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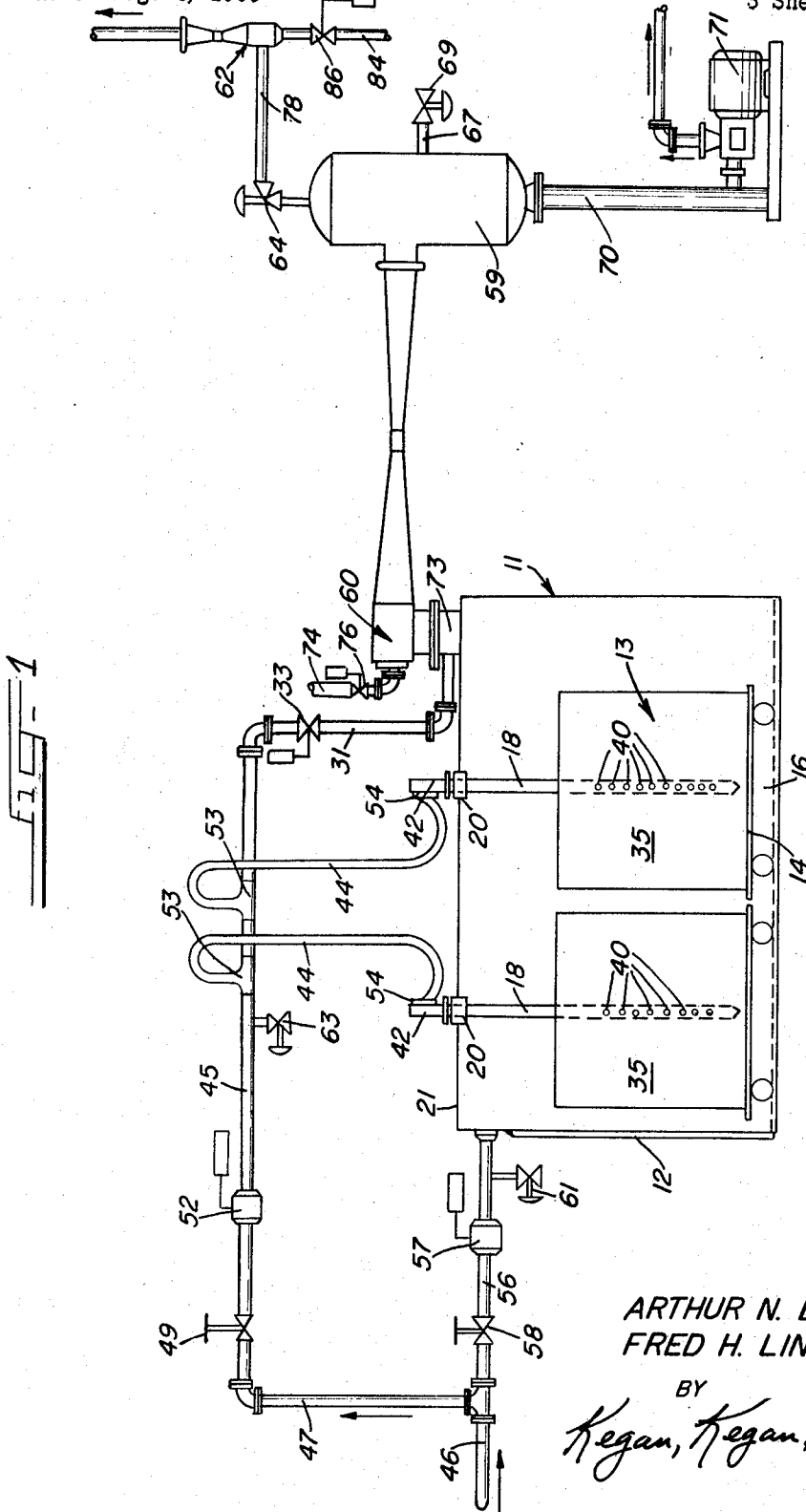
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3,345,992

METHOD FOR CONDITIONING TOBACCO

Filed Aug. 4, 1965

3 Sheets-Sheet 1



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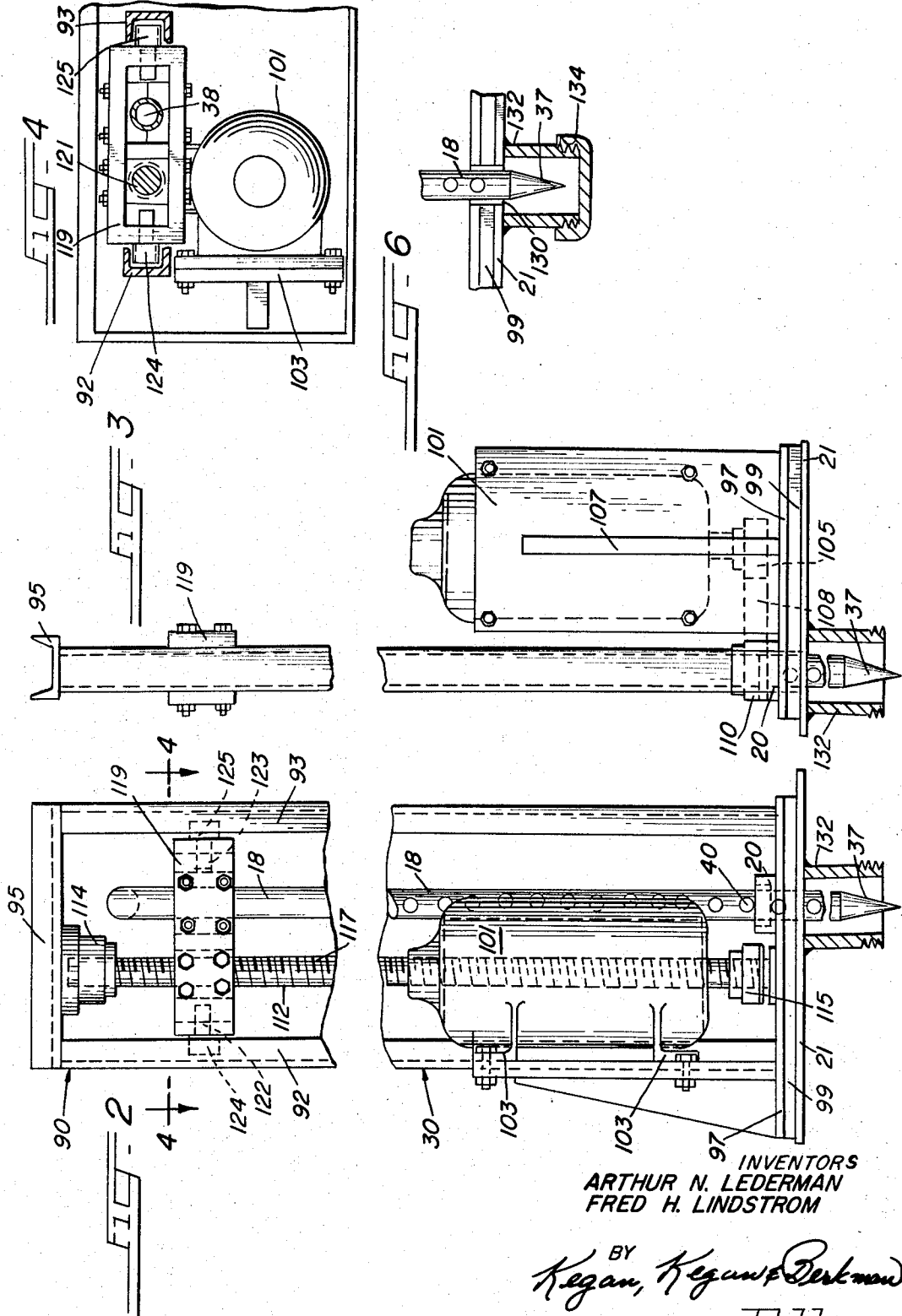
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3 Sheets-Sheet 2



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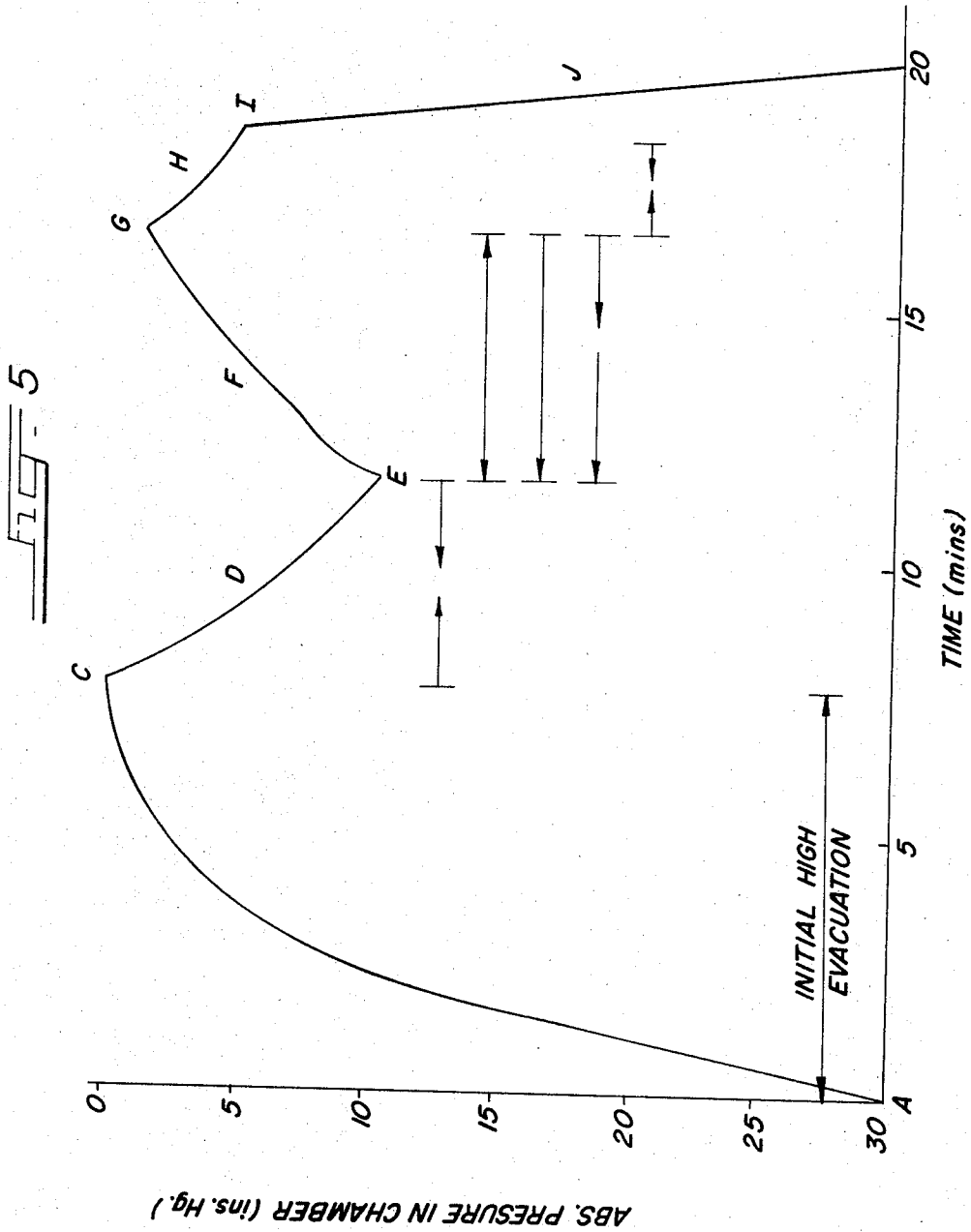
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3 Sheets-Sheet 3



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METHOD FOR CONDITIONING TOBACCO

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This invention relates to an improved method for conditioning and adjusting the moisture content of bulk products such as tobacco which have been stored or confined in hogsheads, bales, boxes, or in similar confining units. More particularly the invention is directed to an improved process for humidifying or moisturizing materials under controlled and direction-oriented cycling conditions of vacuum and steaming. In a preferred embodiment, the invention finds utility in the conditioning and moistening of domestic and foreign types of green, semi-dried or re-dried tobacco to prepare the tobacco for further processing. Also included within the scope of the invention is the apparatus for carrying out the process steps of the invention.

Many different types of processes for the conditioning and moisturizing of tobacco are known in the prior art. However, in each of these processes one or more objectionable features limits or impairs the general usefulness. In some instances the methods employed in the treatment cause excessive powdering or flaking and incident high ratios of scrap product to useful product. Other techniques require excessive processing times, tying up equipment and increasing over-all handling costs. Vacuum techniques of various types have been used. In still other cases pressurized systems have been employed. In some procedures the tightly packed or compressed leaf material has been subjected to contact with steam, water or moist air at the exterior bounding surfaces. In varied techniques, pipes or probes have been driven into the tobacco and water, steam or moist air introduced into the interior of the mass. In each of these and in the other prior art techniques the persistence of "cold spots" due to irregular vapor-penetration, failure to remove air or other non-condensable gases, and to the propensity to "channeling" have impaired the general effectiveness of the processes. Uneven and incomplete moisturizing have been the inevitable result.

It is the aim of the present invention to provide a process which obviates the objectionable features of prior art methods and techniques.

It is a principal object of the invention to provide an improved process for moistening materials under cycling conditions of vacuum and steaming and utilizing the principles of reverse flow, and duo-directional flow.

Another object of the invention is to provide an improved treatment cycle for conditioning tobacco and related products whereby excessive waste is eliminated and a uniformly treated product is obtained.

Still another object of the invention is to provide an improved cycling process in which novel flow reversals through the material being treated promote gentle physical agitation of the bulk product and pulsing within the mass to provide a plurality of varied and random steam paths through the treated material.

A related object of the invention is to provide a tobacco treating process whereby the leaf product is "fluffed" and loosened during the physical introduction of controlled moisture.

Yet another object of the invention is to reduce the time required for effective conditioning of the tobacco.

Other and further objects and advantages of the invention will become apparent from a reading of the following specification taken in conjunction with the drawing in which:

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FIGURE 1 is an over-all schematic representation of a preferred form of the apparatus used in carrying out the method of the invention;

FIGURE 2 is a fragmentary front elevational view of the probe drive assembly of the invention;

FIGURE 3 is a side view of the probe assembly;

FIGURE 4 is a cross-sectional view taken on the lines 4-4 of FIGURE 2;

FIGURE 5 is a graphic diagram of flow cycles embodying the teachings of the present invention; and

FIGURE 6 is a fragmentary cross-sectional view showing a structure for sealing the probe port.

Referring more particularly to the drawings, and especially to FIGURES 1, 2, 3 and 4 there is shown, for the purpose of illustrative disclosure, a preferred embodiment of the apparatus used in carrying out the invention. In the preferred arrangement depicted, the equipment illustrated comprises a treating or conditioning chamber 11, which is preferably an all steel rectangular or cylindrical shaped vacuum vessel, provided with a suitable sealing door 12. In the particular example illustrated, the chamber is a 2-hogshead unit, the hogshead 13 being loaded into the chamber 11 on wheeled platform trucks 14 riding on a trackway 16 extending into the conditioning chamber 11. Vertically positionable probes 18 extend through packing glands 20 connected through the top wall 21 of the chamber 11. Probe drive units 30 (FIGURES 2, 3, and 4) are used to insert or force the probes 18 into the tobacco 35 packed in the hogsheads 13. The probes 18 themselves are provided with sharply tapered ends or points 37 to facilitate insertion into the tightly packed contents of the hogsheads. Longitudinal bores 38 extend axially throughout substantially the full length of the probes and transverse radial bores 40 communicate with the longitudinal bores 38 to provide steam flow paths and evacuation channels or ducts.

The ends 42 of the probes 18 extending or protruding outwardly or externally of the chamber 11 are coupled to high-vacuum type flexible hoses 44 connected to a conduit or line 45 adapted to serve as both a steam supply lead and a vacuum lead during the reversing flow cycling process. A steam supply source (not shown) is connected to the probe units 18 through a lead line 46, a leg 47, a control valve 49, a shut-off valve 52, and line 45 to the flexible hose 44 through a pipe-to-hose coupling 53 and a hose-to-pipe fitting 54. The steam supply line 46 is branched to provide a leg 56 leading into the conditioning chamber through a conventional shut-off valve 57 and a control valve 58. An auxiliary pipe line 31 downstream of the shut-off valve 52 leads to another jet suction stage, through a shut-off valve 33 providing means for more effective evacuation of air and other non-condensable gases through the probe system.

In the particular arrangement illustrated the over-all evacuation system includes a tank or condenser 59, a first stage ejector 60 connected between the conditioning chamber 11 and the condenser 59, and between the probes 18 and the condenser 59, and a second stage ejector 62 connected to both the probes 18 and the chamber 11, through the condenser 59 through an isolation valve 64. The condenser 59 is provided with a cooling water supply line represented as a water pipe 67 extending into the condenser and delivering water serving as steam condensation means. A conventional shut-off valve 69 controls the flow of cooling water into the condensation tank 59. The condenser is preferably of a barometric type and is provided with suitable baffles, piping, etc. (not shown) and a barometric leg or vertical pipe 70 connected adjacent its lower end to a water pump 71. The pump 71 may be of a standard centrifugal type to remove water from the condenser and to ensure adequate water flow velocity. The effluent of the water pump may be dis-

charged to waste or may be directed to a cooling tower (not shown) for ultimate recirculation.

As illustrated schematically in FIGURE 1, the first stage ejector 60 of the evacuation system is connected for evacuation of the conditioning chamber 11 through a suitable pipe or duct connection 73 and for evacuation of the probe lines through pipe 31. A line 74 leading from a steam source (not shown), and provided with a shut-off valve 76, in accordance with accepted and conventional practices, discharges motive steam into the first stage ejector 60 to provide the aspirating or pumping effect in a manner well-known in the art.

A steam supply source (not shown) is connected to feed motive steam into the second stage ejector 62 through a lead 84 and a suitable control valve 86.

It is apparent from the above detailed description of the structure illustrated that both the chamber 11 and the probes 18 are provided with steam supplies as well as with vacuum connections. The purpose of this arrangement will be apparent from a consideration of the following description of the preferred processing methods and the cycling operations of the invention. However, before considering the methods of the invention, the mechanism by which the probes 18 are lowered and retracted will be described.

It has previously been pointed out that the probes 18 are vertically positionable to move through glands 20 in the chamber wall from an elevated position in which the probes are above the tobacco contained in the hogshead 13 to a lowered, functional position in which the probes 18 extend into the tobacco for evacuation and for steam introduction. Referring now to FIGURES 2, 3 and 4, there is shown, for purposes of illustrative disclosure, a preferred structure for a probe drive unit 30 by which the probes 18 are selectively positioned. Mounted above the evacuation and steaming chamber 11 is a yoke 90 which is shaped generally in the form of an inverted U constructed of channel irons to define a pair of vertically extending, facing, and inwardly opening channels or guideways 92 and 93 surmounted by a bridging channel member or bar 95. The lower ends of the vertically extending channels or guides 92 and 93 are connected to a base plate 97 which is in turn fastened to a mounting plate 99 welded to the top wall 21 of the chamber 11.

A gear motor 101 is supported from one of the lateral channels 92 by means of a bracket 103, and a sprocket 105 (FIGURE 3) mounted on the drive shaft 107 of the motor is coupled through a chain 108 to a driven sprocket 110 secured onto a vertically extending propelling shaft 112 rotatably mounted in end bearings 114 and 115 fastened to the bridging channel 95 and to the base plate 97 at opposed ends of the probe driving unit 30. The propelling shaft 112 is provided with external threads 117 extending along its length. A cross-head or probe clamp 119 provided with a cooperating threaded sleeve 121 is fastened onto the threaded shaft 112 so that the sleeve engages and travels along the shaft as the shaft rotates. Extending longitudinally from opposite ends of the cross-head are stub shafts 122 and 123 which extend into the opposed facing channels 92 and 93 and carry rollers or guides 124 and 125 journaled on the shafts. The rollers ride within the guideways defined by the channels 92 and 93. The probe 18 is rigidly and firmly fastened adjacent its upper end into a clamp integral with the cross-head 119 whereby the probe 18 is moved upward or downward with the screw-driven cross-head as the motor-driven threaded shaft 112 is rotated. As shown in FIGURE 1, the free end of the probe 18 extends through the packing gland 20 in the top wall 21 of the vacuum chamber 11. In an alternative arrangement probes may be inserted into the hogsheads or bales prior to placing the hogsheads in the evacuation or conditioning chamber. The exposed ends of the probes are then coupled

to hoses or pipes for vacuum and for steam treatment of the material contained in the hogsheads or bales.

For the purpose of illustrative disclosure, and not by way of limitation, a preferred processing and conditioning cycle is depicted schematically in FIGURE 5. The entire system including the probe lines, the probes, and the sealed chamber containing one or more hogsheads of tobacco to be treated, is subjected to an initial evacuation by means of the second stage steam ejector 62 (FIGURE 1) to remove most of the gas from the chamber. The first stage ejector is then actuated to continue the evacuation through the chamber and through the probes to achieve a final pressure of about 0.3 inch of mercury (C) absolute. In the cycle illustrated, this initial "high evacuation" requires about 7 minutes. Moisturizing steam is then introduced concurrently (C-D-E) into the chamber 11, as indicated schematically by the arrows $\rightarrow \leftarrow$, through line 56 and into the interior of the tobacco through lines 47, 45, 44 and the probes 18, with valve 33 closed.

The pressure in the system is increased (D) to a value of about 10 inches of mercury corresponding to a temperature of about 162° F. (E). Utilization of steam which is saturated is ensured by introducing water into the steam line through valves 61 and 63 downstream of the control valves 52 and 57 and upstream of the probes and the conditioning chamber. Superheating is thus obviated and "excess" moisture is made available for "plating" on the tobacco. Introduction of steam-desuperheating water into the probe line may be delayed a short period of time to avoid an excess of water at the start of the steaming, thus preventing wetting of the tobacco. Steam control valves 49 and 57 are closed to terminate steam introduction and the system is reevacuated (F), after an optional holding period, preferably through both the chamber and the probes, as indicated schematically by the arrows \leftrightarrow (FIGURE 5), though evacuation through the chamber only, indicated schematically by the arrow \leftarrow in FIGURE 5, may be satisfactory in some instances. In another preferred reevacuation cycle, steam is introduced into the probe while the system is evacuated through the chamber, at least for a portion of the reevacuation period, as indicated schematically by the arrows $\leftarrow \leftarrow$ in FIGURE 5. During each reversal, from evacuating to steaming, and vice-versa, there are inflections in the pressure and temperature versus time curve. These discontinuities or shifts and flow reversals cause "pulsing" within and "fluffing" of the tobacco contained in the hogsheads enhancing moisture penetration and greatly minimizing any likelihood of "cold spots." During the gas or steam flow reversals (D) and (F) or any subsequent flow reversal during evacuation and steaming, the equilibrium pressure within the system will decrease and increase with corresponding decreases and increases in temperature.

In the second evacuation (E-F-G) the pressure is reduced to about 2 inches of mercury, corresponding to a system temperature of about 100° F. as indicated in FIGURE 5 (G). Steam is again introduced into the chamber and through the probes (H) causing additional pulsing of the tobacco to loosen the pack and "fluff" the tobacco. As pointed out above, the relative direction of steam flow into the system is indicated by arrows in FIGURE 5. In FIGURE 5, arrows directed inwardly or away from the lateral boundaries of a given cycle stage ($\rightarrow \leftarrow$) represent flow of steam into the system. Arrows directed outwardly or toward the lateral boundaries of a cycle stage ($\leftarrow \rightarrow$) represent evacuation from the system.

If preferred, the 162° F. temperature (E) may be held for about one minute before the reevacuation steps (F) to ensure insect destruction. During the second steaming (H), preferably through both the chamber and the probe ($\rightarrow \leftarrow$), the system pressure is increased to about 5 inches of mercury and the temperature is raised to about 135° F. (I). At this stage, the vacuum is broken (J) returning the chamber to atmospheric pressure and

completing the cycle. The over-all cycle requires about 20 minutes. In the interest of shortening the conditioning time one skilled in the art may readily modify the steps of cycle to complete the treatment within about 16-18 minutes, or even less. The grade, type, and the original condition or state of the tobacco will be an important consideration when scheduling any preferred cycle.

The novel methods of tobacco conditioning which are the essence of the present invention, will be described with reference to the apparatus illustrated in the drawings. Tobacco contained in hogsheads 13 or barrels is loaded onto wheeled trucks 14 positioned on the trackway 16 and the trucks are moved into the conditioning chamber to predetermined positions such that the vertical axes of the hogsheads are substantially in alignment with the vertical paths of travel of the probes 18. The probes 18 are forced into the tobacco to bring the points 37 to a position adjacent the bottom of the hogsheads 13. With the door 12 to the chamber sealed, the conditioning or treatment cycle may be initiated.

Basically, the method of the invention contemplates a simple yet highly effective processing cycle including the following steps. The system is evacuated through the chamber and through the probes, this initial evacuation being to a relatively high degree ensuring that the pressure in the system is below the "equilibrium vapor pressure" of water in the chamber so that the moisture "boils" off and non-condensable gases are removed. The initial rate of evacuation is not critical but important economies are achieved through shortened time cycles. In a typical cycle, the initial evacuation requires about 6 to about 10 minutes. Chamber volumes and equipment considerations will control, but rapid evacuation is preferred. With substantially all of the air and other gases removed from the chamber, and the system pressure in the range of from about 0.15 inch to about 1.0 inch of mercury, and preferably at about 0.3 inch, the initial "moisturization" is carried out. Steam is introduced directly into the chamber and simultaneously into the probes so that moisture penetrates the tobacco from the outer surface inwardly and from the center or core radially outwardly. Water is added to the steam as a spray to ensure saturation and to preclude superheating. During this steaming step the pressure in the system is gradually increased and the temperature within the chamber and within the tobacco rises. In a preferred cycling process, the pressure is increased to from about 6 to about 15 inches of mercury and the temperature rises to a corresponding value of from about 140° F. to about 180° F. In a modified cycle, the initial evacuation and steaming may be through the chamber only.

The highest temperature reached is not critical, but it is desirable in the processing of the tobacco to reach a temperature at which insect destruction is assured. Tests carried out indicate that an expected temperature-time relationship exists. For example, kill or destruction of egg, larva, pupa, and adult moths, beetles, and other insects is achieved in about 1 minute at 170° F., and in about 3 minutes at 150° F. It may be expected that longer times at somewhat lower temperatures may be effective. At still more elevated temperatures shorter times will suffice. Again, in the interest of reducing the processing time, the generally higher temperatures are preferred. However, other obvious considerations, including possible deleterious effects upon the tobacco, dictate against temperatures which are too high.

The "flow" of steam through the tobacco is then reversed by reevacuating the system through the chamber and through the probe (E-F-G), or through the chamber alone, if preferred. During the "reversal" or the switching of the direction of steam flow through the tobacco, the pressure in the ambient system decreases (F) and the temperature drops (G). In a somewhat modified reevacuation cycle, steam is introduced through the probes

while evacuating through the chamber, enhancing the "fluffing" of the tobacco.

The reversal of flow, which is preferably relatively abrupt, causes physical phenomena such as "pulsings" which have several important effects upon the packed tobacco and upon the completeness of air removal from and steam penetration into and upon the uniformity of steam penetration into the product treated. That is, the physical "agitation" or disturbance is conducive to and promotes the formation of new and an increased number of flow paths through the tobacco and tends to minimize "channeling." The number of "cold spots" is greatly reduced and, in most cases, cold spots are practically eliminated. A more uniform ultimate product is obtained and processing losses attributable to powdering are minimized. Since the effectiveness of the reverse flow technique of the invention is enhanced upon repetition of the steps described, it is preferred to include in the process cycle at least two flow reversals or flow reversal stages.

In the re-evacuation step (F) it is not necessary to achieve the high degree of evacuation of the initial process step. Re-evacuation is preferably from both the chamber and the probes until a pressure of about 2 inches of mercury and a corresponding temperature of about 100° F. are reached. Appreciable "fluffing" of the tobacco is achieved during the re-evacuation step.

In the final steps of the cycle, steam is introduced into the system through the chamber and through the probes (G-H-I) to force steam "inward" into the tobacco and radially outwardly, concurrently. The final temperature to be reached may be any desired value but is preferably in the range of from about 120° F. to about 145° F. corresponding to a pressure in the range of from about 4 inches to about 7 inches of mercury. A suitable ultimate steam pressure is about 5 inches of mercury, corresponding to a temperature of about 135° F. (I). If preferred, the system may be subjected to a "holding period" of from about ½ to about 3 minutes at this temperature and pressure to ensure that equilibrium is achieved throughout the contents of the hogshead. The more slowly the final temperature is approached, the shorter is the required holding period. It may, if preferred, be eliminated completely. The final step is to break the vacuum, opening the system to the atmosphere to return the system to ambient temperature and pressure. A preferred procedure is to introduce air through the probes in order to enhance the fluffing of the tobacco.

The novel arrangement of the structural elements of the apparatus has been described with reference to the new methods and processing procedures of the invention. It may be desired, however, to use the equipment in carrying out more conventional processing cycles not calling for use of probes. Under such circumstances a preferred procedure is to withdraw the probe 18 upwardly through the ceiling opening 130 so that substantially the entire probe shaft is outside of the vacuum chamber 11. As illustrated in FIGURE 6 a stub pipe section 132 coaxial with the probe shaft is welded or otherwise connected at the ceiling 21 and extends downwardly into the chamber. The pipe section 132 is threaded at its lower end 134 and a cooperating threaded cap 136 is provided to seal the lower or depending end of the pipe section. Thus, with the shaft of the probe retracted to clear the lower end of the downwardly extending pipe and the sealing cap 136 affixed in position, the chamber may be used in carrying out procedures not involving use of the probes.

Throughout the description and in the specific examples, the invention has for the most part been explained with reference to the treatment or conditioning of tobacco. However, the utility of the methods and of the apparatus disclosed and claimed is not to be construed as limited or restricted in any way to any particular product or group of products. The inventive concept embraces all materials which may advantageously be processed or

treated in accordance with the processes and techniques of the invention. The bulk product which is treated in the chamber of the conditioning apparatus may be in any gross physical shape or packaged form including but not limited to bales and hogsheads. Throughout the specification and in the claims the terms bales and/or hogsheads are used not in any limiting sense but as "equivalents" and one term is intended to include the other.

While disclosures of preferred embodiments of the apparatus and of preferred methods of the invention have been provided, it will be apparent that numerous modifications and variations thereof may be made without departing from underlying principles of the invention. It is, therefore, desired by the following claims to include within the scope of the invention all such variations and modifications by which substantially the results of this invention may be obtained through the use of substantially the same or equivalent means.

What is claimed is:

1. The method of humidifying and increasing the volume of a tobacco pack contained in a bale, hogshead or box to provide a uniformly moisturized tobacco product and comprising the steps of:

placing said pack in a vacuum chamber provided with means for establishing subatmospheric pressures and with means for introducing steam vapor in said chamber;

inserting a probe having a longitudinal bore and radial openings in communication with said bore into said tobacco pack axially, in the center thereof, for substantially the full vertical height of said pack;

evacuating said chamber through a bounding wall thereof and simultaneously evacuating air and other gases through said probe to establish a pressure of about 0.3 inch of mercury absolute in said chamber and within said pack;

introducing steam into said chamber through a wall thereof to penetrate said tobacco pack from outer surfaces thereof inwardly while simultaneously introducing steam through said probe to travel through said pack radially outwardly to fluff the tobacco in the pack and to increase the volume thereof, to bring the pressure in said chamber and said pack to about 10 inches of mercury absolute and the temperature to a corresponding value of about 162° F.;

reevacuating said chamber while simultaneously introducing steam into said tobacco pack through said probe to reverse steam flow through said pack and to reduce the pressure within said chamber to about 5 inches of mercury absolute and the temperature to a corresponding 135° F.; and

restoring the pressure in said chamber and in said pack to atmospheric pressure and the temperature to ambient temperature to provide a uniformly moisturized tobacco product.

2. The method of claim 1 wherein restoration of the pressure in said chamber and in said pack to atmospheric pressure comprises the step of introducing air into said pack and into said chamber through said probe in said pack.

3. The method of conditioning a mass of tobacco contained in a bale or hogshead in a vacuum chamber to provide a uniformly moisturized and humidified product of increased over-all bulk and comprising the steps of: driving a probe having a longitudinal bore and radial openings in communication with said bore axially into said tobacco mass in substantially the center thereof for substantially the full length of said mass; evacuating said chamber through a bounding wall thereof to an absolute pressure in the range of from about 0.15 inch to about 1.0 inch of mercury, while simultaneously evacuating through said probe to

remove substantially all air and other gases from said mass of tobacco;

introducing steam into said chamber through a bounding wall thereof and simultaneously through said probe to bring the absolute pressure within said chamber and within said tobacco to from about 6 to about 15 inches of mercury and to bring the temperature within said chamber and said tobacco in the range of about 140° F. to about 180° F.;

reevacuating through said chamber while simultaneously introducing steam into said mass of tobacco through said probe to fluff said tobacco and to bring the pressure within said chamber and said tobacco to about 2 inches of mercury and the temperature to about 100° F.;

reintroducing steam into said tobacco through said chamber and through said probe to increase steam pressure within said tobacco to a value of between about 4 inches to 7 inches of mercury and the temperature therein to from about 120° F. to about 145° F., and to reverse steam flow through said tobacco to provide a substantially uniformly humidified tobacco product; and

bringing said vacuum chamber and said mass of tobacco to atmospheric pressure and ambient temperature.

4. The method of conditioning a mass of tobacco contained in a bale or hogshead in a vacuum chamber to provide a uniformly humidified product and comprising the steps of:

inserting a perforated probe axially into said tobacco mass in substantially the center thereof for substantially the full depth of said mass;

evacuating said chamber through a bounding wall thereof and concurrently evacuating through said probe to remove substantially all of the air from said chamber and substantially all of the air and other volatile gases from said mass of tobacco;

introducing steam directly into said chamber to enter said mass of tobacco from outer surfaces thereof inwardly while simultaneously introducing steam through said probe to permeate said tobacco radially outwardly from said probe;

reevacuating through a bounding wall of said chamber to reverse the flow of steam through said tobacco; and

resteam said tobacco mass through said chamber and through said probe to provide uniformly humidified tobacco.

5. The method of conditioning a mass of tobacco contained in a box, a bale, or hogshead in a vacuum chamber to provide a uniformly humidified product and comprising the steps of:

inserting a perforated probe axially into said tobacco mass in substantially the center thereof for substantially the full depth of said mass;

evacuating said chamber through a bounding wall thereof and concurrently evacuating through said probe to remove substantially all of the air from said chamber and substantially all of the air and other volatile gases from said mass of tobacco;

introducing steam directly into said chamber to enter said mass of tobacco from outer surfaces thereof inwardly while simultaneously introducing steam through said probe to permeate said tobacco radially outwardly from said probe;

reevacuating through a bounding wall of said chamber and through said probe to reverse the flow of steam through said tobacco; and

resteam said tobacco mass through said chamber and through said probe to provide uniformly humidified tobacco.

6. The method of conditioning a mass of tobacco contained in a bale or hogshead in a vacuum chamber to provide a uniformly humidified product and comprising the steps of:

driving a probe having a longitudinal bore and radial openings in communication with said bore axially into said tobacco mass in substantially the center thereof for substantially the full length of said mass; evacuating said chamber through a bounding wall thereof to an absolute pressure in the range of from about 0.15 inch to about 1.0 inch of mercury, while simultaneously evacuating through said probe to remove substantially all air and other gases from said mass of tobacco;

introducing steam into said chamber through a bounding wall thereof and simultaneously through said probe to bring the absolute pressure within said chamber and within said tobacco to from about 6 to about 15 inches of mercury and to bring the temperature within said chamber and said tobacco in the range of about 140° F. to about 180° F.;

reevacuating through said chamber and said probe to reverse the flow of steam through said mass of tobacco, to fluff said tobacco, and to bring the pressure within said chamber and said tobacco to about 2 inches of mercury and the temperature to about 100° F.;

reintroducing steam into said tobacco through said chamber and through said probe to increase steam pressure within said tobacco to a value of between about 4 to about 7 inches of mercury and the temperature therein to from about 120° F. to about 145° F., and to reverse steam flow through said tobacco to provide a substantially uniformly humidified tobacco product; and

bringing said vacuum chamber to atmospheric pressure and ambient temperature.

7. The method of humidifying a tobacco pack contained in a bale or hogshead to provide a uniformly moisturized tobacco product and comprising the steps of: placing said pack in a vacuum chamber provided with means for establishing subatmospheric pressures and with means for introducing steam vapor in said chamber;

inserting a probe having a longitudinal bore and radial openings in communication with said bore into said tobacco pack axially, in the center thereof, for substantially the full vertical height of said pack;

evacuating said chamber through a bounding wall thereof and simultaneously evacuating air and other gases through said probe to establish a pressure of about 0.3 inch of mercury absolute in said chamber and within said pack;

introducing steam into said chamber through a wall thereof to penetrate said tobacco pack from outer surfaces thereof inwardly while simultaneously introducing steam through said probe to travel through said pack radially outwardly and to bring the pressure in said chamber and said pack to about 10 inches of mercury absolute and the temperature to a corresponding value of about 162° F.;

reevacuating said chamber and said probe to reverse steam flow through said pack and to reduce the pressure within said chamber and said pack to about 5 inches of mercury absolute and the temperature to a corresponding 135° F.; and restoring the pressure in said chamber to atmospheric pressure and the temperature to ambient temperature to provide a uniformly moisturized tobacco product.

8. The method of claim 7 wherein restoration of the pressure in said chamber and in said pack to atmospheric pressure comprises the step of introducing air into said pack and into said chamber through said probe in said pack.

9. The method of conditioning a mass of tobacco contained in a bale or hogshead in a vacuum chamber to provide a uniformly humidified product and comprising the steps of:

driving a probe having a longitudinal bore and radial

openings in communication with said bore axially into said tobacco mass in substantially the center thereof for substantially the full length of said mass; evacuating said chamber through a bounding wall thereof to an absolute pressure in the range of from about 0.15 inch to about 1.0 inch to mercury to remove substantially all air and other gases from said mass of tobacco;

introducing steam into said chamber through a bounding wall thereof to bring the absolute pressure within said chamber and within said tobacco to from about 6 inches to about 15 inches of mercury and to bring the temperature within said chamber and said tobacco in the range of from about 140° F. to about 180° F.;

re-evacuating through said chamber to bring the pressure within said chamber and said tobacco to about 2 inches of mercury and the temperature to about 100° F.;

re-introducing steam into said tobacco through said probe to increase steam pressure within said tobacco to a value of between about 4 inches to about 7 inches of mercury and the temperature therein to from about 120° F. to about 145° F., and to reverse steam flow through said tobacco to provide a substantially uniformly humidified tobacco product; and bringing said vacuum chamber and said mass of tobacco to atmospheric pressure.

10. The method of conditioning a mass of tobacco contained in a bale or hogshead in a vacuum chamber to provide a uniformly humidified product and comprising the steps of:

driving a probe having a longitudinal bore and radial openings in communication with said bore axially into said tobacco mass in substantially the center thereof for substantially the full length of said mass; evacuating said chamber through a bounding wall thereof to an absolute pressure in the range of from about 0.15 inch to about 1.0 inch of mercury to remove substantially all air and other gases from said mass of tobacco;

introducing steam into said chamber through a bounding wall thereof to bring the absolute pressure within said chamber and within said tobacco to from about 6 inches to about 15 inches of mercury and to bring the temperature within said chamber and said tobacco in the range of from about 140° F. to about 180° F.;

re-evacuating said chamber through a bounding wall thereof and simultaneously re-evacuating air and other gases through said probe to bring the pressure within said chamber and said tobacco to about 2 inches of mercury and the temperature to about 100° F.;

re-introducing steam into said tobacco through said probe to increase steam pressure within said tobacco to a value of between about 4 inches to about 7 inches of mercury and the temperature therein to from about 120° F. to about 145° F., and to reverse steam flow through said tobacco to provide a substantially uniformly humidified tobacco product; and bringing said vacuum chamber and said mass of tobacco to atmospheric pressure.

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