

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
5 February 2009 (05.02.2009)

PCT

(10) International Publication Number
WO 2009/016122 A1

(51) International Patent Classification:
A24C 5/18 (2006.01) A24C 5/54 (2006.01)

(74) Agents: READ, Matthew et al.; 20 Little Britain, London EC1A 7DH (GB).

(21) International Application Number:
PCT/EP2008/059812

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(22) International Filing Date: 25 July 2008 (25.07.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0714972.7 1 August 2007 (01.08.2007) GB

(71) Applicant (for all designated States except US): **BRITISH AMERICAN TOBACCO LIMITED** [GB/GB]; Globe House, 1 Water Street, London WC2R 3LA (GB).

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **JURA, Karl** [GB/GB]; British American Tobacco Limited, Globe House, 1 Water Street, London WC2R 3LA (GB). **BRAY, Andrew, Jonathan** [GB/GB]; British American Tobacco Limited, Globe House, 1 Water Street, London WC2R 3LA (GB).

Published:
— with international search report
— with amended claims

(54) Title: METHOD AND APPARATUS FOR FORMING TOBACCO RODS

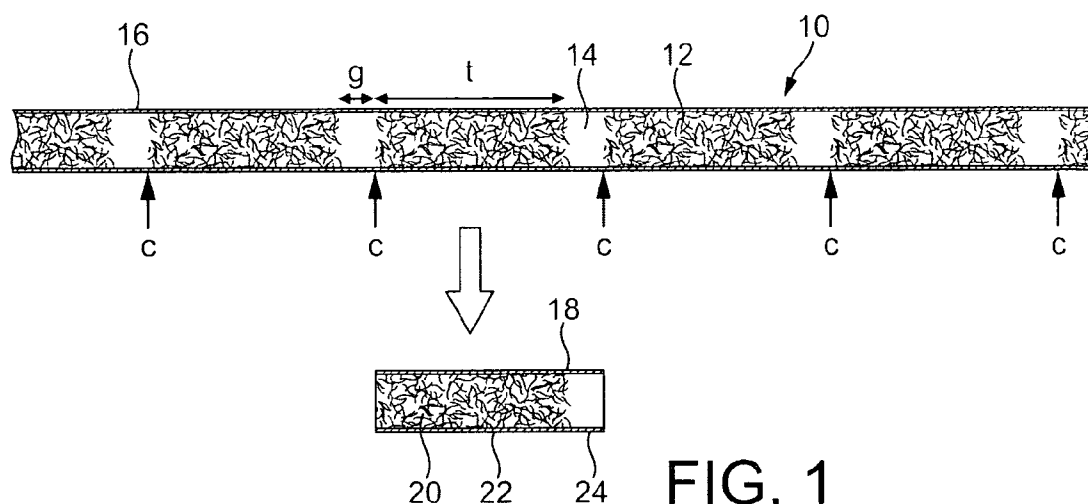


FIG. 1

(57) Abstract: A method of forming tobacco rods comprises providing an endless bead of tobacco, creating regularly spaced apart gaps (14) with no tobacco along the length of the bead, wrapping the bead in an endless length of paper wrapper (16), and cutting through the paper wrapper where it overlays the gaps in order to divide the wrapped bead into individual tobacco rods. The gaps may be created using an ecreteur with trimmer discs configured to trim away the full width of the tobacco rod (10), or by using a rotating screw thread extending into the tobacco.



WO 2009/016122 A1

TITLE OF THE INVENTION**METHOD AND APPARATUS FOR FORMING TOBACCO RODS**5 **BACKGROUND OF THE INVENTION**

The present invention relates to a method and apparatus for forming tobacco rods, where the tobacco rods are suitable for the manufacture of smoking articles with closed ends.

10 Manufactured smoking articles such as cigarettes conventionally comprise a tobacco rod having a wrapping of cigarette paper, and a filter attached to the tobacco rod by a tipping paper, although plain cigarettes, lacking a filter, are also available. In either case, the end of the cigarette which is intended to be lit is often open, so that the tobacco inside the cigarette paper is exposed. This allows leakage or spillage of tobacco from the cigarette, and also allows contaminants and foreign bodies to enter
15 the tobacco.

To address this, it has been previously proposed to close one or both ends of a cigarette by folding or otherwise manipulating a portion of the cigarette paper that extends beyond the tobacco rod. For this, it is necessary to arrange for a tobacco rod of a length shorter than the surrounding wrapper. It is usual in cigarette manufacturing
20 for an endless length or bead of tobacco to be wrapped in an endless length of cigarette paper, with the result being cut through at intervals to form individual rods. This necessarily produces rods in which the tobacco and the paper are of equal length. Hence, alternative techniques are needed to produce tobacco rods with a paper overhang that can be folded to close the end(s) of the cigarette.

25 For example, United Kingdom patent applications GB 0622687.2 and GB 0703785.6 filed on 14 November 2006 and 27 February 2007, both entitled "Smoking article with closed end and methods and apparatus for manufacture thereof" describe adhering an additional portion of foldable paper around the end of a tobacco rod to

-2-

create an overhanging part for folding over to form a closed end. Older examples include US 1,164,118, which describes a cigarette-making machine that forms a tube from an individual cigarette paper, closes one end of the tube, partially fills the tube with tobacco, and then closes the other end. US 501,498 describes a machine that
5 wraps an individual cigarette paper around an individual length of tobacco, compresses the tobacco from both ends to make paper overhangs for folding, and then closes each end by folding. These older approaches are not well-suited to modern cigarette manufacturing techniques, however.

Another technique is to produce a completed conventional smoking article that
10 has a longer than usual length of tobacco rod. The filter end of the smoking article is placed vertically on a vibrating surface, or tapped down. This settles the tobacco further down into the enclosing wrapper, leaving a free end of the wrapper than can be folded over for a closed end. This is potentially disadvantageous, however. Tobacco typically comprises a mixture of various smokable materials, and these tend to settle at
15 different depths after vibration or tapping, giving a non-uniform composition to the tobacco rod.

SUMMARY OF THE INVENTION

Accordingly, a first aspect of the present invention is directed to a method of
20 forming tobacco rods, comprising: providing an endless bead of tobacco; creating tobacco-less gaps in the bead, the gaps regularly spaced apart along the bead; wrapping the bead in an endless length of paper wrapper; and dividing the wrapped bead into tobacco rods by cutting through the paper wrapper where it overlays the gaps.

25 This results in tobacco rods that have an overhanging portion of paper at one or both ends (depending on the position of the cuts) that can be folded inwards over the tobacco to close the end(s) of the completed smoking article. The method includes the conventional steps for making tobacco rods, plus an extra stage of creating the gaps in

the tobacco bead. The extra stage can be readily incorporated into standard production, so existing production lines and methods can be easily adapted to implement the present invention. Moreover, creation of the gaps can be performed rapidly and simply with non-complex equipment and without interruption of the travel of the tobacco
5 through the production process, so production times can be as fast, or nearly as fast, as the production of conventional tobacco rods.

In some embodiments, the method is implemented such that each gap has a length equal to twice a length of paper wrapper required for subsequent folding over the tobacco, and dividing the wrapped bead comprises cutting through the paper
10 wrapper at the longitudinal mid-point of each gap. If the gaps are spaced apart by a distance equal to twice a length of tobacco intended for smoking articles to be made from the tobacco rods, double-length tobacco rods can be formed. Each double length rod comprises two single length rods joined back-to-back, with the overhanging paper for each at the ends of the double-length rod. The method may then further comprise
15 dividing the tobacco rods longitudinally in half by cutting through at the longitudinal mid-point of each tobacco rod, to produce single length rods each comprising one length of tobacco and a paper overhang at one end. These can be used to produce a filter-tipped cigarette with a closed tobacco end.

Alternatively, the gaps may be spaced apart by a distance equal to a length of
20 tobacco intended for smoking articles to be made from the tobacco rods. Thus, the tobacco between the gaps is the length required for a single smoking article, which produces tobacco rods with overhanging paper at both ends, from which a filterless cigarette with two closed ends can be made.

As an alternative for producing single length rods with overhanging paper at
25 one end only, each gap may have a length equal to a length of paper wrapper required for subsequent folding over the tobacco, the gaps may be spaced apart by a distance equal to a length of tobacco intended for smoking articles to be made from the tobacco

rods, and dividing the wrapped bead may comprise cutting through the paper wrapper substantially flush with one end of each gap.

Creating the tobacco-less gaps in the bead may comprise removing tobacco from the bead. Any technique suitable for this may be employed. For example, removing tobacco from the bead may comprise trimming away the full width of tobacco in the bead over the length of each gap using an ecreteur. Ecreteurs are well-known for trimming tobacco from beads to achieve a uniform thickness of tobacco. Hence, no complex modification to a production line is needed to implement this embodiment. An additional ecreteur may be added for creating gaps in the bead, or more simply, an existing ecreteur may be modified or replaced to create the gaps in addition to regular tobacco trimming.

Alternatively, creating the tobacco-less gaps in the bead may comprise dividing the bead into longitudinal portions of tobacco and moving the portions apart. Again, any suitable technique may be used for this. For example, dividing the bead and moving the portions of tobacco apart may comprise bringing a screw thread which is rotating about an axis parallel to the length of the bead into contact with the bead while the bead is travelling longitudinally, the screw thread having a thread with a thickness which increases with distance along the screw thread. Use of a screw thread does not interfere with the forward travel of the tobacco bead along a production line, because a screw which is stationary except for its rotation will move the tobacco longitudinally, like water pulled up by an Archimedes screw. The screw thread may be configured in various ways. For example, the screw thread may have a thread which commences from a point at the leading end of the screw thread, the thread having a radius that increases with distance along the screw thread from the point over at least part of the length of the screw thread. Or, the screw thread may have a thread which commences from a leading edge arranged substantially along a radius of the thread, the thread having a substantially constant radius.

In a further example, dividing the bead and moving the portions of tobacco apart may comprise moving at least one rotating disc into and out of the bead, the disc rotating about an axis parallel to the bead and having a thickness that increases from the edge to the centre of the disc. This technique may be found more complex to
5 implement than a screw thread as regards processing of a moving tobacco bead. However, rotating discs configured in this way are advantageous in that a single disc or assembly of discs can be used to create gaps of different length.

A second aspect of the present invention is directed to apparatus for forming tobacco rods, comprising: a conveying device for supporting and conveying an endless
10 bead of tobacco; a tobacco spacing device operable to create regularly spaced apart tobacco-less gaps in the bead; a garniture and a paper wrapper supply arranged to receive the bead after creation of the gaps and wrap the bead in an endless length of paper wrapper; and a cutter operable to divide the wrapped bead into tobacco rods by cutting through the paper wrapper where it overlays the gaps.

15 The tobacco spacing device may create the gaps by removing tobacco from the bead. For example the device may be an ecreteur having at least one trimmer disc with a circumference height profile configured to trim away the full width of tobacco in the bead over the length of each gap.

Alternatively, the tobacco spacing device may create the gaps by dividing the
20 bead into longitudinal portions of tobacco and moving the portions apart. Such a device may comprise a screw thread rotatable about an axis parallel to the length of the bead such that the thread of the screw thread passes through the bead as it is carried by the conveying device, the thread with a thickness which increases with distance along the screw thread. The screw thread may have a thread which
25 commences from a point at the leading end of the screw thread, the thread having a radius that increases with distance along the screw thread from the point over at least part of the length of the screw thread. Alternatively, the screw thread may have a thread which commences from a leading edge arranged substantially along a radius of

the thread, the thread having a substantially constant radius. In other embodiments, the tobacco spacing device may comprise at least one disc rotatable about an axis parallel to the bead and movable into and out of the bead while rotating, the disc having a thickness that increases from the edge to the centre of the disc.

5

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the invention and to show how the same may be carried into effect reference is now made by way of example to the accompanying drawings in which:

10 Figure 1 shows a longitudinal cross-section through a length of continuous wrapped tobacco bead according to a first embodiment of the invention;

Figure 2 shows a longitudinal cross-section through a length of continuous wrapped tobacco bead according to a second embodiment;

15 Figure 3 shows a longitudinal cross-section through a length of continuous wrapped tobacco bead according to a third embodiment;

Figure 4 shows a plan view of a conventional ecreteur trimming device;

Figure 5 shows a plan view of an ecreteur trimming device according to an embodiment of the invention;

Figure 6 shows a side view of a trimmer disc of the ecreteur of Figure 5;

20 Figure 7 shows a perspective view of a tobacco spacing device according to an embodiment of the invention;

Figure 8 shows a perspective view of a tobacco spacing device according to an other embodiment; and

25 Figure 9 shows a perspective view of a tobacco spacing device according to a further embodiment.

DETAILED DESCRIPTION

The present invention provides a method for forming tobacco rods suitable for making smoking articles such as cigarettes in which the tobacco at the end of the rod in the completed smoking article is covered by folding an overhanging portion of the wrapping paper inwardly over the tobacco. To achieve this, it is necessary to provide a tobacco rod (or smoking article) in which the cigarette paper wrapped around the tobacco extends beyond the tobacco by an amount sufficient to cover the tobacco when the paper is folded. The present invention proposes that this be achieved at an early stage in the conventional cigarette manufacturing process, during the formation of the tobacco bead and subsequent wrapping of the bead in cigarette paper.

Conventionally, loose tobacco is taken from a hopper and arranged in a thin continuous or endless bead having a width or thickness substantially the same as the desired width of tobacco in the completed smoking article. The bead is fed into a garniture which engages the paper cigarette wrapper around the bead and secures the wrapper in place with a continuous line of adhesive running along the length of the paper and bead. The wrapper is also endless, being supplied to the garniture from a roll having a width equal to the circumference of the smoking article plus sufficient extra paper for forming the overlapped stuck seam. This produces a continuous tobacco rod comprising tobacco wrapped in cigarette paper. The continuous rod is then cut into single or double length individual rods for subsequent assembly with filter units.

According to the invention, before the tobacco bead is wrapped in the cigarette paper, a plurality of gaps or spaces are created in the tobacco bead, the gaps being evenly spaced along the length of the bead. The bead is then fed into a garniture for wrapping in endless paper in the conventional manner. Thus, a continuous tobacco rod in which the tobacco filling is divided into portions by tobacco-less gaps or voids is created. This continuous rod is then separated into individual rods by cutting through the paper at positions corresponding with the underlying gaps. Individual tobacco rods

having paper that overhangs at one or both ends are thereby created, using a manufacturing method and apparatus that are entirely conventional, requiring only the addition of a stage for producing the gaps in the tobacco bead.

The length of the gaps determines the length of the overhanging paper. Since
5 the overhanging paper is intended for folding over to cover the exposed tobacco at the end of the rod, the length of the gaps should be chosen accordingly. Similarly, the length of the tobacco portions between the gaps should be chosen with reference to the desired length of tobacco in the completed smoking articles.

The desired arrangement of tobacco and overhanging paper can be achieved in
10 various ways.

Figure 1 shows a longitudinal cross-sectional view of a first embodiment of a continuous tobacco rod before cutting into individual rods. As described above, the continuous rod 10 comprises tobacco arranged in portions 12 with gaps or voids 14 between the tobacco portions. The tobacco 12 and gaps 14 are surrounded by a tubular paper wrapper 16, so that the rod is cylindrical. In this example, each portion of tobacco 12 has a length t equal to the desired length of tobacco in the completed smoking article. Each gap 14 has a length g equal to the desired overhang of paper extending past the end of the tobacco. By cutting the continuous rod 10 at one end of every gap 14 (the same end for each gap), flush with the boundary between the gap 14
15 and the tobacco 12, the continuous rod 10 is divided into individual rods 18, each comprising an individual length of tobacco 20 inside a paper wrapper 22 that extends at one end to form an overhanging foldable portion 24. The arrows c indicate the position of each cut. The foldable overhang can be used to close one end of the tobacco rod, while the other end of the tobacco rod is joined to a filter unit using a
20 tipping paper, to produce a filter tipped smoking article.

Figure 2 shows a second embodiment of a continuous tobacco rod 10. As before, each tobacco portion 12 has a length t equal to the desired length of tobacco in the completed smoking article. The gaps 14, however, have a length g equal to twice

the desired length of paper overhang. The continuous rod is cut at positions *c* that are aligned with the longitudinal mid-point of each gap. These cutting locations produce individual rods 18, each comprising an individual length of tobacco 20 wrapped in a paper wrapper 22 that has an overhanging portion 24 at both ends of the rod 18. This arrangement can be used to close both ends of the tobacco rod 18 to provide a non-filter tipped smoking article.

Figure 3 shows a third embodiment of a continuous tobacco rod 10. In this example, the tobacco portions 12 each have a length *t* that is twice the length of the intended amount of tobacco in the finished smoking article. Similarly, the gaps 14 each have a length *g* that is twice the length of the desired paper overhang. As in the embodiment of Figure 2, the continuous rod 10 is cut at the midpoint of each gap, thereby dividing the paper 16 corresponding to the gaps 12 into two parts. These cuts alone, shown as *c*1, give double-length tobacco rods, each comprising a length of tobacco sufficient for two smoking articles plus a paper overhang at each end. To produce individual, single-length tobacco rods 18, additional cuts *c*2 are made at the midpoint of each tobacco portion 12. This produces tobacco rods 18 each comprising an individual length of tobacco 20 with a paper wrapper 22 having an overhanging portion 24 at one end only. Thus, tobacco rods the same as those produced via the embodiment of Figure 1 can be made by a method that requires only half as many voids to be made in the tobacco bead. The cuts *c*1 through the gaps 14 may all be made first, followed by cutting the double-length tobacco rods in half with the cuts *c*2. Alternatively, the cuts *c*1 and *c*2 may be made alternately in sequence along the continuous rod 10, to divide off each tobacco rod individually.

As described above, to fabricate tobacco rods according to the invention, conventional apparatus may be used to form a tobacco bead and pass the bead into a garniture for wrapping in cigarette paper. The bead travels forward along its length during this process, and after wrapping continues to travel over or past a cutting blade or other cutting device that cuts the continuous rod into the individual rod lengths.

-10-

Before wrapping, the tobacco is retained in the bead shape by a suction or vacuum belt.

Two approaches to formation of the gaps in the bead may be considered. In one approach, sections of tobacco are removed from the continuous bead. The removed sections extend through the full width of the bead, thereby creating a discontinuous bead formed from portions of tobacco spaced by gaps. An alternative approach comprises parting the tobacco bead at regular intervals and pushing the tobacco apart on either side of the partings. A tobacco spacing device may be employed for the removal or parting of the tobacco; this may take various forms as discussed further below.

One technique according to the first approach of removing tobacco sections from the bead uses an ecreteur, or trimming device, as a tobacco spacing device which removes the tobacco. Ecreteurs are commonly used for shaping tobacco beads. When a tobacco bead is initially formed from tobacco taken from a hopper, the bead will be ragged and of varying width or thickness. One or more ecreteurs can be used to trim off excess tobacco to produce a bead of the desired size. The bead width may be constant, or may not be constant so as to provide different tobacco densities along the length of a smoking article.

Figure 4 shows a plan view of a conventional ecreteur as used to trim a tobacco bead. A pair of trimmer discs or blades 30, 32 are arranged to rotate in the same horizontal plane, with their edges adjacent. The two discs 30, 32 rotate in different directions, as shown in the Figure, so that in a trimming region, where the discs 30, 32 are adjacent, the edges of the discs 30, 32 are travelling in the same direction. A bead of tobacco 34, carried for example on a suction belt, passes over the trimming region so that the underside of the bead 34 is brought into contact with the rotating edges of the discs 30, 32. The bead 34 travels along its length in a straight line along a horizontal path equidistant from the centres of the two discs 30, 32, and in a direction opposite to the direction of travel of the edges of the discs 30, 32 in the trimming

-11-

region as shown by the arrow in the Figure. As the tobacco bead 34 meets the rotating edges of the trimming discs 30, 32, any tobacco hanging below the plane of the discs is trimmed or sheared off from the bead 34 by the discs 30, 32, so that the bead 34 has a uniform thickness when it exits the trimming region. A wheel 36 is positioned under
5 the discs 30, 32 in the trimming region, with its axis of rotation in the horizontal plane. The wheel 36 is arranged so that it lies in a vertical plane that is at an angle to the vertical plane occupied by the tobacco bead 34. Its vertical position is chosen such that the upper edge of the wheel is very closely adjacent to the trimmer discs 30, 32. As the tobacco bead 34 travels over the discs 30, 32 and is trimmed, the wheel 26 rotates and
10 carries away the tobacco that is removed from the bead 34. The removed tobacco is returned to the hopper for re-use in the tobacco bead.

In the example of Figure 4, the trimmer discs 30, 32 are flat around their whole circumferences. This configuration trims the tobacco bead to a constant uniform thickness. Alternatively, the trimmer discs 30, 32 may have portions at their
15 circumferences which are higher or lower than other portions of the circumference. If the discs are synchronised in rotation speed and angular position so that the different height portions coincide at the trimming region, the tobacco bead can be trimmed to have a non-uniform thickness along its length. The rotation of the discs will give a repeating pattern of thickness, which can be selected so that the individual parts of the
20 bead intended for individual cigarettes each have the same pattern of thickness, for example to provide a higher density of tobacco at the end of each cigarette.

Further details of ecreteurs, including their use in trimming tobacco beads to non-uniform thicknesses, are given in United Kingdom patent application GB 0624771.2 filed on 12 December 2006, entitled "A smoking article and a method and
25 apparatus for the manufacture of smoking articles".

According to embodiments of the present invention, it is proposed to use an ecreteur to remove tobacco from the tobacco bead to create the required gaps. Portions of the circumference of the trimmer discs of the ecreteur are configured to have a

-12-

height above the remainder of the circumference sufficient to trim away the full thickness of the bead.

Figure 5 shows a plan view of an ecreteur configured according to this embodiment. Each trimmer disc 30, 32 has its circumference region shaped so that portions 40 which are raised above the surface of the disc alternate with portions 38 which lie in the plane of the disc. The discs have substantially the same thickness around their circumferences, so the raised portions 40 are deformations in the surface of the disc, rather than thickened parts. Thus, the trimming edge provided by the rim of the disc is maintained around the full circumference, but at differing heights.

In this example shown, the trimmer discs 30, 32 are configured to create four gaps in the tobacco bead per rotation. Thus, each disc 30, 32 has four raised portions 40, spaced equally apart around its rim. The length of each raised portion 40 in the circumferential direction corresponds to the desired length g of each gap, as discussed with reference to Figures 1, 2 and 3. Between the raised portions 40 are the flat portions 38, each of which has a circumferential length t corresponding to the desired length of the tobacco portions between the gaps, also as discussed with reference to Figures 1, 2 and 3.

Figure 6 shows a side view of the trimmer disc 32, as seen along the arrow vi in Figure 5. This illustrates the varying height profile of the circumference of the disc 32 to define the raised portions 40 and the flat portions 38 which are in the plane of the disc. The raised portions 40 have a height h above the plane of the disc which is large enough to reach up through the full thickness of the bead and completely remove all tobacco from the bead over the length g . If the bead has been previously trimmed by another ecreteur to achieve a uniform thickness, the flat portions 38 may be arranged at a height that passes below or level with the underside of the tobacco bead, so that no trimming occurs outside of the raised portions 40. Alternatively, the usual ecreteur trimming function can be provided by the flat portions 38, so that the height of these portions relative to the bead is selected to trim the bead to a uniform thickness

between the gaps. Further, the flat portions may be replaced by portions having a varying height profile, to produce tobacco with a varying thickness over the length of each individual smoking article, as mentioned above.

Alternative arrangements may be used to create the gaps in the tobacco bead
5 by the complete removal of sections of tobacco from the bead. For example, a spacing device that removes sections of tobacco by suction could be employed, or a spacing device that punches sideways through the bead to push out sections of tobacco.

An alternative approach to removing sections of tobacco is to part the tobacco bead at intervals and push the tobacco aside, along the length of the bead.

10 A tobacco spacing device suitable for this is a rotating screw thread. The screw thread is mounted with its axis of rotation parallel to the length of the tobacco bead, and positioned such that its thread extends radially into the tobacco bead. The pitch of the screw thread is chosen to match the length of the individual tobacco portions. The beginning of the thread cuts into the moving tobacco bead with each rotation of the
15 screw, to divide each portion from the bead. The bead then continues to travel along its forward path as the screw rotates, but divided into individual portions with one portion between each pitch of the thread. The thread itself therefore fills the gaps between the tobacco portions. Hence, by configuring the thread to have a thickness (in the direction along the length of the screw thread and the tobacco bead) that increases
20 with distance along the screw, the tobacco portions are gradually pushed further apart as they move through the screw thread, to create gaps of the required length. Thus, the final thickness of the thread determines the length of the gaps.

A single turn of screw thread may be sufficient to divide and part the tobacco bead adequately, but a more gradual effect may be preferred, in which case the screw
25 thread may comprise more than one turn.

Figure 7 shows a simplified perspective view of a first example of a rotatable screw thread suitable for this purpose. The screw thread 50 is mounted for rotation about a horizontal axis parallel to the path of the tobacco bead 52, just to the side of

-14-

the tobacco bead 52. The tobacco bead 52 is travelling to the right as illustrated, and the screw thread 50 is rotated clockwise as seen from the downstream end (with respect to the direction of travel of the tobacco bead 52) In this example, the front end of the screw thread 52 is configured as a point 54, with the radius of the thread gradually increasing along the first half of the length of the screw. This is similar to a conventional fastening screw, where the point is used to drive the screw into a surface. In the present case, the point and increasing radius is instead used to gradually introduce the thread into the adjacent tobacco bead 52, thus parting the tobacco. The radius may increase over the whole length of the screw, or over a first part of the length only.

The screw thread 50 is fixed except for its rotation, while the tobacco bead 52 moves forwards through the screw. The speed of rotation of the screw thread 50 must be properly matched to the forward linear speed of the tobacco bead 52. Each rotation of the screw thread 50 introduces a new parting in the tobacco bead 52, and the continued rotation carries the individual portions of tobacco 58 through the screw. The entire length of the thread passes through each parting to create the required gaps 60 in the tobacco bead. The thread has a thickness 56 that increases with distance along the screw thread. This gradually pushes the individual portions of tobacco further apart, until they are spaced by the appropriate distance. Thus, the final thickness of the thread is g , the required length of the gaps 60. The tobacco bead 52, continuous on entering the screw thread, is delivered at the other end divided into individual portions to tobacco 58 whose length t is determined by the pitch of the screw thread 50, and spaced apart by regular gaps 60 whose length g is determined by the thread thickness.

Figure 8 shows an alternative embodiment of a rotatable screw thread 50. The screw thread 50 is positioned adjacent to the travelling tobacco bead 52 as in Figure 7, and is again configured so that the pitch determines the length of the tobacco portions 59 and the thickness 56 of the thread increases with distance along the screw to produce gaps 60 of length g in the bead. However, this screw thread has a thread of a

-15-

constant radius (constant thread depth), and does not begin from a point at the front end. Instead, the screw thread has a leading edge 62 in the form of a blade arranged radially across the thread. This edge or blade 62 slices through the tobacco bead 52 as the screw thread 50 rotates, to part the tobacco. The thickness of the thread then
5 increases from the thin edge 62 to force the tobacco apart as it moves along the screw, thereby creating a gap. Each rotation of the screw thread 50 slices through the bead 52 at a new place, owing to the forward travel of the tobacco bead. Thus, the continuous bead 52 is divided into portions of tobacco 58 spaced apart by gaps 60, as required.

As shown in Figures 7 and 8, the tobacco bead 52 is unsupported. In reality,
10 the bead will be travelling on a suction belt or other conveying device which would obstruct the screw thread 50 if the bead 52 was positioned with respect to the screw thread as shown in Figure 7 or 8. Therefore, the screw thread should be spaced from the tobacco bead such that the tobacco passes through at the outer edge of the thread, so that it can be supported on its conveying device.

Other spacing devices for parting the tobacco bead may also be employed. For
15 example, one or more discs may be mounted in a row on an axel, for rotation. The edge of each disc forms a blade edge, and each disc has a thickness that increases from the edge towards the centre of the disc, to a thickness at least as great as the desired length of the gaps to be made in the tobacco bead. The spacing of the discs along the
20 axel corresponds to the desired length of the individual tobacco portions after formation of the gaps. The axel is arranged parallel to the tobacco bead. As the discs rotate, the assembly of discs and axel is moved gradually closer to the bead so that the disc edges cut into the bead at spaced apart intervals, to part the tobacco. Further movement of the assembly pushes the discs further through the bead, and the
25 increasing thickness of the disc forces the tobacco further apart, until the desired gap length is achieved. The discs are then withdrawn.

Figure 9 shows a cross-sectional view through a disc assembly, in the process of creating gaps in a tobacco bead 52. The assembly comprises an axel 70 arranged

-16-

parallel to the tobacco bead 52, the axel carrying five rotatable discs 72. As indicated by the arrows, the assembly is configured for rotation of the discs 72 about the axel 70, and for translation of the discs 72 and the axel 70 towards and away from the tobacco bead 52. The discs 72 cut into the continuous bead 52 to divide it into individual portions of the tobacco of length t determined by the spacing of the discs. The thickness of the discs g determines the length of the gaps in the bead 52 left when the assembly is withdrawn.

The tobacco bead needs to be kept stationary during this process for gap formation, however. Alternatively, the disc assembly can be moved sideways at the same speed as the tobacco bead, but it will then need to be returned to its start position for formation of the next set of gaps. Either arrangement is slow compared to the screw thread example described above, which does not interfere with the normal forward travel of the tobacco bead. However, an advantage of the disc assembly is that a single assembly can be used to create gaps of different sizes, by alteration of the distance by which the discs are pushed into the tobacco bead.

The term "tobacco" as used herein should be understood to include tobacco *per se*, and also tobacco materials and derivatives and other smokable material, alone or in combination. Examples include, but are not limited to stem, lamina and tobacco dust. "Tobacco" therefore refers to the smokable material to be included in a cigarette or smoking article.

Similarly, the terms "smoking article" and "cigarette" are to be understood as including cigarettes, cigarillos, slim cigarettes, cigars and any other smoking article that comprises a length of smokable material with a paper or similar wrapper, with or without a filter unit.

25

CLAIMS

1. A method of forming tobacco rods, comprising:
providing an endless bead of tobacco;
5 creating tobacco-less gaps in the bead, the gaps regularly spaced apart along
the bead;
wrapping the bead in an endless length of paper wrapper; and
dividing the wrapped bead into tobacco rods by cutting through the paper
wrapper where it overlays the gaps.
10
2. A method according to claim 1, in which each gap has a length equal to twice a
length of paper wrapper required for subsequent folding over the tobacco; and
dividing the wrapped bead comprises cutting through the paper wrapper at the
longitudinal mid-point of each gap.
15
3. A method according to claim 2, in which the gaps are spaced apart by a
distance equal to twice a length of tobacco intended for smoking articles to be made
from the tobacco rods.
- 20 4. A method according to claim 3, further comprising dividing the tobacco rods
longitudinally in half by cutting through at the longitudinal mid-point of each tobacco
rod.
5. A method according to claim 2, in which the gaps are spaced apart by a
25 distance equal to a length of tobacco intended for smoking articles to be made from
the tobacco rods.

-18-

6. A method according to claim 1, in which each gap has a length equal to a length of paper wrapper required for subsequent folding over the tobacco; the gaps are spaced apart by a distance equal to a length of tobacco intended for smoking articles to be made from the tobacco rods; and dividing the wrapped bead comprises cutting
5 through the paper wrapper substantially flush with one end of each gap.

7. A method according to any one of claims 1 to 6, in which creating the tobacco-less gaps in the bead comprises removing tobacco from the bead.

10 8. A method according to claim 7, in which removing tobacco from the bead comprises trimming away the full width of tobacco in the bead over the length of each gap using an ecreteur.

15 9. A method according to any one of claims 1 to 6, in which creating the tobacco-less gaps in the bead comprises dividing the bead into longitudinal portions of tobacco and moving the portions apart.

20 10. A method according to claim 9, in which dividing the bead and moving the portions of tobacco apart comprises bringing a screw thread which is rotating about an axis parallel to the length of the bead into contact with the bead while the bead is travelling longitudinally, the screw thread having a thread with a thickness which increases with distance along the screw thread.

25 11. A method according to claim 10, in which the screw thread has a thread which commences from a point at the leading end of the screw thread, the thread having a radius that increases with distance along the screw thread from the point over at least part of the length of the screw thread.

12. A method according to claim 10, in which the screw thread has a thread which commences from a leading edge arranged substantially along a radius of the thread, the thread having a substantially constant radius.
- 5 13. A method according to claim 9, in which dividing the bead and moving the portions of tobacco apart comprises moving at least one rotating disc into and out of the bead, the disc rotating about an axis parallel to the bead and having a thickness that increases from the edge to the centre of the disc.
- 10 14. Apparatus for forming tobacco rods, comprising:
a conveying device for supporting and conveying an endless bead of tobacco;
a tobacco spacing device operable to create regularly spaced apart tobacco-less gaps in the bead;
a garniture and a paper wrapper supply arranged to receive the bead after
15 creation of the gaps and wrap the bead in an endless length of paper wrapper; and
a cutter operable to divide the wrapped bead into tobacco rods by cutting through the paper wrapper where it overlays the gaps.
15. Apparatus according to claim 14, in which the tobacco spacing device creates
20 the gaps by removing tobacco from the bead.
16. Apparatus according to claim 15, in which the tobacco spacing device comprises an ecreteur having at least one trimmer disc with a circumference height profile configured to trim away the full width of tobacco in the bead over the length of
25 each gap.

-20-

17. Apparatus according to claim 14, in which the tobacco spacing device creates the gaps by dividing the bead into longitudinal portions of tobacco and moving the portions apart.

5 18. Apparatus according to claim 17, in which the tobacco spacing device comprises a screw thread rotatable about an axis parallel to the length of the bead such that the thread of the screw thread passes through the bead as it is carried by the conveying device, the thread with a thickness which increases with distance along the screw thread.

10

19. Apparatus according to claim 18, in which the screw thread has a thread which commences from a point at the leading end of the screw thread, the thread having a radius that increases with distance along the screw thread from the point over at least part of the length of the screw thread.

15

20. Apparatus according to claim 18, in which the screw thread has a thread which commences from a leading edge arranged substantially along a radius of the thread, the thread having a substantially constant radius.

20

21. Apparatus according to claim 17, in which the tobacco spacing device comprises at least one disc rotatable about an axis parallel to the bead and movable into and out of the bead while rotating, the disc having a thickness that increases from the edge to the centre of the disc.

AMENDED CLAIMS**received by the International Bureau on 6 January 2009 (06.01.09)**

1. A method of forming tobacco rods suitable for the manufacture of tobacco products with at least one closed end, the method comprising:
 - providing an endless bead of tobacco;
 - creating tobacco-less gaps in the bead, the gaps regularly spaced apart along the bead;
 - wrapping the bead in an endless length of paper wrapper; and
 - dividing the wrapped bead into tobacco rods by cutting through the paper wrapper where it overlays the gaps.
2. A method according to claim 1, in which each gap has a length equal to twice a length of paper wrapper required for subsequent folding over the tobacco; and dividing the wrapped bead comprises cutting through the paper wrapper at the longitudinal mid-point of each gap.
3. A method according to claim 2, in which the gaps are spaced apart by a distance equal to twice a length of tobacco intended for smoking articles to be made from the tobacco rods.
4. A method according to claim 3, further comprising dividing the tobacco rods longitudinally in half by cutting through at the longitudinal mid-point of each tobacco rod.
5. A method according to claim 2, in which the gaps are spaced apart by a distance equal to a length of tobacco intended for smoking articles to be made from the tobacco rods.
6. A method according to claim 1, in which each gap has a length equal to a length of paper wrapper required for subsequent folding over the tobacco; the gaps are spaced apart by a distance equal to a length of tobacco intended for smoking articles to be made from the tobacco rods; and dividing the wrapped bead comprises cutting through the paper wrapper substantially flush with one end of each gap.

7. A method according to any one of claims 1 to 6, in which creating the tobacco-less gaps in the bead comprises removing tobacco from the bead.

8. A method according to claim 7, in which removing tobacco from the bead comprises trimming away the full width of tobacco in the bead over the length of each gap using an ecreteur.

9. A method according to any one of claims 1 to 6, in which creating the tobacco-less gaps in the bead comprises dividing the bead into longitudinal portions of tobacco and moving the portions apart.

10. A method according to claim 9, in which dividing the bead and moving the portions of tobacco apart comprises bringing a screw thread which is rotating about an axis parallel to the length of the bead into contact with the bead while the bead is travelling longitudinally, the screw thread having a thread with a thickness which increases with distance along the screw thread.

11. A method according to claim 10, in which the screw thread has a thread which commences from a point at the leading end of the screw thread, the thread having a radius that increases with distance along the screw thread from the point over at least part of the length of the screw thread.

12. A method according to claim 10, in which the screw thread has a thread which commences from a leading edge arranged substantially along a radius of the thread, the thread having a substantially constant radius.

13. A method according to claim 9, in which dividing the bead and moving the portions of tobacco apart comprises moving at least one rotating disc into and out of the bead, the disc rotating about an axis parallel to the bead and having a thickness that increases from the edge to the centre of the disc.

14. Apparatus for forming tobacco rods suitable for the manufacture of tobacco products with at least one closed end, the apparatus comprising:

a conveying device for supporting and conveying an endless bead of tobacco;

a tobacco spacing device operable to create regularly spaced apart tobacco-less gaps in the bead;

a garniture and a paper wrapper supply arranged to receive the bead after creation of the gaps and wrap the bead in an endless length of paper wrapper; and

a cutter operable to divide the wrapped bead into tobacco rods by cutting through the paper wrapper where it overlays the gaps.

15. Apparatus according to claim 14, in which the tobacco spacing device creates the gaps by removing tobacco from the bead.

16. Apparatus according to claim 15, in which the tobacco spacing device comprises an ecreteur having at least one trimmer disc with a circumference height profile configured to trim away the full width of tobacco in the bead over the length of each gap.

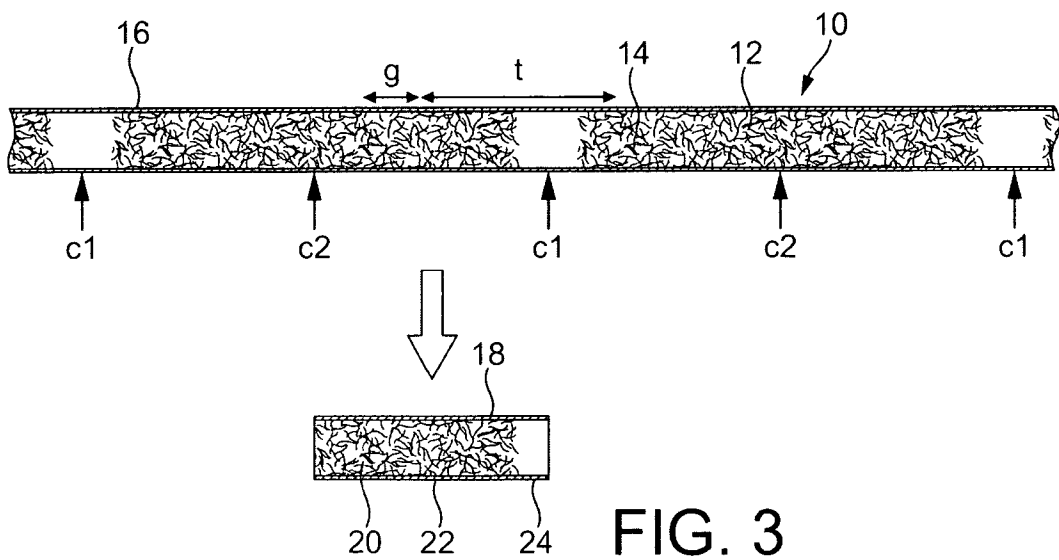
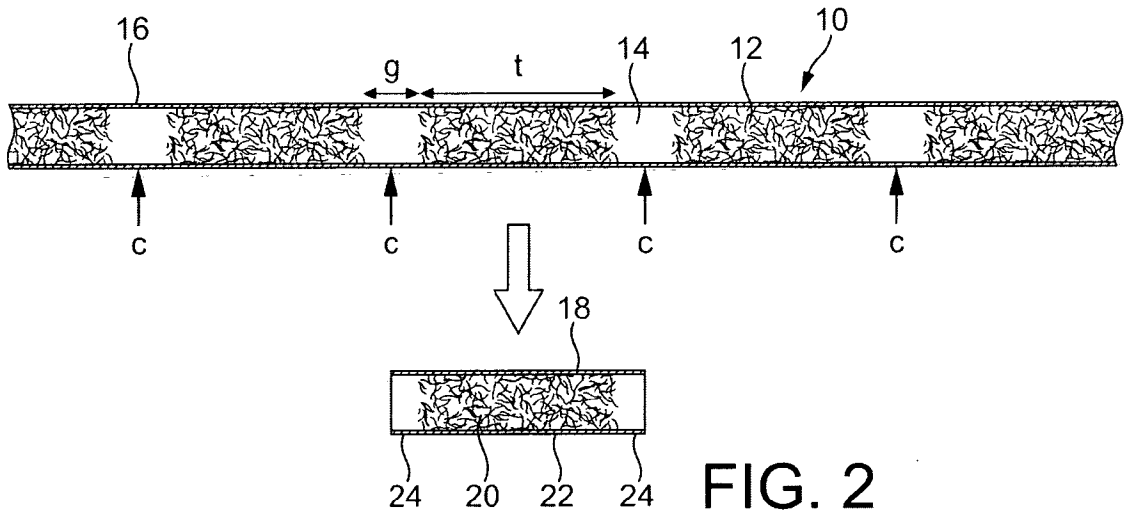
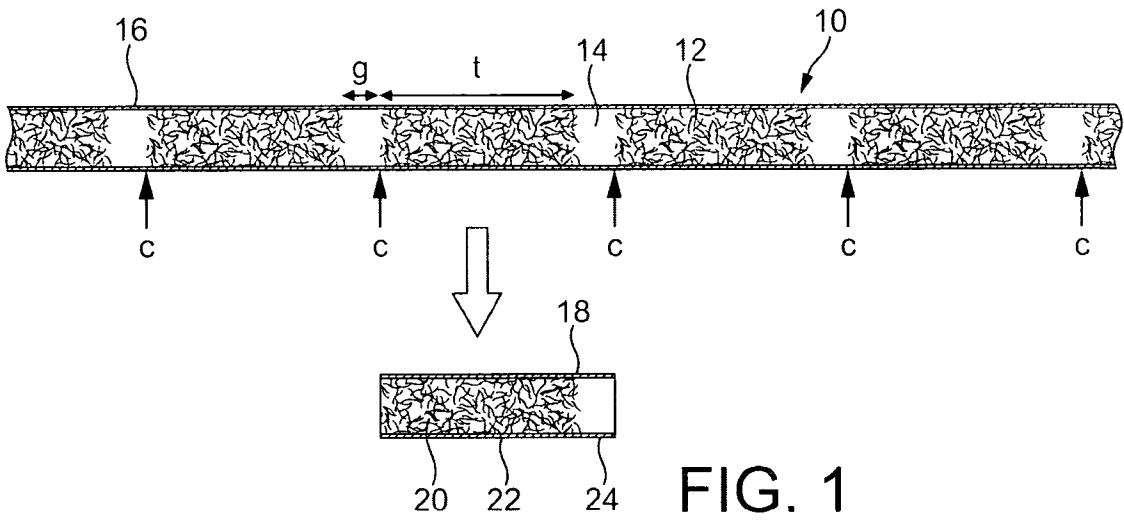
17. Apparatus according to claim 14, in which the tobacco spacing device creates the gaps by dividing the bead into longitudinal portions of tobacco and moving the portions apart.

18. Apparatus according to claim 17, in which the tobacco spacing device comprises a screw thread rotatable about an axis parallel to the length of the bead such that the thread of the screw thread passes through the bead as it is carried by the conveying device, the thread with a thickness which increases with distance along the screw thread.

19. Apparatus according to claim 18, in which the screw thread has a thread which commences from a point at the leading end of the screw thread, the thread having a radius that increases with distance along the screw thread from the point over at least part of the length of the screw thread.

20. Apparatus according to claim 18, in which the screw thread has a thread which commences from a leading edge arranged substantially along a radius of the thread, the thread having a substantially constant radius.

21. Apparatus according to claim 17, in which the tobacco spacing device comprises at least one disc rotatable about an axis parallel to the bead and movable into and out of the bead while rotating, the disc having a thickness that increases from the edge to the centre of the disc.



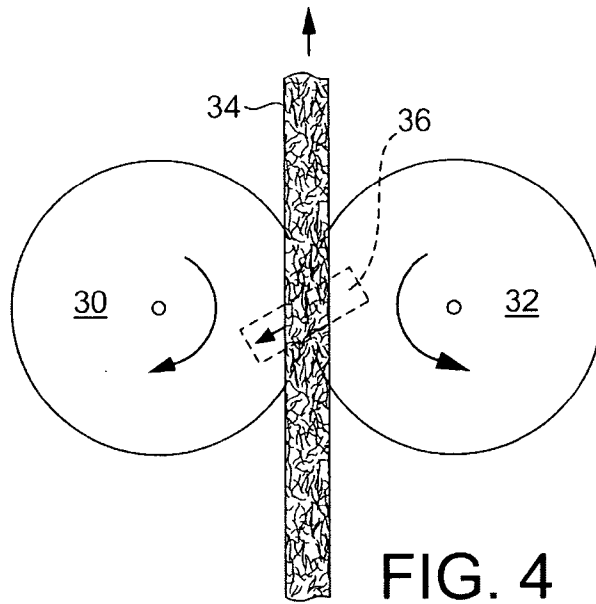


FIG. 4

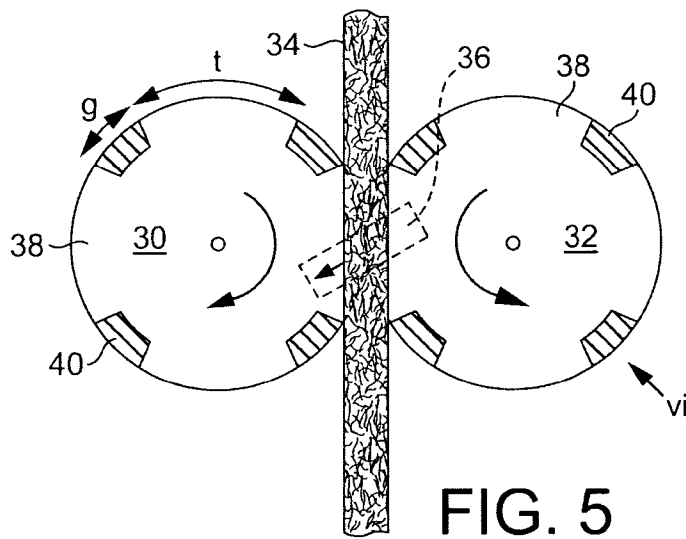


FIG. 5

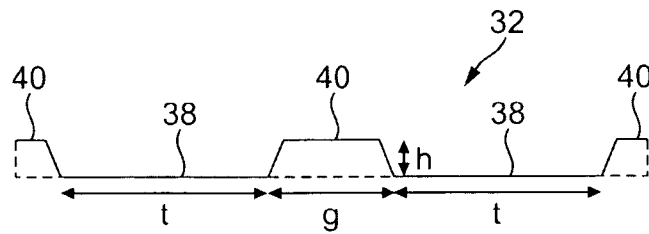


FIG. 6

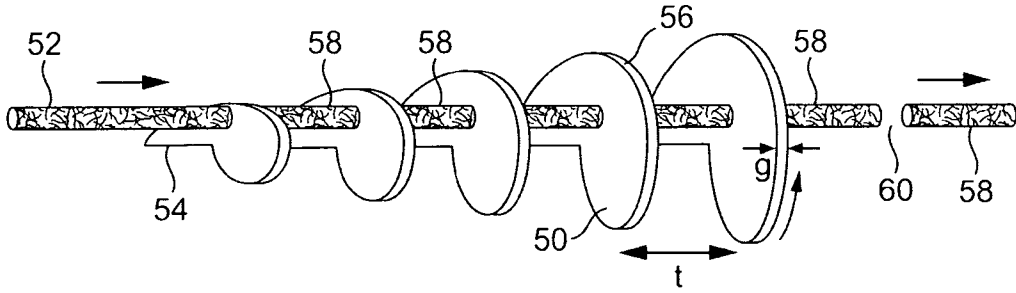


FIG. 7

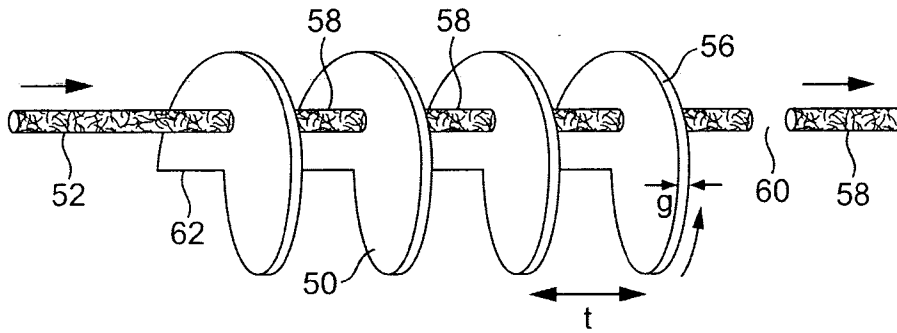


FIG. 8

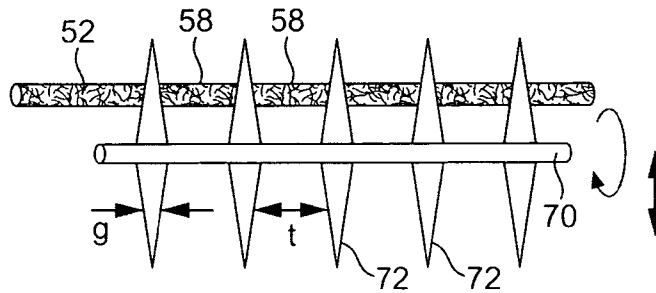


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2008/059812

A. CLASSIFICATION OF SUBJECT MATTER
 INV. A24C5/18 A24C5/54

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 A24C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 124 471 A (IMP GROUP PLC) 22 February 1984 (1984-02-22) page 2, line 35 - line 68; figures -----	1, 7, 14, 15
A	GB 2 168 588 A (IMP GROUP PLC IMP TOBACCO CO LTD) 25 June 1986 (1986-06-25) the whole document -----	1, 14
A	CH 286 485 A (KOERBER KURT ADOLF [DE]; CREUZIGER ALBERT HERMANN [CH]) 31 October 1952 (1952-10-31) page 1, line 20 - line 41 page 2, line 72 - line 78; figure 1 -----	1, 14
A	GB 2 170 693 A (MOLINS PLC) 13 August 1986 (1986-08-13) page 4, line 69 - page 5, line 38; figures -----	1, 14
	-/--	

 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *Z* document member of the same patent family

Date of the actual completion of the international search

28 October 2008

Date of mailing of the international search report

06/11/2008

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040,
 Fax: (+31-70) 340-3016

Authorized officer

Marzano Monterosso

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2008/059812

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 00/54611 A (PHILIP MORRIS LIMITED [AU]; BRUDAR MIKE [AU]; TROFIMIUK ANDREW [AU]; G) 21 September 2000 (2000-09-21) abstract; figures -----	1,14
A	GB 2 172 187 A (KOERBER AG KOERBER AG [DE]) 17 September 1986 (1986-09-17) page 3, line 69 - page 4, line 127; figures -----	1,14

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2008/059812

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2124471	A	22-02-1984	AU 571390 B2 14-04-1988
			AU 1759083 A 09-02-1984
			BR 8304191 A 13-03-1984
			CA 1209873 A1 19-08-1986
			DE 3367155 D1 04-12-1986
			EP 0101227 A1 22-02-1984
			JP 1449622 C 11-07-1988
			JP 59045867 A 14-03-1984
			JP 62055834 B 21-11-1987
			US 4630618 A 23-12-1986
			ZA 8305739 A 25-04-1984
GB 2168588	A	25-06-1986	NONE
CH 286485	A	31-10-1952	NONE
GB 2170693	A	13-08-1986	DE 3603749 A1 14-08-1986
			FR 2577112 A1 14-08-1986
			IT 1190485 B 16-02-1988
			JP 1929086 C 12-05-1995
			JP 6053058 B 20-07-1994
			JP 61227769 A 09-10-1986
			US 4793364 A 27-12-1988
WO 0054611	A	21-09-2000	NONE
GB 2172187	A	17-09-1986	DE 3509612 A1 25-09-1986
			IT 1189990 B 10-02-1988
			JP 61212272 A 20-09-1986
			US 4693263 A 15-09-1987