May 2, 1944. R. D. TOUTON 2,348,038

METHOD OF TREATING TOBACCO

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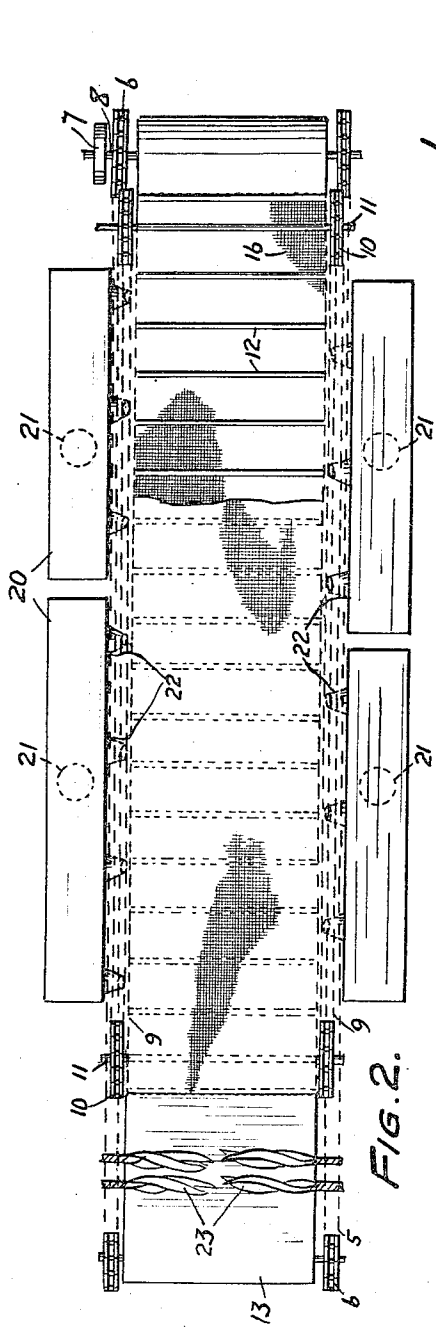

FIG. 2.

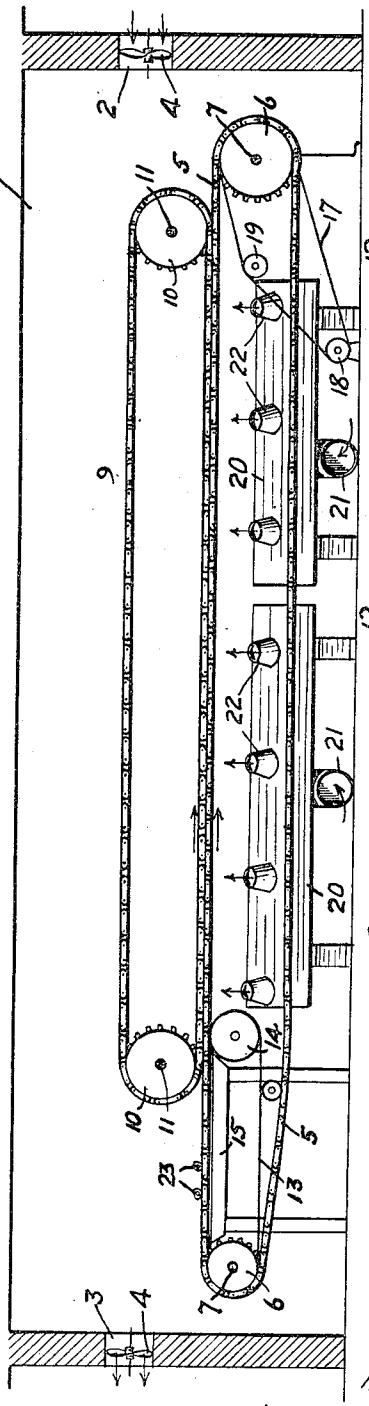

FIG. 1.

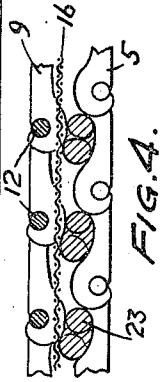

FIG. 4.

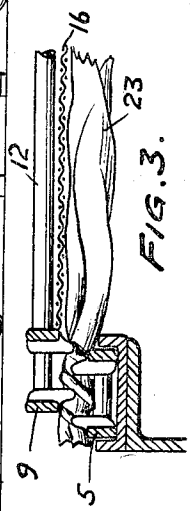

FIG. 3.

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METHOD OF TREATING TOBACCO

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6 Claims (Cl. 131—140)

This invention relates to a novel method of treating tobacco having various application in connection with the preparation of tobacco for use in the manufacture of cigars, cigarettes, and the like.

As is well known, tobacco as received for manufacture is in a dry state and for processing requires initial moistening to a moisture content within relatively narrow limits, in order to enable the tobacco to be handled without breakage and variously to prepare it for treatment, such as fermentation, for the removal or reduction of the amount of undesirable components, as nicotine, ammonia salts, carbohydrates, gums, esters, various acid salts, and the like, or for stripping or blending.

After tobacco has been initially moistened to the desired degree, it has been desired to maintain its moisture content constant throughout the subsequent processing in order to avoid the necessity for remoistening. However, heretofore this desideration has not been obtained due to the fact that in the initial moistening, or in subsequent treatment, the tobacco is heated and loses moisture on subsequent necessary cooling and/or aeration.

As illustrative, it is known to effect the initial desired moistening of tobacco before removal from the package, as a hogshead, by subjecting it to low temperature steam under reduced pressure, which results in heating the tobacco. The tobacco so treated is necessarily cooled subsequently, usually after fermentation, or before any manufacturing process. In the cooling its moisture content is substantially lowered.

Again, if the tobacco be moistened without heat, for example, by wetting the individual hands or dipping the bale and allowing same to sweat, it becomes heated in the fermentation step and loses moisture in the subsequent necessary cooling and/or aeration.

In the usual treatment of various tobaccos for moistening by steam under reduced pressure or in fermentation, the tobacco, depending upon its type, will be heated to a temperature within about the range 105°–160° F., and will desirably acquire a moisture content within about the range 15%–35%. The tobacco then will, in the course of its processing, be cooled to a temperature within about the range 70°–95° F. Generally speaking when in the treatment the tobacco is heated up to say 120–130° F., the desired moisture content, acquired within the limits indicated, will be low, say 15%–22%.

Heretofore in the cooling of the warm tobacco, as by shaking the individual hands, or other exposure to the air, or the like, the moisture content of the tobacco has inevitably been lowered below the desired minimum for the further processing of the particular tobacco.

Now in accordance with the method comprising this invention, it has been found that warm tobacco having desired moisture content can be readily cooled without reduction of the moisture content, by subjecting the warm tobacco to air, preferably streams or jets of air, at the temperature, or somewhat below the temperature, to which the tobacco is to be cooled and having a vapor pressure at, or somewhat higher than, the vapor pressure within the leaf.

In carrying out the method according to this invention, the treating air, conditioned as to temperature and relative humidity to have the desired vapor pressure, will be passed over the tobacco at a rate such that it will withdraw heat from the tobacco in amount per unit of air such that the vapor pressure of the air in contact with and about the tobacco will not be lowered with respect to that of the tobacco to a point where it will withdraw moisture from the tobacco.

To facilitate the cooling of hands of tobacco as a whole, in accordance with the method here, the hands, during the cooling treatment, will desirably be arranged with their butts, which, being closely related or packed, are hard to cool, in contact with a cool surface or surfaces of non-hygroscopic material of high specific heat or conductance, such as, for example, a metal, as iron, steel, aluminum, or the like, so that heat will be extracted thereby by conduction from the butts without extraction of moisture therefrom.

In applying the method here to tobacco which has undergone partial fermentation and is to be subjected to further fermentation, the cooling air may desirably carry ammonia in concentration higher than the concentration of ammonia in the tobacco, with the result that in the cooling of the tobacco without extraction of moisture therefrom the concentration of ammonia in the tobacco will remain unchanged or be increased.

Thus, if the tobacco is fermenting well, having an ammonia concentration equal to about pH 6.0–7.5, the ammonia in the air will be adjusted to maintain such concentration in the tobacco. On the other hand, if a concentration of ammonia in the tobacco equal to say pH 8.0–10.0 is required for good fermentation, the ammonia concentration in the air will be such

as to build up the requisite ammonia concentration in the tobacco by absorption from the air. The ammonia concentration of the tobacco can likewise be lowered and maintained at a specific point by adjustment of the ammonia concentration in the air to such as will enable loss of ammonia from the tobacco to the air.

In applying the method here, the treating air will be recirculated, with periodic reconditioning as to vapor pressure, and fresh air may be admitted to keep down the concentration of acids, ammonia and the like given off by the tobacco, and to keep the treating air fresh for the beneficial action of oxygen on the tobacco.

In proceeding, the cooling of the tobacco may be effected in zones of decreasing temperature, as by subjecting it to streams or jets of air of different temperatures, or by applying the air in counter current to the direction of travel of the tobacco.

As more specifically illustrative of the method according to this invention, the proper condition for the treating air for any given tobacco can be readily determined by placing a sample of the tobacco to be treated, the moisture content of which has been determined in the usual manner by weighing before and after heating to drive off the moisture, on a scale and subjecting it to air at the temperature to which the tobacco is to be cooled and an estimated relative humidity to give the proper vapor pressure with relation to that of the tobacco. Then increasing or decreasing the moisture content of the air and subjecting samples of the tobacco to it until the tobacco at its original weight neither gains nor loses, thus indicating that the vapor pressure of the air is stabilized with the vapor pressure of the tobacco.

When ammonia is included in the air, the ammonia concentration of the air will be estimated and varied until the ammonia concentration in the air is stabilized with respect to the concentration of ammonia originally in the tobacco, as determined by leaching with water and determination of hydrogen ion concentration of the solution, or sufficiently higher to increase the ammonia concentration of the tobacco to the desired point.

As a specific example, assuming that it is desired to cool tobacco which has been moistened with steam under reduced pressure. Assume that the tobacco is at a temperature of about 150° F., has a moisture content of about 20% and is to be cooled to about 75° F. By test, as indicated, the tobacco is found to have a vapor pressure in equilibrium with the vapor pressure of air at 75° F. and a moisture content to give a relative humidity of 88%. Desirably, the vapor pressure of the treating air will be somewhat higher than that of the tobacco, so the air for treatment will be conditioned to say a temperature of about 73.5° F. and a relative humidity of about 95% and will be passed over the tobacco, supported, for example, on a moving carrier, at a rate such that the air will be removed from the tobacco when the temperature of the air has increased 1.5° F. to 75° F., when its relative humidity would still be about 2% above the equilibrium point with no change in moisture content. It will be understood, of course, that in addition to the air directed at or passed over the tobacco in streams or jets, the air in general circulation about the tobacco will be conditioned to proper vapor pressure for the treatment.

In the treatment described, the butts of the hands of tobacco will desirably be gripped between metal, as iron, members for the removal of heat from the butts by conduction without removal of moisture therefrom.

Further, the walls of the chamber will, under the conditions of operation, necessarily be cooler than the tobacco. As a consequence, heat waves will pass from the tobacco to the walls which will cause an accelerated cooling of the tobacco without loss of moisture from the tobacco.

As will be obvious, the carrying out of the method according to this invention is independent of the use of any particular form of apparatus. However, apparatus which may be efficiently used will now be described with reference to the accompanying drawing, in which:

Figure 1 is a longitudinal sectional view of the apparatus shown in Figure 1 with an enclosing chamber.

Figure 2 is a plan view of a tobacco treating apparatus.

Figures 3 and 4 are sectional views showing details of metal supports for hands of tobacco.

In the drawing 1 indicates a chamber or room provided with an inlet 2 and an outlet 3 for air equipped respectively with fans 4, 4.

Within the chamber 1 is a pair of parallel endless chains 5, 5, running over sprockets 6, 6, on suitably supported shafts 7, 7, one of which is driven from a source of power through a pulley 8.

Above the pair of chains 5, 5 is a second pair of endless chains 9, 9, running over sprockets 10, 10 on shafts 11, 11. The chains 9, 9, are weighted and spaced by means of rods 12, which extend between the chains and beneath which is secured a screen 16, and these chains are arranged so that their lower reaches partially lap and ride upon the upper reaches of the chains 5, 5, as shown in Figure 3.

The chains 5, 5, extend beyond the chains 9, 9 and adjacent their extension at the end of the chamber adjacent to the outlet 3, an endless conveyor belt 13, running over pulleys 14, 14, one of which is on shaft 7, is positioned between the chains with its upper reach supported by a table 15. Adjacent to the extension of chains 5, 5 at the end of the chamber adjacent to the inlet 2, an endless conveyor belt 17, positioned between the chains, extends angularly to the horizontal about pulleys 18, 18, one of which is on shaft 7, and over a guide pulley 19.

Along the run of the chains at the outer sides thereof are positioned pairs of manifolds 20, 20 adapted to receive air from an air conditioning apparatus (not shown), or from a plurality of such apparatus, through conduits 21, 21, and to discharge streams or jets of air upwardly between the pairs of chains through nozzles 22, 22.

In operation of the apparatus described for carrying out the method here, hands of tobacco 23, 23 to be cooled are placed upon the conveyor belt 13 with their butts out and are carried by the belt so that the butts enter the nips of the pairs of chains. The butts of the hands are engaged by the overlying reaches of the chains and the upper chains are indented into the butts, as shown in Figure 3, so that they are firmly held.

The hands are carried along by the chains and then subjected to streams or jets of air from nozzles 22, 22, the air being conditioned as described above. At the same time, the air in the chamber in general is maintained in proper condition

by the passage of air, which may be fresh air or air from a conditioning apparatus (not shown), through the chamber from inlet 2 to outlet 3 by operation of the fans 4, 4.

In transit the tobacco leaves will be prevented by the screen 16 from blowing over the chains, or from injury from the bars 9, and on reaching the discharge end of the apparatus the leaves will be picked up for discharge by the conveyor belt 17 before the butts are released from the chains 5, 5 and 9, 9.

As will now be obvious, the air introduced to the tobacco from the first set of manifolds 20, may be warmer than that from the second set, and, again, it will be apparent that the air in general circulation from the inlet 2 to outlet 3 may be warmer in the outlet half of the chamber than in the inlet end. When desired to use ammonia in the treating air, it is obvious that such may be introduced into one or more of the manifolds 20, 20, or into the air supplied to the inlet 2.

As a result of the provision of the method according to this invention, warm tobacco may be readily cooled without loss of moisture, and, at the same time, when the tobacco to be cooled has been completely or partially fermented undesirable volatile components of the tobacco are swept out without impairing the further fermentation procedure, since the delicate balance of moisture content essential to fermentation is retained.

What I claim and desire to protect by Letters Patent is:

1. The method of cooling warm, moist tobacco without substantially changing its moisture content, which comprises passing over warm, moist tobacco air conditioned to have about the temperature to which the tobacco is to be cooled and a vapor pressure of approximately that of the tobacco, at a rate such that the vapor pressure of the air while in contact with the tobacco will not decrease below equilibrium with the vapor pressure of the tobacco at its original moisture content.

2. The method of cooling tobacco having a temperature within about the range 105°–160° F. and carrying moisture within about the range 15–35% to a temperature within about the range 70°–95° F. without substantially changing its moisture content, which comprises passing over warm, moist tobacco air conditioned to have about the temperature to which the tobacco is to be cooled and a vapor pressure of approximately that of the tobacco, at a rate such that the temperature of the air while in contact with the tobacco will not increase sufficiently to decrease the vapor pressure of the air below equilibrium with the vapor pressure of the tobacco at its original moisture content.

3. The method of cooling warm, moist tobacco without substantially changing its moisture content, which comprises passing over the leaves of hands of warm, moist tobacco air conditioned to have about the temperature to which the tobacco is to be cooled and a vapor pressure of approximately that of the tobacco, at a rate such that the temperature of the air while in contact with the tobacco will not increase sufficiently to decrease the vapor pressure of the air below equilibrium with the vapor pressure of the tobacco at its original moisture content, and simultaneously withdrawing heat from the butts of the hands by conduction through a non-hygroscopic medium of high specific heat in contact with the butts.

4. The method of cooling warm, moist tobacco without substantially changing its moisture content, which comprises passing over warm, moist tobacco air conditioned to have about the temperature to which the tobacco is to be cooled and a vapor pressure of approximately that of the tobacco, at a rate such that the temperature of the air while in contact with the tobacco will not increase sufficiently to decrease the vapor pressure of the air below equilibrium with the vapor pressure of the tobacco at its original moisture content, characterized by the fact that the air passed over the tobacco carries ammonia in concentration not less than the concentration of ammonia in the tobacco.

5. The method of cooling warm, moist tobacco without substantially changing its moisture content which comprises continuously moving hands of warm, moist tobacco in a chamber and subjecting it progressively to streams of air conditioned at progressively lower temperatures than that of the warm tobacco and having vapor pressures respectively approximately the same as the vapor pressure of the tobacco, while providing air conditioned to have a vapor pressure of approximately that of the tobacco in the chamber generally.

6. The method of cooling warm, moist tobacco without substantially changing its moisture content, which comprises continuously moving hands of warm, moist tobacco in a chamber and subjecting the leaf portions of the hands progressively to streams of air conditioned at progressively lower temperatures than that of the warm tobacco and having vapor pressures respectively approximately the same as the vapor pressure of the tobacco, while withdrawing heat from the butt portions of the hands by conduction through metal means in contact with the butts.

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