The present invention relates to a plateformed building element (1), intended for the construction of floor structures and/or walls and consists of wood or some other fibrous material with members (2) connecting inner and outer sides (5, 6) positioned at a mutual distance (A). Said connecting members are formed from plateformed lamellae (2), distributed essentially along the whole surface range of the intended building element. They extend incliningly and/or curved in zigzag patterns and are distributed along said building element (1) in pairs (2, 2) forming parallel channels (51) therein.
PLATEFORMED BUILDING ELEMENT COMPRISING ZIGZAG SHAPED LAMELLAE

[0001] The present invention relates to a plateformed building element for the construction of floor structures and/or walls and consisting of wood or other fibrous material with members connecting inner and outer sides positioned at a mutual distance, the connecting members formed from plateformed crossbar-forming lamellae distributed essentially along the whole surface range of the building element, extending at an inclination and/or curved into zigzag patterns and distributed along said formed building element and forming paired channels therein.

[0002] Plateformed building elements used in floor structures and wall systems in buildings are manufactured manually at the building site or prefabricated in a factory. Thereby, pairs of plates are separated at a mutual distance by crossbars.

[0003] Previously known building elements of said kind consist of lamellae, perpendicular to the surface layer of the building element, forming square or rectangular cells.

[0004] SE 3384704 and DE 1941368 disclose previously known building elements exhibiting stiffeners in the form of connections formed from plateformed lamellae extending in folds or waves.

[0005] Building elements with trusses are also known wherein said trusses are formed from inclined plates or metal rods. For instance, FR 2 793 827 A1 discloses trusses composed of angled plates, but this concerns only a beam thus formed and not whole plateformed building elements. Furthermore, WO 99/18304, EP 0 282 424 A1 and U.S. 4,475,328 A disclose trusses forming parallel spaced beams from zigzag-shaped spacing members. The construction of plateformed elements then takes place manually with a multitude of such beams, which, apart from the fact that the building element acquires limited strength, also may be time-consuming and labor-intensive.

[0006] However, nothing of the previously mentioned and known disclosures the occurrence of any plateformed building element comprising inclining and/or curved channel-forming lamellae attached to lateral crossbars through nails or screws whereby the anchoring joints are formed from U-shaped receptacles to which the crossbars can be joined.

[0007] Known embodiments comprise building elements formed from plates on opposite sides of inclined channel-forming lamellae, and which lamellae and plates are joined together by gluing.

[0008] The purpose of the present invention is therefore among other things to achieve an improved building element of the initially mentioned kind that allows reduction of the total cost for more efficient manufacturing in a factory as well as better utilization of the supporting capacity of the material, furthermore giving the building element a low tare weight.

[0009] Said purpose is achieved by way of a plateformed building element characterized mainly in that the lamellae forming the crossbars are attached to strips or beams extending perpendicularly to the lamellae through nails and screws, that the anchoring joint is formed from pairs of U-shaped receptacles for beams arranged inclined or inclinable at an angle towards each other, and that the crossbar-forming lamellae are received with their longitudinal edges in grooves of the receptacles.

[0010] The invention is described below in the form of a number of preferred embodiments, whereby reference is made to the enclosed drawings, in which

[0011] FIG. 1 shows a perspective view of a plateformed building element according to the invention seen from above at an angle,

[0012] FIG. 1A-1C show different embodiments of joints of building element parts,

[0013] FIG. 2 shows a second example of a building element,

[0014] FIG. 2A shows the internal joints of said second element,

[0015] FIG. 3 shows a third example of a building element,

[0016] FIG. 3A shows the internal joints of said third element,

[0017] FIG. 4 shows a fourth example of a building element,

[0018] FIG. 4A shows the internal joints of said fourth example,

[0019] FIG. 5 shows a fifth example of a building element,

[0020] FIG. 5A shows the internal joints of said fifth element,

[0021] FIG. 6 shows a sixth example of a building element according to the invention,

[0022] FIG. 6A-6C show joints for said sixth building element,

[0023] FIG. 7 shows a cross section of a further example of the jointing of the building element, and

[0024] FIG. 8 shows an example of building with the elements.

[0025] The advantage in using beams rather than plates on at least one side of the building element is that the building element is formed essentially only from the centrally situated lamellae arranged to extend at an angle with respect to each other and to be able, in connected mode, to receive essentially the total load of said building element.

[0026] According to the present invention, connection of the building element to lateral beams takes place through U-shaped angulated anchoring joints comprising pairs of U-shaped receptacles for angulated lamellae and for connection to angulated beams as shown, for example, in FIG. 6.

[0027] Also, the building element as defined in the new claim 1 cannot be considered obvious to a person skilled in the art based on what has been shown to be previously known through the two cited novelty referrals SE 384,708 and DE 1941368.

[0028] Thus, with support from what is mentioned above and in particular on account of the considerable defining
performed in the claims, it is hereby requested that the present patent application is approved on the basis of the new claims.

[0029] Advantages obtained through the invention include the following:

[0030] Main Idea of the Building System

[0031] The present wall and floor structure system has a technical level and thereby the right economical qualities. Through new products with new thinking, such as this building-frame intended to be supplemented by other working methods, wood will become more competitive and its value will be increased with great potential. According to calculation, the floor structure system has load bearing capacity at rupture limit conditions and dynamic stiffness towards oscillations at usage limit conditions, in both cases a good measure of overcapacity.

[0032] Inclining the beams and joining them at the upper and lower edges opens up great opportunity in the future for building structures of wood. The system demonstrates the incredible strength of wood in a co-operating cellular system.

[0033] floor structures of this tare weight receive a stiffness and load bearing capacity exceeding other floor structures

[0034] in this floor structure system the whole structure, from the lower to the upper edge, is utilized as load bearing properties

[0035] installations are easily performed along the upper and lower edges

[0036] sound does not easily penetrate the inclined beams

[0037] the same reasoning is valid for fire; if the floor structure system is well insulated the fire penetrates the beams only with difficulty

[0038] the floor structure systems are highly cost-effective

[0039] the possibility to improve the capacity of the floor structure systems increases by increasing the height of the zigzag pattern, which does not appreciably increase the tare weight. It is also possible to place crossbars closer together at the upper and lower edges, and to use plate material

[0040] the building elements are easily jointed in length and width

[0041] the building elements are to be manufactured in a width of 2.40 m and a length of 15 m as necessary. It may also be manufactured in other lengths.

[0042] the floor structure system may be used as roofing elements in which dormers can be placed directly on the roofing element, thereby allowing the whole attic space to be used as a storey

[0043] the height of the floor structure system is smaller than other floor structure systems due to the construction

[0044] the floor structure system is easy to assemble

[0045] the wall element is assembled standing in the full height of the building up to the crest without any reclining wood

[0046] the floor structure rests hanging against the bearing wall, anchored to the wall through work-holders

[0047] the building elements are easily insulated along the triangular channels through profiled insulation mounted in falling lengths

[0048] insulation is easily applied also in-between the crossbeams mounted perpendicularly to the triangular channels

[0049] the floor structure elements may be joined at the construction site in a fixture where the ceilings are mounted in an ergonomic fashion. The elements of the floor structure system are then hoisted into place

[0050] The wall elements may also be assembled, in full length and lying down, at the site and then hoisted into place

[0051] the building system, in parts or as a whole, may also be used for many other structures such as columns, sound shielding fences, ceiling elements in hall-type structures, staircases, elevator shafts etc.

[0052] General Description of the Building Element and its Use:

[0053] The manufacturing of the building elements is to be performed as standardized as possible, with a width of 1.20 m or 2.40 m, but the length may be varied due to the manufacturing method. The building elements can also be spliced in their longitudinal direction.

[0054] The proposed building element for this purpose according to the invention is characterized primarily in that the lamellae are mounted, for instance, at an inclined angle in the form of one or more sine curves absorbing the tensile and compressive forces with a zero in the center of the building elements. Thereby, the forces will co-operate with the outer shell in an efficient manner.

[0055] During construction of building elements, intended for floor structures and/or framed walls from wood or other fibrous materials, the core of the floor structure element or wall element is designed as a trigonometric shape so that the load bearing capacity increases exceptionally in co-operation with the design of the outer shell. The forces co-operate in the way of a sine curve. This is kept together through crossbars, boards or plate material, perpendicularly along the upper and lower edges. At the breaking points, the material is fixed together. It forms long triangular-shaped channels along the crossbars or beams along the lower as well as the upper edges.

[0056] These walls and floor structures are intended to be manufactured as elements in a factory in order to keep the manufacturing costs down. Setting up manufacturing lines involves high initial expenditures, but holds much in store for the future since the manufacturing costs can be kept low.

[0057] The characteristics of the wall and floor structure fulfill many demands. The strength of the elements in all directions is unique. A good tightness is obtained due to the connection of the crossbars and beams. There will be no thermal bridges, and the fireproofing is also good due to the tightness. Namely, a large amount of material has to be burning before the fire penetrates. Soundproofing is good since sound vibrations dissipate against the inclined surfaces.
In Floor Structures and Wall Systems

Instead of placing crossbars of the walls perpendicularly against the outer and inner faces of ground beams and ridge beams, the crossbars are now inclined or curving towards each other with connection in the short sides of the crossbars against the outer and inner edges of the wall. In this way a zigzag pattern is achieved in the wall system, endowing the wall with many good qualities such as the load bearing capacity, soundproofness, fireproofness, tightness, and very good stability in all directions.

The same applies for floor structures. Here, the beams (girder) are positioned inclining towards each other but are connected to each other at the upper end of the beams. This applies also for the lower ends. The connection can be through specially designed metal shoes. Plates, crossbars or boards functioning to keep the building element together may also be used.

The present invention relates to a cellularly divided trigonometric building element in which the cells are kept together along the upper and lower edges through plate material or similar.

More specifically, the invention concerns such a building element of the kind comprising a multitude of cells of similar appearance, next to and mounted towards each other through gluing or similar.

The inclined lamellae form a number of identical cells in the building element. A large number of different cellular systems exist, wherein their appearance depends upon the design of the lamellae. The pattern of the various cells form longitudinal channels in the longitudinal direction of the building element. Each of the different cellular systems has different properties, but it is the most cost efficient cellular system in relation to the most desirable properties that will decide the manufacturing system, which is to be as industrialized as possible. The material in the upper and lower edges of the building element may be different, for example, plate material, boards or crossbars made of wood or other fibrous material mounted with glue or in similar ways. Drawing irons may also be used at the lower edge of the elements in order to increase the load bearing capacity of the building elements. These drawing irons may be used to pull the building elements together into large continuous floor structures during assembly at the construction site.

Prefabricated building element of said kind are utilized above all as load-bearing floor structures and roof elements in the building of one-family houses, apartment buildings, economy buildings, and industrial premises etc. They can, however, also be utilized for other purposes, for instance, as bearing wall elements.

FURTHER SPECIFIED DESCRIPTION OF THE INVENTION

The invention is further described below with reference to the enclosed drawings, in which

FIG. 1 shows a perspective view of a plateformed cell-shaped building element 1 according to a first exemplifying embodiment of the invention with triangular inclined lamellae 2 connected for mounting along the upper edge 3 and the lower edge 4. On the upper face 5 of the building elements 1, materials of different kind are used, such as board plates 5, cross bars or iron struts. At the lower face 4 of the shown building element 1, tie-rods 6 or crossbars are mounted.

FIG. 1A-1C show enlarged end views describing the design of the lamellae during their mounting. All lamellae 2 are identical elements also during mounting between the elements and the design can be greatly varied. The objective is to attain a joint area as large as possible. Therefore, a number of varieties are chosen to be shown: 1A shows a dented embodiment, 1B shows a groove and tongue embodiment, and 1C shows a round stave embodiment. All embodiments are mounted with glue, screws, nails or similar.

FIG. 2 shows a perspective view of a plateformed cell forming building element 101 during a lateral assembly. The building elements are not completely joined in order to show that the tongue (the guide bar) 111 is mounted in a longitudinal groove 110 in a divided triangular crossbar 108 in each building element 101. The procedure forms a triangular crossbar of equal size when joining the building elements 101. The building element 101 is constructed from triangular lamellae 107, grooved 109 for mounting of inclined plateformed lamellae 102. Between the crossbars at the outer edges of the building element 101, the triangular crossbars 108 are provided with an extra groove 110 in order to receive an elongated tongue 111 during assembly of the building elements 101.

FIG. 3 shows a perspective view of another building element 201 according to an exemplifying embodiment of the invention. The embodiment is based upon a plate shaped to form a wave-shaped sine curve, and cells are thereby connected through an outer layer on the upper and lower faces of the building element. The upper face of the building element may be constructed from plate material 205, boards, crossbars or iron struts 206. The same applies to the lower face 204.

FIG. 3A shows a small part of the enlargement of the building elements 201 during connection. They are not completely joined in order to demonstrate that the tongue (the guide bar) 211 is mounted in a guide groove 209 and holding the elements 201, 201 together.

FIG. 4 shows a perspective view of a cell-shaped building element 301 according to an exemplifying embodiment of the invention with a geometrical construction forming a cellular system with lamellae. Said building element forms two wave-shaped sine curves that absorb compressive and tensile forces in the whole cellular system. The inclined cells 302, forming a regular octahedron, are efficient in this embodiment. Plate material 305, 306, boards, crossbars or iron struts are mounted in the upper and lower parts of the building element.
FIG. 4A shows an enlargement of two building elements during connection. The building elements are not completely joined in order to demonstrate that the tongue (guide bar) function is mounted in grooves in the lower and upper parts of the building element.

FIG. 5 shows a perspective view of a cell-shaped building element 401 according to an exemplifying embodiment of the invention with a geometrical construction forming a cellular system with circular lamellae. Said building element forms two wave-shaped sine curves that absorb compressive and tensile forces in the whole cellular system. The inclined arced lamellae 402, together with the surface layer 405; 406, form a strong building element that absorbs great loads. Plate material, boards, crossbars or iron struts are mounted in the upper and lower parts of the building element.

FIG. 4A shows an enlargement of two building elements during connection. The building elements are not completely joined in order to demonstrate that the tongue (guide bar) is mounted in grooves in the lower and upper parts of the building element. Insulation material I can be received in cavities 450 in said building element 401 as well as inside the cells 451.

FIG. 6 shows examples of a floor structure element 501 constructed from a multitude of elongated inclined plate-shaped lamellae 502. Attached perpendicular floor girders 505 and roof girders 506, respectively, are received above and below said lamellae 502. At the bottom of the floor structure, attachment can take place through tie rods (not shown) in order to absorb greater load.

Attachment of the floor girders 505 and the roof girders 506 may take place through attachment members 512, 513 in the form of U-shaped forming irons and angularly perpendicular anchor plates.

Further Specified Description of the Invention:

Thus, more specifically, the invention relates to a plateformed building element 1; 101, 201, 301, 401, 501, 601, intended for the construction of floor structures and/or walls. It consists of wood or other fibrous material with members 2; 102, 202, 302, 402, 502; 602; 102, 202, 302, 402, 502 connecting two inner and outer faces 5; 105, 205; 305, 405, 505, and 6; 106, 206; 306; 406; 506, respectively, positioned at a mutual distance A from each other.

The connecting members are formed from plate-shaped lamellae distributed essentially along the whole surface range of the building element, extending inclined and/or curved in zigzag patterns and distributed along said formed building element forming pairs of parallel channels 51; 151; 251; 351; 451; 551.

Said connecting members are attached to each other towards the inner face of the respective paired faces of the building element, which are preferably plateformed. Connections between the lamellae 2; 102, 202, 302, 402, 502 may be formed by interacting recesses 56, 55 and/or from ledge-shaped rods 57, 58 arranged to be received in groove-shaped notches 59, 60, 61, 62 in said crossbar-forming lamellae 2 as shown in FIG. 1A-1C.

Said regularly arranged lamellae 2; 102; 302; 402; 502 are attached to each other as well as to said paired surface plates. In the embodiment according to FIG. 2, the crossbar-forming lamellae 102 are received with their facing edges in grooves 109 at ledge-shaped connectors 107, 108. In the shown preferred embodiment, said connectors have a triangular cross section, and are attached through glue joints, screw or nail joints to adjacent connecting plates etc. 105; 106. For example, said grooves 109 are arranged to extend in pairs perpendicularly with respect to each other.

The building element 201 shown in FIG. 3 exhibits connective members 202 forming a wave-shaped longitudinal partition in the formed building element 201.

According to embodiments shown in FIGS. 4 and 5, the connective members 302; 402, arranged at the thereby formed building elements 301; 401, are groove-shaped when viewed along the surface extension of the building element and extend in parallel with respect to each other. In the attached mode, they form channels 351; 451 with a round or multihedral cross section.

The crossbar-forming lamellae are attached to the strips and/or beams that extend perpendicularly to said lamellae using glue, nails, or screws.

FIG. 6-6C show how such nail joints 512 are formed from paired U-shaped receptacles 512A, 512B for beams 505, 506 arranged positioned or adjustable at an angle with respect to each other through their receiving parts 512A, 512B. A swivel joint 513 in the shape of a bolt 513A and nut 513B may be arranged to join the two mutually adjustable beam receiving parts 512A, 512B. By turning one receiving part 512A, it is adjusted in height and angle with respect to the other receiving part 512B.

When the floor structure elements 602, 602 are assembled into a whole building element 601 such as floor structures and roof elements, it is possible to reinforce the element by strapping wires or strip iron 675 to the underlying wooden beams 606 with work-holders perpendicular to the inclined lamellae 602, 602 where the irons tensile force is utilized in the tensile moment of the building element. In order to prevent structure-borne sound, known and appropriate soundproofing material is mounted inside the inclined lamellae, preferably at adjoining ends at the respective U-shaped receptacles forming angulated fittings or attachment joints 612. Said receptacles are preferably attached through a bolt 677, screwed into fastened, internally threaded lateral attachment sleeves 678. In FIG. 7, the number 679 denotes the attachment part for the bolt 677 that can be received by a sleeve 680, extending through the same, and may consist of hard or elastic material.

Naturally, the invention is not limited to the embodiments described above and shown in the enclosed drawings. Modifications are possible, in particular concerning the character of the different parts or by the use of equivalent techniques, without deviating from the scope of protection of the invention such as defined in the claims.

1. Plateformed building element for the construction of floor structure and/or walls, and comprising wood or other fibrous material with members connecting inner and outer sides positioned at a mutual distance, the connecting members being formed from plateformed crossbar-forming lamellae distributed essentially along the whole surface range of the intended building element, extending at an inclination and/or curving in a zigzag pattern and distributed along said formed building element and forming pairs of
parallel channels therein, the crossbar-forming lamellae are attached through nails or screws to strips and/or beams extending perpendicularly to said lamellae, that the attachment joint is formed from pairs of U-shaped receiving parts for beams arranged-positioned or adjustable at an angle with respect to each other, and that the crossbar-forming lamellae are received with their longitudinal edges in grooves in the receiving parts.

2. The plateformed building element according to claim 1, wherein the connecting members are attached to one another towards the inner faces of the respective paired, plateformed surfaces of the building element.

3. The plateformed building element according to claim 2, further comprising joints formed from recesses and/or from ledge-shaped rods arranged to be received in groove-shaped notches in said crossbar-forming lamellae.

4. The plateformed building element according to claim 2, wherein the crossbar-forming lamellae are connected to each other as well as to the surface plates.

5. The plateformed building element according to claim 1, that further comprising connectors said connectors exhibit triangular shape and with grooves extending perpendicularly with respect to each other.

6. The plateformed building element according to claim 1, wherein the connecting members are formed from a wave-shaped partition in the formed building element.

7. The plateformed building element according to claim 1, wherein the connecting members are formed from a wave-shaped partition in the formed building element, and that the connecting members form circular or polyhedral channels in the attached mode.

8. The plateformed building element according to claim 3, wherein the crossbar-forming lamellae are connected to each other as well as to the surface plates.

9. The plateformed building element according to claim 2, wherein the connecting members are formed from a wave-shaped partition in the formed building element.

10. The plateformed building element according to claim 3, wherein the connecting members are formed from a wave-shaped partition in the formed building element.

11. The plateformed building element according to claim 4, wherein the connecting members are formed from a wave-shaped partition in the formed building element.

12. The plateformed building element according to claim 5, wherein the connecting members are formed from a wave-shaped partition in the formed building element.

13. The plateformed building element according to claim 8, wherein the connecting members are formed from a wave-shaped partition in the formed building element.

14. The plateformed building element according to claim 2, wherein the connecting members are groove-shaped when viewed along the surface plane of the building element, and that the connecting members form circular or polyhedral channels in the attached mode.

15. The plateformed building element according to claim 3, wherein the connecting members are groove-shaped when viewed along the surface plane of the building element, and that the connecting members form circular or polyhedral channels in the attached mode.

16. The plateformed building element according to claim 4, wherein the connecting members are groove-shaped when viewed along the surface plane of the building element, and that the connecting members form circular or polyhedral channels in the attached mode.

17. The plateformed building element according to claim 5, wherein the connecting members are groove-shaped when viewed along the surface plane of the building element, and that the connecting members form circular or polyhedral channels in the attached mode.

18. The plateformed building element according to claim 8, wherein the connecting members are groove-shaped when viewed along the surface plane of the building element, and that the connecting members form circular or polyhedral channels in the attached mode.

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