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**US-A- 3 713 451**  
**US-A- 4 340 072**  
**US-A- 4 898 191**  
**US-A- 4 917 121**

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## Description

This invention relates to a smoking article which produces smoke and/or an aerosol that resembles tobacco smoke.

It is well known that tobacco smoke consists of thousands of chemicals which are the result of pyrolysis and incomplete combustion of tobacco. Many smoking articles have been proposed that will reduce the amounts of these compounds whilst still maintaining an acceptable smoking article or product.

US Patent Specification 4 340 072 shows a fuel rod that is moulded or extruded from reconstituted tobacco and/or tobacco substitute. A longitudinally extending passage is provided in the impervious fuel rod so that a flow of hot gas is produced during combustion and passes towards an aerosol precursor chamber during smoking. In this construction air entering the passage passes the burning coal and is heated and mixed with the combustion gases from the burning rod and this stream of hot gases passes down the passage and between the granules of the precursor material to exit through a filter tip into the mouth of the smoker. Thus the smoker inhales an aerosol of flavourant from the precursor material which also contains particulate material from the burning fuel rod.

US Patent Specification 4 917 121 shows a smoking article which contains granular material within a tube located in a tobacco column. The end of the tobacco column displaced away from the ignited end is closed so that all the gases pass down the tube. Thus the gases and smoke from the burning tobacco and from the granular material mingle and the particulate material in the tobacco smoke is carried on towards the mouthpiece end.

The present invention provides a smoking article comprising a tobacco rod of smokable material in an outer wrapper and a downstream filter unit which includes a granular element containing adsorbed compounds that will generate an aerosol when hot gases are passed through it, a passage defined by an impervious wall and which extends longitudinally from the end of said rod to said granular element to supply hot gas thereto.

Filter means are provided for filtering smoke travelling along said tobacco rod through the processed and cut tobacco thereof before or simultaneously with said smoke contacting the aerosol generated from the granular element by said hot gases.

When the tobacco rod is lit, hot gases from the burning coal travel preferentially along the passage to the filter end. These hot gases pass through the granular material, thus releasing adsorbed components and forming an aerosol. The quantity of hot gases transmitted along the passage is a function

of its size, the density of the smokeable material surrounding it and the permeability of any outer wrapper. The passage may have a diameter in the range of 0.5 to 5.0 mm but preferably is in the range of 1.0 to 5.00 mm. Temperatures measured at the end of the passage can reach up to 550 °C, thus providing sufficient heat to release components from the granular material.

The filter means act to remove particulate material prior to or simultaneously with the smoke/gases being used to release the components and flavours which condense and form the aerosol.

The longitudinal passage can have a wall made from combustible material such as paper or reconstituted tobacco sheet and is substantially impervious.

The granular element can be backed by a conventional filter element.

Granular materials such as alumina, magnesium silicate, zeolites, ceramics, activated carbon or other porous materials impregnated with selected components or compounds (e.g. nicotine, glycerol, tobacco flavours, tobacco extracts) are contained in a cavity adjacent to the end of a tobacco rod containing the longitudinal passage, and can be loose packed or in sintered form. Thus adsorbed components are desorbed when the hot gas mixture from the passage passes through the granular element of the filter unit.

The desorbed components form an aerosol which preferably then pass through a low efficiency filter which can be made from cellulose acetate, polypropylene, paper or other similar filter material.

The invention can be performed in various ways and some embodiments will now be described by way of example and with reference to the accompanying drawings in which :

Figures 1 to 3 are longitudinal cross-sectional views through three different embodiments of smoking articles according to the invention.

The smoking article shown in Figure 1 comprises a cylindrical tobacco rod 1 made from conventionally processed and cut tobacco at a filling density of 150 to 300 mg cm<sup>-3</sup> wrapped in a cigarette paper 2 of porosity in the range of 4 to 150 CORESTA units but preferably 20 to 80 CORESTA units. A longitudinal passage 3 extends the length of the tobacco rod with the wall of the passage 4 being substantially impervious to air and made of cigarette paper or reconstituted tobacco sheet. When the end of the smoking article is lit, smoke travels preferentially along the tobacco rod 1 whilst the hot gases travel along the passage 3 to a filter unit 5.

A filter element 9 located between the tobacco and a granular bed 6 is made of high efficiency material such as ultra-fine fibres of polypropylene

or other polyolefin material and removes most of the smoke components that travel along the tobacco rod 1 preferentially.

Hot air/gas mixtures pass through a granular element 6 and desorb the components from granules 7. These components form an aerosol and pass through an end filter 8 into the mouth of the smoker. This filter should preferably be of very low retention so that maximum transfer is achieved from the granules to the smoker's mouth and can be made as a conventional filter from cellulose acetate, polypropylene, paper or other similar filter material.

In the arrangement described above the granular material can be magnesium silicate, for example Sepiolite in granular form of for example 15 - 30 mesh, but in order to ease manufacture the granules could be sintered into a rod which is then cut to appropriate size, and between 50 - 200 mg. of granules can be contained in each filter unit.

Typically, the overall length of the smoking article is in the range of 50 to 120 mm with an overall diameter of 5 mm to 8 mm, for example 7.8 mm.

If desired the granular material can be treated with nicotine and glycerol in the range of 0.5 % to 20 % w/w and 0 % to 40 % w/w respectively which will give rise to the release of nicotine when in use.

In the second embodiment, shown in Figure 2, a cavity 10 is located between the filter element 9 and the granular element 6. This allows the hot gas mixture to pass through a larger area of the granular element and helps to prevent the end 11 of the passage 3 becoming blocked with any ash that may come down the passage.

The passage 3 extending axially throughout the length of the tobacco rod 1 can be placed at the periphery thereof.

In order to retain heat within the area of the granules 7 a third embodiment of the present invention is shown in Figure 5 and which includes a thermal insulation section 12 made of for, example, ceramic or other thermal insulating fibres. This prevents excessive heat loss to the surroundings at the same time keeping the outside of the smoking article cool enough to hold. The thermal insulation material 12 is arranged to act as a filter to remove the smoke which travels along the tobacco rod. The materials can be fine fibre and web materials.

It is an object of the present invention to deliver an aerosol to the smoker with significantly reduced quantities of pyrolysis and combustion products from the tobacco. To achieve this, components and flavours are adsorbed onto granular materials in the filter element. When the cigarette is lit, air drawn through the central tube is heated by the burning coal and it is this hot air that "activates" the granular material by releasing com-

ponents and flavours. These vapours condense and form an aerosol which then passes through the filter section. Use of the impervious tube ensures that there is no diffusion of the hot gas from the tube to the tobacco rod or of smoke into the tube.

An additional feature of these designs is the flow characteristics of the hot air and smoke when a puff is taken on the cigarette. These flow characteristics have been modelled using a simple resistor network which indicates that smoke travels preferentially along the tobacco column whilst the hot air travels along the tube. It is the intention that the filter element 9 is highly efficient, thus significantly reducing the quantity of smoke particles formed by the burning tobacco section which pass to the smoker. Gases passing through this route will be of low temperature and will not desorb components from the granular material.

In the present invention it is the hot air/gases passing along the tube that provides the activating effect on the granules. It has been shown that tobacco smoke itself at ambient temperature has no effect whatsoever on the granular material, as would be the case in Figures 1 and 2.

## Claims

1. A smoking article comprising a tobacco rod (1) of smokable material in an outer wrapper (2) and a downstream filter unit (5) which includes a granular element (6) containing adsorbed compounds that will generate an aerosol when hot gases are passed through it, a passage (3) defined by an impervious wall (4) and which extends longitudinally from the end of said rod to said granular element (6) to supply hot gas thereto,

characterized in that filter means (9,12) are provided for filtering smoke travelling along said tobacco rod (1) through the processed and cut tobacco thereof before or simultaneously with said smoke contacting the aerosol generated from the granular element (6) by said hot gases.

2. A smoking article according to claim 1 wherein said filter means (9,12) is made from high efficiency material.
3. A smoking article according to claim 2 wherein said high efficiency material is ultra-fine fibres of polypropylene or polyolefin material.
4. A smoking article according to any one of the preceding claims wherein the filter unit (5) includes a filter element (8) downstream of the granular element (6).

5. A smoking article according to claim 4 wherein said conventional filter element (8) is made from a very low retention material.
6. A smoking article according to any preceding claim wherein said granular element (6) is surrounded by thermal insulation (12).
7. A smoking article according to claim 6 wherein said thermal insulation (12) is also said filter means.
8. A smoking article according to any preceding claim wherein said passage (3) is substantially coaxial with said rod (1).
9. A smoking article according to any one of claims 1 to 7 wherein said passage is located parallel to but eccentric of the axis of said rod (1).
10. A smoking article according to any preceding claim wherein the granular material is a porous material impregnated with selected components or compounds.
11. A smoking article according to claim 10 wherein the porous material is alumina, magnesium silicate, zeolites, ceramics or activated carbon.
12. A smoking article according to claim 10 or claim 11 wherein the selected components or compounds are nicotine, glycerol, tobacco flavours or tobacco extracts.

#### Patentansprüche

1. Rauchartikel umfassend eine Tabakstange (1) aus rauchbarem Material in einem äußeren Deckblatt (2) und eine stromabwärtige Filtereinheit (5), die ein körniges Element (6) enthält, das adsorbierte Verbindungen aufweist, die ein Aerosol erzeugen, wenn heiße Gase durch das Element hindurchströmen, und einen Durchgang (3), der durch eine undurchlässige Wand (4) definiert ist und der sich der Länge nach vom Ende der Stange zum körnigen Element (6) erstreckt, um heißes Gas zuzuleiten, dadurch gekennzeichnet, daß Filtermittel (9, 12) vorgesehen sind, um den Rauch, der sich entlang der Tabakstange (1) durch deren verarbeiteten und geschnittenen Tabak bewegt, zu filtern, bevor oder während der Rauch mit dem Aerosol in Kontakt kommt, das aus dem körnigen Element (6) durch die heißen Gase erzeugt wird.

2. Rauchartikel nach Anspruch 1, worin das Filtermittel (9, 12) aus einem äußerst wirkungsvollen Material besteht.
3. Rauchartikel nach Anspruch 2, worin das äußerst wirkungsvolle Material aus ultrafeinen Fasern aus Polypropylen- oder Polyolefinmaterial besteht.
4. Rauchartikel nach einem der vorhergehenden Ansprüche, worin die Filtereinheit (5) ein Filterelement (8) stromabwärts vom körnigen Element (6) enthält.
5. Rauchartikel nach Anspruch 4, worin das herkömmliche Filterelement (8) aus einem Material mit sehr geringer Retention besteht.
6. Rauchartikel nach einem der vorhergehenden Ansprüche, worin das körnige Element (6) von Wärmeisolierung (12) umgeben ist.
7. Rauchartikel nach Anspruch 6, worin die Wärmeisolierung (12) auch das Filtermittel ist.
8. Rauchartikel nach einem der vorhergehenden Ansprüche, worin der Durchgang (3) mit der Stange (1) im wesentlichen coaxial ist.
9. Rauchartikel nach einem der Ansprüche 1 bis 7, worin der Durchgang parallel, aber exzentrisch zur Achse der Stange (1) angeordnet ist.
10. Rauchartikel nach einem der vorhergehenden Ansprüche, worin das körnige Material ein poröses Material ist, das mit ausgewählten Komponenten oder Verbindungen imprägniert ist.

11. Rauchartikel nach Anspruch 10, worin das poröse Material aus Aluminiumoxid, Magnesiumsilikat, Zeoliten, Keramikmaterialien oder Aktivkohle besteht.
12. Rauchartikel nach Anspruch 10 oder 11, worin die ausgewählten Komponenten oder Verbindungen Nikotin, Glycerin, Tabakgeschmacksstoffe oder Tabakextrakte sind.

#### Revendications

1. Article à fumer comprenant une tige de tabac (1) dans un emballage externe (2) et une unité de filtrage en aval (5) qui inclut un élément granulaire (6) contenant des composés adsorbés qui génèrent un aérosol quand des gaz chauds le traversent, un passage (3) défini par une paroi étanche (4) et qui s'étend longitudinalement à partir de l'extrémité de ladite tige

vers l'élément granulaire (6) pour lui fournir un gaz chaud,

caractérisé en ce que les moyens de filtrage (9, 12) sont prévus pour filtrer la fumée voyageant le long de ladite tige de tabac (1) par le tabac traité et coupé de celle-ci avant ou simultanément avec ladite fumée entrant en contact avec aérosol généré par l'élément granulaire (6) par lesdits gaz chauds.

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2. Article à fumer selon la revendication 1 dans lequel lesdits moyens de filtrage (9, 12) sont fabriqués à partir d'un matériau de grande efficacité.

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3. Article à fumer selon la revendication 2 dans lequel ledit matériau à grande efficacité est formé de fibres ultra fines de polypropylène ou de matériau de polyoléfine.

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4. Article à fumer selon l'une quelconque des revendications précédentes dans lequel l'unité de filtrage (5) inclut un élément filtre (8) en aval de l'élément granulaire (6).

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5. Article à fumer selon la revendication 4 dans lequel ledit élément filtre conventionnel (8) est constitué de matériau à très faible rétention.

6. Article à fumer selon l'une quelconque des revendications précédentes dans lequel l'élément granulaire (6) est entouré d'un calorifugeage (12).

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7. Article à fumer selon la revendication 6 dans lequel ledit calorifugeage (12) est aussi le moyen de filtrage.

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8. Article à fumer selon l'une quelconque des revendications précédentes dans lequel ledit passage (3) est substantiellement coaxial avec ladite tige (1).

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9. Article à fumer selon l'une quelconque des revendications 1 à 7 dans lequel ledit passage est localisé parallèlement mais de manière excentrée par rapport à l'axe de ladite tige (1).

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10. Article à fumer selon l'une quelconque des revendications précédentes dans lequel le matériau granulaire est un matériau poreux imprégné de composants ou de composés sélectionnés.

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11. Article à fumer selon la revendication 10 dans lequel le matériau poreux est de l'alumine, du silicate de magnésium, des zéolithes, des céramiques ou du charbon activé.

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12. Article à fumer selon la revendication 10 ou la revendication 11 dans lequel les composants ou composés sélectionnés sont la nicotine, le glycérol, les arômes de tabac ou les extraits de tabac.

FIG. 1

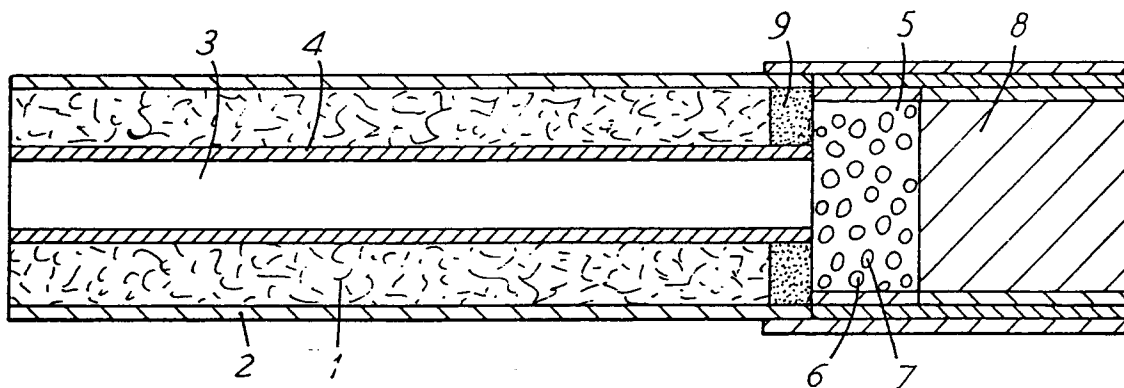


FIG. 2

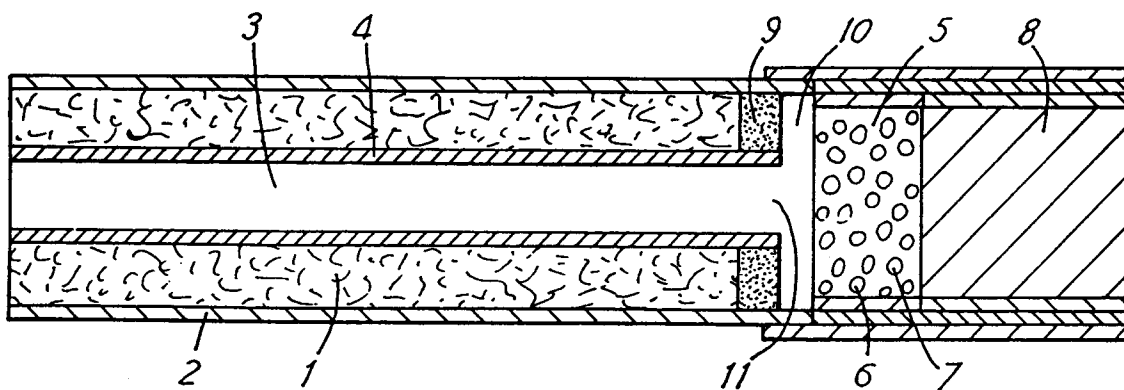


FIG. 3

