive means such as suitable gears arranges that the second roll 13 or, at least, its relevant peripheral surface, always rotates faster than the leading roll 12), will regulate the flow of tobacco through these rolls (12, 13), whilst maintaining their objective to partially open the product.

The partially opened tobacco passes down from rolls (12, 13) to the region between the two roll sets. At the base of this region is a guide 17 and the second pair of rolls (14, 15). Situated in this region are two limit detectors (not shown). These are located in the tube 10 at a position providing the uppermost desired level of tobacco. The detectors act to maintain a near constant level of tobacco above rolls (14, 15) by adjustment of the speed of rolls (12, 13) and the conveyor to the top of the tube. Therefore it can be seen that the speed of rolls (14, 15) are required to be a function of the speed of the rolls (12, 13) above. The motor means (not shown) which drives the rolls (14, 15) include a drive means such as gears which arranges that the second roll (15), or, at least, its relevant peripheral surface, always rotates faster than the roll (14). These second rolls (14, 15) have the effect of fully opening the tobacco whilst feeding the tobacco vertically down to a subsequent apparatus.

The arrangement of Figures 2 and 4 are similar. The arrangement of the upper rolls 12, 13 and guide 16 in Figures 2 and 4 are similar to Figures 1 and 3 respectively (although oppositely disposed in the drawings) but the lower rolls 14, 15 and guide 17 are arranged to discharge the material to one side rather than vertically downwards. Thus the roll 15 is disposed above the roll 14 rather than to one side as in Figures 1 and 3.

In Figure 2 the lower rolls both rotate in the same direction, ie clockwise, whereas in Figure 4 they counter rotate, roll 15 anticlockwise and roll 14 clockwise, in other arrangements the location of rolls 14, 15 in the tube (10) will vary i.e. the line perpendicular and common to the two rolls of a pair can be horizontal, angled or vertical to suit the discharge required by the subsequent device, such as a pneumatic separator. There are however several differences between the regulating (12, 13) and opening (14, 15) rolls. These differences allow the opening rolls (14, 15) to perform their task of fully opening the partially tangled product. The differences can be found in the density and arrangement of the pins on the rolls surfaces and the speed of the rolls. The opening roll set (14, 15) have a higher overall speed.

Thus the arrangement of the rolls (14, 15), can be clearly seen to be designed for the primary function of opening the tobacco, indicated by means of the relative motion at their junction coupled with the lack of obstruction

at their discharge. Control of the speed of the rolls will then have the additional effect of metering the tobacco without incurring additional degradation.

The speed control of the rolls in either case can be by electronic control or by fixed mechanical means (i.e. belt and pulley), with the latter being generally preferred when the product is of predictable quality and characteristics. The spacing between the rolls is monitored at either end of the rolls such that the parallel alignment of the rolls can be maintained.

The guides 16, 17 (such as those illustrated but not fixed by the figures used) in the tobacco stream to ensure the tobacco is fed into the rolls without undue residence or degradation in the apparatus.

So-called "cleaning" combs or rolls may be provided to prevent the return of product into the apparatus via the discharge rolls. Also, in the arrangement of Figure 2 and 4, air may be passed up the tube 10.

## Claims

1. Apparatus for opening tangled tobacco comprising one pair (12, 13) of rotating rolls positioned across a flow path for tobacco, means to drive a one roll of the pair to convey the tobacco at a greater rate than the other roll, and the speed of the rolls being variable so as to regulate flow of the tobacco through the apparatus, a further pair (14, 15) of rotating rolls, means to drive a one roll of the further pair to convey the tobacco at a greater rate than the other roll to thereby open the tangled tobacco, the arrangement being such that, in use, said tobacco passes from one pair of rolls to the other pair of rolls.
2. Apparatus as claimed in claim 1 wherein said one pair of rolls is disposed upstream of said further pair of rolls, and said one pair of rolls, in addition to regulating flow, at least partially opens the tangled tobacco.
3. Apparatus as claimed in claim 1 or claim 2 wherein said one pair of rotating rolls is disposed above said further pair of rotating rolls and detector means are provided to detect the upper level of tobacco above said further pair of rotating rolls and to vary the speed of rotation of said one pair of rolls to maintain said level near constant.
4. Apparatus as claimed in any of claims 1 to 3 wherein the circumferential surfaces of said rolls are each covered in a plurality of pins.

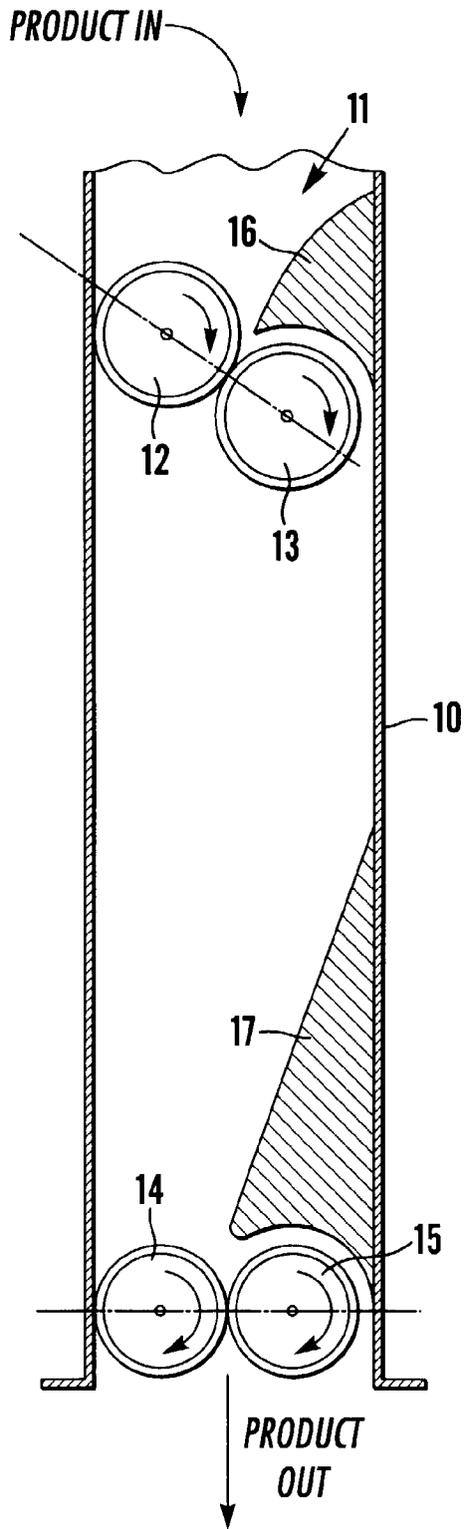


Fig. 1

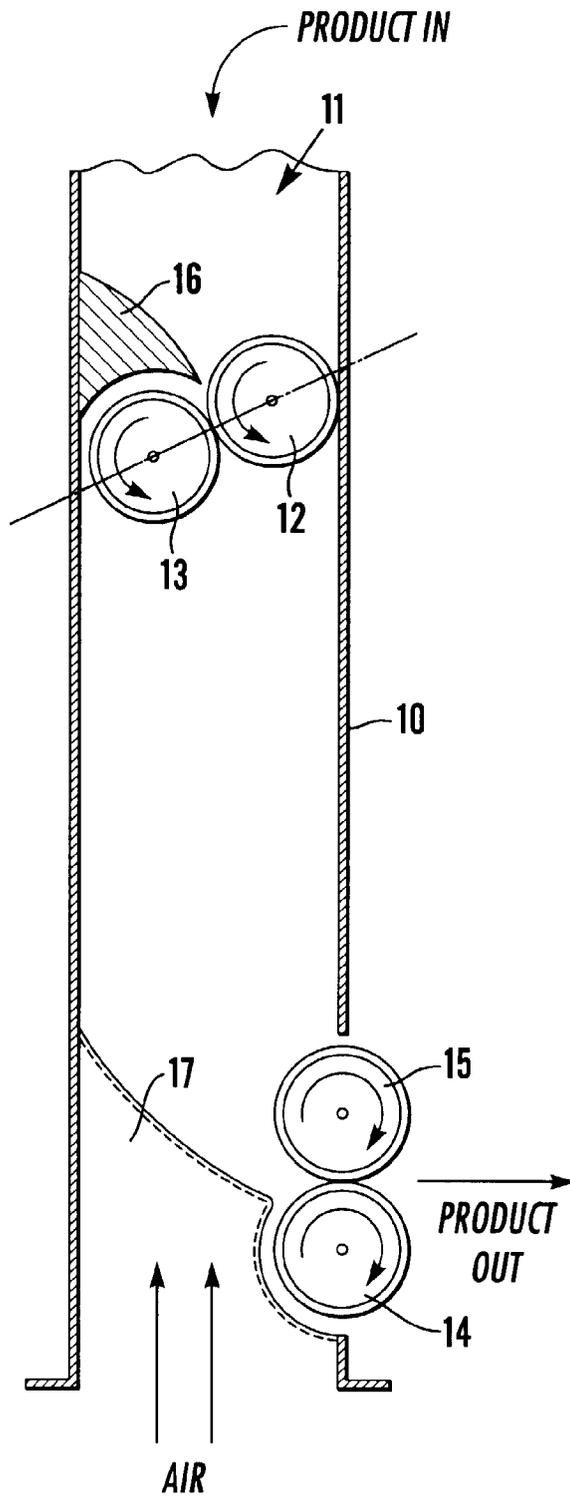


Fig. 2

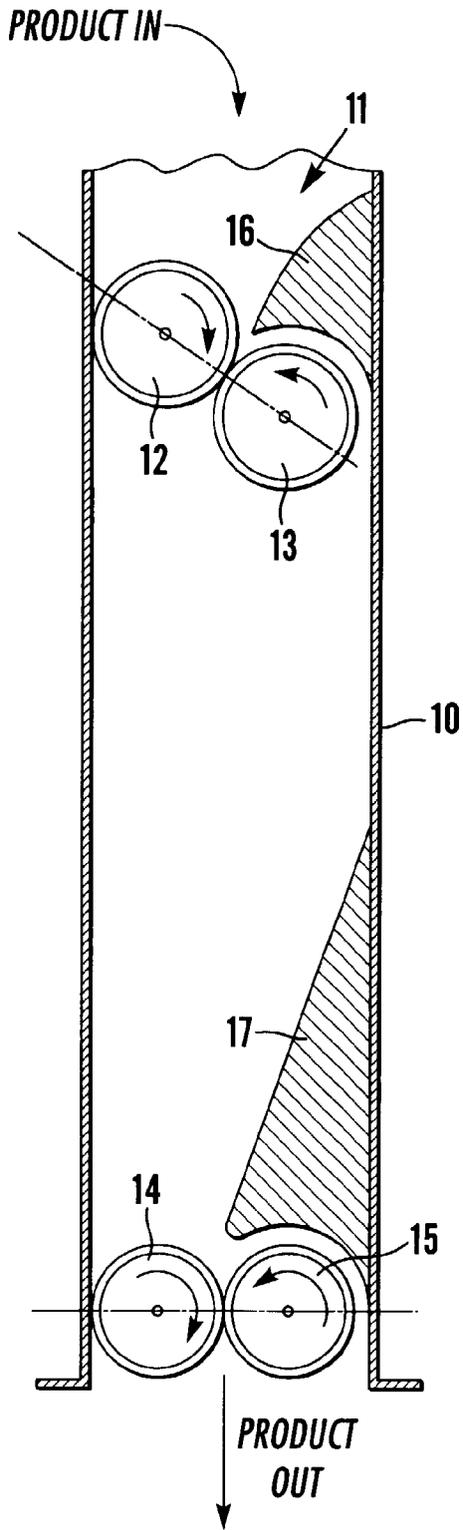


Fig. 3

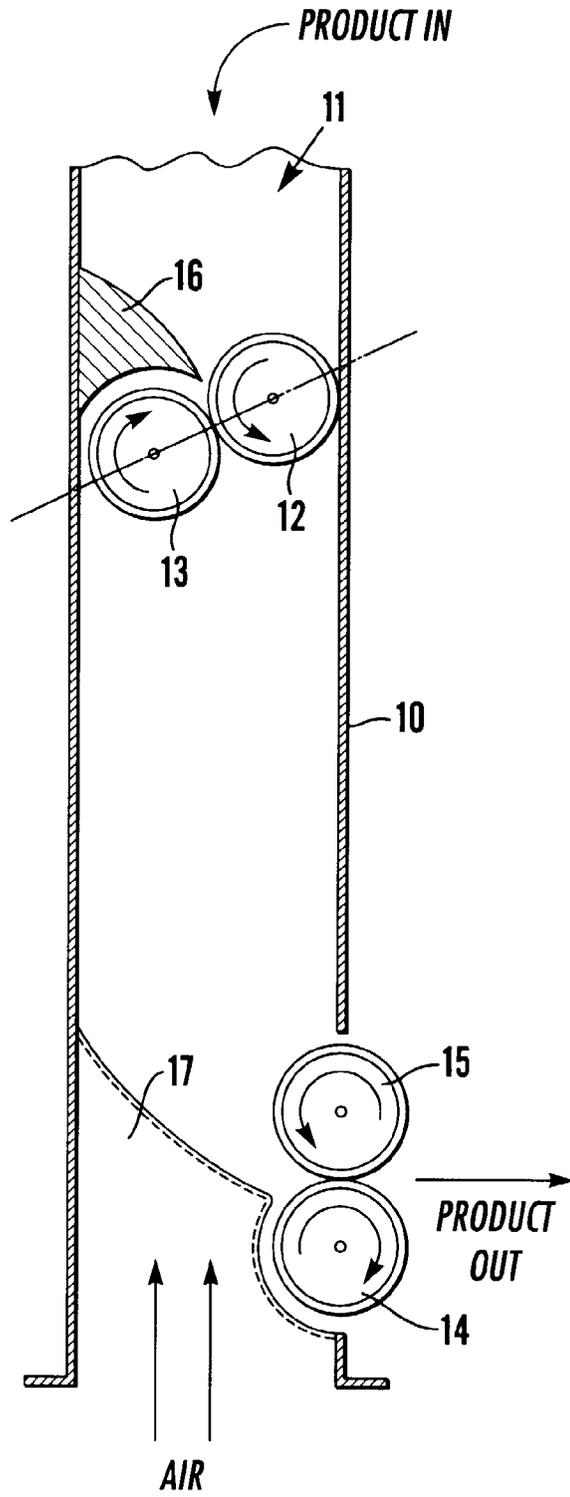


Fig. 4



European Patent  
Office

EUROPEAN SEARCH REPORT

Application Number  
EP 98 30 3333

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP 0 307 070 A (COMPANHIA SOUZA CRUZ INDUSTRIA E COMERCIO) 15 March 1989 * column 7, line 50 - column 9, line 49; figures 1,2,5 *	1-4	A24C5/39
A	FR 2 492 635 A (ROTHMANS OF PALL MALL CANADA LIMITED) 30 April 1982 * the whole document *	1,4	
A	US 1 755 081 A (SCHÜNEMANN) 15 April 1930 * the whole document *	1,4	
A	US 3 903 901 A (WOCHNOWSKI) 9 September 1975 * column 11, line 43 - column 13, line 12; figure 6 *	1,4	
A	US 4 121 596 A (LABBE) 24 October 1978		
A,D	WO 96 31134 A (GBE INTERNATIONAL PLC) 10 October 1996		
A	GB 2 246 502 A (MOLINS PLC) 5 February 1992		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			A24C A24B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		18 August 1998	Riegel, R
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03/82 (Pw/C01)