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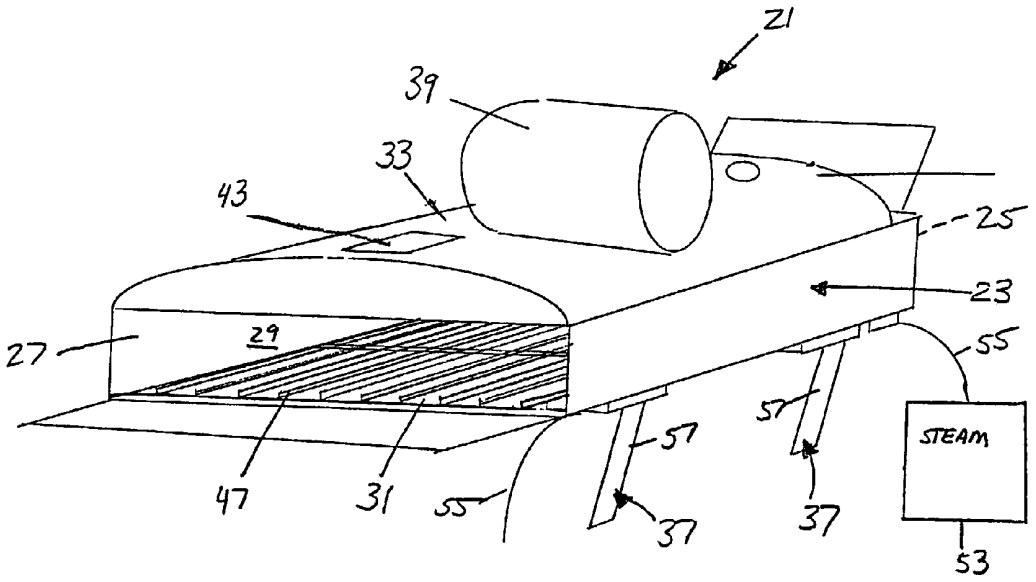
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(54) Title: TOBACCO SMALL LAMINA DRYER AND METHOD FOR DRYING SMALL LAMINA TOBACCO



(57) Abstract: A tobacco small lamina dryer (21) includes a drying chamber (23) having an inlet opening (25) and an outlet opening (27), an interior (29) of the chamber including a bottom portion (31) and a top portion (33) over the bottom portion, a heater (35) for heating the bottom portion of the chamber, a movable support (37) for the chamber, and a vibrator (39) mounted on the chamber. The movable support is sufficiently flexible such that it permits vibration of the chamber to cause material on the bottom portion of the chamber to move in a direction from the inlet opening to the outlet opening when the vibrator vibrates.

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TOBACCO SMALL LAMINA DRYER AND METHOD FOR DRYING SMALL LAMINA TOBACCO

Field of the Invention

The present invention relates to dryers and, more particularly, to tobacco small lamina dryers.

Background and Summary

In drying tobacco, it is desirable to minimize damage to tobacco particles that results in reduction in size of the particles -- sometimes referred to as degradation loss. Tobacco material consisting of larger particles has improved "filling power" as compared to tobacco material with smaller particles -- the larger particles can provide a smoking articles such as a cigarette with a desired firmness even though a smaller mass of the particles is provided. Improved filling power leads to reduced cost in the manufacture of cigarettes.

A major source of degradation loss in the processing of tobacco is in the drying process. One type of dryer for tobacco uses a screw-type conveyor for moving tobacco through a heated region. The screw-type conveyor can damage the tobacco and result in substantial degradation loss. It is desirable to minimize contact of the tobacco with moving parts of a drying apparatus to minimize degradation loss.

Other types of dryers for tobacco include fluidized bed apparatus, such as that disclosed in U.S. Patent No. 4,766,912, wherein tobacco is dried in steam or hot air. U.S. Patent No. 3,957,063 discloses drying tobacco by blowing hot air through a vibrating conveyor, and U.S. Patent No. 5,161,548 discloses directing steam through perforations in a conveyor. The direct contact between the heating medium and the tobacco can be a source of degradation loss and can result in moisture

flashing off of the tobacco, which can be a further source of degradation loss. It is desirable to minimize contact between the tobacco and the heating medium.

The present invention permits minimization of degradation loss without the need for direct contact between the tobacco and moving parts of the drying apparatus, and without the need for direct contact between a heating medium and the tobacco.

In accordance with one aspect of the present invention, a tobacco small lamina dryer includes a drying chamber having an inlet opening and an outlet opening, an interior of the chamber including a bottom portion and a top portion over the bottom portion, a heater for heating the bottom portion of the chamber, a movable support for the chamber, and a vibrator mounted on the chamber. The movable support is sufficiently flexible such that it permits vibration of the chamber to cause material on the bottom portion of the chamber to move in a direction from the inlet opening to the outlet opening when the vibrator vibrates.

In accordance with another aspect of the present invention, a method for drying small lamina tobacco is provided. According to the method, small lamina tobacco is introduced into a chamber through an inlet opening of the chamber. A bottom portion of the chamber is heated. The chamber is vibrated to cause the tobacco to move in the chamber from the inlet opening toward an outlet opening of the chamber. Tobacco is removed from the chamber through the outlet opening.

Brief Description of the Drawings

The features and advantages of the present invention are well understood by reading the following detailed description in conjunction with the drawings in which like numerals indicate similar elements and in which:

FIG. 1 is a schematic, perspective view of a dryer according to an embodiment of the present invention;

FIG. 2 is a schematic side view of a dryer according to an embodiment of the present invention; and

FIG. 3 is a schematic plan view of a manifold for a dryer according to an embodiment of the present invention.

Detailed Description

A tobacco small lamina dryer 21 according to an embodiment of the present invention is shown in FIGS. 1 and 2. The dryer 21 includes a drying chamber 23 having an inlet opening 25 and an outlet opening 27. An interior 29 of the chamber 23 includes a bottom portion 31 and a top portion 33 over the bottom portion. The dryer 21 further includes a heater 35 for heating the chamber 23 and, more specifically, preferably for heating the bottom portion 31 of the chamber, a movable support 37, preferably a plurality of movable supports, for the chamber, and a vibrator 39 mounted on the chamber. The movable supports 37 are movable in the sense that they are sufficiently flexible such that they permit vibration of the chamber 23 to cause small lamina tobacco material on the bottom portion 31 of the chamber to move in a direction from the inlet opening 25 to the outlet opening 27 when the vibrator vibrates.

While the dryer 21 is suitable for drying various materials of various sizes, it is described herein in connection with a preferred intended use for drying small lamina tobacco material. Small lamina is understood, for purposes of the present invention, to refer to tobacco leaf or particles that is adapted to go through a 1/2" screen. The dryer 21 may be of any suitable size, however, it is presently preferred that the approximate dimensions of the dryer be about 10' (3.05 m) long by about 4-5' (1.22 m - 1.52 m) wide by about 6' (18.29 m) high.

The dryer 21 preferably includes one or more exhaust vents 41 in the top portion 33 of the chamber 23. The dryer 21 preferably also includes a fan 43 in flow communication through a fan opening 45 in the chamber 23 with the interior 29 of the chamber and adapted to draw air from the interior of the chamber. The fan 43 is preferably adapted to draw approximately 100 ft^3/minute (0.323 m^3/minute). An

exhaust vent 41 is preferably disposed closer to the inlet opening 25 than the fan opening 45.

The bottom portion 31 of the chamber 23 preferably includes a plurality of fins 47. The fins 47 preferably extend in a direction parallel to the direction from the inlet opening 25 to the outlet opening 27. When the chamber 29 vibrates, the fins 47 facilitate even distribution of the tobacco material over the width of the bottom portion 29. The fins 47 are preferably made from angle iron.

The heater 35 preferably includes a manifold 49 (FIG. 3) attached to a bottom outer surface 51 of the chamber 23 and connected to a source of steam 53 by flexible steam pipe or conduit 55. Steam is supplied to the manifold 49 at a pressure of between 1.0 and about 125 psig (6895 to 861,875 Pa). Preferably, the steam is supplied at a pressure between about 80 and about 120 psig (551,600 to 827,400 Pa). Still more preferably, steam is supplied at a pressure between about 80 and about 110 psig (551,600 to 758,450). Alternatively, a steam/water mixture may be supplied to the manifold 49 with the water functioning to reduce the steam temperature and thus the heating effect of the steam. Other sources of heat may, of course, be used if desired or necessary, such as electric heaters, gas, hot air, and the like. It is preferred that the heater 35 heat the bottom portion 31 of the chamber 23, rather than directly heat the tobacco material in the chamber.

The top portion 33 of the chamber 23 is preferably concave when viewed from inside of the chamber. While not wishing to be bound by theory, it is presently believed that the concave shape facilitates keeping a consistent heat level in the dryer and preventing moisture from flashing off of the tobacco.

The vibrator 39 is preferably a counter rotating motor mounted on top of the chamber 23. The movable support 37 preferably includes one or more resilient legs 57. The legs 57 are preferably sufficiently flexible such that vibration of the chamber 23 results from operation of the counter rotating motor 39, and the vibration is sufficient to cause tobacco material on the bottom portion 31 of the

chamber to move from the inlet opening 25 toward the outlet opening 27. The legs 57 may be made of rubber or some other suitably resilient material.

In operation, the tobacco material will ordinarily be introduced to the dryer from a conveyor (not shown). The conveyor will ordinarily be narrower than the bottom portion 31 of the chamber 23 and the vibration of the chamber 23 caused by the vibrator 39 will cause the material to be distributed over the surface of the bottom portion. The fins 47 facilitate even distribution of the material. After drying, the dried material exits the outlet opening 27 to, for example, a first small lamina shaker or other processing equipment.

In a method for drying small lamina tobacco according to an embodiment of the present invention, small lamina tobacco is introduced into the chamber 23 from, for example, a conveyor belt (not shown) through the inlet opening 25 of the chamber. The bottom portion 31 of the chamber 23 is heated. The chamber 23 is vibrated to cause the tobacco to move in the chamber from the inlet opening 25 toward an outlet opening 27 of the chamber. Tobacco is then removed from the chamber 23 through the outlet opening 27.

As the tobacco passes through the chamber 23, air is preferably continuously vented from the chamber through a vent opening 41 in a top 33 of the chamber. In addition, as the tobacco passes through the chamber 23, air is preferably continuously withdrawn from the chamber through an opening 45 in a top 33 of the chamber with a fan 43.

The chamber 23 is vibrated by operating a vibrator 39 in the form of a counter-rotating motor attached to the chamber. As the chamber 23 is vibrated by a vibrator 39, the plurality of distribution fins 47 on the bottom portion 31 of the chamber facilitates substantially even distribution of the tobacco within spaces between the distribution fins across the bottom portion of the chamber. The bottom portion 31 of the chamber 23 is heated by introducing steam from a steam source 53 to a manifold 49 attached to a bottom outer surface 51 of the chamber.

While this invention has been illustrated and described in accordance with a preferred embodiment, it is recognized that variations and changes may be made therein without departing from the invention as set forth in the claims.

WHAT IS CLAIMED IS:

1. A tobacco small lamina dryer, comprising:

a drying chamber having an inlet opening and an outlet opening, an interior of the chamber including a bottom portion and a top portion over the bottom portion;

a heater for heating the bottom portion of the chamber;

a movable support for the chamber; and

a vibrator mounted on the chamber,

wherein the movable support is sufficiently flexible such that it permits vibration of the chamber to cause material on the bottom portion of the chamber to move in a direction from the inlet opening to the outlet opening when the vibrator vibrates.

2. The tobacco small lamina dryer as set forth in claim 1, further comprising an exhaust vent in the top portion of the chamber.

3. The tobacco small lamina dryer as set forth in claim 1, further comprising a fan in flow communication through a fan opening in the chamber with the interior of the chamber and adapted to draw air from the interior of the chamber.

4. The tobacco small lamina dryer as set forth in claim 3, further comprising an exhaust vent in the top portion of the chamber.

5. The tobacco small lamina dryer as set forth in claim 4, wherein the exhaust vent is disposed closer to the inlet opening than the fan opening.

6. The tobacco small lamina dryer as set forth in claim 1, wherein the bottom portion of the chamber includes a plurality of fins.

7. The tobacco small lamina dryer as set forth in claim 6, wherein the fins extend in a direction parallel to the direction from the inlet opening and the outlet opening.

8. The tobacco small lamina dryer as set forth in claim 1, wherein the heater includes a manifold attached to a bottom outer surface of the chamber and connected to a source of steam.

9. The tobacco small lamina dryer as set forth in claim 8, wherein the manifold is connected to the source of steam by flexible steam pipes.

10. The tobacco small lamina dryer as set forth in claim 1, wherein the top portion of the chamber is concave when viewed from inside of the chamber.

11. The tobacco small lamina dryer as set forth in claim 1, wherein the vibrator is a counter rotating motor.

12. The tobacco small lamina dryer as set forth in claim 1, wherein the movable support includes one or more resilient legs.

13. A method for drying small lamina tobacco, comprising:

introducing small lamina tobacco into a chamber through an inlet opening of the chamber;

heating a bottom portion of the chamber;

vibrating the chamber to cause the tobacco to move in the chamber from the inlet opening toward an outlet opening of the chamber; and

removing tobacco from the chamber through the outlet opening.

14. The method as set forth in claim 13, comprising the further step of venting air from the chamber through a vent opening in a top of the chamber.

15. The method as set forth in claim 13, comprising the further step of withdrawing air from the chamber through an opening in a top of the chamber with a fan.

16. The method as set forth in claim 13, wherein the bottom portion of the chamber includes a plurality of distribution fins thereon, and vibration of the chamber causes the tobacco to be substantially evenly distributed within spaces between the distribution fins across the bottom portion of the chamber.

17. The method as set forth in claim 13, wherein the chamber is vibrated by operating a counter-rotating motor attached to the chamber.

18. The method as set forth in claim 13, wherein the bottom portion of the chamber is heated by introducing steam to a manifold attached to a bottom outer surface of the chamber.

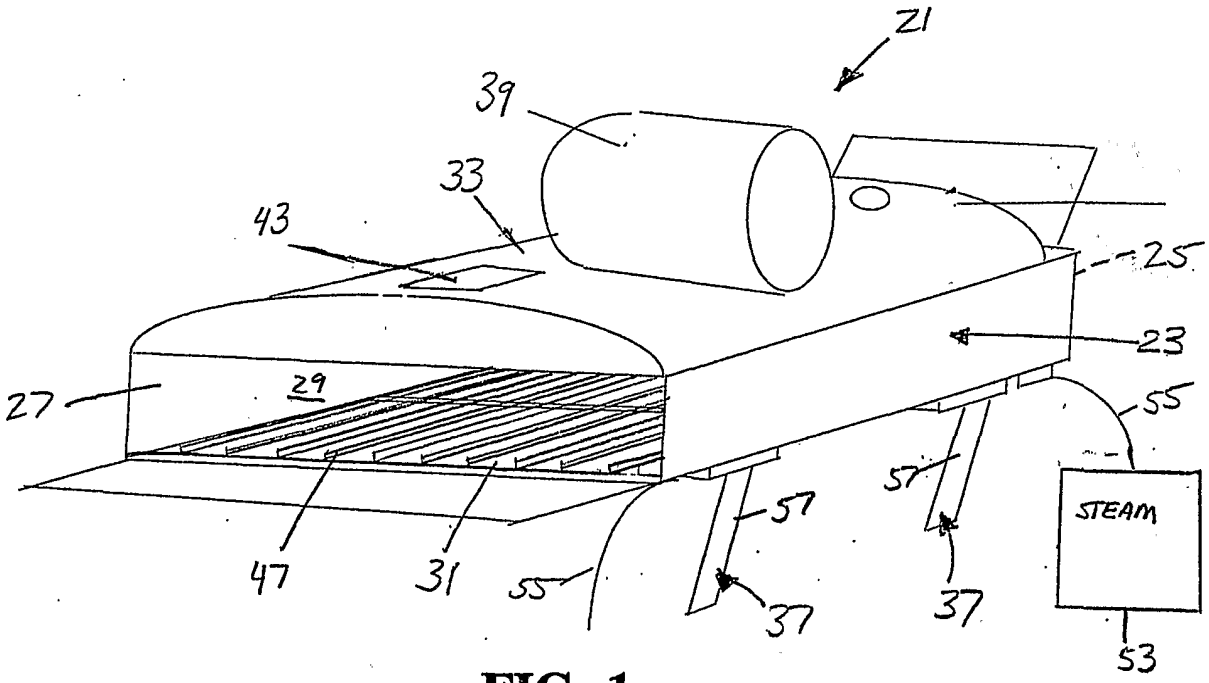


FIG. 1

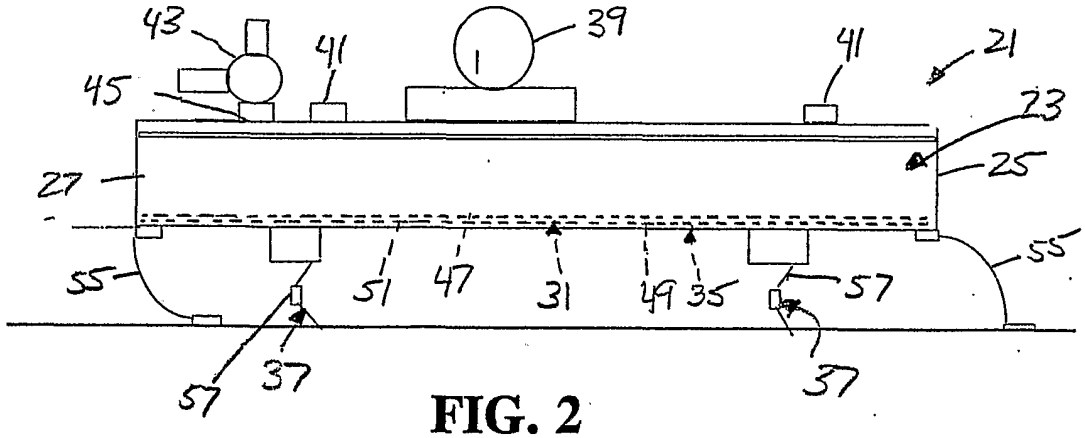


FIG. 2

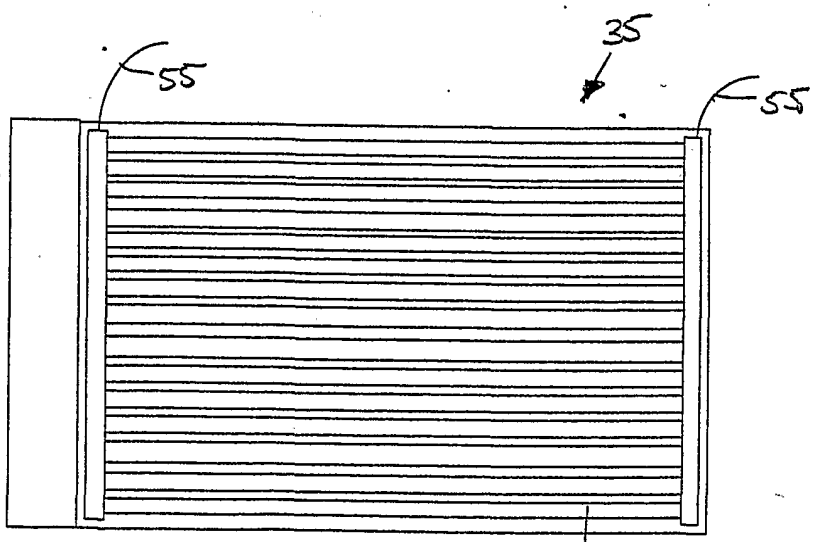


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/07427

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : F26B 9/00; A24B 3/04
US CL : 34/164; 131/304

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)
U.S. : 34/69, 164, 235, 236, 252, 397, 401, 519 ; 131/303, 304, 306

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 practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3,877,469 A (WOCHNOWSKI et al) 15 April 1975 (15.04.1975), Figures 1-3 and columns 3 and 4.	1-4, 12-15
Y		5-11, 16-18
Y	US 5,634,281 A (NUGENT) 03 June 1997 (03.06.1997), column 7, lines 1-30.	5-7, 11, 16, 17
Y	US 5,483,752 A (KREFT et al) 16 January 1996 (16.01.1996), column 3, lines 29-48.	8, 9, 18
Y	US 3,742,961 A (WALLER) 03 July 1973 (03.07.1973), column 3, lines 59-63.	10
A	US 4,367,598 A (HILLINGER et al) 11 January 1983 (11.01.1983).	

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

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