(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 557 314 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
21.05.2025 Bulletin 2025/21

(21) Application number: **24820923.1**

(22) Date of filing: **30.04.2024**

(51) International Patent Classification (IPC):
G21H 5/00 *(2006.01)* ***C01G 23/047*** *(2006.01)*
F02B 51/06 *(2006.01)* ***F02M 27/06*** *(2006.01)*

(86) International application number:
PCT/JP2024/016643

(87) International publication number:
WO 2025/069533 (03.04.2025 Gazette 2025/14)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH MA MD TN

(30) Priority: **27.09.2023 JP 2023164148**
29.03.2024 JP 2024055861

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(54) **SUBSTANCE ACTIVATION MATERIAL AND SUBSTANCE ACTIVATION MEMBER**

(57) Provided are a material for activating a substance and a member for activating a substance capable of exhibiting a greater substance activation effect. A material for activating a substance including a powder of a natural mineral containing a radioactive substance, and a powder of an electron-generating substance that generates electrons by using alpha rays emitted from the natural mineral.

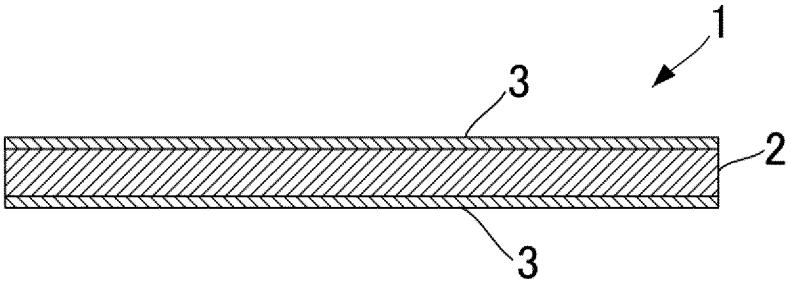

FIG. 1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a material for activating a substance and a member for activating a substance.

BACKGROUND ART

[0002] Recently, activation of substances such as combustion air taken in and exhaust gas emitted from an engine to reduce a fuel consumption amount in highspeed running and to reduce the amount of carbon dioxide contained in the exhaust gas has been proposed (for example, Patent Document 1).

[0003] In such a member for activating a substance, the generated radiation ionizes substances such as combustion air and combustion exhaust gas to be activated, the charges generated at the time of ionization charge a metal constituting the metal layer to generate an electric field and a magnetic field, and the electric field and the magnetic field activate the target substance, which can improve combustion efficiency and efficiently clean the exhaust gas.

PRIOR ART DOCUMENT

PATENT DOCUMENT

[0004] Patent Document 1: JP 2018-59909 A

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0005] Conventional members for activating a substance exhibit certain excellent effects, but it is desired to develop novel materials for activating a substance and members for activating a substance that exhibit further improved substance activation effects.

[0006] The present invention has been made to solve such a problem, and an object thereof is to provide a material for activating a substance and a member for activating a substance capable of exhibiting a greater substance activation effect.

MEANS FOR SOLVING THE PROBLEMS

[0007] The object of the present invention is achieved by a material for activating a substance including powder of a natural mineral containing a radioactive substance and powder of an electron-generating substance that generates electrons by using alpha rays emitted from the natural mineral.

[0008] In the material for activating a substance, the powder of the electron-generating substance preferably contains a powder of titanium dioxide and at least one type of powder selected from lanthanum hexaboride, black silica, metallic magnesium, tungsten, metallic silicon, molybdenum disulfide, and metallic germanium.

[0009] The powder of the natural mineral preferably has an average particle diameter of 200 μm or less, and the powder of the electron-generating substance preferably has an average particle diameter of 200 μm or less.

[0010] It is preferable to further include a flowable binder having conductivity. The flowable binder may be a non-dry type flowable binder or a dry type flowable binder.

[0011] The flowable binder preferably contains at least one type of powder selected from zinc, molybdenum disulfide, and copper.

[0012] The object of the present invention is also achieved by a member for activating a substance including an electron generation unit including a powder of a natural mineral containing a radioactive substance and a powder of an electron-generating substance that generates electrons by using alpha rays emitted from the natural mineral, and an electrode unit connected to the electron generation unit.

[0013] For the member for activating a substance, the powder of the electron-generating substance preferably contains a powder of titanium dioxide and at least one type of powder selected from lanthanum hexaboride, black silica, metallic magnesium, tungsten, metallic silicon, molybdenum disulfide, and metallic germanium.

[0014] The powder of the natural mineral preferably has an average particle diameter of 200 μm or less, and the powder of the electron-generating substance preferably has an average particle diameter of 200 μm or less.

[0015] The object of the present invention is also achieved by a member for activating a substance including a material for activating a substance including a powder of a natural mineral containing a radioactive material and a powder of an electron-generating substance that generates electrons by using alpha rays emitted from the natural mineral, and a

magnet body having a cylindrical shape and having an N-pole at one end and an S-pole at the other end, the member for activating a substance being configured by filling an inside of the magnet body having a cylindrical body with the material for activating a substance. The powder of the electron-generating substance preferably includes a titanium dioxide powder and at least one type of powder selected from lanthanum hexaboride, black silica, metallic magnesium, tungsten, metallic silicon, molybdenum disulfide, and metallic germanium.

[0016] For the member for activating a substance, an electrode is preferably connected to the one end on the N-pole side of the magnet body having a cylindrical shape.

[0017] The electrode is preferably a plate-like electrode to which an entire end surface of the one end of the magnet body is connected, and the plate-like electrode is preferably formed having an area larger than an area surrounded by an outer peripheral contour line of one end of the magnet body.

EFFECTS OF THE INVENTION

[0018] The present invention can provide a member for activating a substance capable of exhibiting a greater substance activation effect.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

Fig. 1 is a schematic configuration sectional view of a member for activating a substance according to an embodiment of the present invention.

Fig. 2 is a schematic configuration sectional view relating to a modification of the member for activating a substance of Fig. 1.

Fig. 3 is a schematic configuration sectional view of a member for activating a substance according to another embodiment of the present invention.

Fig. 4 is a schematic configuration plan view as viewed from a direction of an arrow A in Fig. 3.

Fig. 5 is an explanatory view for describing lines of magnetic force of a cylindrical magnet body.

Fig. 6 is a schematic configuration sectional view relating to a modification of the member for activating a substance of Fig. 3.

Fig. 7 is an image for describing the contents of an experiment using the member for activating a substance according to the present invention.

Fig. 8 is a graph relating to the results of the experiment using the member for activating a substance according to the present invention.

Fig. 9 is a graph relating to the results of an experiment for confirming the effects of the member for activating a substance according to the present invention.

Fig. 10 is a graph relating to the results of the experiment for confirming the effects of the member for activating a substance according to the present invention.

Fig. 11 is a graph relating to the results of the experiment for confirming the effects of the member for activating a substance according to the present invention.

Fig. 12 is a graph relating to the results of the experiment for confirming the effects of the member for activating a substance according to the present invention.

EMBODIMENTS OF THE INVENTION

[0020] Hereinafter, a material for activating a substance according to an embodiment of the present invention will be described. The present invention is not limited to the following embodiments at all, and can be implemented with appropriate modifications within the scope of the object of the present invention. The material for activating a substance according to the present invention is a material capable of generating electrons, including powder of a natural mineral containing a radioactive substance and powder of an electron-generating substance that generates electrons by using alpha rays emitted from the natural mineral. Needless to say, the powder of the natural mineral and the powder of the electron-generating substance are uniformly mixed.

[0021] The natural mineral containing the radioactive substance is not particularly limited, and examples thereof include radium ore, hokutolite, Bad Gastein ore, monazite, phosphate ore, columbite, tantalite, struverite, pyrochlore, bastnasite, cerium concentrate, zircon, gummite, davidite, brannerite, uraninite (pitch blend), ningyoite, autunite, carnotite, tyuyamunite, metatyuyamunite, tyuyamunite ore, schroeckingerite, zirkelite, xenotime, thorogummite, auerlite, maifanite, allanite, tungsten ore, thorianite, brookite, uranophane, torbernite, coffinite, uranothorite, uranium and thorium ore, thorite, and francevillite.

[0022] As the electron-generating substance that generates electrons by using alpha rays emitted from the natural mineral, for example, titanium dioxide (TiO_2) powder may be used.

[0023] The smaller the average particle diameter of the powder of the natural mineral contained in the material for activating a substance according to the present invention is, the higher effect can be obtained. For example, the average particle diameter is preferably set to 200 μm or less, and more preferably set to 100 μm or less. Further, the average particle diameter is more preferably set to 10 μm or less. Similarly, the smaller the average particle diameter of the powder of the electron-generating substance is, the higher effect can be obtained. For example, the average particle diameter is preferably set to 200 μm or less, and more preferably set to 100 μm or less. Further, the average particle diameter is more preferably set to 10 μm or less.

[0024] For the material for activating a substance according to the present invention, the lower limit of the content of the natural ore is not particularly limited as long as the alpha rays can be generated in an amount sufficient to activate the substance to be activated. The lower limit of the content of the natural ore is preferably 0.01 parts by mass or more, more preferably 0.1 parts by mass or more, and particularly preferably 1 part by mass or more, with respect to 100 parts by mass of the material for activating a substance. The upper limit of the content of the natural ore is not particularly limited as long as the amount of radiation to be generated can be set to 0.2 pSv/h or less. The upper limit of the content of the natural ore is preferably 90 parts by mass or less, more preferably 85 parts by mass or less, and particularly preferably 80 parts by mass or less with respect to 100 parts by mass of the material for activating a substance.

[0025] For the material for activating a substance, the content of the electron-generating substance that generates electrons by using alpha rays emitted from the natural mineral is preferably set to a content that can utilize the ionization action of the alpha rays to the maximum. In particular, the content of titanium dioxide contained in the electron-generating substance in the present invention is preferably set to, for example, 1 part by mass or more and 15 parts by mass or less with respect to 100 parts by mass of the material for activating a substance. The material for activating a substance according to the present invention may include, as the electron-generating substance, at least one type of powder selected from lanthanum hexaboride (LaB6), black silica, tungsten, metallic silicon, molybdenum disulfide, metallic germanium, gallium nitride (GaN), tourmaline, boron, and a boron compound, in addition to titanium dioxide powder. Here, the content of lanthanum hexaboride is preferably set to 0.5 parts by mass or more and 5 parts by mass or less with respect to 100 parts by mass of the material for activating a substance. The content of black silica is preferably set to 1 part by mass or more and 5 parts by mass or less with respect to 100 parts by mass of the material for activating a substance. The content of tungsten is preferably set to 0.1 parts by mass or more and 0.5 parts by mass or less with respect to 100 parts by mass of the material for activating a substance, and the content of metallic silicon is preferably set to 2 parts by mass or more and 5 parts by mass or less with respect to 100 parts by mass of the material for activating a substance. The content of molybdenum disulfide is preferably set to 2 parts by mass or more and 5 parts by mass or less with respect to 100 parts by mass of the material for activating a substance, and the content of metallic germanium is preferably set to 2 parts by mass or more and 5 parts by mass or less with respect to 100 parts by mass of the material for activating a substance. The content of gallium nitride (GaN) is preferably set to 0.8 parts by mass or more and 2 parts by mass or less with respect to 100 parts by mass of the material for activating a substance, and the content of tourmaline is preferably set to 2 parts by mass or more and 10 parts by mass or less with respect to 100 parts by mass of the material for activating a substance. The content of boron is preferably set to 0.8 parts by mass or more and 2 parts by mass or less with respect to 100 parts by mass of the material for activating a substance, and the content of the boron compound is preferably set to 0.8 parts by mass or more and 2 parts by mass or less with respect to 100 parts by mass of the material for activating a substance. Examples of the boron compound include disodium octaborate tetrahydrate.

[0026] The electron-generating substance may include metallic magnesium powder in addition to titanium dioxide powder. The average particle diameter of the metallic magnesium powder is preferably set to 0.3 mm or more and 1.5 mm or less, and more preferably set to 0.5 mm or more and 1.0 mm or less. The content of the metallic magnesium powder is preferably set to 15 parts by mass or more and 35 parts by mass or less with respect to 100 parts by mass of the material for activating a substance, and particularly preferably set to 20 parts by mass or more and 30 parts by mass or less with respect to 100 parts by mass of the material for activating a substance. Setting the average particle diameter of the metallic magnesium powder to be considerably larger than the average particle diameter of the powder of the electron-generating substance allows an extremely large number of powders of natural mineral to come into contact with the periphery of one powder of magnesium metal, which makes it possible to release a larger amount of electrons.

[0027] The electron-generating substance may include copper powder in addition to titanium dioxide powder. The copper powder is preferably formed in a flake shape. The average particle diameter of the copper powder is preferably 10 μm or less, and more preferably 1 μm or less. Since the copper powder has high conductivity, the electrons can be efficiently propagated to the outside. The content of the copper powder is preferably set to 1 part by mass or more and 4 parts by mass or less with respect to 100 parts by mass of the material for activating a substance.

[0028] In addition to the titanium dioxide powder, a powder obtained by subjecting the surface of copper powder to silver plating (silver-plated copper powder) may be included as the electron-generating substance. The powder obtained by subjecting the surface of copper powder to silver plating is preferably formed in a flake shape. The average particle

diameter of the powder obtained by subjecting the surface of copper powder to silver plating is preferably 10 μm or less, and more preferably 1 μm or less. In the powder obtained by subjecting the surface of copper powder to silver plating, electrons are released because of joining of dissimilar metals of silver and copper, and thus the amount of electrons to be released further increases. In addition, since the powder obtained by subjecting the surface of copper powder to silver plating has excellent conductivity, the electrons generated in the electron-generating substance can be efficiently propagated to the outside. The content of the powder obtained by subjecting the surface of copper powder to silver plating is preferably set to 5 parts by mass or more and 20 parts by mass or less, and preferably set to 8 parts by mass or more and 14 parts by mass or less with respect to 100 parts by mass of the material for activating a substance.

[0029] The electron-generating substance may include silver powder in addition to titanium dioxide powder. The silver powder is preferably formed in a flake shape. The average particle diameter of the silver powder is preferably 10 μm or less, and more preferably 1 μm or less. In addition, since the silver powder has excellent conductivity, electrons generated in the electron-generating substance can be efficiently propagated to the outside. The content of the silver powder is preferably set to 8 parts by mass or more and 12 parts by mass or less with respect to 100 parts by mass of the material for activating a substance.

[0030] The material for activating a substance according to the present invention may be configured to further contain powder of a carbon substance having conductivity such as graphite. The average particle diameter of the powder a carbon substance is preferably 10 μm or less, and more preferably 1 μm or less. The content of the powder of a carbon substance is preferably set to 1 part by mass or more and 5 parts by mass or less with respect to 100 parts by mass of the material for activating a substance. Further containing the powder of such a carbon substance having conductivity further improves the conductivity and can efficiently propagate electrons to the outside.

[0031] In the material for activating a substance according to the present invention, it is preferable that a flowable binder having conductivity is further mixed. Such a flowable binder is configured to include, for example, metal material powder and a solvent. The flowable binder may be a dry type which becomes dried by natural drying or may be a non-drying type which does not become dried by natural drying. When the flowable binder is configured as a dry type, a solvent that volatilizes through natural drying is used as the solvent, for example. When the flowable binder is configured as a non-drying type, non-drying oil such as non-drying grease or mineral oil can be used as the solvent, for example. The metal material powder contained in the flowable binder preferably has an average particle diameter of 200 μm or less.

[0032] Mixing the flowable binder to form the material for activating a substance makes it possible to maintain a state in which the powder of natural ore and the powder of an electron-generating substance contained in the material for activating a substance are uniformly dispersed. When a dry flowable binder is used, for example, the solvent contained in the flowable binder is volatilized by pouring the material for activating a substance having fluidity into a predetermined mold and then drying the material, and as a result, the material for activating a substance can be molded and solidified so as to have a desired shape. When a non-drying flowable binder is used, the material for activating a substance can have fluidity.

[0033] Here, the metal material having conductivity contained in the flowable binder is preferably, for example, at least one selected from zinc, molybdenum disulfide, and copper. As the flowable binder containing zinc powder, for example, a cold-plating coating material containing zinc can be suitably exemplified. Since the solvent contained in the cold-plating coating material volatilizes at normal temperature, and zinc solidifies after volatilization, the cold-plating coating material containing zinc is suitable for molding and solidifying the material for activating a substance so as to have a desired shape. In addition, since zinc is also a substance that generates electrons by using alpha rays emitted from the natural mineral, electrons are also generated from the electron-generating substance and zinc by using alpha rays emitted from the natural mineral from the member for activating a substance formed by molding and solidifying the material for activating a substance, and thus the amount of electrons to be released increases. In addition, since zinc has conductivity, the electrons generated inside the member for activating a substance can be efficiently propagated to the outside of the member for activating a substance.

[0034] As the flowable binder containing molybdenum disulfide powder, for example, molybdenum disulfide grease can be suitably exemplified. Since this molybdenum disulfide grease is obtained by mixing molybdenum disulfide powder with non-drying grease, the material for activating a substance maintains its fluidity without naturally drying. Such a material for activating a substance containing molybdenum disulfide grease as a flowable binder can be used, for example, by being attached to the tip of a detachable screw component. Molybdenum disulfide is also a substance that generates electrons by using alpha rays emitted from the natural mineral. Copper grease obtained by mixing copper powder with non-drying grease can also be suitably used.

[0035] For the material for activating a substance, the content of the flowable binder is preferably, for example, 50 parts by mass or more and 75 parts by mass or less with respect to 100 parts by mass of the material for activating a substance. When a dry flowable binder is used, the content is not particularly limited to the above numerical range as long as, with the content, the shape formed when the solvent is volatilized and dried can be maintained, for example, the shape in a dry state formed when the material for activating a substance having fluidity is applied and dried, or the shape formed when the material for activating a substance having fluidity is poured into a predetermined mold and then dried to form a desired shape can be maintained. When a non-drying flowable binder is used, the content thereof is not particularly limited to the

above numerical range as long as the material for activating a substance has fluidity.

[0036] For the flowable binder, the content of the metal material powder is preferably as high as possible. When a dry flowable binder is used, the content is not particularly limited as long as, with the content, the shape formed when the solvent is volatilized and dried can be maintained, for example, the shape in a dry state formed when the material for activating a substance having fluidity is applied and dried, or the shape formed when the material for activating a substance having fluidity is poured into a predetermined mold and then dried to form a desired shape can be maintained. When a non-drying binder is used, the content is not particularly limited as long as the material for activating a substance has fluidity.

[0037] Next, a member for activating a substance 1 according to the present invention will be described with reference to the accompanying drawings. The present invention is not limited to the following embodiments at all, and can be implemented with appropriate modifications within the scope of the object of the present invention. Each drawing is partially enlarged or reduced in order to facilitate understanding of the configuration. A member for activating a substance 1 according to the present invention is a member configured using the above-described material for activating a substance, and it includes, for example, an electron generation unit 2 and an electrode unit 3 as illustrated in the schematic configuration sectional view of Fig. 1.

[0038] The electron generation unit 2 includes a powder of a natural mineral containing a radioactive substance and a powder of an electron-generating substance that generates electrons by using alpha rays emitted from the natural mineral.

[0039] Examples of the natural mineral containing a radioactive substance include, as described above, radium ore, hokutolite, Bad Gastein ore, monazite, phosphate ore, columbite, tantalite, struverite, pyrochlore, bastnasite, cerium concentrate, zircon, gummite, davidite, brannerite, uraninite (pitch blend), ningyoite, autunite, carnotite, tyuyamunite, metatyuyamunite, tyuyamunite ore, schroeckingerite, zirkelite, xenotime, thorogummite, auerlite, maifanite, allanite, tungsten ore, thorianite, brookite, uranophane, torbernite, coffinite, uranothorite, uranium and thorium ore, thorite, and francevillite.

[0040] Examples of the electron-generating substance that generates electrons by using alpha rays emitted from the natural mineral include, as described above, a mixture of, for example, titanium dioxide (TiO_2) powder and at least one type of powder selected from lanthanum hexaboride (LaB6), black silica, metallic magnesium, copper, silver-plated copper, silver, tungsten, metallic silicon, molybdenum disulfide, metallic germanium, gallium nitride (GaN), tourmaline, boron, and a boron compound.

[0041] The average particle diameter of the powder of the natural mineral is, for example, preferably 200 μm or less, and more preferably 100 μm or less. Further, the average particle diameter is more preferably set to 10 μm or less. The average particle diameter of the electron-generating substance powder is preferably 200 μm or less, and more preferably 100 μm or less. Further, the average particle diameter is more preferably set to 10 μm or less.

[0042] The electron generation unit 2 can be formed, for example, by further mixing a flowable binder having conductivity with the powder of a natural mineral containing a radioactive substance and the powder of an electron-generating substance that generates electrons by using alpha rays emitted from the natural mineral, and uniformly stirring the mixture to form a material for activating a substance having fluidity, then applying the material for activating a substance having fluidity with a predetermined thickness on the electrode unit 3 having a sheet shape to form the electron generation unit 2, then stacking and another electrode unit 3 having a sheet shape, and drying the obtained stack.

[0043] As the flowable binder, for example, a cold-plating coating material containing zinc can be suitably exemplified. Since the solvent contained in the cold-plating coating material volatilizes at normal temperature, and zinc solidifies after volatilization, the material for activating a substance can be molded and solidified so as to have a desired shape.

[0044] Here, the electrode unit 3 is a member electrically connecting to the substance activation target, and the material thereof is not particularly limited as long as the electrons generated in the electron generation unit 2 can be propagated to the substance activation target. For example, a material having high electrical conductivity such as copper, silver, or gold is preferably used, and copper is more preferably used from the viewpoint of cost.

[0045] Here, the above-described configuration of the member for activating a substance 1 illustrated in Fig. 1 is configured as the member for activating a substance 1 having a sheet shape with a single layer of the electron generation unit 2. However, the member is not limited to such a configuration, and may be configured as a multilayer type member for activating a substance 1 in which the electron generation unit 2 having a sheet shape and the electrode unit 3 having a sheet shape are alternately stacked as illustrated in the schematic configuration sectional view of Fig. 2.

[0046] The member for activating a substance 1 illustrated in Fig. 1 is formed in a sheet shape, but the member is not particularly limited to such a form, and it goes without saying that the member for activating a substance 1 can be configured in various forms (for example, a cylindrical shape, a prismatic shape, a bolt shape, a box shape, a curved shape, or the like) by pouring a material for activating a substance having fluidity into a predetermined mold and then drying it to dry the solvent of the flowable binder.

[0047] In addition, as the member for activating a substance 1, it is also possible to adopt a configuration in which the inside of a magnet body 4 having a cylindrical shape is filled with the above-described material for activating a substance to form the electron generation unit 2, and the electrode unit 3 is connected to the magnet body 4, as illustrated in the schematic configuration sectional view of Fig. 3 and Fig. 4 which is a plan view as viewed from the direction of an arrow A of

Fig. 3.

[0048] The magnet body 4 is configured as a cylindrical magnet body 4 having one end as an N pole and the other end as an S pole. The electrode unit 3 is not particularly limited as long as the electrode unit 3 is connected to the magnet body 4. However, it is preferable that the electrode is connected to one end on the N-pole side of the cylindrical magnet body 4. In particular, as illustrated in Figs. 3 and 4, it is particularly preferable that the electrode unit 3 is configured as a plate-like electrode in which the entire end surface of one end on the N-pole side of the magnet body 4 is connected to close an opening on one end side of the cylindrical magnet body 4. The plate-like electrode is more preferably formed to have an area larger than an area surrounded by an outer peripheral contour line of one end of the cylindrical magnet body 4.

[0049] Here, the material for activating a substance filled in the cylindrical magnet body 4 may include only a powder of a natural mineral containing a radioactive substance and a powder of an electron-generating substance that generates electrons by using alpha rays emitted from the natural mineral, and may further contain a flowable binder having conductivity. The flowable binder may be a dry binder or a non-drying binder.

[0050] In the member for activating a substance 1 formed by filling the inside of the cylindrical magnet body 4 with the material for activating a substance like this, the moving speed of the electrons generated in the material for activating a substance is increased by the lines of magnetic force of the magnet body 4, the moving direction thereof is controlled by the lines of magnetic force, and thus, the electrons can be propagated to the substance activation target at high speed.

[0051] In addition, since the lines of magnetic force of the magnet body 4 exit from the N-pole side and enter the S-pole side as illustrated in Fig. 5, when the electrode unit 3 is connected to one end on the N-pole side, it is possible to efficiently guide the electrons generated in the electron generation unit 2 to the electrode and propagate the electrons to the substance activation target. In particular, as illustrated in Figs. 3 and 4, it is preferable to adopt a plate-like electrode to which the entire end surface of one end on the N-pole side of the magnet body 4 is connected from the viewpoint of efficiently propagating the electrons generated in the electron generation unit 2 to the substance activation target. Further, by forming the plate-like electrode so as to have an area larger than the area surrounded by the outer peripheral contour line of one end of the cylindrical magnet body 4, electrons moving along the lines of magnetic force formed outside the magnet body 4 can be propagated to the substance activation target via the plate-like electrode. That is, the electrons released toward the outside of the magnet body 4 can be efficiently propagated to the substance activation target.

[0052] As illustrated in the schematic configuration sectional view of Fig. 6, the magnet body 4 may include an insulating member 5 that covers the side surfaces and the other end side of the magnet body 4. A material for forming the insulating member 5 is not particularly limited, and a typically known insulating material can be used. The insulating member 5 may be detachable like a rubber cap, or the surface of the magnet body 4 may be covered and fixed with an insulating resin material so as not to be detachable. Providing such an insulating member 5 effectively prevents the electrons generated in the electron generation unit 2 from being released to the outside of the member for activating a substance 1 and can effectively propagate the generated electrons toward the substance activation target.

[0053] The member for activating a substance 1 having such a configuration can effectively activate a substance to be activated by being attached to a device in which the substance is present in various fields. For example, by winding the member for activating a substance 1 having a sheet shape to bring the member in close contact with the surface of an air duct of an automobile engine and fixing the member for activating a substance 1 with a fixture such as a binding band, the electrons generated from the member for activating a substance 1 are propagated to air molecules of intake air flowing inside the air duct, which greatly promotes the activation of the air molecules. When the intake air activated in this manner is supplied into a cylinder of the automobile engine, the fuel injected into the cylinder and the activated intake air are sufficiently mixed, which greatly increases the combustion efficiency of the fuel in the cylinder and can promotes the reduction of the fuel consumption rate and the cleaning of the exhaust gas. Since the member for activating a substance 1 is attached to the outside of the air duct, the member for activating a substance 1 does not become a resistance when the engine sucks air.

[0054] By winding the member for activating a substance 1 around the exhaust pipe of an automobile, the electrons released from the member for activating a substance 1 are propagated to the compounds contained in the exhaust gas, such as carbon monoxide, carbon dioxide, and nitrogen oxide, the activation of these compounds can be greatly promoted, and these compounds are sent to a catalyst device in a state of being greatly activated by the propagated electrons, thus it is possible to clean the exhaust gas very efficiently. Since the member for activating a substance 1 is wound around the exhaust pipe of the automobile, the member is not damaged by the influence of the high-temperature exhaust gas.

[0055] Winding the member for activating a substance 1 around the cylinder block of an automobile causes the electrons released from the member for activating a substance 1 to act on the intake air or the exhaust gas of the automobile engine flowing inside the cylinder block, which greatly promotes the activation of the air or gas. These intake air and exhaust gases are sent to the catalyst device in a state of being greatly activated by the propagated electrons, and are thus cleaned very efficiently.

[0056] The member for activating a substance 1 can also be used in a lubricating device that lubricates a sliding part of a machine with lubricating oil. Lubricating oil is used to reduce friction at a part where metals of a machine slide with each

other. Such lubricating oil is affected by heat, worn metal powder, and the like, and its lubricating ability and heat exchange ability gradually decrease. In addition, when the worn metal powder is accumulated in the oil filter, the passing ability of the lubricating oil deteriorates, and the lubricating performance further deteriorates. Thus, by winding the member for activating a substance 1 around a container that stores lubricating oil for lubricating a sliding part of a machine or a pipe through which the lubricating oil flows, the electrons radiated from the member for activating a substance 1 are caused to act on the lubricating oil flowing inside the lubricating device, which greatly promotes the activation of the lubricating oil. Since the lubricating oil activated by the propagated electrons can smoothly flow between worn metal powder and the like accumulated on the oil filter, not only can the lubricating performance be improved while maintaining the performance of the oil filter, but also the load on the oil pump can be reduced to reduce the power loss.

[0057] The member for activating a substance 1 can also be used in a cooling device that cools a heat generating part of a machine using a coolant. For example, in an engine or the like, a coolant is pressurized and circulated in order to efficiently remove heat generated through combustion from a cylinder block. However, when the coolant is pressurized and circulated, not only a load is applied to the pump, but also leakage occurs from a connecting portion such as a pipe or breakage of a hose occurs. Thus, by winding the member for activating a substance 1 around a container for storing the coolant for cooling a heat generating part of a machine or a pipe through which the coolant flows, the electrons radiated from the member for activating a substance 1 are caused to act on the coolant flowing inside the cooling device, which greatly promotes the activation of the coolant. This can form a coating film on the inner wall surface of the coolant circulation system, can improve the heat transfer coefficient, and can improve the cooling efficiency. In addition, the coolant smoothly flows in a laminar manner, and the circulation resistance of the coolant decreases. As a result, the circulation pressure of the coolant can be reduced, and not only can the load on the pump be reduced to reduce the power loss, but also leakage from the connecting part such as the pipe and breakage of the hose can be prevented. Further, the layer of the coolant activated by the propagated electrons has an effect of preventing corrosion of the coolant circulation system and also preventing deterioration of a rubber hose or the like.

[0058] The member for activating a substance 1 can also be used in a fuel supply device that supplies liquid or gas fuel to a combustion engine such as an engine. In typical combustion, vaporized liquid fuel or gas fuel is combined with oxygen in a combustion chamber to extract thermal energy. To efficiently extract the energy from the liquid fuel or the gas fuel, it is necessary to sufficiently mix the fuel and the air. Thus, by winding the member for activating a substance 1 around a container that stores liquid fuel or gas fuel to be supplied to a combustion engine or a pipeline through which these fuels flow, the electrons generated from the member for activating a substance 1 are caused to act on the fuel described above, which greatly promotes the activation of the fuel. This can make the particle size of the fuel injected from the fuel injection valve to atomize the fuel much finer than in a normal case. As a result, the fuel and the air are sufficiently mixed in the combustion chamber, and the thermal energy of the fuel can be sufficiently extracted. This can be applied not only to gasoline but also to general petroleum that contributes to combustion.

[0059] The member for activating a substance 1 can also be used for a rotor blade constituting a turbine. A rotational driving force is obtained by causing water in hydraulic power generation, water vapor in thermal power generation, and a working fluid such as oil in an automatic transmission of an automobile to act on turbine blades. However, when the fluid and the turbine blade come into contact with each other, the resistance generated in the turbine blade increases as the speed of the fluid increases, and thus, when the speed of the fluid is increased too much, the energy transfer capability from the fluid to the turbine blade is reduced. Thus, by winding the member for activating a substance 1 around the turbine blade or the casing accommodating the turbine blade therein, the electrons generated from the member for activating a substance 1 are caused to act on the fluid described above, which greatly promotes the activation of the fluid. As a result, a laminar flow is formed on the surface of the rotor blade of the turbine, the fluid smoothly flows between the turbine blades. Thus, resistance generated in the turbine blades is reduced, and a rotational driving force can be obtained with high efficiency.

[0060] The member for activating a substance 1 can also be used for a cooling device such as an air conditioner. A cooling device of an air conditioner or a refrigerator vaporizes a refrigerant in an evaporator to deprive heat from air in a living room or the refrigerator, compresses the refrigerant by using a condenser, and dissipates heat to an outside via a radiator. Thus, to improve cooling performance of a refrigerator or an air conditioner, it is necessary to improve heat exchange efficiency of the refrigerant in the evaporator. By winding the member for activating a substance 1 around an evaporator, which is a passage of a refrigerant used for a cooling device, or a pipeline through which the refrigerant flows, the electrons generated from the member for activating a substance 1 are caused to act on the refrigerant, which greatly promotes the activation of the refrigerant. As a result, the activated refrigerant film is brought into close contact with the metal inner wall surface of the evaporator or the pipeline, and thus the heat exchange efficiency between the metal inner wall surface of the evaporator or the pipeline and the refrigerant can greatly improve.

[0061] The member for activating a substance 1 can also be used for a flush water storage container. In general households and the like, tap water is used as a solvent of detergent for washing dishes and the like. To increase the detergency, hot water must be used, and there is a problem that utility costs are required. By winding the member for activating a substance 1 around the flush water storage container or the pipeline through which the flush water flows, the

electrons generated from the member for activating a substance 1 are caused to act on the fluid, which greatly promotes the activation of the flush water. When the tap water activated by the propagated electrons is used as a solvent, the surfactant of the detergent efficiently exhibits an activation action even at room temperature. As a result, the ability to wash dishes, laundry, and the like can greatly improve. The tap water activated by the propagated electrons also has an effect of preventing corrosion in the water pipe.

[0062] The member for activating a substance 1 can also be used for plant growth. For the growth of plants, water containing nutrients is required in addition to sunlight and carbon dioxide in the atmosphere. To promote the growth of plants, it is preferable to increase the amount of water absorbed from the roots of plants. As a method for increasing the amount of water, there is a method of increasing the temperature of water, but in this method, the amount of water absorbed from the roots of plants can only be increased to some extent. Thus, to increase the amount of water absorbed from the root of the plant, the member for activating a substance 1 is wound around a feed water storage container for water containing nutrients to be supplied to the plant or a pipeline through which the supply water flows, and thus the electrons generated from the member for activating a substance 1 act on the fluid described above, and the activation of the feed water or the like is greatly promoted. This makes it possible to activate the water to be supplied to the plant and the nutrients contained therein, and the water and the nutrients thus activated can be easily absorbed by the hair roots of the plant, which can promote the growth of the plant. Nitrogen compounds required by plants are produced when bacteria and enzymes decompose humus, and when highly activated water is supplied, decomposition of humus is promoted and production of nitrogen compounds increases. This makes it possible to greatly promote the growth of plants by using activated water in which such a nitrogen compound is sufficiently dissolved.

[0063] The member for activating a substance 1 can also be used for animal growth. Growth of animals requires water to make up most of their body. Animals raised in zoos and the like obtain drinking water from tap water. However, while the drinking water is stored in the supply water tank, oxidation and deterioration of the drinking water progress. By winding the member for activating a substance 1 around the supply water tank and the pipeline through which the supply water flows, the electrons generated from the member for activating a substance 1 are caused to act on the supply water to activate the supply water. The activated water is easily absorbed into the body of the animals. In addition, there is an antioxidant action because the oxidation-reduction potential is suppressed, and further, there is an effect of enhancing the immune function and promoting growth.

[0064] The member for activating a substance 1 can also be used for growing fish and shellfish. Since the living environment of fish and shellfish is underwater, the quality of water is extremely important. When fish and shellfish are raised, waste products are discharged into the same water tank as the inhabiting water. Thus, when the water is not always purified, the water quality deteriorates. By winding the member for activating a substance 1 around a feed water storage container for water to be supplied to fish and shellfish, a circulation purification device or a pipeline through which the supply water flows, the electrons generated from the member for activating a substance 1 are caused to act on the supply water to activate the supply water. Then, the activated water is easily absorbed into the body of fish and shellfish. In addition, there is an antioxidant action because the oxidation-reduction potential is suppressed, and further, there is an effect of enhancing the immune function and promoting growth.

[0065] The member for activating a substance 1 can also be used for a septic tank for treating sewage. In a septic tank for treating human waste discharged from general households, aerobic bacteria oxidize and decompose organic substances while taking in oxygen in the air. Thus, growing such aerobic bacteria makes it possible to efficiently treat human waste. By winding the member for activating a substance 1 around the aeration air supply pump or the pipeline through which the aeration air flows inside the aeration air supply pump, the electrons generated from the member for activating a substance 1 are caused to act on the air passing through the pump or the air flowing through the pipeline to activate the air. As a result, the activated air can be supplied to the septic tank, and thus aerobic bacteria that decompose human waste are activated, and sewage can be treated with higher efficiency.

[0066] The member for activating a substance 1 can also be used in a spray coating device. When a body of an automobile is coated, it is necessary to further reduce the particle diameter of the coating material to be dispersed in a mist form in order to form a more homogeneous and high-quality coated surface. However, since the conventional spray coating device has a structure in which the coating material is dispersed in a mist form using air as it is, it is difficult to further reduce the particle diameter of the dispersed coating material. By winding the member for activating a substance 1 around a compressed air supply pump used for injecting and atomizing a coating material or a pipeline through which compressed air flows inside the compressed air supply pump, the electrons generated from the member for activating a substance 1 are caused to act on air passing through the pump or air flowing through the pipeline to activate the air, and by injecting and atomizing the coating material using the activated compressed air, mixing of the air and the coating material is promoted, and the particle diameter of the coating material to be atomized can be further reduced. Therefore, a more homogeneous and high-quality painted surface can be formed.

[0067] In addition, it has been confirmed that the flow rate of a fluid (gas, liquid, powder) is accelerated and the transfer efficiency is improved by causing the electrons released from the member for activating a substance 1 to act on the fluid moving in a tube. For example, it is possible to shorten the time required when powder is transferred from a tank truck to a

factory tank through piping. This is considered to be because by applying electrons, static electricity is removed, and frictional resistance between the powder and the pipe is reduced, which accelerates the flow rate. In addition, since electrons are imparted to the exhaust gas by winding the member for activating a substance 1 around the exhaust pipe of an automobile or the like, the exhaust speed of the exhaust gas is also increased, and the removal from the exhaust pipe is improved. As a result, the combustion efficiency of the engine is also improved.

[0068] The inventor has conducted an experiment for confirming the effect of the member for activating a substance according to the present invention, which will be described below. First, the member for activating a substance subjected to the experiment was prepared as the form shown in Fig. 1, and was formed in a rectangular parallelepiped shape having a thickness of 10 mm and a length × a width = 40 mm × 60 mm. The electron generation unit (material for activating a substance) was formed by mixing and sufficiently stirring a powder of radium ore (natural ore), a powder of an electron-generating substance, and a cold-plating solution containing zinc (a flowable binder having conductivity; cold-plating coating material containing 96% of zinc), and then pouring the mixture into a mold, drying, and then taking out the obtained material from the mold, and stacking an electrode unit (length × width = 40 mm × 60 mm) made of copper and having a thickness of 0.02 mm on both surfaces of the mold. A lead wire was connected to the copper electrode units disposed on both surfaces of the member for activating a substance, and a plate-like terminal portion was connected to the tip of the lead wire, so that the electrons generated in the member for activating a substance were propagated from the terminal portion to the activation target. The content of the radium ore (natural ore) was 2 parts by mass with respect to 100 parts by mass of the material for activating a substance, the content of the electron-generating substance was 22.3 parts by mass with respect to 100 parts by mass of the material for activating a substance, and the content of the flowable binder was 75.7 parts by mass with respect to 100 parts by mass of the material for activating a substance. As the electron-generating substance, a powder mixture of titanium dioxide, metallic magnesium, metallic silicon, black silica, lanthanum hexaboride, copper, and metallic germanium was used. The content of the titanium dioxide powder was 8 parts by mass with respect to 100 parts by mass of the material for activating a substance, the content of the metallic magnesium powder was 7.3 parts by mass with respect to 100 parts by mass of the material for activating a substance, the content of the metallic silicon was 3 parts by mass with respect to 100 parts by mass of the material for activating a substance, and the content of the black silica was 2 parts by mass with respect to 100 parts by mass of the material for activating a substance. The content of lanthanum hexaboride was 0.5 parts by mass with respect to 100 parts by mass of the material for activating a substance, and the content of the copper powder was 2 parts by mass with respect to 100 parts by mass of the material for activating a substance.

[0069] As shown in Fig. 7, it has been confirmed that when electrons are applied by connecting the terminal portion of the member for activating a substance thus formed to the high-pressure side pipe of the refrigerant gas of an air conditioner, the blowing temperature during cooling decreases by 1 to 4°C. Specifically, first, the temperature after 20 minutes from switching on of the air conditioner was measured when the member for activating a substance was not used and when the member for activating a substance was used. The temperature measurement points were the high-pressure side surface and the low-pressure side surface of the refrigerant gas pipe, and the indoor blowout port. When the member for activating a substance was not used, the temperatures on the high-pressure side and the low-pressure side of the refrigerant gas pipe were 17.5°C and 22.7°C, respectively, and the temperature of the indoor blowout port was 14.8°C. On the other hand, when the member for activating a substance was used, the temperatures on the high-pressure side and the low-pressure side of the refrigerant gas pipe were 15.5°C and 22.0°C, respectively, and the temperature of the indoor blowout port was 11.6°C. It was found that the temperature of the indoor blowout port was decreased by 3.2°C by using the member for activating a substance. In this experiment, the indoor temperature was 29.5°C, and the set temperature of the air conditioner was the energy saving set temperature of 28°C. It was also confirmed that the noise level was reduced because of the lubricating effect. From these phenomena, it is expected that power can be reduced by managing the set temperature. In general electrical appliances, by applying electrons to devices, thermal conductivity is improved, and efficiency is increased by improving the flow of electricity, and the frictional resistance reduction effect contributes to reduction of electricity charges. The flow of electricity depends on the state of free electrons of the conductor, and it is conceivable that the resistance value is slightly reduced by applying electrons. It has also been confirmed that the cooling capacity improves when electrons are applied to a refrigerant of a freezing machine or mainly a household refrigerator, in addition to an air conditioner.

[0070] Next, an experiment was conducted in which a terminal portion of the member for activating a substance used in the experiment was connected to a motor of an electric fan to apply electrons. Specifically, first, the change in the sound of the motor was measured between when the member for activating a substance was not used and when the member for activating a substance was used. As a result, it was confirmed that when the member for activating a substance was used, the level of the motor sound of mainly 54 Hz decreased, and the motor sound decreased by 3.7 dB from -50.0dB to -46.3dB. From this, it was confirmed that the load on the motor, that is, the frictional resistance of the motor itself was reduced when the member for activating a substance was used. It was also confirmed that the wind noise of the blades of the electric fan also decreased. This is considered to be because the loop in which static electricity is generated by friction with air through rotation of the resin-made blade and further frictional resistance is generated by charging can be cut off by removing static

electricity with the member for activating a substance, and as a result, frictional resistance (frictional resistance mainly generated by static electricity) associated with rotation of the blade is reduced.

[0071] It has also been confirmed that the conductivity of heat of water is improved by applying electrons released from the member for activating a substance 1 to water. Specifically, ordinary tap water and tap water supplied with electrons by the substance active member were prepared, and for each of them, a change in water temperature with the lapse of time (the lapse of heating time) when heating was performed under the same condition was measured. The measurement results are shown in Table 1 below, and the graph thereof is shown in Fig. 8. From the graphs in Table 1 and Fig. 8, it can be seen that the tap water supplied with electrons by the member for activating a substance is more efficiently heated, and the thermal conductivity of water is improved by the supply of electrons. In particular, it was confirmed that the thermal conductivity at 40 to 60°C was improved by nearly 40% with respect to water without electron application. By improving the thermal conductivity of water in this manner, the penetration power is increased, the extraction power for boiled food is improved, and water can quickly permeate in the boiled food. Further, the penetration effect to plants has also been confirmed, and it has been confirmed that when harvested vegetables are immersed in water to which electrons are applied, the water penetrates plants, and freshness is maintained. It has also been confirmed that when the separation state is checked with ordinary water and electron-imparted water after adding oil to the water and stirring, the affinity with oil improves, since ordinary water is separated faster.

[Table 1]

	Initial temperature (° C)	30 seconds later	60 seconds later	75 seconds	90 seconds	105 seconds	120 seconds
Ordinary tap water	17	43.9	72.7	82.6	86.8	93	93.3
Tap water supplied with electrons by member for activating substance	17	59.1	74.6	85.4	91.2	93.7	96.7

[0072] It has also been confirmed that when the electrons released from the member for activating a substance 1 are applied to a cutting machine for metal working, cutting is performed more smoothly, and the cutting accuracy of the worked surface improves. Normally, in a state where no lubricating oil is used, seizure occurs because of contact between metals. Thus, friction is reduced by using an oil film of lubricating oil so that metals do not come into direct contact with each other by using the lubricating oil, but it has been confirmed that even when metals come into contact with each other, frictional resistance is reduced by applying electrons instead of lubricating oil, and thus seizure is less likely to occur.

[0073] Manufacturers recommend replacing an automobile battery usually in 3 years or after 30,000 kilometers of running, because the maximum capacity of the battery is reduced. In the case of a battery having a maximum capacity reduced to 80%, only 80% of the battery can be charged even when the battery is fully charged. However, by adding several mL of an organic germanium solution to which the electrons released from the member for activating a substance 1 are applied to each cell of the battery, the battery with reduced capacity of 80% was able to recover its maximum capacity to 100% only by performing normal operation for several days. For the same battery, an effect of extending the discharge time of a lithium-ion battery was also confirmed. This naturally varies depending on the current value, but it is possible to extend the discharge time by 20 to 30% when the battery is used at the rating of the battery. It was also confirmed that when the electrons are input from the negative terminal through the member for activating a substance 1 at the time of charging the lithium-ion battery, the battery that has become old and whose capacity has decreased gradually increases.

[0074] The following two batteries were prepared as automobile batteries, and a battery recovery test was performed.

[0075] Battery 1: Battery that has been replaced because of battery exhaustion and then left Battery 2: Battery that can be used without problems The battery 1 is a battery with a no-load voltage of 8.8 V and 5V when connected to a charger, which is below the reference voltage of 7.4 V, and the battery cannot be recovered by charging, and the battery 2 is a battery having no problem in normal charging with a no-load voltage of 12.2 V.

[0076] A battery solution in which electrons were supplied was injected to the battery 1 and the battery 2 to a prescribed level of an electrolytic solution (5 cc per cell), and charging was performed. The battery 1 was in a state in which the circuit of the charger was not operated and charging was not possible, and the battery 2 was fully charged in 7 hours of normal charging. Since the battery 1 was left for half a year in a state of battery exhaustion, sulfation of the electrode was crystallized, and the battery 1 was in a non-reproducible state with no current flow. Then, the battery 2 was connected in parallel to the battery 1, the voltage at which the charger operates was increased to 10 V or more, the charging circuit was operated, and the battery 2 was immediately removed. As a result, although the charging circuit operated, no current flowed, and thus there was no change in the state where charging could not be performed because the battery electrode of the battery 1 was damaged. However, after repeating this state several times, a current suddenly started to flow, and

charging became possible. After 5 hours, when about 40% charging was completed, bubbles were blown out from the cap of the electrolytic solution, and the electrolytic solution inside overflowed. As a whole, nearly 20 cc of electrolytic solution overflowed. Since the liquid was contained at the upper level or more before the battery solution to which the electrons were supplied was put, the electrolytic solution was removed for level adjustment. At that time, the liquid was colorless and transparent, but the overflowed liquid was in the state of being mixed with black particles and blackish as a whole. Thereafter, charging of the battery 1 was completed in 4 hours.

[0077] The battery 1 was mounted on MOVE manufactured by DAIHATSU MOTOR CO., LTD., and an engine start test was performed. As a result, it was confirmed that the engine started smoothly when the ignition key was turned. Thereafter, the engine was once turned off, the power window was opened and closed, and then the engine was started again. This operation was repeated four times, and it was confirmed that the engine was started without any problem. Usually, it is said that a battery in which overdischarge (a state in which the battery is lowered to 10 V because of battery exhaustion or the like) has occurred has sulfation covering the electrodes and the battery cannot be completely recovered even when charged. Further, in a battery with the voltage of below 7.4 V, sulfation is crystallized, and it is not conceivable that the sulfation melts when the battery is charged, and it is said such a battery cannot be recovered in a state where the electrodes are covered with the crystallized sulfation for half a year. However, it has been confirmed that such a battery is recovered without any problem by using the member for activating a substance according to the present invention. After the above test, a battery mounting test was performed for one week, but there was no problem when the battery was operated about half a day and night with the air conditioner being always ON, the engine was operated very well, and the dimming effect of the headlight was not felt at all even during idling.

[0078] In addition, the change in engine sound at the time of climbing was measured using DELICA D5 manufactured by Mitsubishi Motors Corporation, for a case where the member for activating a substance was attached to the engine and a case where no member for activating a substance was attached to the engine. The measurement results are shown in Figs. 9 and 10. Fig. 9 shows a measurement result when the member for activating a substance was not attached to the engine, and Fig. 10 shows a measurement result when the member for activating a substance was attached to the engine. The noise level when the member for activating a substance was not attached to the engine is 60.7 dB, whereas the noise level when the member for activating a substance was attached to the engine is 48.7 dB, indicating that the noise level has decreased by 12 dB. The measurement results regarding the frequency distribution are shown in Figs. 11 and 12. Fig. 11 shows a measurement result when the member for activating a substance was not attached to the engine, and Fig. 12 shows a measurement result when the member for activating a substance was attached to the engine. It can be seen from Figs. 11 and 12 that the engine sound in a low frequency range of 150 Hz or less is reduced.

[0079] It has also been confirmed that when electrons were applied at the time of hatching of chicken eggs, the use rate of egg yolk at the time of hatching was almost close to 100%, and when a blood test of chicks was performed, the spleen immune index mRNA value increased, and the body weight increased more than the standard value. It seems that the influence on the sheep hemagglutination antibody titer of chicks and expression of spleen immune-related genes is large. In the case of a human as well, it has been confirmed by using a blood flow microscope that the blood flow rate of a fingertip increases in only 10 seconds when electrons are applied to the ankle of a foot, and it has been confirmed that the surface temperature of the back of a hand increases by 2 to 4°C on average in several 10 minutes.

[0080] Further, the inventor has conducted an experiment for confirming the effect of the non-drying material for activating a substance that not become dried by natural drying, which will be described below. First, four types of non-drying materials for activating a substance to be subjected to the experiment were prepared (Samples 1 to 4). The contents of the materials respectively contained in the non-drying materials for activating a substance are shown in Table 2.

[Table 2]

	Sample 1	Sample 2	Sample 3	Sample 4
Molybdenum disulfide paste	**77%**	**71.2%**	**75.7%**	**68.7%**
Radium (natural ore) powder	**2%**	**2%**	**2%**	**2%**
Titanium dioxide powder	**2%**	**10%**	**3%**	**10%**
Metallic silicon powder	**5%**	**5%**	**5%**	**5%**
Black silica power	**2%**	**2%**	**2%**	**2%**
Copper powder	**8%**	**5%**	**87%**	**8%**
Lanthanum hexaboride powder	**-**	**-**	**0.50%**	**0.50%**
Gallium nitride powder	**-**	**0.80%**	**0.80%**	**0.80%**
Tourmaline powder	**2%**	**2%**	**2%**	**2%**

(continued)

	Sample 1	Sample 2	Sample 3	Sample 4
Powder of carbon substance having conductivity	**2%**	**2%**	**1%**	**1%**

[0081] Here, the molybdenum disulfide paste was a flowable binder, and one containing molybdenum disulfide powder having an average particle diameter of 1 μm in a mineral oil as a base oil was used. For the sample 1 and the sample 2, the content of the molybdenum disulfide powder in the molybdenum disulfide paste was 30 parts by mass with respect to 100 parts by mass of the molybdenum disulfide paste, and for the sample 3 and the sample 4, the content of the molybdenum disulfide powder in the molybdenum disulfide paste was 50 parts by mass with respect to 100 parts by mass of the molybdenum disulfide paste. The average particle diameter of the titanium dioxide powder, the metallic silicon powder, the black silica powder, the copper powder, the lanthanum hexaboride (LaB6) powder, the gallium nitride (GaN) powder, and the tourmaline powder is 1 μm or less.

[0082] The non-drying material for activating a substance according to each of the above samples was applied to a capacitor or a transistor in an audio device (manufactured by DENON: CD player: DCD-1650AR). A plurality of people (10 people) listened to music coming from the audio, and a sensitivity test was performed as to whether or not a change in sound was felt. A sensory test in a state where the non-drying material for activating a substance was not applied was also performed. As a result, it was evaluated that when the non-drying material for activating a substance according to each sample was applied, the transparency of the sound was increased as compared with the case where the material was not applied, and immersive sound came out vividly. This is considered to be an effect obtained from the electrons released from the non-drying material for activating a substance and propagated to the audio device reducing mechanical noise emitted from the audio device and noise coming around from the power source.

[0083] A result was also obtained in which the transparency of the sound and the like were further increased in the case of applying the sample 2 than in the case of applying the sample 1. This is considered to be an effect of increasing the content of titanium dioxide and including gallium nitride. A result was also obtained in which the sound quality was better in the case of applying the sample 3 than in the case of applying the sample 2, and the transparency and realistic feeling of the sound were increased. It is considered that this is because the effect due to the increase in the content of the molybdenum disulfide powder in the molybdenum disulfide paste and the further improvement in conductivity is largely reflected. It is also considered that there is an effect of including lanthanum hexaboride powder. Further, a result was also obtained in which the sound quality was remarkably better in the case of applying the sample 4 than in the case of applying the sample 3, the transparency and realistic feeling of the sound were increased, and the silence in the quiet part where the sound did not flow in the music was also good. This is considered to be an effect of increasing the content of titanium dioxide.

[0084] The inventor also checked whether there is a change in processing accuracy or a change in operation sound of a machine by applying the non-drying material for activating a substance according to the samples 1 to 4 to a power-source-related device of a milling machine that cuts metal or the like by rotating a blade. As a result, it was confirmed that the processing accuracy was improved and the operation sound of the machine became quiet when the non-drying material for activating a substance according to each sample was applied as compared with the case of not applying the material. This is considered to be an effect obtained by reducing the frictional resistance between the blade and the workpiece through the action of the electrons released from the non-drying material for activating a substance and propagated to the milling machine, and as a result, reducing the shaking of the rotating blade. It was also confirmed that the above effect was exhibited even greater in the sample 2 than in the sample 1, greater in the sample 3 than in the sample 2, and greater in the sample 4 than in the sample 3.

[0085] The inventor also conducted a test to check the change in startup time of a personal computer by applying the non-drying material for activating a substance according to the sample 1 to a fixed capacitor of the mother board in a tower-type personal computer (OS: Windows10) built by the inventor 15 years ago. As a result of this test, it was confirmed that the startup time was 25 seconds before application, and changed to 15 seconds after application. The application position of the non-drying material for activating a substance to the fixed capacitor is the electrode portion of the capacitor on the back side of the printed circuit board. Further, as a result of applying the non-drying material for activating a substance according to the sample 1 to the CPU fan of the personal computer and the solid capacitor near the memory, it was confirmed that the sound was reduced and the sensible speed was improved. From this result, it can be seen that the operation speed and quietness of the computer can be improved by the electron-generating paste according to the present invention.

DESCRIPTION OF REFERENCE SIGNS

[0086]

1 member for activating a substance
2 electron generation unit
3 electrode unit
4 magnet body
5 insulating member

Claims

1. A material for activating a substance comprising:

a powder of a natural mineral containing a radioactive substance; and
a powder of an electron-generating substance that generates electrons by using alpha rays emitted from the natural mineral.

2. The material for activating a substance according to claim 1, wherein the powder of the electron-generating substance includes:

a titanium dioxide powder; and
at least one type of powder selected from lanthanum hexaboride, black silica, metallic magnesium, tungsten, metallic silicon, molybdenum disulfide, and metallic germanium.

3. The material for activating a substance according to claim 1 or 2, wherein

the powder of the natural mineral has an average particle diameter of 200 μm or less, and
the powder of the electron-generating substance has an average particle diameter of 200 μm or less.

4. The material for activating a substance according to claim 1 or 2, further comprising a flowable binder having conductivity.

5. The material for activating a substance according to claim 4, wherein the flowable binder is a non-drying flowable binder.

6. The material for activating a substance according to claim 4, wherein the flowable binder is a dry flowable binder.

7. The material for activating a substance according to claim 4, wherein the flowable binder contains at least one type of powder selected from zinc, molybdenum disulfide, and copper.

8. A member for activating a substance comprising:

an electron generation unit including a powder of a natural mineral containing a radioactive substance and a powder of an electron-generating substance that generates electrons by using alpha rays emitted from the natural mineral; and
an electrode unit connected to the electron generation unit.

9. The member for activating a substance according to claim 8, wherein the powder of the electron-generating substance includes:

a titanium dioxide powder; and
at least one type of powder selected from lanthanum hexaboride, black silica, metallic magnesium, tungsten, metallic silicon, molybdenum disulfide, and metallic germanium.

10. The member for activating a substance according to claim 8 or 9, wherein

the powder of the natural mineral has an average particle diameter of 200 μm or less, and
the powder of the electron-generating substance has an average particle diameter of 200 μm or less.

11. A member for activating a substance comprising:

a material for activating a substance including a powder of a natural mineral containing a radioactive material and a powder of an electron-generating substance that generates electrons by using alpha rays emitted from the natural mineral; and

a magnet body having a cylindrical shape and having an N-pole at one end and an S-pole at the other end,

the member for activating a substance being configured by filling an inside of the magnet body having a cylindrical body with the material for activating a substance.

12. The member for activating a substance according to claim 11, wherein the powder of the electron-generating substance includes:

a titanium dioxide powder; and

at least one type of powder selected from lanthanum hexaboride, black silica, metallic magnesium, tungsten, metallic silicon, molybdenum disulfide, and metallic germanium.

13. The member for activating a substance according to claim 11 or 12, wherein an electrode unit is connected to the one end on the N-pole side of the magnet body having a cylindrical shape.

14. The member for activating a substance according to claim 13, wherein the electrode unit is a plate-like electrode to which an entire end surface of the one end of the magnet body is connected.

15. The member for activating a substance according to claim 14, wherein the plate-like electrode is formed having an area larger than an area surrounded by an outer peripheral contour line of one end of the magnet body.

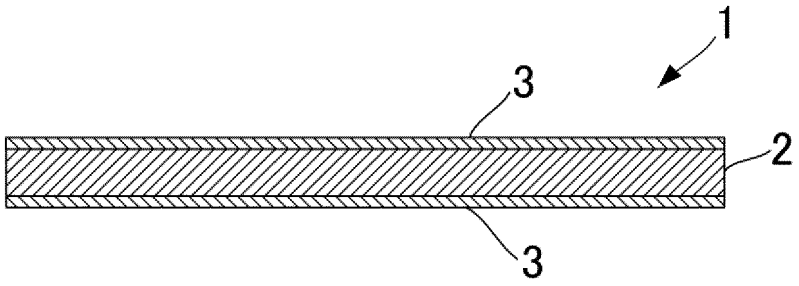

FIG. 1

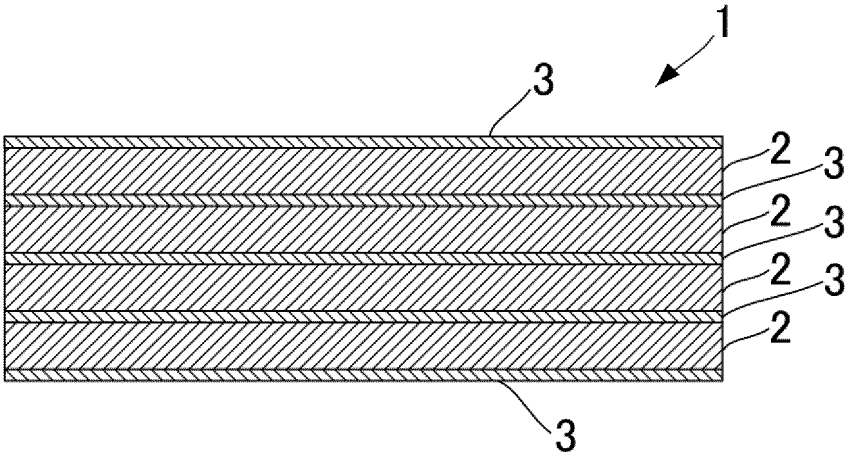

FIG. 2

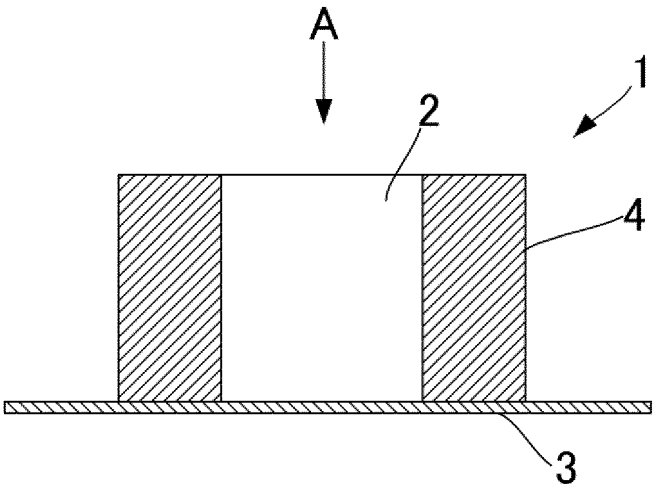

FIG. 3

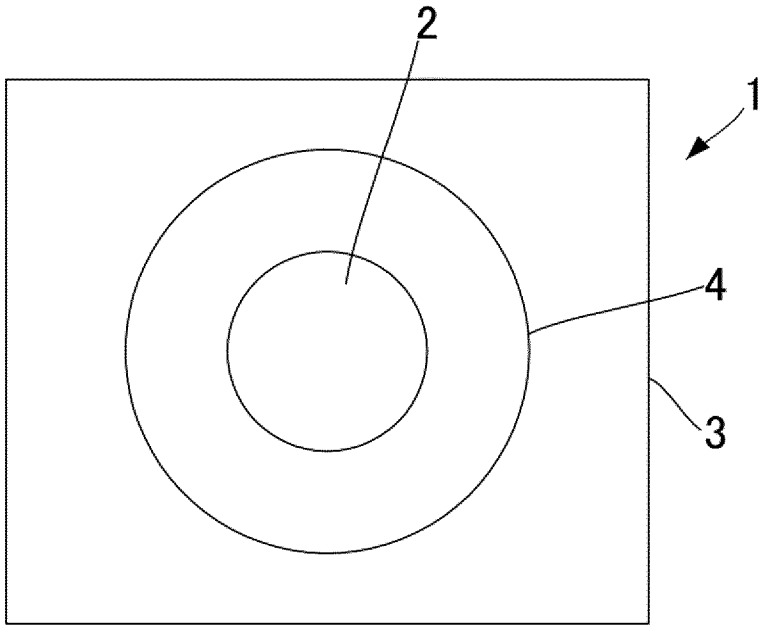

FIG. 4

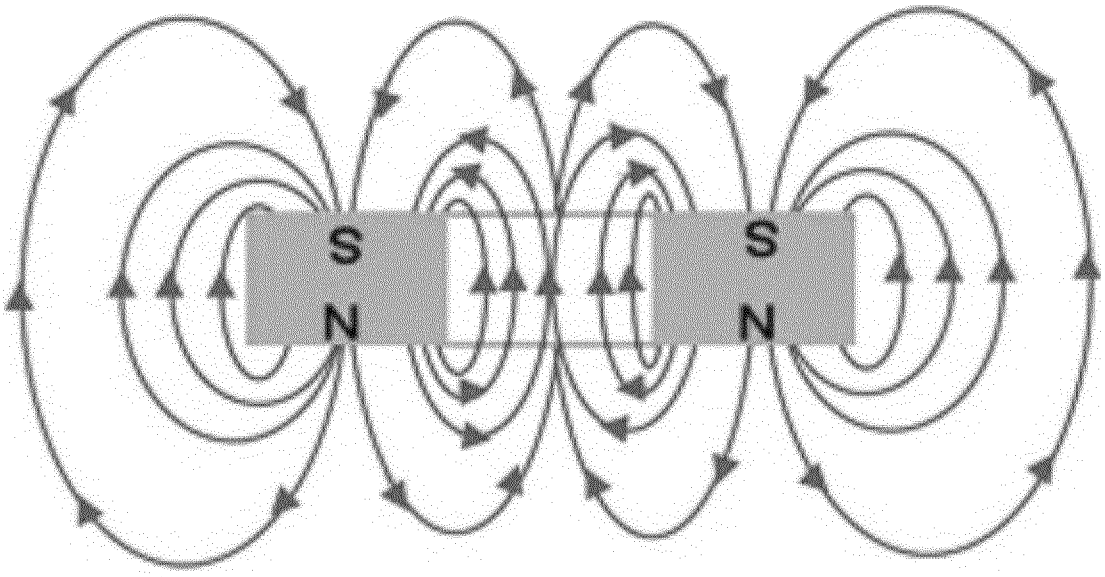

FIG. 5

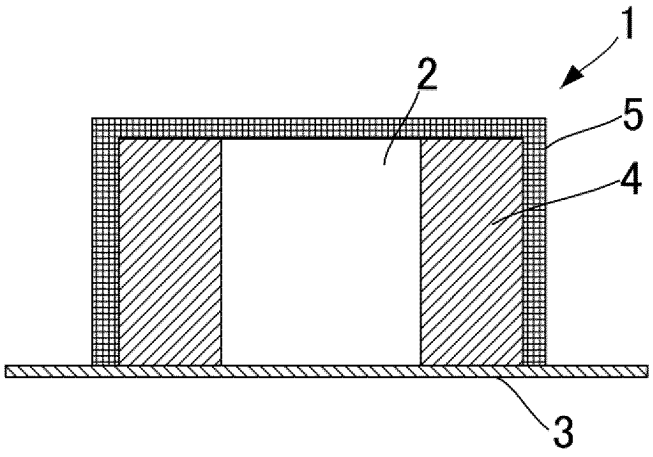

FIG. 6

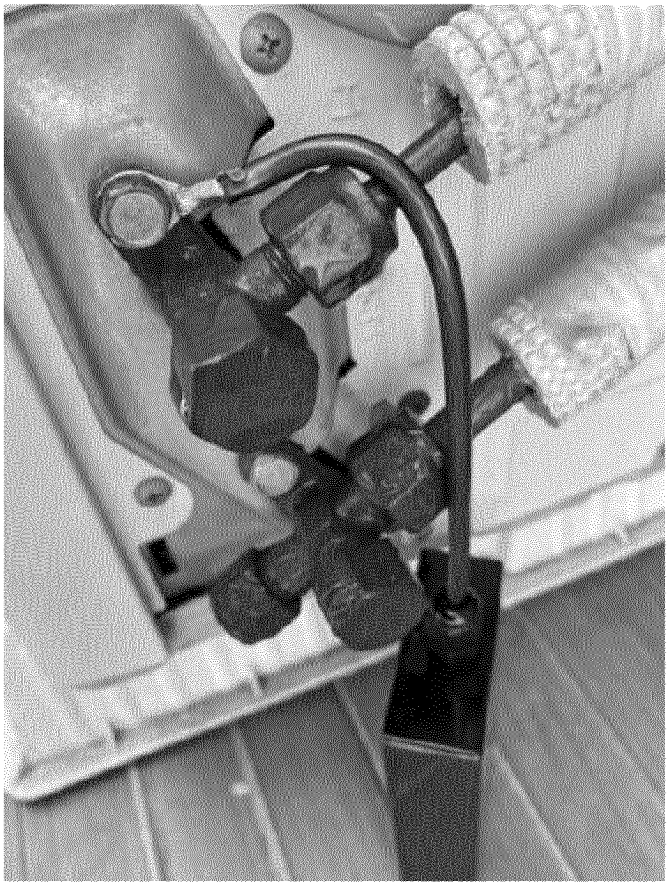

FIG. 7

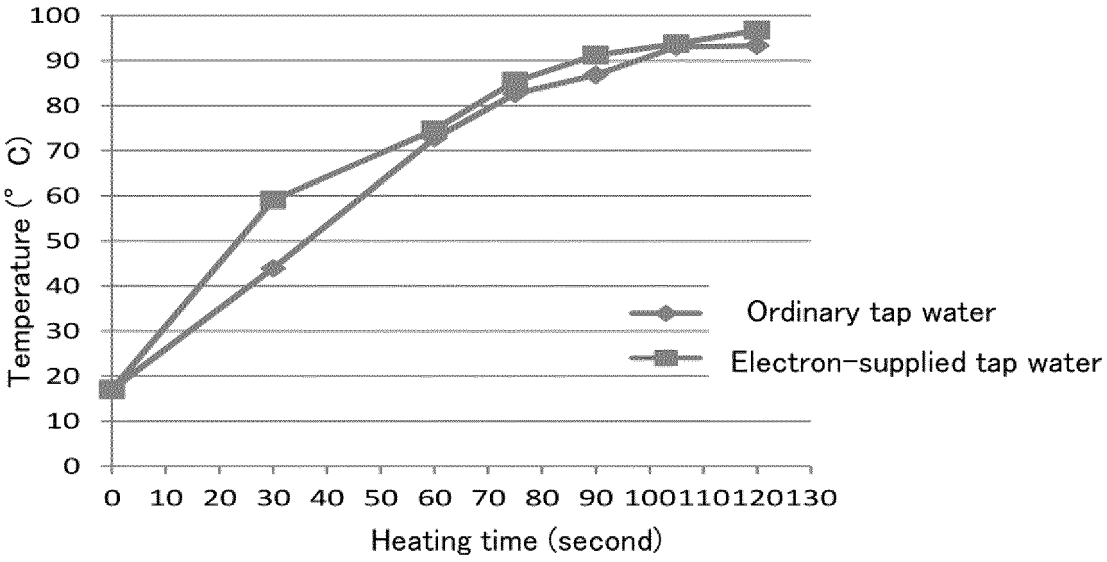
100
90
80
70
60
50
40
30
20
10
0
Temperature (° C)
0 10 20 30 40 50 60 70 80 90 100110120130
Heating time (second)
Ordinary tap water
Electron-supplied tap water

FIG. 8

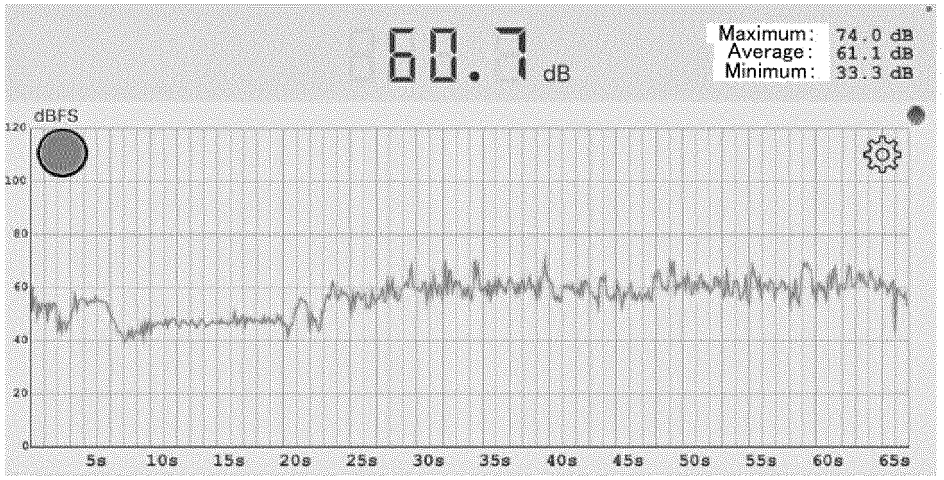
60.7 dB
Maximum: 74.0 dB
Average: 61.1 dB
Minimum: 33.3 dB
dBFS
120
100
80
60
40
20
0
5s 10s 15s 20s 25s 30s 35s 40s 45s 50s 55s 60s 65s

FIG. 9

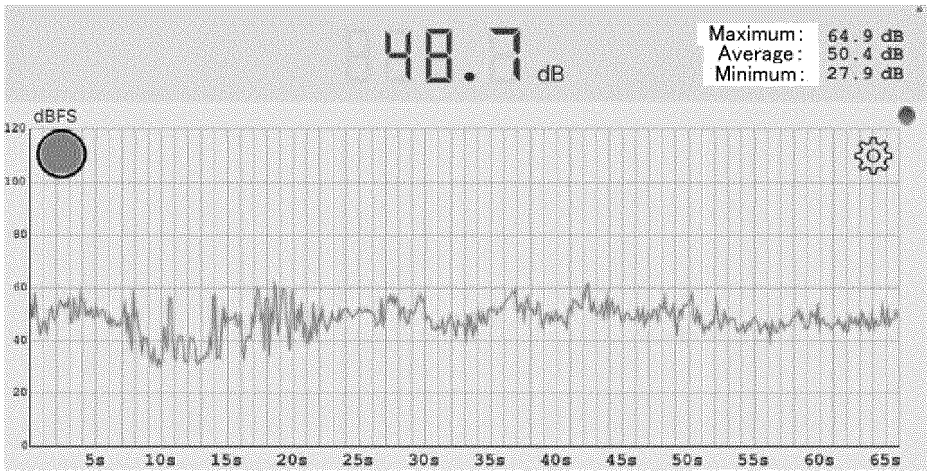
48.7 dB
Maximum: 64.9 dB
Average: 50.4 dB
Minimum: 27.9 dB
dBFS
120
100
80
60
40
20
0
5s
10s
15s
20s
25s
30s
35s
40s
45s
50s
55s
60s
65s

FIG. 10

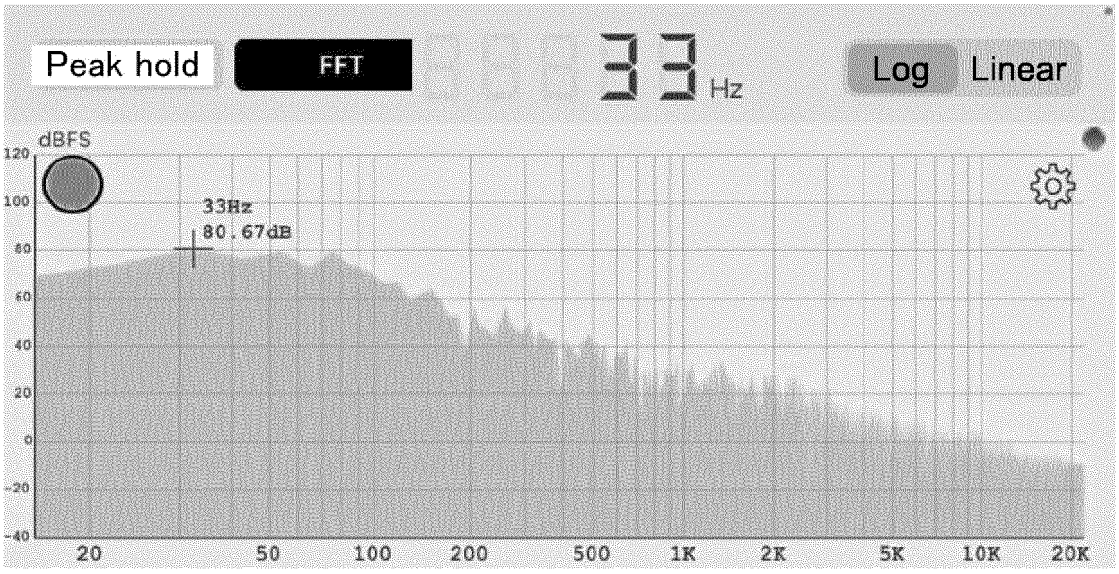
Peak hold
FFT
33 Hz
Log
Linear
dBFS
120
100
80
60
40
20
0
-20
-40
33Hz
80.67dB
20
50
100
200
500
1K
2K
5K
10K
20K

FIG. 11

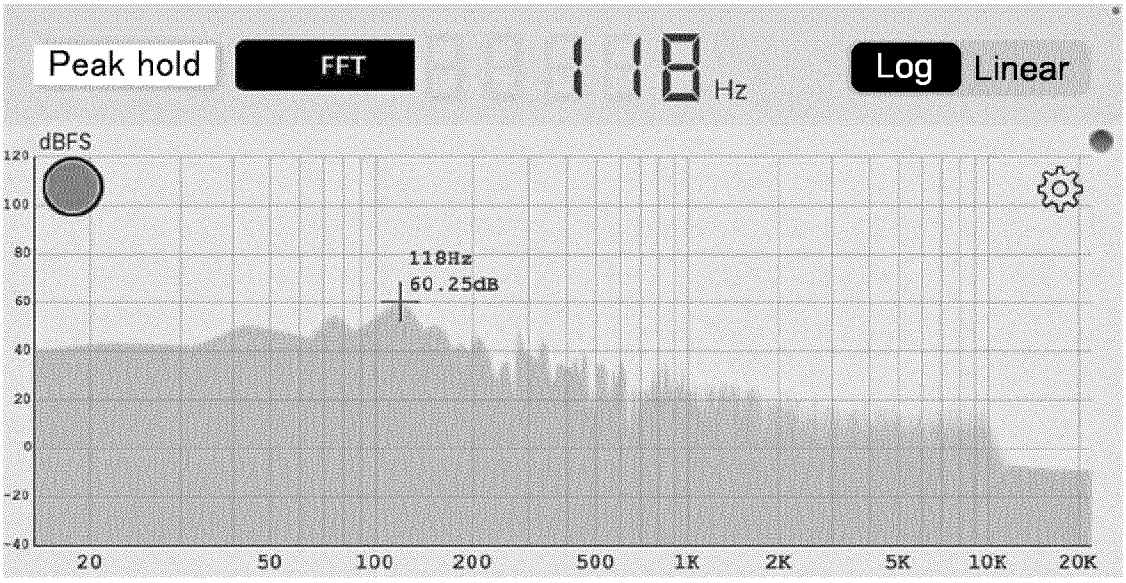
Peak hold
FFT
118
Hz
Log
Linear
dBFS
120
100
80
60
40
20
0
-20
-40
118Hz
60.25dB
20
50
100
200
500
1K
2K
5K
10K
20K

FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2024/016643

A. CLASSIFICATION OF SUBJECT MATTER

G21H 5/00(2006.01)i; ***C01G 23/047***(2006.01)i; ***F02B 51/06***(2006.01)i; ***F02M 27/06***(2006.01)i
FI: G21H5/00 A; C01G23/047; F02B51/06; F02M27/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G21H1/00-1/12; G21H5/00-5/02; F02B51/00-51/06; F02M27/00-27/08; C01G23/047-23/08

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2024
Registered utility model specifications of Japan 1996-2024
Published registered utility model applications of Japan 1994-2024

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2009-180191 A (OKAMOTO, Kazuyoshi) 13 August 2009 (2009-08-13) paragraphs [0012], [0026]	1-3
A		4-15
X	JP 2015-168737 A (NAKAGAWA, Junshaku) 28 September 2015 (2015-09-28) paragraphs [0017], [0020], [0069]-[0070], [0077]-[0078], [0080], [0082]	1, 3-7
Y		4-6, 8-10
A		2, 11-15
X	WO 2012/004857 A1 (W.F.N CO., LTD.) 12 January 2012 (2012-01-12) paragraphs [0016], [0020], [0022], [0025], [0028]-[0029], [0033]	1-3
Y		4-6, 8-10
A		7, 11-15
Y	WO 2006/077635 A1 (W.F.N CO., LTD.) 27 July 2006 (2006-07-27) paragraph [0057]	8-10

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 June 2024	**09 July 2024**
Name and mailing address of the ISA/JP **Japan Patent Office (ISA/JP)** **3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915** **Japan**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2024/016643

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2009-191852 A (W.F.N CO., LTD.) 27 August 2009 (2009-08-27)	1-15
A	JP 2010-121608 A (APORIA KK) 03 June 2010 (2010-06-03)	1-15
A	JP 3155020 U (MURATA TRADING KK) 05 November 2009 (2009-11-05)	1-15

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2024/016643

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 2009-180191 A	13 August 2009	(Family: none)	
JP 2015-168737 A	28 September 2015	(Family: none)	
WO 2012/004857 A1	12 January 2012	(Family: none)	
WO 2006/077635 A1	27 July 2006	US 2008/0272315 A1 paragraphs [0248]-[0249] EP 1840904 A1 CN 1918666 A KR 10-2007-0102631 A	
JP 2009-191852 A	27 August 2009	(Family: none)	
JP 2010-121608 A	03 June 2010	(Family: none)	
JP 3155020 U	05 November 2009	(Family: none)	

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2018059909 A **[0004]**