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(71) Applicants:
• **Fawoo Engineering Co., Ltd.**
Bucheon-si, Gyeonggi-do 421-814 (KR)
• **Yoo, Young Ho**
Seoul 150-771 (KR)
• **Yoo, Taegeun**
Seoul 150-771 (KR)
• **Yoo, A Ram**
Seoul 150-771 (KR)

• **Kim, Sang Sik**
Daejeon, Daejeon 305-759 (KR)

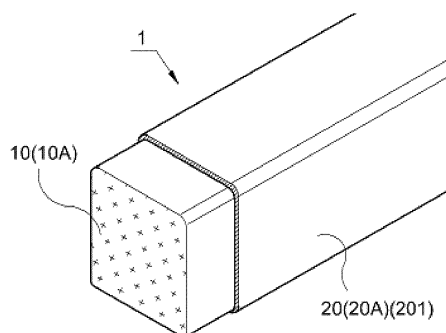
(72) Inventors:
• **YOO, Young Ho**
Seoul 150-771 (KR)
• **YOO, Taegeun**
Seoul 150-771 (KR)
• **YOO, A Ram**
Seoul 150-771 (KR)
• **KIM, Sang Sik**
Daejeon 305-759 (KR)

(74) Representative: **Treeby, Philip David William et al**
RGC Jenkins & Co.
26 Caxton Street
London SW1H 0RJ (GB)

(54) **STRUCTURE HAVING A CORE BAR**

(57) The present disclosure relates to a structural member with a core bar which has good mechanical strength and quality properties compared to existing metallic structural members, significantly reduces manufacturing costs, enables easy construction of various curved building structures such as a dome-shaped building structure or an arch-shaped building structure without a truss structure or a formwork to be economically feasible and excellent in construction efficiency, and contributes to the protection of the global environment. The structural member includes: at least one elastic core bar formed in a bar shape; and an outer body or an outer cover into which the at least one core bar is inserted. The core bar is formed at least one of wood such as a bamboo strip or a composite bamboo bar, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material. The outer body or the outer cover is formed of at least one of a metallic material such as aluminum, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material.

[Fig. 3]



Description

BACKGROUND OF THE INVENTION

1. Field of the invention

[0001] The present disclosure relates to a structural member with a core bar which has good mechanical strength and quality properties as compared with an existing metallic structural member, significantly reduces manufacturing costs, enables easy construction of various curved building structures such as a dome-shaped building structure or an arch-shaped building structure without a truss structure or a formwork to foster economic feasibility and excellent construction efficiency, and contributes to the protection of the global environment.

2. Description of the Prior Art

[0002] Metallic structural members made of, for example, steel or aluminum, are widely used in machines and equipment such as automation equipment as well as in the construction field.

[0003] Such a metallic structural member has disadvantages in that the member increases material costs, the member is hard to handle and manage due to its heavy weight, and a large amount of carbon gas is discharged when producing and processing the raw material thereof harming the global environment.

[0004] In addition, although a curved building structure such as a dome-shaped building structure or an arch-shaped building is preferred due to advantages that no column is needed in a central area and the building structure has an elegant appearance, formworks are constructed or trusses are used when constructing such a curved building structure.

[0005] As illustrated in FIG. 1, a truss T structure is constructed by connecting steel materials such as pipes or iron beams in triangular structures by welding. Thus, manpower and air are wasted for welding operations and, thus, workability is poor.

[0006] In addition, although such a truss structure is strong against tensile force and compressive force, it is weak against a load pressure since it has weak flexural strength and restoring elasticity against deformation caused by a compressive load. In order to reinforce this, since the standard sizes of truss structural members are increased, there are problems in that the structural members occupy a large space and material costs are increased.

[0007] Meanwhile, aluminum profiles (see FIG. 14) widely used, for example, in the construction field are preferred as standardized system structural materials which may reduce operation processes such as cutting, welding, grinding, and painting of steel materials and enable easy assembly. However, since the entire body of such an aluminum profile is made of a metallic material such as aluminum, there are disadvantages in that a rel-

atively expensive metallic material is wasted and costs increase.

[0008] In addition, there is also a disadvantage in that construction may be delayed since, when connecting the aluminum profiles in a longitudinal direction, it is cumbersome to form holes at cross-sectional centers of the profiles in advance and to perform tapping whenever connecting the aluminum profiles.

10 SUMMARY OF THE INVENTION

[0009] The present disclosure has been made in order to solve the problems in the art. An aspect of the present disclosure is to provide an improved structural member with a core bar (hereinafter, simply referred to as a "structural member") which has good mechanical strength and quality properties as compared with an existing structural member and may considerably reduce manufacturing costs.

[0010] Another aspect of the present disclosure is to provide a structural member which enables easy construction of frames of various curved building structures such as a dome-shaped building structure and an arch-shaped building structure using flexure of the structural member without using a truss structure or a formwork, thereby improving construction efficiency.

[0011] Still another aspect of the present disclosure is to provide a structural member in which bamboo material, which is an excellently profitable natural material, is used as a standardized structural member which is waterproof, fireproof, and mothproof so as to save metallic resources which generate a large amount of carbon gas when being manufactured and processed, thereby contributing to protection of the global environment.

[0012] According to an aspect of the present disclosure, there is provided a structural member including: at least one elastic core bar formed in a bar shape; and an outer body or an outer cover into which the at least one core bar is inserted. The core bar is formed of at least one of wood such as a bamboo strip or a composite bamboo bar, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material, and the outer body or the outer cover is formed of at least one of a metallic material such as aluminum, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material.

[0013] The core bar may be formed of a composite bamboo bar, and the composite bamboo bar may be formed by bonding a plurality of bamboo strips into a single body or pressure-molding bamboo which has been split and then crushed.

[0014] The outer body or the outer cover may be provided with an insertion hole into which the core bar is inserted to be supported. The outer body or the outer cover may be formed in a pipe type or a profile type having at least one T-slot.

[0015] The outer body may be formed in a guide pile type which includes a main body into which the core bar

is inserted and an accessory portion provided on the main body. The accessory portion includes at least one guide wing and/or at least one T-slot which is formed to continuously extend in a longitudinal direction on at least one outer surface of the main body.

[0016] The accessory portion may be provided on each of two parallel surfaces of the main body and include a T-slot, first and second guide wings positioned at opposite sides with reference to the T-slot, an end of an insulation material being inserted between the first and second guide wings, and a third guide wing positioned to be spaced apart from the second guide wing and to form an air layer between the second guide wing and the third guide wing. The first guide wing and the third guide wing may be formed at outer edges such that an exterior material or an interior material of a building wall may be fixed thereto.

[0017] The outer body may be formed with at least one protrusion and/or at least one rib, which extends in a longitudinal direction, on an inner wall of the insertion hole into which the core bar is inserted to be supported so as to allow the core bar to be easily inserted and held.

[0018] The outer body or outer cover may be fastened to the core bar by at least one anchoring unit.

[0019] The outer body or the outer cover may be formed with at least one partition wall which divides an internal space.

[0020] According to another aspect of the present disclosure, there is provided a structural member including: an elastic core bar formed in a bar shape; and an outer cover or a coating film formed on an outer surface of the at least one core bar. The core bar is formed of at least one of wood such as a bamboo strip or a composite bamboo bar, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material. The outer body or the outer cover is formed of at least one of a metallic material such as aluminum, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material.

[0021] The outer cover or the coating film may be formed through any one of a method of passing the core bar through a molten liquid of a predetermined material and curing the molten liquid, a coating method, a method of fusing a tubular covering material, and a wrapping method.

[0022] According to still another aspect of the present disclosure, there is provided a tubular structure including: a center core bar arranged centrally and positioned in a longitudinal direction; a plurality of core bars arranged around the center core bar and formed in an elastic bar shape; and an outer body or an outer cover into which the center core bar and the plurality of core bars are inserted. The center core may be formed of at least one of a metallic material, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material. The plurality of core bars may be formed of at least one of wood such as a bamboo strip or a composite bamboo bar, a synthetic resin material, a glass fiber com-

posite material, and a carbon fiber composite material. The outer body or the outer cover may be formed of at least one of a metallic material such as aluminum, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material.

[0023] According to a structural member configured as described above according to the present disclosure, since a substantial proportion of the configuration of the structural member may be formed using, for example, a bamboo material which is relatively inexpensive and light and has a higher tensile strength than a steel material, it is possible to provide a the structural member which has good mechanical strength and to save a metallic material which is an expensive resource compared to an existing structural member which is formed wholly of a metallic material. As a result, it is possible to reduce the manufacturing costs and, thus, obtain substantial economic benefits.

[0024] In addition, since frameworks of various curved building structures such as a dome-shaped building structure or an arch-shaped building structure can be easily constructed using the flexible property of the structural member according to the present disclosure, no formwork is needed and the frameworks are significantly simplified in construction as compared with a truss. Thus, construction efficiency can be remarkably improved.

[0025] Further, since a bamboo material which has a higher weight strength than a steel material is used, it is possible to reduce the weight of the structural member such that the structural member can be easily handled and managed.

[0026] Further, since it is possible to insert an insert nut into a core bar formed of a composite bamboo bar or the like or directly fasten a screw, structural members may be easily connected in a longitudinal direction without a separate tapping process.

[0027] Moreover, since a bamboo material, which is an excellently profitable natural material, may be configured to be used as a structural member which is standardized and is waterproof, fireproof, and mothproof, it is possible to save metallic resources, which exhaust large amounts of carbon gas during manufacturing and processing for such a structural member, thereby contributing to protection of the global environment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] The above and other objects, features and advantages of the present disclosure will be more apparent from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a view illustrating a conventional arch-shaped truss;

FIG. 2 is a view illustrating an arch-shaped frame for describing a technical concept according to the present disclosure;

FIG. 3 is a partial cut-away perspective view illus-

trating a configuration of an exemplary embodiment of the present disclosure;

FIGs. 4a and 4b are cross-sectional views of core bars according to an exemplary embodiment of the present disclosure;

FIGs. 5a to 5c are cross-sectional views illustrating outer bodies or outer covers according to an exemplary embodiment of the present disclosure which are formed in a pipe type;

FIGs. 6a and 6b are cross-sectional views illustrating outer bodies or outer covers according to an exemplary embodiment of the present disclosure which are formed in a profile type;

FIG. 7 is a cross-sectional view illustrating an outer body according to an exemplary embodiment of the present disclosure which is formed in a guide pile type;

FIG. 8 is a cross-sectional view illustrating a use state of the outer body of FIG. 7;

FIG. 9 is a cross-sectional view illustrating a fastened state of an anchoring unit according to an exemplary embodiment of the present disclosure;

FIGs. 10a and 10b are cross-sectional view illustrating structural members according to an exemplary embodiment of the present disclosure;

FIG. 11 is a cross-sectional view illustrating a configuration having an outer cover or a clothing film according to an exemplary embodiment of the present disclosure;

FIGs. 12a and 12b are cross-sectional views illustrating configurations including a center core according to an exemplary embodiment of the present disclosure;

FIG. 13 is a cross-sectional view for describing acting effects; and

FIG. 14 is a cross-sectional view illustrating an example of a conventional profile.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

[0029] Hereinafter, exemplary embodiments for a structural member with a core bar according to the present disclosure will be described in more detail with reference to the accompanying drawings.

[0030] As illustrated in FIGs. 2 to 10, a structural member 1 with a core bar (hereinafter, simply referred to as a "structural member 1") according to an exemplary embodiment of the present disclosure includes at least one elastic core bar 10 formed in a bar shape, and an outer body 20 or an outer cover 20A into which the at least one core bar 10 is inserted. The core bar 10 is formed of at least one of wood such as a bamboo strip 11 or a composite bamboo bar 10A, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material. The outer body 20 or the outer cover 20A is formed of at least one of a metallic material such as aluminum, a synthetic resin material, a glass fiber composite

material, and a carbon fiber composite material.

[0031] Here, the core bar 10 is formed of the composite bamboo bar 10A which has a high flexural strength, tensile strength, and restoration elasticity in which the composite bamboo bar 10A may be formed by bonding a plurality of bamboo strips 11 into a single body or through compression-molding of bamboo in which bamboo is split, crushed, and compressed to be molded.

[0032] Bamboo shoots bud out every year and grow to their full height and thickness within 15 to 20 days. Bamboo which grows 1 m or more every day is the most exuberantly growing plant on earth. Since the harvest age of high quality bamboo is three to four years, the production period of bamboo is considerably short compared to ordinary wood and, thus, bamboo is very profitable. Further, bamboo is an environment-friendly material which generates an extremely small amount of carbon gas until it is processed for use as compared with a metallic material.

[0033] In addition, bamboo is an excellent construction material in that it has high weight strength in tensile strength as compared with steel material and has a high flexural strength and restoration elasticity.

[0034] Each bamboo strip 11 is formed by splitting and processing bamboo in a bar shape having an optional cross-sectional shape. In the bamboo strip 11, the density of fibrous tissue is gradually lowered from a surface layer portion having dense fibrous tissue to an inner layer portion having relatively loose tissue. A section from the surface layer portion to a middle layer portion which remains by removing the outermost layer and the inner layer may be used for the bamboo strip 11 of the present disclosure.

[0035] In addition, the bamboo strip 11 or the composite bamboo bar 10A may be subjected to a carbonization process.

[0036] A structural member 1 according to the present disclosure, which includes the core bar 10 formed of the composite bamboo bar 10A as described above or the like as a main constitutional element, has a high yield strength in relation to the pressure by a load W and is excellent in restoration elasticity against flexural deformation, thereby enabling construction of a durable structure which may be hardly deformed and damaged, as illustrated in FIG. 2.

[0037] FIG. 4a illustrates an exemplary embodiment in which the core bar 10 inserted into one outer body 20 or outer cover 20A is formed by a single body, and FIG. 4b illustrates an exemplary embodiment in which the core bar 10 is formed by two members.

[0038] In addition, an insertion hole 21 is formed in a longitudinal direction through the outer body 20 or the outer cover 20A in which the core bar 10 is inserted into the insertion hole 21 to be supported. The outer body 20 or the outer cover 20A may be formed in a pipe type 201 (see FIG. 5) or a profile type 202 including one or more T-slots 22 (see FIG. 6).

[0039] The outer body 20 or the outer cover 20A of the

pipe type 201 may be formed in a circular cross-section (see FIG. 5a), a polygonal cross-section including a rectangular cross-section (see FIGs. 5b and 5c), or the like.

[0040] In addition, the outer body 20 or the outer cover 20A of the profile type 202 is provided with one or more T-slots 22 extending in the longitudinal direction, the outline on the cross-section thereof may be formed in a circular shape (see FIG. 6a), a polygonal shape including a rectangular shape (see FIG. 6b), or the like.

[0041] In addition, as illustrated in FIGs. 7 and 8, the outer body 20 is formed in a guide pile type 203 which is provided with an accessory portion 203b on a main body 203a into which the core bar 10 is inserted, and the accessory portion 203b may include at least one of one or more guide wings 23 and one or more T-slots 22 which are continuously formed in the longitudinal direction on one or more outer surfaces of the main body 203a.

[0042] The outer body 20 of the guide pile type 203 may be usually used as a framework of a pre-fabricated wall in a building.

[0043] For this purpose, the accessory portion 203b is provided on each of two parallel surface of the body 203a and includes a T-slot 22, first and second guide wings 231 and 232 positioned at opposite sides with reference to the T-slot 22 in which an end of an insulation member 65 is inserted between the first and second guide wings 231 and 232, and a third guide wing 233 positioned to be spaced apart from the second guide wing 232 and form an air layer with the second guide wing 232. The first guide wing 231 and the third guide wing 233 may be formed on outer edges such that an outer exterior material 61 or an interior material 63 of a building wall can be fixed thereto.

[0044] Now, descriptions will be made on a use state of the structural member 1 in which the outer body 20 with a core bar is formed in the guide pile type 203. As illustrated in FIG. 8, a plurality of structural members 1 are arranged at predetermined intervals using the T-slots 22, spacers 50, and fastening members 41, and an insulation material 65 is installed in a vertical arrangement space of the spacers 50. The insulation material 65 may be simply installed by inserting an end of the insulation material 65 between the first guide wing 231 and the second guide wing 232.

[0045] Thereafter, an exterior material 61 is installed using the first guide wings 231 in which an external panel 611 may be installed first and a waterproof sheet 612 and a tile unit 613 may be sequentially attached.

[0046] In addition, a gypsum board 631 and an interior panel 632 which are the interior materials 63 may be sequentially attached using the third guide wings 233.

[0047] In addition, an air layer 24 is formed between the second guide wings 232 and the third guide wings 233, thereby substantially improving heat insulation performance, and an auxiliary air layer corresponding to the thickness of the first guide wings 231 is formed to form dual air layers 241, thereby further improving the heat insulation performance. Thus, the thicknesses of the wall

and the insulation material 65 may be reduced.

[0048] In addition, as illustrated in FIGs. 5b, 6 and 7, the outer body 20 may be formed with at least one protrusion 211 and/or at least one rib, which extend in a longitudinal direction, on an inner wall of the insertion hole 21 into which the core bar 10 is inserted so as to allow the core bar 10 to be easily inserted and held.

[0049] When the core bar 10 is formed in a polygonal shape having corners on the cross-section thereof, as illustrated in FIGs. 6a and 6b, the protrusions 211 of the outer body 20 are formed to hold each corner portion of the core bar 10 in two directions and to form an adhesive introduction space 215 at each corner portion.

[0050] In addition, as illustrated in FIG. 9, the outer body 20 or the outer cover 20A may be fastened to the core bar 10 by one or more anchoring units 30.

[0051] The anchoring units 30 are fastened in order to prevent the outer body 20 from being released in a situation where the outer body 20 is pulled out when inter-connecting and assembling the structural members 1, and, for example, screws may be used as the anchoring units 30.

[0052] In addition, as illustrated in FIG. 10, the outer body 20 or the outer cover 20A is formed with at least one partition wall 27 that divides the internal space thereof.

[0053] When the outer body 20 or the outer cover 20A is formed with the partition wall 27, the strength of the structural member may be increased and core bars 10 may be inserted into only some of a plurality of insertion holes 21 (see FIG. 10b).

[0054] As illustrated in FIG. 11, a structural member 1A according to another exemplary embodiment of the present disclosure includes at least one elastic core bar 10 formed in a bar shape, and an outer cover 20A or a coating film 20B formed on the outer surface of the at least one core bar 10. The core bar 10 may be formed of at least one of wood such as bamboo strips or a composite bamboo bar 10A, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material, and the outer cover 20A or the coating film 20B may be formed of at least one of a metallic material such as aluminum, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material.

[0055] The outer cover 20A or the coating film 20B may be formed through any one of a method of passing the core bar 10 through a molten liquid of a predetermined material and curing the molten liquid, a coating method, a method of fusing a tubular covering material, and a wrapping method.

[0056] As illustrated in FIG. 12, a structural member 1B according to still another exemplary embodiment includes a center core bar 10C arranged centrally and positioned in the longitudinal direction, a plurality of bar-shaped core bars 10 which are elastic and are arranged around the center core bar 10C, and an outer body 20 or an outer cover 20A into which the center core bar 10C

and the plurality of core bars 10 are inserted. The center core bar 10C is formed of at least one of a metallic material, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material, and the core bars 10 is formed of at least one of wood such as bamboo strips or a composite bamboo bar 10A, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material, and the outer body 20 or the outer cover 20A is formed of at least one of a metallic material such as aluminum, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material.

[0057] The center core bar 10C is formed of, preferably, a metallic material having a high elastic strength, and is formed in, for example, a pipe shape or a bar shape having an optional cross-sectional shape and continuously extending in the longitudinal direction. When the center core bar 10C is provided, the strength of the structural member may be enhanced.

[0058] Hereinafter, descriptions will be made on acting effects of the structural members 1, 1A, and 1B according to the present disclosure.

[0059] A structural member according to the present disclosure is provided with an elastic core bar 10 positioned within an outer body 20, an outer cover 20A, or a coating film 20B (hereinafter, commonly referred to as an "outer body") which is generally formed of a metallic material such as aluminum or a synthetic resin material.

[0060] The core bar 10 that occupies a substantial portion of the configuration of the structural member may be formed using, for example, a bamboo material which is relatively inexpensive and light and has a higher tensile strength than steel material. Thus, it is possible to provide a structural member which provides has good mechanical strength, saves a metallic material which is an expensive resource, thereby considerably reducing the manufacturing costs, and has a reduced weight allowing it to be easily handled and managed, as compared with an existing structural member which is wholly formed of a metallic material.

[0061] In addition to the above described advantages, the structural member of the present disclosure may form a rigid curved framework using its flexural property.

[0062] FIG. 13 illustrates a flexed state of a structural member 1, 1A or 1B according to an exemplary embodiment of the present disclosure in which a composite bamboo bar 10A is employed as the core bar 10. As illustrated, when a linear specimen of the structural member 1, 1A, or 1B is flexed with reference to line B-B', a portion positioned farther away from the central point P in a direction B, the structural member should be more expanded and a portion positioned farther away from the central point P in a direction B', the structural member should be more contracted (see direction indicated by arrows). Thus, the flexural strength of the composite bamboo bar 10A is substantially increased compared to a case when the bamboo strips are individually separated from each other.

[0063] In addition, when a bending pressure is applied to the outer body 20 having the insertion hole 21 of which the perimeter is closed, the shape of the outer body 20 is deformed while the surface thereof is dented to reduce the inner space as much as possible. However, since the composite bamboo bar 10A is inserted therein, the flexural deformation is converted into a force pressing the composite bamboo bar 10A such that the composite bamboo bar 10A may prevent the flexural deformation of the outer body 20 and the elastic strength of the outer body may be improved.

[0064] As such, as the flexural deformation of the structural member 1, 1A or 1B is increased, the deformation of the outer body 20 is also increased. In proportion to the deformation of the outer body 20, the compressive force applied to the core bar 10 by the outer body 20 is increased and the compressive force increases the elastic strength of the structural member as a whole.

[0065] Accordingly, the structural member according to the present disclosure has high yield strength against a load pressure and is hardly deformed and damaged due to restoration elasticity against flexural deformation such that a structure employing the structural member can be rigidly retained. In addition, the structure member according to the present disclosure, which is substantially smaller in size and weight compared with a conventional steel truss structure, may be easily handled and managed.

[0066] Further, the strength of the structural member having a closed space corresponding to the insertion hole 21 according to the present disclosure is substantially increased as compared to those having a partially opened space, and a longer circumferential length is more advantageous.

[0067] When the outer body 20 is formed in the profile type 202 (see FIG. 6), the circumferential length of the closed space is substantially increased as compared with an existing profile structural member of the same standard, and the strength of the core bar 10 is added thereto, thereby further increasing the strength of the structural member.

[0068] For example, as compared with a 40 x 40 standard product corresponding to the example of the conventional aluminum profile 200 illustrated in FIG. 14, the structural member 1 of the present disclosure which is made according to the same standard as the conventional aluminum profile and includes an outer body 20 formed in the profile type 202 (see FIG. 6b) has a cross-sectional area of not more than 380 mm² while the compared object has a cross-sectional area of about 726 mm². As a result, the used metallic material is reduced by about half allowing the material costs to be significantly reduced. Further, since the circumferential length of the insertion hole 21 which is the closed space is larger than that of the closed space 210 of the prior art and the strength of the core bar 10 is additionally added, the strength of the structural member 1 according to the present disclosure is significantly high.

[0069] As described above, the structural member 1, 1A or 1B according to the present disclosure, which has good mechanical strength, elastic strength and durability and is economically feasible as compared with an existing structural member, enables rigid and easy construction of a curved building structure such as a dome-shaped structure or an arch-shaped structure as well as a linear building structure and may be applied to the various structures of the mechanical equipment field such as tents, hangers, or guardrails.

[0070] In addition, when the outer body 20 is formed in a guide pile type 203 (see FIGs. 7 and 8), with the help of guide wings 23, an exterior material 61 and an interior material 63 may be guided to be easily assembled, an air layer 24 is formed to improve heat insulation performance, and a pre-fabricated wall may be mounted while installing a power cable 81 or the like in the space of the air layer 24,

[0071] Such pre-fabricated walls may be mounted not only in a linear form, but also in a curved form.

[0072] When the frameworks of a curved building structure using the structural members 1, 1A or 1B may be formed and installed in an optionally curved shape by bending the structural members, the curved building structure is significantly simple in construction as compared to a truss structure, and no formwork is needed. Thus, construction efficiency can be enhanced. In addition, a relatively large load can be supported by the high flexural strength and residual restoration elasticity.

[0073] Further, since the core bar 10 formed of the composite bamboo bar 10A or the like enables insertion of insert nuts or direct fastening of screws, connection and assembly in the longitudinal direction can be easily performed without a separate tapping work.

[0074] Despite its excellent profitability as a natural material, bamboo has limits as a structural member due to difficulties in standardization, waterproofing, fireproofing, or the like. However, according to the present disclosure, bamboo material is processed as a composite bamboo bar 10A or the like and an outer body 20 or the like is used such that the bamboo material is used as a structural member that is standardized and is waterproof, fireproof, mothproof and the like. Thus, the present disclosure enables a metallic resource which generates a large amount of carbon gas in manufacturing and processing to be saved and, thus, may contribute to the protection of the global environment.

[0075] In the foregoing, exemplary embodiments of the present disclosure have been described with reference to the accompanying drawings. Here, terms or words used in the specification and claims shall not be interpreted to be limited to a conventional or dictionary meaning but interpreted as a meaning and concept corresponding to the technical idea of the present disclosure. Accordingly, the configurations described in the specification and illustrated in the drawings are merely exemplary embodiments of the present disclosure and do not represent all the technical ideas of the present disclosure.

Thus, it shall be understood that various equivalents and modified examples which may replace the technical ideas at the filing date of the present application exist.

5 Industrial Applicability

[0076] As described above, the present disclosure provides a structural member which has excellent mechanical strength and quality properties compared to an existing metallic structural member, significantly reduces manufacturing costs and enables easy construction of frameworks of various curved building structures such as a dome-shaped structure or an arch-shaped structure without using a truss structure or a formwork. Thus, the structural member according to the present disclosure is economically feasible and excellent in construction efficiency and may also contribute to the protection of the global environment. Consequently, the present disclosure is very excellent in industrial applicability.

Claims

1. A structural member comprising:

at least one elastic core bar formed in a bar shape; and
an outer body or an outer cover into which the at least one core bar is inserted,
wherein the core bar is formed of at least one of wood such as a bamboo strip or a composite bamboo bar, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material, and
wherein the outer body or the outer cover is formed of at least one of a metallic material such as aluminum, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material.

2. The structural member of claim 1, wherein the core bar is formed as a composite bamboo bar, and wherein the composite bamboo bar is formed by bonding a plurality of bamboo strips into a single body or pressure-molding bamboo which has been split and then crushed.

3. The structural member of claim 1, wherein the outer body or the outer cover is provided with an insertion hole into which the core bar is inserted to be supported, and is formed in a pipe type or a profile type having at least one T-slot.

4. The structural member of claim 1, wherein the outer body is formed in a guide pile type which includes a main body into which the core bar is inserted and an accessory portion provided on the main body, and wherein the accessory portion includes at least one

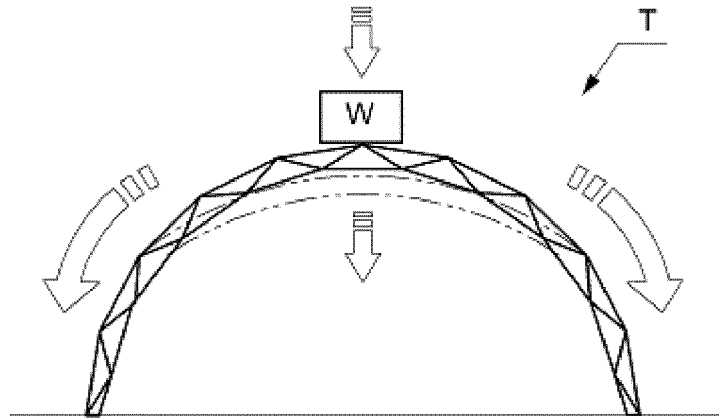
guide wing and/or at least one T-slot which are formed to continuously extend in a longitudinal direction on at least one outer surface of the main body.

5. The structural member of claim 4, wherein the accessory portion is provided on each of two parallel surfaces of the main body and includes a T-slot, first and second guide wings positioned at opposite sides with reference to the T-slot, an end of an insulation material being inserted between the first and second guide wings, and a third guide wing positioned to be spaced apart from the second guide wing and to form an air layer between the second guide wing and the third guide wing, and
wherein the first guide wing and the third guide wing are formed on outer edges such that an exterior material or an interior material of a building wall may be fixed thereto. 5
6. The structural member of claim 1, wherein the outer body is formed with at least one protrusion and/or at least one rib, which extend in a longitudinal direction, on an inner wall of the insertion hole into which the core bar is inserted to be supported so as to allow the core bar to be easily inserted and held. 10
7. The structural member of claim 1, wherein the outer body or outer cover is fastened to the core bar by at least one anchoring unit. 15
8. The structural member of claim 1, wherein the outer body or the outer cover is formed with at least one partition wall which divides an internal space. 20
9. A structural member comprising: 25

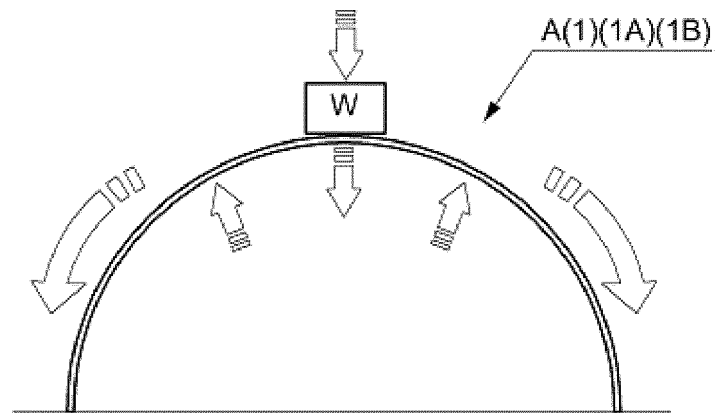
An elastic core bar formed in a bar shape; and
an outer cover or a coating film formed on an outer surface of the at least one core bar,
wherein the core bar is formed at least one of
wood such as a bamboo strip or a composite bamboo bar, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material, and
wherein the outer body or the outer cover is
formed of at least one of a metallic material such as aluminum, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material. 30
10. The structural member of claim 9, wherein the outer cover or the coating film is formed through any one of a method of passing the core bar through a molten liquid of a predetermined material and curing the molten liquid, a coating method, a method of fusing a tubular covering material, and a wrapping method. 35
11. A tubular structure comprising: 40

a center core bar arranged centrally and positioned in a longitudinal direction;
a plurality of core bars arranged around the center core bar and formed in an elastic bar shape; and
an outer body or an outer cover into which the center core bar and the plurality of core bars, wherein the center core is formed of at least one of a metallic material, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material,
wherein the plurality of core bars are formed of at least one of wood such as a bamboo strip or a composite bamboo bar, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material, and
wherein the outer body or the outer cover is formed of at least one of a metallic material such as aluminum, a synthetic resin material, a glass fiber composite material, and a carbon fiber composite material. 45

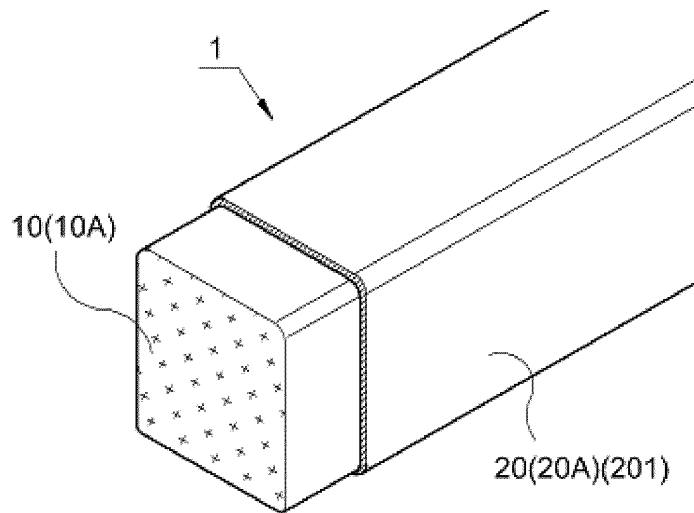
[Fig. 1]



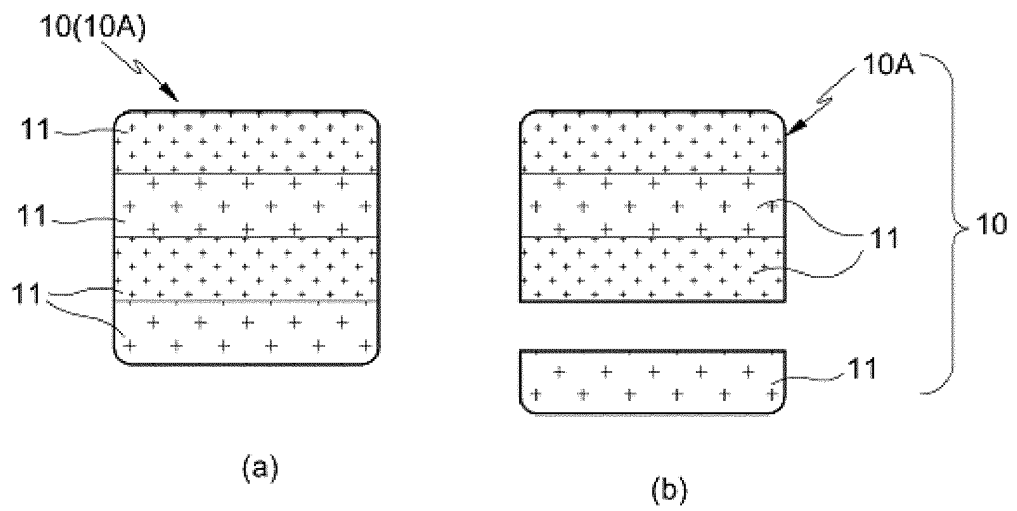
[Fig. 2]



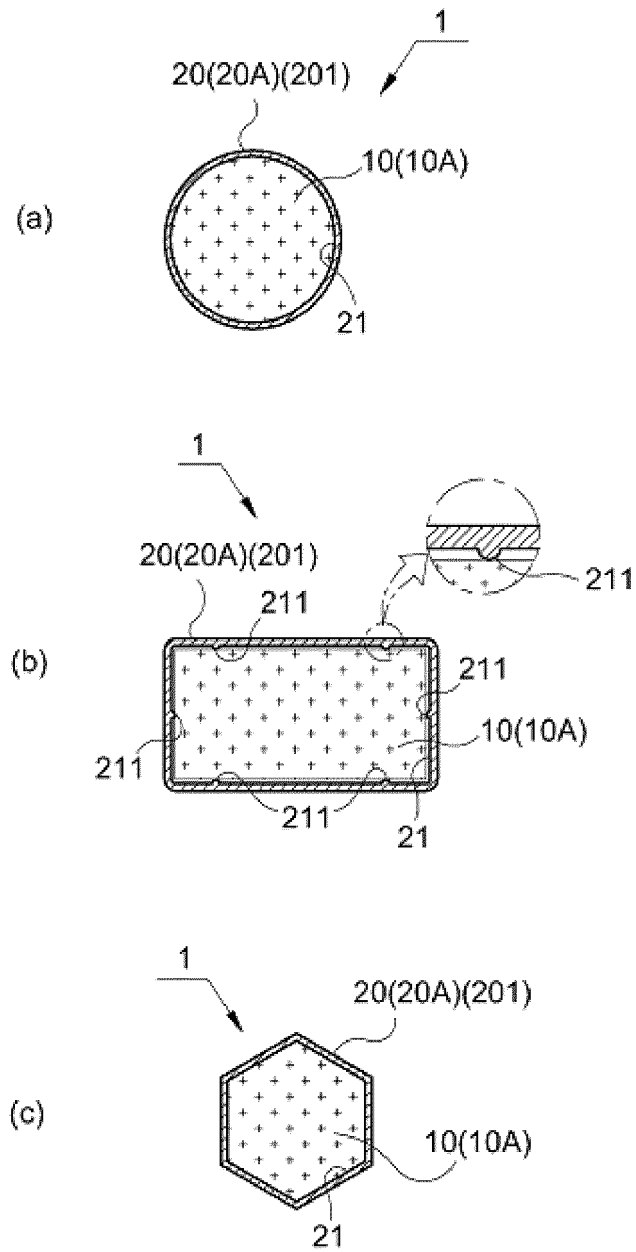
[Fig. 3]



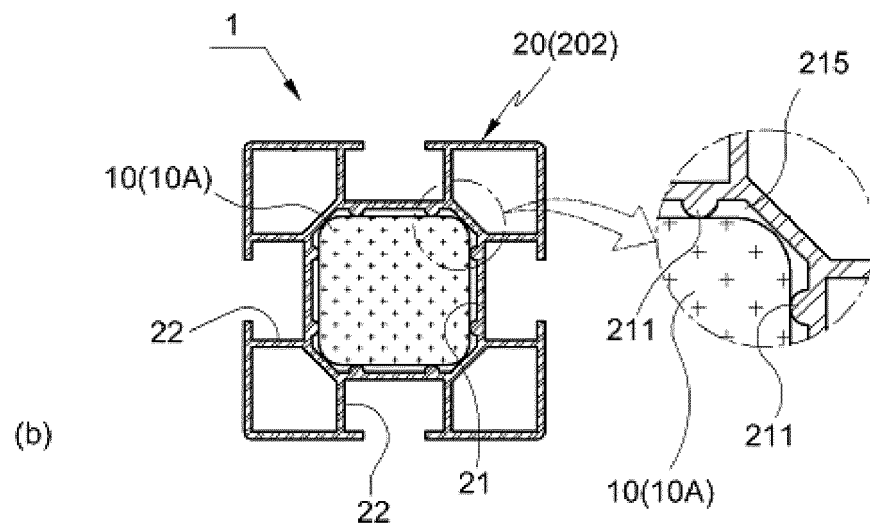
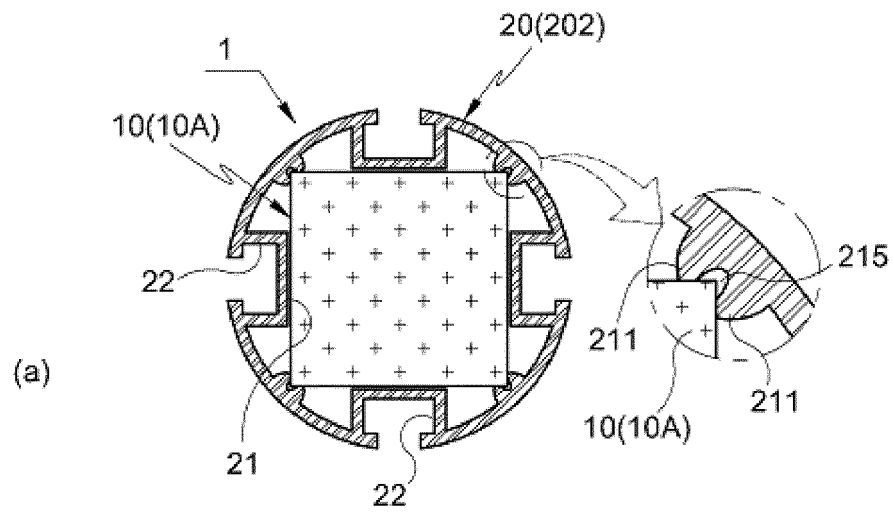
[Fig. 4]



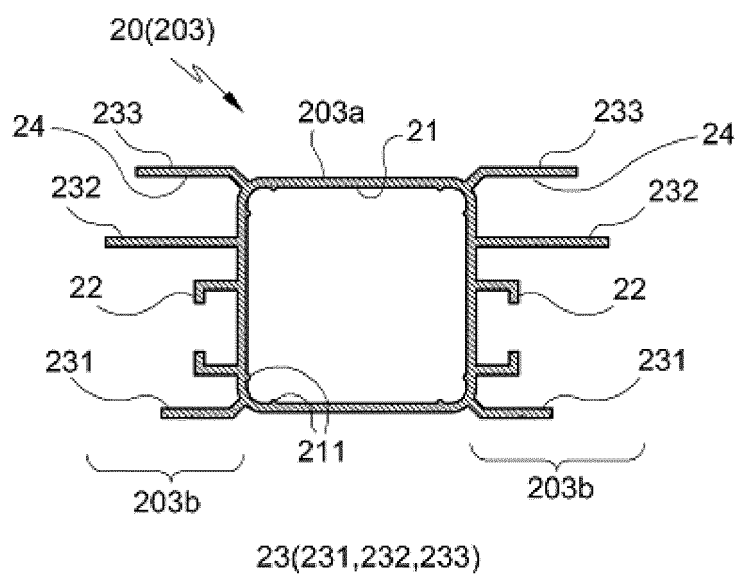
[Fig. 5]



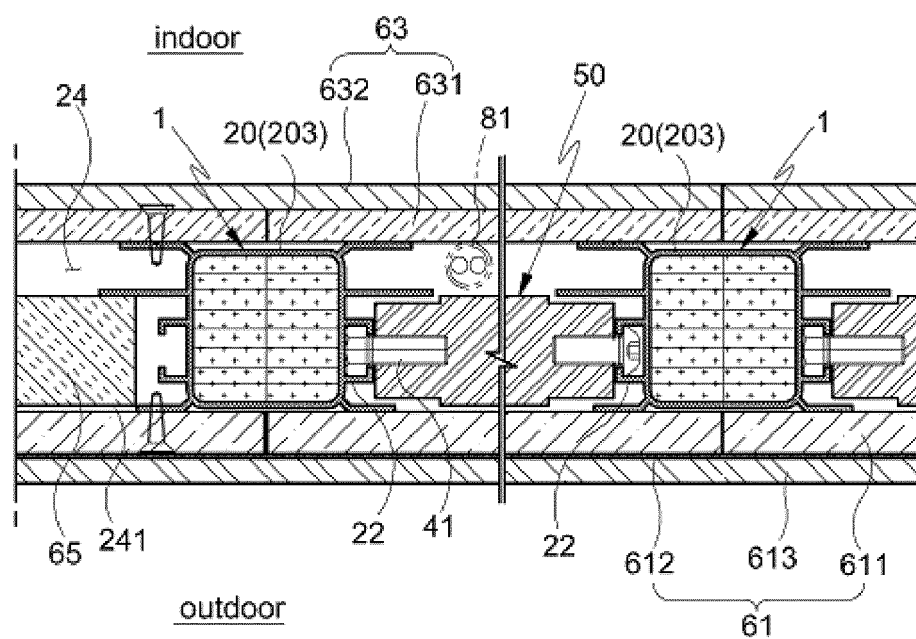
[Fig. 6]



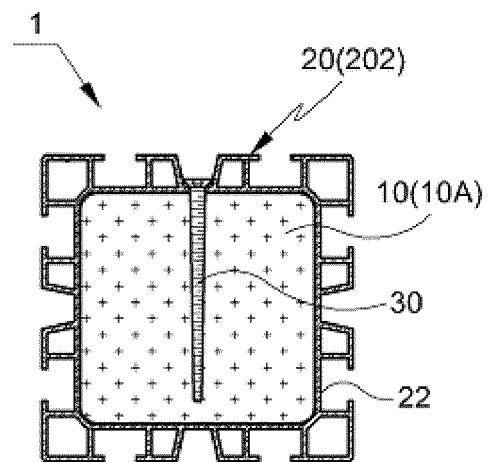
[Fig. 7]



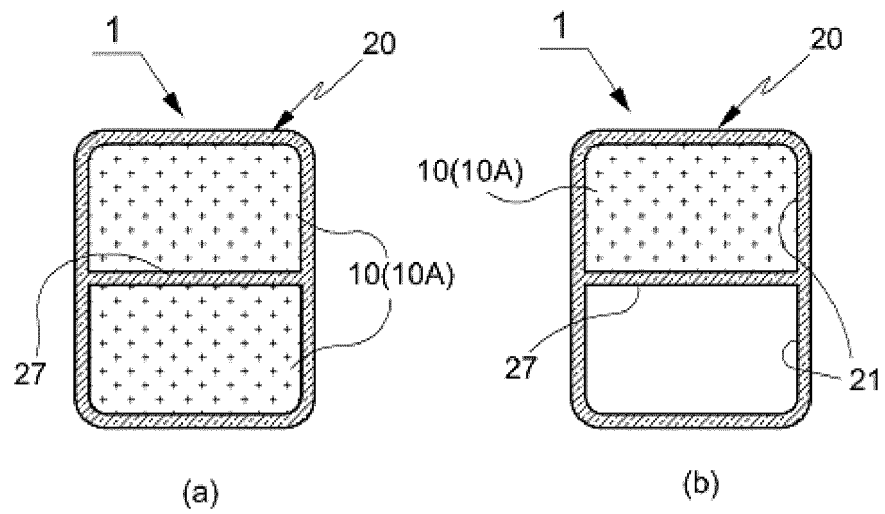
[Fig. 8]



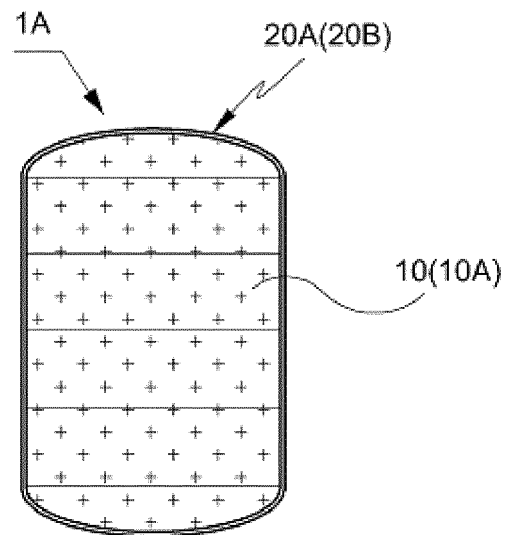
[Fig. 9]



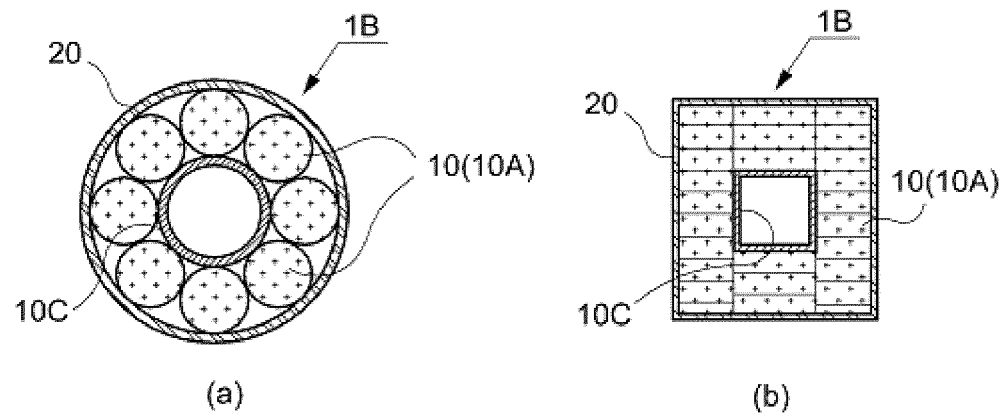
[Fig. 10]



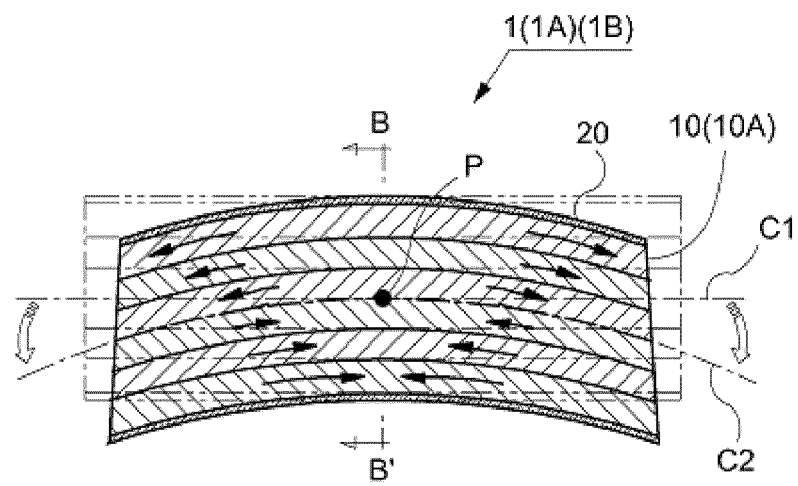
[Fig. 11]



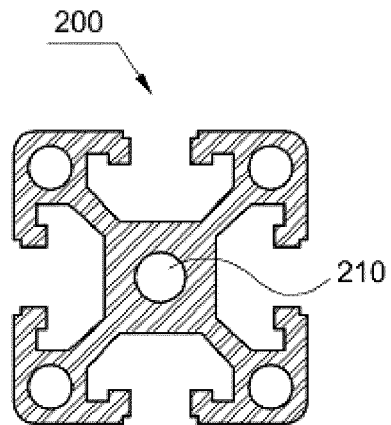
[Fig. 12]



[Fig. 13]



[Fig. 14]



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2012/009031

A. CLASSIFICATION OF SUBJECT MATTER

E04C 3/00(2006.01)i, E04B 1/18(2006.01)i, E04B 1/32(2006.01)i, E04B 7/08(2006.01)i

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)

E04C 3/00; B29C 67/14; B66B 7/12; B27J 1/00; B27K 5/00; E06B 9/01; E04C 3/29; E04C 3/292; A01K 63/00; E06B 5/11

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

Korean Utility models and applications for Utility models: IPC as above

Japanese Utility models and applications for Utility models: IPC as above

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

eKOMPASS (KIPO internal) & Keywords: structure, member, core, elasticity

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 05-176656 A (SUMITOMO RUBBER IND. LTD.) 20 July 1993 See abstract, claim 1 and figure 1.	1,9,11 2-8,10
Y A	JP 02938066 B1 (NAGAI YOSHIMASA et al.) 11 June 1999 See claim 1 and figure 1.	1 2-11
Y A	JP 03130275 U (MEGUMI CHEN) 28 February 2007 See abstract, claim 1 and figure 1.	9 1-8,10-11
Y A	KR 10-2009-0124841 A (HAN, JEONG HWA) 03 December 2009 See claim 1 and figure 1.	11 1-10
A	JP 10-325210 A (MITSUBOSHI:KK) 08 December 1998 See abstract, claim 1 and figure 1.	1-11
A	KR 10-2002-0068636 A (HUR, HEYNG MAN) 28 August 2002 See abstract, claim 1 and figure 1.	1-11

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

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"&" document member of the same patent family

Date of the actual completion of the international search

28 JANUARY 2013 (28.01.2013)

Date of mailing of the international search report

30 JANUARY 2013 (30.01.2013)

Name and mailing address of the ISA/KR


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INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2012/009031

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 10-205065 A (IWANO TOSHIO) 04 August 1998 See abstract, claim 1 and figure 1.	1-11

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2012/009031

Patent document cited in search report	Publication date	Patent family member	Publication date
JP 05-176656 A	11.06.1999	JP 2000-064503 A JP 2938066 B2	29.02.2000 23.08.1999
JP 02938066 B1	20.07.1993	NONE	
JP 03130275 U	27.12.1991	JP H031-30275-30275	27.12.1991
KR 10-2009-0124841 A	03.12.2009	NONE	
JP 10-325210 A	08.12.1998	NONE	
KR 10-2002-0068636 A	28.08.2002	NONE	
JP 10-205065 A	04.08.1998	JP 3252275 B2	04.02.2002