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2,989,057

METHOD OF CURING GREEN TOBACCO

Filed Nov. 20, 1957

2 Sheets-Sheet 1

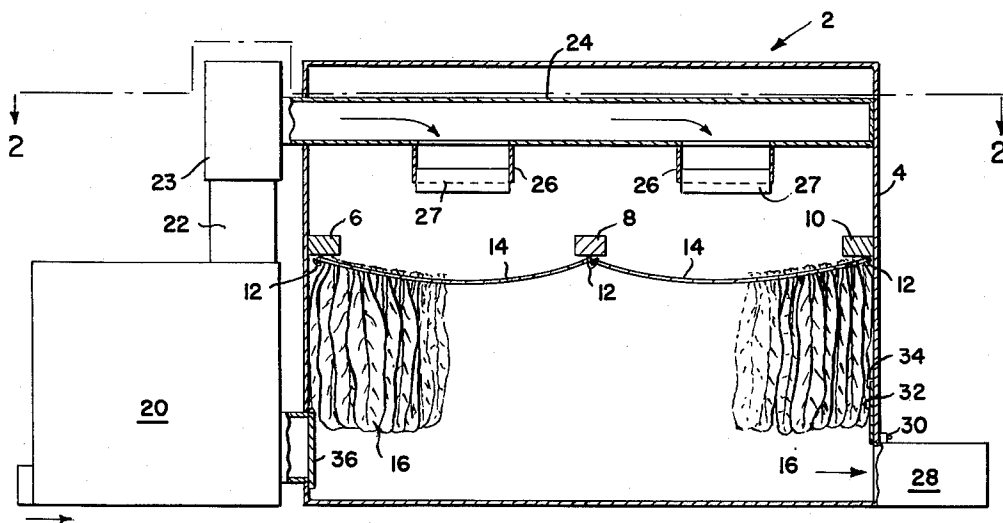


FIG. 1.

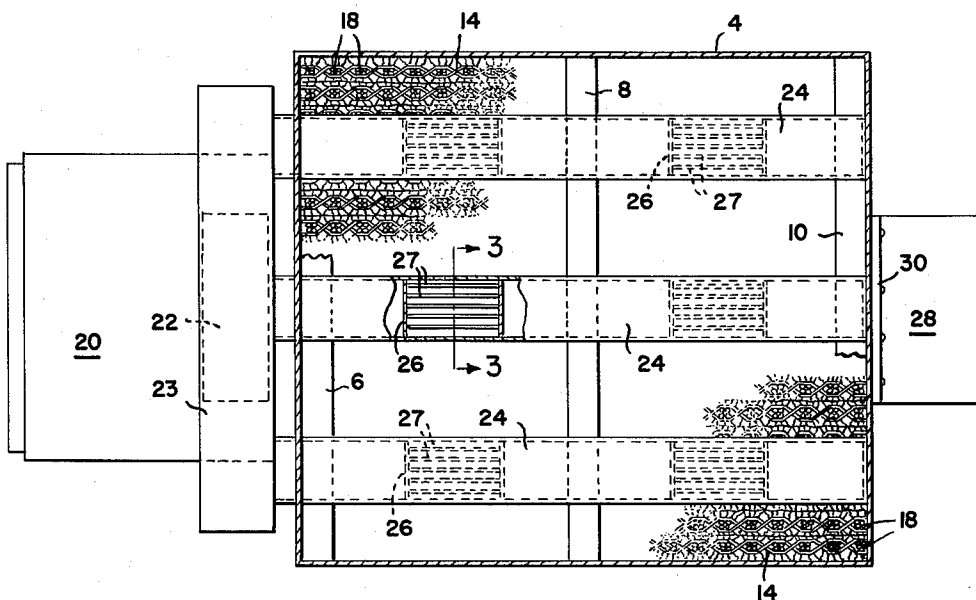


FIG. 2.

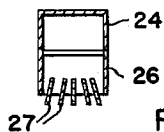


FIG. 3.

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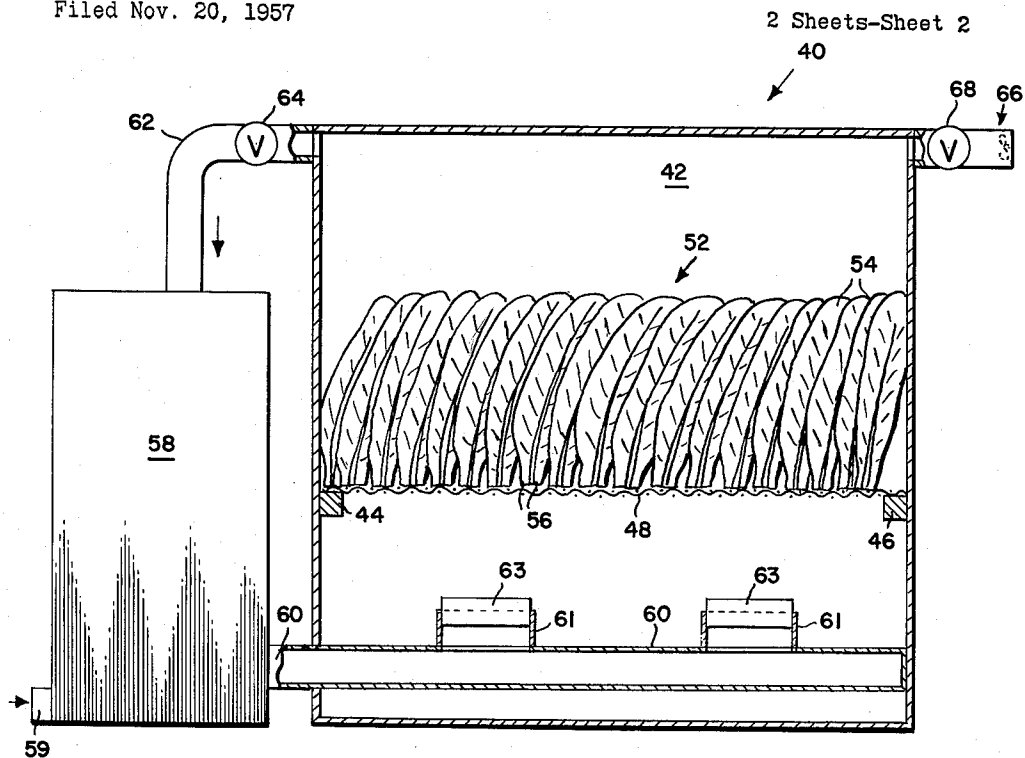


FIG. 4.

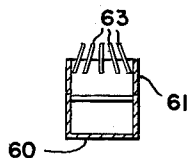


FIG. 5.

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2,989,057

METHOD OF CURING GREEN TOBACCO

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8 Claims. (Cl. 131-140)

This invention relates to a method of curing green tobacco, that is, for removing moisture from the tobacco to the desired extent, bringing the leaf to the desired color and providing the leaf with the desired aroma, grain, taste, elasticity and general soundness. The process in accordance with this invention is applicable, for example, to curing primed types of tobacco and wrapper tobacco leaves for cigars.

The method in accordance with this invention is highly advantageous for a large number of reasons. It provides a more uniform color throughout all the leaves and results in providing leaves having a superior texture. The improved results achieved with this process permit the employment of the higher leaves of the tobacco plant which have heretofore not been harvested due to the low price which they command after being cured by conventional processes.

In addition, the method in accordance with this invention represents a marked reduction in costs as contrasted to heretofore known processes. Since the method requires that the tobacco leaves be tightly packed, it is possible and indeed desirable to eliminate the employment of laths which permits the elimination of the time consuming operations of stringing tobacco onto laths, hanging and removing the laths. The reduction in handling resulting from this method eliminates a substantial percentage of the breakage which occurs incident to the handling of the tobacco during the curing operation. Further, since the tobacco is relatively tightly packed in the curing compartment, a great deal more tobacco can be cured per cubic foot of curing compartment. This invention provides superior curing with buildings and equipment of less initial and maintenance cost than is involved using the presently known methods of curing. Further, adequate equipment to provide the positive and accurately controlled conditions for the optimum curing is made practical in view of the decrease in space requirements for the green tobacco.

A further surprising advantage of this method is that when it is employed, the leaves undergo less shrinkage. This, in turn, permits more cuts per leaf to be obtained after the tobacco is cured.

Finally, this invention provides the ready ability to soften and maintain the tobacco in proper condition for further handling after curing regardless of weather conditions.

The method in accordance with this invention comprises forming a bed of tobacco leaves with the butts extending in one direction and forcing conditioned air through the bed preferably from the butt ends towards the tips of the leaves. Alternatively, the air can be passed through the bed from the tips towards the butt ends of the leaves. It will be understood that the term "air" includes air per se as well as air mixed with the gases produced during the curing and as well as with other gases used in curing such as ethylene oxide. The bed of tobacco leaves will be formed so that the adjacent tobacco leaves are in substantial contact one with the other. In forming the bed the leaves are all placed substantially in a face to face, back to back or face to back relationship. In order to achieve the beneficial results of the method, the bed should be of substantial dimensions, for example, not less than 5 feet square. Advantageous

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results are achieved if the air is confined so that it can only flow through the bed and not around the bed.

By way of illustration, the bed can have 100 to 200 leaves of tobacco per square foot. Such a bed permits a wave motion of the leaves as the air passes through the bed. Clusters of three to six leaves are very satisfactory if the leaves are hung on a string. The butts of such clusters preferably will be one to three inches apart on each string. Advantageously, the strings will be from about two inches to about four inches apart.

The conditioned air is introduced to the bed at a temperature within the range of from about 70° F. to 200° F., preferably from 70° F. to 130° F. and advantageously at 80° F. to 100° F. for cigar wrapper tobacco leaves. This air preferably has a relative humidity of from about 30% to about 75%. In the initial and terminal stages of curing, the relative humidity may follow the practice of employing a relative humidity of up to 95%. In order to pass the conditioned air through the bed, it is maintained at a slight positive pressure. The rate of air flow through the bed will preferably be from 10 feet per minute to 100 feet per minute to provide for a temperature drop in the conditioned air from its entry into the bed to its discharge therefrom of from about .1° F. to about 5° F., preferably from about .2° F. to about 1° F. The air pressure at the discharge side of the bed will be at least slightly lower than the air pressure within the bed due to the packing of the tobacco.

The tobacco is subjected to the conditioned air for a sufficient period of time to cure and dry to the desired color, moisture content and quality.

The natural and orderly energy processes of this curing will be evident, if related to the human body in surface conditions, temperature and moisture dissipation. Using wrapper tobacco for comparison, one green leaf may weight 1½ ounces with a total area (both sides) of 200 square inches. Thus fifteen (15) leaves will equal an average man in superficial area and since ¾ ounce loss is the maximum permissible per leaf in 24 hours, the rate of evaporation is less than 10% of that from the human skin, at rest under normal room conditions and far below the perspiration zone. Accordingly, there is no need for the severe conditions of heat and fluctuating wind ventilations used in the normal cures. No "sweat" or discoloration need ever occur with the new moderate temperatures and effective movement factors.

In all curing, there is a sharp gradient in drying and curing rates from the central and butt sections of the leaf, to those of the edge portions and tips. This is because of (a) relative age and thickness of those portions, (b) the higher original moisture content of central areas, and (c) the recession of moisture from the tips and edges into the stem and its adjacent areas during the curing process. The promotion of thermal and vapor equilibrium by the method of this invention stabilizes the operation and avoids overdrying and/or staining the delicate portions. The separation of the leaves which is the primary objective of barn curing is entirely avoided. Contact, support, and communication of physical movement between leaves are utilized and thus conduction and potent inter-radiation (from the external source and evolution from the curing tobacco) are employed, in contrast to upblast on the tips. Furthermore, the gas (as from respiration) and vapor diffusion in these definite channels is effective and controllable. The heat, vapor and gas wave fronts pass through the mass, in contrast to the erratic convection and diffusion rates caused by vagrant and transient currents from the tight knots of curled tobacco into open lateral spaces and the flues at the ends of the common laths. The sharp chilling effect of the wet bulb temperature, which may well main-

tain the throttled moist leaf areas 10° below other portions of the leaf is avoided, as well as what may be termed the "Corrosive" action of the all too frequently reversible deposit and drying of beads of moisture. Similarly, the whipping and bleaching of tobacco on the outside is eliminated.

The channels established by the stems will create a corresponding directive and proportioning effect of the internal energy over the leaf, stem and vein surfaces, instead of the stagnant and locked in dampness of the doldrums in the knots created by the usual methods. Actually, these leaves are here maintained under some tension as the shrinkage attempts to take place, with benefit in subsequent operations, such as fermentation and sorting. The flat surface of the leaf offers maximum exposure for the functioning of the stomata which are shielded and thus inactive in the usual hanging.

The conditioned air is caused to enter a compact plane of air guiding means, made up of the tobacco leaves and is further distributed under pressure by the delta pattern of stems and veins. The reaction to the air flow pressure causes a smooth wave action, somewhat analogous to a water surface under the influence of a breeze, since the leaf assembly is free to move and the tips, central sections and butts can move relative to each other. This wave action creates an almost imperceptible opening and closing of air passages, and self-adjustment of the mass of tobacco as a whole. A similar effect operates with the same result when the butt ends are supported on a screen, through which the treating air rises into the angularly placed bed of leaves.

In carrying out the method of this invention, it is preferred to have all of the butts of the leaves either pointing upwardly or downwardly. A highly advantageous control of the flow of conditioned air through the bed of tobacco is achieved when the butts are held in the downward position, advantageously at an angle of from 40° to 80° to the horizontal. In this situation as the leaves proceed through the cure, they wilt and fall over towards the horizontal causing a reduction in the flow of conditioned air through the bed.

The method and apparatus in accordance with this invention will be made more apparent by the following description when read in conjunction with the drawings in which:

FIGURE 1 is a schematic vertical section of curing apparatus in accordance with this invention;

FIGURE 2 is a section taken on the plane indicated by the line 2—2 in FIGURE 1;

FIGURE 3 is a vertical section taken on the plane indicated by the line 3—3 in FIGURE 2;

FIGURE 4 is a vertical schematic section of an alternative apparatus in accordance with this invention.

As shown in FIGURE 1, the curing apparatus 2 in accordance with this invention 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 leaves 16 in closely strung relationship are secured to hooks 12 to form a bed 18 of tobacco leaves, the butts extending upwardly. Each hand of tobacco, as shown, comprises four leaves. The stringing up of the tobacco can be accomplished in any convenient manner as, for example, that shown in my Patent 2,682,341, issued June 29, 1954. All of the leaves 16 are substantially face to face, back to back or back to face and the pairs of strings 14 are spaced sufficiently closely together so that the leaves of adjacent pairs will be in contact.

Conditioned air is supplied by air conditioning apparatus indicated schematically at 20. Any conventional air conditioning apparatus can be employed, for example, the apparatus shown in my Patent 2,479,526, issued August 16, 1949. The conditioned air passes from apparatus 20 to conduit 22, to conduit 23 and thence to

branch conduits 24. Each conduit 24 is provided with downwardly directed tubes 26 having fins 27 angularly disposed to distribute the air laterally of the conduits 24.

If desired, a slight negative pressure is maintained on the tip side of the bed 18 by means of an exhaust blower schematically indicated at 28 and connected to compartment 4 as shown at 30. If it is desired to cut the exhaust blower 28 off from compartment 4, this can be accomplished by a door 32 held by a holding latch 34. If it is desired to recirculate air to air conditioning apparatus 20, this can be accomplished by opening door 36 which can be held open by a latch schematically indicated at 38.

An alternative curing apparatus 40 is shown in FIGURE 4. Apparatus 40 is provided with a chamber 42 in which are secured a pair of transverse beams 44 and 46. Screen 48 is secured to the upper side of beams 44 and 46 respectively. A bed of tobacco 52 is formed by stacking tobacco leaves 54 on screen 48 with the butts 56 resting on the screen.

Conditioned air is supplied under pressure at the butt side of the tobacco bed 52 by air conditioning apparatus indicated schematically at 58 provided with an air inlet conduit 59 and which is connected to a conduit 60. Conduit 60 has discharge ducts 61 provided with fins 63 to distribute the air laterally of conduit 60. Air is returned to air conditioning apparatus 58 from chamber 42 by conduit 62 controlled by valve 64. A negative pressure may be maintained on the tip side of the bed 52 by means of a blower indicated schematically at 66. A valve 68 controls the flow of air from chamber 42 to blower 62.

It is not desired to be limited except as set forth in the following claims.

What is claimed is:

1. The method of curing tobacco leaves which comprises: forming a bed of tobacco leaves with adjacent leaves in substantial contact by securing the butt ends of the leaves to a support with the leaves extending in one direction at a substantial angle to the horizontal, and forcing air through the leaves of the bed, said air being introduced into the bed at a temperature of from about 70° F. to about 200° F. and said air being forced through the leaves until the desired color and moisture content are achieved.

2. The method of curing tobacco leaves which comprises: forming a bed of tobacco leaves with adjacent leaves in substantial contact by securing the butt ends of the leaves to a support with the leaves all extending in one direction at a substantial angle to the horizontal, and forcing air through the leaves of the bed to provide for a temperature drop in the air from its entry into the bed to its discharge therefrom of from about .1° F. to about 5° F., said air being introduced to the bed at a temperature of from about 70° F. to about 200° F. and said air being forced through the leaves until the desired color and moisture content are achieved.

3. The method of curing tobacco leaves which comprises: forming a bed of tobacco leaves with adjacent leaves in substantial contact by securing the butt ends of the leaves to a support with the leaves all extending in one direction at a substantial angle to the horizontal, and forcing air through the leaves of the bed, said air being introduced to the bed at a temperature of from about 70° F. to about 200° F. and having a relative humidity of about 30% to about 75% and said air being forced through the leaves until the desired color and moisture content are achieved.

4. The method of curing tobacco leaves which comprises: forming a bed of tobacco leaves with adjacent leaves in substantial contact by securing the butt ends of the leaves to a support with the leaves all extending in one direction at a substantial angle to the horizontal, and forcing air through said bed to provide for a temperature drop in the conditioned air from its entry into the bed to its discharge therefrom of from about .1° F. to

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about 5° F., said air being introduced to the bed at a temperature of from about 70° F. to about 200° F. and having a relative humidity of about 30% to about 75%, and said air being forced through the leaves until the desired color and moisture content are achieved.

5. The method of curing tobacco leaves which comprises: forming a bed of tobacco leaves with adjacent leaves in substantial contact by securing the butt ends of the leaves to a screen butt down with the leaves all extending in one direction at a substantial angle to the horizontal, and forcing air through the leaves of the bed, said air being introduced into the bed at a temperature of from about 70° F. to about 200° F., and said air being forced through the leaves until the desired color and moisture content are achieved.

6. The method of curing tobacco leaves which comprises: forming a bed of tobacco leaves with adjacent leaves in substantial contact by securing the butt ends of the leaves to a support with the leaves all extending in one direction at a substantial angle to the horizontal, forcing air through the leaves of the bed, said air being introduced into the bed at a temperature of from about 70° F. to about 200° F., and exerting a negative pressure on the side of the bed opposite the side at which the air is introduced to the bed, said air being forced through the leaves until the desired color and moisture content are achieved.

7. The method of curing tobacco leaves which com-

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prises: forming a bed of tobacco leaves with adjacent leaves in substantial contact by stringing the butt ends of the leaves to strings with the leaves all hanging downwardly, and forcing air through the leaves of the bed, said air being introduced into the bed at a temperature of from about 70° F. to about 200° F. and said air being forced through the leaves until the desired color and moisture content are achieved.

8. The method of curing tobacco leaves which comprises: forming a bed of tobacco leaves with adjacent leaves in substantial contact by stringing the butt ends of the leaves to strings with the leaves all hanging downwardly, and forcing air through said bed to provide for a temperature drop in the conditioned air from its entry into the bed to its discharge therefrom of from about .1° F. to about 5° F., said air being introduced to the bed at a temperature of from about 70° F. to about 200° F. and having a relative humidity of about 30% to about 75% and said air being forced through the leaves until the desired color and moisture content are achieved.

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