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Molins et al.

[11] **3,854,487**

[45] **Dec. 17, 1974**

[54] **MANUFACTURE OF FILTER TIPPED CIGARETTES**

[75] Inventors: **Desmond W. Molins,** London, England; **Francis A. M. Labbe,** Neuilly-sur-Seine, France; **Edward G. Preston; Norman W. Jackson,** both of London, England

[73] Assignee: **Molins Limited,** London, England

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[52] **U.S. Cl.** ..... **131/61 A,** 131/94
[51] **Int. Cl.** **A24c 05/52**
[58] **Field of Search** ..... 131/94, 61 A, 61 R, 61 B

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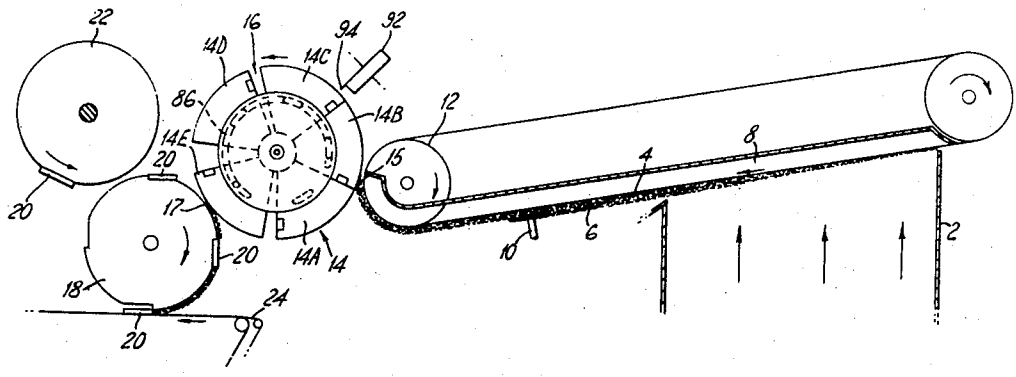
Primary Examiner—Robert W. Michell
Assistant Examiner—John F. Pitrelli
Attorney, Agent, or Firm—Markva & Smith

[57] **ABSTRACT**

Filter-tipped cigarettes are made by inserting filter sections between spaced axially-moving tobacco sections formed by feeding a continuous tobacco stream on to a segmented wheel comprising segments totalling less than 360°, the tobacco stream being cut to separate it into separate sections on the respective segments, after which the segments are moved apart to space apart the tobacco sections.

5 Claims, 5 Drawing Figures



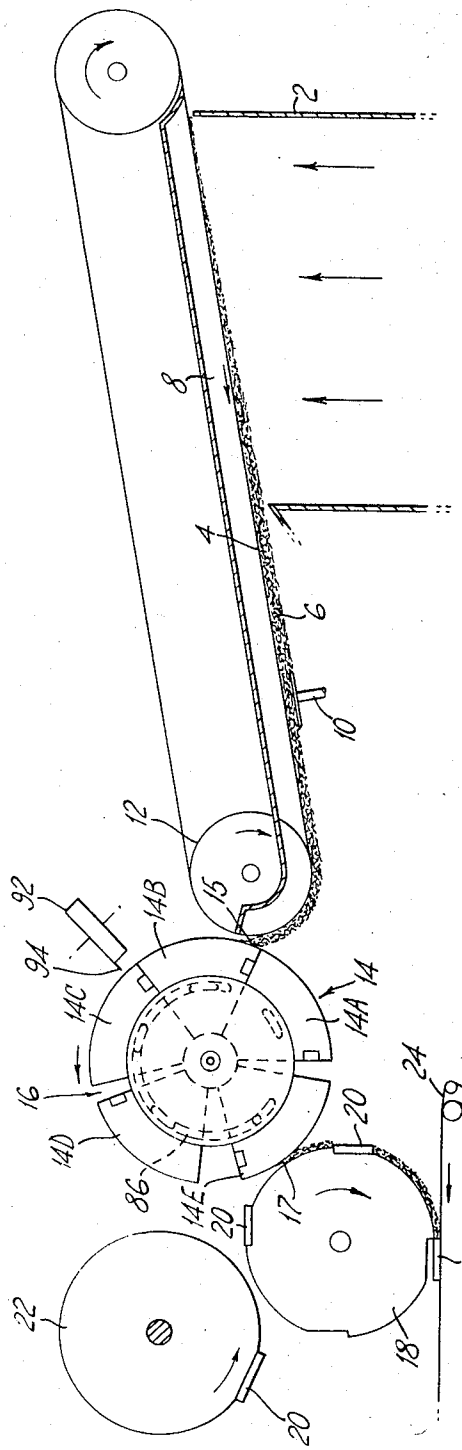


FIG. 1.

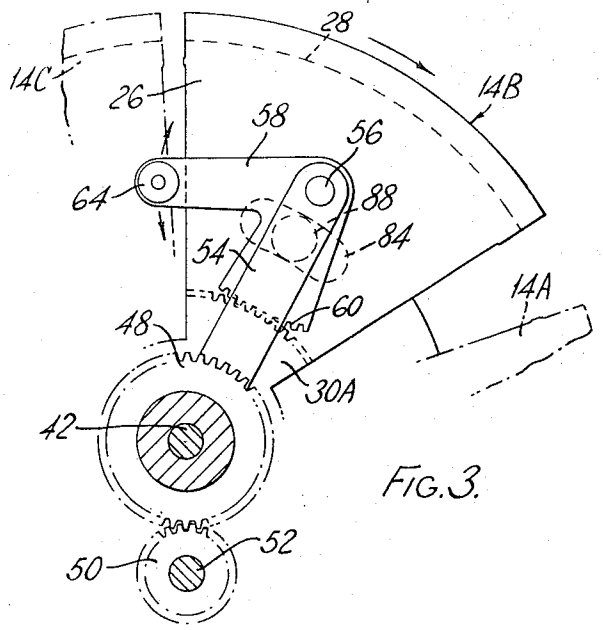

28
14C
26
14B
58
56
64
88
84
54
14A
60
48
30A
42
50
52

FIG. 3.

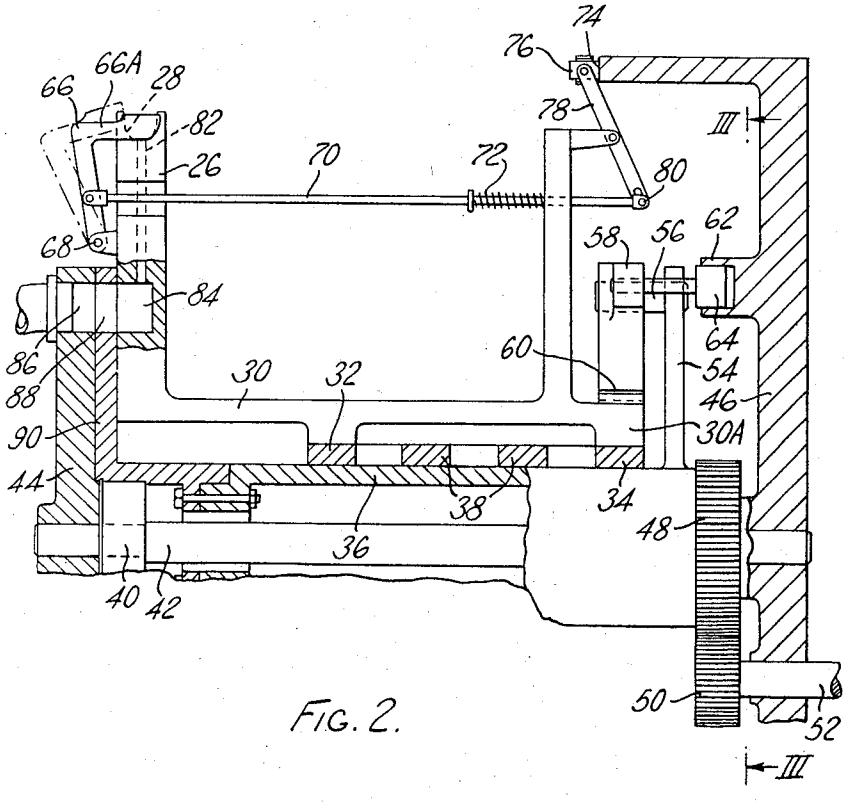

74
76
66A
28
66
78
III
82
26
70
72
80
68
58
56
62
84
64
60
86
54
30
32
88
46
90
30A
44
34
38
48
36
40
42
50
52
III

FIG. 2.

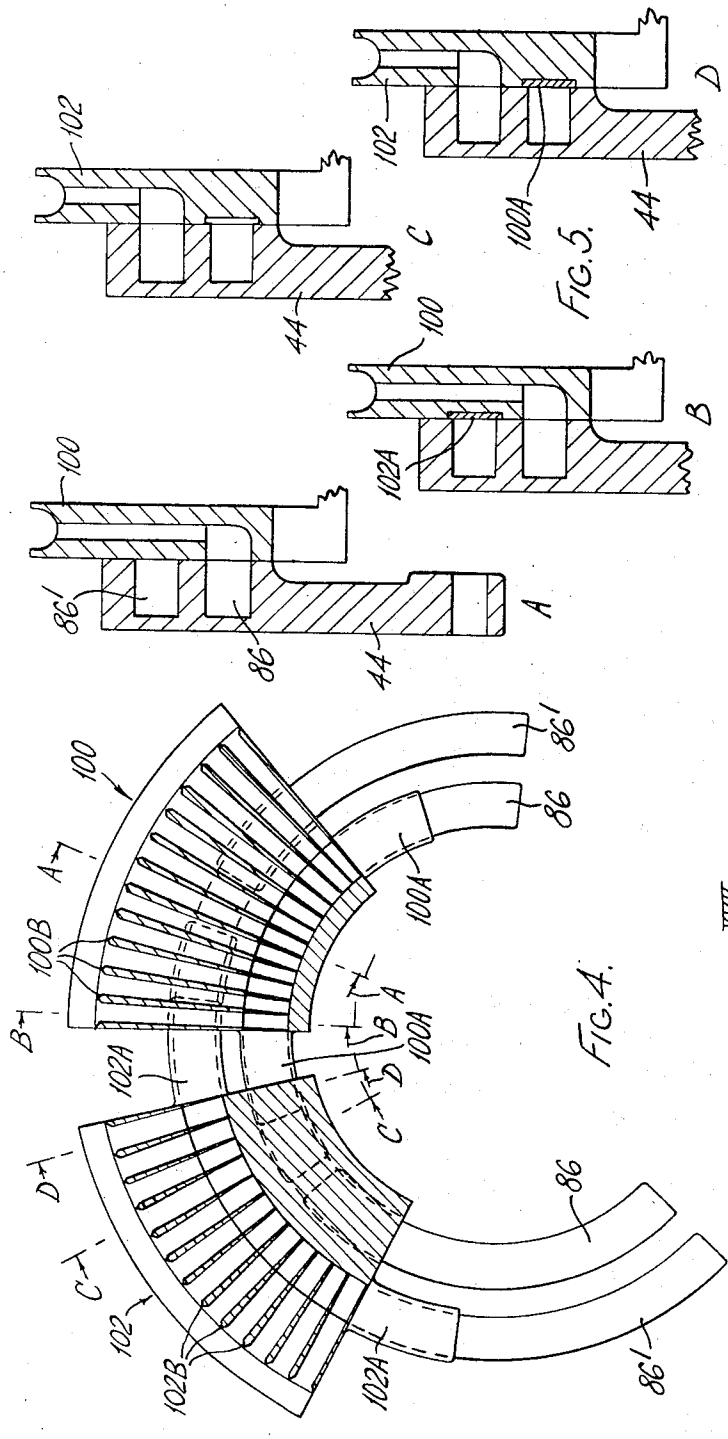


FIG. 5.

FIG. 4.

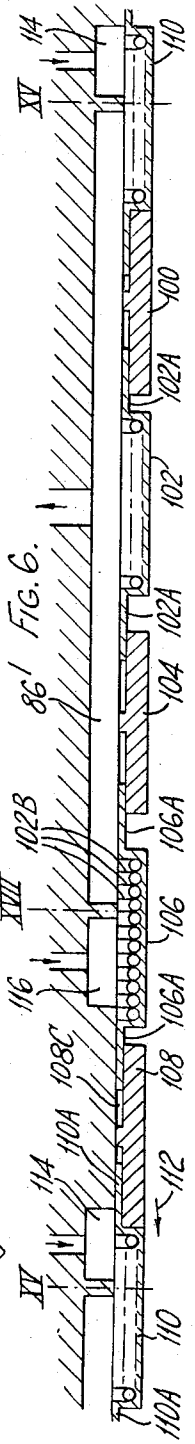


FIG. 6.

MANUFACTURE OF FILTER TIPPED CIGARETTES

This invention is concerned with the manufacture of filter-tipped cigarettes by enclosing in a continuous wrapper web a stream consisting of alternate tobacco and filter sections. The continuous rod thus formed is then cut at regular intervals to form separate filter-tipped cigarettes.

According to the present invention a machine for making filter-tipped cigarettes comprises means for forming a continuous tobacco stream on a wheel which consists of a number of segments which total less than 360° and are movable relatively to one another about the axis of rotation of the wheel, and including means for controlling the relative positions of the segments so that the segments are adjacent to one another in the region where the continuous stream is formed on them, and are spaced apart after receiving the continuous stream, so as to form spaced tobacco sections which are fed onto a continuous wrapper web with filter sections inserted into the spaces between successive tobacco sections.

The spaced tobacco sections are preferably carried from the segmented wheel to the wrapper web by a further wheel. By this means, more time can be allowed for the acceleration of the segments of the segmented wheel.

Preferably the double filter sections are fed on to the further wheel upstream of the point at which the further wheel receives the tobacco sections.

The segments of the segmented wheel are preferably carried by a drive member which rotates about the axis of the wheel as a whole, and each segment can rotate through a limited distance relative to the drive member about the axis of the wheel and is engaged by a control piece which is pivoted to the drive member and rotates about the pivot in a controlled manner during rotation of the drive member so as to move the corresponding segment relative to the drive member in the required manner.

In a preferred arrangement each control piece is moved about its pivot by the action of a fixed cam co-operating with a cam follower on the control piece. Preferably the control piece engages the segment by means of gear teeth.

The segmented wheel may carry a number of knives which partly or completely separate each tobacco section from the following tobacco section and then remain in position to serve as end walls confining the trailing end of each tobacco section as the corresponding segment accelerates. Alternatively, there could be a separate knife arranged adjacent to the segmented wheel to cut between successive segments, in which case the parts carried by the segmented wheels need not necessarily act as knives but may serve instead simply as end walls to prevent the trailing end of each tobacco section from being left behind as the segment accelerates.

An example of a cigarette making machine according to this invention is shown in the accompanying drawings. In these drawings:

FIG. 1 is a diagrammatic overall view of the machine;

FIG. 2 is part of a section through the segmented wheel in a plane extending along the axis of rotation of the wheel;

FIG. 3 is a section on the line III—III in FIG. 2;

FIG. 4 is a fragmentary section through a different segmented wheel for use in the machine shown in FIG. 1;

FIG. 5 shows fragmentary radial sections at lines A to D in FIG. 4; and

FIG. 6 is a flat developed section through one of the suction manifolds in FIG. 4.

As shown in FIG. 1, tobacco is showered upwards by means of air through a chimney 2 and builds up on the underneath surface of a porous band 4 to form a continuous tobacco stream 6. Suction is applied through the band 4 from a suction chamber 8 to hold the tobacco stream 6 on the band. Part of the tobacco stream is trimmed away by a trimmer 10 to produce a substantially uniform tobacco stream.

The arrangement so far described is basically like that of the Molins Mark 8 cigarette making machine, as described for example in British Patent No. 916,141. However, instead of the trimmed tobacco stream being carried by the band 4 directly on to the cigarette wrapper web, as in the Mark 8 machine, the tobacco stream continues partly round a pulley 12 and is received by a segmented wheel 14 at a transfer point 15. In the example shown, the segmented wheel 14 comprises five segments 14A, 14B, 14C, 14D and 14E. FIG. 1 shows the segments in positions in which segment 14A is about to receive a section of the tobacco stream, while segment 14B has just finished receiving a section of the tobacco stream. Segments 14A, 14B and 14C at this point in time are moving with a peripheral speed corresponding to the speed of the band 4. However, segment 14D has begun to accelerate from segment 14C, as shown by the gap 16 between the segments 14C and 14D. The acceleration is completed just before the leading edge of the segment reaches the transfer point 17 at which the tobacco section begins to be transferred to a second transfer wheel 18; during the transfer the peripheral speed of the segment equals that of the wheel 18.

As shown in FIG. 1, the gap 16 at the periphery of the segmented wheel grows to a length sufficient to accommodate double-length filter sections 20 which are placed on the transfer wheel 18 by a feed wheel 22 upstream of the transfer point 17.

The stream thus formed, consisting of alternate sections of tobacco and filters, is carried by the transfer wheel 18 on to a wrapper web 24 which encloses the tobacco and filter sections to form a continuous rod; this rod is subsequently cut in a well known manner through the middles of the tobacco sections and filters, thus forming a stream of axially moving filter-tipped cigarettes.

FIGS. 2 and 3 show the construction of the segmented wheel. One of the segments, 14B, is shown in full in FIG. 3. As shown particularly in FIG. 2, each segment includes a part-circular portion 26 of which the periphery is formed with a groove 28 to receive the tobacco stream. The portion 26 is integral with a connecting part 30 which has two ring portions 32 and 34 surrounding a tubular drive member 36. The ring portions 32 and 34 serve as bearings which allow the segment to rotate through a limited angle around the drive member 36. Each segment includes two ring portions, the positions of these ring portions on the different segments being axially spaced so that all the ring portions can fit around different parts of the drive member. Two

other ring portions **38** forming parts of different segments are shown for example in FIG. **2.**

The drive member **36** is rotatably mounted on end bearings **40** (of which only one is shown) surrounding a fixed shaft **42** of which the ends are secured in stationary housing parts **44** and **46.** A gear wheel **48** is mounted on the right hand end of the drive member and engages a pinion **50** on an input shaft **52.**

The drive member **36** is formed with a radially extending post **54** for each segment. Each post carries an axially extending pin **56** on which is mounted a control piece **58** in the form of a bell crank. One arm of the bell crank is formed with gear teeth **60** which mesh with corresponding gear teeth on the end portion **30A** of the part **30** of the segment. Thus rotation of the bell crank about the pivot pin **56** results in rotation of the segment relative to the drive member about the axis of the drive member **36.** This rotation is produced by a stationary cam track **62** in which a cam follower roller **64** on the bell crank engages. The cam track **62** extends along a roughly circular path around the axis of rotation of the drive member; the path is not exactly circular but instead deviates inwards and outwards from the circular outline so as to accelerate or retard the segment in relation to the drive member as required by the manner of operation described with reference to FIG. **1.** The drive member rotates at a set speed which is approximately midway between the lowest and highest speeds of the segments.

Each segment has in addition, at its trailing side, a knife **66** which is pivoted to the segment by a pivot pin **68** and is controlled as to its movement by a connecting rod **70.** This rod **70** is urged to the left by a compression spring **72** to an extent determined by the position at any given moment of the face of a cam **74** against which a follower roller **76** is urged by the action of the spring **72;** the follower roller **76** is mounted on a lever **78** which is pivoted to the connecting rod **70** at **80.** The cam **74** is so shaped that the knife **66** cuts the tobacco stream in the manner described with reference to FIG. **1** and then remains in position as an end wall until the tobacco stream on the corresponding segment has been transferred to the transfer wheel **18.**

The knife **66** is shown in chain-dotted outline in its inoperative position. After moving from that position to the completed cutting position shown in solid outline, the knife may move still further so that the wide end portion leaves the groove **28** on the far side (i.e. the right hand side) of the segment portion **26,** leaving only the narrower part **66A** in the groove; this part **66A** has a reduced radial dimension so as to allow the tobacco stream to be compressed at the point of transfer from the segmented wheel to the transfer wheel **18,** but the reduced part **66A** is nevertheless adequate to hold the trailing end of the tobacco stream in the groove in the segment against the effect of the inertia force during acceleration of the segment.

Each segment has numerous passageways **82** leading from a short slot **84** to the bottom of the groove **28.** Suction is fed through these passageways when necessary to hold the tobacco stream in the groove. The suction is supplied through an annular slot **86** in the stationary casing part **44,** via an aperture **88** in an end flange **90** forming part of the driving member. As shown in FIG. **1,** the suction slot **86** extends only through approximately 110°, that is to say through an arc sufficient to apply suction while the segments are carrying the tobacco stream. A slot **84** is used, rather than a hole corresponding to the hole **88,** because suction must be transmitted to the passageway **82** while the segment is rotating slightly with respect to the driving member.

FIG. **1** furthermore shows a rotary knife **92** including a blade **94** which passes through the gap between successive segments to cut the tobacco stream before the leading segment (e.g. **14C** in FIG. **1**) begins to accelerate from the following segment (e.g. **14B**). If such a knife is used, the knives **66** or equivalent parts may still be included to serve as end walls confining the trailing ends of the tobacco sections on the segments.

As an alternative, the knives **66** could be arranged to move radially with respect to the segments, for example under the control of a cam adjacent to the segment portion **26.**

Instead of the double filters **20** being fed on to the transfer wheel **18** by the wheel **22,** they could be fed directly on to the wrapper web **24** upstream of the position at which the wrapper web receives the spaced tobacco sections.

Instead of the transfer wheels being in the positions shown, the segmented transfer wheel **14** could for example be directly below the pulley **12,** and the wheel **18** could be below the wheel **14.** The pulleys carrying the band **4** may then be at heights such that the band is inclined to the horizontal in the sense opposite to that shown; i.e. so that the band is moving obliquely upwards while passing across the top of the chimney **2.**

FIGS. **2** and **3** show simple ways of transmitting suction to the segments of the wheel **14.** In practice a more elaborate method is preferred. Firstly, it is desirable to close the gap between successive segments in the region of the suction manifold **86** as there is otherwise a tendency for suction in the manifold to be lost owing to the leakage between successive segments when spaced apart. Secondly, it is desirable to be able to connect each part of each segment to the suction manifold only when that part reaches the point at which it receives tobacco from the band **4,** and then to discontinue the supply of suction when that part reaches the transfer point **17** between the segmented wheel and the further transfer wheel **18.** FIGS. **4** to **6** show how these objectives may be achieved. However, it should be noted that the arrangement shown is one in which it is necessary for the segmented wheel **14** to have an even number of segments, for example **6;** the reason for this will appear from the following description.

FIG. **4** is a section in a plane normal to the axis of the segmented wheel, showing two adjacent segments **100** and **102** when spaced apart. FIG. **5** shows radial sections at lines A, B, C and D. As shown, for example, in FIG. **5A,** the housing part **44** is extended radially so as to accommodate a second arcuate manifold **86'** in addition to the manifold **86.** Both of these manifolds are supplied with suction. Each manifold is arranged to supply suction to alternate segments. Of the two segments shown in FIG. **4,** the manifold **86** supplies suction to the segment **100,** while the manifold 86' supplies suction to the segment **102.** The reason for the dual supply of suction is that each segment has arcuate lugs **100A** or **102A** extending from opposite sides to cover the corresponding manifold when the segments are spaced apart, thus preventing a leakage to atmosphere which would reduce the suction level in the manifolds.

It should be noted furthermore that the port **90** shown in FIG. **2** has been omitted. Instead each of the manifolds **86** and **86'** lies immediately adjacent to the segments. However, as shown particularly in FIG. **4**, the space within each segment is divided by a number of regularly spaced radial vanes **100B** or **102B**; these allow suction at any point on the periphery of the segment to be supplied or cut off at precisely the right moment, that is to say when the space between successive vanes reaches one or other end of the manifold **86** or **86'**.

It will be seen that an even number of segments is required because alternate segments must receive suction from different manifolds.

FIG. **6** is a developed flat section through the centre line of the manifold **86**, showing all six segments. In addition to segments **100** and **102**, there are four further segments **104, 106, 108** and **110**. The direction of movement of these segments relative to the manifold **86** is shown by the arrow **112**. FIG. **6** shows what happens from the stage XV (corresponding to the transfer point **15** in FIG. **1**), through the stage XVII (corresponding to the transfer point **17** in FIG. **1**), and back to stage XV. It will be seen that the manifold **86'** extends from stage XV to stage XVII and communicates only with the segments **102, 106** and **110**. The segments have lugs **102A, 106A** and **110A** on both sides extending into recesses (e.g. **108C**) in the adjoining segments **100, 104** and **108** so as to close off the gap between the segments when they are spaced apart.

Immediately upstream of the stage XV, at which the tobacco is transferred from the band **4** to the segmented wheel, there is a short pressure manifold **114** through which medium-pressure air is supplied so that air blows out of the cooperating segments and helps to hold the tobacco stream on the band immediately before the transfer. Similarly there is a short pressure manifold **116** immediately downstream of the stage XVII.

It will be understood that the segments **100, 104** and **108** are supplied with suction and pressure through manifold **86** in the same way. The manifold **86'** is on the same side of the segments as the manifold **86'**, but it could alternatively be on the opposite side, immediately opposite to the manifold **86'**, in which case the segments **100, 104** and **108** would have the spaces between successive vanes opening out to the opposite side of the segment; that is to say, the manifold **86** would appear in FIG. **6** as a mirror image of the manifold **86'**.

We claim:

1. A cigarette making machine for making filter-tipped cigarettes, including means for forming a continuous tobacco stream on a segmented wheel comprising a plurality of segments which total less than 360° and are movable relatively to one another about the axis of rotation of the wheel; a drive member for said wheel, and a crank member associated with each segment of the wheel, each crank member being pivotally connected to the drive member and having a first arm which carries a cam follower arranged to cooperate with a fixed cam extending around the axis of rotation of the wheel, and a second arm formed with gear teeth which engage with gear teeth on a part connected to the corresponding segment, whereby pivotal movement of the crank member in response to action of said cam and cam follower causes relative movement of the segments by accelerating and decelerating each segment when the wheel is rotated by said drive member, so that the segments are adjacent to one another in one region where the continuous tobacco stream is formed on them, and are spaced apart at a second region so as to form spaced tobacco sections; and means for inserting filter sections into the spaces between successive tobacco sections.

2. A cigarette making machine for making filter-tipped cigarettes, comprising means for forming a continuous tobacco stream on a segmented wheel comprising a plurality of segments which total less than 360° and are movable relatively to one another about the axis of rotation of the wheel; means for cutting the continuous tobacco stream on the segmented wheel, said cutting means comprising a knife member carried adjacent the trailing edge of each segment and operable by a fixed cam, said knife member including a first portion having a radial dimension which is at least substantially equal to the radial dimension of the tobacco stream on the wheel, and a portion having a reduced radial dimension, said knife member being controlled by said cam so that said first portion cuts the tobacco and then, on further movement of the knife member, moves past the tobacco stream to bring the reduced portion into engagement with the trailing end of the tobacco stream section on the corresponding segment, allowing the trailing end portion of the tobacco stream section to be mechanically compressed radially inwards during subsequent transfer of the tobacco stream section; means for controlling the relative positions of the segments whereby the segments are adjacent to one another in one region where the continuous stream is formed on them, and are spaced apart at a second region so as to form spaced tobacco sections; a transfer conveyor for receiving the spaced tobacco sections from the segmented wheel and for carrying the tobacco sections towards a continuous wrapper web; and means for inserting filter sections into the spaces between successive tobacco sections.

3. A cigarette making machine for making filter-tipped cigarettes, comprising means for forming a continuous tobacco stream on a segmented wheel comprising an even number of segments which total less than 360° and are movable relatively to one another about the axis of rotation of the wheel, alternate segments receiving suction from one manifold and the other segments receiving suction from another manifold, including lugs extending between the segments to prevent loss of suction from the manifolds where the segments are spaced apart, the interior of the segments being divided by radial vanes; means for controlling the relative positions of the segments whereby the segments are adjacent to one another in one region where the continuous stream is formed on them, and are spaced apart at a second region so as to form spaced tobacco sections; a transfer conveyor for receiving the spaced tobacco sections from the segmented wheel and for carrying the tobacco sections towards a continuous wrapper web; and means for inserting filter sections into the spaces between successive tobacco sections.

4. A cigarette making machine according to claim **3** wherein said manifolds are arranged on opposite sides of the segmented wheel.

5. A cigarette making machine according to claim **3** wherein said manifolds are spaced radially relative to the segmented wheel.

* * * * *