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Biodegradable Filter for Cigarettes

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

Such filter cigarettes have been described many times in the past. However, a disadvantage of all previously described filter cigarettes with biodegradable filters is the clear effect on the taste of the smoke which is exerted by the different described materials and which has always led to a cigarette which was manufactured with material other than the usual cellulose acetate being rejected by smokers. A further disadvantage, particularly of filters manufactured from biodegradable cellulose, was also the clearly visible difference in the appearance of the filter end. In the past, this has meant that biodegradable filters have not been able to be accepted as monofilters on acetate filter markets.

The object of the invention is therefore to produce a filter cigarette of the kind stated that provides an "acetate-typical" taste impression and an "acetate-typical" optical appearance whilst retaining the advantages of the known filter cigarette.

According to the invention, this object is achieved by the features given in the characterizing portion of claim 1.

Suitable versions are defined by the features of the dependent claims.

The advantages achieved with the invention rest on the selection of a special cellulose material and on the design of a filter cigarette structure matched thereto



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with adaptation of the essential parameters, namely the retention performance of the filter, the strand yield ratio nicotine/condensate of the tobacco strand, the packing density of the tobacco mixture of the tobacco strand, the air permeability of the cigarette paper and finally the degree of filter ventilation in the direction of an overall structure that optimizes the taste impression on the one hand and the optical attractiveness on the other. The nicotine yield of the filter cigarette is up to a maximum of 1 mg and the condensate yield from 6 mg to 12 mg.

The sought-after degree of ventilation of 15 to 50 % can be established by the corresponding design of the ventilation zone in the covering wrapper and wrapping.

According to a preferred embodiment, the ventilation zone of the filter is composed of one or two series of holes which is at least 10 mm away from the mouth-side end; the holes can either be manufactured by laser irradiation or mechanically on the finished cigarette, and should be as small as possible and not very visible, good results being reached with 15 to 25 holes in two ventilation rows.

Surprisingly, it has been shown that the acetate-typical taste impression and the acetate-typical optical attractiveness can only be attained if the filter is manufactured from a cellulose material processed by means of the so-called "air-laid" process to a tangled fleece, and this is further processed "uncrimped" to give the finished filter. In the process, a suitable combination of area weight, thickness and width of air-laid fleece can be established according to the desired filter draw resistance and thus the degree of retention.

In the air-laid process such as described in, for example, the US-PS 4,375,447, for example, the prepared cellulose fibres are not suspended in water as in the standard paper manufacturing process, passed for sheet forming to a permeable sieve on which the cellulose fibres, conditioned by their beating and fibrillation, cross-link with each other mechanically, but are passed maximally separated into a stream of air that transports them onto a permeable continuous sieve and stacks them randomly on the latter. This yields an almost cottonwool-like voluminous fleece which thus does not demonstrate any mechanical strength or fibre linkage. A mechanical bond and thus the necessary mechanical strength which is required for further processing is obtained by adding a binder such as, e.g., polyvinyl alcohol, polyvinyl acetate, polymer starch, dextrin or latex. The degree of the density (g/cm^3) and thus of the voluminosity or thickness is set by subsequent calendering. The area weight (g/m^2) is controlled via the sieve velocity or the introduction of fibre into the stream of air.

The invention is explained in more detail in the following with reference to embodiments:

The filter cigarette has a tobacco strand surrounded by a cigarette paper and a filter joined to the tobacco strand. The packing density of the tobacco blend lies between 200 and 250 mg/ml. The of the strand draw resistance lies between 45 and 65 mm water column pressure gauge, measured closed.

The cigarette paper has a low to medium air permeability in the range from 15 to 50 Coresta units. The nicotine*10/condensate strand yield ratio of the tobacco blend should lie between 0.6 and 0.9.

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The filter consists of the folded-together "uncrimped" air-laid fleece folded together and is surrounded by a porous wrapping paper. A zone-porous covering paper surrounds the wrapping paper and serves to secure the filter to the tobacco strand. The air permeability of the porous zone of the covering paper is selected such that the desired degree of filter ventilation results in conjunction with the wrapping paper lying beneath it.

Tests with such a filter have led, in combination with the specified tobacco strand have lead to a condensate yield of 6 to 12 mg and a nicotine yield of at most 1 mg. Tests with experienced long-term smokers showed that such cigarettes could not be distinguished from cigarettes manufactured conventionally with acetate filters.

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1. Filter cigarette with a biodegradable filter with:
 - a) a tobacco strand surrounded by a cigarette paper;
 - b) a filter manufactured from cellulose fleece manufactured using the "air-laid" process with "normal" degree of retention; and with
 - c) a filter ventilation zone running in circumferential direction;
characterized by the combination of the following features:
 - d) the filter has a degree of condensate retention of 40 to 60 %;
 - e) the cellulose fleece is "uncrimped";
 - f) the strand yield ratio nicotine/condensate of the tobacco strand lies between 0.6 and 0.9 (nicotine*10/condensate);
 - g) the packing density of the tobacco blend of the tobacco strand lies between 200 and 250 mg/ml;
 - h) the tobacco strand draw resistance lies between 45 and 65 mm water column pressure gauge, measured closed;
 - i) the air permeability of the cigarette paper is 20 to 50 Coresta units; and
 - j) the degree of filter ventilation is to 15 to 50 %.
2. Filter cigarette according to claim 1, **characterized in that** the ventilation zone is formed by a combination of porous wrapping and covering papers which begin at least 10 mm from the mouth-side end of the filter.
3. Filter cigarette according to claim 1, **characterized**

in that the ventilation zone in the finished cigarette is manufactured mechanically or by laser irradiation.

4. Filter cigarette according to claim 2, characterized in that the ventilation zone is formed by one or two row(s) of ventilation apertures that is (are) at least 10 mm from the mouth-side end of the filter.
5. Filter cigarette according to one of claims 1 to 4, characterized in that the filter consists of an "uncrimped" cellulose fleece with a thickness of 0.5 to 1.5 mm.
6. Filter cigarette according to one of claims 1 to 5, characterized in that the filter is composed of an "uncrimped" cellulose fleece with a width of 10 to 15 cm.