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Improvements Relating to Smoking Products

The subject invention relates to the making of smoking products by extrusion.

An object of the subject invention is to provide smoking products the smoke of which is of enhanced sensory character.

A further object of the subject invention is to provide a commercially practical method of making improved smoking products.

A yet further object of the subject invention is to provide an inherently low effluent method of making improved smoking products.

Processes for the making of smoking products by extrusion are disclosed in European Patent Publications Nos. 113 595 and 325 476, and in United Kingdom Patent Specification No. 2 201 080.

The subject invention provides a method of making a smoking product, wherein a mixture comprising particulate bulk material, a binder, sugar, ammonia and an ammonium salt is extruded by an extruder to provide a coherent extrudate.

Preferably, the bulk material comprises particulate tobacco. In such case, the mean particle size of the tobacco suitably does not exceed about 350  $\mu\text{m}$ . Suitably, the tobacco comprises Burley tobacco. By preference the tobacco is not tobacco which has been subjected to an extraction process, such for example as a water extraction process.



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The binder may, for example, be a cellulosic binder or an alginic binder. The binder is desirably a cellulosic binder. Suitable cellulosic binders are hydroxypropyl cellulose (HPC), e.g. Klucel (Trade Mark), and sodium carboxymethyl cellulose. A preferred binder is one being or including HPC.

The sugar in the above mentioned mixture is a reducing sugar or is or includes a sugar which, under the processing conditions of a method according to the subject invention, breaks down to give a reducing sugar or sugars. If the bulk material in the mixture comprises tobacco, the sugar of the said mixture may consist of or include sugar in the tobacco. If, however, the tobacco is Burley tobacco, or the greater proportion is Burley tobacco, it will generally be necessary to include extraneous reducing sugar in the mixture.

The reducing sugar, or a part thereof, may be replaced by a non-sugar reducing substance comprising a carbonyl group, so long as there occur within the extruder and/or the extrudate Maillard reactions involving the substance together with the ammonium salt and the ammonia.

Conveniently, the ammonia is fed to the extruder as aqueous ammonia.

The ammonium salt can be an organic or an inorganic ammonium salt. A suitable ammonium salt for the purposes of the subject invention is diammonium hydrogen orthophosphate (DAP).

The above mentioned mixture may also comprise a starch or a modified starch.

The bulk material may comprise a particulate filler, calcium carbonate for example.

A casing substance, licorice or cocoa for example, may be included in the mixture.

There may be fed to the extruder, or otherwise added to the mixture, a humectant, glycerol for example.

Suitably, water is fed to the extruder, or otherwise added to the mixture.

If the aforementioned mixture comprises tobacco, the method of the subject invention is suitably carried out so that there results little reduction, and preferably no, or substantially no, reduction, in the nicotine content of the tobacco.

The method is desirably carried out such that the extrudate expands upon emergence from the extruder die. If the method is so carried out, the extrudate may be subjected to draw down so as to effect a reduction in a cross-sectional dimension of the extrudate.

The extrudate is preferably of web or sheet form, although the extrudate can be of other form, e.g. rod form.

Tobacco may be present in the mixture within a range of 0% to 85% by weight, or more. Preferably, tobacco is present in the mixture at a level of at least about 50% by weight, and more preferably at a level of at least about 75% by weight.

The binder is suitably present in the mixture within a range of about 3% to about 10% by weight.

Extraneous sugar can be present in the mixture at up to about 5% by weight.

The ammonia, as aqueous ammonia, is suitably present within a range of about 0.5 to 3%, and more preferably within a range of about 1.5 to 2.5% by weight.

The ammonium salt is suitably present in the mixture within a range of about 2% to about 7%, and more preferably within a range of about 4% to about 5.5% by weight. Advantageously, the ammonium salt is present at a level two or more times the level at which the ammonia is present.

Starch may be present in the mixture within a range of 0% to about 15%.

A filler may be present in the mixture within a range of 0% to about 85% by weight. It is appropriate for a filler to be present within the mixture if the level of tobacco therein is low, e.g. 5% or less.

Water may be fed to the extruder such that the total water is within a range, on a wet weight basis, of about 15% to about 50%, and more preferably about 20% to about 35%.

Humectant may be present within a range of 0% to about 6% , preferably within a range of about 2% to about 4%.

By preference, Maillard reactions between components of the mixture take place only in the extruder and in the extrudate. However, conditions may be provided such that

Maillard reactions also take place, to a limited extent, prior to the mixture being fed to the extruder.

Conveniently, the extruder used for the purposes of the subject invention is a single or twin screw cooker extruder which is operable to subject the mixture to mechanical working such as to generate heat within the mixture.

In order that the present invention may be clearly understood and readily carried into effect, reference will now be made, by way of example, to the drawing hereof, which shows a schematic of an apparatus for making a smoking product.

In operation of the apparatus shown in the drawing to make a reconstituted tobacco product, particulate tobacco, starch, cellulosic binder, diammonium hydrogen phosphate and sugar are fed respectively from bins 1-5 to a mixer unit 6. The resultant mixture is fed to a hopper 7 of a twin screw cooker extruder generally designated by reference numeral 8. A feed unit 9 of the extruder 8 serves to feed the mixture through a feed pipe 10 to the inlet end of barrel 11 of the extruder 8. Ammonium hydroxide drawn from a tank 12 is fed into a pressurised water feed line 13 under the action of a pump 14. A check valve 15 prevents ammonium hydroxide being pumped up the line 13. The water and ammonium hydroxide are injected via line 13 into the barrel 11. Glycerol drawn from a tank 16 is injected into the barrel 11 through a line 17 under the action of a pump 18.

The barrel 11 is provided with heating and cooling means (not depicted) by the operation of which a desired temperature profile can be maintained along the barrel 11. At operational equilibrium conditions the temperature of the die (designated 19) is suitably maintained at 135°C.

Preferably, the pressure within barrel 11 is maintained at a value sufficient to ensure that water therein remains in the liquid phase. The pressure may be in a range of 3400kPa to 13600kPa.

As the coherent sheet form extrudate (designated 20) issues from the die 19, water in the extrudate 20 flashes off to steam, as a result of which the cross-section of the extrudate 20 becomes greater than the cross-section of the orifice of the die 19 and there is imparted to the extrudate 20 a substantially closed-cell cellular interior structure.

The extrudate 20 is passed about a plain, undriven cylindrical roller 21 and then about two plain, driven cylindrical rollers 22 and 23. Chilled water is circulated through the rollers 22,23 via lines 24,25 from a chilling and pumping unit 26. The extrudate 20 adheres to the rollers 22,23, so that the rollers, which are driven at a peripheral velocity in excess of the linear velocity of the extrudate 20 at exit from the die 19, exert a tractive force on the extrudate 20 and draw down the extrudate 20. The draw down ratio may be, for example, four to five.

Chilled water may, optionally, be circulated through the roller 21.

Downstream of the roller 23 the sheet form extrudate passes about guide roller 27 before entering a cutter unit 28. Upon entering the cutter unit 28 the extrudate passes between slitters 29 and 30 which serve to slit the extrudate into continuous filaments of a width of, for example, 0.8mm. The filaments then pass between a multi-bladed rotary cylinder 31 and a stationary blade 32, whereby the continuous filaments are severed to provide discrete filaments of a length of, for example, 40mm, which discrete filaments are collected in a container 33.

The smoking product collected in the container 33 is eminently suitable for blending with cut tobacco leaf cigarette filler and endows a cigarette utilising such blend with an enhanced sensory character.

A preferred mixture formulation, on a dry weight basis, of particulate materials which may be fed to the extruder is as follows:

|              |       |
|--------------|-------|
| Tobacco      | 80%   |
| Starch       | 10.7% |
| HPC          | 3.7%  |
| DAP          | 5.3%  |
| Invert Sugar | 1.3%  |

Ammonium hydroxide is fed to the extruder barrel 11 at a rate which results in 5% ammonium hydroxide being present within the mixture, on a wet weight basis. Water is fed to the barrel 11 at a rate which results in 30% of total water, on a wet weight basis, being present in the

mixture. Glycerol is fed to the barrel 11 at a rate which results in 2.5 to 3.0% glycerol, on a wet weight basis, being present in the mixture.

The tobacco in such formulation can be a blend, of dust constitution, of waste tobacco materials.

When smoking product made using the above mixture formulation was blended with conventional cigarette filler material and the blend was used in making cigarettes, it was observed that the mainstream smoke of the cigarettes was of enhanced sensory character.

CLAIMS

1. A method of making a smoking product, wherein a mixture comprising particulate bulk material, a binder, sugar, ammonia and an ammonium salt is extruded by an extruder to provide a coherent extrudate.
2. A method according to Claim 1, wherein said bulk material comprises particulate tobacco.
3. A method according to Claim 1 or 2, wherein said binder is a cellulosic binder.
4. A method according to Claim 1, 2 or 3, wherein said sugar, or a proportion thereof, is replaced by a non-sugar reducing substance comprising a carbonyl group, and there occurs in said extruder and/or in the extrudate a Maillard reaction involving said substance together with said ammonium salt and said ammonia.
5. A method according to any one of the preceding claims, wherein said mixture comprises a starch or a modified starch.
6. A method according to any one of the preceding claims, wherein water is added to said mixture.
7. A method according to Claim 6, wherein water in the extrudate flashes off to steam, whereby the cross-section of the extrudate becomes greater than the cross-section of the orifice of the extruder die.
8. A method according to any one of the preceding claims, wherein said ammonia, as aqueous ammonia, is

present in said mixture within a range of 0.5% to 3% by weight.

9. A method according to any one of the preceding claims, wherein said ammonium salt is present in said mixture within a range of 2% to 7% by weight.
10. A method according to any one of the preceding claims, wherein said ammonium salt is present in said mixture at a level, by weight, two or more times the level, by weight, at which said ammonia is present in said mixture.