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[54] **TOBACCO STREAM MANUFACTURE**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 128,412, March 26, 1971, abandoned.

[52] **U.S. Cl.** ..... **131/84 B,** 131/110

[51] **Int. Cl.** **A24c 5/18**

[58] **Field of Search** ..... 131/21 B, 21 D, 84 R, 131/84 A, 84 B, 84 C, 110

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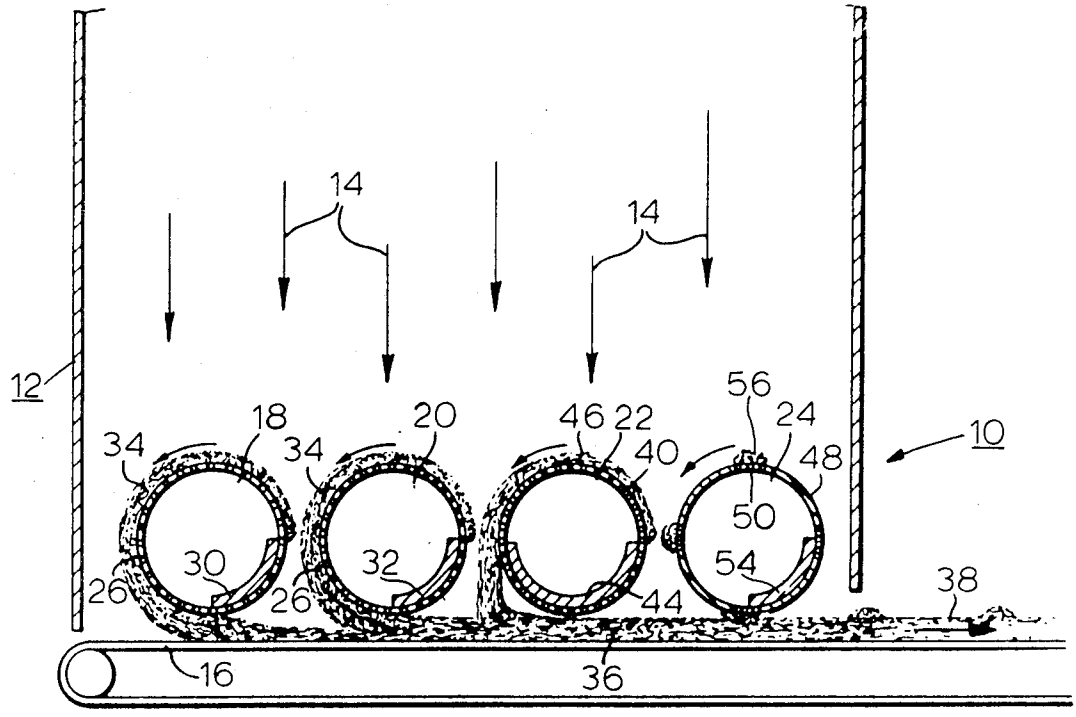
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[57] **ABSTRACT**

A tobacco manipulating apparatus for formation of a tobacco filler rod for use in the formation of cigarettes includes a relatively thin and flat chute, a tobacco particle gatherer located adjacent the discharge of the chute and a relatively flat elongated conveyor to receive tobacco from the gatherer. The gatherer includes a plurality of rotatable discs mounted across the width of the chute and each having substantially the same diameter and including a tobacco receiving peripheral surface in the plane of the chute. A source of vacuum is connected to each disc and vacuum interrupter is provided to prevent the application of vacuum over part of the surface of each disc. In this way a plurality of narrow substreams is formed from a broad stream of such particles in the chute. The narrow substreams are deposited sequentially and tangentially of the discs into the filler rod on the conveyor, the discs being mounted so that a straight line through their axes of rotation is inclined in a downstream direction with respect to the conveyor.

4 Claims, 4 Drawing Figures



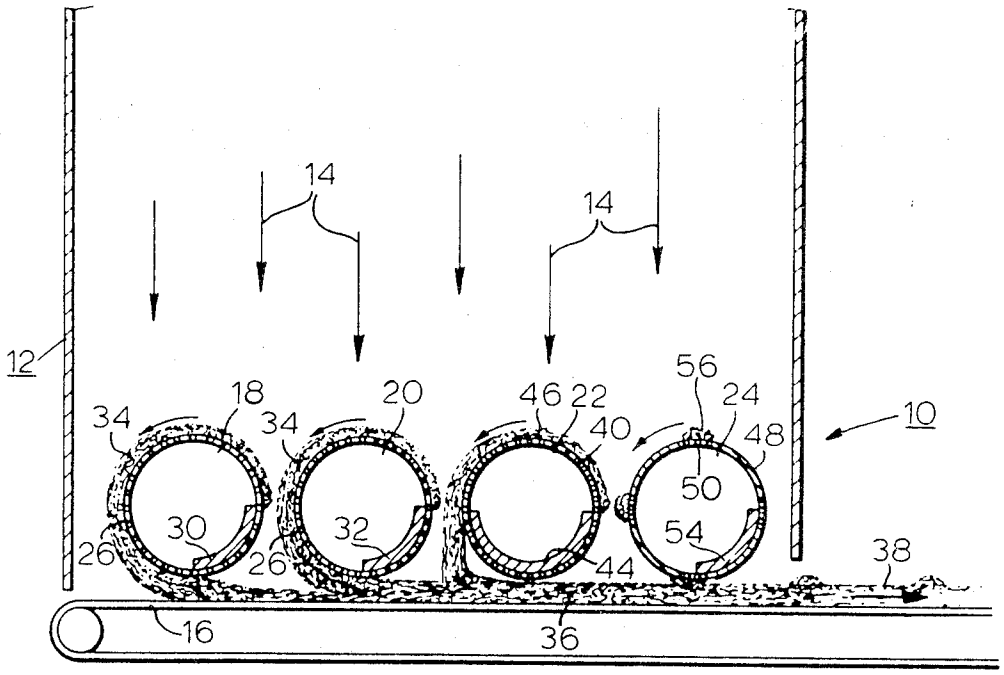


FIG.1

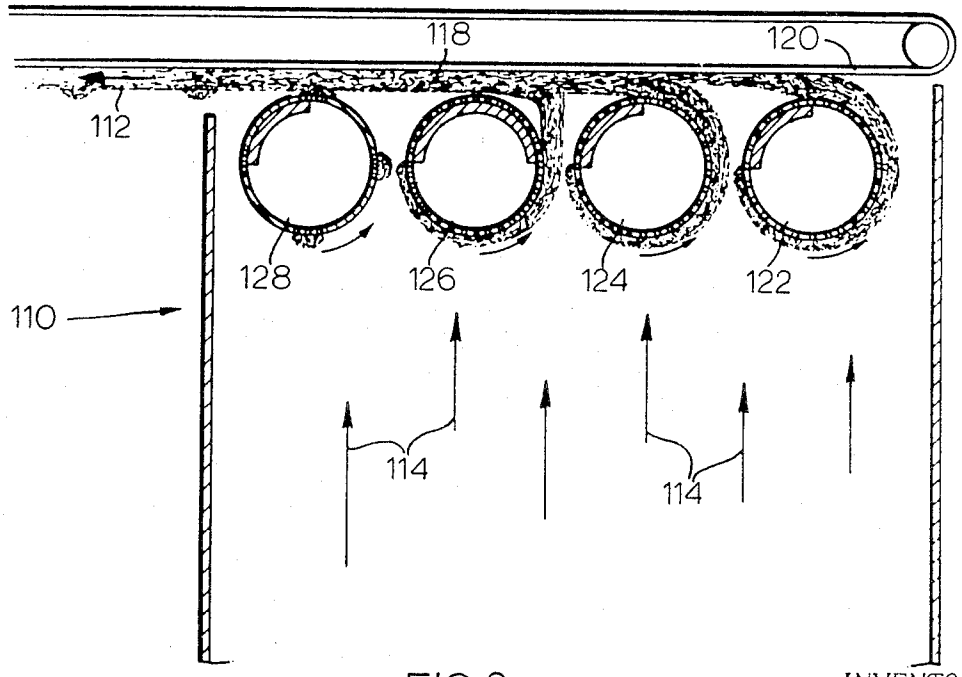


FIG.2

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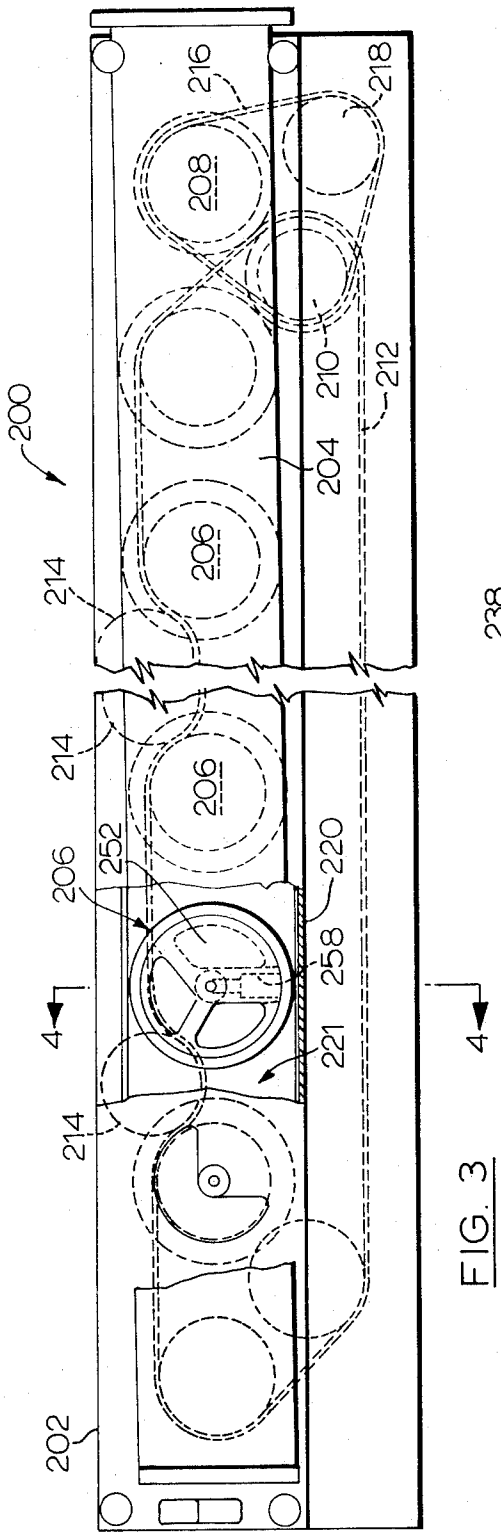


FIG. 3

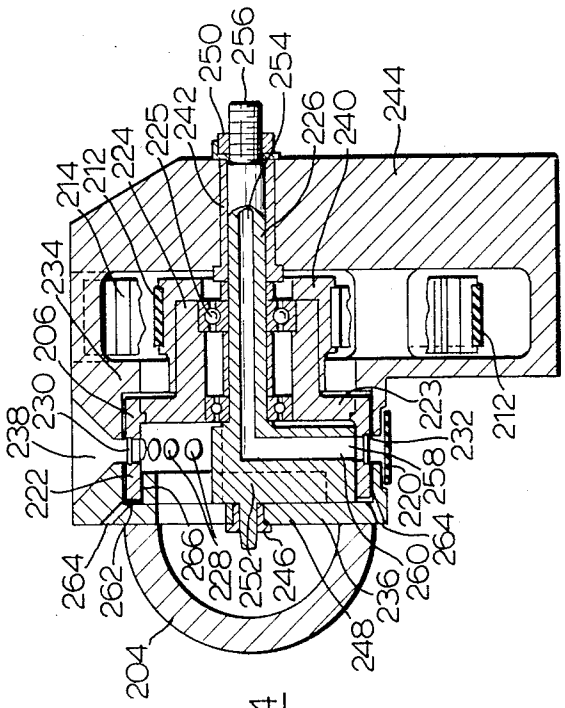


FIG. 4

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TOBACCO STREAM MANUFACTURE

This application is a continuation in part of application Ser. No. 128,412 filed March 26, 1971 now abandoned.

This invention relates to tobacco manipulation apparatus, for use in the formation of a tobacco rod.

In the conventional modern method of formation of tobacco rods, generally for use as a filler for cigarettes, a relatively broad stream of tobacco particles of varying sizes, usually approxiamtely 36 inches wide, first is provided. This stream usually is rendered as even as possible by various means. The broad stream is thin and is gathered together in suitable manner to form a narrow stream of tobacco particles which is built up along its length by particles from the broad stream to form a continuous tobacco rod. Cigarettes are formed from the rod usually by lateral compression, followed by wrapping in paper, after which individual cigarettes are cut from the continuous cigarette rod.

Typically the broad stream of tobacco particles is gathered to form the narrow tobacco rod by allowing the broad stream to fall onto a narrow belt moving substantially perpendicularly to the direction of movement of the broad stream. The particles in the broad stream thereby are subjected to an abrupt lateral component of motion. The belt may have a substantially flat gathering surface. Alternatively, the belt may have a trough-like form.

To reduce the tendency of tobacco particles to be displaced longitudinally of the narrow stream in a direction opposite to the direction of movement of the narrow belt, thereby forming knots or balls of particles in the forming narrow stream, it has become common practice to construct the narrow belt of air-permeable material and to apply a gentle vacuum through the surface. This use of a gentle vacuum has been thought to grip the tobacco particles to the surface of the belt upon contact thereby diminishing the tendency of the narrow stream to ball up.

Close examination by high speed photography of the gathering of the falling broad stream into a narrow stream of tobacco particles has revealed that, while the gentle vacuum is to a certain degree effective in preventing displacement of the particles in those portions of the conveyor where the narrow stream is relatively thin, in thicker portions considerable peaks and valleys of tobacco particles in the forming stream occur since the effectiveness of the vacuum on the tobacco particles remote from the conveyor is diminished. The tobacco rod therefore lacks uniformity of quantity of tobacco in the cross section thereof. This may give rise to unsatisfactory finished products.

It was also observed that there was a marked tendency for longer tobacco particles to be aligned axially in the tobacco rod. The filling power of a cigarette filler rod is important to the economics of cigarette manufacture and axial alignment of longer tobacco particles provides a tobacco rod which does not have as high filling power as one in which at least a proportion of the longer tobacco particles are radially aligned.

The above-mentioned close examination additionally indicated that smaller particles tend to penetrate the surface of the portions of the stream already present on the conveyor belt while larger particles lie on the surface. In effect there is a classification of tobacco particle sizes over the cross section of the rod, with smaller particles tending to be located closer to the conveyor belt and larger particles tending to be located remote from the belt.

One effect of this classification is that bad ends to the cigarettes may result, together with uneven burning rates and uneven burning temperatures, with accompanying effects on smoke constituents and taste.

Because of the lack of uniformity of the quantity of tobacco in the cross section of the rod, it is common practice to provide the rod having peaks which contain more tobacco than is required in the final cigarette and to trim the excess tobacco, generally about 20 percent of the total tobacco in the rod, from the rod. It often is desirable to form cigarettes having a higher density of tobacco at the ends than elsewhere. A number of methods have been practised and suggested to provide such denser ends, generally associated with the trimming operation.

In addition to the formation of a tobacco rod from a falling broad stream of tobacco particles, tobacco rods are formed from broad streams of particles which are projected upwardly in a tunnel by air flow. The particles are gathered on the underside of an air-permeable tobacco impermeable belt moving transverse to the direction of movement of the broad stream. The tobacco particles are held on the undersurface of the belt by suction through the belt.

The present invention is applicable to both the formation of tobacco rods from downwardly flowing and upwardly flowing broad streams of tobacco particles.

In accordance with the present invention, a tobacco manipulating apparatus is provided in which a plurality of narrow substreams of tobacco particles are formed from the broad stream and the narrow stream is assembled from the substreams.

There has previously been described in U.S. Pat. No. 3,034,514 an apparatus for forming narrow substreams from an upwardly flowing broad stream and subsequently assembling the narrow stream from the substreams. In one embodiment of the apparatus described in the above-mentioned U.S. patent, a plurality of flat discs having circumferential air-permeable but tobacco impermeable perforations are mounted for rotation about vertical axes, so that arcuate lengths of the discs are positioned in the path of movement of the upwardly flowing stream.

Thin substreams of tobacco are captured on the arcuate lengths and are transported upon rotation of the discs out of the path of movement of the broad streams. Upon release of the vacuum holding the substreams to the discs, the substreams fall onto a conveyor and form a narrow stream.

While a plurality of overlapping rotating discs is provided in this embodiment, there exist gaps between the overlapping discs through which tobacco particles from the broad stream may pass. Therefore, some of the tobacco particles of the broad stream proceed past the discs and are sucked into the air circulating system. The presence of these particles in the air circulating system may cause problems. As will become more apparent hereinafter, the apparatus of the present invention does not suffer from this defect. In the apparatus of the invention, the substreams are formed on surfaces positioned in the path of the normal flow of the broad stream towards the conventional forming zone. If gaps exist between the surfaces in the apparatus of the present invention, this is of no significance since the small

number of particles passing through such gaps will be captured on the conveyor in the forming zone.

In another embodiment described in the U.S. patent, a plurality of shallow cylindrical wheels are positioned in the path of the upwardly flowing broad stream of tobacco particles, and mounted for rotation about horizontal axes. The wheels have recessed perforated walls which are air-permeable and tobacco impermeable. Each wheel rotates in an opposite direction to those adjacent thereto. Tobacco is captured on the wall of each disc, and the captured tobacco is passed from disc to disc across the width of the broad stream to form a narrow stream on the upper surface of a conveyor.

In the latter embodiment, substreams are only formed on some of the discs, but on others of the discs, the same problems exist as are inherent in the prior art as is discussed above. Since the wheels rotate in opposite directions, and the tobacco particles captured on one surface are transferred to the surface of an adjacent wheel, at least some of the wheels will have facing the broad stream, a surface which already has tobacco particles thereon. Therefore, the same problems of classification and balling up as discussed above would be encountered on these wheels. This embodiment therefore does not solve the existing prior art problems.

The embodiments described in this U.S. Patent also have another serious defect. As has been indicated above, in the modern cigarette-making machines, when the narrow stream is formed from a upwardly flowing broad stream, the narrow stream is formed on the underside of an air-permeable conveyor, and when the narrow stream is formed from a falling broad stream, the narrow stream is formed on the top surface of an air permeable conveyor. It will be observed that in both the embodiments of U.S. Pat. No. 3,034,514 described above, the narrow stream is provided on the upper surface of the conveyor.

The present invention is described further by way of illustration with reference to the accompanying drawings, in which:

FIG. **1** is a sectional schematic representation of a tobacco rod-making apparatus in accordance with one embodiment of the invention;

FIG. **2** is a sectional schematic representation of a tobacco rod-making apparatus in accordance with another embodiment of the invention;

FIG. **3** is an elevational view, with parts cut away of a gatherer in accordance with the present invention; and

FIG. **4** is a section taken on line **4—4** of FIG. **3.** off

With reference to FIG. **1,** a tobacco manipulating apparatus **10** includes a substantially vertically aligned chute **12** confining a falling broad stream **14** of tobacco particles of varying particle sizes. The falling broad stream **14** may be provided in any convenient manner. For example, a shower of tobacco particles may be sprayed onto the top surface of a conveyor belt to form on the belt a borad stream of tobacco particles. This broad stream is conveyed on the belt to the end thereof, at which point particles fall of the conveyor and form the falling stream or curtain **10.**

A conveyor belt **16** is positioned below the chute **12** and is adapted to move transverse to the chute **12.** Generally, the belt **16** moves at a speed substantially in excess of the speed of the falling particles.

A plurality of control wheels or discs **18, 20, 22** and **24,** shown in section, are positioned adjacent to and spaced from the top surface of the belt **16.** The wheels are positioned between the walls of the chute **12** and are located in the path of the falling stream **14.**

In the embodiment illustrated the control wheels **18, 20, 22** and **24** each are positioned in a single plane to rotate in an anti-clockwise direction on horizontal axes which are parallel to each other and transverse to the plane in which the broad stream **14** falls. Additionally, the wheels are located with their axes of rotation located in a plane parallel to the plane of the conveyor top surface. As described below, it is not essential to provide the horizontal axes in the plane parallel to the plane of the top surface of the conveyor **12.** It is possible to stagger the locations of the wheels **18, 20, 22** and **24** from this configuration while maintaining the wheels in the path of the falling stream **14.**

The wheels **18** and **20** are of identical construction and a typical construction is more particularly described below with reference to FIG. **4.** Each wheel **18** and **20** is in the form of a hollow cylinder of shallow depth having a peripheral wall including an air-permeable tobacco impermeable surface **26** extending at least part way between the top and bottom of the cylinder. The surface **26** coconstitutes a narrow substream-forming surface. The porous peripheral surface **26** is positioned in the path of the stream **14** and rotates in the plane of the stream. A vacuum is applied to the interior of the wheels **18** and **20** such as by a vacuum-header pipe **204** in FIG. **4,** so that a considerable suction is applied through the surface **26.**

Inside each of wheels **18** and **20** and located adjacent the inside surface of the wheele is a non-porous fixed shield or shoe **30** and **32** respectively. The shoes **30** and **32** may be constructed in any convenient manner so that the suction applied to the surface **26** is released over those portions of the surface **26** adjacent the shoes **30** and **32.** The shields **30** and **32** are illustrated as located within the wheels **18** and **20** so that the vacuum is prevented from acting over the area of the surface **26** of the wheel which is located from approximately the point of nearest approach of the wheels **18** and **20** to the top surface of the conveyor **16** through about 90° in the direction of movement of the wheels. This configuration maybe varied as desired.

As the tobacco particles in the stream **14** fall towards the conveyor **16,** they are arrested by the suction acting over the porous surface **26** when vacuum is induced within the wheels **18** and **20.** A narrow substream of tobacco particles **34** builds up on each of the surfaces **26** as the wheels **18** and **20** rotate anti-clockwise, the narrow substream having increasing depth in the direction of movement of the wheels as the quantity of tobacco builds up. Preferably, wheels, **18** and **20** rotate at the same speed but it is possible to provide different speeds of rotation, if desired.

When the narrow substream **34** on wheel **18** reaches the shield **30,** the substream no longer is held by the vacuum and therefore the particles of the substream fall from the surface **26** onto the top surface of the conveyor **16.** Generally, the wheels **18** and **20** are positioned close to the conveyor **16,** so that the substream **34** is laid gently on the top surface of the conveyor **16,** thereby avoiding disturbance of the relative locations of the tobacco particles in the substream **34.** As the conveyor generally is moving with considerable speed to the right as shown by the arrow in FIG. **1,** then a degree of displacement of the substream **34** occurs in the

direction of movement of the conveyor surface as it is deposited on the surface, as illustrated.

Similarly, when the narrow substreams **34** on wheel **20** reaches the shield **32,** then the narrow substream **34** of tobacco particles is laid gently on top of the existing stream which was laid from the wheel **18.** The wheels may rotate at any convenient speed relative to the speed of the top surface of the conveyor **16.** Generally, the speed of rotation of the wheels **18** and **20** and linear speed of the conveyor belt **16** are substantially the same so that there is little or no relative speed between the tobacco particles in the substreams **34** and the conveyor **16** when the particles are laid on the conveyor surface.

The rotational speed of the wheels **18** and **20** and the linear speed of the conveyor **16** however may vary from each other so that the substream of tobacco particles is lengthened or shortened on the conveyor belt relative to its length on the surfaces **26,** as desired. If the top surface of the conveyor **16** moves faster than the rotational speed of the wheels, then the substreams **34** are stretched, whereas if the top surface of the conveyor **16** moves slower than the rotational speed of the wheels, then the substreams **34** are abbreviated.

The speed of rotation of wheels **18** and **20** is dependent on the quantity of tobacco desired in the narrow substreams **34** formed on the surface thereof. At lower speeds of rotation, larger quantities of tobacco are deposited on the surfaces **26** and, therefore, the substreams placed on the conveyor **16** are thicker, whereas at higher speeds rotation lower quantities of tobacco are deposited on the surfaces **26** and the substreams placed on the conveyor are thinner. The degree of vacuum applied over the inner surface of the wheels also may be varied as required.

The wheels **18** and **20** therefore control the velocity of approach of the tobacco particles from the falling broad stream **14** to the conveyor **16** by the formation of substreams. The tobacco particles of the broad stream **14** thereby move from one direction to a second direction lateral to the first direction in smooth manner. stream **36** on the top surface of the conveyor **16** has been illustrated utilizing two wheels, so that the tendencies of classification of the particles and the formation of peaks and valleys are reduced. This manner of illustration is a matter of convenience and it is preferred in the present invention to employ more than two such wheels. The actual number of wheels of the type **18, 20** used depends on a number of factors, including the characteristics desired in the finished rod, the width of the broad stream **14** and the distance between the top surface of the conveyor and the source of the broad stream **14.** An arrangement of wheels of typical number is described below with regard to the showing in Fig. **3.**

As the narrow substreams **34** are formed on the porous surfaces **26** of the wheels **18, 20** a minor degree of classification and peak-and-valley formation may occur on each wheel. If a plurality of wheels is provided and a narrow substream of small ultimate depth is formed on each such wheel and the narrow stream **36** is formed from the plurality of narrow substreams, then the stream **36** in effect is formed of a plurality of layers of tobacco particles. The final rod stream **38** formed in this manner has a substantially uniform quantity of tobacco in the cross section thereof, and additionally has a substantially uniform distribution of particle sizes over the cross section.

The wheels of the type **18, 20** are spaced from the top surface of the conveyor **16** any desired distance. As indicated above, generally the distance is such that the substreams are gently laid one on top of the other.

The present invention also provides apparatus with wheels of construction other than wheels **18, 20** described above. Wheel **22** is of similar construction to wheels **18** and **20** and is provided with a peripheral wall including an air-permeable tobacco impermeable surface **40** in similar manner to wheels **18** and **20.** A vacuum is applied to the interior of the wheel to provide a suction through the porous surface **40.** Inside the wheel **22** and located adjacent the inside surface thereof is a non-porous fixed shield or shoe **44** which has a semicircular cross section. The shield **44** extends approximately from the ends of the diameter of the wheel **22** parallel to the conveyor **16** through the lower half of the wheel. As in the case of shoes **30** and **32,** shoe **44** may be constructed in any convenient manner so that the suction is released over the semi-circular portion of the surface **40** adjacent the shoe at any particular time. The shoe **44** may extend over any convenient arcuate length of the wheel **22,** provided that the function of the wheel is achieved.

Tobacco particles from the falling stream **14** are captured by the surface **40** and form a narrow substream **46** of tobacco particles on the surface **40** of increasing depth in the direction of rotation of the wheel **22.** As mentioned above in connection with the conventionally formed narrow stream, the longer strands of tobacco tend to be oriented generally in the direction of the narrow substream **46.**

The wheel **22** rotates at a fast speed relative to the rate of flow of the broad stream **14** and generally at approximately the speed of the conveyor **16.** The relative speeds of the wheel **22** and the conveyor **16** may be varied as desired.

As the wheel **22** rotates anti-clockwise, tobacco particles are projected from the substream **46** at the shield **44** towards the narrow stream **36.** A single wheel of the type **22** is illustrated. It may be desired under certain circumstances to use more than one wheel of this type in conjunction with or in the absence of wheels of the type **18, 20.**

A further construction of wheel in accordance with this invention is wheel **24.** The wheel **24** is of similar construction to wheels **18** and **20** including a cylinder having a peripheral wall including a partially porous surface **48.** The surface **48** is provided with porous portions **50** which are positioned at spaced intervals around the periphery. The porous portions may be provided at any convenient intervals, typically at 90° to each other. Vacuum is applied to the interior of the wheel **24** thereby producing a suction through the porous portions **50** of the surface **48.**

Located inside the wheel **24** is a non-porous fixed shield or shoe **54,** which extends from approximately the closest point of approach of the surface **48** to the top surface of the conveyor **16** through 90° in the direction of movement of the wheel **24.** The shoe **54** may be of any convenient form to release the suction applied through those portions of the porous surface **50** from time to time adjacent thereto.

As the stream of particles **14** falls towards the surface **48,** some of the particles are arrested by the action of

the vacuum on the porous areas **50** thereby forming a plurality of spaced-apart substreams **56** on the surface **48.**

When one of the porous portions **50** of the wheel **24** has rotated to reach the shild **54,** the particular substream adjacent the shield is deposited on the stream **36,** thereby providing areas of increased cross-sectional quantity along the stream **36.** These areas of increased quantity in the cross section are the basis for dense ends in the final cigarette. During the later manufacturing steps to form the cigarettes, the rod **38** is compressed to form a rod of uniform diameter, but due to the presence of larger quantities of tobacco at selected spaced-apart positions along the length of the rod, the uniform diameter rod formed after compression has spaced-apart denser areas, which are positioned equivalent to one or both ends of cigarettes formed from the rod. It will be seen, therefore, that the present invention is able to achieve dense ends without the necessity for complicated trimming techniques.

The speed of rotation of wheel **24** and the number of openings **50** in the surface **48** may be selected to provide for depositing the required number of substreams **56** at the required lcoations equivalent to the one or two lumps of tobacco to be located at spaced-apart locations on the rod **38.**

Where it is desired to employ a wheel of the type **24,** only one usually is required, although it is possible to provide more than one such wheel, if desired. Such wheel **24** may be used in combination with a plurality of the wheels of the type **18,** with or without the presence of one or more wheels of the type **22.** It is possible to use a wheel **24** in conjunction with or separate from wheels **18, 20** and **22.**

It is possible that the stream **36** formed from the substreams **34** may have valleys therein, so that the quantity of tobacco in the cross section of the assembled rod **38** is not constant.

The apparatus described above with reference to FIG. **1** may be varied to achieve different functions. The particular functions chosen are suited to local requirements and depend on a number of factors, such as tobacco costs, type of tobacco and the nature of the market.

The wheels may be spaced apart as desired so that any given quantity of tobacco may fall directly onto the conveyor **16** without being subjected to manipulation by the wheels.

It is not necessary to provide a flow of tobacco particles in the stream **14** which is evenly distributed over its width. By maintaining a substantially fixed configuration of flow it is possible to maintain a consistent end product rod **38.**

Further, the vacuum may be provided over differing portions of the surfaces of the wheels from that illustrated and described above.

Further, it is not necessary that the shoes located within the wheels extend throughout the arcuate distance indicated. It is possible to provide the vacuum cut-off point at any convenient position, for example, in wheels **18, 20** and **24** for deposition of the tobacco onto the conveyor or onto tobacco already deposited on the conveyor. Further, the vacuum shoe may extend any desired arcuate distance from the cut-off point, varying as desired from the approximately 90° for wheels **18, 20** and **24** and the approximately 180° for wheel **22.**

Turning now to FIG. **2,** which illustrates a second embodiment of the invention. This embodiment is similar to that of FIG. **1** with the exception that the apparatus **110** is concerned with the formation of a tobacco rod **112** from an upwardly flowing broad stream **114** of tobacco particles. The upwardly flowing broad stream **114** is confined in a chute **110** and projected by an upward flow of air induced by any convenient means, not shown.

A narrow tobacco stream **118** is formed on the underside of a conveyor belt **120** and is held there by suction applied through the belt **120** by means not shown.

Typical apparatus in which a tobacco filler rod is formed on the underside of a belt from an upwardly flowing stream is shown in U.S. Pat. Nos. 3,030,965 and 3,089,497, and the present invention represents a modification of such apparatus.

In the apparatus of FIG. **2,** a plurality of wheels **122, 124, 126** and **128** is provided adjacent the underside of the belt **120** in the path of the broad stream of particles **114.**

The construction and function of the wheels **122, 124, 126** and **128** is the same as that of wheels **18, 20, 22** and **24** respectively described above with reference to FIG. **1** and further description does not appear necessary. The modifications of the construction and orientation of the wheels **18, 20, 22** and **24** described above apply equally to wheels **122, 124, 126** and **128.**

It will be seen that the tobacco substreams formed on the wheels **122, 124, 126** and **128** are deposited on the underside of the conveyor belt **120.** The wheels thus improve the manner of formation of the final rod **112,** but do not alter the basic configuration of the rod-making apparatus, in that an upwardly flowing broad tobacco stream is deposited on the underside of the belt **120.** The wheels therefore are readily utilizable in existing modern tobacco manipulating equipment, such as that described in the above-mentioned U.S. Pat. Nos, 3,030,965 and 3,089,497.

It will be seen that this arrangement is in contrast to that shown in U.S. Pat. No. 3,034,514 wherein the tobacco in the upwardly flowing broad stream is deposited on the upper surface of the conveyor.

Referring to FIG. **3,** there is shown a typical gatherer **200** including a plurality of wheels for use, for example, in a tobacco rod-making apparatus, such as illustrated schematically in FIGS. **1** and **2** The gatherer **200** includes a frame **202** which extends across the width of the broad stream and is secured in any convenient manner to the chute containing the broad stream. The frame **202** has secured thereto a vacuum header **204** which extends across the width of the frame. The header **204** is in communication with a plurality of discs **206, 208.** All of the discs **206** are of the type **18** (FIG. **1**) and the disc **208** is of the type **24** (FIG. **1**). These discs **206** and **208** are mounted for rotation in the frame as indicated below.

As shown in schematic broken outline, drive for the discs **206** and **208** is provided by a single motor **210,** which drives all of the discs **206** by a continuous belt **212** which engages each of the discs **206** and passes over idler wheels **214.** While idler wheels **214** are only illustrated as being located between selected discs **206,** the wheels **214** are located between each adjacent pair of discs **206.**

A belt **216** and idler wheel **218** achieve the required drive for disc **208.** A narrow stream forming conveyor

220 is located beneath the discs 206, 208. The conveyor 220 is air permeable and suction is applied through the surface of the conveyor 220. Generally there is a high air flow through the conveyor surface while the pressure drop is low.

As may be seen from FIG. 3, the discs 206 are positioned successively a greater distance from the conveyor belt 220 in the direction of intended motion of the belt 220. The left-most disc 206 is positioned a predetermined distance from the conveyor belt 220 so that the substream thereon may be gently laid on the belt 220, the substream when on the belt 220 being substantially tangential to the disc 220. Each successive disc 206 from left to right is spaced from the conveyor 220 a distance when the gatherer 200 is in use, from the top surface of tobacco already positioned on the belt 220, substantially equal to the predetermined distance of disc 206. In this way, the substream from each of these discs is laid gently on the existing stream on the conveyor 220, the substream in each case when laid on the existing stream being substantially tangential to the appropriate disc 206.

As shown more particularly in FIG. 4, each of the discs 206 is in the form of a cylinder 222 which is mounted on a circular flange 223 of a hub 224. The hub 224 is journalled by bearings 225 for rotation about a normally stationary hollow axle 226.

The cylinder 222 has a plurality of openings 228 formed in the wall thereof and a foraminous air permeable, tobacco impermeable screen 230 is seated in a channel 232 in the wall of the cylinder 222 covering the openings 228. The cylinder 222 is mounted for rotation on the axle 226 in a housing consisting of opposed parts 234 and 236. The parts 234 and 236 cooperate to provide an open circumferential channel 238 coinciding with the screen 230. The channel 238 has sloping walls to guide errant tobacco particles onto the screen 230.

A sprocket wheel 240 is mounted on the hub 224 and engages the belt 212 so that the wheel 240, hub 224 and disc 206 are rotated about the axle 226, upon actuation of the motor 210.

The hollow axle 226 is mounted in friction fit in a bushing 242 located in a support frame 244 which includes part 234. The support frame 244 is connected to the frame 202 of the gatherer 200. At its other end the axle 226 is mounted in friction fit in a bushing 246 which is located in a bracket 248 integral with part 236. The friction fits between the axle 226 and the bushings 242 and 246 allow the axle 226 to be rotated on its axis if sufficient force is applied to overcome the frictional forces. A hexagon nut 250 or other convenient gripping means is mounted on the axle to achieve the desired rotation. The friction fit prevent the axle 226 from rotating when the hub 224 is rotated.

The axle 226 is formed integral with a vacuum shoe 252 which extends around the inner periphery of the wall of the disc 206 any desired angular distance.

The axle 226 is formed with a hollow bore 254 which extends from an air relief opening 256 in the nut 250 to the shoe 252. The shoe 252 is provided with a passageway 258 in fluid communication with the bore 254 the passageway 258 terminating at the peripheral surface of the shoe. The passageway 258, bore 254 and opening 256 allow air to pass to the portion of the screen 230 opposite the opening 260 to the passageway 258.

The vacuum header pipe 204 communicates directly with the interior of the cylinder 222 and an integral part thereof constitutes the part 236. Hence, when vacuum is applied to the header pipe, suction is applied through the openings 228 through the screen 230, except over those portions of the screen 230 opposite the vacuum shoe 252. The cylinder 222 rotates in a channel 262 in the part 236. In order to avoid wear to the abutting surfaces of the cylinder 222 and the channel 262, a fluid tight seal is not provided and passageways 264 are provided to leak air through the small gap 266 between the inner annulus of the channel and the disc 206.

The disc 208 is of substantially the same construction as disc 206, except that its screen 230 is provided with perforations only at spaced-apart peripheral locations.

The gatherer 200 is positioned in the path of movement of a falling broad tobacco stream. It will be apparent that only minor modifications are required so that the gatherer 200 may be used with an upwardly flow broad tobacco stream. The axes of rotation of the discs 206 and 208 are horizontal and perpendicular to the path of movement of the broad stream. With the motor 210 operating and vacuum applied to the header 204 the tobacco particles are trapped by the screen 230 and form narrow substreams on the screen 230. The narrow substreams on the discs 206 are released by the air bleed through opening 260 and fall onto the conveyor 220 which is moving to the right as seen in FIG. 3. In the manner described with reference to FIGS. 1 and 2, a tobacco rod is built-up. The disc 208 provides local areas of increased quantity of tobacco to provide ultimately dense ends to the product cigarettes.

It will be seen, therefore, that the present invention provides apparatus which manufatctures an improved tobacco filler rod. In view of the improvements in the characteristics of the tobacco filler rod formed in the present invention as compared to the rod formed by conventional means, cigarettes may be produced having a more consistent and improved quality.

The above-described specific embodiments of the invention represents only examples of the manner in which control of the formation of the narrow tobacco stream may be achieved to suit individual requirements. Other manner of achieving this control are possible and many modifications are possible within the scope of this invention.

What is claimed is:

1. A tobacco manipulating apparatus which comprises means to feed a broad stream of tobacco particles, gathering means comprising a plurality of shallow cylindrical discs positioned adjacent a discharge end of said feed means to collect and convey a plurality of narrow tobacco substreams, each of said discs having substantially the same diameter and having a peripheral wall including an air-permeable, tobacco-impermeable surface and being rotated about its axis, each of said walls having an external surface to form a narrow substream of tobacco particles from said broad stream, each of said discs being hollow and the interior thereof having a pressure that is less than atmospheric, vacuum interrupting means positioned to prevent the application of said pressure over a selected arcuate length of each of said peripheral surfaces; and a conveying surface located adjacent said gathering means outside of said feed means to receive said plurality of tobacco substreams from said gathering means to form thereon

a narrow stream of tobacco particles; a straight line joining the axes of rotation of said plurality of discs being inclined with respect to the conveying surface such that the substreams received from each of said discs onto the conveying surface is substantially tangential to said disc and to the top surface of said narrow stream.

2. The apparatus of claim **1** wherein said vacuum interrupting means is located internally of each of said discs and extends over an arcuate length of each of said peripheral surfaces from the approximate point of nearest approach of said peripheral surface to said conveying surface.

3. The apparatus of claim **1** wherein one of said plurality of discs is provided with a peripheral surface having arcuately spaced apart air-permeable portions and said vacuum interrupting means is located internally of said disc and extends over an arcuate length of said peripheral surface from the approximate point of nearest approach of said peripheral surface to said conveying surface.

4. The apparatus of claim **1** including vacuum means to apply vacuum through said conveying surface.

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