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(56) Documents Cited  
**WO 2000/066187 A1**      **WO 1989/012451 A1**  
**WO 1989/012450 A1**      **US 5595731 A**  
**US 5074439 A**  
**WPI Abstract Accession No 2001-584484 [66] &**  
**FR 2803746 A1**

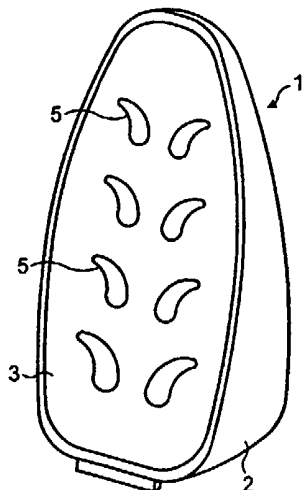
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(54) Abstract Title  
**Use of a super-absorbent polymer as a reservoir for an air freshening, insecticidal or insect repelling agent, and apparatus for dispersing such agents**

(57) There is disclosed a composition which comprises an air modifying agent (such as an air freshener, an insecticide or an insect repellent) and a super-absorbent polymer (and optionally water). The super-absorbent polymer may act as a reservoir for the air modifying agent, from which polymer the agent can be dispersed into the surrounding air. An apparatus for dispersing an air modifying agent into the surrounding air, which comprises such a reservoir (4; see figures 2 and 3) or composition, is also claimed.

Super-absorbent polymers are water-absorbing resins which are characterised by an ability to absorb and retain amounts of aqueous fluids equivalent to many times their own dry weight, and generally include hydrophilic natural or synthetic polymers such as acrylic-based polymers having ionic portions grafted on, hydrolysis products of starch acrylonitrile graft polymers, carboxymethyl cellulose, crosslinked polyacrylates, sulfonated polystyrenes, hydrolysed polyacrylamides, polyvinyl alcohols, polyethylene oxides, polyvinylpyrrolidones and polyacrylonitriles.

In absorbing water, they can swell (normally attributed to the presence of ionisable functional groups, such as carboxyl groups, in the polymer structure) without loss of structural integrity, in many cases in a readily reversible and repeatable manner without loss of properties, over repeated hydration and dehydration cycles.



**FIG. 1**

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date but within the period prescribed by Rule 25(1) of the Patents Rules 1995.

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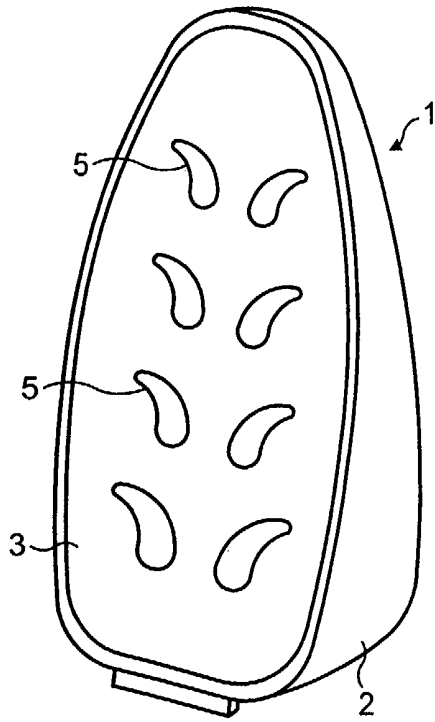


FIG. 1

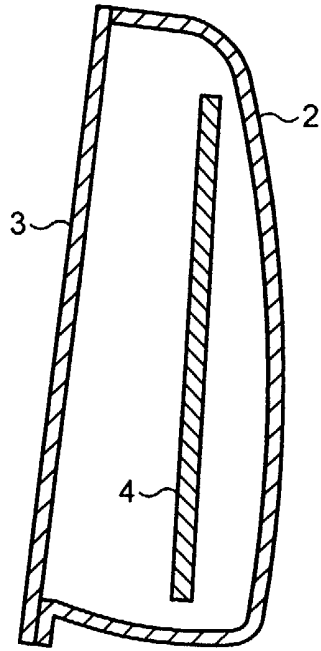


FIG. 2

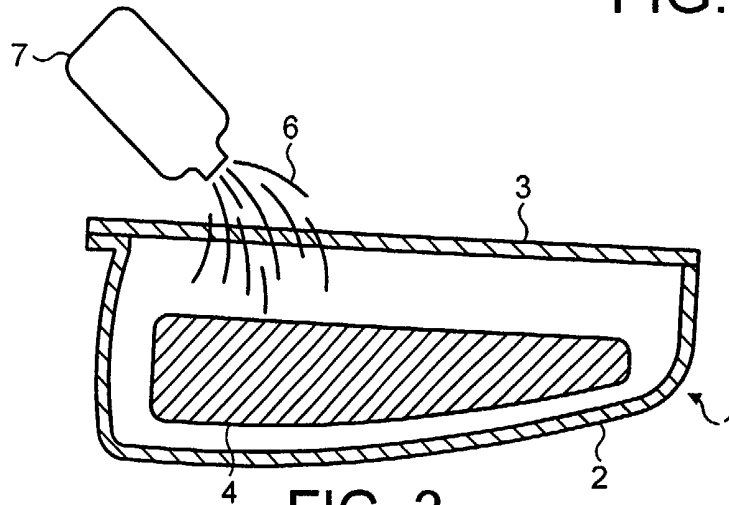


FIG. 3

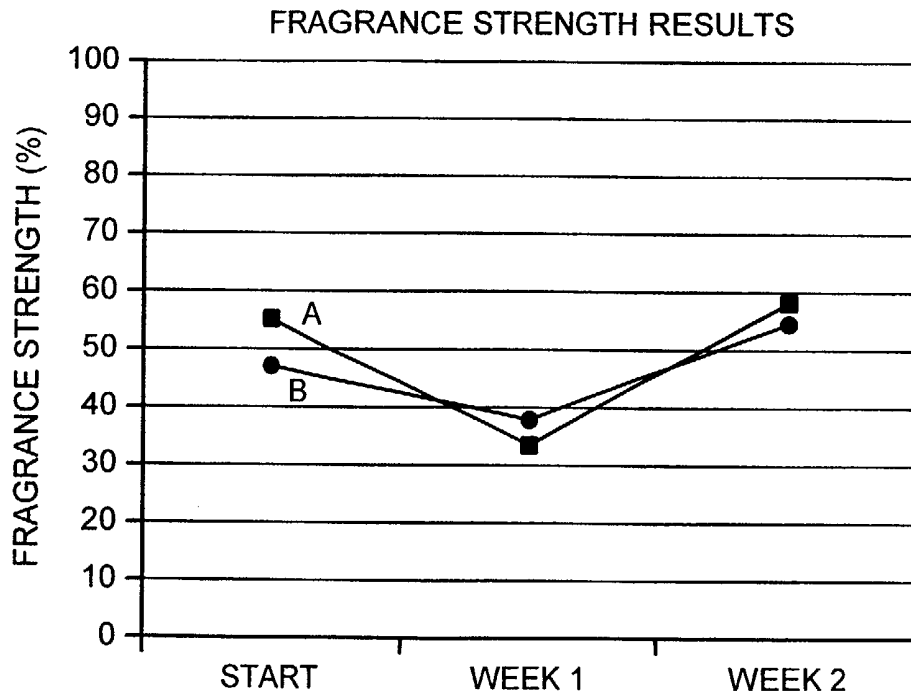


FIG. 4

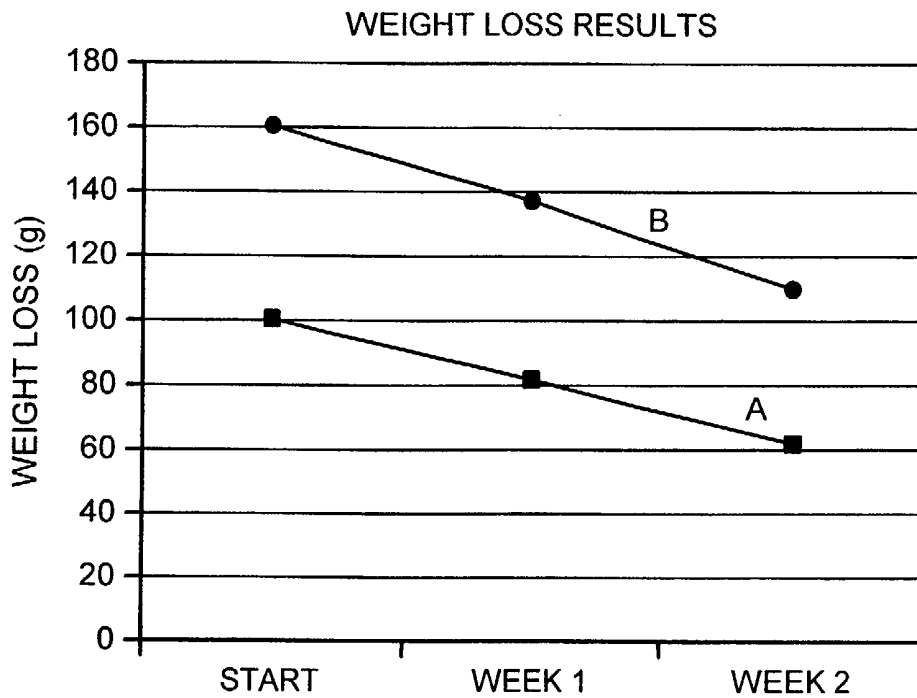


FIG. 5

APPARATUS FOR DISPERSING AN AIR MODIFYING AGENT INTO  
SURROUNDING AIR, AND RESERVOIRS FOR USE THEREIN

5 The present invention relates to an apparatus for dispersing an air modifying agent, such as an air freshener, air fragrance, herbal scent, insecticide, insect repellent or the like, into surrounding air, and more particularly to such an apparatus in which the air modifying agent is contained in a reservoir therefor, the apparatus providing for air flow communication between a surface of the reservoir and surrounding air, whereby the air modifying agent is dispersed from the reservoir into the surrounding air. The invention  
10 further relates to reservoirs for use in such an apparatus.

Apparatus for dispersing an air modifying agent into surrounding air are known, in which an absorbent pad or felt, impregnated with a liquid carrying an air modifying agent, provides a reservoir of air modifying agent which can be dispersed from the  
15 apparatus over a prolonged period of time. The absorbent pad or felt is preferably contained in a housing to protect the reservoir while allowing the necessary air flow communication between the surface of the reservoir and the surrounding air.

It is also known to use as a reservoir for the air modifying agent an aqueous self-supporting gel composition based on carrageenan. GB-A-2297909 describes such a gel composition comprising 1 to 20% by weight of fragrance, 2 to 10% by weight of carrageenan, 0 to 2% by weight of a preservative, 0 to 2% by weight of a colouring agent and 75 to 97% by weight of water, and describes the use of such a gel in an air  
20 fragrancng apparatus comprising a container for the gel.

25 The use of pads and felts and carrageenan-based gel compositions is not totally satisfactory, however. These reservoirs are costly to manufacture, and it is generally difficult or impossible to recharge the relatively dehydrated reservoir with water and agent for re-use.

30 It is an object of the present invention to go at least some way towards overcoming the above disadvantages, or at least to provide an alternative to the prior art.

According to one aspect of the present invention, there is provided an apparatus for dispersing an air modifying agent into surrounding air, the apparatus comprising a reservoir containing the air modifying agent, the reservoir having a surface and being arranged to permit air flow communication between the surface and surrounding air whereby in use the air modifying agent is dispersed from the reservoir into the surrounding air, wherein the reservoir comprises a super-absorbent polymeric composition.

The reservoir may, if desired, be disposed in a housing adapted to protect and support the reservoir while permitting a flow of air to and from the surface of the reservoir.

The reservoir containing the air modifying agent is itself novel and comprises a further aspect of the present invention. It may, for example, find independent application as a refill pack for the apparatus of the first aspect of the invention, or as a means, independent of any apparatus, for dispersing the contained air modifying agent into the surrounding air by direct dispersal from the reservoir.

According to a second aspect of the present invention, therefore, there is provided a reservoir containing an air modifying agent and having a surface from which the air modifying agent can disperse from the reservoir into the surrounding air, the reservoir comprising a super-absorbent polymeric composition.

The reservoir may, if desired, include components such as absorbent and/or support structures, as will be discussed in further detail below.

Alternatively, the reservoir may, if desired, consist essentially of the super-absorbent polymeric composition, the air modifying agent, and optionally water and other minor ingredients. Such a composition is itself novel and comprises a further aspect of the present invention. It may, for example, find independent application as a refill reservoir for the apparatus of the first aspect of the invention, as a means, independent of any apparatus, for dispersing the contained air modifying agent into the surrounding air by direct dispersal from the composition, or as an intermediate in the manufacture of a more complex reservoir structure.

According to a third aspect of the present invention, therefore, there is provided a composition comprising a super-absorbent polymer, an air modifying agent, and optionally water, the super-absorbent polymer preferably being present in an amount effective to provide a reservoir for the air modifying agent and the air modifying agent preferably being present in an amount effective to permit the air modifying agent to disperse from a surface of the composition into surrounding air. The composition is preferably dimensionally stable and self-supporting.

According to a fourth aspect of the present invention, there is provided the use of a composition or structure comprising a super-absorbent polymer as a reservoir for an air modifying agent to be dispersed from the reservoir into surrounding air.

Super-absorbent polymeric compositions are chemical compositions based on super-absorbent polymers (SAPs). SAPs are water-absorbing resins, widely used in sanitary goods, hygienic goods and the like. They generally include hydrophilic natural or synthetic polymers such as acrylic-based polymers having ionic (e.g. sodium salt) portions grafted on, hydrolysis products of starch acrylonitrile graft polymers, carboxymethyl cellulose, crosslinked polyacrylates, sulfonated polystyrenes, hydrolysed polyacrylamides, polyvinyl alcohols, polyethylene oxides, polyvinylpyrrolidones and polyacrylonitriles. SAPs are typically lightly crosslinked, to provide for swellability in the presence of water without loss of structural integrity. In many cases, this swellability is readily reversible and repeatable without loss of properties, over repeated hydration and dehydration cycles.

SAPs are therefore characterised by an ability to absorb and retain amounts of aqueous fluids equivalent to many times their own dry weight, even under moderate pressure. For example, some SAPs can absorb over 100 times their dry weight of distilled water. On contact with water, dry SAPs undergo dramatic swelling caused by the imbibing of water into the polymeric structure. This swelling and absorption of water is normally attributed to the presence of ionisable functional groups in the polymer structure. The ionisable groups are typically carboxyl groups, a high proportion of which are in the salt (e.g. sodium) form when the polymer is relatively dry, and which undergo dissociation and solvation on contact with water. In the dissociated state, the polymer chain contains

many functional groups having the same electrical charge. These groups tend to repel one another, leading to expansion of the polymer structure, which in turn permits further absorption of water. This expansion is limited by the cross-links in the polymer structure, which are present in a sufficient number to prevent solubilisation of the polymer.

The super-absorbent polymeric compositions used in the reservoir of the present invention are preferably re-hydratable, by which is meant that the compositions can undergo more than one dehydration and re-hydration (swelling) cycle without substantial loss of performance efficacy, under normal operating conditions. These normal operating conditions involve slow dehydration (accompanied by loss of the air modifying agent) in air at about room temperature followed by re-hydration by exposure to bulk water containing fresh air modifying agent, again at room temperature.

Super-absorbent polymeric compositions for use in the present invention may consist of an active SAP chemically associated with other materials, e.g. polymeric supporting structures or matrices. In this way, the form and properties of the SAP can be adjusted for fine control of performance. In one preferred embodiment, the SAP may be bonded to a natural polymer such a polysaccharide, for example using a bonding agent such a latex. The super-absorbent polymeric composition is preferably self-supporting, by which is meant that it is of sufficient rigidity that it is firm, is not capable of flowing and maintains its structure on standing. The super-absorbent polymeric composition may, for example, be in the form of a block, a pad, particles or a powder, as desired. The selection of suitable super-absorbent polymeric compositions for use in the present invention will be well within the capacity of those skilled in the art.

The super-absorbent polymeric composition may be present in association with other reservoir components such as another gel and/or a structure for water-absorption and/or support, such as a mat, felt, pad, wick, or any combination thereof. Where a combination of an absorbent structure such as a mat, felt pad or wick (e.g. of cotton fibres, regenerated cellulose fibres, rayon fibres, peat moss fibres, wood pulp fluff, cellulosic tissue, wadding or the like) and a super-absorbent polymeric composition is present, the combination may suitably be substantially the same as such combinations

as are typically used in sanitary napkins or human waste management devices for the absorption of body fluids at efficiencies substantially greater than the use of unmodified absorbent pads. Such a combination is described, for example, in EP-A-1013252, which relates to an absorbent article having a fibrous absorbent structure containing rounded  
5 particles of a super-absorbent polymeric composition. In one embodiment, the composition may be present in association with an absorbent structure such as, for example, an absorbent mat, felt, pad or wick, the composition suitably being homogeneously dispersed throughout the absorbent structure.

10 The super-absorbent polymeric composition for use in the present invention may, for example, comprise an acrylic-based SAP including a sodium-containing salt chain grafted onto the acrylic portion and the SAP being bonded to cellulose by means of latex. A super-absorbent polymeric composition of this type which has been found to be suitable is commercially available in partially-hydrated sheet form from Dyecor  
15 Limited, Waterlooville, England (tel: +44 23 9259 2223; fax: +44 23 9257 1014), having a face weight of about 300 g/square metre, a thickness of about 1.5 mm/ply and an apparent density of about 0.20 g/cubic metre. Such a composition can be charged with air modifying agent by soaking in an aqueous solution containing the air modifying agent. In tests involving a 20 minute soak under a pressure of 0.4 psi followed by a 5  
20 minute drain-off under load, the absorption (ABS) capacity of the super-absorbent composition was found to be about 15.7 g/g.

When fully hydrated (swelled), the super-absorbent polymeric composition may typically contain up to about 50% by weight of SAP and up to about 20% by weight of  
25 the air modifying agent, together with up to about 95% by weight of water. One or more additional ingredient(s) may optionally be present in the super-absorbent polymeric composition, such as, for example, at least one surfactant (typically up to about 10% by weight of the hydrated composition, more preferably about 3% by weight), at least one organic solvent (typically up to about 15% by weight of the  
30 hydrated composition, more preferably about 3% by weight), at least one preservative (typically up to about 1% by weight of the hydrated composition, more particularly about 0.1% by weight), at least one colorant (typically up to about 1% by weight of the hydrated composition, more particularly about 0.1% by weight), at least one bitterness



agent for imparting a bitter taste to the composition to discourage ingestion (typically up to about 1% by weight of the hydrated composition, more particularly about 0.18% by weight), or any combination thereof.

5 The additional ingredients will be readily selectable by those skilled in this art, according to the active air modifying agent and SAP used, and further detailed elaboration of examples is not necessary. As surfactant, for example, a commercially available surfactant such as Crillet-4 (TM) may be used. As organic solvent, for example, ethanol may be used. As preservative, for example, a commercially available  
10 preservative such as Glycosyl L or Parmetol (TM) (available from Schulke & Mayr) may be used. As bitterness agent, for example, Bitrex (TM) may be used. The additional ingredients, when present, are suitably introduced by pre-addition to the aqueous solution used to swell the dehydrated or partially hydrated super-absorbent polymeric composition, when charging the super-absorbent polymeric composition with  
15 the air modifying agent.

The reservoir according to the present invention may be used in any air modifying apparatus and method, especially those in which hitherto a gel or liquid composition and/or an absorbent structure was used. As an example of such an apparatus, there may  
20 particularly be mentioned the apparatus described in our European Patent Application No. EP-A-0934085 (WO-A-98/18503).

The following Example and Test Results are included purely by way of illustration of the invention, with reference to the accompanying drawings, in which:

25

Figure 1 shows a perspective view of an air modifying apparatus;

Figure 2 shows a vertical cross-sectional view of the apparatus of Figure 1, the reservoir being in a relatively dehydrated condition;

Figure 3 shows a vertical cross-sectional view of the apparatus of Figure 1, the  
30 reservoir being charged with an aqueous solution of the air modifying agent and approaching a fully swelled condition;

Figure 4 shows fragrance strength test results relating to the reservoir; and

Figure 5 shows weight loss test results relating to the reservoir.

EXAMPLE

Super-absorbent Polymeric Composition

5 A sheet of the commercially available partially hydrated super-absorbent polymeric material described above was obtained from the supplier Dyecor Limited. The product was stated to have an MD Dry Tensile of about 2500 g/25.4mm, a CD Dry Tensile of about 1950 g/25.4mm and a CD Wet Tensile of about 650 g/25.4mm, as well as a brightness of about 80% and the other physical properties mentioned above.

10

Aqueous Fragrance Composition

An aqueous fragrance composition was prepared by cold mixing the following ingredients in a vessel, with stirring:

15

Fragrance	- 3% by weight
Surfactant (Crillet-4)	- 3% by weight
Solvent (ethanol)	- 3% by weight
Preservative (Parmetol)	- 0.1% by weight
Dye	- 0.1% by weight
Bitterness agent (Bitrex)	- 0.18% by weight
Water	- balance to 100%.

20

25 Preparation of the Reservoir and the Apparatus

A reservoir pad 4 of the required size and shape was cut from the super-absorbent polymer sheet and placed in a conventional container 1 (see Figures 1 and 2). The container comprises a moulded plastics cup portion 2, into which the reservoir pad 4 was initially placed, and a moulded plastics front cover portion 3 which was sealed to the cup portion 2 to close the container 1 with the pad 4 disposed within. The front cover portion is provided with apertures 5 to permit air flow communication between

30

the interior and the exterior of the container. The container 1 is adapted to stand in a vertical orientation, as shown in Figures 1 and 2.

5 The container as shown in Figure 2 contains the pad 4 in its initial partially hydrated form. To charge the pad with fragrance, the container was laid down as shown in Figure 3, presenting the front cover portion 3 uppermost. The aqueous fragrance composition 6 was poured into the plastics cup portion 2 from a bottle 7, whereupon the pad 4 absorbed the aqueous composition 6 and swelled to the condition shown in Figure 3. In the commercial context, the apparatus would preferably be sold to the customer in the  
10 form resulting from the step shown in Figure 3, i.e. with the reservoir in its charged (swelled) condition.

Furthermore, in the commercial context, the aqueous composition 6 would be sold separately in the bottle 7, so that customers who had already bought the apparatus (i.e.  
15 the container 1 and the pre-charged pad 4) could recharge the pad after it had dried back to the condition shown in Figure 2.

After (re)charging as in Figure 3, the apparatus is ready for use and may be stood as in Figure 1, whereby the fragrance will be dispensed into surrounding air by the flow of  
20 air between the interior and the exterior of the container 1.

## 25 TEST RESULTS

### Test Method

30 In the initial charging step described above, the pad was allowed to become fully saturated with the aqueous fragrance composition. The weight of composition taken up was measured (weight of composition added, less weight of unabsorbed composition drained off). The total weight of the apparatus in the ready-to-use condition was also measured. As a comparison against the known carrageenan gel type of reservoir, a

corresponding apparatus was set up with such a reservoir, using the same aqueous fragrance composition, and similarly weighed. In the tests reported below, the apparatus using the reservoir of the present invention is designated A and the comparison apparatus using the carrageenan gel reservoir is designated B.

5

Both apparatus were left to stand at room temperature for the period of the test (two weeks). During this time the reservoirs dried and the fragrance dispersed from the reservoirs into the surrounding air. Weekly measurements of fragrance strength near the front apertures of the containers were taken, and the results are shown in Figure 4.

10

Weekly weight measurements were also taken, and the results are shown in Figure 5.

#### Discussion of Results

The results of Figures 4 and 5 show that the reservoir of the present invention has very similar fragrance strength performance and weight loss results to a conventional carrageenan gel type reservoir. However, the reservoir of the present invention has the additional advantages of reduced cost and enhanced rechargeability, as compared with conventional carrageenan gel type reservoirs.

20

The invention has been broadly described without limitation. Variations and modifications as will be readily apparent to those skilled in the art are intended to be included within the scope of this application and subsequent patents.

**CLAIMS**

1. An apparatus for dispersing an air modifying agent into surrounding air, the apparatus comprising a reservoir containing the air modifying agent, the reservoir having a surface and being arranged to permit air flow communication between the surface and surrounding air whereby in use the air modifying agent is dispersed from the reservoir into the surrounding air, wherein the reservoir comprises a super-absorbent polymeric composition.
2. Apparatus according to claim 1, wherein the reservoir is disposed in a housing adapted to protect and support the reservoir while permitting a flow of air to and from the surface of the reservoir.
3. A reservoir containing an air modifying agent and having a surface from which the air modifying agent can disperse from the reservoir into the surrounding air, the reservoir comprising a super-absorbent polymeric composition.
4. A reservoir according to claim 3, including components such as absorbent and/or support structures.
5. A reservoir according to claim 3, comprising essentially the super-absorbent polymeric composition, the air modifying agent, and optionally water and other minor ingredients.
6. A composition comprising a super-absorbent polymer, an air modifying agent, and optionally water, the super-absorbent polymer preferably being present in an amount effective to provide a reservoir for the air modifying agent and the air modifying agent preferably being present in an amount effective to permit the air modifying agent to disperse from a surface of the composition into surrounding air.

7. A composition according to claim 6 which is dimensionally stable and self-supporting.
  8. The use of a composition or structure comprising a super-absorbent polymer as a reservoir for an air modifying agent to be dispersed from the reservoir into surrounding air.
- 5



INVESTOR IN PEOPLE

Application No: GB 0026005.9  
Claims searched: 1-8

Examiner: Stephen Quick  
Date of search: 30 May 2002

### Patents Act 1977 Search Report under Section 17

#### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): A5E (ECC)

Int Cl (Ed.7): A01N; A61L 9/00, 9/014

Other:

#### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X,E	WO 00/66187 A1 (AMCOL), see (for example) example 8 (page 38)	6 at least
X	WO 89/12451 A1 (LEE COUNTY MOSQUITO CONTROL DISTRICT), see (for example) example VII (page 36), page 16 item 12 (super-absorbent, see page 15 3rd paragraph), page 17 (1st line) and page 19 (3rd paragraph, 1st line)	6
X	WO 89/12450 A1 (LEE COUNTY MOSQUITO CONTROL DISTRICT), see (for example) compositions of table 1 (page 40), page 16 (middle paragraph) and page 32 (last paragraph re fenoxycarb)	3, 6 & 8
X	US 5595731 A (L VALLIERES), see whole document, especially columns 2 (lines 30-36), 3 (lines 30 & 57-59) & 6 (lines 2-11)	3 & 5-8
X	US 5074439 A (L A WILCOX), see whole document, especially columns 1 (lines 36-61) & 2 (lines 1-4 & 15-18)	1-3 & 5-8
A	WPI Abstract Accession No 2001-584484 [66] & FR 2803746 A1 20.07.2001, see abstract (air freshener compositions comprising a perfume and a superabsorbent polymer)	-

X Document indicating lack of novelty or inventive step  
Y Document indicating lack of inventive step if combined with one or more other documents of same category.  
& Member of the same patent family

A Document indicating technological background and/or state of the art.  
P Document published on or after the declared priority date but before the filing date of this invention.  
E Patent document published on or after, but with priority date earlier than, the filing date of this application.