S P E C I F I C A T I O N

BE IT KNOWN THAT, JOHN ELLIN deSOUZA, a Canadian Citizen of 56-16th Street, Roxboro, Province of Quebec, Canada, and ROBERT LOUIS RICE, a Canadian Citizen of 5715 MacMurray Avenue, Montreal 29, Province of Quebec, Canada, having made an invention entitled

TREATMENT OF TOBACCO WITH ORGANIC SOLVENTS IN THE VAPOUR PHASE, the following disclosure contains a correct and full description of the invention and of the best mode known to the inventors of taking advantage of the same.

This invention relates to the treatment of cigarette tobacco whereby the filling capacity of the tobacco is improved without impairing the manufacturing properties of the tobacco or reducing the acceptability, in respect to smoking qualities, of cigarettes manufactured from the treated tobacco.

The term filling capacity refers to that property of tobacco which determines its ability to resist compression. This property, among others, governs the yield per pound of tobacco of acceptably firm cigarettes. It follows from the above definition that in comparing two tobaccos, the tobacco from which cigarettes can be made at a lower weight without impairing the firmness of the cigarette, is the tobacco with the better filling capacity. This property is measured (1) on cigarettes by their resistance to compression under different weight loads and (2) on tobacco by the volume obtained after subjecting a sample of standard weight to compression.

A means of treating tobacco by which the filling capacity of the tobacco is improved, without impairing other properties of the tobacco, is obviously advantageous to the manufacturer.

The present invention pertains to the treatment of tobacco with organic solvents in the vapour phase. The treatment is preferably carried out at or near the vapour temperature of a boiling solvent but need not be restricted to this temperature. The time of treatment may be long or short depending on the solvent used and the results desired.

Incidental to this treatment, a certain amount of solvent vapour is condensed on the tobacco during the initial warming up of the equipment after which the tobacco is entirely in vapour. During the initial warm up stage, a small amount of materials is unavoidably extracted from the tobacco but the amount extracted is never greater than 3% and usually less than 2% of the original tobacco weight.

Solvents are known to have been used in the treatment of tobacco but for the express purpose of denicotinizing tobacco by solvent extraction processes. Such processes have been described in British Patent No. 413,942 to Drummond; German Patent No. 301,439 to Rothenburg; U.S. Patent No. 2,04[illegible],624 to Roselius, and U.S. Patent No. 1,577,768 to Smith. To obtain the objective of denicotinizing tobacco, the patentees describe processes of two or more stages which include raising the moisture content of the tobacco to a high level prior to an extraction with an organic solvent. Not only does this perform an extraction of certain of the tobacco constituents but it tends to deteriorate the leaf structure. Smith, in fact, treats tobacco with live steam at 100 to 150°C and at pressures above atmospheric, followed by an additional treatment with volatile bases such as ammonia, methylamine, etc. Rhodes U.S. Patent No. 2,227,863 describes the extraction of tobacco with fluoro-chlorohydrocarbons for the removal of "tarry materials" and includes in his patent the use of normally gaseous hydrocarbons, the latter requiring the extractions to be carried out at pressures greater than atmospheric.

It will then be seen that the use of solvents has been contemplated for extraction purposes in the liquid state and not for the treatment of tobacco with solvents in the vapour state. The removal of extract, which represents less than 3% of the starting weight of tobacco, is incidental to our process. The present process also differs from the above prior art in that: (1) It is a one stage process, and (2) The treatment is carried out under normal atmospheric pressure.

The object of the present invention is to treat tobacco with a solvent vapour for the purpose of increasing the filling capacity of the tobacco without impairing other properties of the tobacco or removing any significant amount of materials from the tobacco.

The above and other objects of the invention will be apparent from the following detailed description and from the accompanying drawing which is a schematic diagram of the apparatus (laboratory) employed in the treatment of the tobacco with solvent vapours.

Any process by which tobacco can be placed in contact with warm or hot solvent vapours can be used. The apparatus illustrated in the accompanying drawing is by way of example only and could be modified to suit any particular set of conditions such as the type of tobacco being processed, the particular solvents being used and factory layout etc.

The apparatus disclosed includes a reaction flask 5 having a cover 6 set over any suitable heating apparatus or heating mantle 7. A condenser 8 is mounted in the cover 6 adjacent to the vertical wall 9 of the flask 5. A wire basket 10 is suspended by any suitable means in the flask 5 midway between the top level of the solvent 11 and the cover 6. To avoid the condensed solvent from condenser 8 passing through the tobacco in basket 10, the size of the basket 10 and position of same in flask 5 is so designed that no portion of the basket is directly under the condenser tube 12. A thermometer 13 is fitted through the cover 6 and extends down into the flask 5 to provide an external reading of the temperature within the flask.

The type of solvent used can be of the type miscible with water, partially miscible with water or non-miscible with water and can include open and closed chain saturated and unsaturated hydrocarbons, aromatic hydrocarbons, alcohols, ketones, ethers, esters, chlorinated solvents or a mixture of these solvents, and is brought to the desired temperature within the flask 5 in order to generate solvent vapour which will envelope the tobacco carried in the wire basket 10.

During the initial heating-up of the solvent, a certain amount of solvent vapour is condensed on the tobacco. However, after the tobacco attains a rise in temperature approximating that of the vapour, condensing of the vapour on the tobacco will cease. Also, by locating the wire mesh basket away from under the condenser 8, any condensate will fall back to the bottom of the flask and not on the tobacco.

After treatment of the tobacco with the solvent vapours for a requisite length of time, the tobacco is removed from the reaction flask and air dried to remove any residual solvent. After air drying, the tobacco is re-equilibrated to its original moisture content.

In the interest of better understanding of the invention, the following examples of treatment of the tobacco are given, but such examples are not to be construed in any restrictive sense.

Example 1.

Approximately 550 cc of benzene were poured into a 5000 ml. reaction flask, 100 gms. of tobacco were weighed into a wire mesh basket and the basket having a smaller diameter than the inner diameter of the flask was placed in the flask and suspended approximately 6 inches over the surface of the solvent. The cover was placed securely on the flask and a thermometer placed in one outlet of the cover and a condenser in the other outlet. The condenser was so arranged that the condensed solvent was returned to the flask along the side of the vessel without coming into contact with the tobacco in the basket. A heating mantle was placed around the bottom of the flask and the solvent heated by this means. The tobacco was subjected to solvent vapours at a temperature of 74°C to 78°C for 15 minutes.

After treatment, the tobacco was removed from the flask and air dried to remove any residual solvent followed by re-equilibration to its original moisture content.

Tests on the tobacco showed that an increase in filling capacity of 11% was obtained.

Example 2

A series of tobacco samples were processed as above with different solvents and at different temperatures. The results of these treatments are given in the following table:

Solvent	Condition of Treatment		Per Cent Increase In Filling Capacity Over Untreated Tobacco (Control)
	Temperature	Time	
Toluene	100° ± 2°C	20 mins.	14.5
Dichloroethane	75° ± 2°C	20 mins.	8.2
Methanol	64° ± 2°C	20 mins.	15.3
n-Hexane	67° ± 2°C	20 mins.	5.9

In all cases, a certain amount of the original sample of tobacco was retained as a control. After treatment, the control and treated samples were equilibrated at similar conditions of temperature and relative humidity. Following equilibration, the filling capacities were measured simultaneously and the differences expressed as per cent increase in filling capacity of the treated tobacco over the control.

As will be seen, the per cent increase in filling capacity was substantial and was obtained without impairing the manufacturing properties of the tobacco or its smoking qualities.

The low levels of extract eluted by our process is illustrated by the examples given in the following table. Treatment of tobacco samples with n-hexane and benzene vapours removed extracts representing only 0.93% and 0.57% of the original dry weight of tobacco (see column 2, of the table). No nicotine was eluted in the first instance and only 0.1% in the second (see column 3, of the table).

The equilibrium moisture content of tobacco, that is the moisture content at which a tobacco will neither gain or lose moisture at a specified temperature and relative humidity, is of great importance in the handling and manufacturing of tobacco. In column 4 of the table, it is shown that the equilibrium moisture contents of the treated samples were not significantly different from the untreated sample. This demonstrates that our process does not affect this property and lends support to our claim that the tobacco manufacturing properties are not impaired.

Description	% Extract (as % of dry weight of tobacco)	% Nicotine (as % of dry weight of tobacco)	Equilibrium H_2O content (as % of total wt.)	Filling Power Improvement %
1	2	3	4	5
Control tobacco	-	1.61	13.9	-
Treated with n-hexane vapours	0.93	1.63	13.6	5.9
Treated with benzene vapours	0.57	1.51	14.0	11.1

What we claim is:

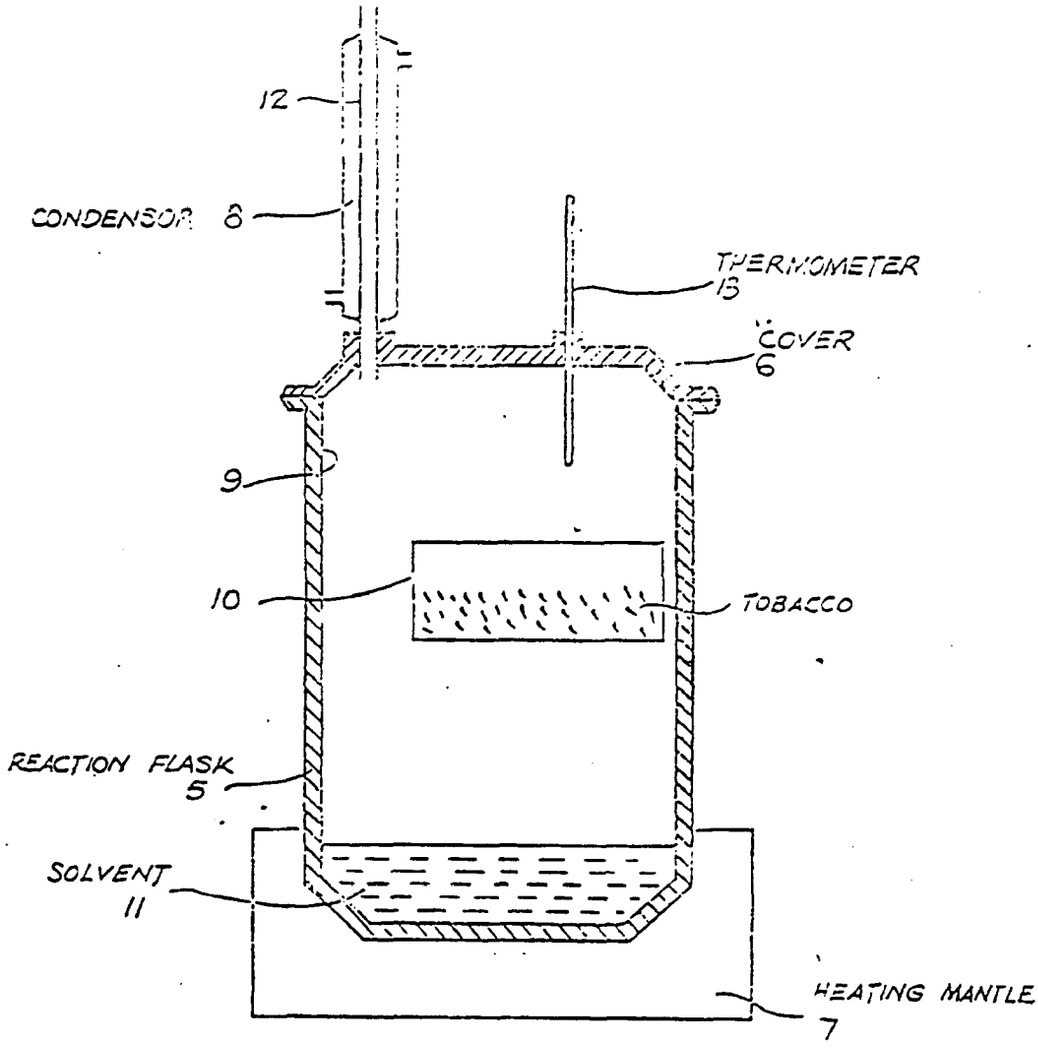
1. A process for treating tobacco to improve its filling capacity which comprises subjecting the tobacco to a solvent vapour, and removing residual solvent from the tobacco by drying.

2. A process for treating tobacco having a normal moisture content to improve its filling capacity which comprises subjecting the tobacco to a solvent vapour, and removing residual solvent from the tobacco by drying.

3. A process for treating tobacco to improve its filling capacity which comprises subjecting the tobacco at its normal moisture content to non-pressurized solvent vapour, and removing residual solvent from the tobacco by drying.

4. A process for treating tobacco to improve its filling capacity which comprises subjecting the tobacco at its normal moisture content to a solvent vapour for a predetermined period at a temperature of from 64°C to 100°C, and removing the residual solvent from the tobacco by drying.

5. A process for treating tobacco to improve its filling capacity which comprises subjecting the tobacco to a solvent in vapour form selected from the group comprising open and closed chain saturated and unsaturated hydrocarbons, aromatic hydrocarbons, alcohols, ketones, ethers, esters, chlorinated solvents and mixtures of these solvents, and removing residual solvent from the tobacco by drying.



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