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COMPLETE SPECIFICATION

DRAWINGS ATTACHED

Improvements relating to the Production of Tobacco Smoking Materials

We, **BRITISH-AMERICAN TOBACCO COMPANY LIMITED**, of Westminster House, 7, Millbank London, S.W.1, a Company incorporated under the laws of Great Britain, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention concerns improvements relating to the production of tobacco smoking materials, especially from particles of tobacco normally considered to be too small for incorporation in tobacco smoking materials such as cigarette tobaccos.

15 The production of smoking material from fine particles of tobacco as practised heretofore encounters certain difficulties. In particular, it may be necessary to introduce, during the manufacture of the material, binding agents or other components essentially foreign to the nature of tobacco in order to impart to the material tensile-strength characteristics which permit it to be mechanically handled and processed in sheet form. Such foreign components, however, may have deleterious effects upon the smoking properties of the resultant product. Other drawbacks of known methods of production of such tobacco materials include slowness of manufacture and high cost. The present invention seeks to avoid these drawbacks.

20 For the production of a tobacco smoking material according to the invention, tobacco is ground to a flour and mixed with a minor proportion of added water, that is a quantity of water less than the quantity of tobacco, without admixture of a binding agent, and the mixture is extruded, the mixture being plasticised by the mechanical work to which it is subjected by the extrusion so as to release the inherent gumminess of the

tobacco.

In practise, the flour is such as will pass a 100-mesh sieve and, with advantage, predominantly pass a 200-mesh sieve, while the water content is within the range of 16 to 30% estimated as a percentage of the wet weight of the tobacco. In contrast with known proposals according to which a large proportion of water is used for the purpose of producing a colloidal suspension, the mixture is of the nature of a thick dough or a free-flowing granular powder. No extraneous binder is included in the mixture, but a humectant may be added in accordance with accepted tobacco practice. The time required for the mixing work necessary to ensure a predetermined amount of gumminess depends to a large extent upon the water content and upon the type of apparatus employed. The water content depends upon the nature and type of the tobacco flour.

Advantageously, the mixture is extruded in substantially filamentary form. The extrusion may be performed in apparatus of simple ram or screw type in which the mixture is forced from a cylinder or barrel through a nozzle or nozzles. Suitably, the diameter or width of nozzle orifice may be within the range from 0.008" to 0.018", depending upon the result required.

Filaments so obtained have favourable tensile-strength characteristics and are suitable for immediate incorporation in cigarette tobacco or other conventional smoking products. They may, however, be further processed, for example by rolling. Thus filaments extruded with a circular cross section may be rolled to a flattened cross section. The properties and shape of the material, its self-supporting character and the ease with which it can be employed make it very acceptable as a smoking material.

Ways of carrying the invention into effect

[Price 4s. 6d.]

will now be more fully described by way of example and with reference to the accompanying drawings, in which:—

Figure 1 is a process diagram,

5 Figure 2 a general elevational view, partly in section, of apparatus including a ram-type of extruder, and

Figure 3 a vertical section through a screw-type of extruder.

10 Referring to Figure 1, if the originating tobacco material, tobacco waste, shorts and so forth, contains coarse particles of silica which might block the nozzles of the extruder die or cause excessive wear in the grinding, 15 mixing or extruding means, it is necessary to remove these particles in a desander 1. The desanding may be effected on a density-differentiation basis by means of a grain classifier of known construction or by sieving followed by pneumatic classification.

20 Desanding may be carried out either before or after the tobacco is passed to a drier 2, depending upon the type of tobacco and its original moisture content. If drying is 25 effected first, it may be helpful in freeing silica particles from the tobacco.

The drier 2 may be a conventional type of pneumatic or rotary-cylinder drier. The tobacco is dried to a moisture content of 4 30 to 6% with the object to facilitating its grinding to a sufficient degree of fineness.

The dried tobacco is fed to a grinding mill 3 in which it is ground so that at least it will pass a 100-mesh/inch sieve and preferably so that predominantly it will pass a 35 200-mesh sieve. The grinding, which is intended to enable the inherent gumminess of the tobacco to be released in subsequent operations, may be performed in a hammer 40 mill, but is preferably carried out in a micronizer or fluid-energy mill in which attrition occurs between the tobacco particles.

To remove particles of silica which have 45 escaped the desanding operation, but which might still cause blocking of the nozzles, it is desirable to pass the ground tobacco through a sieve 4. The sieve mesh will depend upon the size of the nozzle orifices. A 50 100-mesh nylon screen (aperture size 105 microns) has been found adequate with nozzle orifices of 0.015-0.018 inch diameter, but with smaller orifices, say 0.008 inch diameter, a finer sieve may be required.

55 If desired, the coarser tobacco particles may be reground, as indicated diagrammatically at 5.

Before extrusion, a minor proportion of water, preferably such as will increase the 60 moisture content to between 16 and 30%, estimated on the wet weight of the tobacco, is added to the ground tobacco in a mixer 6.

The nature of the mixing will depend upon the type of tobacco. Mixing may be carried 65 out in a planetary mixer, for example a

mixer with a spade-shaped, apertured, blade which not only rotates about its axis but also performs a planetary motion in the bowl of the mixer. Alternatively, use may be made of an interrupted ribbon blade 70 mixer or other mixer which will give a powdery product. It is desirable to ensure that agglomeration of the ground tobacco is prevented, as this would result in an uneven feed to the extruder. 75

If shear mixing is desired, use may suitably be made of a twin Z-blade mixer of a kind well known in the rubber and plastics industry. The conditions of temperature and pressure under which mixing is performed 80 may be varied to suit the degree of plasticisation required. With this kind of mixing, the product is a stiff dough which may require granulating, by known means, to form particles or pellets less than $\frac{1}{4}$ inch in diameter 85 before being fed to the extruder 7.

During the mixing, a known humectant, for example up to 5% of glycerol depending upon the type of tobacco, may also be added, 90 if required.

The extruder 7 may be of either the ram or the screw variety and in either case may be of a conventional type used in the plastics industry.

Figure 2 illustrates, more or less diagrammatically, a convenient arrangement comprising a ram extruder. The ground tobacco is fed from a hopper 11 into a cylinder 12 whence it is extruded by means of a ram 13 operated by hydraulic means (not shown). 95 An electrical heater 14 of sleeve form is disposed around the cylinder 12. The die of the extruder consists of a plate 15 which contains a line or group of fine round orifices or nozzles 16 and which is replaceably held 100 in a nozzle member or manifold 17 which may be of fishtail form. The size of the orifices will naturally depend upon the diameter of the filaments required. Ram extrusion may be preferred to screw extrusion, 105 as higher specific pressures for a lower power expenditure will generally be obtainable. An incidental advantage of higher pressure is reduced risk of nozzle blockage. Specific pressures of up to 10,000 lbs./sq. inch, or 115 even more, can be employed.

A suitable screw extruder is shown in Figure 3. The screw 18, driven through gearing 19 and reacted against a thrust bearing 20 rotates in a barrel 21. A down-turned 120 throat 22 in the nozzle body 17 leads to the die plate 15. Successive zones of the barrel 21 can be heated by a series of electrical heaters 23 and the nozzle body 17 by a heater 24. The said zones and the feed zone 125 of the barrel 21 may also be provided with cooling jackets 25 and the screw 18 can be cooled by water circulating through concentric ducts 26.

The extruded filaments of circular cross 130

section next pass between rollers 8 (Figure 1) by which they are brought to the form of flattened filaments of a rectangular cross section similar to that of cut rag tobacco.

5 The rolling may also produce improved tensile properties and colour.

A suitable arrangement is shown in conjunction with the ram extruder of Figure 2, but this can equally be used with the screw extruder of Figure 3. The filaments descending from the orifice 16 after a short fall, enter the nip 27 of a pair of steel or other hard bowls 28, running at the same speed, similar to callendering bowls. The clearance between the bowls 28 may, for example, be about 0.005 inch and may be made adjustable. By setting the peripheral velocity of the bowls to exceed slightly the velocity of delivery of the filaments from the orifices 16, the filaments may be caused to be snatched away or broken off in lengths compatible with cut tobacco with which the filaments are to be blended. The mean length will depend upon the distance between the orifices 16 and the nip 27. The rolled filaments are removed from the bowls 28 by spring-loaded razor-steel doctor blades 29.

After rolling, the filaments require to be dried down to, say, a moisture content suitable for cigarette making. This is effected in a conventional drier 9 (Figure 1). During this drying, the filaments assume a permanently crinkled appearance similar to that of cut rag tobacco, particularly if a rotary drier is used.

Figure 2 shows a convenient arrangement, in which the filaments fall upon an endless horizontal conveyor band 30 made of coarse-mesh wire and are conveyed thereon through a tunnel drier (not shown) or a counter-current warm-air drier. The dried tobacco is removed by a revolving brush 31 and falls

into a collecting bin 32 or the like, whence it is taken for blending with cut rag tobacco.

If desired, the filaments, as extruded, may have a cross section other than circular, for example a rectangular cross section. The extruded material may alternatively have the form of a thin strip or web.

Specific examples will now be described:

1) Using a screw extruder such as has been described with reference to Figure 3:—

Flue cured tobacco was dried to 4.3% moisture content in a steam heated rotary-cylinder drier. The dried tobacco was fed at 150 lbs./hr. through a fluid-energy mill. The product, at least 98% of which was of a size less than 75 microns, was passed through a 100 mesh nylon screen (aperture size 105 microns) to remove any coarse particles, particularly silica, present.

Mixing was carried out batch-wise, 40 lbs. per batch, in a planetary mixer for 4 minutes with a blade-speed of 45 r.p.m. Approximately 9 lbs. of water was added together with 1.15 lbs. of glycerol (3%). The product was uniformly moist with no tendency to agglomerate into large lumps and could be readily fed into the hopper 11 of the screw extruder 18, 21.

The screw extruder was of a general purpose plastics type with a 2 inch diameter barrel 21 and a 20 to 1 length/diameter ratio, the compression ratio being 2.5 to 1. It was provided with four zone heaters 23 and the die heater 24 was also used. The screw 18 was water cooled by means of the ducts 26. The region of the barrel 21 near the hopper 11 was also cooled to assist feeding. The die plate 15 had 45 nozzles 16 each of 0.016 inch diameter.

Typical runs are set out in the following table:—

Zone Temperatures °C.					Die Temp. °C.	Screw r.p.m.	Screw thrust, tons	Moisture Content		Throughput lbs./hr.
	1	2	3	4				Initial	Final	
85	90	100	110	110	80	20	1.5	23.0	21.3	13.5
	"	"	"	"	"	40	1.75	23.0	20.75	31.0
	"	"	"	"	"	60	2.0	23.0	20.75	48.0
90	90	100	110	110	90	20	1.25	23.0	21.3	12.5
	"	"	"	"	"	40	1.5	23.0	20.2	30.75
	"	"	"	"	"	60	1.75	23.0	20.45	47.5
95	90	100	110	130	100	40	1.5	23.0	20.5	29.5
	"	"	"	"	"	60	1.75	23.0	20.5	44.5

95 The filaments were rolled by being passed between steel bowls 28 having a nip of 0.005 inch. The peripheral velocity was slightly greater than the filament velocity from the extruder and this gave filaments 1 to 4 100 inches in length which, after drying in the air drier, were suitable for blending with cut

lamina tobacco for cigarette manufacture.

2) Using a ram extruder as described with reference to Figure 2:

The same ground tobacco-water-glycerol mixture as was used for Example 1 was extruded in a ram extruder 12, 13 of 1 inch diameter.

The temperature of the cylinder 12 was maintained at 85°C. by the heater 14 and the die had 37 nozzles 16 each of 0.016 inch diameter. The die, although not directly
 5 heated, reached a steady-rate temperature of 65°C. During extrusion, the maximum ram pressure was 4,000 pounds/sq. inch and the mean production rate 5 lbs./hr. After rolling and drying as described in Example
 10 1, the filaments were suitable for blending with cut lamina tobacco.

We are aware of the Customs and Excise Act, 1952 (15 and 16 Geo. 6 and 1. Eliz. 2, Ch. 44) and make no claim to use the inven-
 15 tion in contravention of any of the provisions of that Act.

WHAT WE CLAIM IS:

1. A process for the production of a tobacco smoking material, wherein tobacco
 20 is ground to a flour and mixed with a minor proportion of added water, that is a quantity of water less than the quantity of tobacco, without admixture of a binding agent, and the mixture is extruded, the
 25 mixture being plasticised by the mechanical work to which it is subjected by the extrusion so as to release the inherent gummi-ness of the tobacco.

2. A process as claimed in claim 1,
 30 wherein the proportion of water is 16 to 30% of the wet weight of the tobacco.

3. A process as claimed in claim 1 or 2, wherein a humectant is added to the mixture.

4. A process as claimed in any one of
 35 claims 1 to 3, wherein the mixture is extruded in filament form.

5. A process as claimed in claim 4, wherein the filaments are subjected to rolling.

6. A process as claimed in claim 5, wherein the rolling is effected between rollers
 40 having a peripheral velocity higher than the velocity at which the filaments are extruded, so that the filaments are broken into lengths.

7. A process as claimed in claim 4, 5 or 6, wherein the filaments are finally dried
 45 to a crinkled form.

8. A process as claimed in claim 7, wherein the filaments are dried on a coarse-mesh band.

9. A process as claimed in any one of
 50 claims 1 to 8, wherein the tobacco is dried to 4 to 6% moisture content before being ground.

10. A process as claimed in any one of
 55 claims 1 to 9, wherein the tobacco is freed of coarse particles, particularly of silica, before being ground.

11. A process as claimed in any one of
 60 claims 1 to 10, wherein the tobacco is ground at least to pass a 100-mesh sieve and is passed through such a sieve after grinding.

12. A process as claimed in any one of
 65 claims 1 to 11, wherein the extruding means is heated or cooled during the extrusion.

13. A process for the production of a
 70 tobacco smoking material substantially as hereinbefore described.

14. A tobacco smoking material produced by a process as claimed in any one
 of claims 1 to 13.

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The temperature of the cylinder 12 was maintained at 85°C. by the heater 14 and the die had 37 nozzles 16 each of 0.016 inch diameter. The die, although not directly heated, reached a steady-rate temperature of 65°C. During extrusion, the maximum ram pressure was 4,000 pounds/sq. inch and the mean production rate 5 lbs./hr. After rolling and drying as described in Example 1, the filaments were suitable for blending with cut lamina tobacco.

We are aware of the Customs and Excise Act, 1952 (15 and 16 Geo. 6 and 1. Eliz. 2, Ch. 44) and make no claim to use the invention in contravention of any of the provisions of that Act.

WHAT WE CLAIM IS:

1. A process for the production of a tobacco smoking material, wherein tobacco is ground to a flour and mixed with a minor proportion of added water, that is a quantity of water less than the quantity of tobacco, without admixture of a binding agent, and the mixture is extruded, the mixture being plasticised by the mechanical work to which it is subjected by the extrusion so as to release the inherent gumminess of the tobacco.

2. A process as claimed in claim 1, wherein the proportion of water is 16 to 30% of the wet weight of the tobacco.

3. A process as claimed in claim 1 or 2, wherein a humectant is added to the mixture.

4. A process as claimed in any one of claims 1 to 3, wherein the mixture is extruded in filament form.

5. A process as claimed in claim 4, wherein the filaments are subjected to rolling.

6. A process as claimed in claim 5, wherein the rolling is effected between rollers having a peripheral velocity higher than the velocity at which the filaments are extruded, so that the filaments are broken into lengths.

7. A process as claimed in claim 4, 5 or 6, wherein the filaments are finally dried to a crinkled form.

8. A process as claimed in claim 7, wherein the filaments are dried on a coarse-mesh band.

9. A process as claimed in any one of claims 1 to 8, wherein the tobacco is dried to 4 to 6% moisture content before being ground.

10. A process as claimed in any one of claims 1 to 9, wherein the tobacco is freed of coarse particles, particularly of silica, before being ground.

11. A process as claimed in any one of claims 1 to 10, wherein the tobacco is ground at least to pass a 100-mesh sieve and is passed through such a sieve after grinding.

12. A process as claimed in any one of claims 1 to 11, wherein the extruding means is heated or cooled during the extrusion.

13. A process for the production of a tobacco smoking material substantially as hereinbefore described.

14. A tobacco smoking material produced by a process as claimed in any one of claims 1 to 13.

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