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(54) **MATERIAU DE REVETEMENT POUR SURFACES DE RAYONNEMENT S'UTILISANT POUR PRODUIRE DES ONDES ELECTROMAGNETIQUES ET PROCEDE PERMETTANT DE LE PRODUIRE**

(54) **COATING MATERIAL FOR RADIATION SURFACES TO PRODUCE ELECTROMAGNETIC WAVES AND A METHOD FOR MANUFACTURING SAID MATERIAL**

(57) L'invention concerne un matériau de revêtement pour surfaces de rayonnement s'utilisant pour produire des ondes électromagnétiques, ainsi qu'un procédé permettant de le produire. Ce matériau de revêtement comprend un liant, un agent d'isolation, un dispersant, de l'eau et du graphite, qui sont tous mélangés conjointement. Selon l'invention, le matériau de revêtement comprend entre 55 et 65 % en fractions molaires d'une substance de base comprenant un liant, un agent d'isolation, un dispersant et de l'eau distillée et entre 35 et 45 % en fractions molaires de graphite, le liant comprenant de l'eau distillée, de l'huile sulfatée, des phénols ou de la benzisothiazolinone, de la caséine, de l'urée, un diluant alcalin et du caprolactame. Selon ce procédé de production de ce matériau de revêtement, le liant est préparé dans une première étape, puis la substance de base est produite au cours d'une deuxième étape, ladite substance de base étant ensuite mélangée au graphite au cours d'une troisième étape. Il en résulte un matériau de revêtement présentant une pluralité de dipôles formés par le graphite, l'agent d'isolation et le liant, ainsi que des ondes électromagnétiques à haut degré de rayonnement, à l'état d'excitation.

(57) The invention relates to a coating material for radiation surfaces to produce electromagnetic waves and a method for manufacturing of said material. The coating material consists of a bonding agent, an insulating agent, a dispersing agent, water and graphite which are mixed together. According to the invention, the coating material is made up of a 55 to 60 % mole fraction of a base substance consisting of a bonding agent, insulating agent, dispersing agent and distilled water in addition to a 35 to 40 % mole fraction of graphite. The bonding agent consists of distilled water, sulfated oil, phenolene or benzisothiazolinone, casein, urea, alkali diluent and caprolactam. According to the inventive method which is designed to produce said coating material, a bonding agent is produced in a first step. In a second step, the base substance is produced. In a third step, the base substance is mixed with the graphite. This results in a coating material with a plurality of dipoles which are formed by the graphite, the insulating agent and the bonding agent. Electromagnetic waves with a high degree of radiation are obtained in a state of excitation.

Abstract

The invention relates to a coating material for radiation surfaces to produce electromagnetic waves and a method for manufacturing of said material. The coating material consists of a binding agent, an insulating agent, a dispersing agent, water and graphite which are mixed together. According to the invention, the coating material is made up of a 55 to 60 % mole fraction of a base substance consisting of a binding agent, insulating agent, dispersing agent and distilled water in addition to a 35 to 40 % mole fraction of graphite. The binding agent consists of distilled water, sulfated oil, phenolene or benzisothiazolinone, casein, urea, alkali diluent and caprolactam. According to the inventive method which is designed to produce said coating material, a binding agent is produced in a first step. In a second step, the base substance is produced. In a third step, the base substance is mixed with the graphite. This results in a coating material with a plurality of dipoles which are formed by the graphite, the insulating agent and be binding agent. Electromagnetic waves with a high degree of radiation are obtained in a state of excitation.

Description

Coating material for radiation surfaces to produce electromagnetic waves and a method for manufacturing said material

The invention relates to a coating material for radiation surfaces to produce electromagnetic waves in accordance with the introductory part of Claim 1, and a method for manufacturing said material in accordance with the introductory part of Claim 9.

Coating materials of this type are applied to the radiation surfaces of emitters used in energy technologies, in particular refrigeration technology and temperature-control technology. The electromagnetic waves generated through the interaction of the emitter with the coating material serve, for example, to cool down or heat a material placed in the emission field of the emitter.

A coating material for radiation surfaces to produce electromagnetic waves and a method for manufacturing said material is already known; see DD-208 029. The coating material is a mixture consisting of binding agent, insulating agent, dispersing agent, water and graphite. A polyvinyl acetate and/or a polyacrylate and/or a polypeptide is used as binding agent, whilst an insulating soot is used as insulating agent. Graphite, soot and binding agent form electric dipoles in the coating material which emit electromagnetic waves in the excited state. The process for the preparation of this coating material encompasses essentially two steps: the mixing of these substances by

means of a stirring apparatus, and the application of pressure to reduce the size of the soot and graphite particles.

Only general statements as to the basic composition of a coating material are however made therein, from which no specific composition of the coating material, with good effectiveness with regard to the emission of electromagnetic waves, can be derived.

It is therefore object of the invention to propose a coating material of a specific composition, with which an effective emission of electromagnetic waves can be achieved, as well as to provide a method for manufacturing said coating material.

This problem is solved by the features of Claim 1 as regards the coating material and the features of Claim 9, as regards the method for manufacturing said coating material.

According to Claim 1, the binding agent is composed of:

- 64 to 79 % amount of substance (mole fraction) distilled water,
- 4 to 6 % amount of substance sulfated oil,
- 0.16 to 0.24 % amount of substance phenols or 0.05 to 0.5 % amount of substance benzoisothiazolinon,
- 15 to 19 % amount of substance casein,
- 0.8 to 1.2 % amount of substance urea,
- 2 to 3 % amount of substance alkali diluent and
- 2.5 to 3.5 % amount of substance caprolactam

The coating material itself is composed of 55 to 65 % amount of substance of a base material (base substance) and 35 to 45 % amount of substance graphite, where the base

material consists of a mixture of 39 to 49 % amount of substance binding agent, 18 to 23 % amount of substance insulating agent, 18 to 24 % amount of substance dispersing agent and 12 to 16% amount of substance distilled water. In this composition the coating material builds up a large number of evenly distributed, microscopic electric dipoles formed from the insulating agent, the graphite and the binding agent.

The binding agent contains distilled water as the main component to ensure, dependent on the quantity added, an at least viscous consistency of the binding agent. In this way the individual components of the binding material can be mixed together well.

The sulfated oil, and a flow-control agent if present, act as a solvent intermediary and bring about a uniform and stable distribution of the individual substances in the binding agent as well as good film formation of the coating material on the substrate.

The phenols or benzoisothiazolinon contained in the binding agent, even in small quantities, promote the addition of particles.

Casein can be regarded as the binding agent in the binding agent and enables the individual components to be taken up within the binding agent.

Urea too is used as a solvent intermediary in the binding agent i.e. it promotes an even distribution of the individual components in the binding agent.

The binding agent also contains a diluent functioning as an homogenizer as well as caprolactam as a structural component.

The main component of the base material is the binding agent in which the particles of the insulating agent, as one part of the electric dipole, accumulate. The dispersing agent aids the dispersion process and thereby an even distribution of the binding agent, including the insulator particles, within the base material. The distilled water mixed into the base material serves to liquefy the base material.

The graphite and its individual particles added during mixing of the coating material also deposit themselves in the binding agent, to which the insulator is already bound, and in conjunction with the insulating agent form a large number of microscopic electric dipoles, evenly distributed within the coating material. The graphite can be added in a milled state with very small particle size. This further promotes an even distribution of the graphite in the coating material and therefore the creation of a large number of electric dipoles. A high degree of radiation with regard to the generation and emission of electromagnetic radiation can thereby be achieved with this coating material. An emitting surface coated with a coating material of this type when subjected to a high frequency stimulus emits electromagnetic radiation of a correspondingly high frequency. After preparation, the coating material should preferably have a minimally viscous, spreadable consistency and will dry after the radiation surface has been coated, whereby the surface should preferably be continuous and free of tears.

The sulfated oil can for example be sulfated olive oil, sulfated sesame oil or sulfated palm oil. According to Claim 2, the sulfonated oil of preference is however sulfated ricinus oil, commonly known as sulforicinate or Turkey red oil. This sulfated ricinus oil is especially well suited on account of its interface-active properties.

According to Claim 3, the phenols of preference are carbonized phenols, produced by cracking, which demonstrate particular suitability with respect to the addition of particles. The preferred alternative to phenols is benzoisothiazolinon.

According to Claim 4, the diluent is a solvent based on aromatics and/or alcohol and/or ester and/or ketone, e.g. terpene.

A large variety of common insulators can be used as insulating agent. According to Claim 5, the insulating agent of preference is however an insulating soot. It is advantageous if the soot is added in the milled state with a very small particle size. This promotes an even distribution of the soot in the base material and therefore the overall formation of a multitude of electric dipoles in the coating material.

According to Claim 6, the dispersing agent, for easier dispersion and therefore an even distribution of the binding agent including insulator particles in the base material, is an organic, monomeric and/or polymeric substance.

According to Claim 7, the coating material in its preferred composition contains a thixotropy agent. This thixotropy agent ensures that the coating material displays a viscous consistency i.e. is easily spreadable when applied to a radiation surface, but is sufficiently viscous when at rest such that no drops or tears can form on the surface. In this way the coating material can be applied to a radiation surface and will follow its outline exactly.

According to Claim 8, the coating material in its preferred composition is applied to a radiation surface of an emitter with which electromagnetic radiation can be emitted of a frequency in the same order of magnitude as the natural molecular frequency of the material placed in the emission field of the emitter in order to be heated or cooled. This emitter has a large surface area and is limited by two supply lines layed out in parallel and having a separation distance corresponding to an integral multiple of the wave length emitted by the emitter. This emitter can emit a frequency both in the range of the natural molecular frequency of the material to be heated or cooled as well as a correspondingly suitable frequency for a liquid or gaseous medium also located in the room. In this way the medium too can be included into the temperature change process. A high efficiency is achieved on account of the mutual interaction of the emitter with the material to be heated or warmed, in the range of its frequency of resonance with the natural molecular frequencies. The coating material according to the invention, with its large number of dipoles, contributes to produce an overall effective emission system for electromagnetic waves having a high emission level.

According to Claim 9, in the first process step in the preparation of the binding agent

- 64 to 79 % amount of substance distilled water,
- 4 to 6 % amount of substance sulfated oil,
- 0.16 to 0.24 % amount of substance phenols or 0.05 to 0.5 % amount of substance benzoisothiazolinon,
- 15 to 19 % amount of substance casein,
- 0.8 to 1.2 % amount of substance urea,

- 2 to 3 % amount of substance alkali diluent and
- 2.5 to 3.5 % amount of substance caprolactam.

are mixed together.

In the second process step to prepare the base material

- 39 to 49 % amount of substance of the binding agent prepared in the first process step,
- 18 to 23 % amount of substance insulating agent,
- 18 to 24% amount of substance dispersing agent and
- 12 to 16 % amount of substance distilled water.

are mixed together.

Subsequently, in a third process step to prepare the coating material, 55 to 65 % amount of substance of this base material and 35 to 45 % amount of substance graphite are mixed together, where the insulating agent, the graphite and the binding agent lead to the formation of a large number of electric dipoles for the emission of electromagnetic waves.

These substances are mixed in the individual process steps using either mixing and/or kneading apparatus, like for example a screw mixer, mixing mill or centrifugal mixer, all of which guarantee particularly intensive mixing. At the same time these mixers also reduce the size of the particles added, in particular the insulator particles added in the second process step and the graphite particles added in the third process step. These particles are thereby finely and above all evenly distributed in the coating material and form a large

number of microscopic electric dipoles for the generation of electromagnetic waves with a high emission level. In this manner the coating material can be prepared easily and thus also cost effectively.

In the preparation process in its preferred form, according to Claim 10, sulfated ricinus oil is the preferred sulfated oil used in the binding agent because it is well suited, in particular on account of its interface-active properties. The phenols of preference used in the binding agent are carbonized phenols produced by cracking or benzoisothiazolinon. Furthermore, in the preferred preparation process a solvent based on aromatics and/or alcohol and/or ester and/or ketone is used as diluent in the binding agent. An insulating soot is used as the preferred insulating agent in the base material and it is advantageous to add it in the milled state with a very small particle size. This promotes an even distribution of the soot in the base material and the overall formation of a large number of electrical dipoles in the coating material. Furthermore, an inorganic and/or organic, monomeric and/or polymeric substance is used as dispersing agent to facilitate an even distribution of the binding agent including the insulator particles in the base material.

According to Claim 11, a thixotropy agent is also mixed into the coating material. This thixotropy agent ensures that the coating material is easily spreadable when applied to a radiation surface, but is sufficiently viscous when at rest such that no drops or tears can form on the surface.

According to Claim 12, the prepared spreadable coating material is applied to the radiation surface of an emitter by means of a spraying, painting or knife coating process and dried there. The quantity

applied is selected so that a dry layer of for example 60 to 80 micrometer layer thickness is formed. The emitter can then be used to emit electromagnetic radiation with a frequency in the same order of magnitude as the natural molecular frequency of the material placed in the emission field of the emitter in order to be heated or warmed.

A preferred composition of the coating material, based on a specific example, will now be detailed:

In the first process step, a binding agent is prepared by mixing

71.4 % amount of substance distilled water,
5.0 % amount of substance sulfated ricinus oil,
0.2 % amount of substance carbonized phenols, produced by cracking
16.9 % amount of substance casein,
1.0 % amount of substance urea,
2.5 % amount of substance diluent and
3.0 % amount of substance caprolactam.

Subsequently, in a second process step, a base material is prepared by mixing

44.2 % amount of substance of the binding agent
20.7 % amount of substance of an insulating soot,
21.0 % amount of substance of a dispersing agent and
14.1 % amount of substance distilled water.

Subsequently, in a third process step, a coating material is prepared by mixing

60 % amount of substance of the base material and
40 % amount of substance graphite as a pi electron system.

This coating material was applied to the radiation of an emitter, allowed to dry and then a stimulus applied to the emitter. The electromagnetic radiation thus measured exhibited a high degree of radiation.

To prepare the binding agent, the individual components are mixed together in a mixer according to a specific procedure e.g. with 2000 revolutions/min for 10 to 20 minutes. In the second process step mixing is again carried out at e.g. 2000 revolutions/min for 10 to 20 minutes, whereby at the same time pressure at a level of 6 to 18 MPa can be applied to the base material to bring about a reduction in the soot particle sizes to less than 40 micrometers. In the third process step the substances are again mixed at e.g. 2000 revolutions/min for 10 to 20 minutes, whereby additional pressure, applied at intervals, of a magnitude of 6 to 18 MPa may be applied to the coating material, producing shearing stress that promotes a lengthways orientation of the dipoles in the coating material. To achieve an advantageous dispersion of the individual components the ultrasound dispersion technique can be used as it guarantees a particularly fine distribution of the particles and thus the dipoles.

Patent Claims

1. Coating material for radiation surfaces to produce electromagnetic waves,

composed of binding agent, insulating agent, dispersing agent, water and graphite,

characterized in that

the coating material has the following composition

a. 55 to 65 % amount of substance (mole fraction) of a base material comprising

- 39 to 49 % amount of substance binding agent,
- 18 to 23 % amount of substance insulating agent,
- 18 to 24 % amount of substance dispersing agent,
- 12 to 16 % amount of substance distilled water

and

b. 35 to 45 % amount of substance graphite,

the composition of the binding agent being

- 64 to 79 % amount of substance distilled water,
- 4 to 6 % amount of substance sulfated oil,

- 0.16 to 0.24 % amount of substance phenols or 0.05 to 0.5 % amount of substance benzoisothiazolinon,
- 15 to 19 % amount of substance casein,
- 0.8 to 1.2 % amount of substance urea,
- 2 to 3 % amount of substance alkali diluent, and
- 2.5 to 3.5% amount of substance caprolactam, and

where the insulating agent, the graphite and the binding agent form electrical dipoles for the emission of electromagnetic waves.

2. Coating material according to Claim 1 characterized in that the sulfonated oil is sulfated ricinus oil in preference.

3. Coating material according to Claim 1 or Claim 2 characterized in that the phenols are carbonized phenols produced by cracking or benzoisothiazolinon is used in preference.

4. Coating material according to one of the Claims 1 to 3 characterized in that the diluent is a solvent based on aromatics and/or alcohol and/or ester and/or ketone.

5. Coating material according to one of the Claims 1 to 4 characterized in that the insulating agent is an insulating soot.

6. Coating material according to one of the Claims 1 to 5 characterized in that the dispersing agent is an inorganic and/or organic, monomeric and/or polymeric substance.

7. Coating material according to one of the Claims 1 to 6 characterized in that the coating material contains a thixotropy agent.

8. Coating material according to one of the Claims 1 to 7 characterized in that the coating material is applied to a radiation surface of an emitter so that an electromagnetic radiation can be emitted with a frequency in the same order of magnitude as the natural molecular frequency of the material placed in the emission field of the emitter in order to be heated or cooled.

9. Method for manufacturing a coating material for radiation surfaces to produce electromagnetic waves,

in which binding agent, insulating agent, dispersing agent, water and graphite are mixed together,

characterized in that

in the first process step in the preparation of the binding agent

- 64 to 79 % amount of substance distilled water,
- 4 to 6 % amount of substance sulfated oil,
- 0.16 to 0.24 % amount of substance phenols or 0.05 to 0.5 % amount of substance benzoisothiazolinon,
- 15 to 19 % amount of substance casein,
- 0.8 to 1.2 % amount of substance urea,
- 2 to 3 % amount of substance alkali diluent, and
- 2.5 to 3.5 % amount of substance caprolactam

are mixed together,

and that in the second process step in the preparation of the base material

- 39 to 49 % amount of substance binding agent,
- 18 to 23 % amount of substance insulating agent,
- 18 to 24% amount of substance dispersing agent, and
- 12 to 16 % amount of substance distilled water

are mixed together, and

that in a third process step in the preparation of the coating material

- 55 to 65 % amount of substance of the base material, and
- 35 to 45 % amount of substance graphite

are mixed together,

where the insulating agent, the graphite and the binding agent form electrical dipoles for the emission of electromagnetic waves.

10. Method for manufacturing a coating material according to Claim 9 characterized in

that the sulfonated oil used in the binding agent is sulfated ricinus oil in preference

that the phenols used in the binding agent are carbonized phenols in preference produced by cracking, or that benzoisothiazolinon is used,

that the diluent used in the binding agent is a solvent based on aromatics and/or alcohol and/or ester and/or ketone,

that the insulating agent used in the base material is an insulating soot, and

that the dispersing agent used in the base material is an inorganic and/or organic, monomeric and/or polymeric substance.

11. Method for manufacturing a coating material according to Claim 9 or Claim 10 characterized in that a thixotropy agent is added to the coating material.

12. Method for manufacturing a coating material according to one of the Claims 9 to 11 characterized in that the prepared spreadable coating material is applied to the radiation surface of an emitter by means of a spraying, painting or knife coating process, then hardens there after a drying process, with the emitter emitting electromagnetic radiation with a frequency that lies in the same order of magnitude as the natural molecular frequency of the material placed in the emission field of the emitter in order to be heated or cooled.