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METHOD OF CURING GREEN TOBACCO

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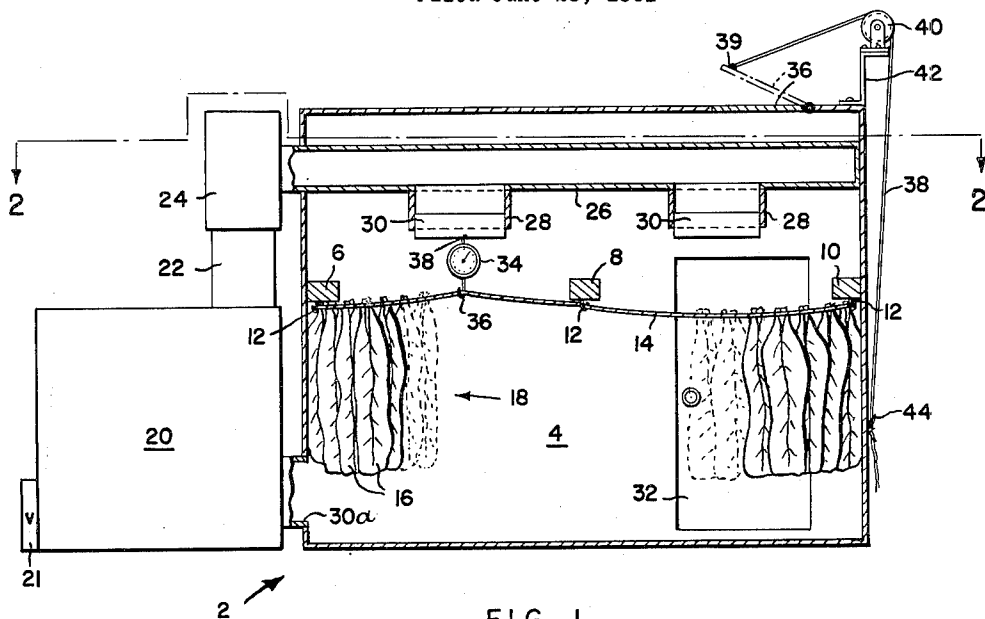


FIG. 1.

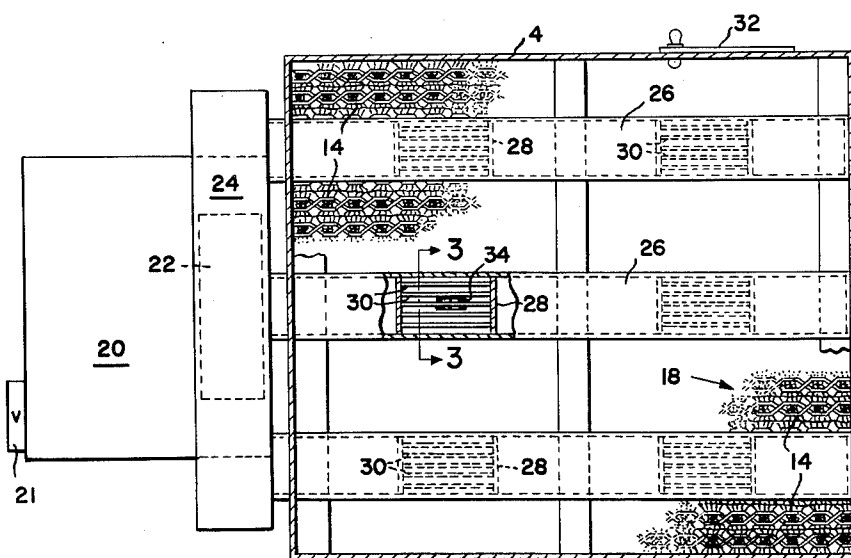


FIG. 2.

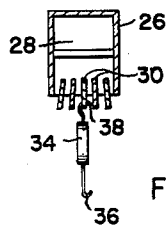


FIG. 3.

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METHOD OF CURING GREEN TOBACCO

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This invention relates to a method of curing green tobacco.

In heretofore known methods of curing green tobacco, the quality of the tobacco has suffered incident to the fact that the thinner and/or more exposed portions of the tobacco leaf are dried more severely than the thicker portions of the leaf. Conversely, if the thinner portions are protected from overdrying, the thicker portions are subject to staining and rotting. Similarly, the portions containing more moisture suffered a cooling effect due to the presence of excess dampness, as well as deterioration from slower than optimum drying. In accordance with this invention it has been found that markedly superior cured tobacco leaf can be achieved by avoiding the overdrying of portions of the tobacco leaf. Improved leaf is achieved in part by reduction of case hardening as well as by the elimination of prolonged evaporative chilling, to permit more uniform chemical conversion and color-texture developments.

In accordance with this invention, the objectionable overdrying is eliminated by the employment of a varying curing cycle, which provides for recurrent periods during which sufficient moisture can be transferred from the thicker and more moist portions of the leaf to the thinner and dryer portions thus maintaining a superior balance of moisture as between the thinner and the thicker portions of the leaf and during which accelerated fermentation can occur. The increased area of moist tobacco permits the use of moderate drying environments without loss of time in accomplishing the drying and improved color, taste and texture result.

In accordance with the method of this invention, a packed bed of tobacco leaves per se or tobacco leaves on cut stalks is formed with the leaves extending generally in a vertical direction. Advantageously the concentration of leaves will be from about 70 to about 160 leaves per square foot and the concentration of stalks when employed will be from about 6 to about 14 stalks per square foot. Air at a temperature in a range of from 75° F. to 125° F. is forced through the green tobacco bed for a period in the range of from about 3 to about 18 hours. Then for a subsequent 3 to 18 hour period the forced air circulation is stopped to provide a rest or equalization period permitting moisture to transfer from the more moist portions to the drier portions of the leaves through the atmosphere surrounding the leaves. During the rest period the lower portion of the bed of tobacco is in free communication with air at atmospheric pressure which initially has a temperature substantially the same as the terminal temperature of the forced air and which is lowered to a temperature from 10% to 35% less than the average temperature of the air during the forced circulation period but in no event to less than 50° F. In any case, the forced air circulation phase of the cycle will be started again before the exudation of moisture from the heavier and undried portions of the leaf has saturated

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the thinner sections and created visible beads, or film, of moisture on the leaf surface and before the temperature of the tobacco leaf has risen due to exothermic reaction in the leaf to a level where the leaf tissue is scalded; generally before the said temperature reaches 95° F. When accomplishing the required temperature change from the forced air period to a rest period or vice versa, the temperature of the air will be changed at a maximum average rate of 1° F. to 10° F. per hour.

The above method steps are repeated for a sufficient period of time to cure and dry to the desired color, moisture content and quality.

The humidity of the entering air will be in the range of from about 30% to about 100% varying generally inversely with the temperature of the entering air and being generally in the lower part of the range during the forced air circulation portion and in the upper part of the range during the rest period. During the rest or equalization periods the average relative humidity will be preferably in the range of from about 80 to about 90% and during the forced air circulation portions of the schedule the average relative humidity will be from about 50 to about 70%. Rapid evaporation occurs during the period of forced air circulation while the evaporation rate is relatively low during the rest period.

Suitable apparatus for carrying out the method in accordance with this invention is shown in the drawings, in which:

FIGURE 1 is a vertical section through a curing apparatus;

FIGURE 2 is a plan view of the curing apparatus of FIGURE 1; and

FIGURE 3 is a vertical section taken on the plane indicated by the line 3-3 of FIGURE 2.

As shown in FIGURE 1, the curing apparatus 2 comprises a chamber 4 having mounted therein beams 6, 8 and 10, each of which carries a series of hooks 12 for the receipt of a string. A plurality of pairs of strings 14, each carrying a series of hands of tobacco leaf 16 in closely strung relationship are secured to hooks 12 to form a bed 18 of tobacco leaf. The stringing up of the tobacco can be accomplished in any convenient manner as, for example, that shown in my Patent No. 2,682,341, issued June 29, 1954.

The amount of air circulated will be regulated in accordance with the total evaporation from the tobacco and will be so established that at the end of an 8 hour drying period, the air being removed from the mass of tobacco is being reduced in temperature not more than 2° F. by reason of evaporative cooling.

Conditioned air is supplied by air conditioning apparatus indicated schematically at 20 and having a valved air inlet 21. Any conventional air conditioning apparatus can be employed, for example, the apparatus shown in my Patent No. 2,479,526, issued August 16, 1949. The conditioned air passes from apparatus 20 to conduit 22 and into manifold 24 which distributes the air to branch conduits 26. Conduits 26 discharge the air downwardly through outlets 28 which contain louvers 30 which act to distribute the air laterally of conduits 26. After passing through the tobacco bed, the air is recirculated to apparatus 20 through conduit 30a. A portion of the damp air is exhausted and replaced with fresh conditioned air to maintain the desired rate of evaporation. An access

door 32 is provided for convenient access to the interior of chamber 4.

In order to measure the loss of moisture of the tobacco as it is being cured, a weighing scale 34 engages a string 14 by hook 36 and is secured as indicated at 38 to a louver 30. Generally speaking, this curing will have been carried to completion when the weight of the green tobacco has been reduced to about 12% to about 15% of the original weight. Of course, less than the entire curing can be carried out by this method if desired, for example until a weight loss of 50% is achieved with subsequent curing being carried out by conventional methods.

The weight of moisture loss, as indicated by the progressive reduction in scale readings, may be utilized manually or automatically to regulate the temperatures, humidities and duration of the cycles to achieve the desired result.

The air from air conditioning apparatus 20 will be at atmospheric pressure during the rest or equalization periods. The chamber is provided with a reversed direction of air flow by stack effect during rest periods, a trap door 36 being provided for the exhaust of air during the rest period. Trap door 36 is controlled by a line 38 secured to door 36 and 39 running over pulley 40 mounted on standard 42 and tied to member 44. The temperature of the mass of tobacco will always be held at least 2° F. above the temperature outside the chamber during the rest periods by controlling the air entering the chamber below the tobacco bed through the positioning of valved air inlet 21. The heat in the bed of tobacco will cause the flow of air to be upwardly through the bed. It is not detrimental to have a slight positive air pressure below the bed of tobacco or above the bed if downward flow is desired so long as the flow is of the order of stack effect flow.

It will be noted that the tobacco is advantageously closely spaced in loading so that the temperature and gas retention effects are selectively greater on the greener portions of the tobacco requiring the maximum maturing or yellowing treatment. Similarly, the exothermic effect of fermentation and chemical conversion is retained and utilized in those sections of the mass. It will be further appreciated that due to the high relative humidities the stomata of the leaf system will tend to remain open, thus providing excellent transmission of vapors and gases into, out from and between the leaves.

It will be understood that other gases can be substituted for, or added to, the air referred to throughout, for example, ethylene oxide, ammonia, etc.

From the above description it will be seen that the method of this invention involves removal of moisture and products of respiration and fermentation with a rapidly flowing heated atmosphere having a relative humidity lower than that of the spaces in the tobacco mass and alternately proceeding with stress relieving, together with equalization of moisture and chemical conversions in a relatively quiet atmosphere having temperatures and moisture contents established mainly by the evaporation and respiration functions of the tobacco itself.

What is claimed is:

1. The method of curing green tobacco which comprises treating a substantially horizontal bed of green tobacco with the leaves extending generally in an up and down direction for a period of from 3 to 18 hours by forcing air at a temperature in the range of from 75° F. to 125° F. through said bed, at the end of said period stopping the flow of air to provide a rest period of from 3 to 18 hours to permit the tobacco to transfer moisture from the more moist portions to the drier portions of the leaves and provide for accelerated fermentation, the bed during said rest period being in communication with air which is initially at substantially the same temperature as the terminal air temperature of the forced air and being lowered to a temperature in the range of from about 10% to about 35% below the average temperature

of the air during the forced air period, the air temperature in all events being maintained above 50° F., and repeating the aforesaid steps until the tobacco is cured the desired amount.

2. The method of curing green tobacco which comprises treating a substantially horizontal bed of green tobacco with the leaves extending generally in an up and down direction for a period of from 3 to 18 hours by forcing air at a temperature in the range of from 75° F. to 125° F. through said bed, at the end of said period stopping the flow of air to provide a rest period of from 3 to 18 hours to permit the tobacco to transfer moisture from the more moist portions to the drier portions of the leaves and provide for accelerated fermentation, the bed during said rest period being in communication with air which is initially at substantially the same temperature as the terminal air temperature of the forced air and being lowered at a maximum average rate of 1° F. to 10° F. per hour to a temperature in the range of from about 10% to about 35% below the average temperature of the air during the forced air period, the air temperature in all events being maintained above 50° F., and repeating the aforesaid steps until the tobacco is cured the desired amount.

3. The method of curing green tobacco which comprises treating a substantially horizontal bed of green tobacco with the leaves extending generally in an up and down direction for a period of from 3 to 18 hours by forcing air at a temperature in the range of from 75° F. to 125° F. and having an average relative humidity of from about 50% to about 70% through said bed, at the end of said period stopping the flow of air to provide a rest period of from 3 to 18 hours to permit the tobacco to transfer moisture from the more moist portions to the drier portions of the leaves and provide for accelerated fermentation, the bed during said rest period being in communication with air which is initially at substantially the same temperature as the terminal air temperature of the forced air and being lowered to a temperature in the range of from about 10% to about 35% below the average temperature of the air during the forced air period, the air temperature in all events being maintained above 50° F., the average relative humidity of the said air at atmospheric pressure being from about 80% to about 90% and repeating the aforesaid steps until the tobacco is cured the desired amount.

4. The method of curing green tobacco which comprises treating a substantially horizontal bed of green tobacco with the leaves extending generally in an up and down direction for a period of from 3 to 18 hours by forcing air at a temperature in the range of from 75° F. to 125° F. and having an average relative humidity of from about 50% to about 70% through said bed, at the end of said period stopping the flow of air to provide a rest period of from 3 to 18 hours to permit the tobacco to transfer from the more moist portions to the drier portions of the leaves and provide for accelerated fermentation, the bed during said rest period being in communication with air which is initially at substantially the same temperature as the terminal air temperature of the forced air and being lowered at a maximum average rate of 1° F. to 10° F. per hour to a temperature in the range of from about 10% to about 35% below the average temperature of the air during the forced air period, the air temperature in all events being maintained above 50° F., the average relative humidity of the said air at atmospheric pressure being from about 80% to about 90% and repeating the aforesaid steps until the tobacco is cured the desired amount.

5. The method of curing green tobacco which comprises treating a substantially horizontal bed of green tobacco with the leaves extending generally in an up and down direction for a period of from 3 to 18 hours by forcing air at a temperature in the range of from 75° F. to 125° F. through said bed, at the end of said period

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stopping the flow of air to provide a rest period of from 3 to 18 hours to permit the tobacco to transfer moisture from the more moist portions to the drier portions of the leaves and provide for accelerated fermentation, the bed during said rest period being in communication with air which is initially at substantially the same temperature as the terminal air temperature of the forced air and being lowered to a temperature in the range of from about 10% to about 35% below the average temperature of the air during the forced air period, the air temperature

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in all events being maintained above 50° F., the flow of air through said bed during the rest period being upwardly through the bed, and repeating the aforesaid steps until the tobacco is cured the desired amount.

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