

Ventilated Filter Cigarette

The invention relates to a ventilated filter cigarette according to the preamble of patent claim 1.

A ventilated filter cigarette is described in EP 0 875 160 A1 which has a filter section which contains a coaxial filter core and a filter casing surrounding the coaxial filter core. In the area of this coaxial filter section, ventilation holes are provided for the introduction of ventilation air into the casing. The configuration of the material specifications and the dimensioning of the individual elements of the tobacco strand and of the filter are designed such that, if the smoker covers the ventilation holes, the smoke, in the manner of a change-over valve, is essentially conducted through the filter casing, whereas when the ventilation holes are uncovered, the smoke flows principally through the filter core of the coaxial filter section. The aim of this development is therefore to be able to quantitatively control the smoke production with varying consumer behaviour, for example to minimize an increase in condensate values.

In physical terms, this smoke is an aerosol, i.e. a mixture of air and liquid droplets. These can be of clearly varying size, something which is not visible to the human eye, however.

The taste evaluation of the tobacco smoke by the consumer, i.e. the aroma quality or the intensity of the

taste impression is influenced by the speed of the smoke stream and by the droplets size and their distribution which can be measured with the help of mobility analysers or by selective gathering and sorting by particle weight or particle size.

The **object** of the invention is to create a filter design with which the distribution of the droplet size supplied to the smoker and the flow rate of the smoke can be controlled.

This object is **achieved** by a filter cigarette with the features of patent claim 1.

If the surface of the core in the mouth-side filter section is wrapped in an air-impermeable manner or is made air-impermeable, a lateral flow of the main-stream smoke can be avoided.

A significant improvement in taste is thereby achieved compared with the state of the art.

The achievement according to the invention led to a filter design which works in several stages:

In the first stage, the condensate and nicotine values are set on a very short section in the filter section facing the tobacco strand. In the second stage, there is a reduction in the filter diameter used by the main-stream smoke, which accelerates the smoke in this area to approximately three times the speed. Such a filter design leads, with reduced condensate values, to a clear increase in aroma compared with a conventional filter. It has been shown that both the smoke composition and the

average droplet size are influenced by the change in the flow rate and that the aroma impression and thus the taste can thus be increased with clearly higher throughflow rates.

As the drawing resistance and the retention are decoupled with the cigarette according to the invention, a drawing quality which is very pleasant for the smoker can also be achieved.

The invention will now be explained in detail using a schematic **drawing**:

The drawing shows in schematic representation a filter cigarette with a tobacco strand 6 and a filter 7 which are arranged colinearly one after the other in customary manner and connected together by a wrapping paper 8. Normally, the tobacco strand is between 55 and 75 mm long, whilst the length of the filter is 21 to 27 mm. The wrapping paper 8 covers approximately 2 to 5 mm of the interface between the filter 7 and the tobacco strand 6. There can be considered as filter materials for the filter 7 planiform, filiform or granular filter materials, such as cellulose, cellulose ester, preferably cellulose acetate, melt-blown filter material e.g. prepared according to WO 97/33026, air-laid filter material, e.g. prepared according to US 4,375,447, filter materials which can be reacted with additives, tobacco, other readily decomposable filter materials or thermoplastic filter fibres.

The addition of additives can take place by scattering or spraying onto the filter materials, e.g. fibres, but also by direct injection into the material strand.

There can be considered as additives for the filter material: Aromatics, acids or bases in suspended or dissolved form, or selectively acting adsorbents such as active carbon or SiO_2 . Through the addition of acids or bases, the pH values of the particle spectra can be influenced.

Further additives with selective retention effect are organic acids and their salts, metals and metal oxides, nitrogen components, ion exchange systems (e.g. zeolites), alcohols, polyphenols and porphyrin derivatives.

A tobacco-strand-side filter section 3 is firstly attached to the tobacco strand 6 in the form of a so-called monofilter to which a mouth-side filter section 4 is attached in the form of a coaxial filter at the end facing away from the tobacco strand 6.

The monofilter forming the tobacco-strand-side filter section 3 is made from one of the filter materials mentioned above, preferably from cellulose acetate with a single titre of 2.50 den and a total titre of 35,000 den, and optionally provided with active carbon.

The external diameter of the tobacco-strand-side filter section 3 is 7.8 mm in one version, its length is 13.0 mm. The pressure drop in the tobacco-strand-side filter section 3 is to be for example 30 to 50 mmH₂O, preferably 42 mmH₂O.

The wrapping paper 8 is provided, exclusively in the area of the tobacco-strand-side filter section 3, with

ventilation holes 5 as ventilation means, which are arranged around the filter 7 in the form of 1 to 3 rows, preferably 2 rows of holes, but in the area of the mouth-side filter section 4, the wrapping paper 8 is completely impermeable. Ventilation air is sucked into the filter 7 through the ventilation holes 5, with the result that already, in the area of the tobacco-strand-side filter section 3, the condensate and nicotine values of the main-stream smoke supplied from the tobacco strand 6 are reduced. A person skilled in the art knows how ventilation holes are to be made, for example in mechanical or electrostatic manner or by laser perforations. Other equally well-known ventilation means are cannulae or material recesses.

The mouth-side filter section 4 forming a coaxial filter has a core 1 and a casing 2 coaxially surrounding the core 1.

The pressure drop of the core can be between 10 and 50 mmH₂O. The casing is constructed so that its pressure drop is greater than that of the core by a factor of at least 2. The casing can also be impermeable to smoke.

Example: Version with a 21 mm-long filter

The core 1 had a diameter of 4.0 mm with a length of 8.0 mm. It was prepared in one version from cellulose acetate with a single titre of 6.0 den and a total titre of 17,000 den. The drawing resistance or the pressure drop of the core 1 was 20 mmH₂O.

The casing 2 coaxially surrounding the core 1 had an internal diameter of 4.0 mm and an external diameter of 7.8 mm, again with a length of 8.0 mm. As material, cellulose acetate with a single titre of 2.1 den and a total titre of 55,000 den was used, which led to a pressure drop of 120 mmH₂O.

In total, the coaxial filter therefore had a length of 8.0 mm with a diameter of 7.8 mm.

As a range for other versions there can be considered: For the core, a single titre in the range from 3.0 to 8.0 den, preferably 6.0 den and a total titre in the range from 15,000 to 50,000 den, preferably 17,000 den. For the casing, a single titre in the range from 1.5 to 3.0 den, preferably 2.1 den and a total titre in the range from 40,000 to 75,000 den, preferably 55,000 den.

The range for the tobacco-strand-side single titre is 1.5 to 5 den and for the total titre 15,000 to 60,000 den.

Filter specification				
		Core	Casing	Strand-side filter section
Material		CA	CA	CA
Single/overall fibre specification	Den	6.00y/17,000	2.10y/55,000	2.50y/35,000
Diameter	mm	4.0	External 7.8 Internal 4.0	7.8
Cross-section area A	mm ²	12.6	35.2	47.8
Cross-section area A	%	26.4	73.6	100
Length	mm	8.0	8.0	13.0
Pressure drop	mmH ₂ O	20	120	42
Pressure drop ΔP	%	16.7	83.3	-
Flow rate S S=100- ΔP	%	83.3	16.7	100
Factor S/A		3.2	0.2	1.0

The above example shows that an approximately three-fold increase in the flow rate in the core, compared with the flow rate in the strand-side filter section, was achieved.

Patent Claims

1. Filter cigarette with wrapped tobacco strand and with a filter (7) containing ventilation means, which consists of two filter sections (3,4), **characterized in that**
 - the ventilation means are arranged in the area of the tobacco-strand-side filter section (3);
 - the tobacco-strand-side filter section (3) is a one-piece filter section and the mouth-side filter section (4) is a coaxial filter section with a core (1) and a casing (2);
 - the pressure drop of the core (1) is less than the pressure drop of the casing (2).
2. Ventilated filter cigarette according to claim 1, **characterized in that** the tobacco-strand-side filter section (3) consists of planiform, filiform, granular or decomposable filter material.
3. Ventilated filter cigarette according to claim 2, **characterized in that** there is used as filter material cellulose, cellulose ester, preferably cellulose acetate, melt-blown filter material, air-laid filter material, filter material which can be reacted with additives, tobacco, other readily decomposable filter materials or thermoplastic filter fibres.
4. Ventilated filter cigarette according to claim 2 or 3, **characterized in that** the filter material is provided with an additive.



5. Ventilated filter cigarette according to claim 4,
characterized in that there is used as additive aromatics, acids or bases in suspended or dissolved form, or selectively-acting adsorbents such as active carbon or SiO_2 .
6. Ventilated filter cigarette according to one of claims 1 to 5, **characterized in that** the core (1) of the mouth-side coaxial filter section (4) consists of coarse-titred fibrous material, the value for single titre lying in the range from 3.0 to 8.0 den and the total titre in the range from 15,000 to 50,000.
7. Ventilated filter cigarette according to claim 6, **characterized in that** the single titre is 6.0 den and the total titre 17,000 den.
8. Ventilated filter cigarette according to one of claims 1 to 5, **characterized in that** the casing (2) of the mouth-side coaxial filter section (4) is made of fibrous material with a single titre in the range from 1.5 to 3.0 den and the total titre lies in the range from 40,000 to 75,000 den.
9. Ventilated filter cigarette according to claim 8, **characterized in that** the single titre is 2.1 den and the total titre is 55,000 den.
10. Ventilated filter cigarette according to claim 1, **characterized in that** the ratio of the pressure drop of the core (1) to that of the casing (2) is greater than 2.

11. Ventilated filter cigarette according to claim 10,
characterized in that the ratio of the pressure drop
of the core (1) to that of the casing (2) is about
6.
12. Ventilated filter cigarette according to claim 1,
characterized in that the surface of the core is
wrapped in an air-impermeable manner or is made air-
impermeable.

