

The invention relates to the use of aromatic substance mixtures, which are to be added to an air stream flowing through electrostatically charged filters. The invention particularly relates to the addition of aromatic substance mixtures to an air stream flowing through filters of this type in a vacuum cleaner.

In the case of known vacuum cleaners, filtration of the dust-charged air drawn in is initially carried out in the vacuum cleaner bag. An electrostatically charged filter, which is to filter out the remaining fine dusts, is often connected downstream of the vacuum cleaner bag.

Nevertheless, it can be seen that the air emerging from the vacuum cleaner extends a certain dust smell, although virtually all dust particles have been separated off. To counteract this attempts have already been made to insert aromatic substances in the form of small rods or the like, for example into the vacuum cleaner bag. The air flowing through carries aromatic substance particles with it which help to hide a dust smell in the air emerging from the vacuum cleaner. Vacuum cleaners of this type operated with aromatic substances and having electrostatically charge filters connected downstream are described in German application 3 404 495. It has been found that the filtering properties of the electrostatic filter subside relatively quickly in vacuum cleaners operated in this manner. The impression of fragrance remains essentially unchanged, but the proportion of fine dust increases.

It is known to provide a deodorising device in a vacuum cleaner per se from French application 2 520 603.

Finally, a pulverulent aromatic substance composition for improving air when cleaning carpet is known from European application 0 031 455, and this is composed of inorganic salts, aromatic substances and zeolites, the aromatic substance compositions being indicated only generally,

but not for example being selected with regard to specific molecular properties.

The electrostatically charged filters are preferably so-called electret filters. An electret is, for example a nonwoven, the fibres of which contain permanent positive and/or negative charges due to suitable pretreatment. These charges attract the likewise charged or induced fine dust particles and fix them electrostatically. Suitable known fibre materials are those based on polypropylene (PP) and polycarbonate (PC). Different properties with regard to dust capacity, degree of separation and filter resistance of the electrets are produced depending on the manufacturing process and treatment process of the fibres.

In view of the inadequacies described, the object of the invention is to maintain the filtering properties at the same level long-term with as little change as possible to the good hiding action of the dust smell from the air emerging from the vacuum cleaner.

This object is achieved according to the teaching of the invention by using polar, aprotic aromatic substances having a molecular weight between 100 and 300 for enriching air flowing through electrostatically charged filters based on polypropylene. This object is also achieved by using apolar, aprotic (non-polar) aromatic substances having a molecular weight between 100 and 300 for enriching air flowing through electrostatically charged filters based on polycarbonate. Surprisingly, it has been shown that unaltered good fragrance properties are maintained almost over the entire service life of the filter while also maintaining optimum fine dust filtering properties.

Aromatic substances of this type, as mentioned above, may be added to the vacuum cleaner by placing them in the vacuum cleaner bag initially in a form known per se, in the form of small rods. However, one particular teaching of the invention indicates adding the aromatic substances to the surface preservative (for floors, upholstery etc.), by means of which a surface is treated for activation prior to vacuum cleaning. Hence, it is no longer necessary to place special small rods of this type or the like into the vacuum cleaner bag. The particles are as it were sucked in automatically with the surface preservative during vacuum cleaning and pass through the vacuum cleaner to ensure, finally, fragrant hiding of possible dust smell in the filtered air released by the vacuum cleaner. The invention teaches the use of a cleaning agent for surface treatment preceding vacuum cleaning which contains aromatic substances having a molecular weight between 100 and 300, which are either predominantly polar and aprotic or predominantly apolar and aprotic. The cleaning agents having predominantly polar and aprotic aromatic substances should be used if filters based on polypropylene are incorporated in subsequent vacuum cleaning. Correspondingly, a cleaning agent having aromatic substances which are predominantly apolar and aprotic should be used if filters based on polycarbonate are used in subsequent vacuum cleaning.

With regard to the aromatic substances of an aromatic substance mixture, which are absorbed in a PP electret particularly acyclic, monocyclic and bicyclic terpene hydrocarbons and alcohols, esters, aldehydes and ketones derived therefrom, individually they do so to different degrees depending on type. Pinenes, myrcene, phellandrene, ocimene, limonene and cineole as individual aromatic substance are absorbed here particularly well, but less well linalool and terpinyl acetate, on the other hand methylionone is not absorbed.

On the other hand, important aromatic substances derived from polar, aliphatic aldehydes are barely absorbed or not at all. Aliphatic carboxylates, aliphatic-aromatic esters or aromatic aldehydes are also barely absorbed or only a little. Examples of afore-mentioned groups which may be mentioned are amyl cinnamic aldehyde, alkyl acetate, amyl salicylate, benzyl propionate and heliatropin. Strong polar, water-soluble organic auxiliaries, such as ethanol and isopropanol are not absorbed at all.

An electret based on polycarbonate has good resistance to turpentine (for example pinenes, phellandrene), but are not resistant to aliphatic and aromatic esters. The latter includes, for example butyl acetate and ethyl salicylate.

Example of a polar, aprotic fragrance
for use in vacuum cleaners

Perfume oil F 45

Methylnaphthylketone	10 % DPG	20
Ambroxane	1 % IPM	10
Calone	1 % DPG	10
Isobutylquinaline	1 % DPG	10
Dihydrojasmine	1 % DPG	10
Galbex	1 % DPG	20
Mandarinal	10 % DPG	3
Methyl methylantranilate	10 % DPG	3
Indolal	10 % DPG	7
Nercelin Bramilia	10 % DPG	5
Celestolide	10 % DPG	5
Isoeugenol	10 % DPG	10
Farenal	10 % DPG	10
Cuminaldehyde	10 % DPG	3

Methyl benzoate	10 % DPG	7
Elintaal	10 % DPG	3
Cananga oil Java		3
Base Flieder Special 0/222257		100
Orange oil guinea sweet		10
Base Mandarine 0/230380		15
Geronial/Nerol mixture		10
Grenylisobutyrol		5
Benzyl salicylate		70
Hunyl salicylate		15
Galaxolide 50		45
Tonalide		5
Base Lemon Blossom special VK 224		300
Base Flower Green KU 104/A1		170
Chrysanthemum Green AP 2244 forte		<u>116</u>
		1,000

The above-mentioned abbreviations "DPG" and "IPM" are solvents known per se. "DPG" means for example dipropylene glycol.

The following values have been determined in an experiment explained in more detail below using a perfume oil as specified above:

Perfume oil type	F 45
Investigation feature	
GC method	34
Dani No.	
GC No.	852 I
Column temperature °C	
Sample gas temperature	20°C
Peak area without electret	49377
Peak area with electret	19881

Area loss %	60
Action time"	
Fragrance on nonwoven	
[h]	93
Amount of fragrance mg	
on filter Ø	28
Degree of particle	
separation electret %	93.8
Degree of particle	
separation electret with	
fragrance %	96.2
Reduction in filter effect %	+ 1.4

In the table above "GC": denotes gas chromatograph. In method 34 1 g of perfume oil are weighed out and in methods 36 or 38 2 g of perfume oil are weighed out into a 500 ml capacity screw glass bottle and sealed by means of an aluminium-laminated septum and a screw cap with bore. The trace of gas chromatograph number 852 I is attached in the appendix. The column is a 30 m capillary column DB 1 non-polar (SE 30). The procedure when taking the gas sample is such that 0.6 ml is taken from the vapour space of the bottle mentioned above at 40° Celsius using a gastight glass syringe SGE/10 ml heated at 40° Celsius, is injected into the injector of the gas chromatograph and then the analysis is started. With regard to adsorption, a single-layer punched out electret filter (Ø 18 mm, 40 mg) is inserted into the same syringe mentioned and is pressed onto the syringe base using the syringe piston, the readable filter volume is 0.2 ml. The syringe thus prepared is heated in the drying cabinet at 40° Celsius.

Gas sample removal and adsorption:

Again 0.6 ml of vapour is taken from the vapour space of the bottle, by removing the piston to the mark 0.8 ml (0.2 ml filter volume + 0.6 ml of vapour) (1st filtration). During injection immediately following, the perfume oil vapour is once again pressed through the electret filter (2nd filtration).

The recording and evaluation of the gas chromatograph is carried out by means of the integrator C-R1B by method 41:

Normal integration of the individual peaks and the total surface area without any factorising. With regard to apparatus and auxiliaries for investigation by gas chromatography, setting up is detailed further below.

As regards the entire experimental arrangement, reference is made to the attached drawing, in which the following construction of the filter test measuring path for determining the degree of separation can be seen:

The fully earthed measuring path consists of a plexiglass tube 1 about 2 m long and 0.15 m diameter, which has an uptake point 2 for a test filter 1.2 m distant from the start of the tube. A motorised fan 3 with continuous control is arranged at the end of the measuring path. Measuring probes 4, 5, which serve for removing a partial volume flow, are arranged both upstream and downstream of the uptake point 2 for the test filter. The partial volume flows taken are passed to the gas sensor 6 and the particle counter 7.

The motorised fan 3 is controlled by means of a transformer which can be controlled between 0 and 220 volts. 8 designates a differential pressure measurement and 9 a volume flow measurement. 10 designates a dust generator.

The filter discs having a diameter of 162 mm are cut from a roll of electret nonwoven (Messrs. 3M, according to details of German patent 2 512 885) using a circular cutter.

The samples are treated with the aromatic substance mixtures in a desiccator. The base of which is covered with an adequate amount of perfume oil. Above it in the gas space at least 3 discs/perfume oil are suspended in a frame. The atmospheric air in the desiccator is pumped out briefly (to about 10^2 millibar) to accelerate adsorption of the filter with perfume oil. The closed desiccator is stored for 48 hours with the samples at room temperature (20° Celsius) until measurement.

During the measurement of the degree of filter separation, the procedure is such that before the start of measurement the perfumed filter discs are inserted into the test filter uptake point. The dust generator is then operated at full capacity and the 5th dust rotor at 121/minute and 7 mm stroke thrust. The test dust thus released is blown into the measuring path. Partial air volume flows are then taken using the particle counting apparatus for 30 seconds in each case upstream and downstream of the test piece and the dust particles contained therein number between 0.3 to 20 μm particle diameter. This is carried out three times for statistical reasons, the results then being printed out. The measured particle numbers upstream and downstream of the test piece are related in inverse proportion and hence expressed as degree of separation in per cent.

In view of the fact that, measured on dust retention capacity of such electrostatic filters consisting of polypropylene, virtually only polar and aprotic substances of molecular weight between 100 and 300, are

present, - filter-blocking substances of non-polar and protic character are thus almost lacking -, it is ensured that for dust particles between 0.3 and 20 μm , the filtering out of fine dust, lying at about 95 %, does not experience considerable reduction in the long term due to addition of aromatic substance; the attached diagram shows that a reduction in the range of 0.1 % was determined, including the measuring error range which is ± 1.5 %. The corresponding case is achieved for electrostatic filters consisting of polycarbonate taking into account the relevant design of the teaching according to the invention (see above).

Appendix: (I) Diagram comparison of the degree of separation of an electret with and without exposure to an aromatic substance mixture according to the invention.

(II) Table apparatus and auxiliaries for investigation by gas chromatography.

(III) Gas chromatography trace No. 852 I

Appendix II

Apparatus and auxiliaries for investigation
by gas chromatography

Gas chromatograph: Dani 3800 fitted with FID 681,
temperature programmer 381-1,
control unit 380-1
Gerstel injector GC 11060800
splitter

Polar separating
column: 30 m FS capillary DB wax (Carbowax 20
M, chemically bonded)
ID 0.25 mm,
0.25 μ m polyethylene glycol film
Messrs. ict, Order No. 122-7032

Non-polar
separating column: 30 m FS capillary DB - 1 (SE 30)
ID 0.25 mm,
0.25 μ m dimethylpolysiloxane
film
Messrs. ict, Order No. 122-1032

Injection syringe
liquid samples: SGE 701; 10 μ l

Injection syringe
vapour samples: SGE 10 MA-HSV; 10 ml

Combustion gases: Compressed air from outside
network, clarified
Hydrogen 3.0 (purity 99.9 %)
Messer Griesheim steel cylinder

Carrier gas:	Helium 4.6 (purity 99.996 %) Messer Griesheim steel cylinder
Carrier gas purification:	Oxisorb cartridge Messrs, WGA, Order No. 2065
Glass bottle:	Narrow-necked packaging glass bottle, clear 500 ml with screw closure, Messrs, Behr, Order No. 120303044, screw connection prepared: screw cap with central bore Ø 2 mm sealing disc of rubber punched out and laminated with self-adhesive aluminium foil.
Recording device:	Shimadzu integrator C-R 1B
Magnetic stirrer:	RCH type, Messrs. Jahnke + Kunkel KG
Thermostat:	Haake circulation thermostat F 30 type
Septum for injector:	SGE Septa type 9 CS, Messrs. WGA, Order No. 041827



PATENT CLAIMS

1. Aromatic substance mixture for air flowing through electrostatically charged filters, consisting of a plurality of individual aromatic substances, such as methylnaphthylketone, ambroxane, calone, isobutylquinoline, dihydrojasmine or the like, characterised in that the aromatic substances of the aromatic substance mixture each have a molecular weight between 100 and 300 and are either predominantly polar and aprotic or predominantly apolar and aprotic.
2. Use of polar, aprotic aromatic substances having a molecular weight between 100 and 300 for enriching air flowing through electrostatically charged filters based on polypropylene.
3. Use of apolar, aprotic aromatic substances having a molecular weight between 100 and 300 for enriching air flowing through electrostatically charged filters based on polycarbonate.
4. Cleaning agent for surface treatment preceding vacuuming, containing an aromatic substance mixture consisting of a plurality of individual aromatic substances, such as methylnaphthylketone, ambroxane, calone, isobutylquinoline, dihydrojasmine or the like, characterised in that the aromatic substances of the aromatic substance mixture each have a molecular weight between 100 and 300 and are either predominantly polar and aprotic or predominantly apolar and aprotic.