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(54) **CIGARETTE PAPER WITH SELECTED ATTENUATOR BANDS**

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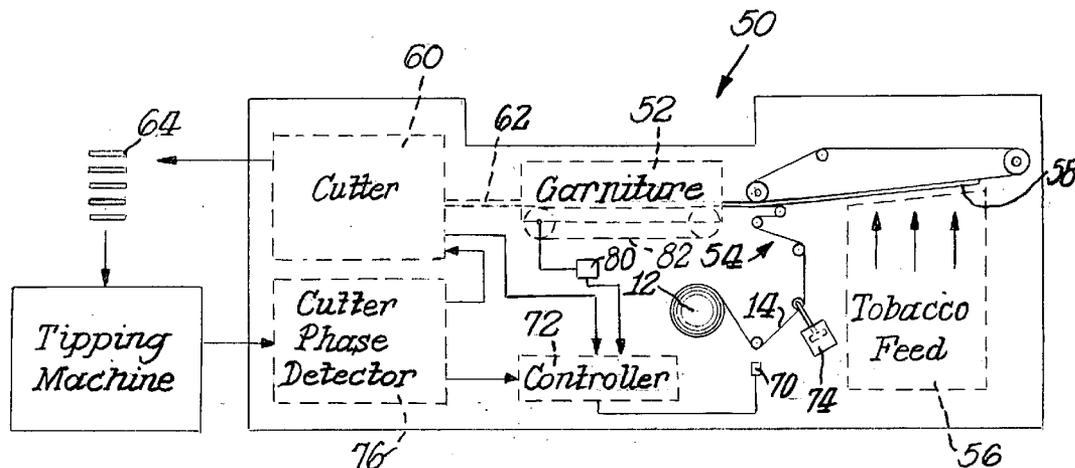
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ABSTRACT

Smoke constituent reduction may be achieved by resolving from puff-to-puff analysis at which location along a tobacco rod production of a particular smoke constituent is maximized, and locally applying an attenuator at such resolved location to reduce production of the constituent. The remainder of the rod is left untreated so as to minimize impact on taste and burn characteristics of the cigarette. The attenuator material may be applied to the cigarette paper using a moving orifice device to create bands of such materials on the cigarette paper at predetermined locations along the tobacco rod.

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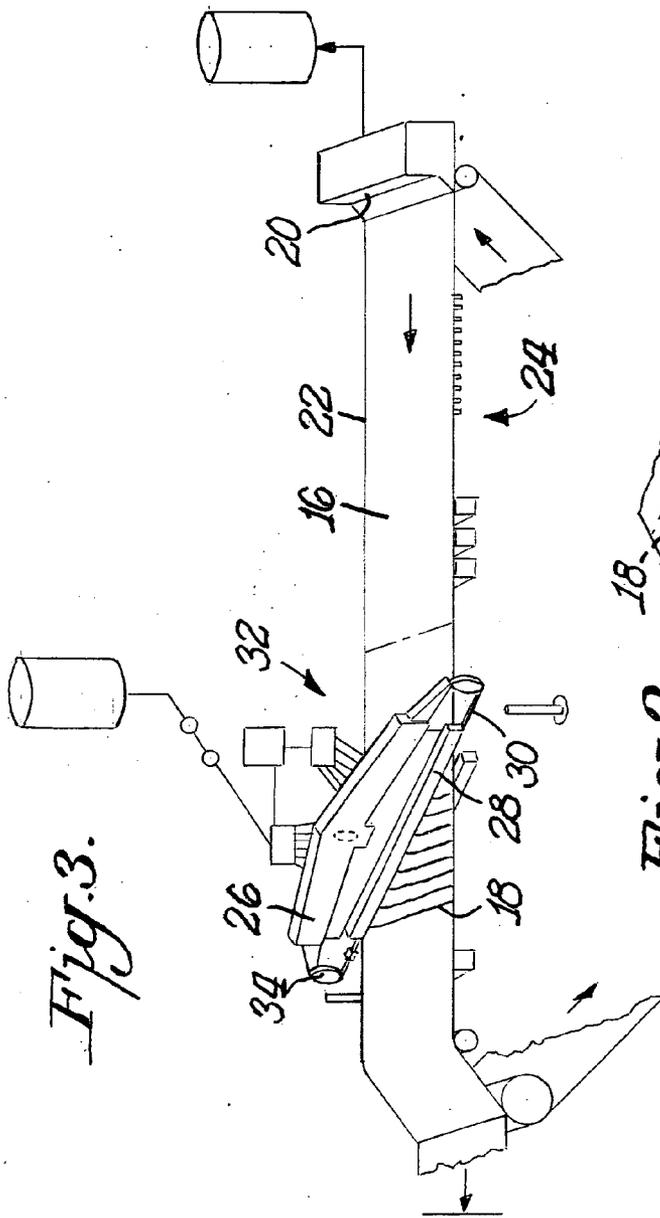


Fig. 3.

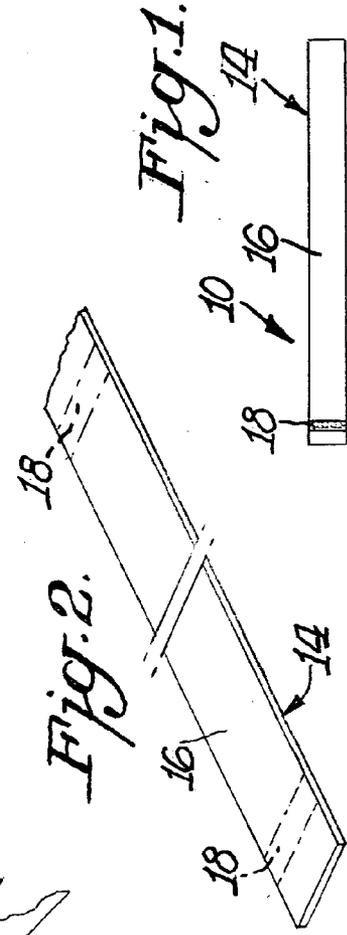
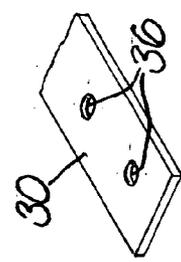


Fig. 1.

Fig. 2.

Fig. 3A.



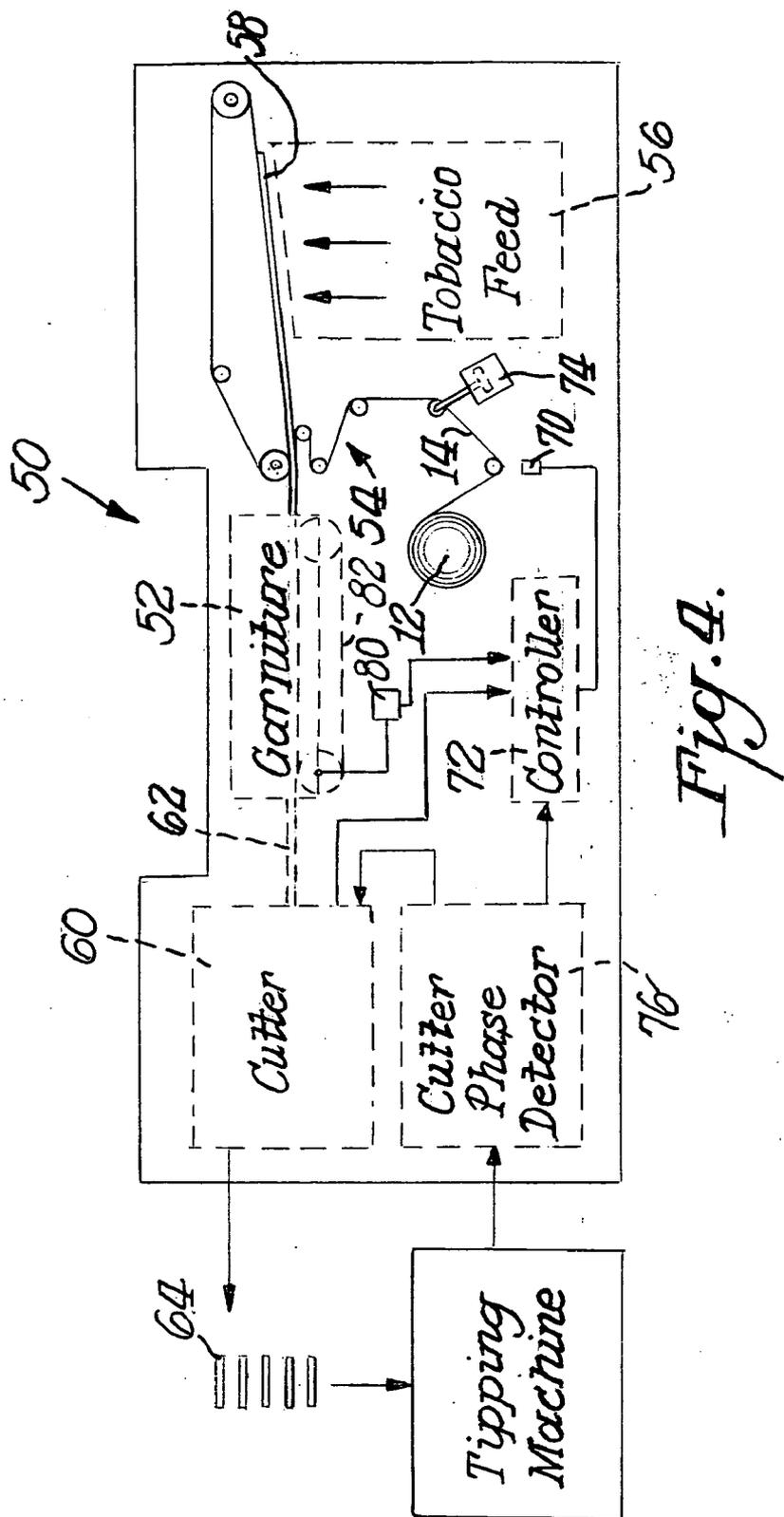


Fig. 4.

CIGARETTE PAPER WITH SELECTED ATTENUATOR BANDS

BACKGROUND OF THE INVENTION

[0001] Smoke constituent reduction may be achieved by resolving from puff-to-puff analysis at which location along a tobacco rod production of a particular smoke constituent is maximized, and locally applying an attenuator at such resolved location to reduce production of the constituent. The remainder of the rod is left untreated so as to minimize impact on taste and burn characteristics of the cigarette.

SUMMARY OF THE INVENTION

[0002] For example, it has been discovered that 40-50% of the formaldehyde found in mainstream tobacco smoke is formed in the first puff. Any one or a combination of cigarette modifications made at the front (lit) end of the tobacco rod will reduce formaldehyde. These modifications include the introduction of an ammonium-source compound, such as ammonium bicarbonate to the tip of the tobacco rod, and the addition of alkali metal salts (fire retardants) such as potassium bicarbonate or potassium phosphate.

[0003] These components may be applied to the cigarette paper using a moving orifice device to create bands of the add-on compound on the cigarette paper. During cigarette making operations, the cigarette rod making machinery includes registration of the compound-containing bands with tobacco rod portions that correspond to the free end portions of the completed cigarettes. The compound-containing band may be approximately 3 to 7 mm wide or possibly wider.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] Novel features and advantages of the present invention in addition to those noted above will become apparent to persons of ordinary skill in the art from a reading of the following detailed description in conjunction with the accompanying drawings wherein similar reference characters refer to similar parts and in which:

[0005] **FIG. 1** is an elevational view of a cigarette produced by the process and apparatus of the present invention;

[0006] **FIG. 2** is a perspective view of cigarette paper produced by the process and apparatus of the present invention;

[0007] **FIG. 3** is a perspective view of apparatus for producing the cigarette paper shown in **FIG. 2**, according to the present invention;

[0008] **FIG. 3A** is a perspective view of a portion of the perforated belt of the moving orifice slurry applicator shown in **FIG. 3**; and

[0009] **FIG. 4** is a diagrammatic view showing the production of the cigarette shown in **FIG. 1**, according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0010] Referring in more particularity to the drawings, a preferred method of manufacturing a cigarette **10** begins with the manufacture of a bobbin **12** of banded paper **14** comprising a continuous ribbon of base web material **16**

together with a plurality of spaced-apart transverse regions (or bands) of add-on material **18** comprising the desired attenuator material. The base web material **16** is typically a flax or wood pulp fiber mat of basis weight and permeability typical of those used in commercially offered cigarettes.

[0011] Preferably, the bobbins **12** are constructed in accordance with processes and apparatus described in commonly assigned U.S. Pat. Nos. 5,534,114 and 5,997,691, which patents are hereby incorporated by reference in their entireties.

[0012] In a preferred embodiment, pulp slurry **20** is deposited upon a Fourdrinier wire **22** of a paper making machine **24** to form the base web **16**. At a location along the Fourdrinier wire **22**, preferably downstream of the wet-line of the wire, additional (add-on) material **18** is deposited upon the base web **16** in the form of transverse (cross-directional stripes) utilizing a moving orifice slurry applicator **26** which is supported in a fixed relation across the wire **22** at an angle to the moving direction of the wire. Preferably, the slurry applicator **26** comprises an elongate, open-bottom slurry box **28**, an endless, perforated belt **30** which passes along the underside of box **28**, a system **32** for supplying add-on material (slurry) to the slurry box and a drive arrangement **34** operative to move the belt along its endless path. Preferably, the belt **30** includes a row of equally spaced apart holes **36** and the endless belt is driven at a predetermined fixed speed, such that, because of the angle of the slurry box **28**, the speed of the wire **22** and the speed of the belt **30**, a plurality of orthogonal spaced apart banded regions **18** are generated upon the base web **16**. Subsequently the base web **16**, together with the banded regions **18** are dried, rolled-up, and slit into bobbins, preferably utilizing drying and slitting techniques commonly practiced in the art of manufacturing cigarette paper.

[0013] A further aspect of the manufacture of cigarette **10** is modification of a typical cigarette making machine **50** comprising a garniture **52**, a paper feed system **54** for feeding a ribbon of paper **14** to the garniture, a tobacco feed system **56** for establishing and feeding a column of tobacco **58** toward the garniture **52** and a cutter **60** downstream of the garniture. Downstream of garniture **52**, a continuous tobacco rod **62** is formed and cut at the cutter **60** into two-up tobacco rods **64**. Preferably, the cigarette maker **50** of the present invention further includes a sensor **70**, a data processing (controller) unit **72** and a "lag-lead" mechanism **74** operative upon the paper **14** as it is being fed into the garniture **52** of the cigarette maker **50**, such that operation of the cutter **60** is always in desired registry (relation) with the banded regions **18**. Preferably, the sensor **70** is configured in accordance with the teachings of commonly assigned U.S. Pat. No. 6,020,969, which patent is hereby incorporated by reference in its entirety.

[0014] More particularly, in the preferred embodiment of the present invention, the sensor **70** is configured to generate a signal indicative of the passing of each banded region **18** by the sensor, which signal is communicated to the controller unit **72**, along with another signal from a cutter phase detector **76** which is indicative of the operational phase relationship of the cutter **60**. The controller unit **72** is programmed to process these signals to generate an output signal to the lag-lead mechanism **74** to maintain proper relation of the banded regions **18** relative to the cutter **60** as the continuous tobacco rod **62** enters the cutter **60**.

[0015] Preferably the lag-lead mechanism **74** is a displaceable roller that is displaceable responsively to signals received from the controller, which in a first or “retracted” position, tends to add an incremental amount of length to the path of the paper **14** so as to retard (cause an incremental amount of lag) the arrival of banded regions to the cutter **60** so that a desired registration of cutter operation and the banded regions is maintained. Alternatively, in a second or “extended” position, the mechanism **74** may effect an incremental shortening of the path of the paper **14** so as to cause an incremental amount of lead (advancement) in the arrival of the banded regions **18** at the cutter **60**.

[0016] In the alternative, the sensor **70** might be located between the garniture **52** and the cutter **60** and be operative upon the continuous tobacco rod **62**. Furthermore, in this embodiment, the lag-lead adjustment mechanism is preferably operative instead upon operation of the cutter so as to maintain the desired phase relationship between the cutter operation and the arrival of banded regions **18** at the cutter **60**.

[0017] Additionally, in another embodiment, the output of the controller **72** is communicated to a servo drive unit **80** of the garniture belt **82** to maintain operational registration of the cutter **60** to the arrival of banded regions **18** at the cutter. If the controller resolves a drift (advance or lag) away from optimal registry, the servo drive **80** is operated as a lag-lead mechanism to make an intermittent compensatory adjustment in the speed of the garniture belt for a brief duration, immediately after which, the garniture belt is returned to its steady state operational speed. Compensatory adjustment of the garniture belt may be used in combination with the lag-lead mechanism **74** or as an alternative to that mechanism.

We claim:

1. A method of manufacturing a cigarette comprising the steps of:

feeding banded cigarette paper along a path through a tobacco rod forming device and to a cutter;

operating said cutter to repetitively and in a predetermined phase relationship with respect to arrival of a banded region of said fed banded cigarette paper at said cutter so as to repetitively produce a tobacco rod structure, said tobacco rod structure including a feature of a banded region at a predetermined location along said tobacco rod structure;

maintaining consistency of said feature by:

during said feeding step, generating a first signal indicative of a passage of a banded region at a first location along said path;

generating a second signal indicative of an operational phase of said cutter,

processing said first and second signals to generate an output signal indicative of a perturbation away from said phase relationship; and

operating a lag-lead mechanism responsively to said output signal and counteractively to said perturbation.

2. The method as claimed in claim 1 further comprising the step of making a bobbin of banded paper by establishing a base web and operating a moving orifice slurry applicator to establish banded regions at spaced locations along said base web.

3. A plurality of tobacco rods each including tobacco, a wrapper and a cut end formed by cutting the tobacco rods in a repeated spatial relation with respect to a band of material applied to the wrapper so that the bands are positioned at a preselected location along the rods.

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