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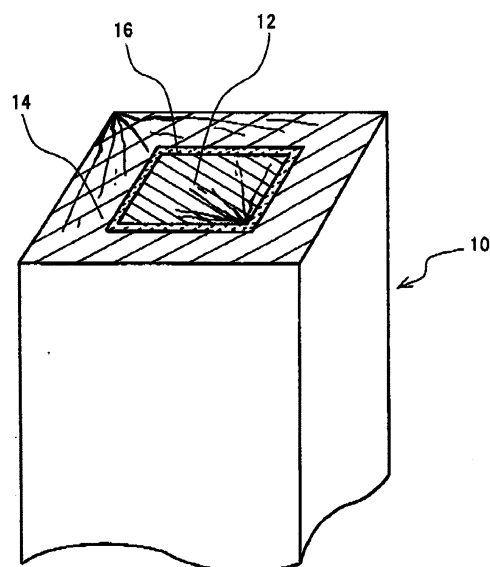
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(54) **WOODEN BUILDING MEMBER**

(57) A wooden building member includes an elongated structural portion having a rectangular cross section and capable of receiving load applied thereto, a coating portion coating an entire length of at least three sides of the cross section of the structural portion, and an insulating portion interposed therebetween in a laminated manner and prevents load from transmitting to the coating portion. Since load is received by the structural portion, structural strength designing is facilitated, and even if the coating portion is completely burned down, the structural portion coated with the insulating portion is not easily burned down. Thus, fireproof capability of the wooden building member can be improved. Further, since a surface of the wooden building member is coated with the coating portion, the insulating portion is not exposed to the exterior thereby improving its appearance.

FIG.1



Description

TECHNICAL FIELD

[0001] The present invention relates to an architectural technique for facilitating designing of a structural strength and for improving a fireproof capability while ensuring an attractive exterior appearance in wooden building members such as posts and beams which structure frameworks of a wooden building or architecture.

BACKGROUND ART

[0002] As disclosed in Japanese Laid-open (Kokai) Patent Application Publication No. H08-151683 (Patent Document 1), frameworks of wooden buildings or architectures are structured by suitably jointing wooden building members, such as posts and beams. The posts and the beams of the wooden building members are such important members that receive various loads, such as own weight of a building, and external forces applied due to deposited snow, wind and earthquake. In recent years, in addition to conventionally used solid materials, laminated lumbers which are obtained by laminating, in parallel, laminar materials (lumbers) having, by severing, a predetermined dimension, respectively, and bonding them with synthetic resin adhesive so as to be formed in one integral part, have been widely used in order to achieve non-defective and uniform wooden building members having high physical strength. Patent Document 1: Japanese Laid-open (Kokai) Patent Application Publication No. H08-151683

DISCLOSURE OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0003] When a fire breaks out in a wooden building, if important members such as posts and beams are burned down before the fire is extinguished, the building might collapse. At this process, the posts, the beams and the like are exposed to the blaze and carbonization from their surfaces to their insides progresses gradually. Structural resistances of the important members of the wooden building should be designed to secure the time from the fire breaking to evacuation, but since a rectangular cross section of the members which receives loads is gradually reduced by the carbonization, the time up to the collapse of the building is uncertain. Whereas the wooden building members are suitable for Japanese climates, their fireproof capability is inferior to that of armored or reinforced concrete and bricks.

[0004] Therefore, in view of such a conventional problem, it is an object of the present invention to provide a wooden building member in which a structural portion which receives a load applied thereto and a coating portion which coats the structural portion are arranged to be separated by interposing therebetween a layered insu-

lating portion which prevents the load applied to the structural portion from being transmitted to the coating portion, so that designing of a structural strength is facilitated and fireproof capability is improved while ensuring an attractive exterior appearance.

MEANS FOR SOLVING THE PROBLEMS

[0005] Therefore, a wooden building member according to the present invention includes: an elongated structural portion having a rectangular cross-section, and configured to receive a load applied thereto; a coating portion with which at least three sides of the cross section of the structural portion are coated over an entire length of the structural portion; and an insulating portion which is interposed between the structural portion and the coating portion in a laminated manner and prevents the load applied to the structural portion from being transmitted to the coating portion.

EFFECT OF THE INVENTION

[0006] According to the present invention, when a fire breaks out in a wooden building and the fire spreads from outsides of wooden building members, a coating portion is exposed to blaze, and carbonization gradually progresses from its outer periphery to its inward portion. When the entire coating portion is burned down for a certain time, an insulating portion in the inward portion appears. Since a structural portion is covered with the insulating portion, the structural portion is not exposed directly to blaze and the carbonization progresses very slowly, and thus the structural portion is not burned down in a short time. On the other hand, since the surfaces of the wooden building members are coated with the coating portion, the insulating portion is not exposed to the outside, and its exterior appearance can be ensured. For this reason, while the appearance of the wooden building members is improved, the fireproof capability can be improved. Since various loads applied to the wooden building are received mainly by the structural portion, the designing of the structural strength is facilitated while the fireproof capability is ensured, and further, even if the coating portion is completely burned down, the building does not collapse.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

FIG. 1 is a perspective view illustrating a post as a wooden building member according to the present invention;

FIG. 2 is a cross-sectional view of the post of the present invention, as illustrated in FIG. 1;

FIG. 3 is a perspective view illustrating a beam as a wooden building member according to the present invention;

FIG. 4 is a cross-sectional view of the beam of the present invention, as illustrated in Fig. 3;

FIG. 5 is an explanatory diagram illustrating conversion of timber for acquiring a laminar material from a round timber and the grain thereof;

FIG. 6 is an explanatory diagram illustrating an edge grain;

FIG. 7 is an explanatory diagram illustrating a flat grain; and

FIG. 8 is an explanatory diagram illustrating a coating portion in the post according to a preferred embodiment of the present invention.

EXPLANATION OF REFERENCE SYMBOLS

[0008]

- 10: Post
- 12: Structural portion
- 14: Coating portion
- 16: Insulating portion
- 20: Beam
- 22: Structural portion
- 24: Coating portion
- 26: Insulating portion

BEST MODE FOR CARRYING OUT THE INVENTION

[0009] The present invention will be described in detail below with reference to the accompanying drawings.

FIGS. 1 and 2 illustrate a wooden building member according to a first embodiment achieved by applying the present invention to a post which is made of a laminated lumber.

A post 10 whose member axis extends in a vertical direction comprises: an elongated structural portion 12 having a rectangular cross-section; and configured to receive a load applied thereto; a coating portion 14 with which a periphery of the cross-section of the structural portion 12 is coated over an entire length of the structural portion 12; and an insulating portion 16 which is interposed between the structural portion 12 and the coating portion 14 in a laminated manner and prevents the load applied to the structural portion 12 from transmitting to the coating portion 14.

[0010] The structural portion 12 is arranged to have any cross-sectional area depending on various loads applied to the post 10 and is made of a laminated lumber which is obtained by laminating laminar materials in parallel, which laminar materials are severed into a predetermined dimension, and bonding them with synthetic resin adhesive to form one integral part. The coating portion 14 has a predetermined thickness t in the cross section of the post 10 and, similarly to the structural portion 12, the coating portion 14 is made of a laminated lumber which is obtained by laminating laminar materials in parallel, which laminar materials are severed into a predetermined dimension, and bonding them with synthetic

resin adhesive so as to form one integral part. Preferably, the insulating portion 16 is composed of a noncombustible material or an incombustible material prescribed by the Building Codes in Japan. The term "the noncombustible material" includes a gypsum board with thickness of 9 mm or more (thickness of board base paper is 0.6 mm or less), a wood wool cement board with thickness of 15 mm or more, a hard wood chip cement board with thickness of 9 mm or more (bulk specific gravity is 0.9 or more), a wood chip cement board with thickness of 30 mm or more (bulk specific gravity is 0.5 or more), a pulp cement board with thickness of 6 mm or more, and the like. The term "the incombustible material" includes a incombustible laminated wood with thickness of 5.5 mm or more, a gypsum board with thickness of 7 mm or more (thickness of board base paper is 0.5 mm or less), and the like. When the gypsum board is used as the noncombustible material or the incombustible material, the insulating portion 16 can be achieved by using the inexpensive base material having high fire-retardant reliability which is widely used in a building or architecture. The insulating portion 16 is fixed or semi-fixed to a periphery of the structural portion 12 by a weak bonding system, concretely, nailing, synthetic resin adhesive or the like, so that various loads applied to the structural portion 12 are prevented from being transmitted.

[0011] A function of the post 10 will be described below. When a fire breaks out in a wooden building and the fire spreads from the outside of the post 10, the coating portion 14 is exposed to blaze and carbonization gradually progresses from its outer periphery to its inward portion. When the entire coating portion 14 is burned down for a certain amount of time, the insulating portion 16 positioned on an inner side of the coating portion 14 appears, and the progression of the carbonization is stopped. At this time, since the structural portion 12 is covered with the insulating portion 16 made of the noncombustible material or the incombustible material, it is not exposed directly to the blaze and the carbonization progresses very slowly, and thus the structural portion 12 is not burned down in a short time. On the other hand, since the surface of the post 10 is coated with the coating portion 14, the gypsum board is not exposed to the exterior, and thus appearance of the post 10 can be ensured. For this reason, while the exterior appearance of the post 10 is ensured, the fireproof capability can be improved. Since the loads applied to the wooden building are received mainly by the structural portion 12, the designing of the structural strength is facilitated while the fireproof capability is ensured and further, even if the coating portion 14 is entirely burned down, collapse of the building does not occur.

[0012] Preferably, the predetermined thickness t of the coating portion 14 is set according to a carbonizing speed of the base material (laminated lumber) so that it is not burned down at least for one hour from the beginning of firing. Concretely, since the carbonizing speed of the laminated lumber is about 0.8 mm/min, the predetermined thickness t may be set to 48.0 mm or more (0.8×60). In

this way, since it takes at least one hour for the coating portion 14 to be completely burned down, a possibility that the building collapses before fire extinction is greatly reduced, and the efficiency as "the fireproof construction" of Japanese building codes, which is very difficult to achieve with a wooden post, can be provided.

[0013] FIGS. 3 and 4 illustrate a wooden building member according to the second embodiment achieved by applying the present invention to a beam which is made of a laminated lumber.

Similarly to the post 10, a beam 20 whose member axis extends in a horizontal direction comprises: an elongated structural portion 22 having a rectangular cross section, and configured to receive loads applied thereto; a coating portion 24 with which three sides of the cross section of the structural portion 22 are coated along the entire length of the structural portion 22, and an insulating portion 26 which is interposed between the structural portion 22 and the coating portion 24 in a laminated manner and prevents the load applied to the structural portion 22 from transmitting to the coating portion 24. That is, the beam 20 has the constitution which is functionally similar to that of the post 10, but since one surface corresponding to one side of the cross section of the structural portion 22 should receive various loads, only both side surfaces and a lower surface each corresponding to the three sides of the cross section of the structural portion 22 are coated with the coating portion 24. At this time, since an upper surface of the structural portion 22 is bonded to, for example, a floor material 30 made of a noncombustible material or the like, and thus is not exposed directly to blaze at the time of a fire. Even if the coating portion 24 and the insulating portion 26 are not provided on the upper surface of the structural portion 22, the fireproof capability of the beam 20 is not adversely influenced. In the beam 20, in order to prevent the coating portion 24 and the insulating portion 26 from easily dropping out of the structural portion 22 due to a gravitational force, it is preferable that the structural portion 22, the coating portion 24 and the insulating portion 26 are made to be integral by using a conventionally known fastening member 28 composed of a bolt and a nut. Since the other parts of the constitution, function and effect are similar to those of the post 10, the description about the post 10 should be referred to.

[0014] In the embodiments, in order to improve the fireproof capability of the wooden building members, it is preferable that at least one of the structural portion and the coating portion is constituted by a noncombustible liquid-impregnated wood building material

Preferably, an aluminum foil is stuck to at least a joint appearing in an outer peripheral surface of the noncombustible material or the incombustible material that is connected by joining for composing the insulating portion. In this way, heat exerted on the joint of the noncombustible material or the incombustible material can be partially reflected, so that the carbonization of the structural portion can be further slowed. When an aluminum foil is stuck

to the entire outer peripheral surface of the noncombustible material or the incombustible material, heat acting on the outer peripheral surface can be partially reflected, so that the progression of the carbonization of the structural portion can be effectively repressed.

[0015] A general laminar material composing a laminated lumber is severed from a round log by conversion of timber as shown in FIG. 5. For this reason, when viewed from a direction A, the grain of the laminar material is "edge grain" as shown in FIG. 6, whereas when viewed from a direction B, the grain becomes "flat grain" as shown in FIG. 7. The directional fire resistance efficiency of the laminar material is verified. As the grain is denser, the carbonizing speed is slower, and thus the laminar material is preferably arranged so that the edge grain appears on the outer peripheral surface of the wooden building member.

[0016] When the post 10 is employed as the wooden building member, as shown in FIG. 8, the laminar material is arranged so that a long side of the cross section of the laminar material extends approximately perpendicularly to respective sides defining the cross section of the structural portion 12 and their extended lines, thereby constituting the coating portion 14. In this way, the edge grain appears on the outer peripheral surface of the post 10, and the fireproof capability can be more improved. At this time, in a portion C in the drawing, the flat grain appears on the outer peripheral surface of the post 10, but since that portion is not positioned in the approximately perpendicular direction with respect to the respective sides defining the cross section of the structural portion 12, no adverse influence directly acts on the fireproof capability of the post 10. Since the predetermined thickness t of the coating portion 14 is uniform over the entire periphery of the cross section thereof, the coating portion 14 can be constituted by suitably combining laminar materials having the same dimension, and thus this is advantageous in, view of the stock management, the cost and the like. Further, since the length of each of the sides forming the cross section of the laminar material is reduced, as many laminar materials as possible can be severed from one round log, thereby reducing the cost of the wooden building members.

[0017] Also when the beam 20 is employed as the wooden building member, by adapting the coating portion 24 similar to that of the post 10, the similar function and effect can be produced.

The structural portion and the coating portion composing the wooden building member may be constituted by a solid material or by combining a laminated lumber and a solid material. When a solid material is used for the coating portion, the predetermined thickness t of the coating portion may be set to 60.0 mm or more (1.0 x 60) because its carbonizing speed is about 1.0 mm/min.

[0018] The present invention can be applied not only to posts and beams as the wooden building members but also to braces, joists and the like.

Claims

1. A wooden building member comprising:

An elongated structural portion having a rectangular cross-section, and configured to receive a load applied thereto; 5

a coating portion with which at least three sides of the cross section of the structural portion are coated over an entire length of the structural portion; and 10

an insulating portion which is interposed between the structural portion and the coating portion in a laminated manner and prevents the load applied to the structural portion from transmitting to the coating portion. 15
2. The wooden building member according to claim 1, wherein the insulating portion comprises a noncombustible material or an incombustible material. 20
3. The wooden building member according to claim 2, wherein an aluminum foil is stuck to at least a joint appearing in an outer peripheral surface of the noncombustible material or the incombustible material. 25
4. The wooden building member according to claim 1, wherein at least one of the structural portion and the coating portion comprises a noncombustible liquid-impregnated building material. 30
5. The wooden building member according to claim 1, wherein the coating portion has a thickness thereof that is set according to a carbonizing speed of its base material thereby allowing the coat portion not to be burned down in at least an hour. 35
6. The wooden building member according to claim 1, wherein the coating portion is constituted in such a manner that laminar materials, each having a rectangular cross section are arranged so that one side of the cross section of the laminar material extends approximately perpendicularly to respective sides defining a cross section of the structural portion and their extended lines. 40 45
7. The wooden building member according to claim 6, wherein the laminar materials are arranged so that edge grain of each of the laminar materials appears as much as possible on an outer peripheral surface of the coating portion. 50

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FIG.1

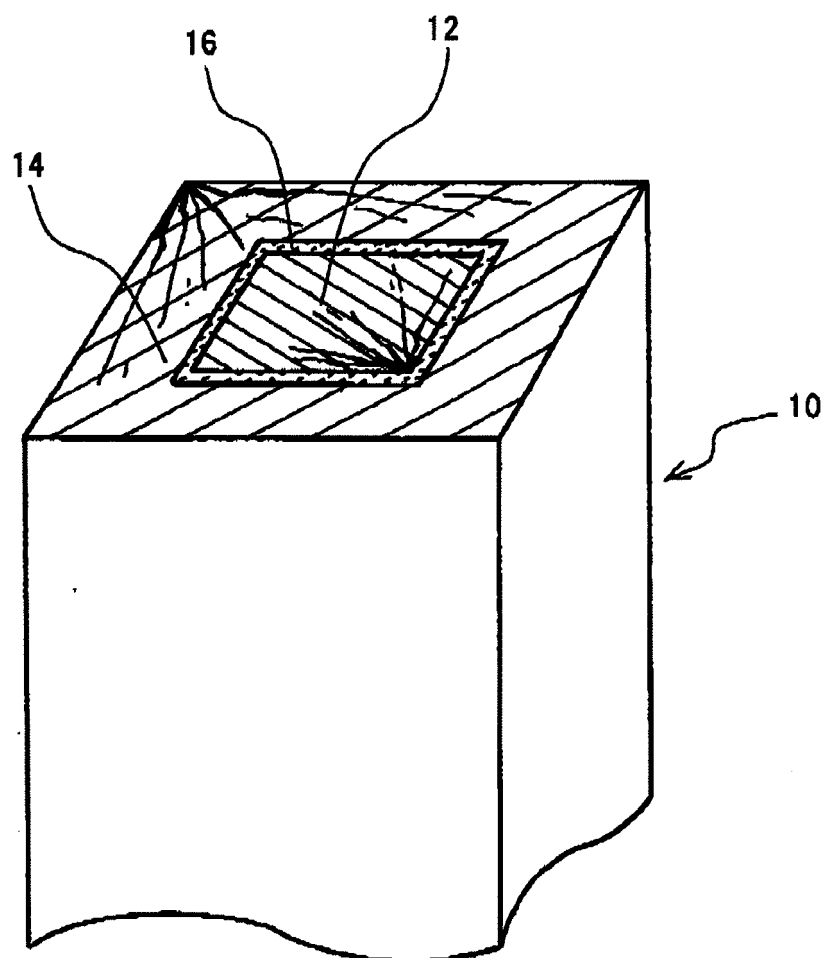


FIG.2

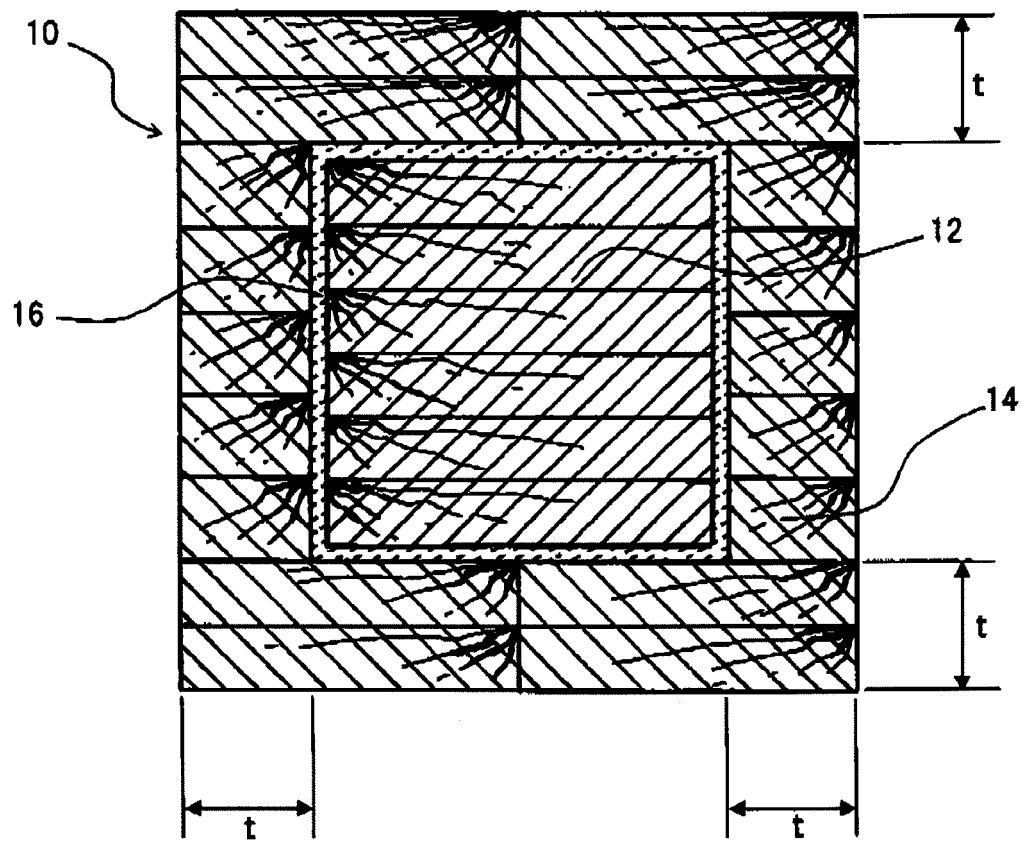


FIG.3

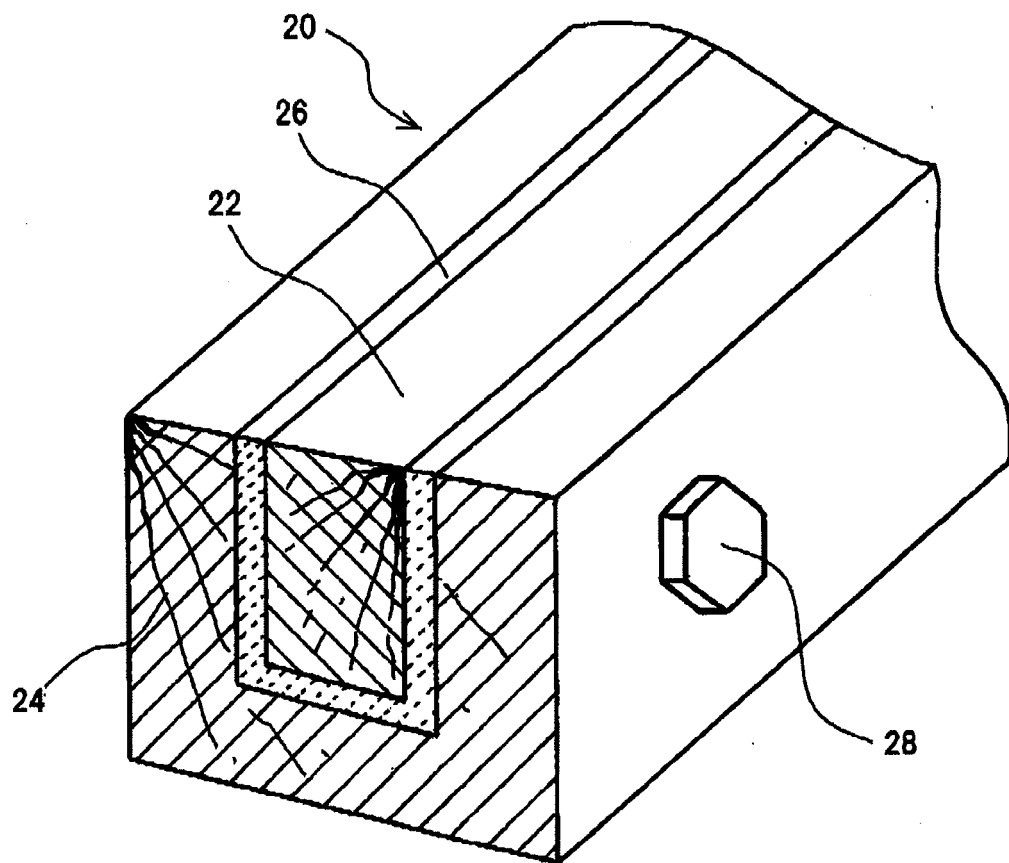


FIG.4

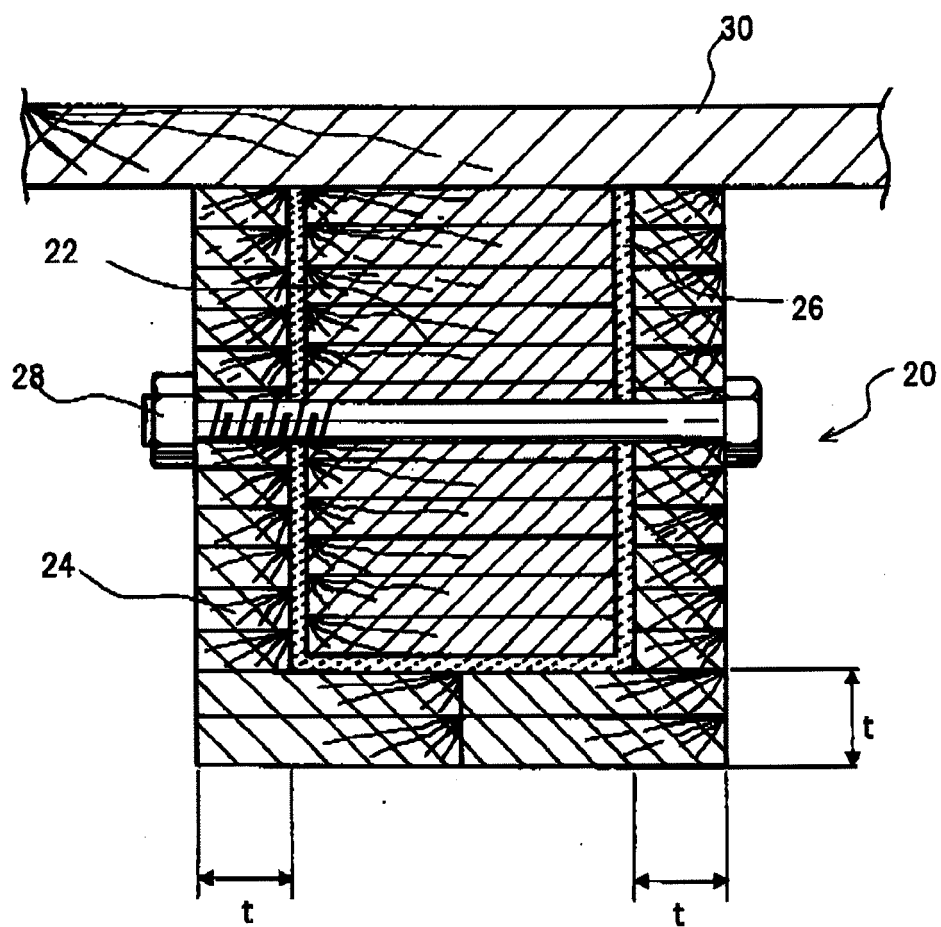


FIG.5

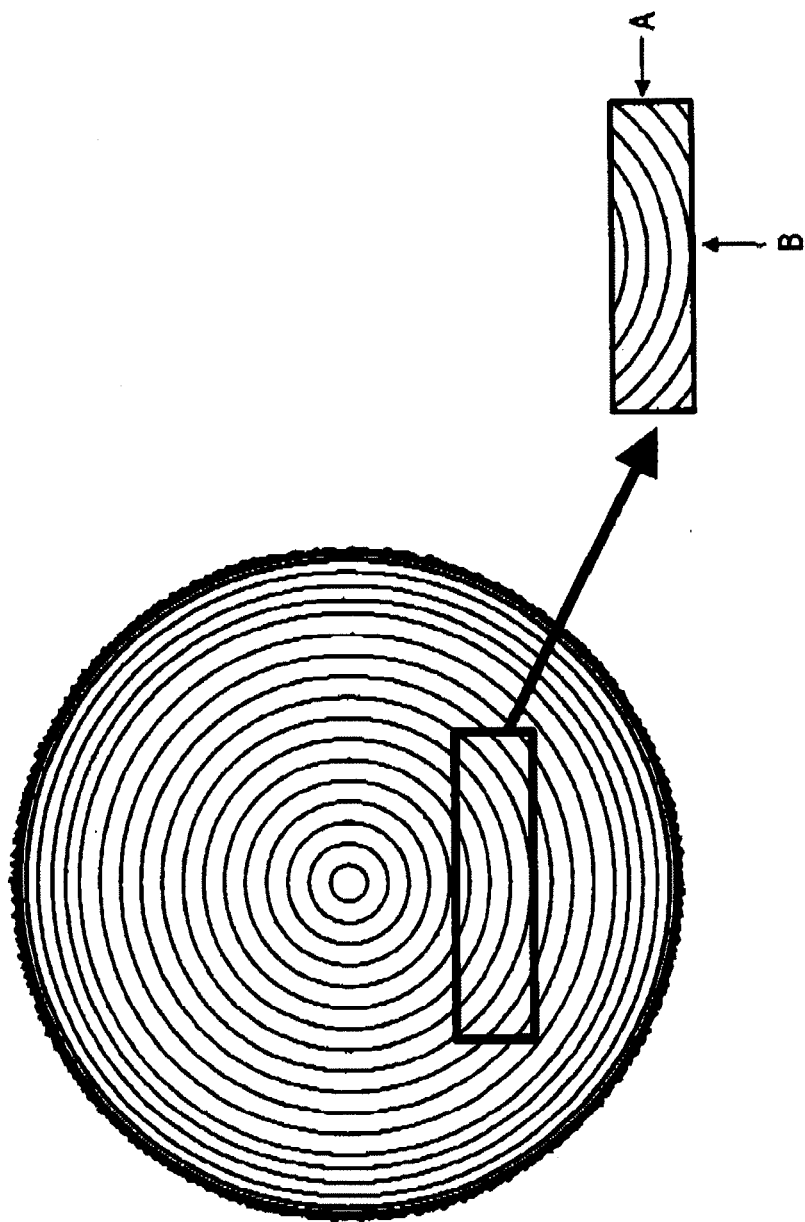


FIG.6

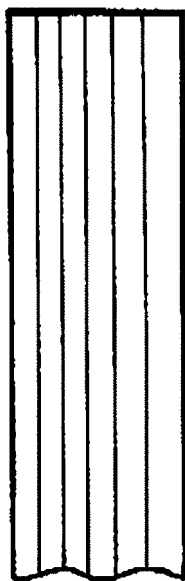


FIG.7

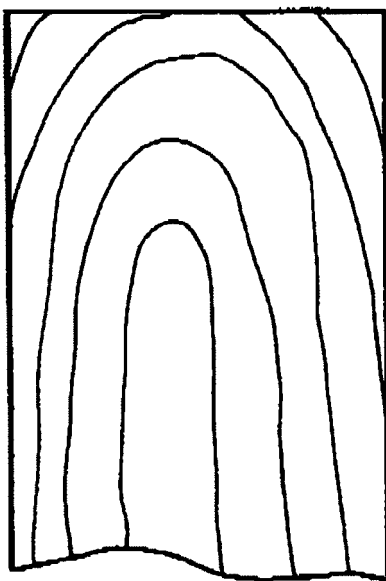
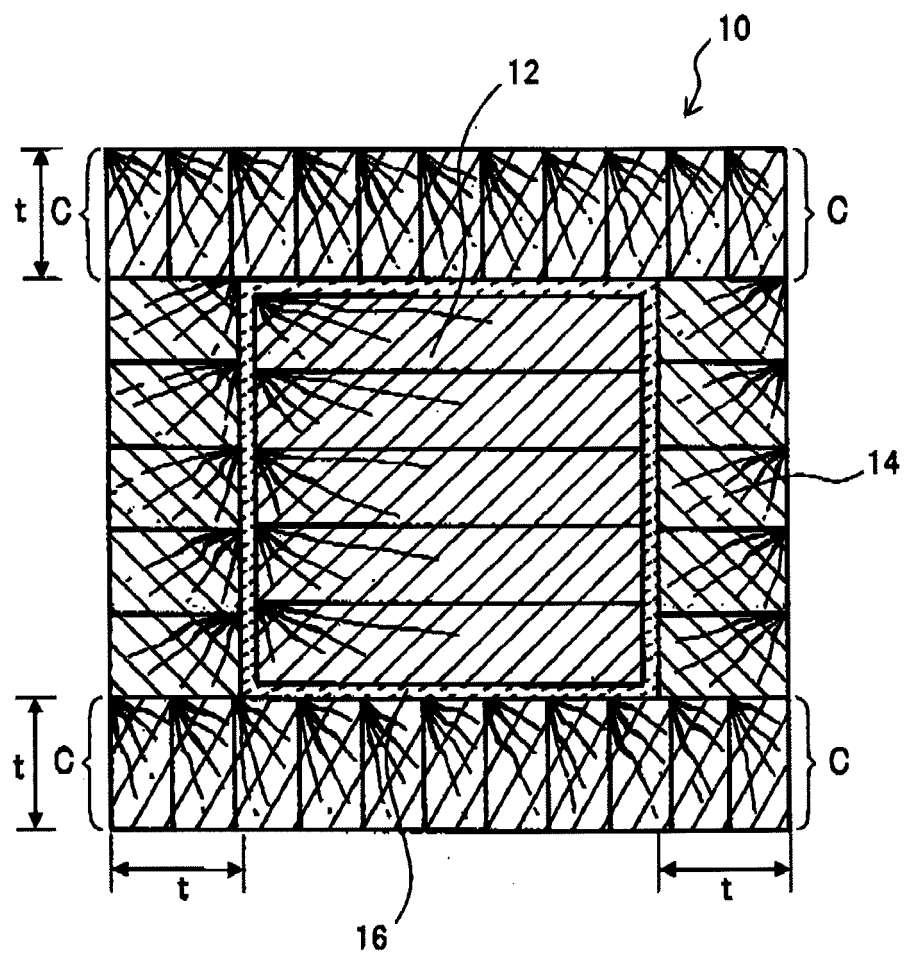


FIG.8



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/315625

A. CLASSIFICATION OF SUBJECT MATTER

E04B1/94(2006.01) i, E04C3/36(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)

E04B1/94, E04C3/36

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

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2006

Kokai Jitsuyo Shinan Koho 1971-2006 Toroku Jitsuyo Shinan Koho 1994-2006

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 Y	JP 2005-36456 A (Obayashi Corp., Takenaka Corp.), 10 February, 2005 (10.02.05), Par. Nos. [0011] to [0018]; Fig. 1 (Family: none)	1, 2, 5-7 3, 4
Y	JP 2004-263448 A (Japan 2x4 Home Builders Association), 24 September, 2004 (24.09.04), Par. No. [0016]; Fig. 1 (Family: none)	3

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

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Date of the actual completion of the international search
23 August, 2006 (23.08.06)Date of mailing of the international search report
05 September, 2006 (05.09.06)Name and mailing address of the ISA/
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/315625

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 97527/1987 (Laid-open No. 2907/1989) (Matsushita Electric Works, Ltd.), 10 January, 1989 (10.01.89), Description, page 5, lines 5 to 7 (Family: none)	4

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP H08151683 B [0002]