July 9, 1963 G. DEARSLEY 3,096,770

CIGARETTE MAKING MACHINE AND METHOD

Filed April 21, 1959 4 Sheets-Sheet 1

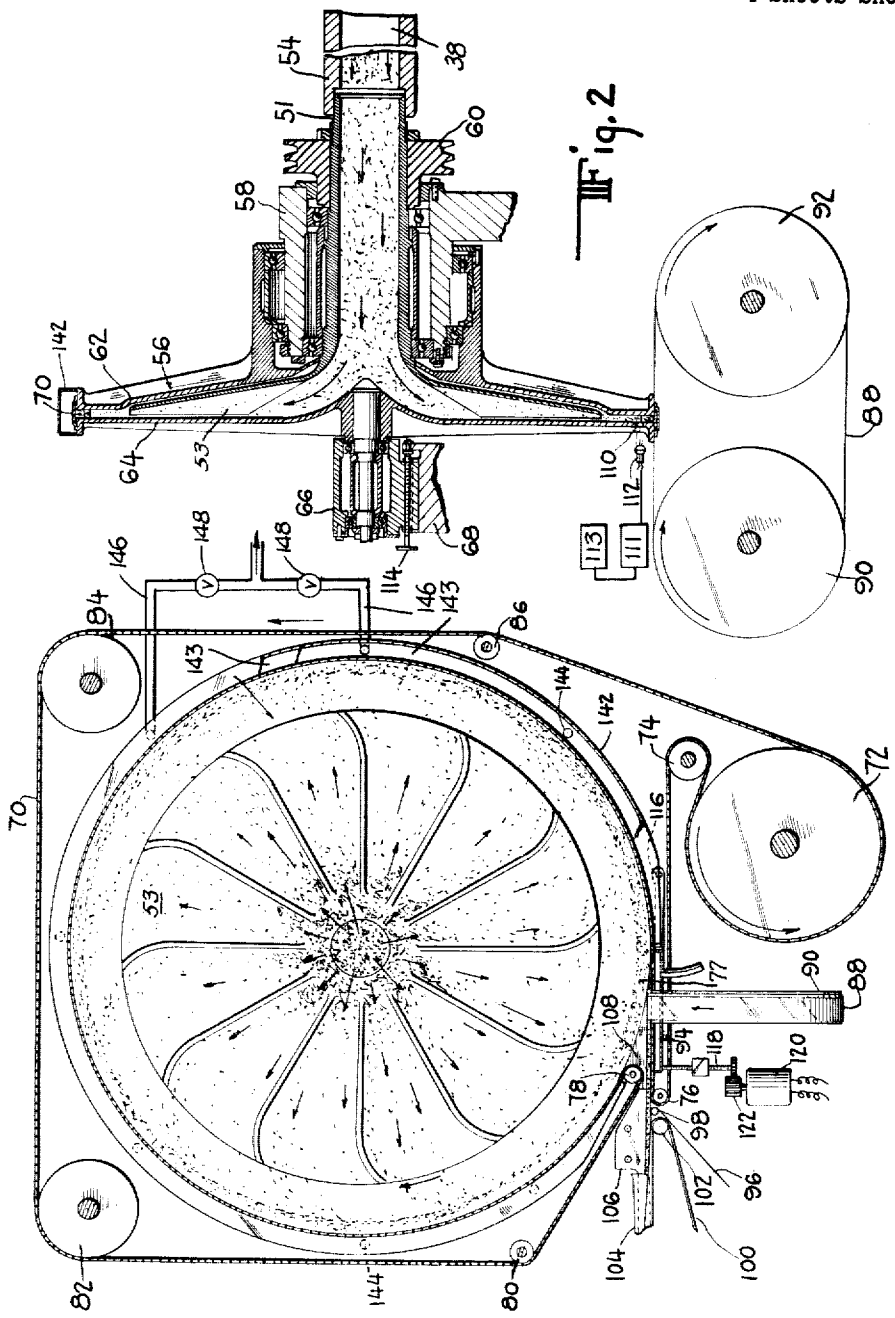


Fig. 2

Fig. 1

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Filed April 21, 1959 4 Sheets-Sheet 2

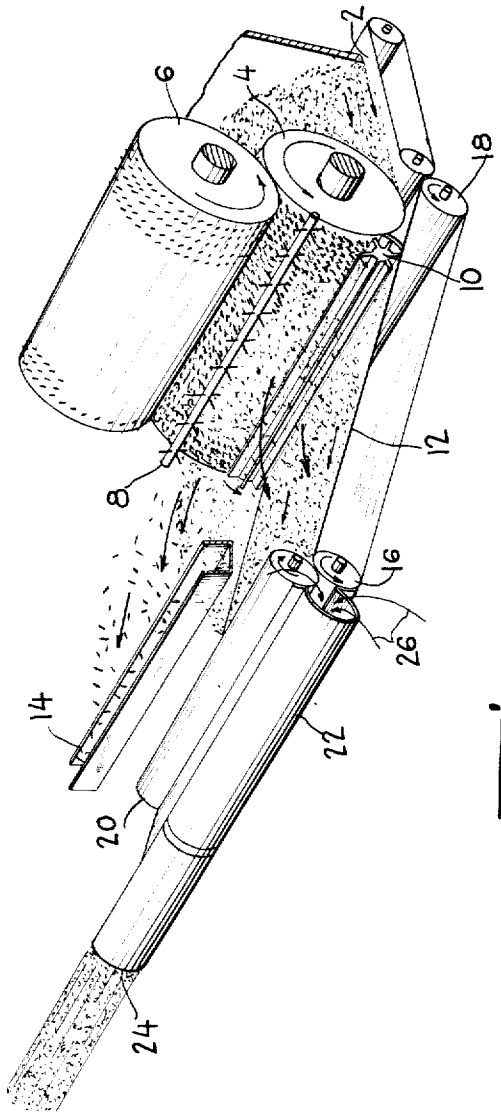


Fig. 3

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CIGARETTE MAKING MACHINE AND METHOD

Filed April 21, 1959 4 Sheets-Sheet 3

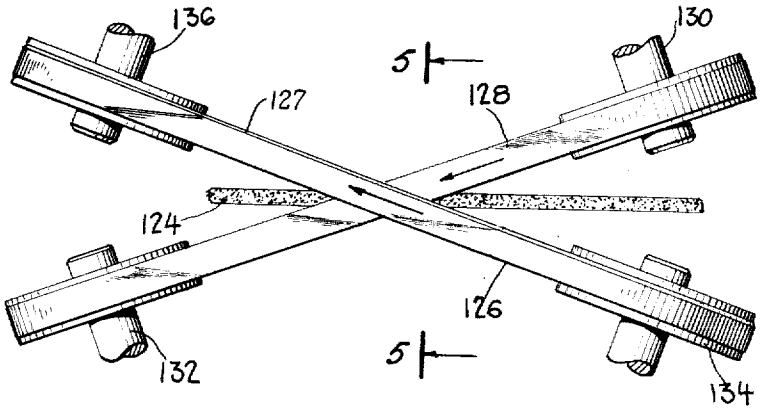


Fig. 4

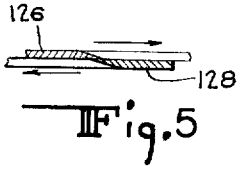


Fig. 5

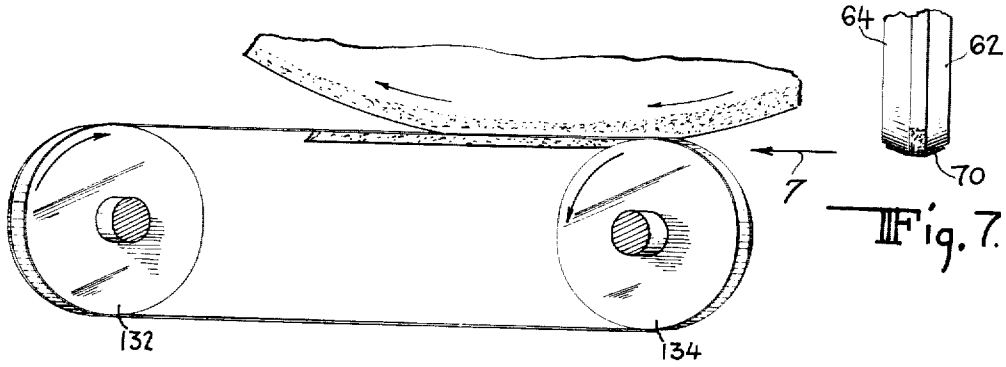


Fig. 7.

Fig. 6.

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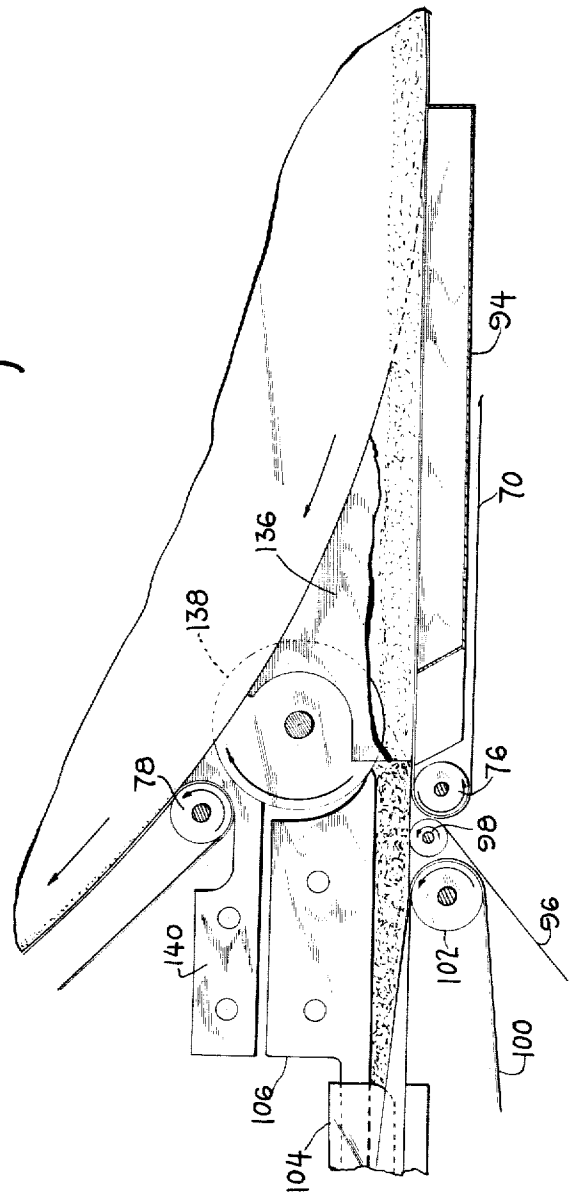
July 9, 1963 G. DEARSLEY 3,096,770

CIGARETTE MAKING MACHINE AND METHOD

Filed April 21, 1959

4 Sheets-Sheet 4

Fig. 8.



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United States Patent Office 3,096,770 Patented July 9, 1963

3,096,770

CIGARETTE MAKING MACHINE AND METHOD

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Filed Apr. 21, 1959, Ser. No. 807,830
30 Claims. (Cl. 131—21)

This invention concerns improvements in tobacco feeding methods and means suitable for such purposes as forming a continuous rod of tobacco as in a continuous rod cigarette making machine.

In continuous rod cigarette making machines, an endless stream or rod of tobacco is formed to be subsequently wrapped in an endless web of cigarette paper to form an endless cigarette rod which is cut into individual lengths, forming cigarettes. One difficulty common in such machines is that comparatively large variations exist in the endless stream of tobacco formed. That is, the mass per unit length varies so that the individual cigarettes finally produced also vary in weight. To cope with this problem various types of gages have been employed to measure the moving stream of tobacco and to use such measurements to control the tobacco feed.

This procedure has involved costly equipment and also required skilled labor for maintenance, and even then the results obtained were far from the perfection desired.

Also, it is seemingly the universal practice to form endless streams of tobacco such as are employed in this class of machinery to form a rod by providing mechanism to produce a shower of tobacco which is collected on an endless moving belt. This involves arranging for the tobacco to approach the belt normal to its surface so that when the tobacco particles are collected to form the desired stream, they must be violently accelerated in the direction of the belt. It is well known that this causes disturbances which make it difficult to form a uniform stream of tobacco even if the shower is uniform, and in practice, the speed of machinery is limited to some degree by this factor, for it is obviously necessary to run such machinery at a speed such that the disturbance due to the sidewise acceleration of the tobacco particles is within acceptable limits.

The purpose of this invention is to provide means for producing a more uniform rod or stream of tobacco by mechanism which is not subject to speed limitations. Another object of this invention is to permit machinery to be employed which is of a much smaller physical size than that employed hitherto, for it permits the tobacco feeding part of a cigarette machine to be placed in any convenient position relative to the rod-forming apparatus, thus making a much more economical use of floor space.

Another object of this invention is to provide tobacco feeding which introduces substantially separate strands of tobacco into the center of an annular space of the desired thickness and causing these strands to move radially outwards to build up into an annulus of compacted tobacco from the outside of which a continuous stream of tobacco may be produced by slicing off a continuous circumferential strip.

Other objects and features of the invention will appear as the description of the particular physical embodiment selected to illustrate the invention progresses. In the accompanying drawings, which form a part of this specification, like characters of reference have been applied to corresponding parts throughout the several views which make up the drawings.

FIGURE 1 shows a front elevation of the tobacco rod forming apparatus.

FIGURE 2 is a sectional view of the apparatus shown in FIGURE 1.

FIGURE 3 shows one method of adapting standard feeding means to produce a tobacco-laden air stream.

FIGURE 4 shows a plan view of an alternative means for severing the tobacco strip to that shown in FIGURE 1.

FIGURE 5 shows a section on line 5—5 of FIGURE 4.

FIGURE 6 shows a side elevation of FIGURE 4.

FIGURE 7 shows a view of FIGURE 6 in direction of arrow 7.

FIGURE 8 shows a front elevation of a variation of mechanism shown in FIGURE 1.

In order to carry this invention into effect, it is necessary to feed tobacco in the form of substantially separate strands into an air stream in which form it is conveyed to the various mechanisms concerned.

FIGURE 3 shows means whereby this may be accomplished using a basic tobacco feed in common use today. In such a feed, bulk tobacco is placed on belt 2 which moves in the direction of arrows pressing the tobacco against a carded drum 4 so that the teeth on that drum become charged with tobacco. Above drum 4 a second carded drum 6 is arranged. This runs in the direction indicated by the arrow for the purpose of brushing off the surplus tobacco on the carding carried on drum 4, so that a more or less uniform carpet of tobacco is produced on the drum 4 after it passes the brushing roller 6.

This carpet is transformed into a shower by the fast running picker roller 8, the pins of which pass between the tines of the carding on feed drum 4 removing the tobacco therefrom and throwing the tobacco shower onto a paddle-like unit 10 which projects it into the desired direction substantially parallel with moving belt 12. In such a shower of tobacco the heavier particles generally consisting of the heavier pieces of stem, are thrown farther than the lighter strands so that they may be collected in the box 14, the lighter strands falling onto the surface of the belt 12.

Such winnowing means are not very efficient, although they are very widely used, and for the purposes of this invention, further winnowing means are provided according to the description below.

Reverting to the tobacco feed, the collecting belt 12 is run at a suitable high speed in the direction of the arrows shown to insure that the tobacco particles collected on its uppermost surface are in a substantially separated condition. Generally speaking, it is desired that one strand should not be allowed to fall on top of another strand which is already on the belt. This belt 12 is supported and driven by two rollers 16 and 18.

Above the front roller 16 a second roller 20 is positioned to lightly contact the top surface of the belt and the strands of tobacco thereon. This roller 20 is usually made of metal such as steel, but may if desired be surfaced with a resilient material such as rubber. A suitable sheet metal duct element 22 is shaped as shown with one portion made in close contact with and wrapped around the upper roller 20, and another portion in close contact with and wrapped around the belt carrying roller 16 in such a manner as to form a channel along the length of the rollers 20 and 16 as shown.

It will be seen that if the end 24 of this duct-like member is connected to a fan for the purpose of drawing air through the confined space formed between it and the rollers 20 and 16, air will be caused to enter the end as indicated by the arrows 26 which will carry away the strands of tobacco delivered into that air stream by reason of the movement of the band 12 carried on the roller 16, cooperating with the roller 20.

With such an arrangement, very little air is permitted to leak in between the roller 20 and the band 12 carried on the roller 16; similarly, no air is permitted to leak

in between the duct member and the roller **20** and the band **12** carried on the roller. In this way, the air is constrained to move in a direction parallel to the axes of the rollers **20** and **16**, so that a high velocity can be obtained using a very small quantity of air so as to enable the separate strands of tobacco to be removed as soon as they arrive in the air stream, in which way they are carried away separately so as not to become entangled one with another during transport.

The tobacco-laden air upon leaving a winnower enters the rod forming apparatus via pipe **54**, FIGURE 2. The air which carries the tobacco through all the apparatus described up to this point is moved by a centrifugal fan which may be placed between the winnower and the rod forming apparatus entry means **54**, or may be placed within the rod forming apparatus as shown at **56** in FIGURES 1 and 2.

As will be seen, the fan **56** has radial passages **53** and is carried on a hollow spindle **51** which constitutes the entry pipe to the fan in order that the air and tobacco particles may be delivered via the center thereof, moving outwardly to the periphery of the fan by centrifugal force. The fan is mounted on bearings as shown which are supported in a fixed portion of the main frame **58**. It is driven at the desired speed by means of V-belts cooperating with the fan pulley **60**. The side casings which complete the centrifugal fan are both rotatably mounted, the rear casing **62** being mounted on bearings supported on an extension of the fixed main frame **58** with the front casing **64** being supported on its own bearings in the bracket **66**, which in turn is adjustably mounted on a portion of the main frame **68** which is fixed to and a part of the previously mentioned main frame **58**.

The endless foraminous band **70** which is driven in the direction shown, by drum **72**, passes over rollers **74** and **76** around the outside diameter of the fan casing **62** and **64** and then over rollers **78**, **80**, **82**, **84**, and **86**. This band is sufficiently wide to bridge the space between the fan sides **62** and **64** to be adequately supported on each side of this space as shown. In this way, an annular space is formed between the fan sides **62** and **64** and the belt **70** around the outside diameter into which space the compacted annulus of tobacco is built up.

It will be understood that the rotating fan rotor **56** by the well understood centrifugal action of such fans will pull a current of air through the entry pipe **54**, which air will carry with it separate tobacco particles from the feed mechanism already described. The air and tobacco particles being flung outwardly will reach the foraminous band **70** which will permit the passage of air, but which will prevent the passage of the tobacco strands which will accordingly build up to a complete annulus whose width is equivalent to the space between the fan casings **62** and **64**, this annulus being of a compacted nature due to the force resulting from the change in momentum which the tobacco particles suffer when they are brought to rest upon strands already in position, which force will be augmented by the continuing passage of air through the tobacco matrix already in place.

The continuous passage of air through the matrix also holds it in position after the matrix is formed and so permits the apparatus to be mounted in the preferred position with the fan axis in a horizontal plane.

As will be seen, the foraminous band **70** is caused to travel for a short distance in a horizontal plane tangential to the outside diameter of the fan casings **62** and **64** by being caused to run over roller **76**. Due to the continued air pressure on the inside of the annulus of compacted tobacco, the annulus will become distorted at this point and will tend to follow the tangential path bounded by the band **70** passing over roller **76**.

A band knife **88** passing over driving pulleys **90** and **92** is continuously sharpened by means not shown and is so positioned that the top run of the knife is the desired distance above the tangential run of the belt **70**. The cutting edge of this band knife also runs in contact with the outside diameter of the fan casings **62** and **64** so that as the annulus of tobacco is rotated and moves along the tangential portion of the band **70** towards roller **76**, it comes into contact with the cutting edge of the band knife **88** which slices off a strip from the outside diameter whose height is determined by the distance between the knife and the tangential run of the belt **70**.

The strip thus severed from the main annulus of tobacco is caused to travel with the tangential run of the foraminous belt **70** towards the roller **76** by applying suction into the box **94** which by acting through the belt **70** causes the severed tobacco to adhere to its surface and move with it. This suction applied in the box **94** also assists the air pressure which exists inside the annulus of compacted tobacco to distort the annulus at the tangential run of band **70** in preparation for the cutting by means of the knife **88**, which suction also holds the tobacco matrix in position preventing undue disturbance by the knife. Immediately adjacent to the roller **76** the endless cigarette paper web **96** is introduced over roller **98**. This paper is carried away on another endless band **100** which passes over roller **102** and carries the tobacco stream under the well known cigarette machine tongue **104** to be formed into an endless cigarette rod by known means.

A top guide **106** is provided at this point to help control the tobacco stream which at all points between the fan bodies **62** and **64**, and the cigarette machine tongue **104** is contained between two side guides, not shown.

It will be understood that when the band knife **88** severs the strip of tobacco from the outside of the annulus of compacted tobacco, the new surface which is left after cutting is of the same radius as the original annulus. A guide **108** is provided at this point to support the freshly cut surface of the annulus until it reaches the foraminous band **70** at roller **78** where the air pressure will press it tightly against that band with which it will continue to rotate.

During the whole of this movement, the fan rotor **56** is continuing to deliver air and tobacco onto the inside surface of the annulus which is being continuously built up to preserve the dimensions of that annulus in order that substantially constant conditions may exist regarding its density. In order to maintain these constant conditions it is evident that some control must be exercised over the amount of tobacco being fed into the apparatus.

One method of accomplishing this is to provide a transparent window **110** in either the rear wall **62** or front wall **64** of the fan casing. At substantially the same radius as this window one or more lights and photoelectric cells **112** are provided in such a manner that the cell or cells will be able to differentiate between the light reflected from the surface of the opposite fan wall and that reflected from the tobacco annulus. The signal is amplified in amplifier **111** and fed to control device **113** which adjusts the speed of the primary feeding apparatus similar to that shown in U.S. Patent No. 2,729,213, and in FIGURE 3 which will control the amount of tobacco delivered to the rod forming apparatus so as to keep the width of the compacted annulus of tobacco constant.

With tobacco stream forming mechanisms in general, it is necessary for obvious reasons to be able to adjust the weight per unit length of the tobacco stream formed. It is also frequently desirable to be able to change this weight per unit length whilst the machine is in operation and for this particular apparatus three separate methods among others are particularly suitable. Firstly, if the band knife **88** is operating at a fixed distance from the tangential run of the belt **70**, the height of the tobacco strip being severed will be constant and its mass per unit length may be changed by altering its width.

This may be accomplished by moving the front casing **64** relative to the rear casing **62** by moving its supporting bracket **66** by means of the screw **114**, which will alter

the dimensions of the cross-section the annular space in which the annulus is formed and thereby cause it to be wider or narrower as required. The distance between casings **62** and **64** may be controlled by control device **113**.

Secondly, if the space between the fan sides **62** and **64** is maintained constant, the height of the tobacco strip may be altered to change the mass per unit length of the strip produced. This may be accomplished by altering the position of the tangential run of the band **70** where it passes below the cutting edge of the knife. The band at this point is supported by the top face of the suction box **94** which is pivoted about the pivot **116** and positioned by means of the screw **118**.

It will be seen that by turning the screw **118**, the box **94** will be raised or lowered to alter the distance between its top face and the cutting edge of band **88** to so change the height of the tobacco strip severed by that knife and thereby change its mass per unit length. This may be effected by control device **113**.

A third method of adjusting the weight of the strip may be accomplished by varying the rate at which the strip is transferred from the band **70** over roller **76** onto cigarette paper **96** over roller **98**. It is well known to run the cigarette paper in such apparatus at a slower rate of speed than that of the tobacco stream being delivered onto it for purposes of selectively densifying the stream at the point of transfer.

This difference in speed is usually constant, but it is quite evident that the speed may be varied in order to cause the incoming tobacco stream to be built up to a more dense stream on the tobacco paper in accordance to any requirement. To accomplish this the whole of the rod forming apparatus described will be driven via a variable speed mechanism so that its speed may be adjusted to deliver the tobacco at the required rate onto the constant speed cigarette paper **96**.

The methods of adjusting the weight of the final tobacco stream described above may each be operated manually or may each be operated by signals produced by means of known gaging methods, such as the photoelectric detector described, which are in common use for measuring the mass of a passing tobacco stream. Such gaging devices may be applied to this mechanism to measure the stream adjacent to its point of severance and would produce an electric current proportional in some way to the mass of tobacco passing, which current would be used to operate an electric motor for turning the adjustment controls.

Such a motor is shown at **120** which will turn screw **118** by means of the gear **122** attached to the motor shaft. Such a motor could equally well drive the adjusting screw **114** or could turn the control means of the variable speed drive which may alternatively be used for controlling the speed of the rod forming mechanism as described above.

As already described, the compacted tobacco at the moment of severing the slice which forms the desired tobacco stream, is under control by being adhered to the moving belt **70** by reason of suction in the box **94**. It also has pressure applied to the inside of the annulus by reason of the movement of the fan rotor **56** and is confined between the two fan walls **62** and **64** so that as the knife **88** is kept in a properly sharpened condition no difficulty is experienced in severing the strip.

However, if the knife **88** is through negligence allowed to become less sharp than desirable, it may under some circumstances disturb the tobacco at the moment of cutting and so cause the severed strip to contain inequalities which do not exist in the outer strata of the compacted annulus. In order to cope with such conditions, the slicing arrangement shown in FIGURES 4, 5, 6 and 7 may be employed. FIGURE 4 shows a plan view of this arrangement, **124** representing the severed strip of tobacco which has been severed by two knives **126** and **128** arranged substantially as shown, being supported on their respective pulleys **130**, **132**, **134** and **136**.

Knife **126** has its chamfer **127** on top and knife **128** has its chamfer below. Thus, the cutting edges run together slicing the tobacco between two blades functioning somewhat similar to the two blades of a pair of scissors. This is shown in FIGURE 5. The point at which the cutting edges of the blades come into contact with each other is arranged in the center of the compacted tobacco to be cut, so that the force exerted by the cutting edge of one knife against the tobacco is exactly balanced by the corresponding force exerted by the cutting edge of the other knife. Also, the linear velocities of the knives **126** and **128** are so arranged that their component of movement in the direction of movement of the compacted tobacco is substantially the same, so that as the cutting process proceeds with this system of knives, the compacted tobacco will move according to the speed of the band **70**, which will be matched by the horizontal component of the knives **126** and **128**, thus avoiding completely any possibility of disturbing the tobacco at the cutting.

In order to accommodate these knives, the shape of the outside diameter of the fan casings **62** and **64** must be modified as shown in FIGURE 7, permitting the tape **70** assume the trough shape as illustrated.

It is evident that a simplification of this general scheme may be employed to form a tobacco stream, which modification would permit machine speeds much higher than those currently in use and would, because of the method employed of compacting and distributing the tobacco strands, produce a more uniform rod than is normal. This modification is shown in FIGURE 8. As will be seen, the slitting knife is not incorporated in this mechanism and the incipient annulus of tobacco is built up only sufficiently to form the unit mass of the final stream desired, so that the whole of the tobacco collected on the band **70** is removed from the mechanism at the delivery point, to be deposited on the endless cigarette paper web in a manner already described. In order to accomplish this, it is evident that some means must be provided to enable the tobacco stream to be extracted without releasing the air pressure which exists inside the fan casing. This may be accomplished as follows:

Two side plates **136** are provided which seal against the outside diameter of the fan sides **62** and **64** and against the band **70** where it moves in a tangential direction towards roller **76**, and a narrow roller **138** is provided below which the tobacco stream is pressed onto the top surface of the band **70** as it passes outwardly in the direction of the arrow. This roller **138** fits snugly between the two sides **136** and also between the fan sides **62** and **64** in a substantially airtight joint. Between this roller and the roller **78** over which the band **70** passes is fitted a filling piece **140** which seals against the outside diameter of the fan sides **62** and **64** and against the roller **138** and against the band **70** supported on roller **78**.

Thus air pressure may be maintained inside the apparatus at all times permitting the tobacco stream to pass out of it between the roller **138** and band **70** without permitting air to pass out at the same time. Thus, the desired tobacco stream may be formed utilizing the advantages of this invention without going to the extent of the more complicated alternative form.

According to the above description, a tobacco laden air stream is formed by drawing air from the open room by means of a fan, introducing tobacco particles into the air stream and directing said stream into the center of an annular space from which point it flows outwardly towards the foraminous band which forms the outside confining surface of the annular space and on which the tobacco is deposited as the air passes through the band into the open room again. This is the simplest arrangement and is satisfactory on most classes of tobacco, for the air is filtered through the compacted tobacco annulus

and foraminous band before it is released into the room, ensuring that no undue quantity of tobacco dust is permitted to escape with the discharged air.

However, with some classes of tobacco and under some conditions this may not be entirely satisfactory and it may be desirable to build the apparatus so that the air is constrained to flow in a closed circuit so that any dust which may pass through the foraminous band is re-circulated through the apparatus, so avoiding completely contamination of the atmosphere. One method of accomplishing this is shown in FIGS. 1 and 2.

The rolls **80**, **82**, **84** and **86** would be moved outwardly away from the center of the apparatus to provide more space between them and the periphery of the fan casings **62** and **64**. Completely encircling this periphery in the space so provided is furnished a hollow box like member **142** shown in cross section on FIGURE 2. A plurality of pipes **144**, are suitably spaced around the casing or box **142** and connected therewith. These pipes **144** are connected directly to the entrance end of the duct element **22**, FIGURE 3. This allows the air which passes through the foraminous belt **70** to be conducted directly back into the apparatus again, carrying any dust it may contain with it, thus avoiding contamination of the atmosphere.

With such a closed circuit the fan employed to circulate the air may be placed anwyhere in said circuit, the example shown in FIGURES 1 and 2 being one of many possible alternatives.

Also, in that embodiment of this invention employing the circular hollow box **142** to collect and return the air through the apparatus, said hollow box may be made in two or more compartments **143**, each compartment being connected by its own pipe **146** to a common return with a valve **148** in each pipe, to permit adjustment of the air passing through each segment of the apparatus covered by that portion of the box. In this way control may be exercised over the air passing to compensate for the gradually increasing thickness of the tobacco annulus mentioned herein.

The invention hereinabove described may therefore be varied in construction within the scope of the claims, for the particular device selected to illustrate the invention is but one of many possible embodiments of the same. The invention, therefore, is not to be restricted to the precise details of the structure shown and described.

What is claimed is:

1. In a tobacco manipulating machine such as a continuous rod type cigarette making machine, a fan rotor having radial passages for delivering shredded tobacco centrifugally towards its periphery, rotatable walls forming a casing for the fan rotor, a perforated belt for supporting said tobacco at the periphery of said casing, a belt guide for guiding said belt away from said periphery at a predeterminted portion of the path of travel of the periphery of said casing, a severing device positioned in said path for removing a determined portion of tobacco accumulating around the periphery of said casing and means for delivering said portion of tobacco to the rod forming mechanism of a cigarette making machine.

2. In a tobacco manipulating machine such as a continuous rod type cigarette making machine, a pair of circular rotatably mounted walls spread from each other to permit the passage of air and tobacco therebetween, means in at least one of said circular walls to permit the entry of said air and tobacco, a perforated belt for collecting said tobacco at the periphery of said walls, a belt guide for guiding said belt away from said periphery at a predetermined portion of the path of travel of the periphery of said walls, a severing device positioned in said path for removing a determined portion of tobacco from that accumulating around the periphery of said walls and means delivering said portion to the rod forming mechanism of a cigarette making machine.

3. A tobacco manipulating machine having the features provided for in claim 2 wherein means are provided for changing the amount of tobacco delivered to said rod forming mechanism.

4. The method of forming a cigarette rod which comprises feeding continuously a stream of shredded tobacco, centrifugally forming a compacted rotating annulus of tobacco of the desired thickness continuously shearing a continuous strip of tobacco from the annulus of compacted tobacco regulating the amount of tobacco sheared to provide a continuous strip of substantially constant mass per unit length, and then forming said strip continuously into a cigarette rod.

5. Apparatus for feeding and forming shredded tobacco into a continuous cigarette rod comprising a centrifugal fan rotor having a hollow core and radial passage ways connecting said hollow core with the periphery of said motor, rotatable walls forming a casing for said rotor, a source of supply for tobacco particles connected to said hollow core so that said tobacco particles are drawn through the core and fan rotor together with the air which is caused to move therethrough when the fan rotor is rotated, a belt travelling with the periphery of said casing for a predetermined portion of the travel thereof to support the centrifugally delivered tobacco at the periphery of said walls, means removing a determined quantity of tobacco from the tobacco that has been accumulated on the belt around said walls as the periphery of said walls travels past a given point and means for forming the tobacco so removed into a cigarette rod.

6. Apparatus for forming shredded tobacco into a continuous rope comprising a source of supply of tobacco strands, means providing a moving air stream into which the tobacco strands are fed and which transports said strands in a widely dispersed formation, a pair of rotatably mounted circular side walls mounted with a space between them, a drive for rotating said walls, means for introducing the air stream carrying the tobacco strands into the center of the space between the side walls so that said air stream and tobacco strands are constrained to move between the side walls outwardly in substantially radial directions, a perforate belt wrapped around nearly all of the periphery of the side walls for a predetermined portion of the travel thereof to support the radially delivered tobacco thereon while the transporting air is permitted to pass there through and means removing a determined quantity of tobacco from that accumulated on the belt around said walls as the periphery of said walls travels past a given point, said quantity so removed constituting the continuous rope desired.

7. In a tobacco manipulating machine such as a continuous rod type cigarette making machine, means forming a compacted rotating annulus of tobacco of the desired thickness by feeding substantially separate strands of tobacco into the approximate center of an annular space, means to locally distort one portion of the annulus so that the distorted portion momentarily moves in a tangential path, a severing means which severs a continuous strip from the outside diameter of said annulus in such a manner that the severed strip continues in a tangential path and the remainder of the annulus continues in a circular path, means for guiding the freshly severed surface, a measuring device adapted to control the dimensions of the strip severed by said severing means, a feeding means for building up of the inside of the annulus simultaneously with the severing of the strip at such at rate that the tobacco annnulus is maintained at substantially constant dimensions, and means for transferring the severed strip of tobacco on to an endless cigarette paper web, to be formed into a cigarette rod.

8. A tobacco manipulating machine having the features provided for in claim 7 wherein said feeding means consist of a pneumatic feed for the delivering substantially separate strands of tobacco to said tobacco annulus forming means.

9. A tobacco manipulating machine having the fea-

tures provided for in claim 8 wherein said tobacco annulus forming means are covered by a sufficient thickness of tobacco forming a sieve, said forming means consisting of a foraminous belt of such a texture that it would not form an efficient sieve without the assistance of the tobacco in order that the belt may offer the minimum resistance to the air passing through it.

10. A tobacco manipulating machine having the features provided for in claim 7 wherein said forming means includes a confining foraminous endless band and wherein said feeding means consists of a rotary fan for maintaining an air flow through the annulus of compacted tobacco so as to push the annulus of tobacco tightly against said confining foraminous band, to hold it in place and to locally distort the portion of the annulus of tobacco at the zone adjacent said severing means for severing the tangential strip of tobacco from the outside of the annulus.

11. A tobacco manipulating machine as provided for in claim 10 wherein means are provided for collecting the air as it leaves the annulus forming mechanism, and for conducting said air back to a tobacco strand supplying apparatus.

12. A tobacco manipulating machine as provided for in claim 10 wherein means are provided for collecting the air as it leaves the annulus forming mechanism, said means being divided into a plurality of separate compartments, each with its own pipe into which a valve is fitted to permit adjustment to be made in the air passing through each compartment, said pipes being merged into a single pipe adapted to conduct the air back to a tobacco strand supplying apparatus.

13. A tobacco manipulating device having the features provided for in claim 10 wherein a suction box is positioned to apply suction to the underside of the tangentially extended run of the foraminous belt to assist in the distortion of the portion of the annulus of compacted tobacco approaching the severing means, and to prevent relative movement between the compacted tobacco and the foraminous belt before, during the after severing.

14. A tobacco manipulating machine for forming a continuous stream of tobacco comprising, a centrifugal fan rotor, means to feed tobacco laden air into the approximate center of the fan rotor, a pair of freely rotatably mounted circular members forming the side walls of the fan assembly, a foraminous band of which one run is wrapped around almost all of periphery of the side walls with an extended run of the band moving tangentially to the side walls, the three sided space formed by the side walls and the foraminous band being of suitable dimensions to form a compacted mass of tobacco of the desired dimensions, a band knife whose cutting edge is substantially parallel to the axis of the fan rotor and which is positioned relative to the tangential run of the foraminous band to sever a strip of tobacco from the compacted mass, a conveyor for receiving and conveying said strip to the rod forming mechanism of a cigarette making machine, and means to recirculate the remainder of the tobacco between the circular side walls forming a matrix upon which further tobacco is compacted to re-form the compacted tobacco mass to substantially its original dimensions to again be presented to the band knife.

15. A method of forming a compacted annulus of tobacco of the desired thickness of substantially constant cross sectional dimensions comprising feeding a desired amount of tobacco, forming a compacted annulus of tobacco, scanning the inside diameter of the annulus by means of a light beam to measure the radial depth of the annulus and, in conjunction with a photoelectric cell, generating a signal to control the amount of tobacco fed into the annulus to maintain the inside diameter of the annulus at a substantially constant diameter.

16. A tobacco manipulating machine for forming a continuous stream of tobacco having the features provided for in claim 14 wherein the freely rotatable side walls of the fan assembly are relatively adjustable in an axial direction so as to vary the space between them to cause variation in the thickness of the compacted annulus of tobacco to adjust the mass per unit length of the strip of compacted tobacco severed from the outside diameter of the annulus.

17. A tobacco manipulating machine having the features provided for in claim 16 where there is provided a gauge to measure said strip of tobacco prior to severing for controlling the adjustment of the side walls.

18. A tobacco manipulating machine for forming a continuous stream of tobacco having the features provided for in claim 14 wherein a support is provided for the tangential run of the foraminous band, together with an adjusting means for said support, mounted to vary the distance between the top surface of the said band and the severing means to change the cross section of the strip of compacted tobacco severed and thereby its mass per unit length.

19. A tobacco manipulating machine having the features provided for in claim 18 wherein there is provided a gauge to measure said strip of tobacco prior to severing for controlling the operation of said adjusting means.

20. A tobacco manipulating machine for forming a continuous stream of tobacco having the features provided for in claim 14 wherein is provided a variable speed drive for said machine to adjust the speed thereof to vary the rate at which the severed strip of compacted tobacco is delivered on to a constant speed cigarette paper web thus making it possible to adjust the mass per unit length of the stream of tobacco so formed on the cigarette paper.

21. A tobacco manipulating machine having the features provided for in claim 20 wherein there is provided a gauge to measure the mass of the strip or stream of tobacco produced for controlling the operation of said variable speed drive.

22. A tobacco manipulating machine for forming a continuous stream of tobacco having the features provided for in claim 2 in which the severing device comprises crossed band knives, having cutting edges, the point of intersection of their cutting edges being approximately in the center of the width of the moving tobacco to be cut, and the chamfers which form the cutting edges on the knives being on the sides opposite to those which rub together at the point of intersection, means for driving each band knife in the same general direction in which the tobacco is moving and at such speeds that their components of velocity parallel to the direction of movement of the tobacco are substantially equal to the velocity of movement of the tobacco so that the tobacco is severed by the scissors-like action of the two band knives without disturbance.

23. Mechanism for forming an endless stream of tobacco comprising, a centrifugal fan rotor, means to feed tobacco laden air into the approximate center of the fan rotor, a pair of freely rotatably mounted circular members forming the side walls of the fan assembly, a foraminous band of which one run is wrapped around almost all of the periphery of the side walls with an extended run of the band moving tangentially to the side walls, said foraminations being of such a texture that they will permit the tobacco conveying air to pass through them whilst retaining the tobacco on their surface, the three sided space formed by the side walls and the foraminous band being of such dimensions as to form a stream of tobacco of the desired dimension.

24. Apparatus for forming shredded tobacco into a continuous rope comprising a source of supply of tobacco strands, means providing a moving air stream into which the tobacco strands are fed and which transports said strands in a widely dispersed formation, a pair of rotatably mounted circular side walls mounted with a space between them, a drive for rotating said walls, means for introducing the air stream carrying the tobacco strands into the center of the space between the side walls so that said air stream of tobacco strands is con-

strained to move between the side walls outwardly in substantially radial directions, a perforate belt wrapped around nearly all of the periphery of the side walls for a predetermined portion of the travel thereof to support the radially delivered tobacco thereon whilst the transporting air is permitted to pass therethrough, an extended run of the belt running tangentially to the side walls to carry the tobacco deposited thereon away from the side walls in the form of a continuous rope.

25. An air lock device for use with the mechanism described in claim 23 comprising, a driven exit wheel whose thickness is substantially equal to the space between the rotatably mounted side walls of the centrifugal fan and which is so mounted to project into that space, two side plates mounted to fill the space between the fan side walls and the tangential belt extension, one being mounted on each side of the exit wheel in rubbing contact with it, and a triangular shaped member whose profile fills the space between the exit wheel, the outside diameter of the fan side walls and the foraminous belt at the end of the run opposite the tangential extension, so that the tobacco stream can pass between the two side plates and under the exit wheel whilst supported on the top surface of the foraminous band without permitting the passage of any substantial quantity of air.

26. A method of forming a continuous rope of tobacco comprising the steps of forming a hoop of compacted tobacco, rotating the compacted hoop, maintaining air pressure inside the hoop to distort it locally prior to severing, severing a strip continuously from outside of the hoop where it is distorted so that that portion of the hoop remaining after the strip is severed therefrom is of the same outside diameter as that of the hoop before distortion, said continuous strip so severed constituting the continuous rope desired, continuously supplying tobacco to the inside of the hoop simultaneously with the removal of the strips from the outside of the hoop, the supply to the inside of the hoop being at a rate to compensate for the removal of the strip from the outside of the hoop so that the quantity of tobacco contained in the hoop remains constant at all times.

27. Mechanism for producing a continuous rope of tobacco such as is required for example in a continuous rod type cigarette making machine comprising a pair of circular rotatably mounted walls, spaced from each other to permit the passage of air and tobacco therebetween, means in at least one of the said circular walls to permit the entry of said air and tobacco under pressure from a source provided, a perforated belt for collecting said tobacco at the periphery of said walls as the air passes through thereby forming a hoop of compacted tobacco between the two walls and the perforate band, said hoop being under constant internal pressure by reason of the air employed to deliver the tobacco therein, a belt guide for guiding said belt away from said periphery at a predetermined portion of the path of travel of the periphery of said walls, said internal air pressure causing the hoop of tobacco to be distorted to follow the belt where it leaves the periphery of the side walls, a severing device positioned in this region for removing a determined portion of tobacco from the hoop where it is distorted so that the outside diameter of the hoop remaining after the portion of tobacco is removed therefrom is of the same outside diameter as that of the hoop before distortion, the determined portion of tobacco removed by the severing device constituting the rope of tobacco desired, means for continuously supplying air and tobacco to the inside of the hoop simultaneously with the removal of the determined portion of tobacco from the outside of the hoop to maintain the distorting air pressure inside the hoop continuously and to supply tobacco to the inside of the hoop at a rate to compensate for the removal of the determined portion from the outside of the hoop so that the quantity of tobacco contained therein remains constant.

28. Apparatus as described in claim 23 in which an air lock device is provided to permit the tobacco rope to be withdrawn from the apparatus without permitting the exit of a significant quantity of air, comprising a rotating roller closely fitting between the two side walls between which it projects, said roller pressing closely against the rope of tobacco issuing from the mechanism, holding it firmly against the foraminous band, a side guide on each side of the rotating roller, the peripheries of the side walls and the top surface of the foraminous band join in such a manner that substantially air tight joints exist at all points, and a filler piece positioned between the rotating roller, the outside diameter of the side walls and the foraminous band.

29. A method of forming a rod of tobacco of a desired density comprising the steps of forming an annulus of tobacco by centrifugally compacting air-borne tobacco particles in an annular porous main matrix, by the force resulting from the change in momentum of the air-borne particles of tobacco as they impinge on the surface of the porous matrix or on an underlying tobacco layer previously so deposited, while air escapes through the porous matrix and forming a continuous tobacco rod from the annulus of tobacco.

30. A method of forming a rod of tobacco of a desired density as claimed in claim 29 comprising the further step of maintaining the compacted condition of the annulus of tobacco after formation by a second force exerted by the air current passing through the deposited tobacco layer and the porous matrix, said second force assisting that produced by the force due to the change in momentum of the tobacco particles to produce the desired total compacting force.

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