

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in or relating to Continuous Rod Cigarette making Machinery

5 We, MOLINS MACHINE COMPANY LIMITED, a British Company, of 2 Evelyn Street, Deptford, London, S.E.8, England, 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 in or relating to continuous rod cigarette-making machinery, in which a continuous tobacco filler is formed.

15 In the complete specification and drawings of British Patent Application No. 6407/57 (Serial No. 854,736) there is disclosed apparatus in which a continuous tobacco filler is formed by impelling tobacco, by means of an air current, through a passage having side walls, towards a moving, air-pervious conveyor surface on which the tobacco forms a filler stream and is held by suction. The filler stream is conveyed by the conveyor through a channel comprising opposed walls which confine the stream laterally, and past a trimming device which trims the filler stream to a desired depth by removing surplus tobacco.

20 Since the width of the filler stream is controlled, the filler of desired depth produced by trimming the stream is of desired cross-sectional size, and it will, if its density is uniform, have the desired mass per unit length. (This assumes that the tobacco, considered as a body, is all of equal compressibility, which depends on such factors as the type of tobacco used, its moisture content, and the length and coarseness of the tobacco shreds; in practice these factors are usually controlled so that for at least considerable lengths of the filler stream its compressibility can be considered to be uniform).

40 It is to be understood that the depth to which the tobacco filler stream is trimmed may be altered from time to time by adjust-

ment of the distance between the conveyor surface and the trimming device, for example by some control device responsive to measuring or testing operations made on the filler or a wrapped cigarette rod formed from the filler, and further, certain spaced portions along the length of the filler may be deliberately left at a greater depth than the portions between them, for example where "dense end" cigarettes are to be made. Where reference is made herein to trimming the filler stream to a desired depth, and producing a filler of the desired cross-sectional size, therefore, it will be understood to mean a depth or size which is the desired depth or size for any particular setting of the trimming device relative to the air-pervious conveyor surface, and also, in a case where spaced portions are intentionally left deeper than others as mentioned above, a desired depth of the said spaced portions and a desired depth of the portions therebetween is meant.

65 In the apparatus disclosed in the complete specification and drawings referred to above, it is found that there is a tendency for the filler stream of tobacco formed and held by suction against the air-pervious conveyor surface to vary in quantity and thickness or depth (that is, in the distance by which it extends from the said surface) from place to place along its length before the trimming operation. It has further been found that such variations in the depth of the filler stream cause variations in the degree to which the tobacco is compressed along different parts of the stream, so that its density varies along its length. Accordingly if the stream is trimmed to a given depth to form a filler, it is found that there are variations in density, and hence in mass per unit length, of different parts of the filler.

85 It is found that the variations in compression of the tobacco follow directly from the

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variations in quantity and thickness or depth of the untrimmed tobacco stream along the length of the air-pervious conveyor surface, since particles of tobacco touching the conveyor surface are believed to be subject to the greatest degree of compression, while particles farthest from the conveyor surface have the minimum compression.

In the construction referred to above, all the tobacco forming the tobacco filler stream is engaged by the opposed side walls, which therefore direct the air through the whole depth of the stream (whatever that depth may be from place to place along the length of the stream) in a direction such that the whole compressive effect of the air on the tobacco is exerted in a direction substantially normal to the air-pervious conveyor surface. Accordingly, tobacco relatively close to the conveyor surface (that is, tobacco which will form part of the filler after the trimming operation) is compressed to a greater density in deeper portions of the stream, and to a less density in less deep portions.

According to the invention there is provided apparatus in a continuous rod cigarette-making machine for producing a tobacco filler for enclosure in a cigarette-paper web, comprising a conveyor having an air-pervious conveyor surface to carry lengthwise a tobacco filler stream, suction means to draw air through the filler stream to urge the latter against the air-pervious surface, a trimming device to remove surplus tobacco from the filler stream to produce the said filler, and side walls having opposed tobacco-confining surfaces which latter extend a predetermined distance, less than the depth of the filler stream, from the air-pervious conveyor surface, and are arranged to constrain air to flow between them substantially unidirectionally through the part of the filler stream confined between them, and to permit air to flow in converging directions through that part of the filler stream which projects beyond the confines of the said surfaces, and thereby at a velocity lower than that at which it flows through the confined part, whereby the projecting part of the filler stream is less compressed by the air than is the confined part. The trimming device may be arranged to trim the filler stream at a level such that the whole of the tobacco constituting the filler is tobacco which has been confined between the said surfaces.

By means of this arrangement, tobacco beyond the predetermined distance from the air-pervious conveyor surface is subjected to air pressure not wholly directed in a direction normal to the said surface, but in other directions as well. Thus a substantial part of the compressive force exerted by the air on that part of the tobacco stream which projects beyond that predetermined distance from the air-pervious conveyor surface acts in a direc-

tion or directions transverse to the direction normal to the band, and has less effect on the compression of tobacco within the said selected distance or depth than would be the case if all the air passed unidirectionally through all the tobacco, and thus variations in the density of the tobacco within a given depth are less than would otherwise be the case.

It is to be understood that where the word "width" is used herein in relation to a tobacco filler stream, it means the dimensions between the said opposed walls which confine the stream laterally; while the word "depth" in relation to the stream means the dimension transverse to the width of the stream.

It is also to be understood that the expression "filler stream" where used herein means an untrimmed stream of tobacco, while the word "filler" means that part of the stream which remains when surplus tobacco has been removed by the trimming operation, and which is intended for enclosure in a cigarette-paper web to form a continuous cigarette rod.

It is further to be understood that the expression "substantially normal to the air-pervious conveyor surface", where used herein, refers to a direction substantially normal to a line extending across the width of the air-pervious conveyor surface, since, as will appear from the specific arrangement to be described hereafter by way of example, the direction of air flow towards the air-pervious conveyor surface may be somewhat inclined to the length of the air-pervious conveyor surface.

The side walls may have extensions which extend beyond the said predetermined distance from the air-pervious conveyor surface and which are recessed laterally beyond said distance to provide further surfaces joining the said tobacco-confining surfaces at the said distance and receding outwardly from them, to permit air to flow in converging directions through that part of the filler stream which projects beyond the confines of the said surfaces. Parts at least of the said further surfaces may be concave.

The tobacco filler stream may be carried beneath the air-pervious conveyor surface, in which case the side walls project downwardly from the said surface.

The arrangement may be such that along a part of the air-pervious conveyor surface upstream of and spaced from the trimming device, the extensions form part of a passage into which tobacco particles are fed by tobacco-feeding means, and through which a current of air is caused to flow towards the air-pervious conveyor surface to impel the tobacco particles thereto so as to form the filler stream thereon, the laterally recessed parts of said extensions providing an enlarged space communicating with the said passage and wider than the passage, so that air

approaching the said opposed surfaces moves towards the latter in converging directions.

The said trimming device may be arranged to trim the filler stream at a position closer to the air-pervious conveyor surface than the said predetermined distance from said surface.

Further according to the invention there is provided, in apparatus for making a continuous cigarette rod, conveyor means to feed a tobacco filler stream, from which a filler is to be formed by the removal of surplus tobacco, in a predetermined path, the said filler stream exhibiting variations in depth, means confining the filler stream as far as a predetermined level and extending from the conveyor means to said predetermined level only, to confine that part of the filler stream which extends from the conveyor means to said level, and to leave unconfined a further part of the filler stream extending beyond said confining means, means causing air to flow in converging directions and at relatively low velocity toward the unconfined part of the filler stream to enter the filler stream, the said confining means directing the said air to flow unidirectionally toward the conveyor means and at relatively high velocity through the confined part of the filler stream to apply more compressive force to the said confined part than to the unconfined part, trimming means to trim the filler stream by separating and removing surplus tobacco from the filler stream, said trimming means being positioned to remove tobacco which has been unconfined, thereby producing, for enclosure in a continuous cigarette paper web, a trimmed filler, and cigarette rod forming mechanism toward which the trimmed filler is fed in said predetermined path.

Apparatus in accordance with the invention will now be described by way of example with reference to the accompanying drawings, in which:—

Figure 1 is a front elevation, partly in section, of part of a cigarette-making machine;

Figure 2 is a section on the line II—II, Figure 1;

Figure 3 is a section on the line III—III, Figure 1;

Figure 4 is a section on the line IV—IV, Figure 1;

Figure 5 is an end view illustrating diagrammatically arrangements for feeding tobacco and forming a tobacco stream by means of an air current; and

Figure 6 shows a fragment of a perforated conveyor band, to a greatly enlarged scale.

An air-pervious, endless metal conveyor band 1 constituting an air-pervious conveyor surface passes over pulleys 2 and 3, Figure 1, and over a shoe 4 which is adjustably mounted to take up slack in the band. The pulley 2 is driven in the direction indicated by the arrow.

The band 1 extends directly beneath a suction chamber 5, the edges of the band, as

shown in Figures 2 to 4, engaging shoulders formed on opposed members 6 which form a conduit communicating with the suction chamber.

Extending downwardly from the band 1 are opposed walls 7, whose opposed surfaces have parts 7a which are arranged to converge for a short distance in a direction away from the band, as shown in Figures 2—4. These convergent surfaces 7a, form, with the band, a channel along which a stream of tobacco is conveyed by the band 1.

The opposed walls 7, and extensions thereof, extend downwardly to form side walls of a long, narrow passage 8 which is provided with end walls 9 and 10. At its lower extremity, as shown diagrammatically in Figure 5, the passage 8 is open to allow a current of air to enter and flow upwardly through it. Figure 5 also shows diagrammatically tobacco-feeding means by which tobacco particles are fed into the passage to be carried by the air current upwardly towards the band 1 to form a tobacco filler stream thereon. These arrangements for causing the air to flow in the passage and for feeding tobacco into the passage will be described later.

The conveyor band 1 and suction chamber 5 extend beyond the passage 8, as shown in Figure 1, and about mid-way between the end wall 9 and the pulley 2 is located a trimming device which comprises a pair of discs 11 arranged side by side a short distance beneath the band 1. The discs 11 (only one of which is visible in Figure 1) are arranged to be rotated so that their opposed edges cooperate to trim the stream of tobacco carried past them by the band 1, by removing surplus tobacco. Preferably the discs are arranged for bodily movement up and down in response to measurements effected on the tobacco stream, or on the wrapped cigarette rod, or on both, by measuring devices (not shown).

Beyond the discs 11 the band 1 and suction chamber 5 extend over a cigarette-paper web 12 carried by a tape 13, the arrangement being such that the trimmed tobacco filler is led on to the paper web while still suctionally held by the band 1, so that the filler is continuously controlled and has little or no opportunity of losing its lateral compression imparted to it by suction. The paper web is partially folded about the filler before the latter is released from the band after moving past the extreme end of the suction chamber 5.

A pivoted flap 14 is mounted just to the left of the left-hand end of the passage 8 (as viewed in Figure 1) in order to close the gap between the channel along which the tobacco stream is conveyed out of the passage, and the top edge of the end wall 9. The flap 14 is urged upwardly by the pressure of air flowing from atmosphere towards the band 1. Its purpose is to prevent air from flowing from atmo-

sphere over the wall 9 into the passage, which might cause turbulence in the region of the tobacco stream and consequent disturbance of the tobacco in the stream.

One of the side walls of the passage 8 is apertured by the provision of a grill 15, Figures 1 and 2, formed of expanded metal whose numerous small apertures constitute louvres. These apertures communicate with a duct 16, Figures 2 and 5, from which air is drawn by suction means to be referred to later. The purpose of this arrangement is to draw off some of the air from the passage 8 and thus provide a greater flow of air through the passage than would be practical if the whole of the air were drawn through the conveyor band 1. The presence of this grill 15 near the top of the passage may be in part responsible for the tendency for air to flow into the passage over the end wall 9, as explained above, if not prevented from doing so by the flap 14.

The opposed walls 7 vary in shape along the length of the band 1. At that part of the channel which extends about half-way along the length of the passage 8 from the end wall 10 (and which may for convenience be termed the first half of the passage), the opposed surfaces of the walls 7 are, beyond the convergent surfaces 7a, parallel, as shown in Figure 2.

In the second half of the passage 8, the opposed walls 7 are shaped as shown in Figure 3. Immediately beyond the surfaces 7a the walls are recessed laterally to provide an enlarged space 17 between concave recessed surfaces 18. The opposed walls immediately beyond this enlarged space are formed with surfaces 19 which diverge (considered in the direction of the air flow towards the band 1), whilst beyond the surfaces 19 the passage walls are parallel. In order to avoid sharp corners at the junctions of the surfaces 18 with the surfaces 7a and 19, these corners are chamfered as shown in Figure 3.

In the construction illustrated, the extreme distance between the recessed concave surfaces 18 is 20 mm., and the surfaces 19 diverge from one another through a total angle of 11°. The purpose of diverging the surfaces 19 in this manner is to provide a suitable entrance to the enlarged space 17 through which air can flow with the minimum turbulence, and the corners are chamfered as mentioned above for the same reason.

The distance from the band 1 to the level to which the surfaces 7a extend, i.e. to the position at which the channel formed between the surfaces 7a joins the enlarged space 17, is 13 mm. This is a greater distance than the distance by which the trimming discs 11 are spaced from the band 1. This latter distance may vary with adjustment of the trimming device as mentioned above, but is on the average about 10.5 mm.

The width of the band 1, in the construction illustrated, is 9 mm.

Figure 4 shows the shape of the channel beyond the passage 8, that is, between the end wall 9 and the trimming device 11. At this position the walls 7 are recessed to provide an enlarged space 117 which is open to atmosphere, the greater part of the opposed surfaces 118 being parallel and spaced apart by a distance of 20 mm. Adjacent the discs 11, the walls 7 are cut away to accommodate the discs, the average position of the discs relative to the band 1 being shown in Figure 4 by a dot-and-dash line marked T.

The means for causing air to flow through the passage 8, and for feeding tobacco particles into the passage, will now be briefly described with reference to Figure 5.

A carded conveyor drum 21 receives tobacco in bulk on the upper part of its surface and carries it past a carded refuser roller 22, and the tobacco is picked from the drum 21 by a picker roller 23 and impelled across a guide plate 24. Beyond the plate is an air duct 25 at whose entrance is a rotating perforated cylinder 26, and the passage 8 is located alongside the duct.

The suction chamber 5 communicates by way of a conduit 27 with a suction fan 28 by which air is drawn through the band 1. The duct 25 is connected by a conduit 29 with a further suction fan 30. The duct 16 connects the passage 8 to the conduit 29 so that air is drawn from the passage through the louvred grill 15, Figures 1 and 2. Within the conduit 29 is a dust separating device 31 by which dust is extracted and passed with some air through a conduit 32 into the conduit 27. The outlet of the fan 30 communicates with a conduit 33 which conducts air to an air manifold 34, through which the air is discharged to a diffuser 35 comprising a curved plate 36, a sheet 37 of expanded metal, and a chamber 38 to receive short particles of tobacco which may be contained in the air. The plate 36 is apertured to allow air to flow over its right-hand edge into the chamber 38, and out of the chamber through a central aperture.

Air flows upwardly through the expanded metal sheet 37 to be drawn into the passage 8 and duct 25.

The air discharged by the fan 28 passes through a conduit 39 to a multi-unit cyclone 40 by which, after removal of dust, the air is discharged to atmosphere. Accordingly the air drawn into the passage 8 and duct 25 consists of air from the diffuser 35 mixed with atmospheric air.

A further dust-separating device 41 is provided in the conduit 39 and is connected by a conduit 42 to the channel through which the band 1 moves, at a position beyond the passage 8, so as to convey a certain quantity of short tobacco particles to the tobacco

stream. This can be controlled or put out of action if desired by a valve 43.

The air drawn into the passage 8 and duct 25 passes through an apertured plate 44. The air drawn through the cylinder 26 into the duct 25 deflects the tobacco impelled over the plate 24 so that the tobacco particles move in a curved path into the entrance to the passage 8, in which they are accelerated by reason of the high-velocity air current flowing upwardly through the passage.

Vanes 45 direct the air entering the passage in a direction at a slight angle to the length of the band 1.

In operation of the apparatus, tobacco particles are impelled up the passage 8 by the high-velocity air current, and build up on the band 1 to form a stream thereon. The suction exerted on the tobacco through the perforated band 1 causes the tobacco to be compressed laterally—that is, in a direction substantially normal to the band—to a considerable extent. The stream builds up gradually as the band moves from right to left, Figure 1, and in the early stages of building up, the depth of the stream is not great and in the first half of the passage (where the opposed walls have the shape shown in Figure 2) the stream will not generally project beyond the divergent surfaces 7a.

As the band progresses further to the left, Figure 1, more and more tobacco builds up on the band 1 until tobacco projects beyond the surfaces 7a. This occurs in the second half of the passage, where the opposed walls 7 have the shape shown in Figure 3. Thus when the stream increases in depth to such an extent as to project beyond the surfaces 7a, the tobacco so projecting extends into the enlarged space 17.

The stream thus built up on the band 1 in the passage is carried out of the passage towards the trimming device 11, and after leaving the passage and before reaching the trimming device, has its lowermost part projecting into the space 117, Figure 4.

The tobacco-feeding means described above are arranged to supply tobacco to the passage in such quantity that the depth of the stream built up on the band 1 is not more than about 4 mm. greater than the distance from the band to the juncture of the surfaces 7a and the recessed walls 18 and 118, Figures 3 and 4, but as far as practicable the stream is built up to a depth such that some tobacco will always project into the enlarged space 17 before leaving the passage 8, and into the space 117 after leaving the passage.

As pointed out above, the depth of the stream tends to vary from place to place along its length, due to small variations in the quantity of tobacco supplied to the passage, or possibly to variations in the condition of the tobacco affecting its compressibility. The stream is compressed by the pressure of air

drawn through it and through the perforated conveyor band 1. If the whole of the air so drawn through the tobacco is directed in a direction substantially normal to the band, the whole of its compacting or densifying action on the tobacco is exerted in that direction, and where the stream varies in depth, there will be corresponding variations in the density to which the tobacco is compressed in that section of the stream which remains after the trimming operation, and which forms the filler.

The constructions being described is so arranged that any part of the tobacco stream projecting beyond a certain predetermined level, that is, beyond a predetermined distance from the band 1—namely the distance from the band to the junction of the surfaces 7a and the recessed surfaces 18 or 118—is exposed to air which travels not only in a direction substantially normal to the band, but also to air moving in convergent paths towards the exposed sides of the stream and having components transverse to the said direction. That is to say, air passing up the passage 8 spreads out into the enlarged space 17, and not only has a lower velocity in that part but some at least of the air travels over or close to the concave walls 18, and enters the exposed part of the stream of tobacco from the sides, so that the air flowing towards the band moves in convergent directions immediately before reaching the predetermined level or distance from the band. Thus, it is believed, a good deal of the effect of the air on the tobacco projecting into the space 17 tends to compress that tobacco in directions transverse to the normal to the band 1, whilst air moving normal to the band has a reduced effect on tobacco which is in the space 17. Thus this arrangement reduces to a considerable degree the upward compressive effect of the air on that exposed part of the stream from what it would be if the walls along the whole length of the stream were straight and parallel, such as shown in Figure 2 for the first part of the stream. Accordingly, variations in the compression of the whole depth of the stream in a direction normal to the band, due to variations in the depth of the stream, are reduced by the construction shown in Figures 3 and 4.

Similarly at a position outside the passage 8, where the tobacco stream projects downwardly into the space 117, Figure 4, the air entering the space 117 from atmosphere is in part directed against the exposed sides of the projecting tobacco.

It will be seen that both inside and outside the passage 8 that part of the air which impinges against the sides of the projecting part of the tobacco stream does so below the junction of the opposed surfaces 7a (which engage the sides of the main bulk of the tobacco stream) and the recessed surfaces 18 and 118 respectively. Thus tobacco projecting beyond

a predetermined level, i.e. beyond a selected, fixed distance from the band—in the present construction, 13 mm.—is subjected to the action of air which in part is travelling in converging directions which have components transverse to a direction normal to the band 1. Thus, to some extent, the compressive effect of the air on tobacco projecting beyond the fixed distance of 13 mm. from the band is nullified so far as it affects the compression of the tobacco within the said fixed distance—i.e. tobacco between the surfaces 7a. It is also possible that a considerable proportion of the air entering the tobacco stream does so at the region where the surfaces 7a join the recessed surfaces 18 or 118, having by-passed the bulk of the projecting tobacco. Furthermore owing to the increase in cross sectional size of the air stream in the space 17 the velocity of the air is reduced in that part so that in addition to some of the air moving in transversely to tobacco extending into the enlarged space 17, the pressure exerted by air moving normal to the band 1 will be less than the pressure exerted by the air between the surfaces 7a. In any case, it is found that with this arrangement, variations in the density of the filler produced by trimming the stream are reduced to a useful degree.

Mention has been made above of the fact that, in the construction described herein, the direction of air flow towards the band is, by means of the vanes 45, Figure 5, inclined to the length of the band. Thus it can be seen from Figure 1 that the end walls 9 and 10 of the passage 8 are slightly inclined to the perpendicular to the band 1. The purpose of thus directing the air is to give to the tobacco particles impelled through the passage a component of movement in the direction of movement of the band 1. It will be seen however, that this does not materially affect the functioning of the arrangements described above, and this feature of the construction is mentioned only in order to make it clear that, as stated above, the term "normal to the air-pervious conveyor surface" is to be understood as meaning "normal to a line across the width of the air-pervious conveyor surface."

In British Patent Application No. 5451/61, (Serial No. 914,822) which is divided out of the complete specification of the present application, there is claimed a tobacco-manipulating machine comprising means to form a continuous tobacco filler (e.g. a continuous rod cigarette-making machine), an air-pervious conveyor to convey a filler stream, air flow producing means to pass air through the filler stream and the conveyor to hold the filler stream thereto; means to extract tobacco particles from the air after it has passed through the filler stream, and means to convey the extracted particles towards the filler stream for incorporation therein.

WHAT WE CLAIM IS:—

1. Apparatus in a continuous rod cigarette-making machine for producing a tobacco filler for enclosure in a cigarette-paper web, comprising a conveyor having an air-pervious conveyor surface to carry lengthwise a tobacco filler stream, suction means to draw air through the filler stream to urge the latter against the air-pervious surface, a trimming device to remove surplus tobacco from the filler stream to produce the said filler, and side walls having opposed tobacco-confining surfaces which latter extend a predetermined distance, less than the depth of the filler stream, from the air-pervious conveyor surface, and are arranged to constrain air to flow between them substantially unidirectionally through the part of the filler stream confined between them, and to permit air to flow in converging directions through that part of the filler stream which projects beyond the confines of the said surfaces, and thereby at a velocity lower than that at which it flows through the confined part, whereby the projecting part of the filler stream is less compressed by the air than is the confined part.

2. Apparatus as claimed in Claim 1, wherein the trimming device is arranged to trim the filler stream at a level such that the whole of the tobacco constituting the filler is tobacco which has been confined between the said surfaces.

3. Apparatus as claimed in Claim 1 or Claim 2, wherein the side walls have extensions which extend beyond the said predetermined distance from the air-pervious conveyor surface and which are recessed laterally beyond said distance to provide further surfaces joining the said tobacco-confining surfaces at the said distance and receding outwardly from them, to permit air to flow in converging directions through that part of the filler stream which projects beyond the confines of the said tobacco-confining surfaces.

4. Apparatus as claimed in Claim 3, wherein parts at least of the said further surfaces are concave.

5. Apparatus as claimed in any of the preceding claims, wherein the tobacco filler stream is carried beneath the air-pervious conveyor surface and the side walls project downwardly from the said surface.

6. Apparatus as claimed in Claim 3 or Claim 3 and 4 or Claim 3 and 5 or Claims 3, 4 and 5 wherein along a part of the air-pervious conveyor surface upstream of and spaced from the trimming device, the extensions form part of a passage into which tobacco particles are fed by tobacco-feeding means, and through which a current of air is caused to flow towards the air-pervious conveyor surface to impel the tobacco particles thereto so as to form the filler stream thereon, the laterally recessed parts of said extensions

a predetermined level, i.e. beyond a selected, fixed distance from the band—in the present construction, 13 mm.—is subjected to the action of air which in part is travelling in converging directions which have components transverse to a direction normal to the band 1. Thus, to some extent, the compressive effect of the air on tobacco projecting beyond the fixed distance of 13 mm. from the band is nullified so far as it affects the compression of the tobacco within the said fixed distance—i.e. tobacco between the surfaces 7a. It is also possible that a considerable proportion of the air entering the tobacco stream does so at the region where the surfaces 7a join the recessed surfaces 18 or 118, having by-passed the bulk of the projecting tobacco. Furthermore owing to the increase in cross sectional size of the air stream in the space 17 the velocity of the air is reduced in that part so that in addition to some of the air moving in transversely to tobacco extending into the enlarged space 17, the pressure exerted by air moving normal to the band 1 will be less than the pressure exerted by the air between the surfaces 7a. In any case, it is found that with this arrangement, variations in the density of the filler produced by trimming the stream are reduced to a useful degree.

Mention has been made above of the fact that, in the construction described herein, the direction of air flow towards the band is, by means of the vanes 45, Figure 5, inclined to the length of the band. Thus it can be seen from Figure 1 that the end walls 9 and 10 of the passage 8 are slightly inclined to the perpendicular to the band 1. The purpose of thus directing the air is to give to the tobacco particles impelled through the passage a component of movement in the direction of movement of the band 1. It will be seen however, that this does not materially affect the functioning of the arrangements described above, and this feature of the construction is mentioned only in order to make it clear that, as stated above, the term "normal to the air-pervious conveyor surface" is to be understood as meaning "normal to a line across the width of the air-pervious conveyor surface."

In British Patent Application No. 5451/61, (Serial No. 914,822) which is divided out of the complete specification of the present application, there is claimed a tobacco-manipulating machine comprising means to form a continuous tobacco filler (e.g. a continuous rod cigarette-making machine), an air-pervious conveyor to convey a filler stream, air flow producing means to pass air through the filler stream and the conveyor to hold the filler stream thereto; means to extract tobacco particles from the air after it has passed through the filler stream, and means to convey the extracted particles towards the filler stream for incorporation therein.

WHAT WE CLAIM IS:—

1. Apparatus in a continuous rod cigarette-making machine for producing a tobacco filler for enclosure in a cigarette-paper web, comprising a conveyor having an air-pervious conveyor surface to carry lengthwise a tobacco filler stream, suction means to draw air through the filler stream to urge the latter against the air-pervious surface, a trimming device to remove surplus tobacco from the filler stream to produce the said filler, and side walls having opposed tobacco-confining surfaces which latter extend a predetermined distance, less than the depth of the filler stream, from the air-pervious conveyor surface, and are arranged to constrain air to flow between them substantially unidirectionally through the part of the filler stream confined between them, and to permit air to flow in converging directions through that part of the filler stream which projects beyond the confines of the said surfaces, and thereby at a velocity lower than that at which it flows through the confined part, whereby the projecting part of the filler stream is less compressed by the air than is the confined part.

2. Apparatus as claimed in Claim 1, wherein the trimming device is arranged to trim the filler stream at a level such that the whole of the tobacco constituting the filler is tobacco which has been confined between the said surfaces.

3. Apparatus as claimed in Claim 1 or Claim 2, wherein the side walls have extensions which extend beyond the said predetermined distance from the air-pervious conveyor surface and which are recessed laterally beyond said distance to provide further surfaces joining the said tobacco-confining surfaces at the said distance and receding outwardly from them, to permit air to flow in converging directions through that part of the filler stream which projects beyond the confines of the said tobacco-confining surfaces.

4. Apparatus as claimed in Claim 3, wherein parts at least of the said further surfaces are concave.

5. Apparatus as claimed in any of the preceding claims, wherein the tobacco filler stream is carried beneath the air-pervious conveyor surface and the side walls project downwardly from the said surface.

6. Apparatus as claimed in Claim 3 or Claim 3 and 4 or Claim 3 and 5 or Claims 3, 4 and 5 wherein along a part of the air-pervious conveyor surface upstream of and spaced from the trimming device, the extensions form part of a passage into which tobacco particles are fed by tobacco-feeding means, and through which a current of air is caused to flow towards the air-pervious conveyor surface to impel the tobacco particles thereto so as to form the filler stream thereon, the laterally recessed parts of said extensions



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providing an enlarged space communicating with the said passage and wider than the passage, so that air approaching the said opposed surfaces moves towards the latter in converging directions.

7. Apparatus as claimed in any of the preceding claims, wherein the said trimming device is arranged to trim the filler stream at a position closer to the air-pervious conveyor surface than the said predetermined distance from said surface.

8. In apparatus for making a continuous cigarette rod, conveyor means to feed a tobacco filler stream, from which a filler is to be formed by the removal of surplus tobacco, in a predetermined path, the said filler stream exhibiting variations in depth, means confining the filler stream as far as a predetermined level and extending from the conveyor means to said predetermined level only, to confine that part of the filler stream which extends from the conveyor means to said level, and to leave unconfined a further part of the filler stream extending beyond said confining means, means causing air to flow in converging directions and at relatively low velocity toward the

unconfined part of the filler stream to enter the filler stream, the said confining means directing the said air to flow unidirectionally toward the conveyor means and at relatively high velocity through the confined part of the filler stream to apply more compressive force to the said confined part than to the unconfined part, trimming means to trim the filler stream by separating and removing surplus tobacco from the filler stream, said trimming means being positioned to remove tobacco which has been unconfined, thereby producing, for enclosure in a continuous cigarette paper web, a trimmed filler, and cigarette rod forming mechanism toward which the trimmed filler is fed in said predetermined path.

9. Apparatus in a continuous rod cigarette-making machine, as claimed in claim 1 and constructed, arranged, and adapted to operate substantially as described herein with reference to the accompanying drawings.

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