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[54] **METHOD OF PRODUCING A RECONSTITUTED TOBACCO PRODUCT**

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[58] **Field of Search** 131/2, 15, 17, 140–144

[56] **References Cited**

UNITED STATES PATENTS

2,576,021	11/1951	Koree	131/2
3,020,179	2/1962	Hess	131/140 C
3,121,433	2/1964	Plunkett et al.	131/140 C
3,145,717	8/1964	Osborne et al.	131/143 C

FOREIGN PATENTS OR APPLICATIONS

1,171,878	11/1969	Great Britain	131/140 C
1,230,576	5/1971	Great Britain	131/140 C

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[57] **ABSTRACT**

Modified tobacco fibers, having reduced bonding ability, are produced by cooking tobacco stalk material and then soaking the resulting fibers in a caustic solution. A combination of tobacco lamina and mid-rib is extracted; the fibers remaining after extraction are mixed with the modified fibers and the mixture formed into a sheet which is impregnated with the extract material.

9 Claims, No Drawings

METHOD OF PRODUCING A RECONSTITUTED TOBACCO PRODUCT

This invention relates generally to tobacco products, and to smokable articles made therefrom. It has particular reference to improved reconstituted tobacco sheets and to methods of making them.

A general object of the invention is to provide a reconstituted tobacco product, composed exclusively of tobacco, the pyrolysis of which engenders a reduced proportion of tarry substances in the products of combustion than is produced by tobacco made without non-tobacco additives and without the modification of this invention.

The invention is based on the fact that in a smokable article the mildness and flavor of the tobacco, and the products of combustion, are affected in large part by the immediate environment in which the minute particles of combustible tobacco ingredients undergo pyrolysis. In British Pat. No. 1,171,878 it is pointed out that pyrolysis in a less confined environment than that in which smoking tobacco is usually burned is conducive to an improvement in taste and mildness, and engenders products of combustion having a dimished proportion of tars.

Reconstituted tobacco, and the procedures involved in making it, are admirably suited to the practice of the invention. As is known, one of the procedures involves essentially a treatment of natural tobacco to separate soluble extractibles from fibers, the conversion of the fibers by papermaking techniques into a paper-like fibrous web, and the incorporation in the web of the extract to restore the soluble tobacco ingredients. The present invention relates to the manufacture of the fibrous web in such a way that the combustible ingedients of the finished product, when ignited, undergo pyrolysis in a combustion environment beneficially different from that which is usually present. More particularly, the web is caused to embody a uniformly distributed greater void fraction, as hereinafter defined.

The type of web structure which achieves the invention's objective is one in which there are multitudinous small labyrinthine passages and voids uniformly distributed throughout the sheet, in contrast to the conditions present in conventional relatively dense but porous webs. A web embodying the features of the present invention is one in which the fibers are bonded together in the loosest possible way commensurate with the maintained existence of a self-sustaining web. The desired result is brought about by a minimization of the degree of bonding of the fibers of which it is composed.

The term "void fraction" as used herein and in the claims is intended to signify the volume, per unit volume of tobacco sheet, occpied by the labyrinthine passages and voids referred to. In other words, it is the ratio of void volume to total volume. It is determined by first measuring the "apparent" or "superficial" specific volume (V_t) of the tobacco sheet, then measuring the specific volume of only the solid substance of the sheet (V_s). The void fraction is equal to

$$(V_t - V_s)/V_t$$

The superficial specific volume can be found by measuring the volume of mercury displaced by a segment of fibrous web of known weight, mercury being chosen since its high surface tension prevents it from penetrating into the pores and intestices of the web. The second specific volume can be calculated from the weight of the same segment of web in air and the known densities of the substances comprising it.

A number of techniques are disclosed in the above-identified British patent for increasing the void fraction of the fribrous web. However, these techniques, while useful, either involve adding non-tobacco material to the slurry from which the web is made or are limited in the extent to which they are effective.

The present invention, on the other hand, provides a highly effective way of increasing the void fraction of the web without using any non-tabacco additives. More partiularly, with this invention the void fraction is increased by adding to the web-making slurry tobacco fibers of special character derived from the main stalk of the tobacco plant.

According to the invention, tobacco stalks are first cooked to individualize the stalk fibers. It is believed that the cooking dissolves the lignin in the stalk, thus freeing the fibers from each other. Thereafter, the cooked fibers are treated with a concentrated caustic solution, i.e., a solution of sodium hydroxide (NaOH) or potassium hydroxide (KOH). This second step, which is carried out at room temperature (about 23°C), removes hemicelluloses, thus reducing the conformability of the fiber, and changes the fiber surface, thereby reducing the bonding ability of the tobacco stalk fibers. The treated fibers are then added to the suspension of fibers used to make a reconstituted tobacco sheet. The resulting sheet has an increased void fraction, as compared to an otherwise identical sheet not containing the modified fibers of this invention, and as a result less tar is produced when a smokable article made from the sheet burns.

The idea of cooking tobacco main stalks in a caustic soda (NaOH) solution, and using the resulting fibers in making wrappers for cigars is described in British Pat. No. 1,230, 576. However, these fibers retain their high bonding ability unless subjected to the second, or alkaline treatment, step described above.

It has been found that a reconstituted tobacco sheet containing the modified fibers of this invention retains its void fraction even if highly compressed when wet. Toleration of pressing makes the sheet less delicate for processing and yields additional latitude during the papermaking process.

Illustrative of the features of the invention, and the desirable quality of the tobacco product which results, are the following examples:

EXAMPLE I

Stalks of bright leaf tobacco were broken up into lengths from 4 to 6 inches and cooked for three hours at 170°C in a solution containing 60 grams per liter of sodium hydroxide and 6 grams per liter of sodium sulfide.

Half of the resulting fiber was washed and put aside for use in sheet-making and the other half was subjected to further treatments, described below.

EXAMPLE II

The fiber from Example I was soaked at room temperature for 20 minutes in a solution of 20 percent sodium hydroxide. After that period, the caustic solution was poured off and the fiber washed repeatedly with water. The moisture was determined on an aliquot proportion and from the weight before and after it was de-

termined that 29.7 percent of the fiber weight had been lost by this extraction.

EXAMPLE III

In order to demonstrate the effect of the extractive process of Example II on the bonding proclivity of the tobacco fiber, two laboratory handsheets were made, according to known papermaking techniques, of the fiber after separately beating samples of the fiber from Examples I and II in a Waring blender at a low speed for 5 minutes. The sheet weight in each case was 54 grams per square meter. Tensile strengths of these sheets were as follows:

Sheet made only of fiber from Example I	1850 grams per inch
Sheet made only of fiber from Example II (Causted Treated Fiber)	87 grams per inch

EXAMPLE IV

Using more fiber of the sort prepared in Example I, a series of treatments as described in Example II, were made with caustic soda solutions. However, solutions having different concentrations were used. These concentrations, and the tensile strengths of resulting handsheets are shown below:

Concentrations	Tensile Strengths
a. 10% Caustic Solution	503 gm/in
b. 15% Caustic Solution	98 gm/in
c. 20% Caustic Solution	87 gm/in
d. 25% Caustic Solution	66 gm/in

It is apparent that the caustic treatment of the fiber has somewhat reduced effectiveness with concentrations as low as 10 percent. Concentrations higher than 20 percent are effective, but are unneccessary and extravagant. Therefore, the preferred range of caustic concentration is 15 to 20 percent.

EXAMPLE V

In this example, reconstituted tobacco sheets were made, according to the extraction process, with and without the addition of varying amounts of the treated stalk fiber.

The basic reconstituted tobacco was made up of a mixture of 50 percent of fine tobacco fragments left over from the manufacture of cigarettes of so-called American blend, 40 percent of midribs of flue-cured tobacco, and 10 percent of midribs of burley tobacco. The midribs were cut up dry in a Waring blender and mixed with the fines. The mixture was steeped in boiling water and the soluble extract removed in a small home-type wine press. The mixture was steeped a second time and that liquid pressed out. The extract was concentrated by evaporation to 34 percent solids.

The tobacco fiber material left after extraction of the solubles was put in a laboratory Valley beater and beaten until, by visual observation, there were no large lumps of midrib apparent in the stock. Portions of this stock were mixed briefly with more water in a Waring blender and formed into handsheets in a Noble and Wood laboratory mold. Other sheets were made in which treated tobacco stalk fiber from Example II was added in varying amounts, it being mixed into the stock in the Waring blender prior to sheet formation.

After drying, these sheets were impregnated with the concentrated tobacco extract. This impregnation was done by repeatedly immersing the sheet in the concentrated extract, running it through a ringer and drying it. This process was continued until the basis weight of the sheets reached 100 grams per square meter. These sheets were dried and the void fraction determined.

The tobacco sheets were then shredded and the tobacco used to make cigarettes with a Hauni-Baby laboratory cigarette machine. The cigarette paper used was Schweitzer type 556. The delivery of particulate matter of these cigarettes was determined, using the method of the United States Federal Trade Commission. The results are reported as dry particulate matter, including nicotine.

Sample	Treated Fiber Additive	Void Fraction	Particulate Delivery in Milligrams
1.	None	41	21.6
2.	20% fiber from Example I	46	19.2
3.	10% treated fiber from Example II	58	14.1
4.	20% treated fiber from Example II	61	12.7
5.	40% treated fiber from Example II	66	11.2

The sheet made with 40 percent of treated fiber was extremely fragile and could not be handled easily. None of the other sheets presented this difficulty.

In the examples above, the first step of the preparation of the modified tobacco stalk fiber was by means of the so-called kraft process, i.e., cooking of the plant material in a strong caustic solution. Alternatively, this first step can be accomplished using a slightly alkaline solution of sodium sulfite. When this variation is employed, the second step, the treatment with caustic at room temperature, has an even more pronounced effect than it does if the fibers are first prepared with the strongly basic cook. The following example illustrates this point.

EXAMPLE VI.

Lengths of tobacco stalk were cooked in a manner similar to that used in Example I, but the solution used contained 25 grams per liter of sodium hydroxide and 15 grams per liter of sodium sulfite. This cook was for 3 hours at 160°C. The cooked fiber, after washing, was divided. A portion of it, designated (A) was put aside in that condition, and the rest of it, designated (B), was treated for one-half hour with a solution of 20 percent sodium hydroxide and then washed.

Handsheets of reconstituted tobacco were made as in Example V, except that the modified fibers used were in one case 20 percent of the fiber (A) above and in the other case 20 percent of the fiber (B). The sheets were impregnated, the void fraction determined on portions of them, and cigarettes made and smoked to determine the delivery of dry particulate matter. Results were as follows:

Additive	Void Fraction	Particulate Delivery in Milligrams
20% Fiber A	52	20.4
20% Fiber B	59	15.7

In the previous examples, the second step of the fiber-modifying process employs sodium hydroxide. However, as indicated by the following example, potassium hydroxide can be used in the alternative:

EXAMPLE VIII

Stalks of burley tobacco were broken up and cooked in the manner of Example I. A mass of the resulting fiber was placed in a beaker and the beaker then filled with a solution of 20 percent potassium hydroxide. This was stirred briefly and then let stand for 30 minutes. After that period, the caustic solution was poured off and the fiber washed repeatedly with water. Reconstituted tobacco sheets were prepared in a handsheet mold using 20 percent of this treated fiber. The sheet was subsequently impregnated with concentrated tobacco extract and the void fraction determined at 63 percent. Cigarettes were made and tested, the delivery being 13.2 mg of dry particulate matter. This compares favorably with Sample 4 of Example V.

Therefore, in this specification and the claims which follow, the term "caustic"is intended to identify either NaOH or KOH.

Thus, it will be seen that the present invention affords a practicable means for reducing the tars produced by burning reconstituted tobacco without adding any non-tobacco material to the product, but instead by using specially treated tobacco fiber.

The invention has been shown and described in preferred form only, and by way of example, and many variations may be made in the invention which will still be comprised within its spirit. It is understood, therefore, that the invention is not limited to any specific form or embodiment except insofar as such limitations are included in the appended claims.

What is claimed is:

1. A method of making a reconstituted tobacco product for use in a smokable article, comprising the steps of:

a. cooking natural tobacco stalk material at an elevated temperature to individualize the stalk fibers,

b. thereafter soaking the cooked stalk fibers in a concentrated caustic solution to produce modified fibers which do not bond to each other or to other fibrous material as readily as do fibers not so modified.

c. separating other natural tobacco material into fibrous material and extract material,

d. mixing the modified fibers with the fibrous material and forming the mixture by papermaking techniques into a paper-like web, and

e. impregnating the web with the extract material.

2. A method as defined in claim **1** wherein the caustic solution is at room temperature.

3. A method as defined in claim **1** wherein the caustic solution is sodium hydroxide or potassium hydroxide.

4. A method as defined in claim **1** wherein the caustic solution is 10 percent to 25 percent caustic.

5. A method as defined in claim **1** wherein the caustic solution is 15 to 20 percent caustic.

6. A method as defined in claim **1** wherein the tobacco stalk material is cooked in a solution containing sodium hydroxide.

7. A method as defined in claim **1** wherein the tobacco stalk material is cooked in a solution containing sodium sulfite.

8. A method as defined in claim **1** wherein the amount of modified fibers in the mixture was between 10 and 40 percent of the amount of combined modified fibers and other fibrous material.

9. A method as defined in claim **1** wherein the amount of modified fibers in the mixture was between 10 and 20 percent of the amount of combined modified fibers and other fibrous material.

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