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(54) **Method and system for manufacturing tobacco articles**

(57) A method of drying cigars during their manufacture comprises the steps of: providing a plurality of tobacco rods; arranging the plurality of tobacco rods in a continuous layer; and applying a radio frequency, RF,

radiation to the plurality of arranged tobacco rods having a first moisture level to thereby heat the tobacco rods at a temperature within the range of 190° - 212° F and reduce the first moisture level.

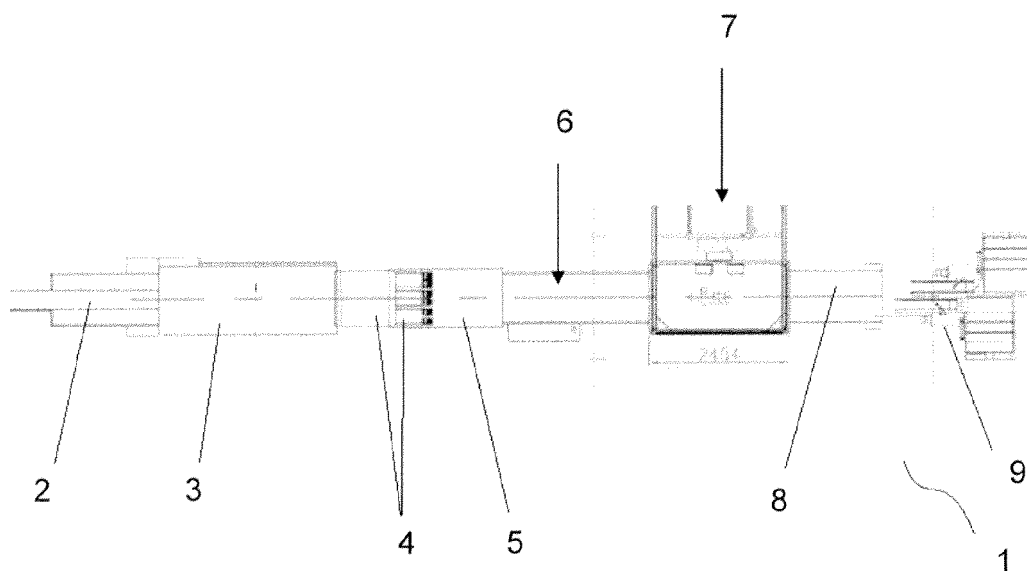


Figure 1A

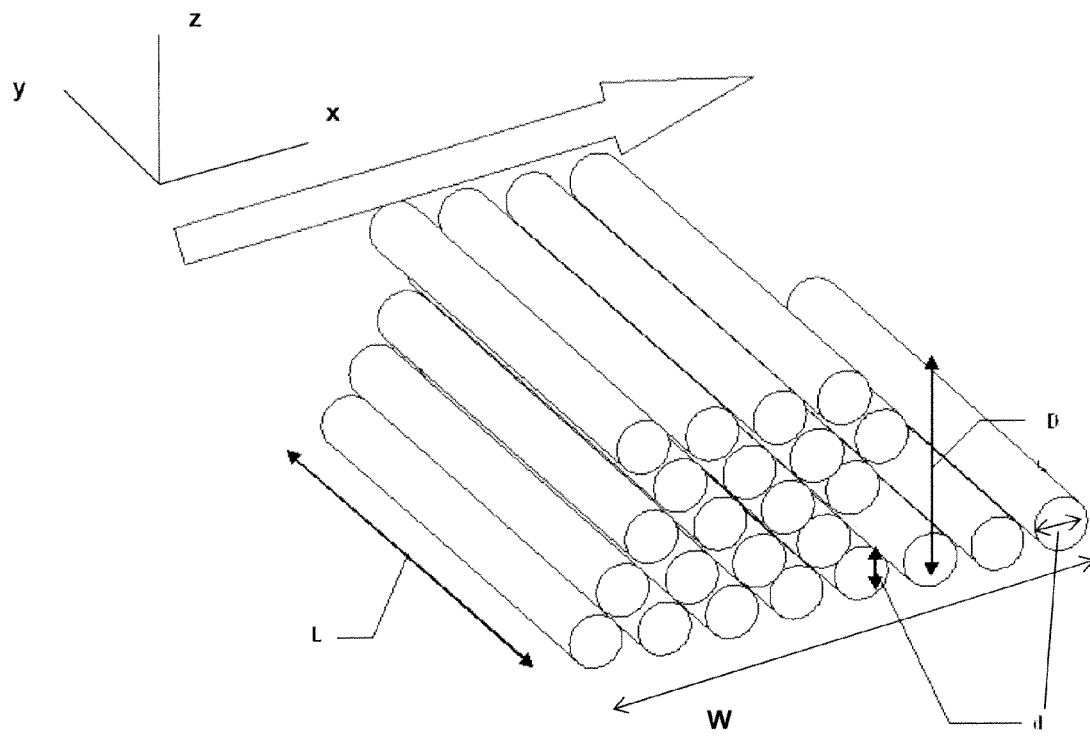


Figure 1B

Description

[0001] The present invention relates to the manufacturing of tobacco articles. In particular, the invention relates to a method and system of drying cigars during their manufacturing process.

[0002] Methods of manufacturing tobacco articles, such as cigars for example, are well known. Traditionally, cigars have been hand made, but most cigars available on the market nowadays are machine made. At present, standard processes for manufacturing cigars include the following steps:

1. Double length cigar rods are machined from loose tobacco at about 13% by weight moisture.
2. The double length rods are stored for approximately 24 hours. This allows the rods time for cooling and moisture equilibration required to achieve sufficient firmness for further processing (and gives the tobacco varieties inside the cigar rods time to fuse their taste). Moisture equilibration is the process whereby the moist rods reach equilibrium with the ambient relative humidity of the air by absorbing or desorbing moisture.
3. The double length rods are wrapped in natural tobacco leaf. This may raise the moisture of the wrapped cigar rods to 25% by weight moisture for bigger diameter cigars, e.g. 10mm, and to 30% by weight moisture for smaller diameter cigars, e.g. 7mm.
4. The wrapped tobacco rods (also referred to as over wrapped or over rolled cigar rods) are stored in bundles on trolleys which are moved to a conditioning room for drying from up to 30% to approximately 16% by weight moisture.
5. The semi-dried wrapped cigar rods are moved, usually by trolleys, to a pressing unit which cuts them to single cigar length and trims any badly formed cigar ends.
6. The single length cigars are dried to pack moisture. The pressed single length cigars are moved in trays on trolleys to a conditioning room for 24 to 48 hours to dry to pack moisture at 12.5%.

[0003] Standard processes of manufacturing cigars comprising the steps listed above have several disadvantages. Firstly, these processes are slow, taking approximately six working days from making the double length cigar rods to packing the cigars. Furthermore, additional time is required between cigar making cycles for the cigars to return to appropriate levels of heat and moisture before the next process can commence. Typically, it takes 24 hours to allow the cigars to return to appropriate levels to permit further processing with acceptable yield and quality.

[0004] Secondly, during standard manufacturing processes, cigars are manually loaded onto trolleys and moved to and from the conditioning room. This requires

excessive storage space, is energy consuming as well as labour intensive.

[0005] Thirdly, standard processes often lead to imperfect products thereby reducing the manufacturing process efficiency. Cigar rods are usually dried in bundles of approximately 1800 rods. The cigar rods at the outer edges of these bundles tend to over dry, e.g. having 12% by weight moisture instead of a moisture target of 16% by weight required for the pressing process stage. At cigar conditioning room settings of 60% Relative Humidity (RH) and 20 degrees Centigrade required to achieve target pack moisture by weight of 16% the over-wrapped cigars achieve a range of moistures depending on their position in the bundle and drying time. If the process is set to have the cigars at the outer edge, these may reach an equilibrium moisture value of 16%. Cigars at the centre of the bundle experience little moisture loss, e.g. up to 21% by weight moisture, and tend to under dry. The under dried, wet, cigar rods are too soft to machine process further and are therefore rejected. Furthermore, the inhomogeneous moisture content throughout the rod can affect smoking quality by causing collapse of the expanded cigar filler used in the cigars. If the process is set to have the cigars at the centre of the bundle dried to reach the equilibrium moisture value of 16%, cigars at the outer edge reach tend to over dry, and may suffer outer wrap damage during pressing.

[0006] In recent years, the use of electromagnetic radiation for drying cigars during their manufacturing process has been proposed. However, not all electromagnetic radiation is useful for drying cigars during their manufacturing or indeed legal.

[0007] At the lower energy part of the electromagnetic spectrum, infrared and microwave radiation may be used legally. Infrared radiation has a nominal frequency range of approximately 430 to 1 THz while microwave radiation has a nominal frequency range of 0.3 to 300 GHz.

[0008] However, the use of infrared radiation has a disadvantage in that infrared radiation heats the surface of cigar rods, drying the outside of a cigar rod, while the centre of the cigar rod dries more slowly. The over dried outer wrap on the cigar rod is therefore easily damaged. Cigars must be rotated in the infrared heating source to prevent one sided drying which causes the cigars to bend. Furthermore, infrared radiation does not automatically alter its power in response to moisture variability in the dried sample.

[0009] Accordingly, the use of infrared radiation is not appropriate for obtaining the required moisture loss of 10% by weight for cigar rods produced by a standard over wrapping machine. Standard over wrapping machines include, for example, a Medium Speed Over roller producing 50 double length rods per minute (MSO-50) made by Ensa, or a High Speed Over roller producing 200 double length rods per minute (HSO-200) made by Arenco. Accordingly, the MSO-50 typically provides a throughput of 100 single length cigar rods per minute, while the HSO-200 provides a throughput of 400 cigar

rods per minute.

[0010] Microwave radiation is rapidly absorbed at cigar surfaces. Additionally, microwave radiation generates interference patterns, creating hot and cold spots within a drying cavity containing the sample to be dried. Therefore cigar rods dried via microwave radiation are not heated uniformly, leading to inhomogeneous moisture content throughout the rod. Accordingly, non uniform heating in small microwaves requires rotating of the sample in the drying cavity to achieve improved moisture consistency. This is energy consuming and impractical for drying cigar rods during their manufacture.

[0011] Accordingly, there is a need for a technique for drying cigars which overcomes the disadvantages associated with existing manufacturing processes.

[0012] In accordance with one aspect of the present invention there is provided a method of drying cigars during their manufacture, the method comprising the steps of providing a plurality of tobacco rods arranging the plurality of tobacco rods in a continuous layer; and applying a radio frequency, RF, radiation to the plurality of arranged tobacco rods having a first moisture level to thereby heat the tobacco rods at a temperature within the range of 190 - 212° F and reduce the first moisture level.

[0013] In accordance with another aspect of the present invention there is also provided a system for drying cigars during their manufacture, the system comprising:

means for providing a plurality of tobacco rods;
means for arranging the plurality of tobacco rods in a continuous layer; and a RF dryer adapted, in use, to apply radiation to the plurality of arranged tobacco rods having a first moisture level to thereby heat the tobacco rods at a temperature within the range of 190° - 212° F and reduce the first moisture level.

[0014] According to the present invention therefore, cigar rods, referred to as tobacco rods, are dried in a continuous layer using radio frequency, RF, radiation. It would be understood that the term 'continuous' refers to arranging the tobacco rods in rows of parallel tobacco rods such that there is none or very little empty space between the tobacco rods in a row. The layer is continuous in a horizontal direction in the plane of the layer, which is also the direction in which the tobacco rods are transported through the RF dryer, for example on a conveyor belt. This direction is also referred to as the direction of mass flow. The tobacco rods may be in contact along their axial length or have small evenly spaced gaps between them.

[0015] The tobacco rods may be arranged in multiple rows of parallel tobacco rods, the rows being stacked on top of each other in a vertical direction perpendicular to the plane of the layer. Preferably, the layer may be one to 5 rows deep in the vertical direction. At more than one row deep, all tobacco rods are in contact horizontally and vertically. At depths greater than 5 cigars, drying be-

comes progressively less uniform, the tobacco rods in the centre rows having relatively slightly higher moisture than the tobacco rows in the outer rows (i.e. bottom and top rows in the layer).

[0016] The width of each layer is approximately equal to the diameter of each tobacco rod d times the number of parallel tobacco rods in each row, arranged along the direction of mass flow. The length of each layer may be equal to the length of the tobacco rods times the number of tobacco rods in the row arranged in a direction in the layer plane perpendicular to the direction of mass flow. In preferred embodiments, the length of each layer is equal to the length of the tobacco rods. The depth of each layer is approximately equal to the diameter of each tobacco rod times the number of rows in each layer.

[0017] Unlike in standard processes which group the tobacco rods into discontinuous bundles, in the method according to the present invention all tobacco rods are arranged in continuous layers (preferably a single layer) and are therefore subjected to the same drying conditions, drying uniformly.

[0018] Preferably, the RF radiation has a frequency range of 30 kHz to 0.3 GHz, preferably 13 to 40 MHz in order to avoid the problems associated with using microwave radiation. RF has a nominal frequency range of 30 kHz to 300 GHz. The preferred non-microwave radio frequency range, of 13 to 40 MHz is less energetic than microwave radiation (having a nominal frequency range of 0.3 to 300 GHz) and is therefore legal. The non-microwave RF radiation has a longer wavelength than microwave and therefore has a greater penetration power than microwave radiation. Accordingly, RF energy does not surface heat or generate hot and cold spots at usable cavity dimensions and can be easily and cost effectively scaled to production throughput.

[0019] Advantageously, RF radiation can self adjust power as moisture in the drying cavity changes, higher moisture allowing for greater power transmission. Additionally, RF radiation is channelled to high moisture areas of a variable moisture sample. Since RF radiation is absorbed by moisture, higher moisture samples receive more energy which results in a consistent cigar output moisture for subsequent processing. This increases the firmness of the cigars as well as pressure drop and smoking quality while reducing the standard deviation of the pack moisture. Furthermore, reduced variability in the moisture of cigars leads to avoiding the expanded filler to collapse when exposed to high moisture content and results in improved visual and smoking quality.

[0020] Advantageously, the energy consumption in the process according to the invention is reduced approximately by a factor of 5. Heated air and moisture required for conditioning drying are not required for the RF drying process. Accordingly, the RF energy is used only when the RF dryer cavity is activated by the introduction of cigar layers into the cavity. Advantageously, the energy used in drying is proportional to the quantity of moisture in the RF cavity.

[0021] Furthermore, the processing time is reduced to approximately one working day instead of 5 to 6 working days required in standard processes, thereby increasing the speed of the process by about 5 times.

[0022] A further advantage of using RF radiation is the low unit cost of the RF dryer. One RF dryer per rod machine maker or high speed pressing unit minimises conveyor costs. A single RF drying unit can dry the output of a number of making machines, including MSO and HSO over-wrapping machines or high speed pressing units where conveying costs are relatively low. Furthermore, the power consumption is lower for RF drying processes in comparison with standard conditioning room processes.

[0023] Each tobacco rod may be wrapped in tobacco leaf before the step of arranging the tobacco rods in a single layer and their subsequent drying. In comparison with standard processes, RF energy is focused on areas of high moisture in the layer of tobacco rods, reducing the drying time from about 144 hours required in standard processes to minutes. Furthermore, the drying of tobacco rods arranged in continuous layers is more consistent giving a reduced standard deviation in moisture levels throughout the tobacco rod. A further advantage of drying the wrapped tobacco rods in a continuous layer using RF

frequency is that the number of rejected rods at pressing due to rod collapse or tobacco leaf chipping is reduced by 3%.

[0024] Alternatively, each tobacco rod may be wrapped in tobacco leaf after RF drying the tobacco rods. This provides an advantage in that there is no time delay before packing, decreasing the process time by approximately 142 hours. Furthermore, the drying time, measured between over-wrapping and packing the tobacco rods, is reduced from about 144 hours to minutes.

[0025] Advantageously, by wrapping the tobacco rods after RF drying in accordance with the present invention, the maximum moisture achieved by the cigar in processing is significantly reduced. The reduced maximum process moisture prevents the collapse of expanded tobacco where this is present in the cigar. Additionally, the drying obtained is more consistent giving reduced standard deviation in moisture levels throughout the rod and thereby a more consistent product feel and smoke.

[0026] Furthermore, the cigar firmness and draw resistance are significantly increased, potentially permitting weight saving at any required, fixed, cigar hardness. Draw resistance represents a measure of the effort required for the smoker to draw smoke from the cigar; the draw resistance is increased with the tobacco weight in the cigar and with expansion of the cigar filler. Accordingly, consumer acceptability is improved by increased draw resistance and the visual quality of the cigars is improved by reduced damage to the outer tobacco leaf.

[0027] In order to obtain optimum heating performance, the tobacco rods are heated to reach an internal temperature i.e. approximately at the centre thereof, of about 212° F (100° C). This may be achieved by obtained

by applying the RF frequency at a power of 4-25 kW to heat a tobacco rod for 20 - 120 seconds.

[0028] Examples of methods and systems of drying cigars during their manufacturing in accordance with the present invention will now be described with reference to the following figures.

Figure 1A is a schematic representation of a system of manufacturing cigars;

Figure 1B represents an example of a continuous layer of tobacco rods;

Figure 2 is a table providing details of a first embodiment of a method of drying cigars during their manufacturing process;

Figure 3 is a table providing details of a second embodiment of a method of drying cigars during their manufacturing process; and

Figure 4 is a table providing details of a third embodiment of a method of drying cigars during their manufacturing process.

[0029] With reference to Figure 1A, an exemplary system 1 of manufacturing cigars comprises a hopper 2 which produces double length tobacco rods and over-wraps the tobacco rods. The hopper 2 feeds the over-wrapped tobacco rods into a presser 3 where the double length rods are pressed and cut at cigar length. The system 1 further comprises a collator 5, which may include for example, a standard High Speed Pressing (HSP) collator unit 4 adapted to collate 1200 rods per minute. For example, standard HSP collator units are manufactured by Brockfeld & Meyer. The collator 5 is adapted to transfer the tobacco rods pressed and cut by the presser 3 into a trimmer 6 which trims any badly formed rod ends.

[0030] The trimmed tobacco rods are then arranged in continuous layers, preferably a single layer, and dried in a dryer 7 which operates at RF frequencies. As shown in Figure 1 B, the tobacco rods are continuous in the horizontal direction x or direction of mass flow indicated by the arrow. The tobacco rods may be in contact along their axial length L or have small evenly spaced gaps between them. The layer may be one to 5 rows deep in the vertical direction z. At more than one row deep, all tobacco rods are in contact horizontally and vertically. At depths greater than 5 tobacco rods, drying becomes progressively less uniform, the tobacco rods in the centre rows having relatively slightly higher moisture than the rods in the outer rows.

[0031] The width W of each layer is approximately equal to the diameter of each tobacco rod d times the number of parallel tobacco rods in each row, arranged along the direction of mass flow x. The length L of each layer may be equal to the length of the tobacco rods, although it will be appreciated that a row may comprise a plurality of tobacco rods arranged along the y direction. The depth D of each layer is approximately equal to the diameter d of each tobacco rod times the number of rows in each layer.

[0032] For example, a suitable RF dryer 7 for use in the process is a SWP series RF dryer manufactured by Strayfield Ltd. The RF dryer 7 may operate at adjustable frequencies. For example, the RF dryer manufactured by Strayfield operates at around 27.1 MHz. This RF frequency is chosen to minimise higher voltages required for lower frequency, around 13 MHz, which may cause fires by arcing. Furthermore, the frequency is selected to maximise power delivery.

[0033] At 27.1 MHz, the band width tolerance is maximised allowing maximum flexibility in the RF dryer operation and suitable RF control systems. Furthermore, the RF dryer may operate at fixed or variable powers, typically 0-25 kW at 0-10 m/min conveyor speed. Preferably, the RF dryer is operated between 4 and 25 kW. The selection of wavelength and internal electronic control systems is required for optimum drying performance.

[0034] In practice, it has been found that optimum drying performance is achieved when the tobacco rods are internally heated, i.e. approximately at the centre thereof, at a temperature of about 212° F (100° C). In order to obtain the required amount of heating of the tobacco rods, there is a trade-off between the rate of energy to be absorbed by the tobacco rods and the amount of time that the cigar rod is heated. The power dissipation of the RF dryer varies inversely with the time that the tobacco rods are subjected to the RF field, i.e. the speed of the conveyor belt. The present inventors have found that, using the radio frequency of around 27.1 MHz, optimum drying performance is obtained by operating the RF dryer in the range 4-25 kW to dry a tobacco rod for 20 - 120 seconds. In other words, when the tobacco rods enter a heating region in the RF dryer, the tobacco rods are heated for 20 -120 seconds to about 212° F.

[0035] A standard RF dryer has a length of approximately, 3m, a width of 1 m and a height of 2m. It would be appreciated that these are merely exemplary values, and are not intended to be limiting.

[0036] The dried cigars may then be forwarded to an inspection unit 8 for checking the quality of the cigars. Finally, the inspected cigars may be forwarded to a tray filling unit 9 for packing and further processing.

[0037] As shown in Figure 1, the RF dryer 7 may be installed just before the inspection unit 8, after the trimmer 6. It will be appreciated however that the RF dryer 7 could be located anywhere in the manufacturing system 1. Alternative locations of the RF dryer 7 will be described in more detail below, with reference to alternative methods in accordance with the present invention.

[0038] Figure 2 is a table providing details of a first embodiment of a method of drying cigars during their manufacture in accordance with the present invention. In the first step of the process, the machine makes double length (DL) tobacco rods S10 at about 13% by weight moisture from loose tobacco. The double length tobacco rods may be arranged in bundles for transfer to the next process stage S12, where the double length rods are over wrapped achieving moisture of up to 30% by weight.

Alternatively, instead of bundling, the cigar rods could be transferred on conveyors between process stages, as indicated in Figures 2 to 5.

[0039] Over wrapping the 10mm diameter tobacco rods typically adds about 9 to 17% moisture. Therefore, the over wrapped rods have a moisture of approximately 22 to 30%. The required moisture loss post RF drying usually depends on the amount of moisture applied at the wrapping step S12. If the moisture of the wrapped rods is higher than the nominal value of 16% required for pressing, then moisture may be easily removed using a conditioning room set at 70% RH and 30 degrees Centigrade or an RF drying stage.

[0040] For rods dried in a conditioning room S14 pre RF drying of the over wrapped tobacco rods are left to rest for about 48 hours for example in the conditioning or drying room in order to achieve moisture equilibrium. The double length rods are then fed by a hopper 2 into a presser 3 where they are pressed S16 and cut to single cigar length. Optionally, the moisture content after pressing S16 may be slightly reduced to the final desired value of approximately 15% by using a heated presser 3.

[0041] The single length cigar rods having 15% moisture are dried S18 to approximately 12.5% moisture in a RF dryer 7, the rods arranged, preferably, in a single continuous layer. Alternatively, the rods may be stacked in several continuous layers, preferably up to five layers. Finally, the cigars may then be inspected and forwarded to a tray filling unit 9 and subsequently packed S19, retaining the 12.5% pack moisture.

[0042] Figure 3 is a table providing details of a second embodiment of a method of drying cigars during their manufacturing. As will be described in detail below, this embodiment includes a single stage RF drying stage, wherein the RF dryer 7 may be used. The RF dryer may be fitted in the hopper 2, just before the tobacco rods are over-wrapped.

[0043] As a first step, the machine makes S20 double length rods at about 13% by weight moisture from loose tobacco. The double length rods are then RF dried S22 in a, preferably single, continuous layer to 5% moisture. Alternatively, the rods may be stacked in several continuous layers, preferably up to five layers. Almost immediately after RF drying, the rods are over wrapped in tobacco leaf S24, resulting in a total moisture of approximately 14%. The over wrapped rods may be then left to rest for about two hours to achieve moisture equilibrium.

[0044] The moisture content of the over wrapped rods may be slightly reduced to the final desired value of approximately 13% by the use of a heated presser 3 which presses S26 and cuts the cigars to single length. Finally, the single length cigar rods at 13% moisture are ready for inspection and packing S28. Advantageously, this process requires only one RF dryer 7 at the cigar making machine and there is no requirement for conditioning at any stage. Cigars processed in this manner retain a circular end profile.

[0045] Preferably, the single cigars may be RF dried

in a second stage to produce cigars at pack moisture 12.5%, as shown in Figure 4.

[0046] As a first step, the machine makes S30 double length rods at about 13% by weight moisture from loose tobacco. The double length rods are then RF dried S32 in a, preferably single, continuous layer to 7% moisture. Alternatively, the rods may be stacked in several continuous layers, preferably up to five layers. Almost immediately after RF drying, the rods are over wrapped in tobacco leaf S34, resulting in a total moisture of approximately 16%. The over wrapped rods may be then left to rest for about two hours to achieve moisture equilibrium.

[0047] The moisture content of the over wrapped rods may be reduced from 16% to a value of approximately 15% by the use of a heated presser 3 which presses S36 and cuts the cigars to single length. Finally, the single length cigar rods at 15% moisture are ready for RF drying, S38 inspection and packing S39. This process requires two RF dryers 7 at the cigar making machine and expressing process stages, advantageously there is no requirement for slow conditioning room drying at any stage.

[0048] RF drying can also be used at the over rolling and pressing stages in a two stage process similar that shown in Figure 4.

Claims

1. A method of drying cigars during their manufacture, the method comprising the steps of:
 - providing a plurality of tobacco rods;
 - arranging the plurality of tobacco rods in a continuous layer; and
 - applying a radio frequency, RF, radiation to the plurality of arranged tobacco rods having a first moisture level to thereby heat the tobacco rods at a temperature within the range of 190° - 212° F and reduce the first moisture level.
2. A method of drying cigars during their manufacture according to claim 1, wherein the RF radiation has a frequency range of 30 kHz to 0.3 GHz, preferably 13 to 40 MHz.
3. A method of drying cigars during their manufacture according to claim 1 or claim 2, wherein the layer is a stack comprising at least one row of parallel tobacco rods, preferably up to five rows of parallel tobacco rods.
4. A method of drying cigars during their manufacture according to claim 1 to claim 3, further comprising, before the step of arranging the plurality of tobacco rods in a continuous layer, the step of wrapping each tobacco rod in tobacco leaf.
5. A method of drying cigars during their manufacture

according to claim 1 to claim 3, further comprising the step of wrapping each tobacco rod in tobacco leaf.

6. A method of drying cigars during their manufacture according to claim 4 or claim 5, further comprising the step of pressing the wrapped tobacco rods to thereby obtain cigars.
7. A method of drying cigars during their manufacture according to claim 6, further comprising the step of cutting the cigars to a predetermined length.
8. A method of drying cigars during their manufacture according to claim 7, further comprising the step of applying a RF radiation to the cigars having a second moisture level to thereby reduce the second moisture level.
9. A method according to claim 8, wherein the second moisture level is between 14 and 18% by weight moisture, and wherein the second moisture level is reduced to approximately 12 to 13% by weight moisture, preferably to 12.5% by weight moisture.
10. A method according to any preceding claim, wherein the tobacco rods are heated at a temperature of 212° F.
11. A method according to any preceding claim, wherein the RF radiation is applied at a power less than 25 kW, preferably between 4 and 25 kW.
12. A method according to any preceding claim, wherein the tobacco rods are heated in a time between 20 and 120 seconds.
13. A system for of drying cigars during their manufacture, the system comprising:
 - means for providing a plurality of tobacco rods;
 - means for arranging the plurality of tobacco rods in a continuous layer;
 - and
 - a RF dryer adapted, in use, to apply radiation to the plurality of arranged tobacco rods having a first moisture level to thereby heat the tobacco rods at a temperature within the range of 190° -212° F and reduce the first moisture level.

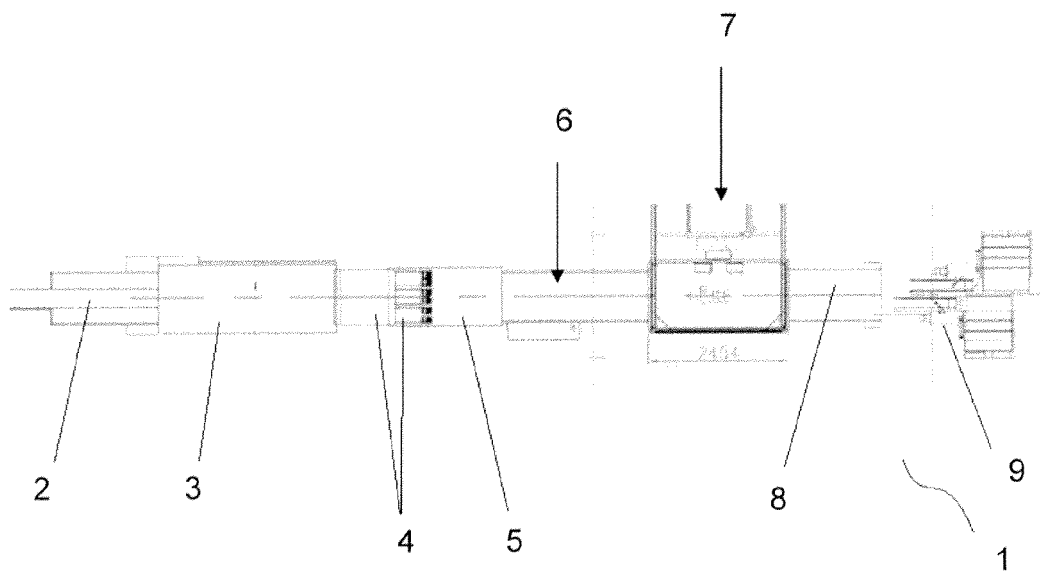


Figure 1A

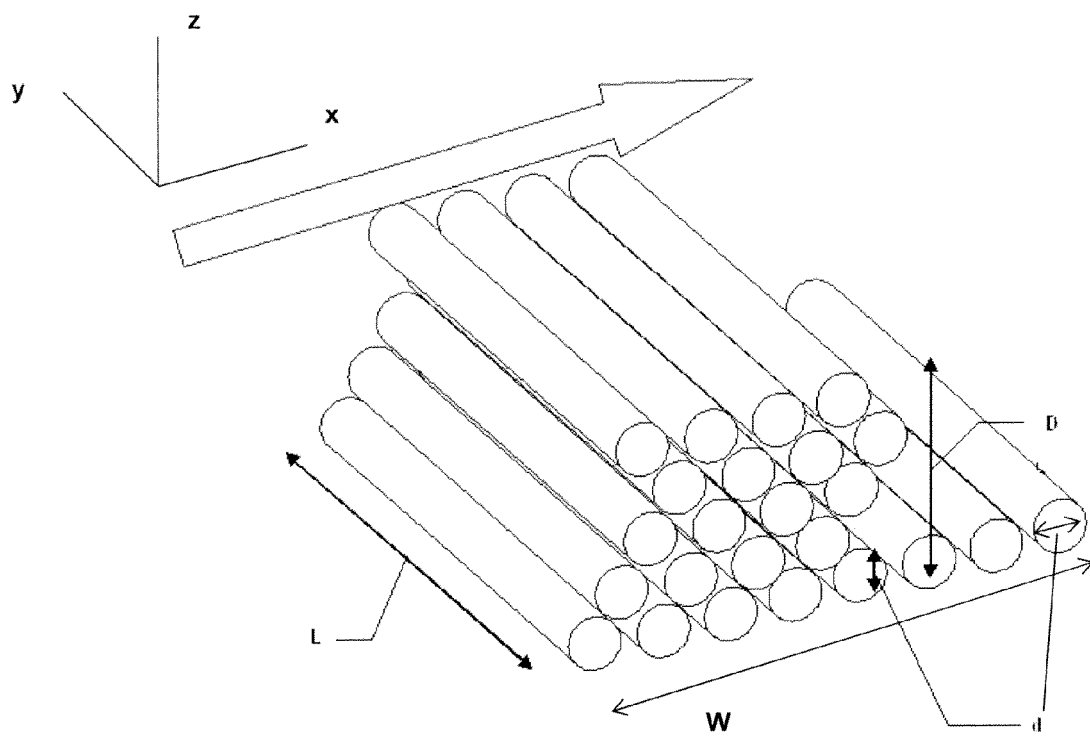


Figure 1B

EP 2 524 607 A1

Single Stage Condition/ Single Stage RF.

Process	Time (Hours)	%Moisture
DL Rod Making S10	24	13
Bundles		13
Over Rolling S12		21-25
Bundles	48	
Conditioning Room S14		16
Pressing S16		15
RF Drying S18		12.5
Packing S19		12.5

Figure 2

Single Stage RF

Process	Time (Hours)	%Moisture
DL Rod Making S20	2	13
RF Drying S22		5
Over Rolling S24		13-15
Bundles		
Pressing S26		12-14
Packing S29		12-14

Figure 3

RF drying ex Making/ RF drying ex Pressing.

Process	Time (Hours)	%Moisture
DL Rod Making S30	2	13
RF Drying S32		7
Over Rolling S34		15-19
Bundles		
Pressing S36		14-18
RF Drying S38		12.5
Packing S39		12.5

Figure 4



EUROPEAN SEARCH REPORT

Application Number
EP 12 16 8429

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 3 820 549 A (FLINCHBAUGH D) 28 June 1974 (1974-06-28) * the whole document *	1-7, 10-13 8,9	INV. A24C1/38 A24B15/22
A	-----		
Y	GB 706 052 A (HELVAR OY) 24 March 1954 (1954-03-24) * page 1, lines 28-34, 59-74 *	1-7,10, 11,13	
Y	DE 16 32 261 B1 (WAGNER JAKOB) 3 February 1972 (1972-02-03) * column 3, lines 30-38 * * column 6, lines 18-23 *	12	
A	GB 947 280 A (KURT KOERBER) 22 January 1964 (1964-01-22) * page 1, lines 50-56 * * page 2, lines 45-51 *	1,13	
A	GB 322 799 A (NEVIL MONROE HOPKINS) 16 December 1929 (1929-12-16) * page 1, lines 10-43 *	1-13	
A	EP 1 092 354 A1 (NIKOLAOU ATHANASIOS [GR]) 18 April 2001 (2001-04-18) * paragraphs [0001], [0008] - [0010]; figures *	1-13	TECHNICAL FIELDS SEARCHED (IPC) A24C A24B
A	DE 10 51 180 B (ARNOLD ANDRE ZIGARRENFABRIK G) 19 February 1959 (1959-02-19) * column 1, lines 1-6 * * page 1, line 49 - column 3, line 49 * * figures *	1-13	
A	US 6 202 649 B1 (WILLIAMS JONNIE R [US]) 20 March 2001 (2001-03-20) * claims 4,10,14 *	1-13	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 30 August 2012	Examiner Kock, Søren
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			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 12 16 8429

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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30-08-2012

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 3820549	A	28-06-1974	NONE		
GB 706052	A	24-03-1954	NONE		
DE 1632261	B1	03-02-1972	NONE		
GB 947280	A	22-01-1964	NONE		
GB 322799	A	16-12-1929	NONE		
EP 1092354	A1	18-04-2001	AT	261255 T	15-03-2004
			AU	2933700 A	23-04-2001
			BG	106706 A	31-01-2003
			BR	0013560 A	09-04-2002
			CA	2388627 A1	19-04-2001
			CN	1379627 A	13-11-2002
			DE	69915477 D1	15-04-2004
			DE	69915477 T2	13-01-2005
			DK	1092354 T3	12-07-2004
			EP	1092354 A1	18-04-2001
			ES	2220025 T3	01-12-2004
			IL	148150 A	03-08-2009
			JP	2003511053 A	25-03-2003
			NO	20020660 A	10-04-2002
			PL	354194 A1	29-12-2003
			PT	1092354 E	31-08-2004
			SI	1092354 T1	31-10-2004
			TR	200200641 T2	21-06-2002
			UA	73750 C2	15-08-2002
			WO	0126493 A1	19-04-2001
DE 1051180	B	19-02-1959	NONE		
US 6202649	B1	20-03-2001	US	6202649 B1	20-03-2001
			US	6425401 B1	30-07-2002
			US	2002174874 A1	28-11-2002
			US	2005109357 A1	26-05-2005