(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 952 105 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
14.08.2019 Bulletin 2019/33

(21) Application number: **13873179.9**

(22) Date of filing: **04.02.2013**

(51) Int Cl.:
A24B 3/04 *(2006.01)* ***A24B 3/18*** *(2006.01)*

(86) International application number:
PCT/JP2013/052490

(87) International publication number:
WO 2014/118988 (07.08.2014 Gazette 2014/32)

(54) EXPANDING METHOD OF TOBACCO RAW MATERIAL AND EXPANDING SYSTEM OF THE SAME

BAUSCHVERFAHREN FÜR TABAKAUSGANGSMATERIAL UND BAUSCHSYSTEM DAFÜR

PROCÉDÉ D'EXPANSION DE MATIÈRE PREMIÈRE COMPOSÉE DE TABAC ET SYSTÈME D'EXPANSION ASSOCIÉ

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(43) Date of publication of application:
09.12.2015 Bulletin 2015/50

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EP 2 952 105 B1

Printed by Jouve, 75001 PARIS (FR)

Description

Technical Field

[0001] The present invention relates to an expanding method of volumetrically expanding a tobacco raw material using steam, and an expanding system of the same.

Background Art

[0002] In general, volumetrically expanded tobacco raw materials are contained in cigarettes. Volumetrically expanded tobacco raw materials are obtained in such a manner that tobacco raw materials are brought into contact with steam so as to form swelled tobacco raw materials, and thereafter, the swelled tobacco raw materials are rapidly dried through flush drying into the volumetrically expanded tobacco raw materials (see Patent Document 1, for example). Swelling of tobacco raw materials volumetrically expands the tobacco raw materials, and drying of the swelled tobacco raw materials further volumetrically expands the tobacco raw materials. Specifically, the expanding method disclosed in the above Patent Document volumetrically expands the tobacco raw material in two stages.

Prior Art Document

Patent Document

[0003]

Patent Document 1: International Publication No. WO 2012/132008 (WO 2012/132008 A1)
Patent Document 2: US 3 978 867 A

Summary of the Invention

Problems to be solved by the Invention

[0004] In the case of Patent Document 1, swelling processing of a tobacco raw material, and drying processing of a swelled tobacco raw material are substantially carried out in succession. Hence, the swelled tobacco raw material is dried while the swelled tobacco raw material is maintained at a high temperature. For drying the swelled tobacco raw material, superheated steam or heated air at a sufficiently high temperature as a heating medium are required. Requirement of the superheated steam or the heated air having such a high-temperature results in a tremendous energy consumption for drying processing of the swelled tobacco raw material. To the contrary, decreasing of the temperature of the superheated steam or the heated air deteriorates evaporation rate of moisture contained in the swelled tobacco raw material, which makes it hard to sufficiently expand the tobacco raw material.

[0005] An object of the present invention is to provide an expanding method of a tobacco raw material and an expanding system of the same that are capable of volumetrically expanding the tobacco raw material in an effective manner without excessively increasing energy consumption required for drying processing.

Means for Solving the Problems

[0006] The above object is attained by an expanding method of a tobacco raw material of the present invention, and the expanding method includes: a swelling step of bringing the tobacco raw material into contact with first steam so as to swell the tobacco raw material into a swelled tobacco raw material; a drying step of drying the swelled tobacco raw material through flush drying that brings the swelled tobacco raw material into contact with second steam; and a heat-dissipating step of allowing the swelled tobacco raw material to dissipate heat thereof between the swelling step and the drying step.

[0007] According to the above expanding method, the temperature of the swelled tobacco raw material is decreased prior to carrying out the drying step. Hence, at the time of starting the drying step, a difference in temperature between the dew point temperature of the second steam and the temperature of the swelled tobacco raw material is increased. Due to this difference in temperature, at the initial stage of the drying step, when the swelled tobacco raw material is brought into contact with the second steam, the second steam is partially cooled and condensed down to its dew point temperature. Accordingly, water and heat generated by the condensation of the second steam enhances softness of tissues of the swelled tobacco raw material.

[0008] By applying softness to the swelled tobacco raw material in this manner, it is possible to effectively carry out flush drying, that is, volumetric expansion on the swelled tobacco raw material, resulting in high bulkiness of a volumetrically expanded tobacco raw material obtained from the swelled tobacco raw material.

[0009] The present invention also provides an expanding system of a tobacco raw material that carries out and corresponds to the aforementioned expanding method.

Advantageous Effects of the Invention

[0010] In the expanding method and the expanding system of a tobacco raw material according to the present invention, since the temperature of the swelled tobacco raw material is decreased prior to the drying step (flush drying) of the swelled tobacco raw material, at the initial stage of the drying step, the swelled tobacco raw material becomes wet with condensed water of the second steam, and the temperature of the material, that is the material temperature, rises, as described above, thus enhancing softness of the swelled tobacco raw material. As a result, it is possible to effectively carry out the drying step, that is, the volumetrically expanding processing of the swelled tobacco raw material without increasing energy con-

sumption required for the drying step, thereby attaining high bulkiness of the volumetrically expanded tobacco raw material obtained in this drying step.

Brief Description of the Drawings

[0011]

FIG. 1 is a drawing schematically showing an expanding system for carrying out an expanding method of a tobacco raw material according to one embodiment of the present invention.

FIG. 2 is a drawing showing details of a heat-dissipating apparatus in FIG. 1.

FIG. 3 is a graph used for explaining operation of the heat-dissipating apparatus.

FIG. 4 is a graph showing a relation between amount of moisture and bulkiness of each swelled tobacco raw material after being flush-dried, using an expansion starting temperature of each swelled tobacco raw material as a parameter.

Mode for Carrying out the Invention

[0012] With reference to FIG. 1 and FIG. 2, an expanding system of volumetrically expanding a tobacco raw material will be described hereinafter, and an expanding method of volumetrically expanding a tobacco raw material in one embodiment of the present invention will be naturally apparent in accordance with the following description.

[0013] The expanding system includes a swelling apparatus 10, and this swelling apparatus 10 may be formed by a cyclone, for example. The swelling apparatus 10 includes an inlet 12, an exhaust port 14, and a discharge port 16 respectively in a side surface, a top surface, and a bottom surface of the swelling apparatus 10. A steam passage 18 extends from the inlet 12, and this steam passage 18 is connected to a steam source 20.

[0014] The steam source 20 generates saturated steam as first steam, and this saturated steam is supplied via the steam passage 18 to the swelling apparatus 10. A temperature, a pressure, and a flow rate of the saturated steam in the steam passage 18 are, for example, 100 to 105°C, atmospheric pressure, and 110 kg/h, respectively.

[0015] A feed-in passage 22 branches from the steam passage 18. This feed-in passage 22 extends upward to be connected via an air locker 26 to a feed-in port 24 of a tobacco raw material. In the case of the present embodiment, the tobacco raw material is obtained from veins, that is, midribs of tobacco leaves. Specifically, the tobacco material is obtained by moisture-conditioning, rolling, and shredding midribs into a particle state.

[0016] The aforementioned tobacco raw material contains moisture of 36wt%, and fed from the feed-in port 24 via the air locker 26 into the steam passage 18. Thereafter, the tobacco raw material is supplied together with saturated steam to the swelling apparatus 10. Hence, the tobacco raw material comes into contact with the saturated steam in the steam passage 18 and the swelling apparatus 10, and the tobacco raw material takes in moisture and heat from the saturated steam to be swelled into a swelled tobacco raw material (swelling step, volumetrically expanding processing at the first stage).

[0017] Herein, it is assumed that a processing rate of the tobacco raw material is 300 kg/h, a time period required to swell the tobacco raw material is, for example, approximately 0.5 to 2 seconds, and the swelled tobacco raw material contains moisture of 40wt%.

[0018] The saturated steam used for swelling the tobacco raw material may be discharged as a heating medium for a single use, but in the light of economic efficiency, it is preferable to reuse the saturated steam by returning the saturated steam from the exhaust port 14 of the swelling apparatus 10 via a return passage 27 into the steam source 20, as shown in FIG. 1. Meanwhile, the swelled tobacco raw material is discharged from the discharge port 16 of the swelling apparatus 10 into a discharge passage 28. The discharge passage 28 is connected via an air locker 30 to an inlet 34 of a heat-dissipating apparatus 32.

[0019] The heat-dissipating apparatus 32 allows the swelled tobacco raw material supplied from the inlet 34 thereof to dissipate heat, thereby decreasing a temperature of the swelled tobacco raw material (heat-dissipating step). Specifically, in the heat-dissipating apparatus 32, the temperature of the swelled tobacco raw material is decreased down to a temperature lower than a dew point temperature (100°C) under an atmospheric pressure of the saturated steam and the superheated steam, for example, down to an expansion starting temperature (to be specific, approximately a room temperature) defined based on an environment temperature where the swelling system is installed or around the environment temperature. In this heat-dissipating step, the moisture of the swelled tobacco raw material is reduced merely from 40wt% to approximately 38wt%. The heat-dissipating apparatus 32 will be described in detail later.

[0020] The heat-dissipating apparatus 32 further includes an outlet 36, and this outlet 36 is connected to a feed-in passage 38. The feed-in passage 38 is connected via an air locker 40 to a drying passage 42. Hence, the heat-dissipating apparatus 32 discharges the swelled tobacco raw material from the outlet 36, and the discharged swelled tobacco raw material is fed through a feed-in passage 38 and the air locker 40 into the drying passage 42.

[0021] The drying passage 42 connects a heating medium source 44 and an inlet 47 of a flush dryer 46 as a drying apparatus. The heating medium source 44 generates superheated steam as second steam, for example, and supplies this superheated steam toward the flush dryer 46. This superheated steam has a temperature Th of 160 to 280°C, for example, which is higher than a temperature of the saturated steam flowing through the

steam passage 18. The superheated steam has a flow rate of 30 m/s, for example.

[0022] As apparent from the aforementioned description, the swelled tobacco raw material, in a state of having amount of moisture of approximately 38wt% and an expansion starting temperature sufficiently lower than the dew point temperature of the superheated steam, is fed into the drying passage 42 and supplied together with the superheated steam toward the flush dryer 46. Accordingly, the swelled tobacco raw material is brought into contact with the superheated steam in the drying passage 42 and the flush dryer 46, thereby rapidly heating and volumetrically expanding the swelled tobacco raw material through condensing heat transfer of the superheated steam.

[0023] Specifically, the superheated steam coming into contact with the fed swelled tobacco raw material is partially cooled and condensed down to its dew point temperature by the swelled tobacco raw material. Hence, the surface of the swelled tobacco raw material becomes wet with water generated by the condensation of the superheated steam (dew point temperature is 100°C), and thus the tissues of the swelled tobacco raw material become softer, and the temperature of the swelled tobacco raw material rapidly increases to the dew point temperature of the superheated steam at the same time.

[0024] Thereafter, the temperature of the swelled tobacco raw material gradually increases from the dew point temperature by receiving heat supply from the superheated steam, through which the swelled tobacco raw material is dried. Such a drying process rapidly evaporates the moisture contained in the swelled tobacco raw material; thus the inner pressure of the swelled tobacco raw material increases, which volumetrically expands the swelled tobacco raw material once again (drying step, volumetrically expanding processing at the second stage). At this point, the manufacturing of the volumetrically expanded tobacco raw material is completed.

[0025] As aforementioned, at the initial stage in the drying step, the condensation of the superheated steam while the temperature of the swelled tobacco raw material is increased from the expansion starting temperature of the swelled tobacco raw material to the dew point temperature (100°C) of the superheated steam enhances softness of the swelled tobacco raw material, and the softness of the swelled tobacco raw material at this stage becomes an important factor for volumetrically expanding the swelled tobacco raw material in an effective manner. Hence, in order to further enhance bulkiness of the volumetrically expanded tobacco raw material, it is preferable to set a difference in temperature between the dew point temperature of the superheated steam and the aforementioned expansion starting temperature to be as great as possible.

[0026] In the case of the present embodiment, a cyclone is also used for the flush dryer 46. In this case, the superheated steam used for drying and volumetrically expanding the swelled tobacco raw material is returned from a discharge port 48 of the flush dryer 46 via a return passage 50 to the heating medium source 44, and meanwhile the volumetrically expanded tobacco raw material is discharged from an discharge port 52 of the flush dryer 46 via an air locker 54 to a discharge passage 56. Thereafter, the volumetrically expanded tobacco raw material is used, as one of filling materials for cigarettes, for manufacturing the cigarettes. Needless to mention, the filling materials include cut tobacco obtained by shredding leaves of tobacco.

[0027] FIG. 2 shows Example 1 of the above described heat-dissipating apparatus 32.

[0028] The heat-dissipating apparatus 32 includes a vibratory conveyer 58 as a conveyance passage, and the vibratory conveyer 58 has a start end 60 and a terminal end 62. The start end 60 is disposed immediately below the inlet 34 of the heat-dissipating apparatus 32, and the terminal end 62 is disposed adjacent to the outlet 36 of the heat-dissipating apparatus 32. The vibratory conveyer 58 as above configured receives at the start end 60 the swelled tobacco raw material discharged from the swelling apparatus 10, conveys continuously or intermittently the received swelled tobacco raw material toward the terminal end 62, and discharges the swelled tobacco raw material from the terminal end 62 to the outlet 36 (conveyance process).

[0029] A time period required to convey the swelled tobacco raw material from the start end 60 to the terminal end 62 of the vibratory conveyer 58 is equal to a time period required to decrease the temperature of the swelled tobacco raw material at the time of being discharged from the swelling apparatus 10 down to the aforementioned expansion starting temperature.

[0030] In the case of the above Example 1, heat dissipation from the swelled tobacco raw material is naturally carried out through heat exchange between the swelled tobacco raw material and the surrounding atmosphere. Hence, it is preferable that an intermediate section of the vibratory conveyer 58 is arranged as far apart as possible from mechanical equipment having a high temperature, such as the swelling apparatus 10 and the flush dryer 46.

[0031] The heat-dissipating apparatus 32 in Example 2 may further include a blower 64. The blower 64 has a blower head 66 in a pipe shape, and this blower head 66 is disposed above the vibratory conveyer 58, for example, in a manner as to extend along the vibratory conveyer 58. In this case, the blower head 66 includes a number of nozzle ports 68 arranged with intervals therebetween in the longitudinal direction of the blower head 66, and is connected to an air conditioner 70, for example. The air conditioner 70 supplies conditioned air as coolant toward the blower head 66, and this conditioned air has a temperature equal to or lower than the aforementioned expansion starting temperature.

[0032] Accordingly, in the case of Example 2, during the continuous conveyance of the swelled tobacco raw material on the vibratory conveyer 58, the blower head 66 injects the above conditioned air from the nozzle ports

68 toward the swelled tobacco raw material on the vibratory conveyer 58 (air-blowing process), thereby allowing the swelled tobacco raw material to forcibly dissipate its heat. As a result, the temperature of the swelled tobacco raw material rapidly decreases to the expansion starting temperature, which enables significant reduction in length required for the vibratory conveyer 58.

[0033] The above injection of the conditioned air may be carried out in a state in which the conveyance of the swelled tobacco raw material is temporarily stopped. Accordingly, the present invention may propose the heat-dissipating apparatus 32 as Example 3.

[0034] In the case of Example 3, the vibratory conveyer 58 extends through a heat-dissipating chamber 72. The heat-dissipating chamber 72 includes the aforementioned air conditioner 70 as the blower, and this air conditioner 70 supplies conditioned air having a temperature equal to or lower than the expansion starting temperature into the heat-dissipating chamber 72 so as to keep the temperature in the heat-dissipating chamber 72 constant. In this case, the swelled tobacco raw material on the vibratory conveyer 58 is allowed to temporarily stay in the heat-dissipating chamber 72, and wait on the vibratory conveyer 58 until the temperature of the swelled tobacco raw material is decreased down to the expansion starting temperature.

[0035] In addition, every heat-dissipating apparatus 32 in the aforementioned Example 1 to Example 3 may include a thermometer 74 for confirming whether or not the temperature of the swelled tobacco raw material is decreased down to the expansion starting temperature. As shown in FIG. 1, the thermometer 74 is disposed at a portion of the feed-in passage 38 between the heat-dissipating apparatus 32 and the air locker 40, and measures a temperature T_{ST} of the swelled tobacco raw material discharged from the heat-dissipating apparatus 32. A temperature Te of the swelled tobacco raw material at this time is set as the expansion starting temperature.

[0036] With such a thermometer 74, it is possible to adjust the conveyance speed of the swelled tobacco raw material by the aforementioned vibratory conveyer 58, and the performance of the air conditioner 70 based on the measurement results from the thermometer 74, thus accurately adjusting the temperature of the swelled tobacco raw material to the expansion starting temperature.

[0037] As apparent from FIG. 1, the drying passage 42 is also provided with a thermometer 76, and this thermometer 76 is disposed in the vicinity of the inlet 47 of the flush dryer 46, and measures a temperature of the superheated steam flowing into the flush dryer 46. With such a thermometer 76, it is possible to adjust operation of the heating medium source 44 based on the measurement results from the thermometer 76, thereby maintaining the temperature of the superheated steam to be supplied to the flush dryer 46 at a desired temperature.

[0038] With respect to the temperature T_{ST} of the swelled tobacco raw material, if Ti represents the temperature of the swelled tobacco raw material at the inlet 34 of the heat-dissipating apparatus 32, Te represents the temperature of the swelled tobacco raw material at the outlet 36, that is, the aforementioned expansion starting temperature, and Td represents the dew point temperature of the superheated steam, every heat-dissipating apparatus 32 in Example 1 to Example 3 is configured, as shown in FIG. 3, such that the heat-dissipating apparatus 32 conveys the swelled tobacco raw material received at the inlet 34 toward the outlet 36 while allowing the swelled tobacco raw material to dissipate its heat; and during this process, the temperature T_{ST} of the swelled tobacco raw material is decreased from Ti to Te in a manner as to maximize a difference in temperature ΔT between the dew point temperature Td and the expansion starting temperature Te.

[0039] Hence, when the swelled tobacco raw material is fed into the flush dryer 46 via the drying passage 42, the above difference in temperature ΔT is secured between the dew point temperature Td of the superheated steam and the expansion starting temperature Te; therefore, efficient volumetric expansion of the swelled tobacco raw material can be attained as aforementioned, thus obtaining volumetrically expanded tobacco raw material excellent in bulkiness. Such a volumetrically expanded tobacco raw material excellent in bulkiness significantly contributes to reduction in used amount of cut tobacco that is one of filling materials for cigarettes.

[0040] As aforementioned, the temperature T_{ST} of the swelled tobacco raw material is controlled by the expansion starting temperature Te, thereby keeping the bulkiness of the volumetrically expanded tobacco raw material constant. This significantly contributes to stabilization of cigarette quality.

[0041] To the contrary, if the bulkiness required for the volumetrically expanded tobacco raw material is the same as bulkiness required in the conventional arts, the temperature Th of the superheated steam can be decreased. In this case, it is possible to reduce energy consumption of the heating medium source 44.

[0042] A graph in FIG. 4 shows a relation between amount of moisture and bulkiness of the volumetrically expanded tobacco raw material obtained from each of rots E1, E2, C1, and C2 of the swelled tobacco raw material, using the expansion starting temperature Te and the temperature Th of the superheated steam as parameters.

[0043] The following table 1 shows the expansion starting temperature Te and the temperature Th of the superheated steam for each of E1, E2, C1, and C2 of the swelled tobacco raw material.

[Table 1]

	Te (°C)	Th (°C)
ROT E1	27 to 28	190
ROT E2	28 to 29	220

(continued)

	Te (°C)	Th (°C)
ROT C1	62 to 64	190
ROT C2	69 to 76	220

[0044] As apparent from Table 1 and FIG. 4, comparing the rot E1 and the rot C1 both having the same temperatures Th of the superheated steam, the rot having a lower expansion starting temperature Te exhibits a higher bulkiness of the volumetrically expanded tobacco raw material. The same result can be obtained in the rot E2 and the rot C2 both having the same temperatures Th of the superheated steam.

[0045] The present invention is not limited to the above described one embodiment, and various variations can be made.

[0046] For example, in the expanding system according to one embodiment of the present invention, a cyclone-type mechanism is employed in both the swelling apparatus 10 and the flush dryer 46, but a mechanism other than the cyclone-type mechanism may also be employed. The conveyance passage of the heat-dissipating apparatus 32 may be embodied by using a conveyance mechanism other than the vibratory conveyer 58. Furthermore, the expanding system separately includes the steam source 20 and the heating medium source 44, but the steam source 20 and the heating medium source 44 may be integrated into one source so as to supply the saturated steam and the superheated steam from the common heating medium source.

Explanation of Reference Signs

[0047]

10 swelling apparatus (swelling step)
32 heat-dissipating apparatus (heat-dissipating step)
46 flush dryer (drying apparatus, drying step)
58 vibratory conveyer (conveyance passage, conveyance process)
64 blower (air-blowing process)
66 blower head
68 nozzle ports
70 air conditioner
72 heat-dissipating chamber

Claims

1. An expanding method of a tobacco raw material comprising:

a swelling step of bringing the tobacco raw material into contact with first steam so as to swell the tobacco raw material into a swelled tobacco raw material;
a drying step of drying the swelled tobacco raw material through flush drying that brings the swelled tobacco raw material into contact with second steam; and
a heat-dissipating step of allowing the swelled tobacco raw material to dissipate heat thereof between the swelling step and the drying step.

2. The expanding method of a tobacco raw material according to claim 1, wherein
the heat-dissipating step decreases a temperature of the swelled tobacco raw material down to an expansion starting temperature lower than a dew point temperature of the second steam.

3. The expanding method of a tobacco raw material according to claim 2, wherein
in the drying step, superheated steam is used as the second steam.

4. The expanding method of a tobacco raw material according to claim 3, wherein
the heat-dissipating step includes a conveyance process of conveying the swelled tobacco raw material, and
the conveyance process conveys the swelled tobacco raw material for a time period required to decrease the temperature of the swelled tobacco raw material at an end time of the swelling step down to the expansion starting temperature.

5. The expanding method of a tobacco raw material according to claim 4, wherein
the conveyance process continuously conveys the swelled tobacco raw material.

6. The expanding method of a tobacco raw material according to claim 4 or claim 5, wherein
the heat-dissipating step further includes an air-blowing process of bringing the swelled tobacco raw material into contact with coolant of which temperature is equal to or lower than the expansion starting temperature during the conveyance process of the swelled tobacco raw material.

7. The expanding method of a tobacco raw material according to claim 3, wherein
the heat-dissipating step includes a staying process of allowing the swelled tobacco raw material to temporarily stay in a heat-dissipating chamber (72), and an air-blowing process of supplying coolant of which temperature is equal to or lower than the expansion starting temperature into the heat-dissipating chamber (72).

8. An expanding system of a tobacco raw material com-

prising:

a swelling apparatus (10) bringing the tobacco raw material into contact with first steam so as to swell the tobacco raw material into a swelled tobacco raw material; and
a drying apparatus (46) drying the swelled tobacco raw material through flush drying that brings the swelled tobacco raw material into contact with second steam;
characterized in that the expanding system further comprises a heat-dissipating apparatus (32) allowing the swelled tobacco raw material to dissipate heat thereof between the swelling apparatus (10) and the drying apparatus (46).

9. The expanding system of a tobacco raw material according to claim 8, wherein
the heat-dissipating apparatus (32) includes a conveyance passage (58) for causing the swelled tobacco raw material to stay within a heat-dissipating chamber(72).

10. The expanding system of a tobacco raw material according to claim 9, wherein
the drying apparatus (46) includes superheated steam in contact with the swelled tobacco raw material as the second steam.

11. The expanding system of a tobacco raw material according to claim 9, wherein
the heat-dissipating apparatus (32) includes a conveyance passage (58) for conveying the swelled tobacco raw material from the swelling apparatus (10) to the drying apparatus (46).

12. The expanding system of a tobacco raw material according to claim 11, wherein
the conveyance passage (58) is formed by a conveyer for continuously conveying the swelled tobacco raw material.

13. The expanding system of a tobacco raw material according to claim 11 or claim 12, wherein
the heat-dissipating apparatus (32) further includes a blower (64) which brings the swelled tobacco raw material into contact with coolant of which temperature is equal to or lower than the expansion starting temperature during the conveyance of the swelled tobacco raw material.

14. The expanding system of a tobacco raw material according to claim 9, wherein
the heat-dissipating apparatus (32) further includes a heat-dissipating chamber (72) where the swelled tobacco raw material temporarily stays, and a blower (64) supplying coolant of which temperature is equal to or lower than the expansion starting temperature into the heat-dissipating chamber (72).

Patentansprüche

1. Expansionsverfahren für ein Tabakausgangsmaterial, umfassend:

einen Quellungsschritt, bei dem der Tabakausgangsmaterial mit einem ersten Dampf in Kontakt gebracht wird, um das Tabakausgangsmaterial zu einem gequollenen Tabakausgangsmaterial zu quellen;
einen Trocknungsschritt zum Trocknen des gequollenen Tabakausgangsmaterials durch Spültrocknung, der das gequollene Tabakausgangsmaterial mit einem zweiten Dampf in Kontakt bringt; und
einen Wärmeableitungsschritt, bei dem das gequollene Tabakausgangsmaterial zwischen dem Quellungsschritt und dem Trocknungsschritt Wärme ableiten kann.

2. Expansionsverfahren für ein Tabakausgangsmaterial nach Anspruch 1, wobei
der Wärmeableitungsschritt eine Temperatur des gequollenen Tabakausgangsmaterials auf eine unter einer Taupunkttemperatur des zweiten Dampfes liegende Expansions-Ausgangstemperatur absenkt.

3. Expansionsverfahren für ein Tabakausgangsmaterial nach Anspruch 2, wobei
im Trocknungsschritt als zweiter Dampf überhitzter Dampf verwendet wird.

4. Expansionsverfahren für ein Tabakausgangsmaterial nach Anspruch 3, wobei
der Wärmeableitungsschritt ein Förderverfahren zum Fördern des gequollenen Tabakausgangsmaterials umfasst und
das Förderverfahren das gequollene Tabakausgangsmaterial für denjenigen Zeitraum fördert, der erforderlich ist, um die Temperatur des gequollenen Tabakausgangsmaterials zu einem Endzeitpunkt des Quellungsschrittes auf die Expansions-Ausgangstemperatur abzusenken.

5. Expansionsverfahren für ein Tabakausgangsmaterial nach Anspruch 4, wobei
das Förderverfahren das gequollene Tabakausgangsmaterial kontinuierlich fördert.

6. Expansionsverfahren für ein Tabakausgangsmaterial nach Anspruch 4 oder 5, wobei
der Wärmeableitungsschritt ferner einen Luftblasprozess umfasst, bei welchem das gequollene Tabakausgangsmaterial mit Kühlmittel in Kontakt

gebracht wird, dessen Temperatur gleich oder niedriger als die Expansions-Ausgangstemperatur während des Förderverfahrens des gequollenen Tabakausgangsmaterials ist.

7. Expansionsverfahren für ein Tabakausgangsmaterial nach Anspruch 3, wobei
der Wärmeableitungsschritt einen Halteprozess umfasst, bei welchem das gequollene Tabakausgangsmaterial vorübergehend in einer Wärmeableitungskammer (72) verbleiben kann, und einen Luftblasprozess zum Zuführen von Kühlmittel, dessen Temperatur gleich oder niedriger als die Expansions-Ausgangstemperatur in der Wärmeableitungskammer (72) ist.

8. Expansionssystem für ein Tabakausgangsmaterial, umfassend:

eine Quellvorrichtung (10), die das Tabakausgangsmaterial mit einem ersten Dampf in Kontakt bringt, um das Tabakausgangsmaterial zu einem gequollenen Tabakausgangsmaterial zu quellen; und
eine Trocknungsvorrichtung (46) zum Trocknen des gequollenen Tabakausgangsmaterials durch Spültrocknung, die das gequollene Tabakausgangsmaterial in Kontakt mit einem zweitem Dampf bringt;
dadurch gekennzeichnet, dass das Expansionssystem ferner eine Wärmeableitungsvorrichtung (32) umfasst, die es dem gequollenen Tabakausgangsmaterial ermöglicht, zwischen der Quellvorrichtung (10) und der Trocknungsvorrichtung (46) dessen Wärme abzuleiten.

9. Expansionssystem für ein Tabakausgangsmaterial nach Anspruch 8, wobei
die Wärmeableitvorrichtung (32) einen Förderkanal (58) aufweist, um zu bewirken, dass das gequollene Tabakausgangsmaterial in einer Wärmeableitungskammer (72) verbleibt.

10. Expansionssystem für ein Tabakausgangsmaterial nach Anspruch 9, wobei
die Trocknungsvorrichtung (46) als zweiten Dampf überhitzten Dampf in Kontakt mit dem gequollenen Tabakausgangsmaterial umfasst.

11. Expansionssystem für ein Tabakausgangsmaterial nach Anspruch 9, wobei
die Wärmeableitvorrichtung (32) einen Förderkanal (58) zum Fördern des gequollenen Tabakausgangsmaterials von der Quellvorrichtung (10) zu der Trocknungsvorrichtung (46) umfasst.

12. Expansionssystem für ein Tabakausgangsmaterial nach Anspruch 11, wobei
der Förderkanal (58) durch einen Förderer zum kontinuierlichen Fördern des gequollenen Tabakausgangsmaterials ausgebildet ist.

13. Expansionssystem für ein Tabakausgangsmaterial nach Anspruch 11 oder Anspruch 12, wobei
die Wärmeableitvorrichtung (32) ferner ein Gebläse (64) umfasst, welches das gequollene Tabakausgangsmaterial mit einem Kühlmittel in Kontakt bringt, dessen Temperatur während des Transports des gequollenen Tabakausgangsmaterials gleich oder niedriger als die Expansions-Ausgangstemperatur ist.

14. Expansionssystem für ein Tabakausgangsmaterial nach Anspruch 9, wobei
die Wärmeableitvorrichtung (32) ferner eine Wärmeableitungskammer (72), in der sich das gequollene Tabakausgangsmaterial vorübergehend aufhält, und ein Gebläse (64) umfasst, das ein Kühlmittel zuführt, dessen Temperatur gleich oder niedriger als die Expansions-Ausgangstemperatur in der Wärmeableitungskammer (72) ist.

Revendications

1. Procédé d'expansion d'une matière première de tabac comprenant :

une étape de gonflement consistant à mettre la matière première de tabac en contact avec la première vapeur de manière à gonfler la matière première de tabac en une matière première de tabac gonflée ;
une étape de séchage consistant à sécher la matière première de tabac gonflé par un séchage par rinçage qui met la matière première de tabac gonflé en contact avec de la seconde vapeur ; et
une étape de dissipation de la chaleur consistant à laisser la matière première de tabac gonflée dissiper sa chaleur entre l'étape de gonflement et l'étape de séchage.

2. Procédé d'expansion d'une matière première de tabac selon la revendication 1, dans lequel
l'étape de dissipation de la chaleur diminue une température de la matière première de tabac gonflé jusqu'à une température de départ de dilatation inférieure à une température de point de rosée de la seconde vapeur.

3. Procédé d'expansion d'une matière première de tabac selon la revendication 2, dans lequel
dans l'étape de séchage, la vapeur surchauffée est utilisée comme deuxième vapeur.

4. Procédé d'expansion d'une matière première de tabac selon la revendication 3, dans lequel
l'étape de dissipation de la chaleur comprend un processus de transport de la matière première de tabac gonflée, et
le processus de transport transporte la matière première de tabac gonflé pendant une période de temps nécessaire pour diminuer la température de la matière première de tabac gonflé à la fin de l'étape de gonflement jusqu'à la température de départ de l'expansion.

5. Procédé d'expansion d'une matière première de tabac selon la revendication 4, dans lequel
le processus de transport transporte en continu la matière première de tabac gonflée.

6. Procédé d'expansion d'une matière première de tabac selon la revendication 4 ou la revendication 5, dans lequel
l'étape de dissipation de chaleur comprend en outre un procédé de soufflage d'air consistant à mettre la matière première de tabac gonflée en contact avec un liquide de refroidissement dont la température est égale ou inférieure à la température de départ de l'expansion pendant le transport de la matière première de tabac gonflée.

7. Procédé d'expansion d'une matière première de tabac selon la revendication 3, dans lequel
l'étape de dissipation de chaleur comprend un procédé d'arrêt permettant à la matière première de tabac gonflée de rester temporairement dans une chambre de dissipation de chaleur (72), et un procédé de soufflage d'air pour fournir un réfrigérant dont la température est égale ou inférieure à la température de départ d'expansion dans la chambre de dissipation de chaleur (72).

8. Système d'expansion d'une matière première de tabac comprenant :

un appareil de gonflement (10) mettant la matière première de tabac en contact avec la première vapeur afin de gonfler la matière première de tabac en une matière première de tabac gonflée ; et
un dispositif de séchage (46) séchant la matière première de tabac gonflé par séchage par affleurement qui met la matière première de tabac gonflé en contact avec de la seconde vapeur ;
caractérisé en ce que le système d'expansion comprend en outre un dispositif de dissipation de chaleur (32) permettant à la matière première de tabac gonflée de dissiper sa chaleur entre le dispositif de gonflage (10) et le dispositif de séchage (46).

9. Système d'expansion d'une matière première de tabac selon la revendication 8, dans lequel
l'appareil de dissipation de chaleur (32) comprend un passage de transport (58) pour amener la matière première de tabac gonflée à rester dans une chambre de dissipation de chaleur (72).

10. Système d'expansion d'une matière première de tabac selon la revendication 9, dans lequel
l'appareil de séchage (46) comprend de la vapeur surchauffée en contact avec la matière première de tabac gonflée comme deuxième vapeur.

11. Système d'expansion d'une matière première de tabac selon la revendication 9, dans lequel
l'appareil de dissipation de chaleur (32) comprend un passage de transport (58) pour transporter la matière première de tabac gonflée depuis l'appareil de gonflage (10) vers l'appareil de séchage (46).

12. Système d'expansion d'une matière première de tabac selon la revendication 11, dans lequel
le passage de transport (58) est formé par un convoyeur pour transporter en continu la matière première de tabac gonflée.

13. Système d'expansion d'une matière première de tabac selon la revendication 11 ou la revendication 12, dans lequel
l'appareil de dissipation de chaleur (32) comprend en outre un ventilateur (64) qui met la matière première de tabac gonflée en contact avec un réfrigérant dont la température est égale ou inférieure à la température de départ de dilatation pendant le transport de la matière première de tabac gonflée.

14. Système d'expansion d'une matière première de tabac selon la revendication 9, dans lequel
l'appareil de dissipation de chaleur (32) comprend en outre une chambre de dissipation de chaleur (72) dans laquelle la matière première de tabac gonflée reste temporairement, et un ventilateur (64) fournissant un fluide de refroidissement dont la température est égale ou inférieure à la température de départ d'expansion dans la chambre de dissipation de chaleur (72).

FIG. 1

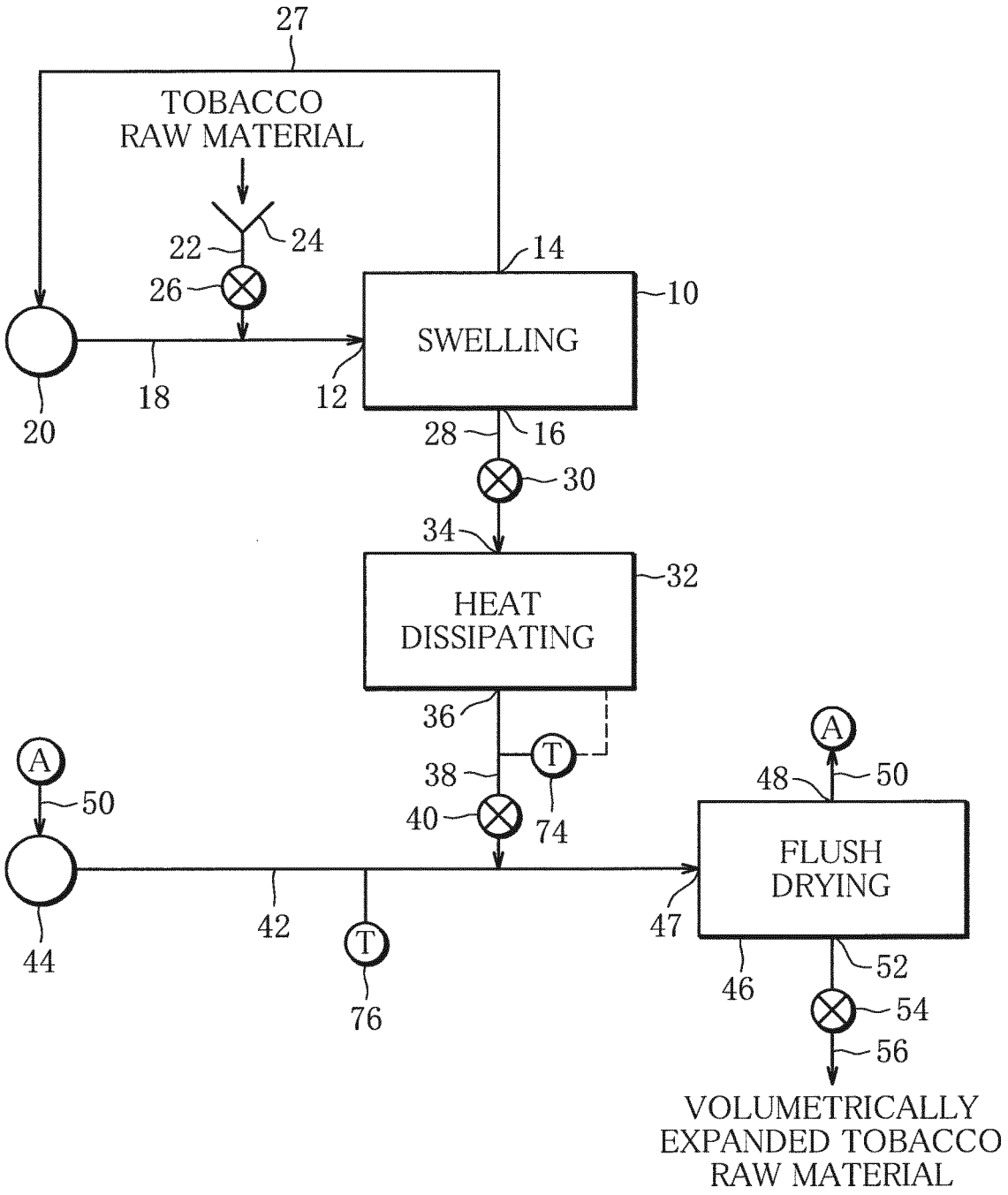

27
TOBACCO
RAW MATERIAL
22
24
26
14
10
SWELLING
18
12
20
28
16
30
34
HEAT
DISSIPATING
32
36
T
38
40
74
A
50
A
48
50
FLUSH
DRYING
42
T
76
44
47
46
52
54
56
VOLUMETRICALLY
EXPANDED TOBACCO
RAW MATERIAL

FIG. 2

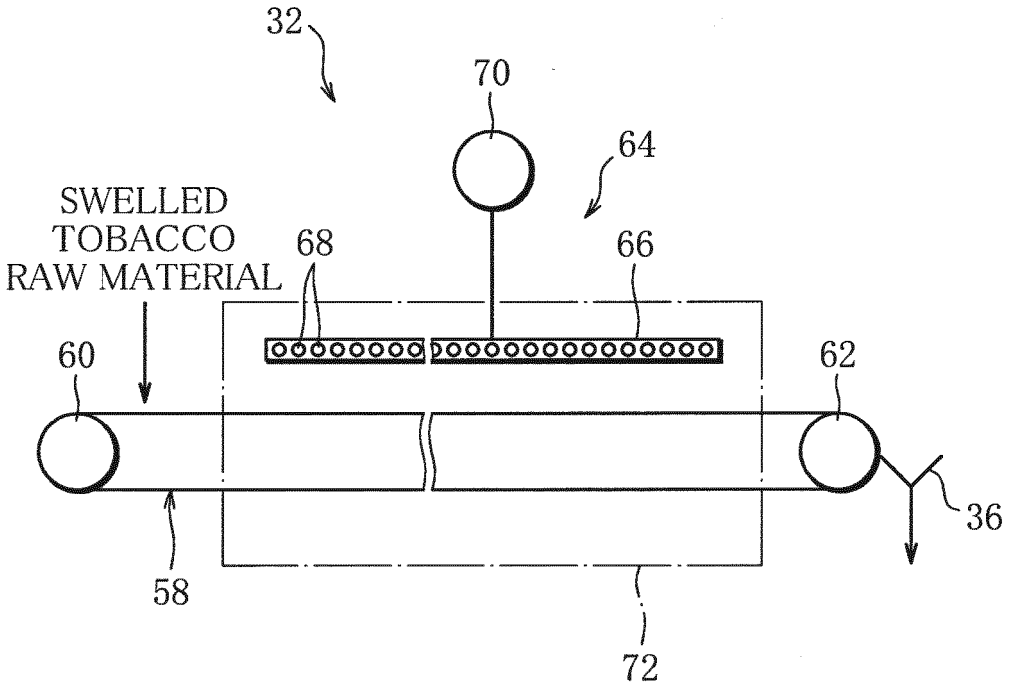

32
70
64
SWELLED
TOBACCO
RAW MATERIAL
68
66
60
62
36
58
72

FIG. 3

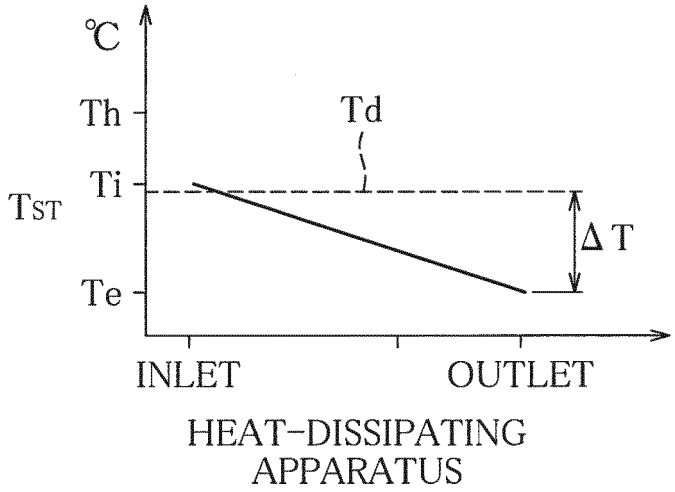
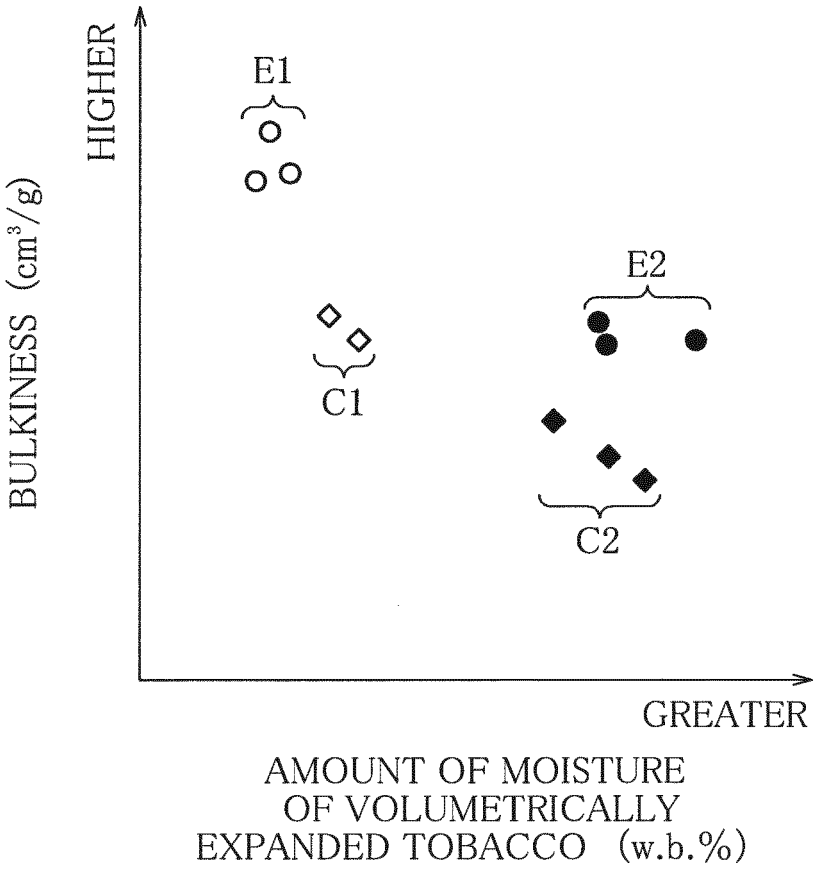

℃
Th
Td
Ti
TST
ΔT
Te
INLET
OUTLET
HEAT-DISSIPATING
APPARATUS

FIG. 4


BULKINESS (cm³/g)
HIGHER
E1
C1
E2
C2
GREATER
AMOUNT OF MOISTURE
OF VOLUMETRICALLY
EXPANDED TOBACCO (w.b.%)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2012132008 A **[0003]**
- WO 2012132008 A1 **[0003]**
- US 3978867 A **[0003]**