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Bio-degradable Filters for Cigarettes



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The invention concerns a bio-degradable filter according to the preamble of Patent claim 1.

In the case of cigarettes, paper filters represent the best solution from the ecological viewpoint. Despite the poor success of purely paper filters, there is to be a reversion to these because of several material-specific properties of paper.

The main problem of paper filters is the different nature of the taste of smoke when compared to conventional cellulose acetate filter cigarettes. Further problems are represented by the clearly different retention, and clearly inferior hardness with same retention and a coarse pore structure of the filter section surface when compared with cellulose acetate filters.

These problems lead to the smoker rejecting cigarettes with paper filters on taste, visual and haptic grounds.

The main cause of this can be seen in the different form of materials. The paper lies in the form of non-woven fabric or leaf, while cellulose acetate is in the form of fibre. All differing treatment processes e.g. the differing strength of crimping or pleating of the non woven fabric of paper, so as to achieve the visual and haptic properties of cellulose acetate, have failed. Thus hitherto no process is known for changing paper in its chemical retention so as to correspond to acetate. As a consequence of the unresolved problem, cigarettes today are composed of a double filter, containing one paper and one cellulose segment.

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This form of embodiment is certainly dear because of complicated production techniques and not yet ideal from the ecological point of view.

From EP 0 032 044 B1, there is known a process for the production of a fibre web with loosely packed fibres, whereby the dry threads are brought up in an air stream to a sifter on a conveyer. The fibres are subjected in passing to a shaping head and on their emergence are not subjected to any cross current forces, so that an essentially uniform basic weight is maintained in the transverse direction of the fibre web. Thus fibre bedding can be produced with surface weights of more than 70g/m^2 . This familiar process is called "Air-laid". Because of the fluffiness of the cotton-wool-like material, it is not possible to produce a cigarette filter, however.

The EP-A-0 711 512 discloses a cigarette filter that consists mainly of cellulose ester.

Here, the filter material, and thus the cellulose ester can also contain other substances that are described as secondary or second rank components. Amongst these other substances that can be additionally present, there belongs inter alia natural cellulose.

It is the task of the invention to develop a single filter that is clearly more bio-degradable than cellulose acetate and also maintains indistinguishably the taste impression, the appearance, the hardness and the retention property of cellulose acetate for the consumer.

For the solution of this problem, there serve the characteristics of claim 1.

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.

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 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;

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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

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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 30% ET*	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

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

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

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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, manufactured from a cellulose fleece manufactured according to an air-laid process, characterized in that the filter is formed of V-shaped folded fibre web strips which are spirally twisted. (Fig. 3)
2. Filter according to claim 1, characterized in that the surface weight of the V-shaped folded fibre web strips which are spirally twisted lies between 20 and 100 g/m².
3. Filter according to claim 2, characterized in that the surface weight of the V-shaped folded fibre web strips which are spirally twisted lies between 40 and 70 g/m².
4. Filter according to claims 1-3, characterized in that the thickness of the V-shaped folded fibre web strips which are spirally twisted lies between 0.5 and 1.5 mm prior to folding.
5. Filter according to claim 4, characterized in that the surface weight of the V-shaped folded fibre web strips which are spirally twisted lies between 0.7 and 1.2 mm prior to folding.
6. Filter according to claims 1 to 5, characterized in that 5 to 30% binders are added to the V-shaped folded fibre web strips which are spirally twisted prior to folding.
7. Filter according to claim 6, characterized in that the V-shaped folded fibre web strips which are spirally twisted contains 20% binder.
8. Filter according to claim 6 or 7, characterized in that the binder is latex.

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9. Filter according to claim 6 or 7, characterized in that the binder is polyvinyl alcohol.
10. Filter according to claim 6 or 7, characterized in that the binder is polyvinyl acetate.
11. Filter according to claim 6 or 7, characterized in that the binder is a copolymer of vinyl acetate and ethylene.
12. Filter according to claim 6 or 7, characterized in that the binder is of water-soluble strength.
13. Filter according to claim 12, characterized in that the binder is of a water-soluble polymer strength.
14. Filter according to claim 13, characterized in that the binder is dextrin.