

[54] TOBACCO EXPANSION PROCESS

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[22] Filed: Mar. 7, 1972

[21] Appl. No.: 232,541

[52] U.S. Cl. 131/140 P

[51] Int. Cl. A24b 03/18

[58] Field of Search 131/140-144

[56] References Cited

UNITED STATES PATENTS

3,144,871	8/1964	De Souza et al.	131/140 P
3,524,451	4/1968	Fredrickson	131/140 P
3,683,937	8/1972	Fredrickson et al.	131/140 P

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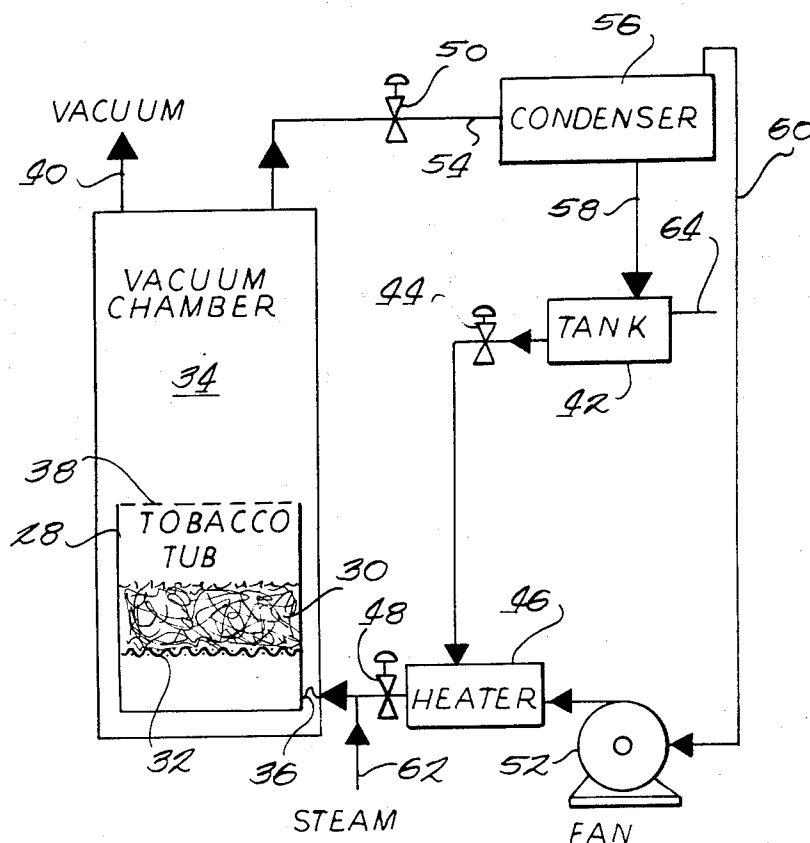
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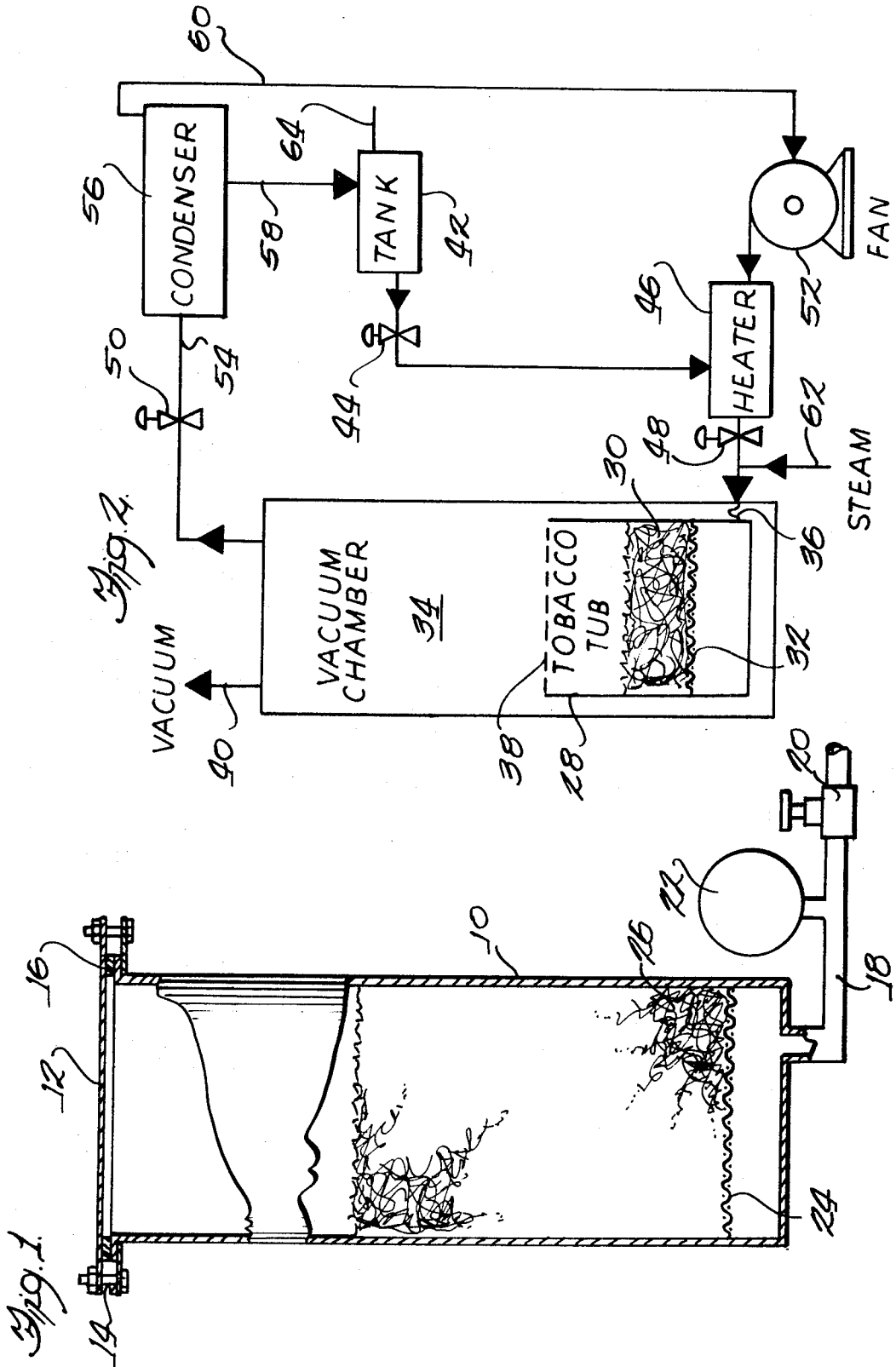
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ABSTRACT

The filling capacity of tobacco is increased by establishing a body of water-moistened tobacco in a bed in a hermetically sealed chamber. A partial vacuum is applied to the bed to remove occluded air and the tobacco is contacted with vapors of a compound having an atmospheric pressure boiling point between about -10 and $+80^{\circ}\text{C}.$, the temperature of the tobacco during contact being maintained at or below the boiling point of the compound at the prevailing pressure, whereby the tobacco is impregnated with the compound in the liquid state by condensation. The impregnated tobacco is then equilibrated, and a drying gas at a temperature between about 40° and $80^{\circ}\text{C}.$ is passed through the bed to remove a portion of the moisture and the impregnating compound as vapors. A hot gas at a temperature above about $90^{\circ}\text{C}.$ and more than about $18^{\circ}\text{C}.$ above the boiling point of the compound is then passed through the tobacco to expand it.

6 Claims, 2 Drawing Figures





TOBACCO EXPANSION PROCESS

BACKGROUND OF THE INVENTION

This invention relates to a process of treating tobacco and has for an object the provision of a process for increasing the filling capacity of tobacco.

Tobacco leaves when harvested contain a considerable quantity of water and during the normal tobacco curing process this water is removed by drying, resulting in shrinkage of the leaf structure. In the usual process of preparing tobacco for storage and subsequent cigar or cigarette manufacture, the tobacco regains very little, if any, of the shrinkage resulting from the drying step so that a significant loss in the filling capacity of the tobacco is the result. Thus, the cured tobacco has a bulk density which is in excess of that required for making satisfactory cigarettes or cigars. Also, during cutting of leaf or strips for making cut filler for cigarettes, frequently the shreds are laminated together to form hard, dense particles which occupy far less volume than the original shreds occupied. This is wasteful since these hard compacted shreds are not necessary in the tobacco to produce an article which is satisfactory for smoking.

Several procedures have been suggested in the prior art for increasing the normal filling capacity of tobacco. Certain of these procedures have involved puffing operations in which the tobacco is subjected to high pressure steam, followed by sudden release of pressure. Such processes have not usually been satisfactory since they result in the production of excessive amounts of fines. Also, it has been suggested that the filling capacity of tobacco may be increased (i.e., bulk density reduced) by exposing the tobacco to the vapors of an organic liquid to condense the liquid in the tobacco followed by air drying at ambient temperatures and pressures. However, such procedures have not been wholly satisfactory because they are not effective for increasing the filling capacity to any great extent. Other methods that have been proposed involve contacting the tobacco with a volatile organic liquid and then heating the liquid-impregnated tobacco to a temperature above the boiling point of the liquid whereby to vaporize the liquid directly in the tobacco causing expansion. Embodiments of these last-mentioned procedures are described in U.S. Pat. Nos. 3,524,451 and 3,524,452 issued Aug. 18, 1970, and No. 3,575,178 issued Apr. 20, 1971.

An object of this invention is to provide a batch process for expanding tobacco.

Another object of this invention is the provision of a tobacco expansion process which involves the use of vapors of a tobacco impregnating compound and which may be carried out in equipment readily available to tobacco processors.

A further object of this invention is the provision of a process for increasing the filling capacity of tobacco under conditions such that the process can be readily controlled to produce the desired product.

An additional object of this invention is the provision of a process for expanding tobacco using vapors of an impregnating compound thereby eliminating the requirement of handling large quantities of liquid in commercial operations.

A further and additional object of this invention is to provide a process for increasing the filling capacity of tobacco which eliminates the requirement of using ex-

cessive quantities of impregnating liquid thereby avoiding substantial energy requirements associated with the vaporization of excess liquids.

A still further object of this invention is the provision of a tobacco expansion process which facilitates recovery of the impregnating liquid through the use of relatively simple and inexpensive equipment.

Further and additional objects will appear from the following description, the accompanying drawing and the appended claims.

GENERAL DESCRIPTION OF THE INVENTION

In accordance with one embodiment of this invention, a process is provided in which a body of tobacco having a moisture content of about 8 to 30 percent by weight (dry basis) is established in a bed in a hermetically sealable chamber. The chamber is sealed and a vacuum applied to remove a portion of the non-condensable gas (e.g., air) occluded within the tobacco. The tobacco is then contacted with vapors of a compound which has an atmospheric pressure boiling point between about -10 and $+80^{\circ}\text{C}$. under conditions such that a substantial portion of the vapors condense on the moist tobacco. The tobacco body is then allowed to stand (i.e., equilibrated) for a period of time to permit penetration of the condensate into the tobacco particles. A drying gas at a temperature between about 40° and 80°C . is then passed through the bed to remove as vapor a portion of the water and a portion of the compound. Thereafter the tobacco is subjected to vapor-expanding conditions by passing a gas, preferably steam, heated to a temperature above about 90°C . and at least 18°C . above the boiling point of said compound at the prevailing pressure through the impregnated tobacco whereby to vaporize the liquid impregnant and to expand the vapor and cause simultaneous expansion of the tobacco. The resulting tobacco has a lower bulk density (i.e., higher filling capacity) than the untreated tobacco charged to the process and is suitable for use in the manufacture of smoking tobacco articles such as cigarettes, cigars, pipe tobacco and the like.

The tobacco to be treated in accordance with the process of this invention is preferably a cured tobacco and may be in the form of shreds, strips, leaves, stems or sheets of reconstituted tobacco. However, the process is easier to control and the best results are obtained if tobacco shreds are used. This is for the reason that usually shreds are relatively easy to handle and the final product of the process need not be subjected to shredding as may be necessary for cigarette manufacture. Shredding of the final product results in compressing the product which tends to destroy the ultimate objective of the process of this invention, namely, to expand the tobacco and eliminate compressed particles, as may have resulted from prior treatment including shredding. Any type of tobacco may be used in the practice of this invention, and it is particularly useful for the processing of burley, flue-cured and Oriental (e.g., Turkish) tobaccos.

Burley and flue-cured tobaccos used in the manufacture of cigarettes ordinarily have a moisture content of about 11 to 14 percent by weight. In the practice of this invention, the moisture content of the tobacco when contacted with the vapor of the compound is usually in excess of about 8 percent by weight, and preferably within the range of 10 to 20 percent by weight of the

tobacco. The desired moisture content may be achieved by drying the tobacco or by the addition of water, as may be appropriate. This latter may be effected by any suitable procedure such as sprinkling, spraying, wet steam treatment, or the like, as is known to those skilled in the art. The presence of the indicated percentage of moisture is desired since the internal structure of the tobacco is thereby rendered sufficiently pliable or flexible to permit the ready penetration of the impregnating compound into the individual tobacco particles and the expansion of puffing when the impregnating compound vaporizes and expands within the tobacco upon subsequent treatment with the steam or other hot gas. If the moisture content is less than about 8 percent, the impregnation step proceeds at a very slow rate. If the moisture content is greater than about 20 percent, the partial drying step described below would be unnecessarily prolonged.

In accordance with this invention, the moist tobacco, which usually contains an occluded gas such as air, is introduced into a hermetically sealable impregnating chamber, the chamber is sealed and a vacuum applied to remove at least a portion of the occluded gas. Preferably the vacuum is applied to the chamber to reduce the absolute pressure from atmospheric to less than about 1/10 atmospheric. By removing occluded air, the tobacco can be most effectively contacted by the vapor and the condensate in the subsequent impregnating step. The vapors of the impregnating compound are then introduced into the chamber so that the compound rapidly comes into contact with the tobacco. During the vapor treatment the tobacco in the chamber is maintained at a temperature and pressure which will permit a substantial proportion of the vapors to condense directly on the tobacco particles. Thus, the temperature is preferably at or below the boiling point of the impregnating compound at the pressure prevailing within the chamber to insure that the desired vapor condensation occurs. Also, it is preferred that the temperature of the tobacco during the impregnating step be above about 0° C. so that impregnation with the vapors and the subsequent condensation will readily occur.

The amount and concentration of vapors in the atmosphere used to treat the tobacco are not critical except to the extent that sufficient vapor should be present to provide an impregnated tobacco which will contain sufficient condensed liquid and vapor to permit the desired expansion when the impregnated tobacco is subjected to the heating and expansion step. In accordance with the present invention, the impregnating vapor is introduced into the previously evacuated chamber containing the tobacco. This permits the quantity of the impregnating material to be precisely controlled. For example, if 20 percent by weight impregnant is desired on the tobacco, the quantity to be admitted to the chamber is readily calculated based on the weight of the tobacco plus the additional quantity of vapor necessary to occupy the void space in the chamber under the pressure conditions selected. Super-atmospheric pressure may be employed during impregnation, if desired, to introduce the calculated quantity of vapor into the chamber. Alternatively, the impregnation step may be carried out by forcing the impregnating vapor through the tobacco in the chamber thereby causing significant amounts of the vapor to contact the tobacco with resul-

tant condensation. Other variations may also be used to effect impregnation with equally satisfactory results.

Regardless of the details of the impregnation technique used, it is desirable that the actual amount of impregnant introduced into the tobacco be such that after the tobacco has been subjected to the gas drying step and just before expanding with the hot gas, the impregnant concentration will be at least one part but not more than 40 parts by weight based on the weight of the tobacco (dry basis) and preferably between 2 parts and 10 parts by weight of impregnant per 100 parts of tobacco (dry basis). This will minimize redistribution of tobacco constituents which are soluble in the condensed impregnant.

The compounds or mixtures employed for impregnating the tobacco are preferably ones which are organic in nature, are chemically inert to the tobacco being treated and have boiling points at atmospheric pressure between about -10° and +80° C. Compounds having boiling points above 80° C. do not provide good expansion and are difficult to remove completely from the tobacco without adversely affecting its flavor and aroma. Compounds having boiling points below about -10° C. at atmospheric pressure require that the temperature of the tobacco be brought to an abnormally low point or the pressure to be increased to an undesired or unnecessarily high level in order to enable the necessary condensation to occur on the tobacco. Preferably, the atmospheric pressure boiling point of the impregnating compound or mixtures is between about 15° and 40° C. Illustrative organic compounds which may be used to carry out this invention include acetone, methyl ethyl ketone, methyl ethyl ether, methyl propyl ether, diethyl ether, dimethoxymethane, furan, tetrahydrofuran, methanol, ethanol, ethyl formate, pentane, isopentane, hexane, pentene, hexene, cyclobutane, cyclopentane cyclohexane, cyclopentene, cyclohexene, benzene, ethyl chloride, propyl chloride, t-butyl chloride, methylene chloride, methyl bromide, ethyl bromide, chloroform, carbon tetrachloride, ethylidene chloride, trichlorofluoromethane, trichlorotrifluoroethane, octafluorocyclobutane, 1,1,1-chlorodifluoroethane, 1,2-dichlorotetrafluoroethane, chlorodifluoromethane and azeotropic mixtures of the above-mentioned compounds such as the trichlorofluoromethane-isopentane azeotrope. Compounds that are preferred are the nonoxygenated organic compounds which are relatively nonpolar in nature and are relatively or substantially immiscible in water. These preferred compounds, as a group, have relatively low specific heats and thus require only a low energy input to cause them to vaporize and expand within the tobacco. Preferred materials are the hydrocarbons and the halogenated hydrocarbons within the group previously mentioned. Most preferred are isopentane and trichlorofluoromethane because their boiling points permit the impregnation step to be carried out without excessive heating or cooling requirements. As previously noted, mixtures of vapors of several compounds may also be used if the boiling points of the mixtures are within the indicated temperature range.

After vapor impregnation and condensation, the tobacco is allowed to stand (i.e., equilibrate) for at least 10 minutes and up to several hours in order to allow the condensate to penetrate into the tobacco shreds or other pieces. This penetration is aided by the moisture present in the tobacco (i.e., from 10 to 20 percent) at

this stage. Following equilibration the partial drying step is carried out prior to steaming. The partial drying step is an important feature of this invention and is effected by rapidly passing dry air or other chemically inert gas, such as vapors of the impregnating compound, through the tobacco bed to remove as vapors, portions of the moisture and the impregnating compound. The temperature of the drying vapors as they enter the bed of tobacco is between about 40° C. and about 80° C. and time of sweeping the vapors through the tobacco is preferably from about 5 to 30 minutes. The purpose of the partial drying step is to remove sufficient water from the tobacco so that during the subsequent steaming step, water condensing on the tobacco will not raise the tobacco moisture so high that the expanded tobacco might collapse again. It will be appreciated by those skilled in the art that the temperature of the gas used in the partial drying step is determined to some extent by the moisture content of the gas source. Since removal of moisture from the tobacco is a primary objective, it is preferred that the sweeping gas be as dry as practicable in order to achieve good drying efficiency.

After the partial drying step, moisture that remains in the tobacco is at least about 5 percent by weight and the amount of impregnant is at least about one percent by weight. All impregnant is not removed during the partial drying step because the final portions of impregnant do not migrate very rapidly from the dried tobacco even though the tobacco is warmed to a temperature above the boiling point of the impregnant.

Following partial drying, the tobacco is then rapidly heated to vaporize the impregnating liquid whereby the liberated vapors expand and puff the tobacco particles to the desired extent. The expanding step is preferably carried out directly in the chamber used for impregnation but it may be carried out after removal to a separate piece of equipment. In any event, the impregnated tobacco is rapidly heated by a hot moist gas, preferably steam, to raise the temperature at least 18° C. without a corresponding increase in pressure whereby the tobacco is puffed by vaporization of the liquid and subsequent vapor expansion. Preferably the hot gas temperature is at least about 90° C. and the time of exposure to the hot gas may vary from a few seconds to several minutes.

After the puffing, it may be desirable, at least with certain organic materials, to remove last traces of the vapors by passing hot, moist air through the expanded tobacco. The expanded tobacco is then adjusted, if necessary, to the moisture content desired for the final product. This is usually carried out by wet steaming, spraying, etc., and the final moisture content is preferably within the range of 11 to 14 percent by weight. This tobacco product, having decreased bulk density, is particularly useful for the manufacture of smoking products such as cigarettes, cigars and pipe tobacco. The bulk density having been decreased, considerable savings in tobacco cost are obtained in the manufacture of these smoking products without sacrificing quality.

In order to measure the filling capacity of a cut filler tobacco product as described in the following examples, a compressometer is used which is essentially composed of a cylinder 9.5 centimeters in diameter with a graduated scale on the side. A piston 9.4 centimeters in diameter slides in the cylinder. Pressure is applied to the piston and volume in milliliters of a given

weight of tobacco, 100 grams, is determined. Experiments have shown that this apparatus will accurately determine the volume (filling capacity) of a given amount of cut tobacco with good reproducibility. The pressure on the tobacco applied the piston in all examples was 2.30 pounds per square inch applied for five seconds, at which time the volume reading was taken. This pressure corresponds closely to the pressure normally applied by the wrapping paper to tobacco in cigarettes. The moisture content of the tobacco affects the filling capacity values determined by this method, therefore, comparative filling capacities were obtained at similar moisture contents.

DESCRIPTION OF THE DRAWING

For a more complete understanding of this invention, reference will now be made to the accompanying drawing in which

FIG. 1 is a schematic showing of the apparatus used for carrying out the process of Example I embodying this invention, and

FIG. 2 is a schematic showing of equipment that may be used for carrying out this invention in commercial practice where it is desirable to recover the impregnant used.

FIG. 1 shows a hermetically sealable pressure vessel or chamber 10 in which is 11 inches high by 4½ inches in diameter. A cover 12 is removably fastened to the flanged top of the vessel by bolts and nuts 14 and a gasket 16 is placed underneath the cover for hermetically sealing the vessel 10. A vapor line 18 of ¼-inch pipe extends from the bottom of the vessel, and attached to line 18 are a valve 20 and pressure gauge 22. Mounted an inch above the bottom of the vessel 10 is a wire screen disk 24 to support a bed of tobacco 26. The inside of the vessel is lined with three layers of wet strength cardboard (not shown), each 1/64 of an inch thick (e.g., template paper) to serve as insulation.

FIG. 2 is a schematic of plant scale equipment for expanding tobacco by the method of this invention. A tobacco tub 28 which may be supported on wheels (not shown) is filled half full of tobacco 30 which rests on a screen 32 near the bottom of the tub. The tub of tobacco is pushed into a vacuum chamber 34, and a flexible hose 36 is coupled to the bottom of the tub. Across the top of tub 28 is a hold-down screen 38 to prevent expanding tobacco from overflowing the tub. It is obvious that more than one tub of tobacco can be treated simultaneously in vacuum chamber 34.

The chamber is evacuated through vacuum line 40, and this line is then closed. Trichlorofluoromethane, or other suitable impregnating material, is fed from tank 42 through valve 44 into heater 46. The impregnant boils in heater 46 and vapor goes through valve 48 and flexible line 36 into tub 28 and condenses on tobacco 30. Vapor is fed in this manner until a rate pressure, e.g., 15 psig., is reached. Valve 44 is then closed.

After an equilibration period (e.g., 1 hour) to allow impregnant to penetrate into the tobacco, valve 50 is opened and fan 52 is turned on. Vapor leaves the vacuum chamber through line 54 and goes into cold water condenser 56. Vapor that condenses (moisture and also a portion of impregnant) flows into tank 42 through conduit 58. Vapor pressure exerted by the impregnant prevents all vapor from condensing. Vapor that does not condense leaves the condenser 56 through line 60 and passes through fan 52, heater 46,

and the tub of tobacco 30. This operation consists of warm dry vapor sweeping up through the tobacco for the purpose of evaporating a portion of the impregnant and a portion of the moisture from the tobacco.

Fan 52 and heater 46 are then turned off, and valve 48 is closed. Steam is introduced through line 62 for a short period of time, e.g., 15 to 90 seconds. Steam condenses on tobacco 30, causing impregnant deep in the tobacco to flash to vapor and expand the tobacco. Expanding tobacco causes the top of the bed to rise and the tobacco bed may reach hold-down screen 38.

Impregnant vapor driven out of the tobacco, and any excess steam, condense in condenser 56 and the condensate flows into tank 42. Water in tank 42 floats on the impregnant, trichlorofluoromethane, and can be periodically drawn off through tap 64.

In order to facilitate removal and handling of the tub of tobacco, it can be readily cooled by closing valve 50 and again evacuating chamber 34.

SPECIFIC EXAMPLES

EXAMPLE I

Cut (i.e., shredded) flue-cured tobacco at 20 percent by weight moisture (dry basis) was loaded into the vessel 10 shown in FIG. 1. The bed of tobacco 26 was 10 inches deep, and rested on screen 24. The quantity of tobacco used was 270 grams, equivalent to 216 grams dry tobacco and 54 grams moisture. The washer 16 and cover 12 were placed on the vessel and the vessel was sealed.

Air was removed from the vessel by connecting valve 20 to a vacuum pump for 15 minutes. Valve 20 was then closed and connected to a small flask (not shown) that contained 135 grams of liquid trichlorofluoromethane. Valve 20 was again opened and the flask of liquid was heated by means of a water bath. The liquid evaporated and the vapor passed into the vessel in contact with the tobacco 26.

After all of the volatile liquid had entered the vessel, gauge 22 indicated 4 pounds pressure. Valve 20 was closed and the vessel 10 was placed in an oven at 50° C. for 90 minutes. The pressure rose to 17 psig.

The vessel was removed from the oven and connected at valve 20 to an ice water condenser. Valve 20 was opened, causing excess trichlorofluoromethane vapor to leave the vessel 10 and condense; the quantity recovered was 88 grams.

Cover 12 was then removed from the vessel. The tobacco bed had reached to 7.5 inches of depth. A source of dry air at 55° C. was connected to line 18 and the air was passed into the bottom of the vessel and up through the tobacco rapidly. A hold-down screen, weighted with 300 grams of weights, was placed over the tobacco to hold the tobacco plug in the vessel against rising air.

Air flow at 55° C. through the tobacco was continued for 20 minutes. The warm dry air evaporated a large portion of volatile impregnant from the tobacco, removed some moisture, and also warmed the tobacco.

The side wall of the vessel was extended 6 inches by adding a section of cardboard tube (not shown) to the top of the vessel. A source of saturated steam was connected to valve 20, and steam was passed up through the bed 26 of tobacco for 30 seconds. Steam caused the tobacco to expand, and caused the bed thickness to increase from 7.5 to 16 inches.

The filling capacity of the tobacco was measured by the compressometer described above. Filling capacity

prior to treatment was 443 ml./100 grams, and filling capacity after expansion was 827 ml./100 grams, both measurements made on tobacco conditioned to 12.4 percent moisture.

EXAMPLE II

The general procedure of Example I was repeated except that 100 grams of tobacco having a moisture content of 12.4 percent was treated with 110 grams of trichlorofluoromethane. The vessel was heated at 45° C. for 90 minutes during which time the gauge pressure increased from 6 to 16 pounds. The vessel was then removed from the oven and vented by opening valve 20. A source of trichloromonofluoromethane vapor was connected to line 18 and vapor heated to 80° C. by means of a suitable heat exchanger (not shown) was passed up through the tobacco for 15 minutes. A total of 1.5 liters of trichloromonofluoromethane was vaporized during this 15-minute period at the end of which time the temperature of the vapor emerging from the top of the tobacco bed was 60° C. The tobacco was then contacted with saturated steam for 15 seconds via line 18 to give expanded tobacco with a filling capacity of 634 ml./100 grams (measured after adjusting the moisture to 12.4 percent). Untreated tobacco had a filling capacity of 374 ml./100 grams.

EXAMPLE III

Cut flue-cured tobacco (4 pounds, moisture 13.9 percent) was put into a metal tub 16 inches wide and 30 inches long. The tobacco formed a bed 3.5 inches deep which rested on a perforated metal plate two inches above the tub bottom. The tub of tobacco was put into a jacketed autoclave equipped with special connections. These included a line into the top of the autoclave chamber for introducing or removing vapor, and a second line into the bottom which was connected directly to the bottom of the tub below the perforated metal plate.

A vacuum generated by steam jets and connected to the top of the autoclave was employed to evacuate the autoclave for 15 minutes. The evacuated autoclave was heated by circulating 65° C. water through the jacket and trichlorofluoromethane vapor at 65° C. was introduced into the chamber until pressure in the autoclave reached 30 psig. After the tobacco had equilibrated at 30 psig. for 45 minutes, pressure was released via the connection in the bottom of the tub. The jacket temperature was then raised to 82° C. and heated trichlorofluoromethane vapor was rapidly passed through the autoclave from top to bottom. This sweeping operation was continued for 10 minutes. Steam was then passed into the bed of tobacco for 30 seconds causing the impregnated tobacco to expand. The autoclave was evacuated once again for 15 minutes to dry and cool the expanded tobacco.

The above sequence of operations caused filling capacity of the tobacco to increase from 442 to 850 ml./100 grams, both measurements at a 12.4 percent tobacco moisture basis.

EXAMPLE IV

Cut flue-cured tobacco (85 pounds, moisture 13.2 percent) was put into a round wooden tub, 42 inches in diameter. The tobacco was supported on wire mesh, 4 inches above the bottom of the tub. Depth of the tobacco bed was 14 inches. The tub of tobacco was

placed in a vacuum chamber that is normally used for conditioning a hogshead of tobacco. A pipe connection into the bottom of the tub served as access for introducing vapor or steam into the tobacco at the bottom of the bed.

The chamber was closed and was evacuated for 30 minutes by means of steam jets. The vacuum line was closed, and warm trichlorofluoromethane vapor was introduced into the evacuated chamber via the tub connection until vapor filled the chamber at a positive pressure of 5 psig. Tobacco was allowed to equilibrate at this pressure for 1 hour before venting the chamber. Steam was introduced to the bottom of the tobacco bed for 45 seconds causing the impregnated tobacco to expand. The chamber was evacuated for 25 minutes in order to remove excess moisture and to cool the tobacco.

The product contained 14.1 percent moisture. After conditioning to 12.4 percent moisture, the filling capacity was 651 ml./100 grams, compared to an initial filling capacity of 433 ml./100 grams (12.4 percent moisture). In this example, the impregnated tobacco was not warmed and dried by sweeping hot vapors through the tobacco (as in Example III), and, consequently, the product was not as highly expanded.

It will be appreciated from the foregoing that this invention provides a means whereby the impregnating liquid may be rapidly and efficiently introduced into the tobacco before the latter is subjected to the heat expansion process. A method has been provided whereby large quantities of impregnating fluid are rendered unnecessary and, accordingly, it is not necessary to provide expensive equipment for the recovery and recycling of impregnating fluid although it will be appreciated that economic conditions may dictate that the fluid be recovered for reuse in the process. Equipment suitable for recovery of the impregnant can be readily adapted for use with the apparatus and process described herein. Also, by this procedure the processor can make use of equipment that is normally found in plants for processing tobacco for the manufacture of cigarettes, cigars and the like. One such piece of equipment which can be readily modified is disclosed in U.S. Pat. No. 3,262,458 issued July 26, 1966.

While particular embodiments of this invention have been described in the foregoing, it will, of course, be

apparent that other modifications may be made without departing from the spirit and scope of this invention.

What is claimed is:

1. A process for expanding the filling capacity of tobacco which comprises establishing a body of tobacco having a water moisture content of between about 8 and 30 percent by weight (dry basis) in a stationary bed in a hermetically sealable chamber, sealing said chamber and applying a partial vacuum thereto to remove a portion of the occluded, non-condensable gases therefrom, passing vapors of a compound having an atmospheric pressure boiling point between about -10 and $+80^{\circ}$ C. into said chamber having a temperature at or below the boiling point of said compound at the prevailing pressure whereby the tobacco in said bed is impregnated by said compound at least partially in the form of a condensate, equilibrating the body of impregnated tobacco body for a period sufficient to insure penetration of said condensate into the individual particles of the tobacco body, passing a drying gas through said bed at a temperature between about 40° and 80° C. for a time sufficient to remove as vapor a portion of the water moisture and the impregnating compound, and thereafter rapidly passing a hot gas having a temperature above about 90° C. and at least about 18° C. above the boiling point of said compound at the prevailing pressure into contact with said tobacco whereby to vaporize and remove substantially all of said compound within said bed and concomitantly expand the tobacco.

2. The process of claim 1 in which the amount of compound impregnating the tobacco when the hot gas passed into contact therewith is between about 1 and 40 parts by weight of compound per 100 parts by weight of tobacco (dry basis).

3. The process of claim 2 wherein said amount is between about 2 and 10 parts by weight of compound per 100 parts by weight of tobacco (dry basis).

4. The process of claim 1 wherein said compound is a hydrocarbon or a halogenated hydrocarbon.

5. The process of claim 4 wherein said compound is trichloromonofluoromethane.

6. The process of claim 1 wherein said tobacco is shredded tobacco.

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