

Biodegradable Filter for Cigarettes

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

From the ecological point of view, paper filters
5 represent the optimal solution for cigarettes. However, the nevertheless small success of pure paper filters is attributable to several material-specific properties of the paper.

10 The main problem of paper filters is the difference in taste of the smoke when compared with conventional cellulose acetate filter cigarettes. Further problems are posed by the clearly different retention, a clear deterioration in hardness for the same retention, and a
15 coarse-pored structure of the cut surface of the section of the filter in comparison with cellulose acetate filters.

These problems mean that smokers reject cigarettes with
20 paper filters on the grounds of taste, appearance and touch.

The main cause of this can be seen as the different form of the materials. The paper occurs in fleece or sheet

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form, the cellulose acetate in the form of fibres. All attempts using different processing methods, for example, crimping or pleating the paper fleece to a greater or lesser degree to achieve the optical and tactile
5 properties of cellulose acetate have failed. In the same way, there is to date no known process to change the chemical retention properties of the paper so that it corresponds to acetate.

10 As a consequence of these unsolved problems, cigarettes are constructed today with double filters containing a paper and a cellulose segment.

This version is expensive due to complicated
15 manufacturing techniques, and not yet optimal from an ecological point of view.

A process is known from EP 0 032 044 B1 for the manufacture of fibre webs with loosely packed fibres in
20 which the dry fibres are applied in a stream of air in a sieve to a supporting web. As they pass through a shaping head and leave it, the fibres are not subjected to any cross-flow forces, as a result of which a substantially constant basic weight is maintained in the cross
25 direction of the fibre web. This means that fibre beds can be manufactured with a unit weight of more than 70 g/m². This known process is also called the "air-laid"

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process. Due to the "fleecy softness" of the cottonwool-like material, however, no cigarette filters have thus been able to be manufactured from it.

5 The **object** of the invention is to develop a monofilter that is clearly better biodegradable than cellulose acetate, and that also retains the taste impression, appearance, hardness and retention property so that it cannot be distinguished from cellulose acetate by
10 consumers.

This object is **achieved** by the features of patent claim 1.

15 Surprisingly, it has been shown that a paper which was manufactured using a so-called air-laid process and further processed to a filter in the manner according to the invention achieves the set object.

20 In the air-laid process, 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
25 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
5 required for further processing is obtained by adding a binder such as, e.g., polyvinyl alcohol, polyvinyl acetate, polymer starch, dextrin or latex in a stream of air. The degree of the density (g/cm^3) and thus of the voluminosity or thickness is set by subsequent
10 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 the following with
15 reference to an embodiment; there are shown:

Figure 1 a fibre web manufactured according to the air-laid process with cutting lines running in longitudinal direction;

20

Figure 2 the indicated manner of folding of the air fibre web strips;

Figure 3 the spiral winding of the fibre web strips of
25 Figure 2.

Figure 1 shows a fibre web 10 manufactured using the air-laid process with a unit weight of approximately 40-50 g/cm² that is cut into a number of n fibre web strips beginning from a line A-A, with n = 5 for the embodiment shown. It is pointed out, however, that n can also be another number, 4 or 6 for example, n = 4 being a preferred number which cannot however be portrayed well in graphical terms in the spiral arrangement according to **Figure 3**.

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The five fibre web strips 1-5 which are obtained by lengthwise cuts in the fibre web 10 of **Figure 2**, are, according to the invention, first folded in a V-shape by a suitable device, such as is shown in **Figure 2**. The free ends of the fibre web strips 1-5 folded in a V shape are then laid against each other, and the strips brought together by a suitable device so that the apices 14 of the fibre web strips folded in a V-shape are arranged in the region around the central axis of the cigarette filter to be manufactured, and, lying against each other in a spiral, are thus twisted into a cylindrical casing as is shown schematically in cross-section in **Figure 3**. In reality, due to an initial compression, the individual fibre web strips 1-5 lie so tightly pressed together after the spiral winding according to **Figure 3** that the impression is thereby created of a homogenous, closed filter that looks like the mouth-side end of a cellulose

acetate filter. In other words, because of the "fleecy softness" of the material, it is no longer possible to recognise that only a few layers of fibre web strips are thus twisted together in a spiral as is shown in **Figure**

5 3.

The wrapped fibre web strips 1-5 wound according to **Figure 3** are held together in the usual way by a filter covering paper 12 so that the paper filter according to
10 the invention has the appearance of a cellulose acetate filter once it is completed.

Examples:

The cigarette samples listed in the following table were
15 made up and compared with one another:

Cigarette	A	B	C	D	E	F
Blend	American Blend		American Blend with 30% ET*		American Blend with 50% ET*	
Strand length	63 mm		59 mm		59 mm	
Filter length	21 mm		25 mm		25 mm	
Cigarette-Ø	7.80 mm		7.80 mm		7.80 mm	
Filter material	Acetate 3.0 y/35000 HC	Airlaid 50 g/m ² 0.8 mm thick	Acetate 3.0 y/35000 HC	Airlaid 50 g/m ² 0.8 mm thick	Acetate 2.1 y/36000 SSC	Airlaid 70 g/m ² 1.1 mm thick
Filter weight (mg)	107	110	123	120	140	145
Filter draw resistance of filter (mm WC)	58	55	65	63	105	98
Tar (mg/cig.)	12.7	12.9	7.1	7.1	3.8	3.7
Nicotine (mg/cig.)	0.87	0.85	0.64	0.66	0.40	0.41
Filter retention (%)	35.4	36.1	51.2	51.5	67.3	68.0
Filter ventilation (%)	18	18	40	38	60	62

ET = expanded tobacco

The following specifications were used as filter materials:

Acetate 3.0 y/35000 HC with 7 % triacetine admission

5 Acetate 2.1 y/36000 SSC with 7 % triacetine admission

Air-laid B+D 48 g/m², latex binder and approx. 0.8 mm

thickness

E 70 g/m², latex binder and approx. 1.1 mm

10 thickness

In this, HC stands for high crimp and SSC for super-strong crimp.

15

Result:

The analytically and physically determined data were produced according to currently valid DIN/ISO provisions, and show no differences within the framework of
20 measurement accuracies. The taste evaluation was carried out by 15 trained smokers, and did not lead to significant differences in the pair comparisons.

The biodegradation of the cigarette filter material
25 according to the invention takes place within a time span comparable to (cigarette) cellulose filter material customary in the trade. This means a clear improvement

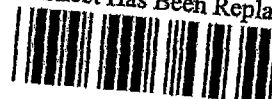
compared with cellulose acetate. The evaluation of biodegradability takes place according to the "Sturm test" customary in the industry which is described by R. N. Sturm in J. Americ. Oil Chemists' Soc. 50 (1973) May, 5 pp. 159-167 in the article "Biodegradability of nonionic surfactants: screening test for predicting rate and ultimate biodegradation".

Claims



1. Filter for tobacco goods, in particular cigarettes, **characterized in that** this is manufactured from a cellulose fleece manufactured according to an air-laid process.
2. Filter according to claim 1, **characterized in that** the unit weight of the cellulose fleece lies between 20 and 100 g/m².
3. Filter according to claim 2, **characterized in that** the unit weight of the cellulose fleece lies between 40 and 70 g/m².
4. Filter according to one of claims 1-3, **characterized in that** the thickness of the cellulose fleece lies between 0.5 - 1.5 mm.
5. Filter according to claim 4, **characterized in that** the thickness of the cellulose fleece lies between 0.7 - 1.2 mm.
6. Filter according to one of claims 1-5, **characterized in that** 5 - 30 % binder has been added to the cellulose fleece.

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7. Filter according to claim 6, **characterized in that**
the cellulose fleece contains 20 % binder.
8. Filter according to one of claims 1-7, **characterized**
in that the binding agent is latex.
9. Filter according to one of the claims 1-7,
characterized in that the binder is polyvinyl
alcohol.
10. Filter according to one of claims 1-7, **characterized**
in that the binder is polyvinyl acetate.
11. Filter according to one of claims 1-7, **characterized**
in that the binder is a copolymer of vinyl acetate
and ethylene.
12. Filter according to one of claims 1-7, **characterized**
in that the binding agent is a water-soluble starch.
13. Filter according to claim 12, **characterized in that**
the binder is a water-soluble polymer starch.
14. Filter according to claim 13, **characterized in that**
the binder is dextrin.

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