

PATENT SPECIFICATION

827,011

DRAWINGS ATTACHED.

Inventor:—ALFRED CHARLES DAVIS.*Date of filing Complete Specification (under Section 3(3) of the Patents Act, 1949): Dec. 20, 1957.**Application Date: Dec. 21, 1956. No. 38990/56.**Application Date: Dec. 21, 1956. No. 38991/56.**Application Date: Aug 23, 1957. No. 26674/57.**Complete Specification Published: Jan. 27, 1960.*

Index at Acceptance:—Classes 59, A7(D:F:G:J:K), A26; 78(1), A1(C2L1:C3L1:F1);
117, A1B; and 130, I(2:10:X2).

International Classification:—A24b. B02d, f. B65g.

COMPLETE SPECIFICATION.

Improved Method and Apparatus for Treating Tobacco.

We, THE IMPERIAL TOBACCO COMPANY (OF GREAT BRITAIN AND IRELAND) LIMITED, a British Company, of East Street, Bedminster, Bristol 3, 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:—

This invention relates to the treatment of normal tobacco, and/or puffed tobacco, either before or after having been cut into shreds. Such tobacco is hereinafter referred to as process tobacco.

In the normal preparation of tobacco to render it suitable for smoking, either as pipe tobacco or as a filler in cigarettes or cigars, or for use as snuff, a certain amount of scrap tobacco, comprising for example, leaf lamina or stem, is produced.

For example, one operation that is frequently employed is that known as "threshing". In this the leaves, either as whole leaves or leaf pieces, are mechanically threshed to remove the lamina from the stems, and the thick portions of stem near the butt ends of the leaves are separated and removed as they are unsuitable for smoking because of their high cellulose content. These unsuitable thick portions of stem are usually not absolutely clean, that is to say all pieces of lamina are not necessarily removed, and such pieces constitute valuable leaf, not only from a monetary value point of view, but also because they may be of good quality tobacco.

A subsequent operation can be performed on the thick portions of stem to remove the pieces of lamina, but even then the pieces

are considered as "scrap" tobacco because of their small size, since, when they subsequently pass with the larger pieces of lamina to a machine for cutting, these small pieces are further reduced in size and thus become very small bits that may, for instance, fall out of the ends of cigarettes when carried loosely in a packet.

Medium thickness portions of stem, i.e. stems further from the butts, do not contain the same high cellulose content as the thick portions near the butt and are therefore suitable for smoking, but they tend to form hard lumps, known as spills, in the tobacco which may pierce the paper of a cigarette, and are thus frequently discarded. Thus some medium thickness stems also provide a source of scrap tobacco.

In manufacturing operations shredded tobacco is sometimes rendered unsuitable for use. For example, if a defect occurs in a cigarette-making machine a considerable amount of cigarette rod may be formed before the machine is brought to rest and such rod is usually discarded as the shredded tobacco is then unsuitable for re-use in that manufacturing operation. Tobacco, such as above described, which has been discarded during a manufacturing operation, either in shredded or other form, also provides a source of scrap.

Thus in the preparation of tobacco to render it suitable for smoking and in manufacturing operations to provide tobacco articles, there are many sources of scrap tobacco, that is to say tobacco which is for some reason unsuitable for use or reuse, although it is frequently of good quality. It will be appreciated that this material may

be leaf lamina, stems, or may be cut or shredded tobacco.

Due to the high cost of tobacco it is most undesirable to discard this scrap and there is a further point that if high quality scrap tobacco can be rendered suitable for smoking it can then be mixed with inferior quality tobacco to improve the smoking properties of the latter.

Scrap tobacco as above defined may, in accordance with this invention, constitute treatment material for treating process tobacco.

Another source of tobacco for use in providing treatment material for applying to process tobacco in accordance with this invention is what may be termed "blending" tobacco, that is, good quality tobacco chosen for its blending or flavouring properties and adapted to improve the smoking properties of process tobacco of inferior quality. In this case non-scrap tobacco may provide the treatment material.

Puffed tobacco is normal tobacco that has been subjected to an operation that expands the cell walls substantially beyond their elastic limit, and one suitable method of puffing tobacco leaf and/or stem comprises supplying steam thereto in a container in the substantial absence of air, increasing the steam pressure upon and correspondingly the temperature of the tobacco and then suddenly reducing the pressure by connecting the container with a chamber maintained at a pressure considerably below atmospheric.

Such puffed tobacco, as hereinafter explained, may be used as process tobacco. As it is prepared and used in the same manner as normal tobacco, scrap is produced therefrom in a similar way, so that puffed tobacco provides also yet another source of treatment material.

The expression "treatment material" as employed herein, means tobacco which may be scrap or blending tobacco, and whole or part leaves, derived either from normal tobacco or puffed tobacco.

As already intimated "process tobacco" consists of normal and/or puffed tobacco.

The object of the present invention is to provide improved methods and apparatus for treating process tobacco, involving the use of very finely divided treatment material hereinafter referred to as powdered treatment material or powder. A further object is to improve the smoking properties of inferior quality tobacco.

Powdered treatment material as referred to in this Specification concerns treatment material of the order of 1 to 76 microns, that is to say material which has been ground to size small enough to pass through a sieve 200 British Standard Mesh having apertures of 76 microns, 40,000 apertures per sq. inch.

Further reference to this particle size will appear hereinafter.

The present invention provides a method of treating the hereinbefore defined process tobacco in which fragments of treatment material, also constituted as hereinbefore defined, are subjected to the action of high velocity jets of a compressible fluid, for example air, so as to reduce said treatment material to powder of the order of 1 to 76 microns by effecting attrition between the fragments, the powder thus obtained being applied to the process tobacco to be treated to which it adheres as a discontinuous coating due to the inherent gumminess and/or other characteristic features of tobacco.

The powder may be applied to the process tobacco by mixing it therewith, or it may be forcibly applied e.g. by blowing it on under the influence of a current of air.

Preferably the process tobacco is agitated during or after the application of the powdered material so as to disperse said powdered material throughout the tobacco and so provide the treated process tobacco.

The treated process tobacco may be compressed to bind the powdered treatment material into intimate contact with the tobacco and while so compressed said treatment tobacco may be cut or shredded whereby sugars or the like contained in the tobacco are released to the surface and so assist in the adherence of the powdered treatment material.

The treated process tobacco may be dried and/or cooled preferably after being compressed and cut.

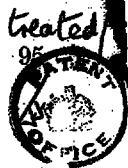
Preferably the process tobacco is treated when in a moistened condition.

The present invention also provides apparatus for applying powdered treatment material to process tobacco, both as hereinbefore defined, said apparatus comprising a receptacle for the process tobacco to be treated, means for agitating the tobacco in said receptacle, and means for reducing the treatment material to powder of the order of 1 to 76 microns, said means including a chamber having a plurality of tangentially disposed orifices through which a compressible fluid, e.g. air, is injected for effecting attrition between the treatment material to reduce it to powder, and an exit orifice through which the powdered treatment material issues for delivery to said receptacle.

The receptacle for the process tobacco may comprise a rotatable cylinder having internal vanes or tines, whereby rotation of the cylinder acts to agitate the tobacco.

In another form the receptacle for the tobacco comprises a conveyor that may be vibrated so as to agitate the tobacco.

In still yet another form the receptacle for the tobacco may comprise a hopper adapted to deliver the tobacco to a plurality of



machines, e.g. cutting machines, and said hopper includes a delivery member for feeding tobacco to said machines, said member acting also to agitate the tobacco.

5 While the great majority of the treatment material should be brought to a very fine condition of from 1 to 76 microns particle size, somewhat larger sizes are not entirely unsuitable for the remainder of the material.

10 However, the larger the size of the particles of applied tobacco, the less thereof clings to the process tobacco and it has been found that with particles up to about 76 microns practically all of them remain in intimate contact with the process tobacco to be treated, even when that tobacco is subjected to subsequent processing that might be expected to loosen the particles, for instance drying and cooling.

20 Experiments have shown that if process tobacco is treated with tobacco particles varying in size between 1 and 76 microns by applying the powder to the tobacco while the latter is agitated, as little as 0.5% of added powder fails to cling to the leaf. The application of the powder in an experiment consisted in depositing 12 lb. of leaf lamina in an interiorly vaned rotatable drum and shaking 12 oz. of the powder on to the leaf. 25 The drum was then closed and rotated for five minutes to agitate the tobacco and the coated leaf was removed, the residual powder was then weighed and found to be 0.5% of the quantity added, the tobacco leaf was also weighed and this showed an increase corresponding to 99.5% by weight of the added powder. Shaking, or rubbing, of the leaf failed to remove the powder.

30 When the leaf was subsequently cut in a tobacco cutting machine no residue was found in the hopper of the machine. It is thought that the tobacco sugars that exude from the leaf during the cutting operation assist in retaining the powder on the tobacco, 35 and also that the cutting operation itself forces the powder into more intimate contact with the tobacco. Further, the pressure to which the tobacco in the hopper is subjected binds the powder into more intimate contact with the tobacco.

40 The experiment was continued up to the manufacture of finished cigarettes and it was found by calculation that 90% of the powdered tobacco remainder clinging to the tobacco in the cigarettes, the majority of the losses being collected in the dust box of the cigarette machine in the normal manner. 45

50 In a similar operation using powdered tobacco of larger particle size of the order of 77 to 152 microns 100 British Standard Mesh having apertures of 152 microns 10,000 apertures per sq. inch, about 2% of the powder did not cling to the tobacco and, furthermore, when the leaves were 55 rubbed between the fingers, powder which at

first clung to the tobacco, was comparatively easily rubbed off.

The comparative ease with which the coarser powder was removed led to the conclusion that subsequent processes would result in so much of this powder failing to cling to the tobacco as to render this manufacturing process uneconomic. 70

From the above experiments it will be appreciated that it is only necessary to expose the leaf or shreds to the powder, whereupon the powder clings firmly thereto. 75

This clinging or adherence is mainly due to the characteristic features of tobacco as is hereinafter explained. 80

Another reason for the adherence is that the powder is normally warmer than the leaf or shreds, and it is a known fact that dust or smoke is attracted to a cool surface and when so attracted will intimately associate itself therewith. For example, fine dust floating in the air of a room is deposited as a pattern on the ceiling according to the arrangement of the ceiling joists, the dust settling on the portions of the ceiling extending between the joists. (See "Thermal Properties of Buildings" by N. S. Billington, Chapter 4). 85

The fineness of particle size is of importance in that the particles are sufficiently small to fill in, or fit in to the irregularities, which are characteristics of tobacco, in the surface of the lamina or shreds. To appreciate this, if a small quantity of 1 to 76 micron size powder is squeezed between finger and thumb, a film of the powder remains firmly in contact with the skin after the surplus has been brushed off and such film can only be removed by washing the hands, from which it will be appreciated that the, so called, film fills or fits into the irregularities of the skin and that rubbing the finger and thumb together does not touch the powder i.e., the powder is below the upper surfaces of the irregularities. 90 95 100 105 110

Tobacco both in leaf form and shredded is characteristically a gummy substance, it contains a good proportion of sugars and these render the surface of the leaf gummy. This is a further cause of the adherence of powder to the tobacco. 115

Damping the tobacco leaf or shreds tends to bring the sugars towards the surface of a leaf and this results in a greater quantity of powder clinging thereto but too much moisture is undesirable as it causes the particles to cling together before settling on the leaf or shred which is clearly to be avoided. 120

It must also be appreciated that the powder itself is gummy since, due to its minute particle size, the sugars tend to be exposed on the surface. 125

Another tobacco characteristic which causes powder to cling to it is the fact that 130



a number of small hairs extend from the surface of a leaf, and this assists the clinging of the powder to the tobacco.

Although it has been stated that the powder may be applied to tobacco leaf or shredded tobacco, it may also be applied to processed stem additives in a blend, for example, cut rolled stem, puffed or otherwise.

Forms of apparatus for applying powdered treatment material to process tobacco in accordance with the present invention are diagrammatically illustrated in the accompanying drawings in which:—

Fig. 1 shows one embodiment in which the treatment material is applied to the process tobacco by mixing it therewith in a rotating drum and in which fragments of the treatment material are reduced to powder of the order of 1 to 76 microns by effecting attrition between the fragments.

Fig. 2 is a plan view of a mill in which fragments of treatment material are reduced to powder of the order of 1 to 76 microns.

Fig. 3 shows similar apparatus to Fig. 1 except that the powder is applied to the process tobacco forcibly by blowing it under the influence of a current of air.

Fig. 4 shows a suitable installation in which the powder is added to the tobacco on a vibratory conveyor and is subsequently passed to a battery of tobacco cutting machines.

Referring to Figs. 1 and 2. The treatment material is delivered by a weighing conveyor 1 into a rotatable drum 2 in which it is thoroughly mixed together and simultaneously dried to a moisture content of about 5%. 3 is a conveyor which passes the mixed and dried treatment material into a mill 4. This mill 4 is of conventional design and includes a rotating cutter that co-operates with interior peripheral knives to chop the treatment material into small fragments. The fragments pass continuously from the bottom of the mill 4 into a hopper 5 that leads to a second mill 6.

The mill 6 comprises a circular chamber 7 having a plurality of somewhat tangentially directed orifices 8, said orifices communicating through ports 9 with a common annular tube 10. The common annular tube is connected at 11 to a source of compressed air. To the upper wall of said chamber 7 and at the centre thereof is secured by means of a flange 12 an exit pipe 13 for air, said pipe leading to a filtering sock 14, while at the centre of the lower wall of the chamber 7 is secured an exit tube 15 for the powder treatment material. This exit tube 15 directs powder via a valve 16 towards a conveyor 17. 18 is a suitable delivery passage secured to the upper wall 19 of the chamber 7 through which fragments of treatment material may be de-

livered to the interior of the chamber 7. The delivery passage 18 may conveniently include a screw conveyor for delivering fragments into the chamber, or alternatively the fragments may be delivered by venturi action.

The operation of the above described mill 6 is as follows:—

The treatment material is delivered through the passage 18 into the chamber 7 where it comes under the action of the air jets issuing through the tangentially disposed orifices 9. This effects attrition between the fragments and they are quickly reduced in size to powder of the order of 1 to 76 microns. The action of the air jets also causes a vortex within the chamber that acts to carry the powder towards the centre of the chamber whence it passes through the exit tube 15 and the valve 16 on to the conveyor 17. The majority of the exhausted air passes through the tube 13 and any dust that is entrained therein is collected in the sock 14. A certain amount of air also passes through the tube 15 and carries the powder treatment material with it.

It has been mentioned above that the treatment material is quickly reduced to powder of the order of 1 to 76 microns, but it is to be understood that the particle size is dependent on the exact operation of the mill. Thus the size to which the material is reduced is dependent on the speed of delivery through the passage 18 and the force of air through the orifices 8, and these are so chosen as to reduce the fragments of treatment material to a particle size of 1 to 76 microns at the speed desired to maintain the whole apparatus in continuous operation at a suitable speed to suit the manufacturing operation.

20 is a rotatable drum, set at a slant, and having internal tines 21 adapted, when the drum is in rotation, to mix powdered treatment material fed by the conveyor 17 and process tobacco together and feed the treated tobacco towards a delivery conveyor 22. 23 is a feed hopper for the process tobacco.

A funnel 24 provides a passage, leading via a fan 25 to a filter sock 26, through which surplus powder may be collected.

The above apparatus works in the following manner:—Treatment material is fed on the weighing conveyor 1 through the mixing and drying chamber 2 and the conveyor 3 to the first mill 4 where it is chopped into small fragments. These fragments are then ground in the second mill 6 to powder of the order of 1 to 76 microns and said powder is then fed with the process tobacco, which passes into the hopper 23 from a weighing conveyor 233, into the rotating cylinder 20. Here the tobacco and powdered treatment material are thoroughly mixed and

delivered to the conveyor 22 which carries the treated tobacco away for further manufacturing operations. It will be appreciated that by providing the conveyor 1 and the conveyor 23 as weighing conveyors, the proportion of powdered treatment material being applied to the process tobacco can readily be controlled.

The embodiment illustrated in Fig. 3 corresponds substantially with that above described with regard to Figs. 1 and 2, except that the second mill 6 feeds the powdered treatment material to a powder blower 27, from which through a pipe line 28 the powder is forcibly applied to the process tobacco. Thus the parts in Fig. 3 have been given the same numbering as Fig. 1 and the operation is the same, except that instead of applying the treatment material to the process tobacco by mixing it therewith in the cylinder 20, said treatment material is forcibly blown into said chamber by the powder blower 27 so that the process tobacco, in passing through the chamber, passes through an atmosphere containing powdered treatment material.

Fig. 4 shows the application of treatment material powdered in accordance with the invention to process tobacco and subsequent manufacturing operations. 30 is a vibratory conveyor for feeding process tobacco through a hopper 31 into a timed rotating cylinder 32. Whilst the process tobacco is on the conveyor 30 and being agitated thereby, powdered treatment material is delivered from a hopper 33 through the passage 34 on to the tobacco as it passes beneath it.

The treated tobacco passes from the cylinder 32 into a hopper 35 that is common to a plurality of tobacco cutting machines 36, 37, 38. The treated tobacco in the hopper 35 is delivered beneath a pinned refuser roller 39 on a conveyor 40 from which it falls to a conveyor 41 moving at right angles. The treated tobacco falls off the end of the conveyor 41 on to the vaned drum 42, which normally rotates in the counter clockwise direction, by which it is fed into the funnel 43 leading to the cutting machine 36. Suitable mechanism is provided that, when the hopper of the machine 36 is full, acts to reverse the rotation of the vaned drum 42, so that tobacco falling on to said drum is delivered on to a conveyor 44. This, via a vaned drum 45, in a similar way, passes the tobacco through a funnel 46 leading to the machine 37. When both machines 36, 37 are filled, the machine 38 is filled through the funnel 47 in a similar manner, and so on.

Fig. 4 is included mainly to indicate various positions at which powdered treatment material may conveniently be applied to process tobacco and be agitated there-

with to provide a discontinuous coating of the powdered treatment material on the tobacco and also to indicate means by which the treated process tobacco may be compressed so as to bind the treatment material into intimate contact therewith. Furthermore, it shows where the treated process tobacco is cut to release sugars or the like to the surface to assist in the adherence of the powdered treatment material.

Thus treatment material may, as hereinbefore described, be added to and dispersed throughout the process tobacco while the latter is being agitated by the vibratory conveyor 30, it may be added direct into the cylinder 32 and be dispersed throughout the process tobacco by agitation due to the rotation of said cylinder, it may be added to process tobacco in the hopper 35 and be dispersed throughout said tobacco due to agitation therein by rotation of the pinned roller 39, or it may be added to process tobacco on the conveyor 41 and be dispersed throughout the tobacco due to agitation by means of the vaned drum 42.

36, 37, 38 are tobacco cutting machines of which 48, 49 and 50 are rotary knives and it is to be understood that these machines operate on the general principle of compressing the tobacco in the hoppers 51, 52, 53, to form a hard cheese and cutting the cheese with knives 48, 49, 50. Thus the treatment material in said hoppers is bound into intimate contact with the tobacco therein due to compression, while the action of the rotary knives 48, 49, 50 on the treated tobacco acts to release sugars or the like to the surface and so assist in the adherence of the treatment material to the tobacco.

54 is a vibratory conveyor that delivers tobacco from the cutting machines for further manufacturing, e.g. for bulking and then passing to cigarette-making machines. Bulking here refers to a process which is customarily carried out at several stages of tobacco manufacture with the object of evening out moisture control variations and consists in storing the tobacco in suitable containers, for example, bins, for a period of time.

The hereinbefore described invention is also applicable to the treatment of manufactured tobacco articles e.g. cigars. In this case the cigars are preferably treated in a moist condition, for instance when the wrapper leaf contains about 20% moisture. The method of treatment consists in applying treatment material produced according to the invention and consisting of unadulterated tobacco powder of from 1 to 76 microns to the moist cigars whilst rotating them about their longitudinal axes.

WHAT WE CLAIM IS:—

1. A method of treating the hereinbefore



5 delivered to the conveyor 22 which carries the treated tobacco away for further manufacturing operations. It will be appreciated that by providing the conveyor 1 and the conveyor 233 as weighing conveyors, the proportion of powdered treatment material being applied to the process tobacco can readily be controlled.

10 The embodiment illustrated in Fig. 3 corresponds substantially with that above described with regard to Figs. 1 and 2, except that the second mill 6 feeds the powdered treatment material to a powder blower 27, from which through a pipe line 15 28 the powder is forcibly applied to the process tobacco. Thus the parts in Fig. 3 have been given the same numbering as Fig. 1 and the operation is the same, except that instead of applying the treatment material to the process tobacco by mixing it there- 20 with in the cylinder 20, said treatment material is forcibly blown into said chamber by the powder blower 27 so that the process tobacco, in passing through the chamber, passes through an atmosphere containing powdered treatment material.

25 Fig. 4 shows the application of treatment material powdered in accordance with the invention to process tobacco and subsequent manufacturing operations. 30 is a vibratory conveyor for feeding process tobacco through a hopper 31 into a timed rotating cylinder 32. Whilst the process tobacco is on the conveyor 30 and being agitated thereby, powdered treatment material is delivered from a hopper 33 through the passage 34 on to the tobacco as it passes beneath it.

40 The treated tobacco passes from the cylinder 32 into a hopper 35 that is common to a plurality of tobacco cutting machines 36, 37, 38. The treated tobacco in the hopper 35 is delivered beneath a pinned refuser roller 39 on a conveyor 40 from which 45 it falls to a conveyor 41 moving at right angles. The treated tobacco falls off the end of the conveyor 41 on to the vaned drum 42, which normally rotates in the counter clockwise direction, by which it is fed into the funnel 43 leading to the cutting machine 36. Suitable mechanism is provided that, when the hopper of the machine 36 is full, acts to reverse the rotation of the vaned drum 42, so that tobacco falling 50 on to said drum is delivered on to a conveyor 44. This, via a vaned drum 45, in a similar way, passes the tobacco through a funnel 46 leading to the machine 37. When both machines 36, 37 are filled, the machine 38 is filled through the funnel 47 in a similar manner, and so on.

65 Fig. 4 is included mainly to indicate various positions at which powdered treatment material may conveniently be applied to process tobacco and be agitated there-

with to provide a discontinuous coating of the powdered treatment material on the tobacco and also to indicate means by which the treated process tobacco may be compressed so as to bind the treatment material into intimate contact therewith. Furthermore, it shows where the treated process tobacco is cut to release sugars or the like to the surface to assist in the adherence of the powdered treatment material.

Thus treatment material may, as hereinbefore described, be added to and dispersed throughout the process tobacco while the latter is being agitated by the vibratory conveyor 30, it may be added direct into the cylinder 32 and be dispersed throughout the process tobacco by agitation due to the rotation of said cylinder, it may be added to process tobacco in the hopper 35 and be dispersed throughout said tobacco due to agitation therein by rotation of the pinned roller 39, or it may be added to process tobacco on the conveyor 41 and be dispersed throughout the tobacco due to agitation by means of the vaned drum 42.

36, 37, 38 are tobacco cutting machines of which 48, 49 and 50 are rotary knives and it is to be understood that these machines operate on the general principle of compressing the tobacco in the hoppers 51, 52, 53, to form a hard cheese and cutting the cheese with knives 48, 49, 50. Thus the treatment material in said hoppers is bound into intimate contact with the tobacco therein due to compression, while the action of the rotary knives 48, 49, 50 on the treated tobacco acts to release sugars or the like to the surface and so assist in the adherence of the treatment material to the tobacco.

54 is a vibratory conveyor that delivers tobacco from the cutting machines for further manufacturing, e.g. for bulking and then passing to cigarette-making machines. Bulking here refers to a process which is customarily carried out at several stages of tobacco manufacture with the object of evening out moisture control variations and consists in storing the tobacco in suitable containers, for example, bins, for a period of time.

The hereinbefore described invention is also applicable to the treatment of manufactured tobacco articles e.g. cigars. In this case the cigars are preferably treated in a moist condition, for instance when the wrapper leaf contains about 20% moisture. The method of treatment consists in applying treatment material produced according to the invention and consisting of unadulterated tobacco powder of from 1 to 76 microns to the moist cigars whilst rotating them about their longitudinal axes.

WHAT WE CLAIM IS:—

1. A method of treating the hereinbefore

- defined process tobacco in which fragments of treatment material, also constituted as hereinbefore defined, are subjected to the action of high velocity jets of a compressible fluid, for example air, so as to reduce said treatment material to powder of the order of 1 to 76 microns particle size by effecting attrition between the fragments, the powder thus obtained being applied to the process tobacco to be treated to which it adheres as a discontinuous coating due to the inherent gumminess and/or other characteristic features of tobacco.
2. A method of treating process tobacco as claimed in Claim 1, in which the powder is applied to the process tobacco by mixing it therewith.
3. A method of treating process tobacco as claimed in Claim 1, in which the powder is forcibly applied to the process tobacco, e.g. by blowing it on under the influence of a current of air.
4. A method as claimed in any of the preceding claims, in which the process tobacco is agitated during or after the application of the powdered material so as to disperse said powdered material throughout the tobacco and so provide the treated process tobacco.
5. A method as claimed in any of the preceding claims in which the treated process tobacco is compressed to bind the powdered treatment material into intimate contact with the tobacco and while so compressed said treated tobacco is cut or shredded whereby sugars or the like contained in the tobacco are released to the surface and so assist in the adherence of the powdered treatment material.
6. A method as claimed in any of the preceding claims in which the treated process tobacco is dried and/or cooled preferably after being compressed.
7. A method as claimed in any of the preceding claims in which the powdered treatment material is applied to the process tobacco as said tobacco is being fed to the hopper of a cutting machine, or when said tobacco has been so fed, whereby the tobacco is agitated in said hopper to disperse the powder throughout said tobacco.
8. A method as claimed in any of Claims 1 to 6 in which the powdered treatment material is applied to the process tobacco as said tobacco is being fed to the hopper of a cigarette making machine, or when said tobacco has been so fed, whereby the tobacco is agitated in said hopper to disperse the powder throughout said tobacco.
9. A method as claimed in any of Claims 1 to 6 in which the powdered treatment material is applied to the process tobacco as said tobacco is being fed to a receptacle that may be rotated or vibrated to agitate the tobacco, or when said tobacco has been so fed, the treated process tobacco being subsequently removed from the receptacle for further processing.
10. A method as claimed in any of the preceding claims in which the process tobacco is treated when in a moistened condition.
11. Apparatus for applying powdered treatment material to process tobacco, both as hereinbefore defined, said apparatus comprising a receptacle for the process tobacco to be treated, means for agitating the tobacco in said receptacle, and means for reducing the treatment material to powder of the order of 1 to 76 microns, said reducing means including a chamber having a plurality of tangentially disposed orifices through which a compressible fluid, e.g. air, is injected for effecting attrition between the treatment material to reduce it to powder, and an exit orifice through which the powdered treatment material issues for delivery to said receptacle.
12. Apparatus as claimed in Claim 11 in which the receptacle for the process tobacco comprises a rotatable cylinder having internal vanes or tines, whereby rotation of the cylinder acts to agitate the tobacco.
13. Apparatus as claimed in Claim 11 in which the receptacle for the tobacco comprises a conveyor that may be vibrated so as to agitate the tobacco.
14. Apparatus as claimed in Claim 11, in which the receptacle for the process tobacco comprises a hopper of a tobacco cutting machine or a hopper common to two or more tobacco cutting machines and said hopper includes means, e.g. a delivery member, for agitating the tobacco, and means are provided to feed powdered treatment material to said hopper whereby said material is dispersed throughout the tobacco to be treated.
15. Apparatus as claimed in any one of Claims 11 to 14, in which treated process tobacco is passed to a cooling and/or drying machine after being cut in a tobacco cutting machine.
16. Apparatus as claimed in Claim 11, in which powdered treatment material is fed to the process tobacco after the latter has been cut in a tobacco cutting machine, for example when the tobacco is being fed by a vibratory conveyor that acts also to agitate the tobacco.
17. Apparatus as claimed in Claim 11 in which powdered treatment material is fed to the process tobacco after the latter has been cut in a tobacco cutting machine, for example when the tobacco is being fed into the hopper of a cigarette making machine, or has been so fed, in which hopper



9



the tobacco is agitated to disperse the powder throughout the tobacco.

18. Process tobacco treated with treatment material according to the method claimed in any of Claims 1 to 10.

19. Process tobacco treated with treatment material according to the method claimed in any of Claims 1 to 10, and in apparatus as claimed in any of Claims 11 to 17.

20. The improved methods and appar-

atus for treating process tobacco with treatment material substantially as hereinbefore described and as illustrated in the accompanying drawings.

STEVENS, LANGNER, PARRY
& ROLLINSON,
Chartered Patent Agents,
and
Agents for the Applicants.

15

PROVISIONAL SPECIFICATION.

No. 38990, A.D. 1956.

Improved Method and Apparatus for Treating Tobacco.

We, THE IMPERIAL TOBACCO COMPANY (OF GREAT BRITAIN AND IRELAND) LIMITED, a British Company, of East Street, Bedminster, Bristol 3, do hereby declare this invention to be described in the following statement:—

This invention relates to the treatment of normal and/or puffed tobacco, either before or after having been cut into shreds. Such tobacco is hereinafter referred to as process tobacco, since it is the material which is subjected to a manufacturing process.

In the normal preparation of tobacco to render it suitable for smoking, either as pipe tobacco or as a filler in cigarettes or cigars, or for use as snuff, a certain amount of scrap tobacco, comprising for example, leaf lamina or stem, is produced.

For example, one operation that is frequently employed is that known as "threshing". In this the leaves, either as whole leaves or leaf pieces, are mechanically threshed to remove the lamina from the stems, and the thick portions of stem near the butt ends of the leaves are separated and removed as they are unsuitable for smoking because of their high cellulose content. These unsuitable thick portions of stem are usually not absolutely clean, that is to say all pieces of lamina are not necessarily removed, and such pieces constitute valuable leaf, not only from a monetary value point of view, but also because they may be of good quality tobacco.

A subsequent operation can be performed on the thick portions of stem to remove the pieces of lamina, but even then the pieces are considered as "scrap" tobacco because of their small size, since, when they subsequently pass with the larger pieces of lamina to a machine for cutting, these small pieces are further reduced in size and thus become very small bits that may, for instance, fall out of the ends of cigarettes when carried loosely in a packet.

Medium thickness portions of stem, i.e.

stems further from the butts, would be not so unsuitable for smoking as the thick portions, were it not for the fact that they form hard lumps, known as spills, in the tobacco and may pierce the paper of a cigarette, thus rendering it unsuitable for smoking. Thus medium stems also provide a source of scrap tobacco.

In manufacturing operations shredded tobacco is sometimes rendered unsuitable for use. For example, if a defect occurs in a cigarette machine a considerable amount of cigarette rod may be formed before the machine is brought to rest and such rod must be discarded as the shredded tobacco is then unsuitable for re-use in that manufacturing operation. Tobacco which has been discarded during a manufacturing operation, either in shredded or other form, is herein referred to as "waste tobacco".

Thus in the preparation of tobacco to render it suitable for smoking and in manufacturing operations to provide tobacco articles, there are many sources of scrap and waste tobacco, that is to say tobacco which is normally unsuitable for use, although it is usually of good quality. It will be appreciated that this material may be leaf lamina, stems, or may be cut or shredded tobacco.

Due to the high cost of tobacco it is most undesirable to discard this scrap or waste and there is a further point that if high quality scrap or waste tobacco could be rendered suitable for smoking it could then be mixed with inferior quality tobacco to improve the smoking properties of the latter.

Scrap or waste tobacco as above defined may, in accordance with this invention, be used for treating process tobacco.

Another source of tobacco for use in treating process tobacco according to this invention is what may be termed "blending" tobacco, that is, good quality tobacco chosen for its blending or flavouring pro-

65

70

75

80

85

90

95

100

105



perties and adapted to improve the smoking properties of process tobacco of inferior quality.

5 Puffed tobacco is normal tobacco that has been subjected to an operation that expands the cell walls substantially beyond their elastic limit, and one suitable method of puffing tobacco leaf and/or stem comprises supplying steam thereto in a container in the substantial absence of air, increasing the steam pressure upon and correspondingly the temperature of the tobacco and then suddenly reducing the pressure by connecting the container with a chamber maintained at a pressure considerably below atmospheric.

20 Such puffed tobacco, as hereinbefore explained, may be used as process tobacco, and as it is prepared and used in the same manner as normal tobacco, scrap and waste are produced in a similar way. Thus puffed tobacco provides also yet another source of producing material for treating process tobacco.

25 It has previously been proposed to use scrap or waste tobacco by forming it into sheets, e.g. by a paper making process, but difficulty was experienced in that the sheet was too brittle unless a plasticiser was added. The treatment to which the said tobacco was subjected also had deleterious effects on the material and the resultant sheets were unpleasant to smoke.

30 A method of making a tobacco article is also known which comprises shaping to the form of the article a quantity of tobacco to constitute the filler of the article, applying to the shaped filler tobacco a solution, slurry or sol containing finely divided or colloidal sized particles of tobacco, such as blending or flavouring tobacco, drying the tobacco and applied solution, slurry or sol to form a continuous film-like coating or enclosure about said filler, and applying an enclosing wrapper. It will be noted that this method involved the drying of the process tobacco wetted by the use of a solution or sol.

50 The object of the present invention is to provide improved methods and apparatus for treating process tobacco, involving the use of treatment material as hereinafter defined. A further object is to improve the smoking properties of inferior quality tobacco.

60 According to the present invention, finely divided treatment material is mixed with process tobacco to be treated, to which it adheres, due to the inherent gummyness and/or surface tension of tobacco, and so provides a discontinuous coating of the finely divided tobacco particles on said process tobacco.

65 If desired additional gummy material, preferably of the same constitution as that

of the gum in the process tobacco, may also be applied to said tobacco.

Preferably the process tobacco is treated when in a moistened condition.

70 The expression "treatment material" as employed herein, includes scrap, waste or blending tobacco, and whole or part leaves, derived either from normal tobacco or puffed tobacco.

75 As already intimated "process tobacco" includes normal and/or puffed tobacco.

Apparatus for treating process tobacco in accordance with the present invention will now be described by way of example.

80 The scrap and/or waste tobacco which is to provide the treatment material is delivered by a conveyor provided with a scale so that the weight of treatment material fed may be controlled. The treatment material is delivered to an inclined rotating drying cylinder, heated by gas jets, and this acts through tines to mix the scrap and waste together, feed the material through the cylinder and, at the same time, dry it to a water content of about 5% to 6%.

90 The mixed and dried treatment material is then fed to a milling device that is secured to one side of a conical hood surmounting a mulling mechanism. Between the milling device and the hood is interposed a rotary valve.

95 The milling device is of the type comprising a cylindrical chamber having a plurality of inwardly directed peripheral blades coacting with knives on a rotating vaned drum whereby, as the treatment material passes through, it is cut or chopped into small pieces. The valve slowly rotates to permit the said pieces to fall through an orifice into the interior of the muller.

100 The muller is of the type comprising a rotating crosshead carrying eccentrically mounted pivoted grinding rollers adapted through centrifugal action to rotate in contact with the wall of the muller casing so as to grind material fed therebetween down to particles varying in size from about 1 to 500 microns (30 B.S. Mesh).

105 From the muller the powdered tobacco is airborne through suitable trunking to a cyclone that permits the powder to fall to a conveyor leading to a centrifugal separator.

120 The air separator is conveniently of the type which comprises a number of discs rotating on a hollow central spindle, one below the other, within a drum, said discs being smaller in diameter than an interior wall of the drum within which they rotate. Peripheral vanes extend inwardly and downwardly from said interior wall, such as to collect powder thrown from one disc and direct it on to the disc immediately below. A fan arranged at the top of the apparatus 130

creates a current of air which flows upwardly past the edges of the discs and vanes, and then downwardly outside the interior wall, through a gap into the interior again. A hopper is located below the lowermost disc and vane to receive rejected powder, sometimes referred to as "tailings".

The hollow central spindle constitutes an entry tube centrally above the discs and this leads powdered tobacco onto the topmost disc. The discs rotate at high speed and throw the powder centrifugally into the current of air. Light particles are raised in the air current and pass down outside the interior wall to a delivery orifice.

Particles too heavy to be raised by the air current pass via a vane to the disc below where the same operation takes place. This operation is repeated according to the number of discs (e.g. six) and finally the tailings fall to an exit orifice. These tailings are either returned to the miller in some convenient manner, or are rejected. Rotary valves control the orifices in order to avoid any interference with the air current.

A separator as above described divides the powder into two grades. The ascending fines, which constitute finely divided scrap tobacco, vary in size from about 1 to 75 microns, and the tailings are above 75 microns. It has been found that fines of this size are suitable for applying to the tobacco to be treated.

Thus particles from about 1—75 microns size pass through the delivery orifice to an enclosed conveyor that delivers them to a substantially closed rotating cylinder having internal fines and being set on a slant, the arrangement being such that the process tobacco and treatment material are fed thereto and mixed together while being passed therethrough.

Thus tobacco to be treated (process tobacco), which preferably has a moisture content of 17—25%, is continuously delivered by a conveyor to the rotating cylinder and, while it is being fed therethrough by the fines, the treatment material is mixed thoroughly with it and the dry particles of tobacco adhere to the process tobacco on account of the inherent gumminess and/or surface tension of tobacco, that is, the finely ground tobacco is not mixed with water and wet ground to form a slurry.

Preferably the process tobacco is weighed as it is delivered to the cylinder and thus in conjunction with the weight of the treatment material shown on the scale, the rate of supply of material to the process tobacco may be controlled.

The fines adhere to the process tobacco as a discontinuous coating, that is to say, a leaf of process tobacco examined under a microscope after treatment will be found

to be almost entirely covered with the particles, but such particles adhere as a discontinuous coating in that the bare leaf can be seen between particles. Such a coating is to be distinguished from a coating of finely divided colloidal sized tobacco particles applied as a solution, sol or slurry to provide a continuous film on the tobacco to be treated. It should be noted that process tobacco under treatment may be in a tangled condition and so certain portions of it may not be exposed to the tobacco particles in the treating drum, and the word "discontinuous" does not refer to these untreated portions but, as hereinbefore explained, to the fact that the various particles do not form a continuous film on exposed portions.

A conveyor receives process tobacco treated with treatment material, and this tobacco is then passed for further processing in the usual way. An extractor removes surplus powder.

In an alternative apparatus, a fluid energy mill is used to grind the tobacco into small particles.

This simplifies the apparatus by dispensing with the miller and its associated air trunking, the cyclone and separator, the reason for this being that the said fluid energy mill is capable of grinding the small pieces of tobacco received from the milling device down to micron size e.g. down to from 1 to 152 microns, but the majority are below 75 microns. It has been found in practice that of a sample of treatment material delivered to a fluid energy mill 93% of the powder produced was below 75 microns and only 7% above.

The finely divided tobacco particles issuing from the fluid energy mill are then fed by a suitable conveyor to a rotating cylinder to be mixed with the process tobacco which is fed thereto in the same way as previously described.

Instead of applying the treatment material as a continuous process as above described, it may be done batchwise. That is to say predetermined quantities of process tobacco and treatment material may be fed to the cylinder which is then rotated so as to mix them thoroughly together, whereupon the treated process tobacco is extracted from the cylinder and the cycle of operations repeated for as many batches as desired.

In applying the present invention to pipe smoking tobacco the finely divided scrap tobacco particles are produced in the same way as above described but are applied to the process tobacco to be treated when the latter has a moisture content of about 35%. This is so because, during manufacture, pipe tobacco is usually brought to a higher moisture content than cigarette tobacco and it has been found convenient to treat it at

a stage where the moisture content is highest. It may, however, be treated at any other suitable stage of manufacture.

5 In the case of cigars the filler tobacco, the binder leaves and the wrapper leaves, which all constitute process tobacco, may all be treated, the filler and binder preferably when at a moisture content of about 25% and the wrapper preferably at a
10 moisture content of about 20%.

Whilst approximate moisture contents have been referred to both as regards the treatment material and the process tobacco to be treated, it is to be understood that
15 these are not critical, and have only been stated because in experiments so far carried out the process tobacco has been treated at a stage in manufacture that was found convenient, and the moisture content at
20 these different stages have been quoted. In this connection it should be noted that tobacco in its natural state is gummy and that this gumminess is rendered more apparent as the moisture content increases.

25 In the hereinbefore described invention where the expression "moistened" or "dampened" is used, it is to be understood that it means that the tobacco referred to has been artificially moistened. In this
30 connection it should be noted that tobacco has a great affinity for moisture and thus

it can be said that it is probably never completely dry, in fact after a short time its moisture content reaches equilibrium with, or substantial equilibrium with that of the surrounding atmosphere. Similarly when the word "drying" is used it is not intended to infer that the tobacco is completely dry but that some moisture has been removed.

There are other characteristics of process tobacco which may assist adherence of the finely divided particles thereto, for instance some of said particles may be held on a piece of leaf tobacco by being entangled in the natural hairs of the surface. On the other hand the gumminess inherent in the process tobacco may be increased by the addition of further gum of the same constitution. For example the process tobacco may be sprayed with the gum either before it enters the rotating cylinder, or it may be added to said tobacco when it is in the cylinder.

It is to be understood, however, that in whatever form it is used, the process tobacco is not artificially wetted with water alone.

STEVENS, LANGNER, PARRY
& ROLLINSON,

Chartered Patent Agents,
Agents for the Applicants.

PROVISIONAL SPECIFICATION.

No. 38991, A.D. 1956.

Improved Apparatus for Treating Tobacco.

60 We, THE IMPERIAL TOBACCO COMPANY (OF GREAT BRITAIN AND IRELAND) LIMITED, a British Company, of East Street, Bedminster, Bristol 3, do hereby declare this invention to be described in the following statement:—

This invention relates to the treating of tobacco and is concerned with improvements in or modifications of the method of treating process tobacco as described in the co-pending Applications Nos. 23760 of 1955 and 36567 of 1955 (Serial No. 817,832), in which finely divided treatment material is pneumatically applied, that is, blown as airborne particles on to the process tobacco to be treated, to which it adheres due to the inherent gumminess and/or surface tension of tobacco, and so provides a discontinuous coating of the finely divided tobacco particles on said process tobacco.

The expression "process tobacco" where used in this Specification comprises any one or any combination of the following:—
80 Normal tobacco, puffed tobacco, and tobacco made up in sheet or web form (for example, by a paper making process from

tobacco fibres): such sheet or web tobacco may be subsequently puffed. Further, the process tobacco may be cut or uncut.

Treatment material as used in this Specification may be derived from normal tobacco and/or tobacco made up in web form, either of which may also be puffed. Treatment material, however, is preferably provided by small pieces that cannot otherwise conveniently be used in making pipe, cigarette or cigar tobacco and may for example include bits of stem. Treatment material may be derived from tobacco of a different quality from that of the process tobacco and hence may comprise blending tobacco.

The normal sources of some of the above-mentioned treatment materials are fully described in the Complete Specification of the abovementioned Applications Nos. 23760/55 and 36567/55 to which reference may be made. Treatment material, may also, as already intimated herein, be prepared from tobacco made up in sheet or web form.

The object of the present invention is to



finely

provide improved apparatus for treating process tobacco with finely divided treatment material in accordance with the method defined in the Complete Specification above referred to.

According to one feature of the present invention apparatus for treating process tobacco with finely divided treatment material comprises a mixing chamber for the treatment material, means for reducing the treatment material to small pieces, and for reducing said small pieces to powder, a receptacle for receiving process tobacco to be treated and a blower adapted to blow the powder on to the tobacco in the receptacle so as to apply a discontinuous coating of powder to said tobacco.

Preferably the treatment material is dried while it is in the mixing chamber, or before passing thereto.

In one constructional form of the present invention the apparatus for reducing treatment material to a finely divided form and applying it to process tobacco comprises essentially a mixing chamber, a milling device to chop the treatment material into small bits, a so called energy mill or jet mill, to reduce the small bits to finely divided powder, a powder dispenser, and a receptacle in which the process tobacco is treated with the finely divided powder.

The treatment material which, as previously mentioned may comprise bits of stem, small pieces of leaf lamina or tobacco made up in web form and any or all of it may be puffed, is fed by a suitable conveyor to the mixing chamber.

The mixing chamber consists in a rotating cylinder set at a slight angle so that as it rotates the treatment material is slowly fed therethrough. If desired gas jets, or other heating means, may be provided to heat the cylinder so that the material is dried to a moisture content of about 5% to 6% during its passage.

The dried material then passes via a second conveyor into the upper end of a suitable type of milling device. This device consists of a cylindrical chamber having a plurality of inwardly directed peripheral blades coacting with knives on a rotating vaned drum, whereby, as the treatment material passes downwardly therethrough it is chopped into small pieces varying in size from about 211 to 500 microns.

The small pieces of material issuing from the milling device then pass to a fluid energy mill for further reduction in size by grinding.

Confusion should be avoided by the uses herein of the words "milling" device and fluid energy "mill", and it is to be understood that the milling device produces a comparatively coarse product whereas a

fluid energy mill or jet mill reduces a coarse product to very small particle size.

In the fluid energy mill a compressible fluid reduces the pieces to a finely divided powder by effecting attrition between the solid particles. Thus the mill comprises a shallow cylindrical chamber, say, 12" diameter and 1" in axial height having an entry orifice or orifices for the material to be reduced and a number of fluid nozzles (e.g. air) arranged tangentially to a common circle of smaller diameter than the chamber but coaxial therewith. At the centre of the chamber is an upwardly directed outlet for the fluid and concentrically below it an outlet incorporating a cyclone to segregate powdered material from the fluid.

Such a mill is suitable for reducing treatment material to a finely powdered condition, the size of the particles being in the order of 1 to 152 microns, but the majority are below 75 microns. It has been found in practice that of a sample of treatment material delivered to a fluid energy mill 93% of the powder produced was below 75 microns and only 7% above.

The finely divided powder issuing from the fluid energy mill is delivered to a compressed air operated powder dispenser whose delivery pipe is connected to a receptacle containing the process tobacco to be treated.

This receptacle comprises a substantially closed rotating cylinder set on a slope and having tines adapted to toss the tobacco about while it is being fed therethrough.

A suitable conveyor feeds process tobacco to the receptacle and a conveyor at the other end thereof collects the treated tobacco and delivers it for further manufacturing processes, e.g. cutting and making up into cigarettes.

As above explained, the delivery pipe from the powder dispenser is connected to the process tobacco receptacle so that as the tobacco passes therethrough it is continuously subjected to an atmosphere of finely divided treatment material, which adheres thereto due to the inherent gumminess and/or surface tension of the process tobacco.

It has been found that by using a fluid energy mill as above described, which reduces as much as 93% of the treatment material to particles below 75 microns, it is unnecessary to separate the larger particles, known as tailings, before treating the process tobacco. Such larger particles fall to the bottom of the process tobacco receptacle and can be recovered and reground. This considerably simplifies the apparatus necessary to grind and apply the treatment material and avoids the use of additional mechanisms which had heretofore been deemed necessary.

Preferably the treatment material is

weighed as it passes into the mixing chamber, as is the process tobacco being fed to the treating receptacle whereby the percentage of finely divided tobacco being added may be controlled.

The process tobacco may be treated when containing varying degrees of moisture. For example, cut cigarette tobacco may conveniently be treated when at a moisture content of about 18%, cigar fillers and binders at about 25%, cigar wrappers at

about 20%, and pipe tobacco at about 35%. These percentages have been chosen as indicating the moisture content of the various tobaccos when they are at a manufacturing stage found suitable for applying the powdered treatment material.

STEVENS, LANGNER, PARRY
& ROLLINSON,
Chartered Patent Agents,
Agents for Applicants.

PROVISIONAL SPECIFICATION.

No. 26674, A.D. 1957.

Improved Method of Treating Tobacco.

We, THE IMPERIAL TOBACCO COMPANY (OF GREAT BRITAIN AND IRELAND) LIMITED, a British Company, of East Street, Bedminster, Bristol 3, do hereby declare this invention to be described in the following statement:—

This invention relates to the treatment of normal, or puffed, tobacco leaf, or such tobacco after it has been cut into shreds or tobacco manufactured in sheet form for instance or a paper making process.

In the manufacture of tobacco goods (e.g. cigarettes, pipe tobacco, cigars) a certain amount of material is produced which is unsuitable for inclusion in such goods, for instance due to degradation in the preparation thereof, or faults in manufacture. Other unsuitable material comprises the mid rib of the leaf, a coarse stem which is usually discarded.

It is important, due to the high cost of tobacco and the high duty thereon, to be able to use or reuse this unsuitable material in the manufacture of tobaccos, and it is an object of the present invention to provide a method of utilising such material.

It is a further object of the present invention to provide a method of blending one tobacco with another.

According to a feature of the present invention a method of treating tobacco leaf, shredded tobacco or tobacco sheet, consists in applying very finely divided tobacco powder thereto.

It is preferable for the applied tobacco to be brought to a very fine condition of the order of from 1—75 microns particle size, but somewhat larger sizes are not entirely unsuitable.

However, the larger the size of the particles of applied tobacco, the less thereof clings to the process tobacco and it has been found that with particles not larger than 75 microns (200 B.S. Mesh = 76 microns) practically all said particles remain in intimate contact with the process tobacco to be

treated, even when that tobacco is subjected to subsequent processing that might be expected to loosen the particles, for instance drying and cooling.

Experiments have shown that if tobacco leaf is treated with tobacco particles varying in size between 1 and 75 microns by trundling the powder into contact with the leaf, as little as 0.5% of added powder fails to cling to the leaf. The trundling operation in the experiment consisted in depositing 12 lb. of leaf lamina in an interiorly vanned rotatable drum and shaking 12 oz. of the powder onto the leaf. The drum was then closed and rotated for five minutes and the coated leaf was removed, the residual powder was then weighed and found to be 0.5% of the quantity added, the tobacco leaf was also weighed and this showed an increase corresponding to 99.5% by weight of the added powder. Shaking, or rubbing of the leaf failed to remove the powder.

When the leaf was subsequently cut in a tobacco cutting machine no residue was found in the hopper of the machine. It is thought that the tobacco juices that exude from the leaf during the cutting operation may assist in retaining the powder on the tobacco, and also that the cutting operation itself may force the powder into more intimate contact with the tobacco, since it will be appreciated that during this cutting operation the tobacco is under considerable pressure.

The experiment was continued up to the manufacture of finished cigarettes and it was found by careful calculation that 93% to 95% of the powdered tobacco remained clinging to the tobacco in the cigarettes.

In a similar trundling operation using powdered tobacco of larger particle size of the order of 77—151 microns (100 B.S. Mesh = 152 microns) nearly 2% of the powder did not cling to the tobacco and, furthermore, when the leaves were rubbed between the fingers, powder which at first



clung to the tobacco, was comparatively easily rubbed off.

The comparative ease with which the coarse powder was removed led to the conclusion that subsequent processes would result in so much of the coarse powder failing to cling to the tobacco as to render this manufacturing process uneconomic.

The method of applying the very fine powdered tobacco to the leaf or shredded tobacco is not limited to the tumbling above referred to. Thus in another method, it may be blown on to the tobacco. It appears only necessary to expose the leaf or shreds to the powder, whereupon the powder clings firmly thereto.

This may be due to the fact that the powder is normally warmer than the leaf or shreds, the latter being in a moister condition it being a known fact that dust or smoke is attracted to a cool surface and when so attracted will intimately associate itself therewith. For example, fine dust floating in the air of a room is deposited as a pattern on the ceiling according to the arrangement of the ceiling joists, the dust settling on the portions of the ceiling extending between the joists. (See "Thermal Properties of Buildings" by N. S. Billington, Chapter 4; Cleaver-Hume Press Ltd.—1952).

It is also evident that the fineness of particle size is of importance in that the particles are sufficiently small to fill in, or fit into the irregularities in the surface of the lamina or shreds. To appreciate this, if a small quantity of 1—75 micron size powder is squeezed between finger and thumb, a film of the powder remains firmly in contact with the skin after the surplus has been brushed off and such film can only be removed by washing the hands from which it would appear that the, so called, film fills or fits into the irregularities of the skin and that rubbing the finger and thumb

together does not touch the powder i.e., the powder is below the upper surfaces of the irregularities.

Damping the tobacco leaf or shreds may result in a greater quantity of dispersed powder clinging thereto but too much moisture is undesirable as it causes the particles to cling together before settling on the leaf or shred which is clearly to be avoided.

The unsuitable material may be reduced to fine particle size in any convenient manner, but a particularly convenient method is to grind it in what is known as a micronizer or fluid energy mill. In this a compressible fluid (air) reduces the solid material by effecting attrition between the solid fragments.

Manufactured cigars can readily be treated with finely divided tobacco particles. In this instance, of course, the trundling method is not employed. Conveniently the cigars may be fed on a conveyor past powder applying jets and at the same time they are rotated about their longitudinal axes. In another applying method for cigars (or tobacco leaf or shreds) they may be fed through a container containing tobacco powder laden air. Cigars may be dampened before being treated.

The powder produced for example from a high quality tobacco may be applied to a tobacco of inferior quality, so as to blend the two tobaccos together.

Although it has been stated that the powder may be applied to tobacco leaf or shredded tobacco, or tobacco manufactured in sheet form, it may also be applied to processed stem additives in a blend, for example, cut rolled stem, puffed or otherwise.

STEVENS, LANGNER, PARRY
& ROLLINSON,
Chartered Patent Agents,
Agents for the Applicants.