Appeal decision

Appeal No. 2018-9230

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| Appellant | SAES Getters S.p.A. |
| Patent Attorney | MURAYAMA, Yasuhiko |
| Patent Attorney | JITSUHIRO, Shinya |
| Patent Attorney | ABE, Tatsuhiko |
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The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2016-528637, entitled "Shock-absorbing device", [international publication on Jan. 29, 2015, WO2015/011642; national publication of the translated version on Sep. 8, 2016, National Publication of International Patent Application No. 2016-527454] has resulted in the following appeal decision:

Conclusion

The appeal of the case was groundless.

Reason

No. 1 History of the procedures

The present application was originally filed on Jul. 22, 2014 (Heisei 26) as an International Patent Application (claim of priority under the Paris Convention was received by a foreign receiving office on Jul. 25, 2013, Italy (IT)), and the history of the procedures is as outlined below.

Dec. 11, 2015 : Submission of a translation of amendment of Patent Cooperation Treaty Article 34

Jun. 16, 2017 : A written amendment

Aug. 31, 2017 : A notice of reasons for refusal

Nov. 29, 2017 : A written opinion and a written amendment

Mar. 1, 2018 : A decision of refusal

Jul. 4, 2018 : A written request for appeal

Aug. 9, 2018 : A written amendment

Jun. 14, 2019 : Notice of reasons for refusal (hereinafter, referred to as "reasons for refusal by the body")

Sep. 17, 2019 : A written opinion and a written amendment

No. 2 The Invention

The Invention is specified by the matters described in Claims 1-21 of the Scope of Claims amended by the amendment of Sep. 17, 2019, and the invention according to Claim 1 thereof is as follows. (In this regard, however, refer to the following Note; hereinafter, the invention according to Claim 1 is referred to as "Invention 1").

Note that, it is recognized that "- slender metallic structures" in Claim 1 is an error of "- the former slender metallic structures", and thus Invention 1 has been recognized in a manner interpreting it as "- the slender metallic structures".

[The Invention 1]

"A shock-absorbing device (10; 20; 30; 300; 310; 40; 50; 60; and 111) comprising a first holding element (11; 31; 41; 51; 61; 1111) and a plurality of slender metallic structures (12, 12', 12", $12^n$; 32, 32', 32", $32^n$, 33; 42, 42', 42", $42^n$; 52, 52'; 1112, 1112', $1112^n$, 1113, 1113', $1113^n$) having a first end and a second end, the slender metallic structures respectively having a slenderness ratio equal to or higher than 10, wherein the slender metallic structures are respectively fixed at their first ends to the first holding element, wherein

- the slender metallic structures are shock-absorbing devices (10; 20; 30; 300; 310; 40; 50; 60; 111) that are fixed at different positions of the first holding element,

- a mutual distance between the slender metallic structures of at least one pair of slender metallic structures (12, 12'; 32, 33; 42, 42'; 52, 52'; 62, 62'; 1112, 1113) is, when L is a length of the slender metallic structures, equal to or lower than 0.75*L, the mutual distance being measured with respect to their first ends,

- at least 90% of planes perpendicular to adjacent slender structures are mutually parallel or form an angle equal to or lower than 20°, wherein

Each of the slender metallic structures is a flat layered or sheet-shaped element and/or a straight threadlike element or a wire-shaped element, and

the slender metallic structures are configured to absorb impact energy working in directions perpendicular to planes that are vertical one after another with respect to the slender metallic structures,

at least 90% of the slender metallic structures comprise superelastic alloy, and wherein

the length L has a value between 3 mm to 30 cm."

No. 3 Outline of reasons for refusal of the body

Outline of reasons for refusal notified by the body with respect to the inventions according to Claims 1-8, and 10-21 before amendment are as follows.

(Inventive step) Since the inventions according to Claims 1-8, and 10-21 of this application are ones that could have been invented with ease by a person ordinarily skilled in the art in the technical field of the invention (hereinafter, referred to as "a person skilled in the art") before the application was filed based on the inventions described in the following publications distributed in Japan or abroad or the inventions made available to the public through electric communication lines before the application thereof, the appellant should not be granted a patent for these in accordance with the provisions of Article 29(2) of the Patent Act.

Publications
Cited Document 1 : Description of United States Patent No. 6460837
Cited Document 2 : Description of United States Patent No. 8282746
Cited Document 3 : Description of United States Patent No. 3616126

No. 4 Judgment by the body
1 Cited Document 1
(1) Matters described in Cited Document 1
In Cited Document 1 cited in the reasons for refusal by the body, there are the following descriptions together with drawings.
(1a) "FIELD OF THE INVENTION
The present invention relates to a filament-based energy absorbing system and, more particularly, to a system which utilizes a plurality of inexpensive discrete filaments as the energy absorbing component of the system." (Column 1, lines 3 to 7)

(1b) "BACKGROUND OF THE INVENTION
Energy absorbing systems are used in a variety of applications every day. These systems are utilized as guard rails at exit off ramps (typically bright yellow canisters filled with water or sand) and elevator bump stops (to absorb the impact of a falling elevator which snapped its cable). A common application for such systems is to incorporate them into automobiles, trucks, and other vehicles to make the vehicles safer during accidents. The energy absorbing systems (or energy absorbing materials) are placed at various critical locations within the vehicles so that, in the event of an accident, the energy of the accident is primarily absorbed by the energy absorbing system and not by the occupants of the vehicle. Typical placement for these energy absorbing systems (or energy absorbing materials), in the vehicle, is between the interior pillar post covers and the pillar posts of the vehicle, within instrument panels, under headliners, behind knee bolsters, etc. Additionally, energy absorbing systems are placed between the bumper covers (FACIA) and the structural components of the vehicle (e.g. the actual bumper, the bumper shocks, the frame, etc.). The energy absorbing systems are often created from injection molded polypropylene "egg crate" type material. Additional materials used for currently available energy absorbing systems are foam and bubble wrap. Each of these panels has to be custom designed and fitted for each individual application. This results in expensive tooling and production costs, since these pieces tend to be very rigid and, therefore, each piece has to be molded into the shape of the object to which it is being attached. Since the interior of each vehicle model tends to be dissimilar from that of any other vehicle model, each vehicle model would require its own specific set of energy absorbing systems or panels. Since, as stated above, many of these individual systems are injection molded, there is an extensive cost associated with producing each of these systems, as each one requires a unique mold and expensive tooling to manufacture the piece. Further, foam-based energy absorbing systems, when compressed, act as a solid barrier and no longer absorb energy. Since the average vehicle interior utilizes many energy absorbing systems or panels, it is clearly discernable how the use of rigid, injection-molded energy absorbing systems is a costly proposition for the automobile manufacturer." (Column 1, lines 8 to 51)

(1c) "Wherefore, it is therefore an object of the present invention to overcome the shortcoming and drawbacks associated with prior art energy absorbing systems and provide an energy absorbing system which is relatively inexpensive to manufacture." (Column 1, lines 53 to 57)

(1d) "The present invention results from the realization that a truly effective energy absorbing system can be achieved by utilizing a plurality of inexpensive discrete energy absorbing filaments attached to a backing member, so that the energy absorbing filaments function as the energy absorbing components or elements of the system. The present invention features a filament based energy absorbing system including a backing member having a top surface and a bottom surface; and a plurality of first energy absorbing filaments rigidly attached to the top surface of the planar backing member so that the plurality of first filaments extend or radiate away from the top surface." (Column 2, lines 5 to 16)

(1e) "The backing member may include a first longitudinal edge; a second longitudinal edge; a first longitudinal wall section rigidly attached to the first longitudinal edge and positioned perpendicular to and extending or radiating away from the top surface; and a second longitudinal wall section rigidly attached to the second longitudinal edge and positioned perpendicular to and extending or radiating away from the top surface, wherein the backing member forms a U-shaped channel surrounding the plurality of first energy absorbing filaments. The first and second longitudinal wall sections may be crimped toward one another to rigidly attach the plurality of first energy absorbing filaments to the backing member. The plurality of first energy absorbing filaments may be constructed of a material chosen from the group consisting of, for example, polypropylene, nylon, polyester, polyvinyl chloride, polystyrene, bassine, tampico, horse hair, pig bristle, animal fiber, palmyra, brass, and steel." (Column 2, lines 39 to 55)

(1f) "In accordance with the present invention, the filament-based energy absorbing system 10 (see FIG. 1) includes a backing member 12 having a top surface 14 and a bottom surface 16. A first end portion of a plurality of first energy absorbing filaments 18 is rigidly attached to a top surface 14 of planar backing member 12 so that the plurality of first filaments 18 radiate and extend away from top surface 14. It is important to note that the plurality of first filaments 18 are shown as extending substantially perpendicular to top surface limitation of the invention. Specifically, it may be desirable, for various design reasons, to have the plurality of first filaments 18' (shown in phantom) extend and an angle, e.g. an angle of about 20 to 70 degrees, with respect to the top surface 14.
A means or connection mechanism 20 attaches the filament-based energy absorbing system 10 to a base structure 22, typically a pillar post panel, an instrument panel, a headliner, a knee bolster, etc., requiring energy absorption. The connection mechanism 20 can be one of many different means such as a heat staking process in which an extrusion 24 (shown to the side of system 10 for the sake of clarity) passes through a through bore or hole in the planar backing member 12, where this extrusion is melted to the backing member 12 to form a plastic, rivet-like fastener which holds and secures the system 10 to the base structure 22. Alternatively, a sonic welding process can be employed where one of the two pieces (either the base structure 22 and/or the

system 10) is vibrated at a high frequency until the two pieces actually fuse or melt together. Additionally, the connection mechanism 20 could be a standard industrial or construction adhesive, such as epoxy. Further, the connection mechanism 20 could be, for example, a conventional fastener 26 such as a staple, a mating nut and bolt, or a mechanical snap lock. The filaments 18 may have a linear energy absorbing characteristic such that the rigidity of the filament is equal and constant along its entire length (linear filaments). Alternatively, for various design reasons, it may be desirable to utilize filaments in which the rigidity of the filament varies along the length of the filament (non-linear filaments), e.g. the rigidity either increases or decreases along the length of the filaments 18. Such non-linear filaments may be utilized when it is desirable to control the location or area where the filaments will initially bend when exposed to a force. If it is desirable to have the filaments initially bend in the middle region of the filament, the filaments can be processed so that the rigidity of the filament in the middle region is reduced, e.g. the transverse cross section dimension of the filaments is decreased.

While, thus far, the plurality of filaments 18 have been described as all being the same length, this is for illustrative purposes only and is not intended to be a limitation of the invention. Specifically, some of the plurality of filaments 18 may be longer or shorter than a majority of the other filaments 18 of the system 10. This would enable the designer to fine-tune the energy-absorption characteristics of the system. For example, in the event of a minor impact which requires only minor energy absorption, only the longer filaments 18; i.e., portions 28 of the longer filaments 18, would absorb the impact. However, in the event of a larger force being exerted, the portions 28 of the longer filaments 18 would initially collapse and then the shorter "standard-length" filaments 18 would begin to absorb the energy of the exerted force. The plurality of energy absorbing filaments 18 may be constructed from various materials such as polypropylene, nylon, polyester, polyvinyl chloride, polystyrene, various other plastics, bassine, tampico, horse hair, pig bristle, animal fiber, or palmyra and have a variety of different diameters (depending on the desired rigidity and other characteristics). Additionally, the placement of plurality of first energy absorbing filaments 18 may be varied or positioned in accordance with specific design criteria so that the desired energy absorbing characteristic, for the specific application, can be achieved.

Depending on the application, the planar backing member 12 may be constructed of a rigid material, for example, such as steel, brass, aluminum, wood, polypropylene, polyester, nylon, or polyvinyl chloride. It is desirable to use a backing member 12 constructed of a rigid material when the base structure 22, to which the system is being attached, is relatively flat. In the event that a rigid material is used for the substantially flat backing member 12, various methods can be employed to attach filaments 18 to planar backing member 12.

For example, holes (not shown) can be drilled or otherwise formed in the backing member 12 and a tuft of filaments can be attached or secured within each of the holes. Alternatively, an adhesive (not shown) can be used to glue the filaments 18 in the holes. Further, a wire drawing process can be used to draw the tufts of filaments 18 through the holes, whereafter the trailing ends of the tufts are stitched together.

In addition, the tufts can be fused to the flat surface of the backing member 12. Alternatively, the backing member 12 may be constructed of a somewhat flexible material such as a relatively thin piece of steel, brass, aluminum, polypropylene, polyester, nylon or polyvinyl chloride."  (Column 4, line 12 to Column 5, line 42)

(1g) "The pluralities of first and second energy-absorbing filaments preferably have a transverse cross-section diameter of between 0.006 and 0.060 inch and more preferably a transverse cross-section diameter of between 0.010 and 0.032 inch.  The pluralities of first and second energy-absorbing filaments preferably have an axial length of between 0.25 and 3.00 inches and more preferably an axial length of between 0.375 and 2.00 inches."  (Column 8, lines 5 to 12)

(2) From the above-mentioned descriptions, it can be said that, in Cited Document 1, there are described the following technical matters.
(i) According to the description of column 4, line 12 to column 5, line 42 (the description (1d)) and Fig. 1 of Cited Document 1, it is obvious that the plurality of energy-absorbing filaments 18, which are components of an energy-absorbing device based on a filament described in Cited Document 1, have the first end and the second end.
(ii) According to Fig. 1 of Cited Document 1, it can be observed that the plurality of energy-absorbing filaments 18 of an energy-absorbing device based on a filament are configured in such a way that the first ends thereof are respectively fixed to different positions of the backing member 12, and extend from the upper surface 14 of the backing member 12.
(iii) The plurality of energy-absorbing filaments 18 of an energy-absorbing device based on a filament described in Cited Document 1 are respectively fixed so as to extend substantially perpendicular to the backing member 12 (column 4, line 12-line 25 of Cited Document 1 (the description (1d)) and Fig. 1).

(3) From the descriptions of the summaries (1a)-(1g) and Fig. 1 of Cited Document 1, and the above-mentioned technical matters (i)-(iii), it can be said that the following invention (hereinafter, referred to as "Cited Invention") is described, in Cited Document 1.
[Cited Invention]
"An energy-absorbing device based on a filament, comprising:
a backing member 12; and
a plurality of energy-absorbing filaments 18 comprising a first end and a second end, wherein
the first ends of the plurality of energy-absorbing filaments 18 are respectively fixed at different positions of the backing member 12, wherein
the plurality of energy-absorbing filaments 18 are respectively fixed to the backing member 12 so as to substantially extend perpendicular to the backing member 12, and wherein
the plurality of energy-absorbing filaments 18 are selected from the group consisting of polypropylene, nylon, polyester, polyvinylchloride, polystyrene, bassine, tampico, horse hair, pig bristle, animal fiber, palmyra, brass, and steel."

2 Cited Document 2
(1) Matters described in Cited Document 2
There are the following descriptions in Cited Document 2 cited in reasons for

refusal by the body, together with drawings.
(2a) "ABSTRACT

A mechanical structure is provided with a crystalline superelastic alloy that is characterized by an average grain size and that is characterized by a martensitic phase transformation resulting from a mechanical stress input greater than a characteristic first critical stress. A configuration of the superelastic alloy is provided with a geometric structural feature of the alloy that has an extent that is no greater than about 200 micrometers and that is no larger than the average grain size of the alloy. This geometric feature is configured to accept a mechanical stress input." (Front page ABSTRACT)

(2b) "BACKGROUND OF INVENTION

This invention relates generally to methods for suppressing mechanical vibration and mechanical impact shocks, and more particularly relates to materials and structures for suppressing mechanical vibration and impact shocks." (Column 1, lines 15 to 19)

(2c) "In accordance with the invention, superelastic alloy structures of the invention can be arranged in applications for absorbing mechanical shock, for suppressing mechanical vibration, and dissipating mechanical energy from mechanical and electromechanical systems both for macro-scale as well as micro-scale and nano-scale applications. Referring to FIG. 6A, in one example configuration, there is provided a vibration suppression system 55 including an array of pillar structures 10 of the invention. The array of pillars 10 is provided on a mechanical support 58 that is configured to accept a mechanical input 12 that includes mechanical force and vibration, e.g., by interface to a moving structure or other ambient condition. The array of pillars 10 is configured on the mechanical support 58 on a side opposite the mechanical input and is connected to, e.g., a platform 60 on which is provided a mechanical system 62, e.g., a MEMS structure or apparatus. As mechanical force 12 is input at the support 58, the pillar structures 10 repeatedly cycle through austenitic-martensitic transformations, thereby damping mechanical vibrations to mechanically isolate the MEMS apparatus from the mechanical input. Note that no active control or energy input is required to achieve this actuation of the pillar structures in their damping role; the actuation is completely automatic and self-controlled.

Referring to FIG. 6B, superelastic alloy wire and fiber of the invention can similarly be configured for mechanical shock absorption and vibration damping. In this example a housing 65 is provided for accepting mechanical input 12, shown here for application of tension to the housing, if such is desired for a given configuration. The housing 65 is connected to a mechanical support 68 through one or more superelastic alloy structures of the invention; here a range of structures are shown for illustrative example. For example, one or more structure pillars 10, fibers or wires 25, bundles 48 of fibers or wires, and cables 49 or braids of fibers or wires can be connected between the mechanical housing and the mechanical support. As mechanical stress 12, e.g., tension, is input to the housing, all of the superelastic alloy structures cycle through austenite-martensite-austenite transformations, damping vibration and absorbing shock energy input to the housing. Note again that no active control or energy input is required to achieve this mechanical damping; the structures of the invention actuate automatically to dissipate energy between the housing 65 and the mechanical support 68.

Turning now to techniques provided by the invention for producing the superelastic alloy structures of the invention, superelastic alloy fibers or wires can be produced by any suitable method, including, e.g., Taylor wire hot drawing, swaging, rolling, extrusion, pultrusion, solid-state wire drawing, and the like. Whatever fiber production process is employed, it is preferred in accordance with the invention that the resulting superelastic fiber be arranged to have a bamboo-type microstructure along the length of the fiber, meaning that the boundaries between grains of the fiber generally span the fiber diameter, as shown for the fiber 25 of FIG. 3B. This bamboo microstructure reduces the number of grain boundary junctions in the material, which can be preferential sites for fracture. Such fracture is common for many polycrystalline shape memory alloys, which are characteristically quite brittle, and can result in intergranular fracture from grain displacement during phase transformations, due, e.g., to stress concentrations at grain boundaries and grain boundary junctions. The bamboo fiber microstructure of the invention can limit such intergranular fracture and also provides material properties that approach that of a single crystal alloy without requiring the complexity of single crystal structure fabrication.

In one well-suited process, superelastic alloy fibers of the invention are produced by Taylor wire hot drawing. In this process, a selected superelastic alloy material is melted and provided in a glass tube, from which the fiber is drawn with mechanical action, at a uniform drawing speed. The fiber is drawn with a low vacuum or inert gas atmosphere inside the tube to suppress oxidation of the molten alloy as the fiber is drawn. The fiber is cooled during the drawing at a cooling rate that is sufficiently high to prohibit fiber deformation as the fiber solidifies and that is sufficiently low to maintain a high-temperature austenite phase. The tube from which the fiber is drawn preferably is formed of a glass that is compatible with the selected alloy material and that is characterized by a drawing temperature that is greater than the alloy melting temperature and lower than the alloy boiling temperature, with a viscosity-temperature behavior that allows for quick glass crystallization after the alloy melt solidifies in the tube. Preferably the thermal expansion coefficient of the tube glass is reasonably close to that of the selected alloy, in order to avoid the development of thermal stress during cooling of the alloy melt in the tube.

In one example Taylor wire hot drawing process provided by the invention, a selected alloy, e.g., a CuAlNi alloy, is melted and drawn from a Borosilicate Pyrex glass tube of about 4 mm inner diameter, at a draw temperature of about, e.g., 1100°C-1150°C, with a drawing speed selected to produce a selected fiber diameter; the faster the drawing speed, the smaller the fiber diameter. For example, a drawing speed of about 3-4 meters/second is sufficient to produce a fiber with a diameter of about 20 microns. Once a fiber of a selected diameter is drawn from a glass tube, preferably the fiber is annealed at a selected temperature that is much higher than the eutectoid temperature and lower than the liquidus temperature, e.g., preferably about 850°C to 950°C for the example CuAlNi alloy, and for a suitable duration, e.g., 1-3 hours, depending on the structure dimensions, and then quenched in cold water. This annealing-quenching process imparts the bamboo microstructure of grains along the fiber length and encourages the formation of the high-temperature austenite phase.

It is recognized that a range of production techniques can be employed to form superelastic alloy fibers and wires, and the invention is not limited to a particular production technique. Fibers and wires can be formed by, e.g., mechanical swaging, solid-state drawing, extrusion, pultrusion, micro-casting, or other selected techniques. Whatever technique is employed, it is preferred that such produces a bamboo microstructure of grains generally spanning the fiber diameter along the fiber length if the fiber is polycrystalline."  (Column 12, line 56 to Column 14, line 36)

(2) From the above-mentioned descriptions, it can be said that, in Cited Document 2, there is described the following technology (hereinafter, referred to as "Technology of Cited Document 2").

"A technology in which, in a mechanism to suppress mechanical impact by arrangement of pillar structures to absorb energy of mechanical impact inputted against the structures, superelastic alloy is utilized as the material of the pillar structures."

3 Comparison / Judgment

(1) Comparison

Invention 1 and Cited Invention will be compared.

Since "the backing member 12" of Cited Invention is an element that fixes and holds the plurality of energy-absorbing filaments 18, it corresponds to "the first holding element" of Invention 1.

Since "the energy-absorbing filaments 18" of Cited Invention are of a slender structure, and, in addition, "are selected from the group consisting of polypropylene, nylon, polyester, polyvinylchloride, polystyrene, bassine, tampico, horse hair, pig bristle, animal fiber, palmyra, brass, and steel", it can be said that these are metal when brass or steel is selected, and thus correspond to "slender metallic structures" of Invention 1.

"The first ends of the plurality of energy-absorbing filaments 18 are respectively fixed at different positions of the backing member 12" of Cited Invention corresponds to "the slender metallic structures are respectively fixed at their first ends to the first holding element", and "that are fixed at different positions of the first holding element" of the Invention 1, because the plurality of energy-absorbing filaments 18 are fixed to the backing member 12 at their first ends, and it can be said that these are fixed to different positions of the backing member 12.

In the constitution that "the plurality of energy-absorbing filaments 18 are respectively fixed to the backing member 12 so as to substantially extend perpendicular to the backing member 12" of Cited Invention, when planes that are respectively vertical to respective neighboring slender structures of the plurality of energy-absorbing filaments 18 are considered, it can be said that the planes are approximately parallel to each other, and, therefore, it can be said that Cited Invention has the constitution of "at least 90% of planes perpendicular to adjacent slender structures are mutually parallel or form an angle equal to or lower than 20°" of Invention 1.

Taking Fig. 1 of Cited Document 1 also into consideration, "the plurality of energy-absorbing filaments 18 are selected from the group consisting of polypropylene, nylon, polyester, polyvinylchloride, polystyrene, bassine, tampico, horse hair, pig bristle, animal fiber, palmyra, brass, and steel" of Cited Invention can be said to be a matter that the plurality of energy-absorbing filaments 18 are formed as a straight threadlike element or a wire-shaped element, and thus corresponds to "the slender metallic structures are a flat layered or sheet-shaped element and/or a straight threadlike element or a wire-shaped element" of Invention 1.

"An energy-absorbing device based on a filament" of Cited Invention is configured that the plurality of energy-absorbing filaments 18 absorb impact energy working in the axial direction of the plurality of energy-absorbing filaments 18 (the description (1f)), and, therefore, it can be said that it includes a constitution corresponding to "the slender metallic structures are configured to absorb impact energy working in directions perpendicular to planes that are vertical one after another with respect to the slender metallic structures" of Invention 1, and thus corresponds to "shock-absorbing device" of Invention 1.

From the above, the corresponding feature and different features between Invention 1 and Cited Invention are as follows.

[Corresponding Feature]

"A shock-absorbing device comprising:

a first holding element; and

a plurality of slender metallic structures having a first end and a second end, wherein

the slender metallic structures are respectively fixed at their first ends to the first holding element,

- the slender metallic structures are shock-absorbing devices that are fixed at different positions of the first holding element,
- at least 90% of planes perpendicular to adjacent slender structures are mutually parallel or form an angle equal to or less than 20°, wherein

the slender metallic structures are a flat layered or sheet-shaped element and/or a straight threadlike element or a wire-shaped element, and wherein

the slender metallic structures are configured to absorb impact energy working in directions perpendicular to planes that are vertical one after another with respect to the slender metallic structures."

[Different Feature 1]

Regarding a slenderness ratio of the slender metallic structures, "the slender metallic structures respectively have a slenderness ratio equal to or higher than 10" in Invention 1, whereas a slenderness ratio of the energy-absorbing filaments 18 of Cited Invention is not specified.

[Different Feature 2]

Regarding an interval of the slender metallic structures, Invention 1 is specified as "a mutual distance between the slender metallic structures of at least one pair of slender metallic structures is, when L is a length of the slender metallic structures, equal to or lower than 0.75*L, the mutual distance being measured with respect to their first ends", whereas an interval between the energy-absorbing filaments 18 of Cited Invention is not specified.

[Different Feature 3]

Regarding a material of the slender metallic structures, Invention 1 is specified as "at least 90% of the slender metallic structures comprise superelastic alloy", whereas the energy-absorbing filaments 18 of Cited Invention are specified as "selected from the group consisting of polypropylene, nylon, polyester, polyvinylchloride, polystyrene, bassine, tampico, horse hair, pig bristle, animal fiber, palmyra, brass, and steel".

[Different Feature 4]

Regarding a length of the slender metallic structures, Invention 1 specified as "the length L has a value between 3 mm to 30 cm", whereas a length of the energy-absorbing filaments 18 of Cited Invention is not specified.

(2) Judgment

Different Features 1-4 will be discussed below.

A Regarding Different Feature 1

Relating to the energy-absorbing filaments 18 of Cited Invention, it is described, in column 8, line 5 to line 12 of Cited Document 1, that, as the first energy absorption filaments, "preferably have a transverse section diameter of 0.006 to 0.060 inch, and, more preferably, have a transverse section diameter of 0.010 to 0.032 inch." and "the plurality of first and second energy absorption filaments preferably have a shaft length of 0.25 to 3.00 inch, and, more preferably, have a shaft length of 0.375 to 2.00 inch.", and, also referring to Fig. 1, it is obvious that a ratio of the shaft length to the transverse section diameter; which is a slenderness ratio of the plurality of energy-absorbing filaments 18 of Cited Invention is equal to or higher than 10.

Therefore, it cannot be said that Different Feature 1 is a substantive different feature.

Even if Different Feature 1 is a substantive different feature, when an energy absorbing effect is made to be exerted by bending filamentous materials such as slender metallic structures as is the case with Cited Invention, it could have been evoked with ease by a person skilled in the art that, if the same material is used, the buffering effect can be increased by making the length in the axis direction be long to accumulate a lot of energy, and thus, also taking the descriptions of column 8, line 5 to line 12 and Fig. 1 of Cited Document 1 into consideration, it could have been conceived of by person skilled in the art with ease to make the slenderness ratio of the energy-absorbing filaments 18 of Cited Invention be equal to or higher than 10.

Incidentally, relating to the point that the slenderness ratio of the slender metallic structures is equal to or higher than 10, the critical significance of the numerical value 10 is not supported by the description of application.

B Regarding Different Feature 2

With reference to Fig. 1 of Cited Document 1, it is obvious that the matter that a mutual distance between the plurality of energy-absorbing filaments 18 of Cited Invention is measured with respect to their first ends and is made to be equal to or lower than 0.75 multiplied by the length can be perceived.

Therefore, it cannot be said that Different Feature 2 is a substantive different feature.

Even if Different Feature 2 is a substantive different feature, when an energy absorbing effect is made to be exerted by bending filamentous materials such as slender metallic structures as is the case with Cited Invention, it could have been evoked with ease by a person skilled in the art that the buffering effect can be increased by making the density of the slender metallic structures high to accumulate a lot of energy. In addition, relating to the point that "a mutual distance between the slender metallic structures of at least one pair of slender metallic structures is, when L is a length of the slender metallic structures, equal to or lower than 0.75*L, the mutual distance being measured with respect to their first ends" of Invention 1, the critical significance of the numerical value is not supported by the description of application, and thus it can be said that it is a numerical value that can be set by a person skilled in the art depending on the required performance.

Therefore, it can be said that it could have been conceived of by a person skilled in the art with ease to make a mutual distance between the plurality of energy-absorbing filaments 18 of Cited Invention be measured with respect to their first ends and be equal to or lower than 0.75 multiplied by the length.

C Regarding Different Feature 3

Since a pillar structure using superelastic alloy in Technology of Cited Document 2 (refer to 2(2)) and an energy absorption filament of Cited Invention are common in a point of being a slender structure and in a point of absorbing mechanical impact energy by bending, no technical difficulty is recognized at all for a person skilled in the art in trying to apply Technology of Cited Document 2 to the energy-absorbing filaments 18 of Cited Invention to made of superelastic alloy.

In addition, in Invention 1, relating to the numerical value 90% of the matter of "at least 90% of the slender metallic structures comprise superelastic alloy", the critical significance of that numerical value is not supported by the description of application, and it can be said that it is a matter that can be set by a person skilled in the art depending on required performance in the shock-absorbing device to determine, a blending ratio of the slender metallic structures made of superelastic alloy in the slender metallic structures of a shock-absorbing device, and to make an effect exerted by the superelastic alloy.

Therefore, based on the Technology of Cited Document 2, it could have been conceived of by person skilled in the art with ease to make Cited Invention have the constitution of Invention 1 concerning Different Feature 3.

D Regarding Different Feature 4

Relating to the energy-absorbing filaments 18 of Cited Invention, it is described, in column 8, line 9 to line 12 of Cited Document 1, as the first energy absorption filaments, that "preferably have a shaft length of 0.25 to 3.00 inch, and, more preferably, have a shaft length of 0.375 to 2.00 inch.", and, since one inch = 25.4 mm, the above-mentioned description becomes "preferably have a shaft length of 6.35 mm to 7.62 cm".

Therefore, it cannot be said that Different Feature 4 is a substantive different feature.

Even if Different Feature 4 is a substantive different feature, when an energy absorbing effect is made to be exerted by bending filamentous materials such as slender metallic structures as is the case with Cited Invention, it could have been evoked with ease by a person skilled in the art that energy absorbed by slender metallic structures depends on the size of the slender metallic structures; that is, the length in the axial direction and the transverse section diameter in the case of Cited Invention.

Therefore, it can be said that, in Cited Invention, it could have been conceived of with ease by a person skilled in the art to set the length of the energy-absorbing filaments 18 as 3 mm to 30 cm, by taking into consideration the description of column 8, line 9 to line 12 of Cited Document 1, "preferably have a shaft length of 0.25 to 3.00 inch, and, more preferably, have a shaft length of 0.375 to 2.00 inch.".

E Regarding effects

When the effect of Invention 1 is examined, even taking Different Features 1-4 into consideration comprehensively, the effect to be exerted by Invention 1 is nothing but one in the range that is predicted from the effect to be exerted by Cited Invention and the Technology of Cited Document 2, and thus it cannot be said there is a remarkable effect.

F Summary

As described above, Invention 1 could have been invented by a person skilled in the art with ease based on Cited Invention and the Technology of Cited Document 2.

G Others

(A) The Applicant (the Appellant of the appeal) alleges roughly as follows in the written opinion submitted on Nov. 29, 2017, the written amendment submitted on Aug. 9, 2018, and the written opinion submitted Sep. 17, 2019.

In Cited Document 1, there is no description or suggestion about use of a superelasticity material as the energy-absorbing filaments 18, and use of superelasticity material that is far more expensive and contradicts the object of utilizing inexpensive discrete filaments described in Cited Document 1, too; therefore, it cannot be thought that, in the invention described in Cited Document 1, "at least 90% of the slender metallic structures comprise superelastic alloy" will be used.

Therefore, the above-mentioned allegation will be discussed below.

If a technical effect is given priority over an economic effect, it can be said that it is sufficiently possible to try to apply a particular prior art to Cited Invention in expectation of a technical effect that is given priority. In addition, as instructed in the above-mentioned (3), it cannot be acknowledged that there is a technical difficulty in applying Technology of Cited Document 2 to the energy-absorbing filaments 18 of Cited Invention.

Furthermore, one of the objects of the Cited Invention (the invention described in Cited Document 1) is to make expensive molds, which are needed in the case of prior art, in which an impact energy-absorbing device is a foam body or a bubble sheet, for the purpose of performing injection molding of each impact energy-absorbing device for individual applications, unnecessary, to thereby provide an inexpensive energy absorption system by providing an impact energy-absorbing device having a constitution in which a plurality of energy absorption filaments are attached to a backing member (refer to column 1, line 30 to line 51 of Cited Document 1), and, from the viewpoint of making expensive molds unnecessary, even if superelastic alloy is expensive, it cannot be said that to select superelastic alloy as the material of energy absorption filaments in Cited Invention is a matter for which application of the technology thereof should be refused as a matter that inhibits the object (to provide an inexpensive energy absorption system by making expensive molds unnecessary).

Therefore, the above-mentioned allegation by the applicant (Appellant of the appeal) cannot be adopted.

(B) In addition, the Applicant (the Appellant of the appeal) also alleges, in the written opinion submitted on Sep. 17, 2019, roughly as follows.

Although Cited Document 2 indicates that a superelasticity element is used in an impact absorption system, there is also an instruction in the abstract and Claim 1 of Cited Document 2, that superelasticity fibers need to be extremely small, and, specifically, the minimum dimension (3 mm) of the slender metallic structures in the invention according to Claim 1 of the present application is larger than the maximum dimension (200 micrometers) of the superelastic alloy shown in Cited Document 2 by ten times or more; therefore, Cited Document 1 and Cited Document 2 cannot be combined.

However, although it is described in the abstract and Claim 1 of Cited Document 2, as a constitution of the superelastic alloy for suppressing mechanical vibration and impact, that "having an extent that is no greater than about 200 micrometers and that is no larger than the average grain size of the alloy" ("...a configuration of the superelastic alloy providing a geometric structural feature of the alloy having an extent that is no greater than about 200 micrometers and that is no larger than the average grain size of the alloy..." (Front page "ABSTRACT")), it is not a matter that indicates that the length of the superelastic alloy of the Technology of Cited Document 2 needs to be about 200 micrometers or less, and, furthermore, since the above-mentioned description of Cited Document 2 is not a description that has technical nonconformity with the description of column 8, line 9 to line 12 of Cited Document 1 that, as the first energy absorption filaments, "the pluralities of first and second energy absorption filaments preferably have a transverse section diameter of 0.006 to 0.060 inch, and, more preferably, have a transverse section diameter of 0.010 to 0.032 inch. The pluralities of first and the second energy absorption filaments preferably have a shaft length of 0.25 to 3.00 inch, and, more preferably, have a shaft length of 0.375 to 2.00 inch.", it should be said that application of the Technology of Cited Document 2 to Cited Invention is not inhibited, and thus the allegation of the Applicant (Appellant of the appeal) cannot be adopted.

4 Closing

As above, since Invention 1 is an invention for which the appellant should not be granted a patent in accordance with the provisions of Article 29(2) of the Patent Act, the present application should be rejected without examining the inventions according to the other claims.

Therefore, the appeal decision shall be made as described in the conclusion.

February 14, 2020

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| Chief administrative judge: | HIRATA, Nobukatsu |
| Administrative judge: | OZAKI, Kazuhiro |
| Administrative judge: | INOUE, Makoto |