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(54) Controlled release article for protecting thatched roofs

(57) The present invention relates to a controlled release article which contains one or more active agents. The active agent can be an algaecide, fungicide and/or a fire retardant. The article can be a film, strip or straw. It can be incorporated into a thatched roof. By using active agents that are particularly suited for the problem, the roof can be protected against fires and attacks by algae, etc. resulting in a roof which not only looks better but which will also need less repair. A preferred material for making the article is a combination of a (synthetic) polymer and starch.

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Description

[0001] Thatched roofs have been built for a long time and are still popular in some countries. The advantage of thatched roofs is that the insulation properties are very good. They keep the house cool during summers and warm in winter. Thatched roofs are also popular because they are entirely made of natural materials.

[0002] A disadvantage of these roofs is that they are regarded as less safe in case of fire than conventional roof materials. To solve this problem thatched roofs are often sprayed with a fire retardant. Such fire retardant coatings are for example described in DE 19727998 and NL 9101915. The drawback of spraying fire retardants is that they can create a change in color of the roof which is undesirable from an esthetic point of view.

[0003] A further solution to make the roofs fire retardant is the incorporation of sheets of mineral fibers into the roof, such as described in DE 4420671. The drawback of this method is that it can only be applied in new roofs. A further drawback is that it is relatively expensive.

[0004] Another reason why thatched roofs could become less accepted is that in several cases, algae have suffocated the surface so that a composting process takes place inside the thatch layer. The effect of this is to dramatically reduce life expectancy. There are several factors which may be the cause of this, such as design and decreased sulfur content in the air. Also the air pollution is an important factor. As thatch is a completely natural product it too has become affected by pollutants. Friendly organisms die, increased nitrogen feeds algae: thatch deteriorates. The presence of algae, moss and dirt is also undesirable from an esthetic point of view.

[0005] These above mentioned problems can now be solved by means of the present invention which provides a controlled release article for the protection of thatched roofs which gradually releases one or more active agents over time. The controlled release article comprises a matrix with the active agent incorporated in the matrix.

[0006] The controlled release article can be a film. The film is particularly suitable for newly built thatched roofs where it can be positioned underneath or between reed layers. The controlled release article can also have a strip or straw like shape, preferably similar to natural reed. The latter embodiment of the invention will be referred to hereafter as "artificial reed". The artificial reed can be laid in the roof during construction or pushed in during renovation. Also combinations of film and artificial reeds are possible, for instance a film having artificial reeds attached thereto with a predetermined distance between the artificial reeds.

[0007] By incorporating into the roofs films or artificial reeds containing active agents that are particularly suited for the problem, the roof can be protected against fires and attacks by algae, etc. resulting in a roof which not only looks better but which will also need less repair.

[0008] Controlled release mechanisms which can be used are known in the art and depend on the type of material used as a matrix for the active agents. According to one mechanism the matrix material is slowly removed due to microbial activity and the ingredients are set free. The external effect of washing out by rain provides spreading of the ingredients over the roof. Another mechanism is that via dissolving of the ingredients a wash out effect occurs that is determined by diffusion of the ingredients through the matrix material. Another mechanism is degradation under the influence of U.V. radiation (photodegradation) and thus gradual release of the active agents incorporated therein. The preferred mechanism is a combination of two or more of the above described mechanisms. Depending on the type of mechanism involved the article can either partly or completely degenerate over time.

[0009] The article of the invention releases the active agents over time to the surrounding area of natural thatch. The controlled release properties are selected such that the article releases the active agents during a time period which corresponds with the "life cycle" of the thatch layer in which the article is incorporated. In that case the degenerated article can be replaced at the same time as the thatch layer. Therefore, the article will gradually release the active agents over a period of at least 6 months, preferably at least 1 year, most preferably at least 3 years up to a period of 30 to 80 years.

[0010] The controlled release article can comprise a polymer matrix with the active agents incorporated therein. Any polymeric matrix which releases the active agents over time, can be used. Such matrices are known to the skilled person and are readily available on the market. Preferably, the polymeric matrix comprises a non-water soluble polymer, preferably a thermoplastic polymer, and a water soluble polymer. The amount of water soluble polymer, based on the total weight of non-water soluble polymer and water soluble polymer is 10 to 100 % by weight, preferably 25 to 80 % by weight.

[0011] The non-water soluble polymer is a polymer that does not dissolve in water at 20 °C, i.e. at the most 5 wt.% of this polymer dissolves in water at 20 °C. It is preferably selected from polyethylene, polypropylene, polyvinyl chloride, polystyrene, ethylene/vinyl acetate copolymer, ethylene/methyl acrylate copolymer, ethylene/acrylic acid copolymer, polycaprolactone, polyurethane, copolymers and blends thereof. The non-water soluble polymer is preferably a polyolefin, most preferably polyethylene.

[0012] The water soluble polymer dissolves in water at 20 °C in amount of at least 80 % by weight. The water soluble polymer can be selected from biopolymers, such as gelatin and water soluble polysaccharides such as starch, modified starch, cellulose, modified cellulose, carboxymethylcellulose and water soluble derivatives of chitine, and synthetic polymers such as poly(meth) acrylic acid, polyvinyl alcohol, polyethylene oxide and polyacryl amide. Of the biopolymers, starch is preferred.

A suitable starch is Solanyl™. Of the synthetic polymers polyvinyl alcohol is preferred. A suitable polyvinyl alchol is PVAXX™.

[0013] According to the present description starch is understood to be native starch, granular starch, fractions and derivatives of starch and agricultural raw materials which are rich in starch (containing at least 60 % starch wt./wt.), such as wheat flour. The starch can originate from a wide variety of natural sources, such as wheat, corn, amylocorn, wax corn, potatoes, quinoa, rice, etc.

[0014] The article comprising non-water soluble polymer, water soluble polymer and active agents can be prepared as follows. First the active agents are processed in the presence of some water in the water soluble polymer. A granulate will be obtained that contains defined amounts of active agents. Typical particle sizes of the granulate pellets range from 1 to 10 mm, in particular 3-4 mm. The next step is that these pellets are mixed with the non-water soluble polymer, blended with further additives and processed under shear and elevated temperature, for instance in an extruder. The pellets are melted together with the non-water soluble polymer and dispersed as little droplets inside the plastic. The typical size of these droplets will be around 5 to 200 microns.

[0015] According to a first embodiment, the active agent contained in the controlled release article can be an algaecide, fungicide and/or cleaning agent. The cleaning agents, fungicides and/or algaecides incorporated serve to protect the roofs against moss, algae, fungi, mycella and dirt. Any algaecide and/or fungicide suitable for protecting materials such as natural reed can be used. These materials are known to a skilled person. Examples are benomyl and copper based fungicides. Examples of algaecides are copper, copper compounds, such as copper sulphate, quaternary ammonium compounds and zinc pyrithione. Against moss ferro sulphate can be used. A general preservative is for example sodium benzoate.

[0016] As a cleaning agent the surfactant compounds generally used in soaps or detergents like alkylates, sodium salts or sodium compounds may be used. The cleaning agent may contain a whitener such as for example sodium tetraacetylethylene diamine, hydrogen peroxide or a precursor thereof. It may also contain suitable enzymes. Combinations thereof are also possible.

[0017] According to a second embodiment of the invention, the active agent is a fire retardant. Examples of fire retardants are halogens, halon fire retardants and intumescent fire retardants. These fire retardants are known in the art. Examples of possible fire retardants are diammonium phosphate and sodium silicate.

[0018] The article can further contain any additives known in the art, such as plasticizers, pigments, fillers and U.V. stabilizers. Of particular importance are the pigments. Preferably pigments are added which mask the article so that it is not obviously visible between the natural reeds. The article preferably degrades under the influence of UV-light. This can for instance be reached by using additives which can speed up or slow down the rate of photo degradation, for instance by reducing the molecular weight of the polymer by catalytic or oxidation reactions that are UV-induced.

[0019] An example of a material which can be used according to the invention is a coextruded material of 50 % by weight polyethylene and 50 % by weight starch, for instance Solanyl a potato based starch containing as active agents polybor (borax), zinc pyrithione and copper sulphate.

[0020] Another material that can be used for the controlled release article is a cellulosic material that is impregnated with the active agents. A preferred material is paper or cardboard.

[0021] The artificial reeds according to the invention can be incorporated into the roofs together with the natural reed. According to the invention it is therefore preferred that the reeds have mechanical properties comparable to the natural reed. One way of accomplishing this is by making the artificial reeds round. Further the material can be adjusted such that the reeds have the right flexibility and surface roughness.

[0022] The dimensions of the artificial reed will also be similar to that of the natural reed. The length is variable in conjunction as to where it finds itself on the roof, anywhere between 10 to 100 cm. The diameter depends on the thickness of the artificial reed to ensure that sufficient active agent can be incorporated into the artificial reed. The diameter can also be adjusted such that it corresponds largely to that of the type of natural reed used for the roof. In general the diameter will vary between 1 mm to 15 mm.

[0023] When the controlled release article is a film, it will generally have a thickness of 0.05 to 2 mm. The width of the film will generally be in the range of 10 cm to 100 cm. The length of the film can be cut on site by the skilled person depending on the size of the roof.

[0024] A further aspect of the invention relates to the thatched roof containing the controlled release article of the invention. The amount of the article in the roof will depend on many factors, such as the dimensions of the article and concentration of active agents. Also the location of the building will determine to what extent the roof is exposed to external influences. In case of artificial reeds in general one would expect the surface of the roof to contain between 1 to 25 % artificial reeds.

[0025] With thatched roofs any form of thatch is meant, i.e. any sheltering cover, such as a house roof, made of a plant material. Suitable plant materials are wheat straw, water reed, long straw, heather etc. Depending on the type of natural material used for the thatch, the dimensions and shape of the artificial reed can be adjusted.

[0026] The present invention also provides a method of protecting a thatched roof, wherein controlled release articles containing one or more active agents are incorporated in the roof. As described above the active agent

is an algicide, fungicide, cleaning agent and/or fire retardant. Preferably the controlled release articles have the properties as described above.

Claims

1. Controlled release article for the protection of thatched roofs which gradually releases one or more active agents over time.

2. Article according to claim 1, wherein the active agent is an algaecide, fungicide, cleaning agent, fire retardant or mixture thereof.

3. Article according to claim 1 or 2, which is a film.

4. Article according to claim 1 or 2, which has a strip or straw like shape preferably similar to natural reed.

5. Article according to any of claims 1 to 4, comprising a polymeric matrix and one or more active agents incorporated in the polymeric matrix.

6. Article according to claim 5, wherein the polymeric matrix comprises a non-water soluble polymer and a water soluble polymer, wherein preferably the amount of water soluble polymer, based on the total weight of non-water soluble polymer and water soluble polymer, is 10 to 100 % by weight, preferably 25 to 80 % by weight.

7. Article according to claim 6, wherein the thermoplastic polymer is selected from polyethylene, polypropylene, polyvinyl chloride, polystyrene, ethylene/vinyl acetate copolymer, ethylene/methyl acrylate copolymer, ethylene/acrylic acid copolymer, polycaprolactone, polyurethane and blends thereof.

8. Article according to claim 6 or 7, wherein the water soluble polymer is selected from the group of biopolymers including gelatin and water soluble polysaccharides, preferably starch, modified starch, cellulose, modified cellulose, carboxymethylcellulose and water soluble derivatives of chitine, and the group of synthetic polymers including poly (meth)acrylic acid, polyvinyl alcohol, polyethylene oxide and polyacryl amide.

9. Article according to claim 6, wherein the non-water soluble polymer is polyethylene and the water soluble polymer is polyvinyl alcohol or starch.

10. Article according to any of claims 1 to 4, **characterized in that** comprises a cellulosic material, preferably paper, impregnated with the active agents.

11. Method of protecting a thatched roof, **characterized in that** an article according to any of the preceding claims is incorporated in the roof.

12. Thatched roof, containing an article according to any of the claims 1 to 10.

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EUROPEAN SEARCH REPORT

Application Number
EP 01 20 2012

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X Y A	DE 32 20 536 A (STOLLBERG) 25 August 1983 (1983-08-25) * page 8, paragraph 2 - paragraph 3; figures *	1,2,4,5, 10-12 6-9 3	E04D9/00 E04D13/00
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Y	US 4 891 404 A (NARAYAN ET AL.) 2 January 1990 (1990-01-02) * column 1, paragraph 1 * * column 5, line 49 - column 6, paragraph 1 *	6-9	TECHNICAL FIELDS SEARCHED (Int.Cl.7) E04D
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 June 2001	Righetti, R

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82