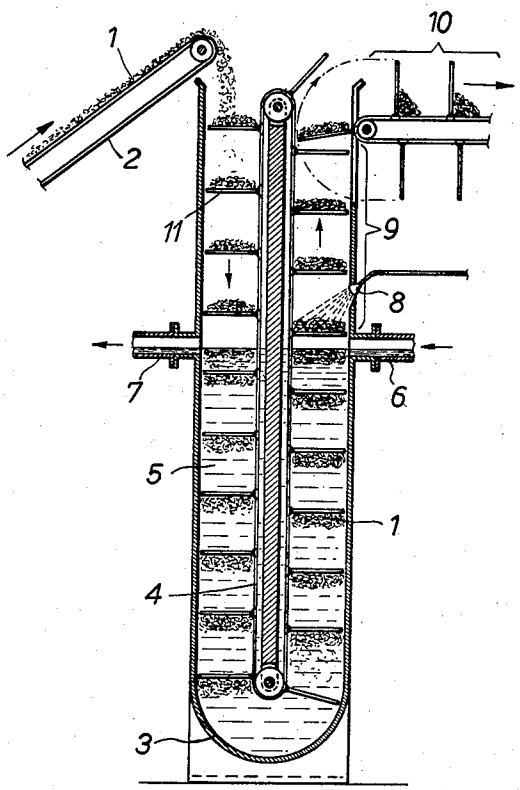
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PROCESS FOR TREATING TOBACCO AND TOBACCO OBTAINED BY SAID PROCESS

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PROCESS FOR TREATING TOBACCO AND TOBACCO OBTAINED BY SAID PROCESS

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The present invention relates to a new process for treating tobacco, which permits not only a decrease in quantity of tar and nicotine in the tobacco itself, but furthermore and especially a diminution in quantity of tar, cancerogenic and irritating substances in the smoke produced by combustion of the treated tobacco.

It is well known in the art that the toxicity of tobacco smoke is related with the presence of nicotine on one hand, and with certain cancerogenic substances on the other hand.

The cancerogenic effects of the smoke have been attributed essentially to the presence of 3,4 benzopyrene, but the present state of research in this field has shown, that there are further cancerogenic aromatic hydrocarbons susceptible to be formed by combustion of tobacco as dibenzo-3,4,9,10-pyrene, cyclopentano-5,6-(and -6,7-)-benzo-1,2-anthracene and others. Furthermore there are other classes of compounds and substances having a cancerogenic effect as aliphatic hydrocarbons formed by "cracking" effects upon distillation of paraffines present in tobacco leaves during combustion, and polymerised brown compounds derived from pyrrol, aldehydes and ketones on the one hand and from pyrroline, pyrrolidine, pyridine and their homologs, phenols and organic acids on the other hand, such as the products described by S. Neukomm and J. Bonnet (Helv. XXXIX 1724 (1956), XL, 113, 117 (1957); Oncologia 10, 107, 124, 137 (1957).

Nicotine is present as well in the natural tobacco leaf as in the smoke thereof, whilst the cancerogenic substances and among them especially the polycyclic hydrocarbon compounds are found practically only in the tobacco smoke. This means that the combustion process taking place during smoking of the tobacco is the essential phenomenon for the production of cancerogenic compounds and products.

The tobacco smoke furthermore contains certain irritating substances, such as volatile bases and polymers formed during the combustion of tobacco.

Until now, the only commercially available means for retaining certain noxious substances present in tobacco smoke, especially nicotine, consisted of incorporating a filter at one end of a cigarette or in a cigarette holder, which filter is made from various organic or mineral materials (as cellulose, silica and others); in most cases, the employed treatments are of purely physical or physico-chemical nature and concern mostly a treatment of the tobacco smoke only, with the scope of eliminating the nicotine therefrom.

Numerous methods have been proposed for reducing the nicotine or tar content in the tobacco itself. All these methods use one or more organic solvents and are applied either to the tobacco leaves, to the cut tobacco or to the manufactured tobacco. However, most of these methods are multi-step processes, the principal step being an extraction, and the others being either a humidification, a modification of the pH by alkalisation or acidification, an impregnation by an aqueous solution or other operations of that kind, either before or after the principal step. Furthermore, it has to be noted that many of these methods comprise a re-addition of the tars, which were eliminated by the extraction, to the extracted tobacco to

give it back a normal aroma as otherwise it could not be smoked.

One-step processes have also been described in the prior art, but none of them permits a continuous treatment of the tobacco, i.e. none of them could be incorporated into the normal chain of tobacco processing or cigarette manufacturing, and they therefore do not offer the desired practical advantages. One of these processes requires an apparatus comprising big buckets having a perforated base, these buckets having to be filled separately and to be connected afterwards to the solvent circuit; in this case the solvent suggested is petrol ether (specific gravity 0.62–0.63), which is extremely volatile and forming light and inflammable vapors and therefore requires a closed circuit.

Another known process uses a low-pressure chamber (vacuum chamber), wherein the tobacco leaves are suspended; the extraction is carried out with trichlorethylene or another organic solvent saturated with calcium nitrate.

Still another process suggests a high-pressure chamber to keep in a liquid state the normally gaseous fluorochlorinated hydrocarbons used as solvents.

Generally, it can be said that all processes and methods known heretofore produce a tobacco having a strongly modified aroma, because they all try to extract the total quantity of toxic material; this is also a reason why so many of them provide adding again the denicotinised extract to the tobacco after extraction. Moreover, all these known methods are rather complicated and expensive and not suitable for being incorporated into the usual processing of tobacco.

We have found that it is indispensable for eliminating or reducing the toxic effects of tobacco smoke, i.e. its cancerogenic and irritating effects, to treat the tobacco itself in such a way that its own structure is modified. By this method cancerogenic and irritating substances as well as their precursors, i.e. the components which are being transformed into cancerogenic and irritating substances during the combustion of tobacco, can be at least partially eliminated or modified in such a way that the danger for the smoker is reduced.

This is realized by modifying the structure of the tobacco itself by means of a rapid, cold and partial extraction carried out in a single step or operation with tobacco found in its natural state in the chain of processing after it has been cut and before being roasted or stacked (depending on the kind of tobacco). By this structure modification the combustion process taking place when the tobacco is smoked is also modified, and the formed smoke is poorer in toxic substances, such as polymerised compounds, brown substances, tars and polycyclic hydrocarbons.

This effect is obtained by using dry carbon tetrachloride used in a proportion of 1–2 litres per kilogram of tobacco, the cut tobacco preferably having a relative humidity of 10–15%, is treated at room temperature (18–25° C.) with the solvent flowing in counter-current. The time of the extraction preferably does not exceed one hour. The tobacco thus extracted is rinsed with a small amount of solvent and the fluid dripped off therefrom. The solvent remaining in the moist tobacco can be eliminated by an air stream or any other suitable means before the tobacco passes to the next step of the normal manufacturing process.

The treatment is carried out at room temperature and thereby considerably simplified. Any means and apparatus suitable for a continuous extraction may be used for carrying out our improved process.

By this process it is not only possible to extract certain deleterious substances or their precursors from tobacco, but especially to modify the structure of the tobacco leaf in such a manner that owing to the modified

conditions of combustion, toxic substances are only formed in a very reduced amount during combustion.

The tobacco obtained by this process has a modified structure, the modification being directly visible under the microscope with certain tobaccos, the smoke formed by combustion of this modified tobacco containing a tar content which is reduced at least 30%, anthracene and pyrene derivatives at least 40% and 3,4-benzopyrene at least 55%. The irritating substances present in the tars and not being cancerogenic themselves, but responsible for the smoker's cough on the one hand, and favouring the incidence of bronchial cancer, are also considerably reduced in the smoke of the treated tobacco. On the other hand, nicotine, although being reduced in quantity, is not entirely eliminated from the tobacco by the treatment according to the invention.

The smoke obtained by combustion of a tobacco treated according to the invention reduces the danger of producing cancer, since the contents of cancerogenic and irritating substances have been reduced. The smoke, however, still has a stimulating effect which is appreciated by most smokers. These considerable advantages are obtained without a noticeable modification of the taste and aroma of the smoke, so that the smoker fully enjoys all advantages of a tobacco with reduced risk of cancerous illness. If desired, the nicotine content of the smoke can still be reduced, for example by incorporating a filter tip.

Our improved process can be carried out for example in a counter-current apparatus as shown diagrammatically in the annexed drawing. The cut tobacco 1 coming from the cutting machine on a conveyor 2 is introduced into an open-ended U-shaped tube 3 comprising an elevator 4 provided with a series of screens or grates 11. By these grates the tobacco is transported through a solvent containing zone 5 at room temperature, the fresh tobacco being put into contact with the most saturated solvent as it is usual in counter-current extractions. The speed of the elevator is such that the tobacco remains in the solvent for not more than one hour. The amount of solvent present in the tube corresponds to a proportion of 1–2 litres per kilogram of tobacco. Fresh solvent is continuously added through the inlet 6, whilst the saturated solvent and extracts are continuously drained off at the outlet 7. The solvent may be recovered in any known manner and returned into the extraction cycle, whilst the extracts may be fractionated, purified and prepared for any desired use. The extracted tobacco leaving the solvent area is rapidly rinsed with a small amount of solvent projected by a spray nozzle 8, dripped off in the draining zone 9 of the tube, and any remaining solvent is removed by drying in a drying area 10, using an air stream, for example. The tobacco is then conveyed to the roasting or stocking process, where the manufacturing chain continues as usual.

The smoke of the treated tobacco has substantially the full aroma of non treated tobacco, but contains less tars and polycyclic hydrocarbons than ordinary tobacco. This result is obtained in substantially uniform manner with the different types of smoking tobacco, as shown in the following table:

Tobacco	Percent reduction in the smoke of treated tobacco			
	Anthracene	Pyrene	3,4-Benzopyrene	Tars
Maryland	41.2	38.2	63.9	32.5
Oriental	43.3	43.0	64.9	33.3
Virginia	48.5	45.0	54.0	34.2

The apparatus described above is one preferred means for carrying out our improved process, but it does not limit the scope of the invention in any respect and can be replaced by any other means allowing a continuous, rapid extraction at room temperature and adapted for introduction into the ordinary tobacco manufacturing chain.

In this manner the described process yields a tobacco of special structure, the combustion of which does not result in the production of the same quantity of polycyclic hydrocarbons, and especially 3,4-benzopyrene, as the combustion of untreated tobacco.

The described process is particularly useful for the manufacturing of cigarettes. It can however be applied just as well to cigar or pipe tobacco. In this case better results are obtained by treating the whole tobacco leaves or the manufactured cigars instead of the cut tobacco.

We claim:

1. A process for modifying the structure of tobacco so that smoke produced by the combustion of the resulting modified tobacco contains at least 30% less tars, at least 40% less anthracene and at least 55% less 3,4-benzopyrene than smoke produced by the combustion of the tobacco before modification, said process comprising the single step of steeping cut tobacco in carbon tetrachloride for a period of at most one hour at a temperature of from about 18° to about 25° C. and at atmospheric pressure, the moisture content of said cut tobacco being from 10 to 15%.

2. A process for modifying the structure of tobacco so that smoke produced by the combustion of the resulting modified tobacco contains at least 30% less tars, at least 40% less anthracene and at least 55% less 3,4-benzopyrene than smoke produced by the combustion of the tobacco before modification, said process comprising the single step of continuously partially extracting cut tobacco with carbon tetrachloride by contacting cut tobacco having a moisture content of from 10 to 15 percent with carbon tetrachloride for a period of at most one hour at about room temperature and atmospheric pressure, the proportion of carbon tetrachloride to cut tobacco being from about 1 to 2 liters per kilogram.

3. In the processing of tobacco for the preparation of a smoking product, which processing includes a cutting operation, the improvement wherein said cutting operation is followed next by steeping the resulting cut tobacco in carbon tetrachloride for a period of at most one hour at a temperature of from about 18° to about 25° C. and at atmospheric pressure, the moisture content of said cut tobacco being from 10 to 15%.

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