April 25, 1967 W. RICHTER 3,315,685

METHOD OF PRODUCING A CONTINUOUS TOBACCO ROD

Original Filed Nov. 16, 1959 5 Sheets-Sheet 1

Fig. 1

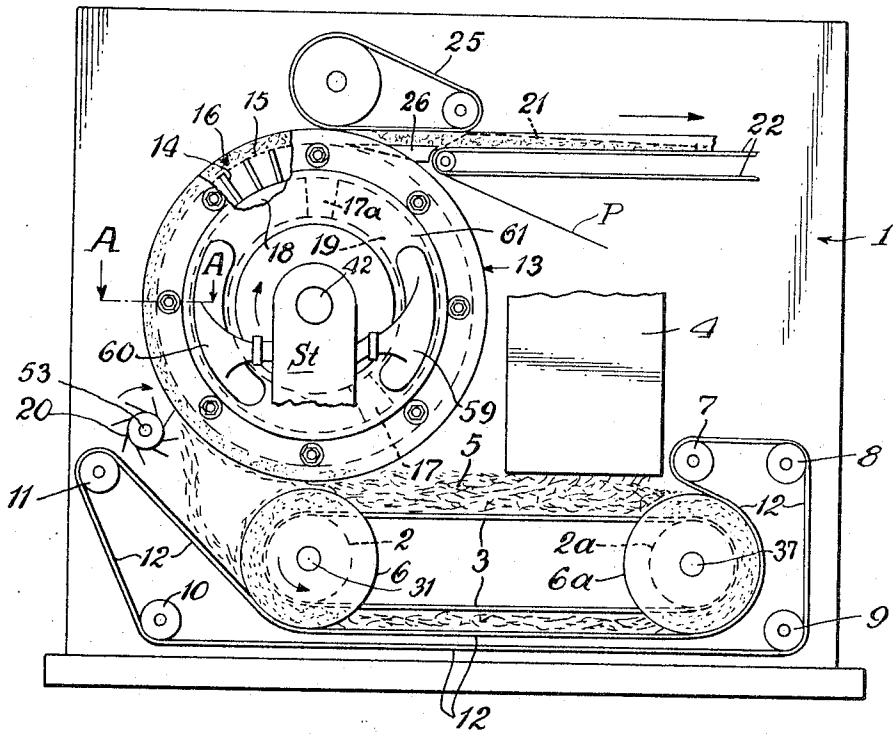


Fig. 2

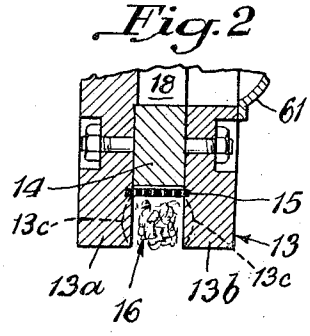


Fig. 3

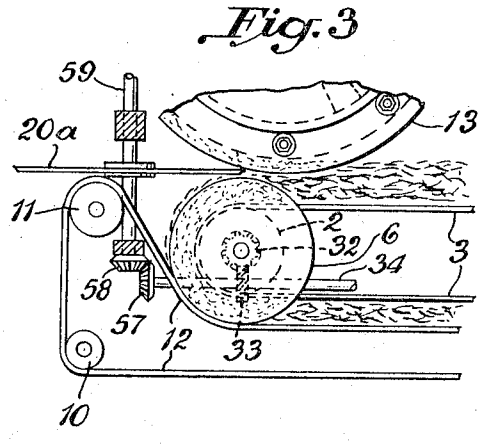


Fig. 4

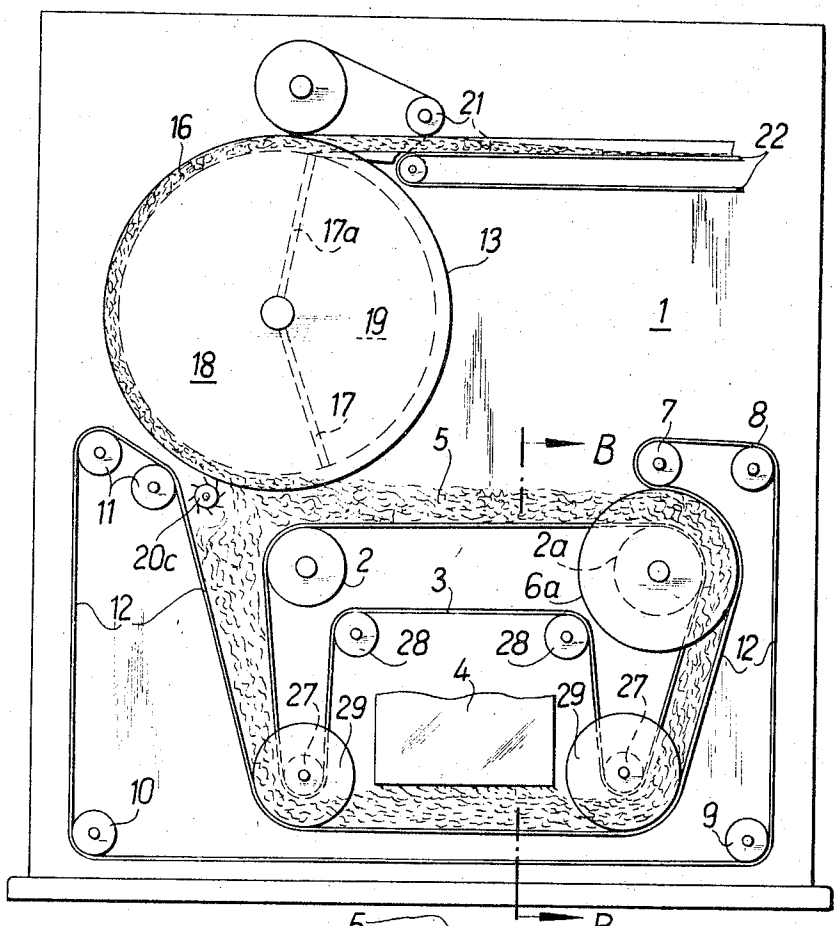

16
21
22
17a
13
19
1
18
17
5
B
7
8
11
20c
2
2a
3
6a
12
28
28
12
4
27
29
29
27
10
9
5
B
2a
6a
3
1
4
12

Fig. 5

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Fig. 6

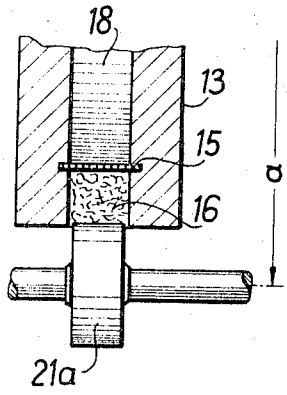


Fig. 8

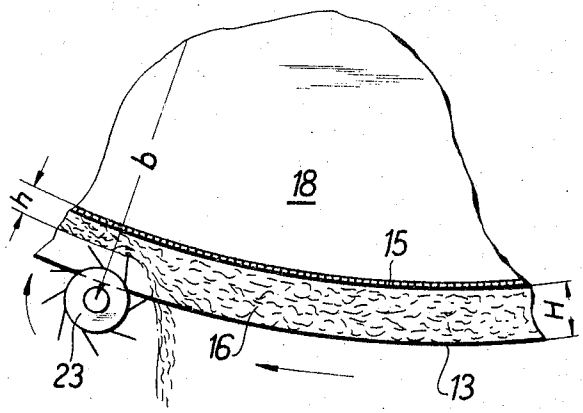
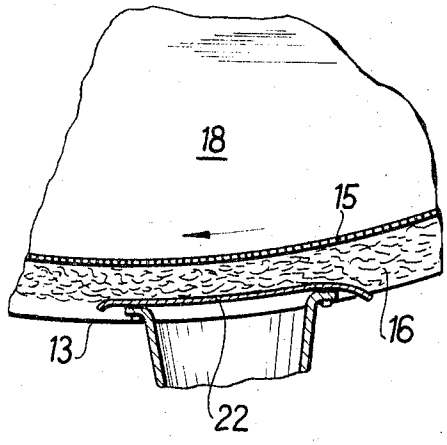


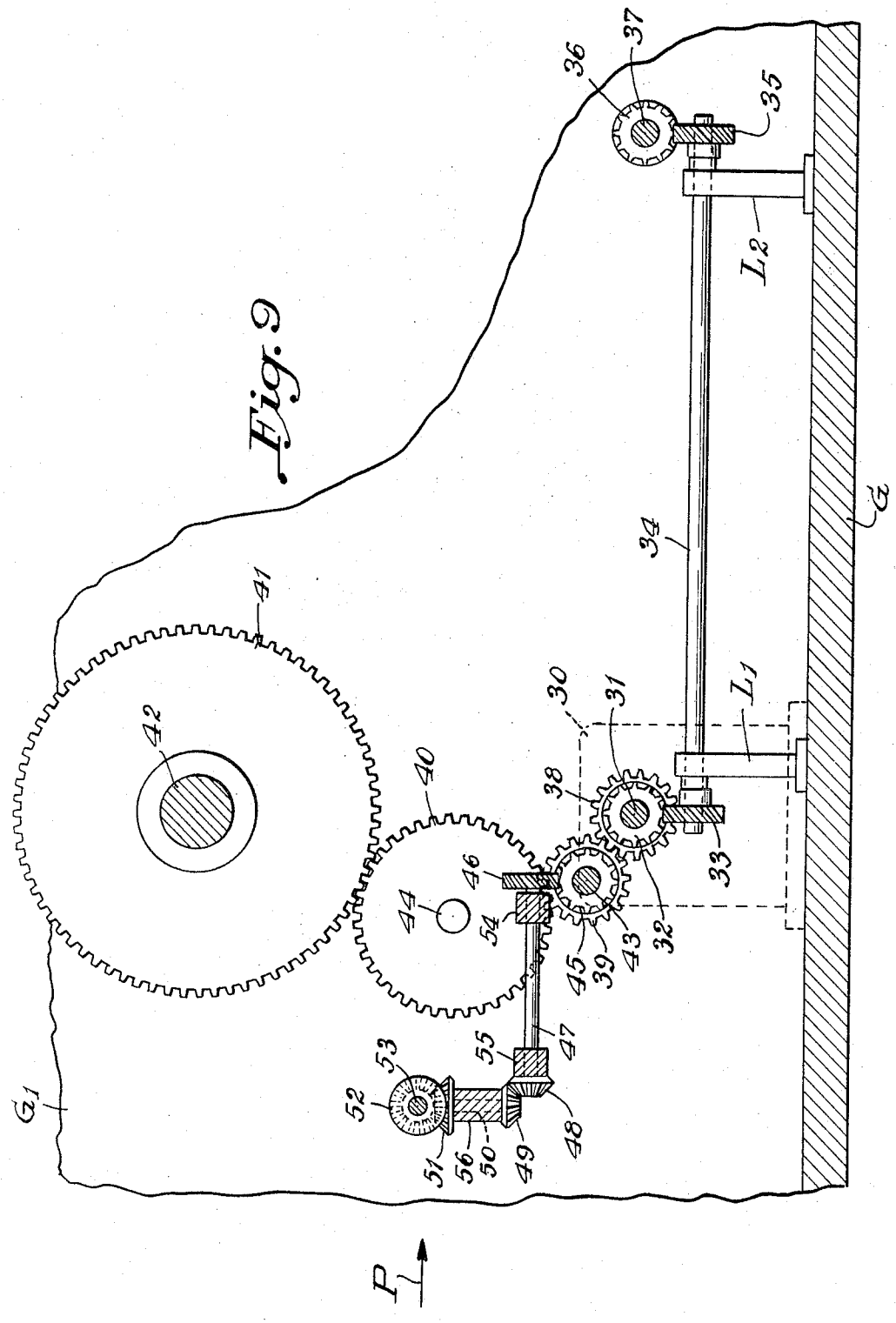
Fig. 7



METHOD OF PRODUCING A CONTINUOUS TOBACCO ROD

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Fig. 9



METHOD OF PRODUCING A CONTINUOUS TOBACCO ROD

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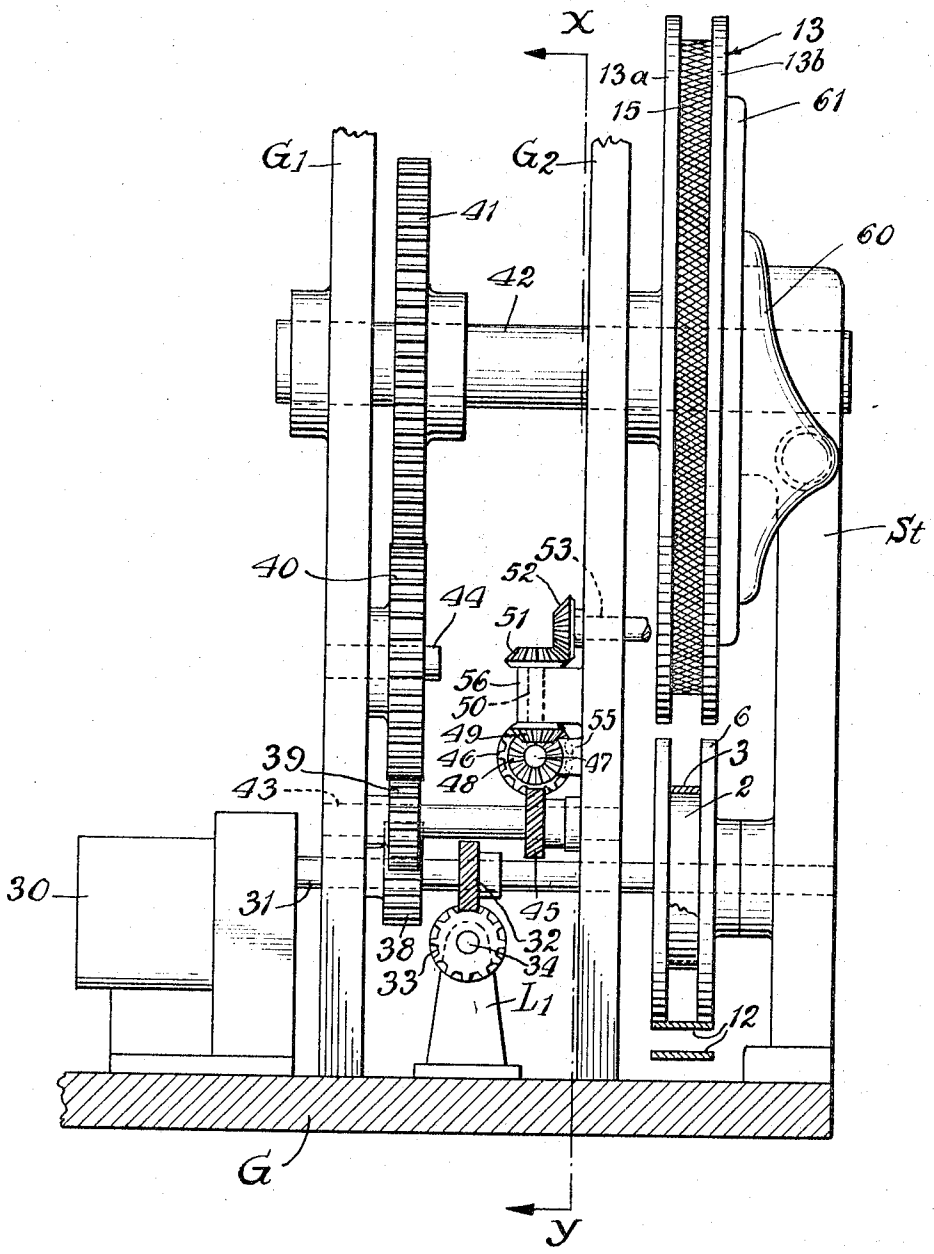


Fig. 10

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METHOD OF PRODUCING A CONTINUOUS TOBACCO ROD

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Continuation of application Ser. No. 853,273, Nov. 16, 1959. This application Jan. 25, 1963, Ser. No. 253,886
Claims priority, application Germany, Nov. 21, 1958, H 34,865
13 Claims. (Cl. 131—84)

This is a continuation of my application Ser. No. 853,273, filed Nov. 16, 1959, now abandoned.

The present invention relates to the manufacture of tobacco containing products, and more particularly to the manufacture of cigarettes.

The present invention relates to a method of producing a tobacco rod which is of uniform cross-section and which may be of uniform density. Known methods of forming a tobacco rod of which I am aware at this time are not completely satisfactory because the density of the tobacco rod is not always uniform. Such non-uniformity in the density of tobacco rods is due less to the organic nature of the tobacco and to its often varying physical properties than to the influence of conventional cigarette making machines wherein tobacco is often subjected to treatment which prevents it from forming a rod having the desired characteristics and which treatment in some cases affects the coherence between the particles of the already formed tobacco rod. For example, when tobacco fleece is being removed from a carding roller, the fibers may be torn apart to such an extent that the structure of the fleece is substantially altered or that the fleece is desroyed before it is fed to the rod-forming parts of the machine.

With these considerations in mind, one object of the present invention is to provide a method which comprises separating a continuous stream of tobacco by suction from a thicker tobacco layer which travels in an endless path, and transforming the continuous stream into a tobacco rod.

The separation of the tobacco stream from the thicker tobacco layer may be effected by means of a rotary forming wheel rotating in peripheral contact with the non-uniform tobacco layer and exerting a sucking action upon a portion of the tobacco layer so as to pick up required quantities of tobacco from the non-uniform tobacco layer.

The method of my invention will now be described with reference to the accompanying drawings in which:

FIG. 1 is a diagrammatic side elevational view of a cigarette rod making machine which may be utilized for carrying out the method of my invention,

FIG. 2 is an enlarged fragmentary section as seen in the direction of arrows from the line A—A of FIG. 1,

FIG. 3 is a fragmentary side elevational view of a slightly different cigarette rod making machine,

FIG. 4 is a diagrammatic side elevational view of a modification of the device shown in FIG. 1,

FIG. 5 is a fragmentary transverse section as seen in the direction of arrows from the line B—B of FIG. 4,

FIG. 6 is a fragmentary axial section through the suction wheel of the device shown in FIG. 1 or 4 and illustrates a rotary compressing member for the tobacco stream,

FIG. 7 is a fragmentary section taken at right angles to the section of FIG. 6 and illustrates a fixed compressing member for the tobacco stream,

FIG. 8 is a section similar to that of FIG. 6 but showing a trimmer which can be used in addition to the trimmer shown in FIG. 1 or 4,

FIG. 9 is an enlarged vertical section through the driving means of the cigarette rod making machine shown in FIG. 1 or 3, as seen from the line X–Y of FIG. 10, and FIG. 10 is an end view of the driving means as seen in the direction of the arrow P in FIG. 9.

The machine shown in FIG. 1 employs an endless substantially horizontal travelling conveyor belt **3** for advancing the tobacco layer which is to form a tobacco rod. This endless conveyor belt **3** is supported by the machine frame **1** and is trained around horizontal guide rollers **2**, **2***a*. A shower of tobacco is deposited on the upper stretch of the conveyor belt **3** by the discharge member **4** of a tobacco distributor or feeder of conventional construction so as to form on the conveyor belt **3** a continuous travelling mass or layer **5** of tobacco the thickness or cross-section of which is substantially greater than the cross-section of the tobacco rod to be formed and whose width equals the width of the belt **3**. Suitable guide rails may be provided along each side of the travelling belt **3** to keep the width of the tobacco layer within desired limits so that the quantity of tobacco in the layer may approach that of a tobacco rod.

A forming wheel **13** with a groove **16** in its circumference rotates in a vertical plane about the axis of a horizontal driven shaft **42** which is located at a level above the roller **2**. As shown in FIG. 2, the wheel **13** comprises two axially spaced circular discs **13***a*, **13***b* held in spaced relation by spacer members **14**. A porous or air-permeable annular tape **15** is clamped or otherwise secured between the discs **13***a*, **13***b* and is concentric to the shaft **42** to form the bottom wall of the groove **16** the side walls of which are formed by the two discs **13***a* and **13***b*. The cross-sectional area of the groove **16** is only slightly greater than the cross-sectional area of the desired cigarette rod. The hollow space defined by the circular tape **15** and by the two discs **13***a* and **13***b* accommodates a stationary suction chamber **18** extending between two stationary radial walls **17**, **17***a* (FIG. 1), and also a compressed air chamber **19** formed between the radial walls **17***a* and **17** or along a part of the zone between the walls **17***a*, **17**. The suction prevailing in the chamber **18** or the air pressure prevailing in the chamber **19** will be operative in the circumferential groove **16**. A tobacco trimming roller **20** is located near to the roller **2** and is adjacent to the periphery of the forming wheel **13** to serve as a means for levelling or equalizing the surface of the tobacco stream which has been transferred into the groove **16**. The tobacco rod obtained upon trimming of the tobacco stream leaves the groove **16** of the wheel **13** after the latter has rotated through about 180 degrees from the point where the tobacco stream has entered the groove **16**. At the discharge point, compressed air enters the groove **16** from the chamber **19** and at this point the tobacco rod meets a strip of cigarette paper P which is fed to the top stretch of an endless cigarette rod forming belt **22** on which the tobacco rod enters a guide **21** leading into a cigarette rod forming device of a conventional type. An endless presser belt **25** and a bridge member or stripper **26** may be provided to assist in transferring the equalized tobacco stream to rod forming members including a conveyor belt **22**.

That portion of the tobacco layer **5** which is not picked up by suction and which does not enter the groove **16** of the wheel **13** continues to travel in an endless path by moving with the conveyor belt **3** and is held against the lower run of the belt **3** by an endless belt **12** trained around guide rollers **7**, **8**, **9**, **10** and **11**. Such returning portion of the tobacco layer is also supported by flanges **6**, **6***a* respectively provided on the rollers **2** and **2***a*.

In using the machine shown in FIGS. 1 and 2, tobacco particles showered from the discharge member **4** of the

tobacco distributor onto the conveyor belt **3** form on the latter a continuous layer or mass **5** the cross-section of which is substantially greater than that of the desired tobacco rod. This layer is conveyed toward the roller **2** and its top portion is transferred into the groove **16** of the wheel **13** by suction, namely, by the current of air passing upwardly across the groove **16** and through the perforated tape **15**. The remaining or lower portion of the tobacco layer **5** passes around the roller **2** to be returned to the starting point of the endless conveyor belt **3** beneath the discharge member **4**. During such return movement, the remainder or bottom portion of the tobacco layer **5** is held between the lower run or stretch of the conveyor belt **3** and the upper stretch of the conveyor belt **12**.

The rotary forming wheel **13** takes up so much tobacco from the conveyor belt **3** that the groove **16** is completely filled and that a portion of the tobacco stream projects beyond the outer edges of the discs **13***a*, **13***b* which define the outer periphery of the forming wheel **13**. The surface of the tobacco stream in the groove **16** is then levelled by the trimming roller **20** or by a similar equalizing device, such as the rotating circular cutter **20***a* shown in FIG. 3. This circular cutter **20***a* is arranged at the transfer point where tobacco enters the groove **16** in the wheel **13**. The cutter **20***a* is fixedly mounted on a vertical shaft **59**. As soon as the resulting tobacco rod which is carried by the rotating forming wheel **13** passes beyond the outer end of the stationary radial wall **17***a* it is forced out of the groove **16** by the pressure prevailing in the compressed air chamber **19** and the tobacco rod is then introdued into the guide element **21** above the cigarette rod forming belt **22**. At the same time, tobacco residues are removed from the groove **16** by compressed air passing outwardly from the compressed air chamber **19** through the perforated bottom wall **15**.

Excess tobacco removed by the trimming roller **20** descends by gravity and is added to the returning portion of the tobacco layer **5** carried between the endless conveyor belts **3** and **12** to return beneath the discharge end of the tobacco distributor **4**. The continuously travelling portion of the tobacco layer **5** forms a reserve and not only serves as a buffer which compensates for any irregularities in the rate at which tobacco is being discharged by the tobacco distributor but it also causes some mixing of the tobacco particles.

The tobacco distributor should be adjusted to supply such a quantity of tobacco as is required to form the desired tobacco rod so that the quantity of tobacco remaining in circulation on the endless belt **3** and carried between the belts **3** and **12** remains substantially constant. Further, owing to the manner in which the tobacco stream is formed in the groove **16** of the forming wheel **13** and owing to the fact that the surface of the tobacco stream in the groove **16** is trimmed or equalized by the trimming roller **20**, the resulting tobacco rod which is carried upwardly by the forming wheel is of substantially uniform cross section and density so that the weight of cigarettes produced by the machine is as uniform as possible.

In the modified machine which is shown in FIG. 4, a tobacco layer **5** circulates continuously on an endless tobacco receiving belt **3** the lower stretch of which is trained around additional guide rollers **27** and **28**, the roller **28** being disposed at a substantial distance above the upper stretch of the conveyor belt **12**. In fact, the central portion of the lower stretch of the belt **3** is spaced from the surface of the tobacco layer on the central portion of the upper stretch of the conveyor belt **12** so that the discharge member **4** of the tobacco distributor may shower additional tobacco onto the upper surface of the tobacco layer moving along and with the upper stretch of the conveyor **12**. Owing to such arrangement, tobacco particles discharged by the distributor are mixed with the tobacco stream which is returned by the trimmer to the conveyor **12** so that the possibility of any of the tobacco particles remaining in continuous circulation in the layer **5** is reduced and a certain mixing action is obtained to insure that a maximum tobacco particles advance without undue delay into the forming wheel **13** and toward the cigarette rod-forming device.

In the modified machine of FIG. 4 the conveyor belt **12** is trained around flanges **29** which are concentric with the guide rollers **27** for the conveyor belt **3** and around flanges **6***a* which are concentric with the guide roller **2***a*. The surface of the tobacco stream in the groove **16** of the wheel **13** is trimmed or levelled by means of a rotary brush **20***c* in a manner similar to that described with reference to FIG. 1.

If it should be desired to produce so-called dense-end cigarettes, portions of the groove **16** may be enlarged as indicated at **13***c* in FIG. 2, at locations therealong which are equally spaced along the periphery of the wheel **13**, the spacing being such that when the rod is cut into individual cigarettes, at least one end portion of each cigarette will be more dense than the remainder thereof. Details of such enlarged portions are illustrated in greater detail in my co-pending application Ser. No. 493,322, filed Oct. 6, 1965.

The use of the forming wheel **13** is not limited to the just described machines since the wheel may also be used as a means for conveying a pre-formed tobacco stream. As shown in FIG. 6, a roller **21***a* may enter the forming groove **16** and its distance *a* from the axis of the forming wheel **13** may be adjusted so that the tobacco stream located in the forming groove **16** is compressed to a desired degree.

Further, and as shown in FIG. 7, a presser member **22** may be arranged at a point adjacent to the groove **16** and may be adjusted radially with respect to the forming wheel **13** for the purpose of mechanically compacting and/or smoothing the tobacco stream in the groove **16**.

Finally, and as shown in FIG. 8, an additional tobacco trimming element **23**, such as a rotary trimming roller, a brush or the like may be mounted at the periphery of the wheel **13** in such a way that its distance *b* from the axis of the forming wheel is adjustable. The width of the element **23** corresponds to the width of the groove **16**. This element acts upon the tobacco stream in the forming groove **16** in such manner that the initial height H of the stream is reduced to a constant height *h*. Obviously, the exact form of the wheel **13** can be selected according to the intended purposes of application without departing from the basic inventive idea.

The method of the present invention insures that the structure of the tobacco rod is substantially uniform in desired zone of the rod and, furthermore, an originally non-uniform tobacco stream may be converted into a tobacco rod of uniform density and of predetermined cross-section, which in some cases may be pre-compacted, and while maintaining this uniform structure the tobacco rod is fed to conventional cigarette rod-forming means in order to form a cigarette rod of uniform density and weight.

The driving means shown in FIGS. 9 and 10 will be described with reference to FIG. 1.

The roller **2** is driven directly by the output shaft **31** of an infinitely variable geared engine **30** (see FIG. 10). A spiral gear **36** which is mounted on a shaft **37** with the roller **2***a* is driven by a spiral gear **32** mounted on the shaft **31** through a spiral gear **33**, a shaft **34**, and a spiral gear **35**.

The shaft **31** is rotatable in housing walls G_1 and G_2 and in a supporting block S*t*. The shaft **34** is mounted in bearing blocks L_1 and L_2 which are mounted on a base plate G.

A shaft **42** on which the forming wheel **13** is mounted is driven by the shaft **31** through a train of gears **38**, **39**, **40** and **41** (FIG. 9). The gear **39** is mounted on a shaft **43** which is rotatable in the housing walls G_1 and

G_2. The gear 40 is mounted on a bearing pin 44 which is mounted in the housing wall G_1. The shaft 42 is mounted in the housing walls G_1 and G_2 and in the supporting block S*t*.

The trimming roll 20 is driven by the shaft 43 through a spiral gear 45 which is mounted on the shaft 43, through a spiral gear 46, through a shaft 47, through a pair of bevel gears 48, 49, through a shaft 50, through a pair of bevel gears 51, 52, and through a shaft 53 on which the trimming roll 20 is mounted.

In FIG. 10, the trimming roll 20 is not shown and only a portion of the shaft 53 is shown.

The shafts 47 and 50 are mounted in bearing blocks 54, 55, 56, shown also in FIG. 9, which are mounted on the housing wall G_2. For the sake of clarity, the bearing blocks 54, 55 have been omitted in FIG. 10.

The shaft 53 is mounted in the housing wall G_2, see FIG. 10.

In FIG. 3, the circular knife like trimming member 20*a* is driven by the lengthened shaft 34 (see FIG. 9) through a pair of bevel gears 57, 58 the latter of which is mounted on the knife shaft 59.

What I claim is:

1. A method of producing a continuous cigarette rod of constant cross section, comprising the successive steps of forming a continuous tobacco layer of uneven cross section and having an upper portion and a lower portion; continuously separating by suction the upper portion from the lower portion of the tobacco layer whereby the upper portion forms a continuous tobacco stream and contains tobacco in excess of that desired in the tobacco rod; conveying and trimming the tobacco stream by removing excess tobacco therefrom whereby the tobacco stream forms a tobacco rod of constant cross section wherein each unit length contains the same quantity of tobacco as each unit length of the desired cigarette rod; continuously wrapping the tobacco rod into a strip of cigarette paper to form a continuous cigarette rod; feeding trimmed-off excess tobacco into the separated lower portion of the tobacco layer; and returning the lower portion of the tobacco layer together with trimmed-off excess tobacco to the point where the tobacco layer is formed.

2. A method of producing a continuous tobacco rod comprising the steps of forming a filler stream of tobacco in excess of that required in said rod, conveying the filler stream in an elongated closed path, pneumatically removing tobacco from the upper portion of a horizontal and straight portion of the closed path, the removed portion comprising a further filler stream also containing tobacco in excess of that required in said rod, conveying the further filler stream in a vertically disposed arcuate path which is tangent to said straight and horizontal portion, trimming the excess tobacco from the further filler stream in said arcuate path thereby providing said continuous tobacco rod, and conveying and returning the tobacco in said filler stream remaining after said removal of the upper portion thereof, and the excess tobacco trimmed from the further filler stream in said arcuate path, through the remainder of the closed path to the location where said filler stream is formed.

3. A method of producing a continuous wrapped tobacco rod, comprising the steps of forming a continuous tobacco layer having an upper, a lower and an intermediate portion and moving the layer in an elongated

path, by separating some of said portions by suction and directing the intermediate and the upper portion of said layer in a first path and the lower portion in a second path, whereby the intermediate and the upper portion form a continuous tobacco stream wherein the intermediate portion becomes the lower part with respect to said upper portion and is excess with respect to the desired quantity of tobacco in said rod, removing said lower excess part from said stream and directing it into said second path, and returning said separated lower portion and said excess to the location where said continuous tobacco layer is formed.

4. A method as set forth in claim 1, wherein said tobacco stream is trimmed in a plurality of stages.

5. A method as set forth in claim 1, wherein said continuous tobacco layer is formed by showering additional tobacco onto the lower tobacco layer and trimmed-off excess tobacco.

6. A method as set forth in claim 1, further comprising the step of compressing the tobacco stream prior to wrapping.

7. A method as set forth in claim 1, further comprising the step of compacting the tobacco stream during separation of the upper and lower portions of said tobacco layer.

8. A method as set forth in claim 1, wherein the step of forming said continuous tobacco layer comprises feeding to the point where the tobacco layer is formed additional tobacco in such quantities which at least equal the quantity of tobacco in the tobacco stream.

9. A method as set forth in claim 1, further comprising the step of intermittently compacting spaced zones of said tobacco stream.

10. A method as set forth in claim 9, wherein the tobacco stream is compacted by application of mechanical pressure.

11. A method as set forth in claim 1, wherein said stream is conveyed in an arcuate path.

12. A method as set forth in claim 11, wherein said arcuate path is located in a vertical plane.

13. A method as set forth in claim 1, further comprising the step of conveying said continuous tobacco layer in a substantially horizontal path.

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