

Dec. 14, 1965

D. G. STRUBEL ETAL

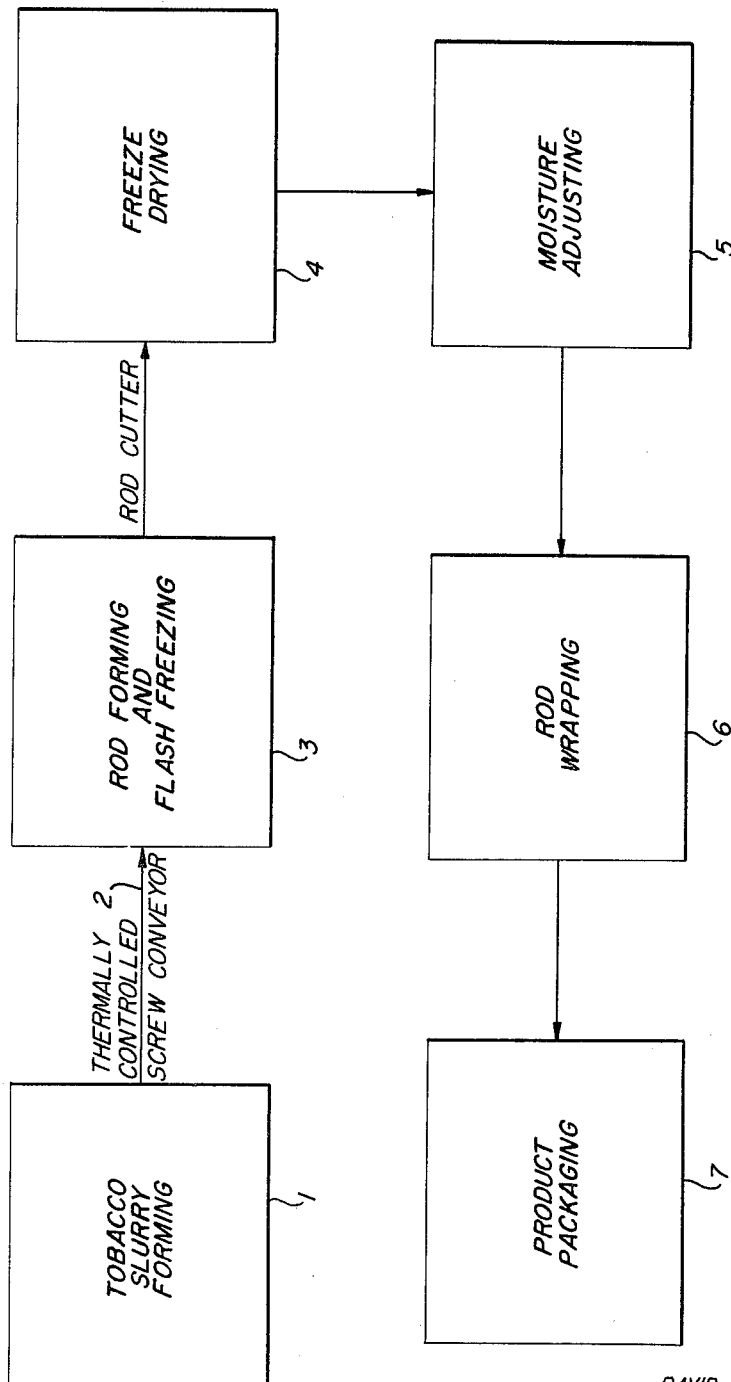
3,223,090

RECONSTITUTED TOBACCO PRODUCTS AND METHOD OF MAKING SAME

Filed Sept. 11, 1963

3 Sheets-Sheet 1

FIG. 1



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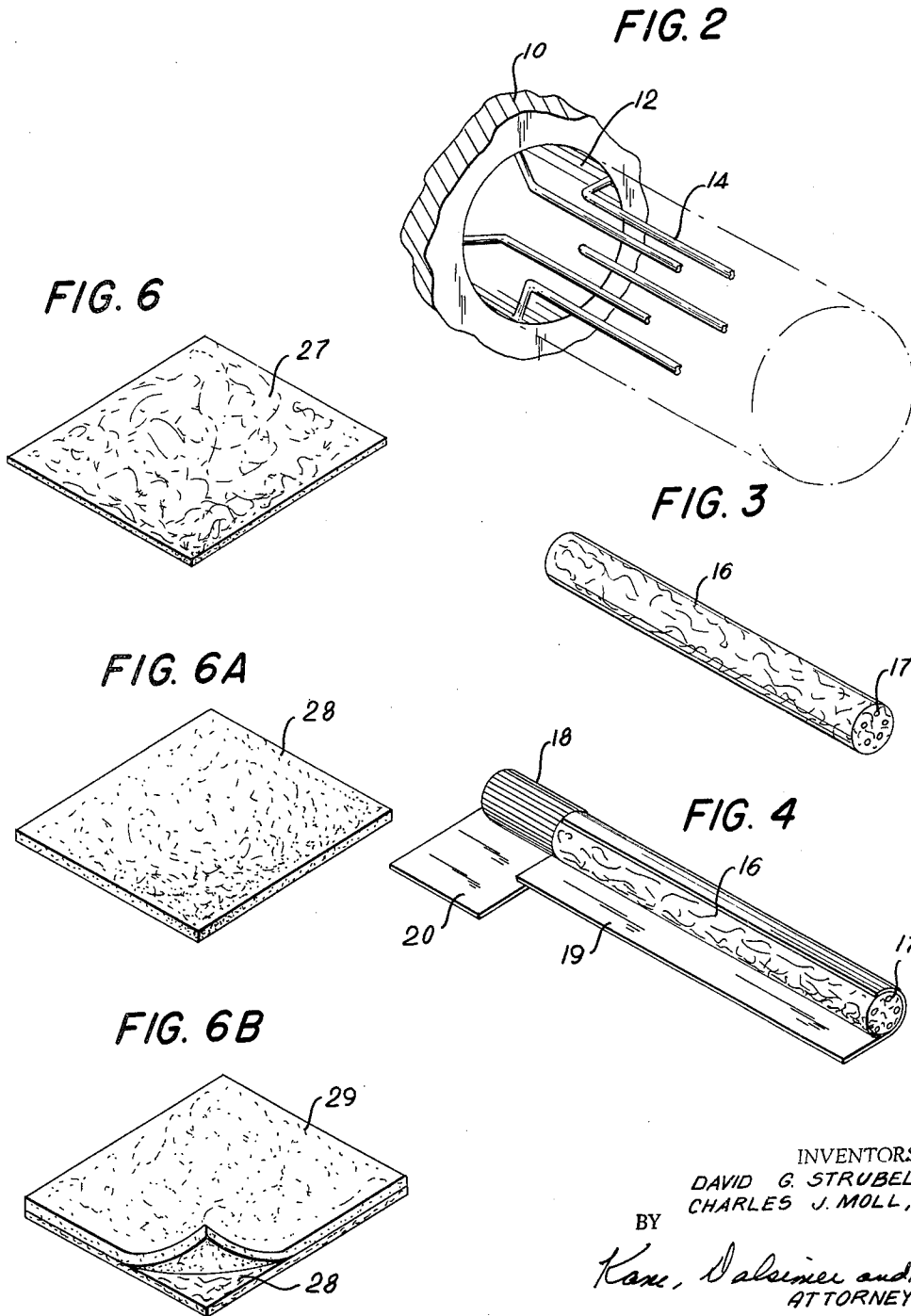
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Filed Sept. 11, 1963

3 Sheets-Sheet 2



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Filed Sept. 11, 1963

3 Sheets-Sheet 3

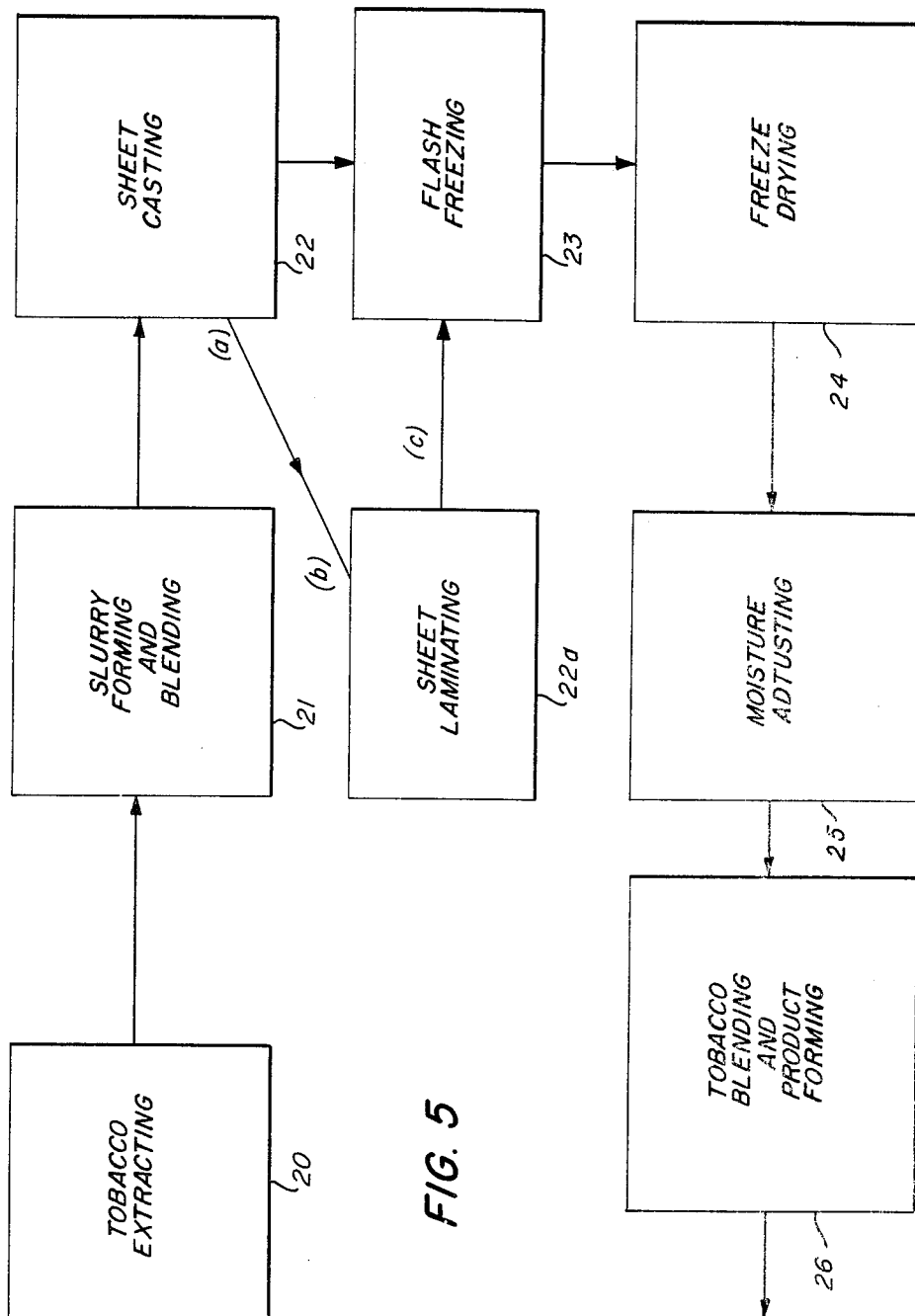


FIG. 5

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RECONSTITUTED TOBACCO PRODUCTS AND METHOD OF MAKING SAME

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Filed Sept. 11, 1963, Ser. No. 308,184
6 Claims. (Cl. 131-140)

This invention relates to reconstituted tobacco products and methods of making same. More particularly, our invention pertains to the provision of a new and improved reconstituted smoking tobacco product by suspending finely divided tobacco mixture in a liquid and forming the resulting mixture in any predetermined configuration at reduced temperatures and pressures.

During the manufacture of tobacco products, such as cigarettes, cigars, pipe tobacco and the like, a substantial portion of the tobacco processed therefor is physically unsuitable for use therein as for instance, tobacco stems and manufacturing fines. In part of the process for preparing tobacco leaf into smoking tobacco products, it is necessary to strip the leaf to remove the stems and veins therefrom. The stems and veins form by-products which are used among other things for the production of reconstituted tobacco. Manufacturing fines generally consist of a mixture of winnowings, leaf lamina, trimmings and shorts. It has been the general practice of tobacco manufacturers to process the manufacturing fine and stems in such a form so that they may be reused and incorporated as a component part of tobacco blends. In order to utilize the stems and the manufacturing fines, methods have been devised in which they are processed to form sheet-like material, known as reconstituted tobacco, which is thereafter shredded and incorporated in tobacco products being processed.

However, many disadvantages and difficulties are encountered when forming the processed sheet material. The formed reconstituted tobacco sheet material generally loses much of its original flavor which is leached out of the tobacco, and when the reconstituted tobacco sheet material is dried to the proper moisture level, it often has a dark color so that the material when mixed or incorporated into a tobacco blend, the characteristic color of the blend appears to be darkened. The processes generally employed necessitate a considerable amount of heat and mechanical working so that the stems and other portions of the manufacturing fines can be comminuted to an extremely small particle size, thus requiring expensive equipment such as heating apparatus, storage tanks and homogenizers. Further, after the tobacco mixture is cast into sheet form, considerable heat either in the form of hot dry air or steam is needed to drive off the residual water contained therein. The high temperatures required also drive off or diminish the natural flavors from the tobacco.

It is therefore an object of our invention to provide a new method of forming reconstituted tobacco sheet material which is light in color and in which a minimum of high temperatures are used to form the sheet. Another object of our invention is to provide tobacco sheet material in which substantially all of the flavor and aroma of the tobacco remains therein and in which the sheet material has increased filling capacity. Still other objects of our invention are to provide reconstituted tobacco sheet material in which the sheet material is light in color, the flavor and aroma remains substantially unchanged and in which the formed sheet material is substantially cellular in structure.

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Another object of our invention is to provide a tobacco product using freeze dry procedures and having any desired configuration such as in the form of a sheet, a rod or laminated sheets.

A further object of our invention is to provide a tobacco product which is relatively inexpensive and easy to manufacture.

Other objects and advantages of our invention will become more apparent from a description of the drawings and illustrative examples which follow.

Generally our invention contemplates a process for making reconstituted tobacco and reconstituted smoking tobacco products in which a mixture of a liquid and finely divided tobacco is formed into any desired predetermined configuration. The formed tobacco material is subjected to freeze drying procedures, thus allowing the formed configuration to set and substantially remove the liquid therefrom. In this connection, the reconstituted tobacco and smoking tobacco products, after being set in a predetermined configuration, are dried by subjecting them to conditions of temperature and pressure in which the vapor and solid phases of the liquid substantially exist simultaneously. Also, according to our invention, we provide a reconstituted tobacco product in which the flavor and aroma of tobacco remains substantially unchanged from the original tobacco mixture and in which flavor and aroma materials may be incorporated to enhance the organoleptic properties thereof.

For a better understanding of our invention, reference had to our drawings illustrating specific embodiments thereof, in which:

FIG. 1 is a diagrammatic and schematic flow sheet illustrating the steps for forming rod-like reconstituted tobacco;

FIG. 2 illustrates a section of an extrusion plate showing means for controlling the porosity of the formed rod-like material;

FIG. 3 is a perspective view of a length of tobacco rod after flash freezing;

FIG. 4 is a perspective view of a fully assembled rod in the form of a cigarette after freeze drying before the wrapper is sealed;

FIG. 5 is a diagrammatic and schematic flow sheet illustrating the steps of forming sheet-like reconstituted tobacco;

FIG. 6 is a section of a sheet of reconstituted tobacco made by a conventional process;

FIG. 6A is a section of a sheet of reconstituted tobacco after it has been freeze dried, and

FIG. 6B is a section of freeze dried reconstituted tobacco sheet in laminated form.

A preferred form of our invention which is illustrated diagrammatically and schematically in FIG. 1 sets forth a process for forming a smoking tobacco product in the form of a rod such as a cigarette rod. A slurry of finely divided and comminuted tobacco is prepared by mixing one part of tobacco and approximately of from 3 to 14 parts water as diagrammatically shown at 1 in FIG. 1. The tobacco used may consist of manufacturing fines with or without a minor proportion of stems and veins. Also, cured, cased and blended commercial tobacco may be used with or without mixtures of manufacturing fines or stems. A hygroscopic agent is added to the slurry in varying proportions based upon the dry weight of tobacco material used.

The desired particle size is obtained in the usual manner such as by subjecting the slurry to pulping, grinding and/or mulling procedures. After the slurry has been reduced to the proper particle size, it is passed through a thermal screw conveyor 2 of conventional design in which the temperature of the slurry is reduced substan-

tially to its freezing point. Thereafter, it is formed into a rod which is diagrammatically shown at 3. A cavity or opening 12 of an extrusion plate 10 is illustrated in FIG. 2. The extrusion plate 10 may be formed with one or more circular openings 12 which correspond in circumference to a finished tobacco product such as a cigarette. Mounted on plate 10 and telescopically positioned within opening 12 are one or more fine wire cores 14. Wire cores 14 may or may not be provided, however they are used to form air channels in the extruded rod so that the pressure drop of the rod may be adjusted substantially to that of a normal cigarette rod.

As the rods are formed by passing through openings 12 of plate 10, they are subjected to flash freezing so that they are set in substantially the same form as when extruded.

Other means may be employed to form a rod such as by casting, molding or any other convenient method in which the formed rod will not be substantially deformed prior to flash freezing. Thus, when using casting or molding procedures, it is convenient to flash freeze the formed rod during the casting or molding step.

Flash freezing may be accomplished by passing the formed rod through a zone of low temperatures of from -50° to -195° C. The rods when subjected to these low temperatures will freeze very rapidly thus maintaining their desired form. After the rods have passed from the flash freezing zone, they are cut to the desired length such as a cigarette rod 16 shown in FIG. 3. Rod 16 is provided with air channels 17 so that the pressure drop of the formed rod is substantially that of a conventional cigarette rod.

Cut-rod 16 is placed in a freeze drying apparatus and subjected to freeze drying procedures as represented diagrammatically at 4 and maintained in a frozen state. Rods 16 are subjected to reduced pressures of less than approximately 5 mm. absolute and temperatures of less than the freezing point of the formed tobacco material. Cut-rod 16 is dried in the frozen state and under reduced pressures so that sublimation occurs, that is, ice sublimates directly to water vapor. Since the cut-rod 16 dries in a rigid frozen condition, shrinkage and deformation of the rod is minimized. The resulting rod's structure is cellular and porous.

The vacuum is released and the dried rods 5 adjusted for moisture content. This may be accomplished in the usual manner for adjusting the moisture content of tobacco by placing the rods in a room of the desired relative humidity and allowing the rods to come to equilibrium with the air. This procedure may be accelerated by spraying the dry rods with water. In this connection, it may be desirable to incorporate into the rod, flavors and humectants or other organoleptic materials generally used for manufacture of tobacco products. The flavoring additives and humectants may be incorporated into the dried tobacco rods by forming a water mixture or water suspension therewith so that flavors and other additives may be incorporated into the dried rod at the same time that the moisture content is adjusted. Other means generally employed in the tobacco industry may be used to incorporate flavors and other additives in the dried rods such as by forming a mixture in a suitable solvent and thereafter spraying the formed mixture on the rods.

After rods 16 have been adjusted for moisture content and the desired flavoring additives incorporated therein, the rods are processed in a similar manner as are conventional cigarette rods. Rods 16 are encased in a wrapper 6 as shown in FIG. 4 at 19 on a modified cigarette-making machine. If desired, a suitable filter element 18 encased in a filter tipping wrapper 20 may be incorporated at one end of the rod 16 and encased in wrapper 19. Finished rods 15 are packaged as represented diagrammatically at 7 for shipment in the usual manner. As indicated previously, the rods may take any configuration such as the configuration of cigarettes and cigars of all types.

When the rod is in the form of a cigar, then a leaf wrapper may be used to encase the rod.

We have found that smoking tobacco products, such as cigarettes, made according to the above described process are light in color, with substantially all of the flavor and aroma present after they are processed as in the unprocessed tobacco material. We have also found that the reconstituted tobacco material embodying the present invention has increased filling capacity, i.e. more cigarettes can be made from a pound of tobacco at the same relative firmness as compared with ordinary tobacco or ordinary reconstituted tobacco. When smoking a cigarette of the type described above, it was found to have pleasing organoleptic properties and was substantially free from harshness generally associated with tobacco smoke.

Another preferred form of our invention which is illustrated diagrammatically and schematically in FIG. 5, comprises a process for forming a smoking tobacco product in the form of a sheet.

Comminuted tobacco material consisting of stems, is extracted with a liquid such as water at elevated temperatures and the liquid drained and discarded as represented diagrammatically at 20 in FIG. 5. Manufacturing fines are mixed with the extracted stems as represented diagrammatically at 21 and the mixture is mechanically worked to reduce the finely divided tobacco to the desired particle size. Mechanical working may be accomplished by conventional means, such as by passing the tobacco material through a wet hammer mill, grinding, mulling or the like.

The liquid tobacco mixture is cast on an endless belt to form a tobacco sheet material as represented diagrammatically at 22. The proportions of liquid to tobacco material used may vary. However, a sufficient proportion of liquid is maintained so that the liquid tobacco mixture is uniformly cast to form a sheet of substantially uniform density.

The tobacco sheet material is partially dried such as by passing the sheet material through an elevated temperature zone or by passing the sheet material through a low pressure zone and vacuum distilling the liquid therefrom. When the tobacco sheet material is dried sufficiently to sustain its own weight, it is subjected to flash freezing procedures as represented diagrammatically at 23. It is then removed from the casting surface and thereafter subjected to reduced pressures while at the same time maintaining the sheet material below its freezing point, thereby removing the liquid therefrom as represented diagrammatically at 24.

Alternatively, after the tobacco sheet material is dried sufficiently to sustain its own weight, a layer of the liquid tobacco mixture is cast over the partially dried layer thereby forming a laminated tobacco sheet as represented diagrammatically at 22a. The laminated sheet is partially dried and is subjected to the flash freezing procedure as described above for the unlaminated sheet and thereafter is subject to the same freeze drying procedures by maintaining it at a reduced pressure and at a temperature below the freezing point of the water as represented diagrammatically at 23.

After the sheet material is dried, it is removed from the low pressure zone and adjusted for moisture content in the same manner as described above and as represented diagrammatically at 25. As previously described, flavors and humectants or other organoleptic materials generally used for manufacture of tobacco products, may be incorporated into the sheet material at the same time the moisture is adjusted. The flavoring or other additive materials may be mixed with the water such as a water mixture or water suspension and sprayed on the sheet material.

The moisture adjusted tobacco sheet material is shredded and incorporated into smoking tobacco products in the usual manner as represented diagrammatically at 26. The processed sheet material is light in color, resembling that of high grade tobacco and when incorporated

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into smoking tobacco products, a mild pleasant taste is experienced by the smoker.

In FIG. 6 a segment of reconstituted tobacco sheet material 27 is representative of reconstituted tobacco materials presently used showing fibrous comminuted tobacco dispersed therethrough. Also, the thickness of the sheet is slightly exaggerated. Generally, sheet material of this type is from approximately 0.005" to 0.008" in thickness.

In FIG. 6A a segment of reconstituted smoking tobacco sheet material 28 is shown in the form prepared according to our invention. After freeze drying, the comminuted tobacco material is formed in porous and cellular form having a thickness of approximately from 0.030" to 0.040" and an apparent density of from between 0.050 to 0.50 gram per cc.

In FIG. 6B a segment of reconstituted tobacco material formed in accordance with our invention is shown as a plurality of superimposed sheets laminated together. The structure of the sheets is similar to that of FIG. 6A.

Specific examples of forming smoking tobacco material according to our invention are as follows:

Example 1

A mixture of 200 grams of flue cured, Burley tobacco and mixed manufacturing fines consisting of leaf lamina, winnowings, shorts and trimmings are mixed with 1500 ml. of water. To this mixture is added 6% glycerine based on the dried weight of the tobacco material. The resulting mixture is pulped using a Waring blender, Model No. CB3 at low speed for 20 minutes. Copper tubing having a bore of 1/4" in diameter and 85 mm. long, is filled with the water-tobacco mixture. Any convenient means may be used to fill the copper tubes such as by subjecting each tube to a mild vacuum until each tube is filled with the mixture. Fine wire cores extending substantially the length of the tube and telescopically positioned within the tube bore as shown in FIG. 2, are provided so that air channels are formed in the tobacco rod after the tobacco filled rods have been processed and dried. The tobacco filled rods are subjected to flash freezing such as by immersing the tubes in liquid nitrogen or placing the tubes in a container in which dry ice is used to reduce the temperature. After the rods are frozen, the frozen tobacco rods are removed from the tubing by subjecting the tubing to elevated temperatures so that the liquid around the circumference of the frozen rod is melted and the frozen rod extruded therefrom. The frozen rods are subjected to freeze drying procedures as by being placed in a vacuum or freeze dried and subjected to an absolute pressure of less than approximately 5 mm. while maintaining the rods below their freezing point. The water is evaporated from the rod by converting the ice directly to the gaseous phase so that the configuration of the frozen rod remains substantially unchanged after it is dried. It was observed that the rod shows little or no deformation along its length and surface and has an apparent density of from between 0.150 to 0.300 gms./cc.

The moisture content of the rod is adjusted to approximately 12 to 14% and enclosed in a cigarette wrapper. The formed tobacco rod is a light tan color resembling the color of a high grade tobacco. Upon smoking a mild and pleasant taste is experienced by the smoker and the formed air channels in the tobacco rod adjust the pressure drop of the rod to substantially that of a normal filter cigarette.

Example 2

Two parts of Burley stems are extracted in water and the water soluble portion is discarded. The remaining stem solids are mixed with three parts of manufacturing fines as in Example 1. The resulting mixture is passed through a series of wet hammer mills containing 0.006

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inch, 0.004 inch and 0.003 inch screens. The tobacco, after treatment in the wet hammer mills is substantially fibrous and the water content of the mixture is adjusted to give a solids content of 8%. Thereafter, the mixture is cast on a continuous stainless steel band to form a sheet and partially dried by condensing steam on the underside of the band. When the cast sheet material has dried to approximately 50% moisture it is subjected to flash freezing procedures by passing the sheet material through a low temperature zone of from -50° to -195°. The frozen sheet is removed from the stainless steel band, and subjected to freeze drying procedures by placing in a vacuum or freeze dryer and evaporated to dryness as in Example 1. Upon removal from the dryer, the sheet material is adjusted for moisture content of from approximately 12 to 14% and flavors added thereto. The flavors or other organoleptic materials may be incorporated into the dried sheet material as described in Example 1. The sheet material is then shredded and blended into cured, cased and blended commercial tobacco for making into cigarettes. The reconstituted tobacco sheet material has a light tan color resembling the color of high grade tobacco and has a thickness of approximately 30 to 40 thousandths of an inch having a density of from .050 to .50 grams per cc. After the sheet material is incorporated into cigarettes and upon smoking, a mild and pleasant taste is experienced by the smoker.

Example 3

The same procedure is followed as in Example 2 to form a tobacco sheet. After the tobacco mixture in the sheet has dried sufficiently to set in a substantially rigid form, an additional overlayer of the tobacco mixture is cast, thus forming a laminated sheet. It can be readily seen that by repeating this procedure, a sheet of any number of layers may be formed. After the final layer has been cast and has dried to approximately 50% moisture, the laminated sheet is treated as in Example 2.

It is apparent from foregoing examples that the flavor and aroma of the materials that were present at the beginning of the process are substantially present in the finished sheet or rod. It is also apparent that flavor and aroma materials may be added at any convenient step in the process. However, it is preferred that the flavor and aroma additives be incorporated when the moisture content of the dried tobacco material is adjusted to the proper level. The flavor and aroma additives may be incorporated therein forming a mixture and/or water suspension and spraying on to the tobacco sheet or rod. Any of the conventional tobacco additives generally employed in the industry today may be used such as menthol and mentholated compounds, cinnamon, licorice, chocolate or any other flavoring additives which are used to enhance the organoleptic properties of tobacco products.

It is apparent that many modifications and changes may be employed without departing from the spirit of our invention as described in the drawings, specification and specific examples and should not be limited thereto but given the interpretation as set forth by the appended claims.

We claim:

1. A process for making reconstituted tobacco and reconstituted smoking tobacco products which comprises: preparing a mixture of a major portion of water and a minor portion of finely comminuted tobacco, forming said mixture into a predetermined configuration, flash freezing said formed configuration by subjecting it to a temperature substantially lower than the freezing point of water so that said configuration is rapidly set and then freeze drying said set configuration by subjecting it to a temperature below the freezing point of said mixture and at a reduced pressure of less than approximately 5 mm. absolute in which the vapor and solid phases

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of said water substantially exist simultaneously so that the water is sublimed therefrom.

2. The constituted smoking tobacco product made by the method defined in claim 1.

3. A process for making reconstituted tobacco and reconstituted smoking tobacco products as set forth in claim 1 wherein said set configuration is subjected to reduced pressures of less than approximately 3.0 mm. after flash freezing while maintaining said set configuration below its freezing point.

4. A process for making constituted tobacco and reconstituted smoking tobacco products as set forth in claim 1 wherein said set configuration is the form of a cigarette rod.

5. A process for making reconstituted tobacco and reconstituted smoking tobacco products as set forth in claim 1 wherein said set configuration is in the form of a sheet.

6. A process for making reconstituted tobacco and reconstituted smoking tobacco products as set forth in claim

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1 wherein said set configuration is in the form of a plurality of superimposed sheets laminated together.

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