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A. MORTENSEN

3,552,079

LAMINATED TONGUE AND GROOVE BUILDING ELEMENT

Filed Oct. 14, 1968

2 Sheets-Sheet 1

Fig. 1

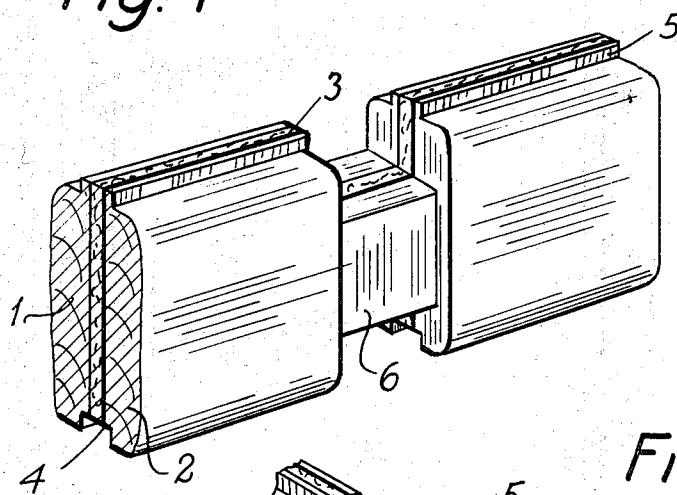
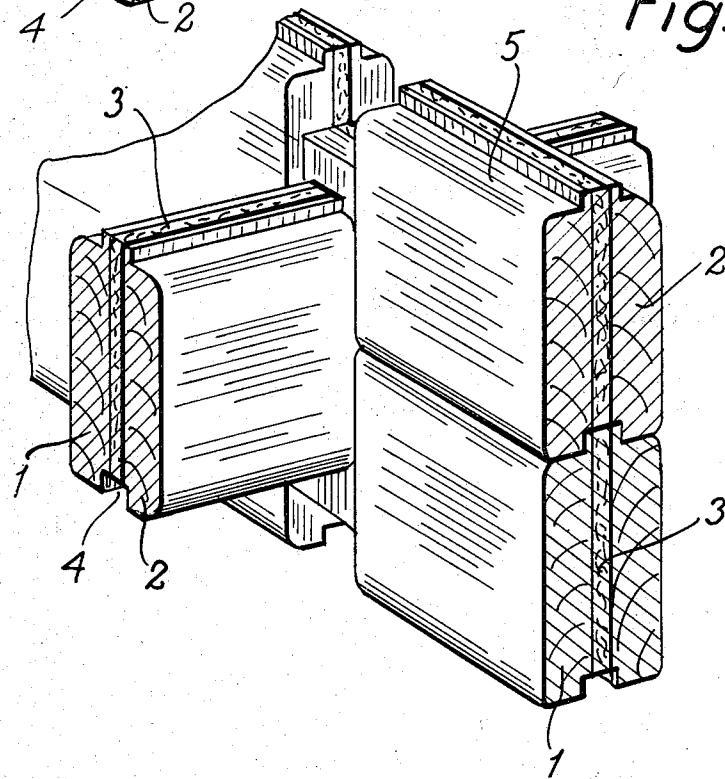


Fig. 2



INVENTOR.

AAGE MORTENSEN

BY

Mason, Fenwick & Lawrence

ATTORNEYS

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A. MORTENSEN

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Fig. 3

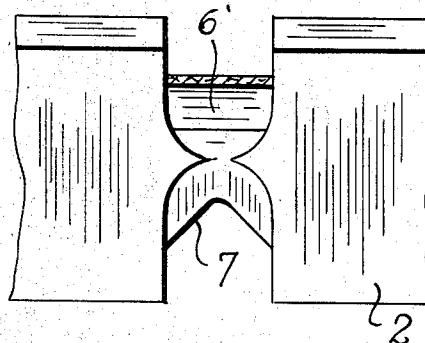


Fig. 4

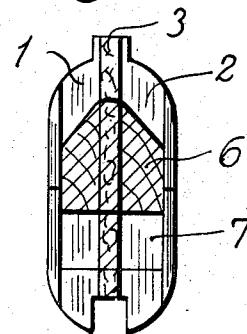


Fig. 5

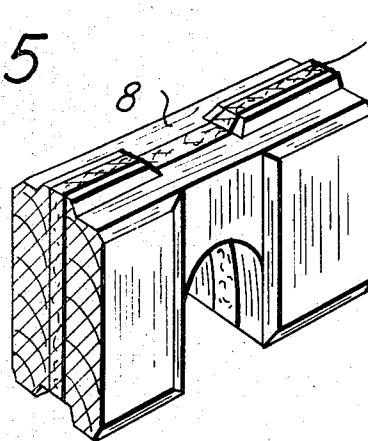


Fig. 6

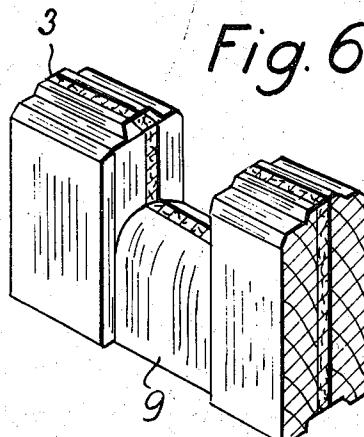


Fig. 7

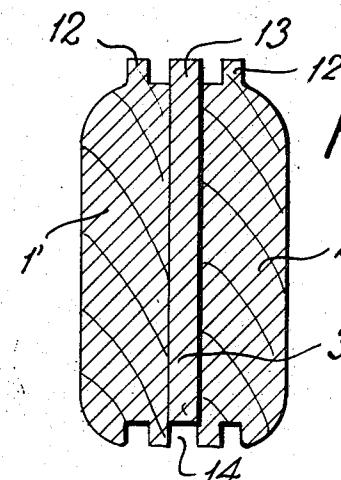
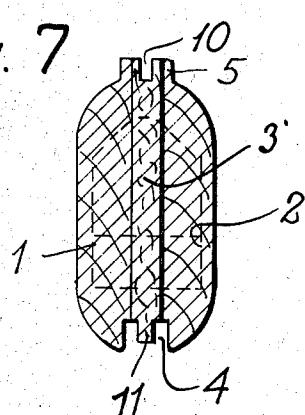


Fig. 8

INVENTOR.

AAGE MORTENSEN

BY

Mason, Fenwick & Hawtree

ATTORNEYS

**1****3,552,079****LAMINATED TONGUE AND GROOVE  
BUILDING ELEMENT**

**Aage Mortensen, Hvidovre, Denmark, assignor to A/S  
V. Jeppesens Savvaerk, Soborg, Denmark**  
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5 5,323/67; Sweden, Nov. 8, 1967, 15,304/67  
Int. Cl. E04b 1/10; E04c 1/10, 2/24

**U.S. Cl. 52—593****4 Claims****ABSTRACT OF THE DISCLOSURE**

A building element comprising a panel-shaped insulating material extending between two timber half-beams, the whole element being formed as a beam with one or more tongues and grooves and with the insulating material extending in the full height of the beam from the bottom of a groove or a surface between two tongues to the opposite edge of the beam, and an angle joint between two walls made of building elements having notches round a neck section for mutual connection of the elements.

**BACKGROUND OF THE INVENTION****Field of the invention**

The invention concerns a building element incorporating a built-in insulating material.

**Description of the prior art**

Use is made in a number of forms of construction of laminated panels or sheets which incorporate a layer of insulating material but these panels are normally used only in houses erected by means of a rigid framework of columns on which the panels are fastened. In the case of timber houses and many other forms of houses the walls are usually insulated by placing panel insulation inside the wall proper and at some distance from it. This method is rather inconvenient and time-consuming, and in the case of log-houses the method conceals the inner surface of the log wall, which is undesirable both from the point of view of appearance and because the internal wall and insulating material subsequently require considerable maintenance in the form of paint and paper. An open timber wall on the other hand requires almost no maintenance once it has been given a coat of preserving fluid, varnish or other substance. To avoid having to conceal the timber construction and thus retain the characteristic log-house effect, architects have (with a view to making allowances for the climate and the fact that such houses are frequently used as summer and year-round accommodation) in the past employed such thick lengths of timber that the houses—although not insulated—are pleasant to live in. The use of such heavy timber at the current high cost of this material means however that the houses become relatively expensive, and the expense of heating houses of this type becomes quite considerable if houses, as is the practice increasingly, are employed not only as week-end accommodation in summer but also as leisure-time houses for year-round use.

Another problem connected with the insulation of log-

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houses constructed of horizontal beams is that the walls, which are built of logs joined longitudinally by a system of tongue and groove with notches for corner joints but without a rigid framework, will sink for some time after the building has been erected. This sinking results from the dehydration of the timber and will continue for 1-2 years. A wall which is two meters high will sink approx. 5 cm. If a log-house of the above-mentioned type is to be insulated, a system must be employed in which laths are fastened to each individual beam or log in order that the shrinking of the timber in each beam will not combine to produce a massive shrinking of the whole wall, but will remain distributed throughout the individual beam. The insulating material in this case is located between the laths. This method is expensive and difficult since it requires the extra lath structure, and there is a danger that leaks occur in the tongue-and-groove joints or in the corner joints. If the lath construction is to be avoided, there is by known methods only the alternative to wait 1-2 years before fitting the insulation material until the timber has dried and the sinking of the walls is concluded.

**SUMMARY OF THE INVENTION**

The object of the invention is to permit a quick and simple erection of well-insulated log-houses without requiring a rigid framework, and in such a manner that the characteristic construction of the said houses is retained, the beams or logs being visible from both sides of the wall, and the further object is to permit the construction of such houses in such a manner that they will in practice prove no more expensive than non-insulated log-houses of the same type.

An essential feature of the building element according to the invention, is that it comprises a timber beam with at least one tongue and groove, and that the insulating material is panel shaped and extends the full length of the beam, at least from the bottom of a groove or the surface between two tongues to the opposite edge of the beam.

One advantage of employing building elements in the form of beams with inlaid insulating material is that, simply by hammering the beams together, the builder can erect an insulated, sealed wall quickly. And since the timber material in the middle of the beams is replaced by the cheaper insulating material, a saving of timber is effected to the extent that the beams, in spite of the extra work involved, can be manufactured at more or less the same price as an ordinary timber beam of the same dimensions.

In one embodiment of the invention, the insulating material is an expanded foam plastic material with considerable compressive strength and can be glued together with the two, for the most part symmetrical, halves of the timber beam. This provides a beam well insulated against heat and damp, which on account of the symmetrical structure can absorb a considerable vertical load. The plastic foam material does not shrink when the timber dries, i.e. even if timber in the log wall, constructed of horizontal building elements as in the invention, shrinks in drying, there is no risk that the tongue-groove joints or corner joints will leak. In addition the plastic foam material prevents water from penetrating the wall, which counteracts a reduction in the insulation properties of the

timber itself, and at the same time restricts the damaging effects that might otherwise arise from rot.

A preferred form of execution of the building element described in the invention is peculiar in that it has at least two tongues, formed by the insulating material having a longitudinal groove between the tongues of the surrounding timber beam, and by the insulating material on the opposite edge of the beam forming a projecting tongue between the walls of the groove formed by the surrounding components of the timber beam. This provides a tight joint between the layers of insulation in the individual beams, the insulation forming a continuous panel extending the full height of the wall.

A form of execution of the building element described in the invention with one or more layers of insulating material is peculiar in that the element incorporates a tongue of timber running parallel to one or more tongues containing insulating material, the timber tongue being a permanent structural whole with the timber of the beam; corresponding grooves are cut in the opposite edge of the beam. This provides an insulated wall of great strength.

An angle joint between two walls in a log-house built up of alternately crossing beams, each with a notch round the neck of the beam so that each beam in one wall fits over the neck of a beam in the crossing wall, is according to the invention peculiar in that the layers of insulation in each beam extend at least all the way up to the upper and lower face of each neck section, and that the layers have such longitudinal dimensions as to subject them to strong compressive force in a transverse direction when the beams are hammered together in an angle joint. This ensures not only fine insulating properties but also completely sealed corner joints, which are equally important.

A particularly tight angle joint caused by a relatively light compression of the insulating materials in the neck sections of the beams and a pressure of the insulating material against the transverse timber surface can, in accordance with the invention, be obtained by providing the beams with notches which in cross section at the neck section are roof-shaped or arched at the top and corresponding shaped or arched on the underside, the insulating material projecting slightly from the profits of the timber notch.

#### BRIEF DESCRIPTION OF THE DRAWING

The invention is described below with reference to the accompanying drawings where:

FIG. 1 shows a beam-shaped building element executed in accordance with the invention,

FIG. 2 shows an angle joint made by building elements as illustrated in FIG. 1,

FIGS. 3 and 4 show side and sectional views of the neck section of another form of execution of the building element in accordance with the invention, for ensuring an even tighter joint than that illustrated in FIG. 2,

FIGS. 5 and 6 show portions of two beams with two different types of neck sections which, when the beams are hammered together in an angle joint, ensure that they form a flush lap joint, and

FIGS. 7 and 8 show a cross section through another two forms of executions of the building element in accordance with the invention.

The building elements shown in FIGS. 1 and 2 are in the shape of beams with two symmetrical half-beam layers of timber 1 and 2, separated by an insulating layer 3 of expanded plastic foam 3 to which they are glued. Layer 3 extends the full height of the beam from the bottom of a groove 4 to the upper side of a tongue 5 whose upright sides of wood form a part of each of the half-beams 1 and 2. Near each or at places where the beams are to be assembled with beams in a transverse wall there is a neck section 6, and the layer of insulation 3 also extends to the upper and lower faces of this neck section, ensuring that the walls are completely insulating without cold gaps at the corners and the insulating material helping to seal

the corner joints when the beams are hammered together as illustrated in FIG. 2.

The beams illustrated in FIGS. 3 and 4 are similarly constructed of two halves 1 and 2, but have a familiar form of ridge-roof-shaped section 6, which works in conjunctions with a corresponding roof-shaped, transverse notch 7 in a crossing beam, ensuring increased seal properties. The insulating layer 3 between the halves can be easily compressed at the top of the roof-shaped neck section 6, being pressed into notch 7 and helping to increase the seal properties.

FIGS. 5 and 6 show two beams which have neck sections 8 and 9 constructed differently, so that the beams can be hammered at right angles to each other until they lie on the same horizontal plane. This form of beam also has an intermediate layer of insulation 3 between the two symmetrical halves of the beams. Thus, permits the construction of a well-insulated house, sealed against the weather, which has beams laying at the same level all the way round the walls. This form is slightly more expensive than the aforementioned because of the two different types of neck sections.

FIG. 7 shows a cross-section of a preferred form of execution of the building element described in the invention, with two half-beams 1 and 2 having an insulating layer 3 between them, which at the top between the sides 5 of the half-beams forms a groove 10 which can accommodate a tongue 11 on the beam above. Tongue 11 is designed in the insulating material 3 at the opposite edge of the beams so that it extends into the groove 4 formed by the two half-beams. When a number of beams are hammered together one above the other to form a wall the insulating material will form a sealed, continuous panel inside the whole wall, extending the full height of the latter.

In the form of execution illustrated in FIG. 8 the beam has two timber tongues 12 designed as part of the respective half-beams 1 and 2, and layer 3 extends upward between tongues 12 to form another tongue 13 which can be accommodated by a corresponding groove 14 in the opposite edge of the beam.

If desired, the two half-beams can be mutually connected at long intervals by locating wedges in the space otherwise occupied by the layer of insulation. This would give the beams increased strength but would not reduce the beams' insulating properties to any great extent. The beams would furthermore be made structurally more stable if the said wedges were located with their fibres pointing in the same direction as the fibres in the half-beams in order that the fibres can work in the same manner in the event of alteration in the moisture content of the timber.

What is claimed is:

1. A laminated building element comprising a pair of wooden half-beams, a central panel of insulating material sandwiched between said wooden half-beams and having a heat transmission capacity less than that of said wooden half-beams, a recessed groove formed along one edge of said half-beams, a tongue comprising an extension of said central panel extending outwardly in said recessed groove and a second groove formed solely within one edge of said central panel along the edge of said beams opposite said tongue and having a width equal the thickness of said tongue whereby opposite edges of said building elements are matingly received with respect to each other to provide a wall-type construction.

2. The invention of claim 1 wherein said central panel is formed of foam plastic material.

3. A laminated building element comprising a pair of wooden half-beams, a central panel formed of insulating material having a heat transmission capacity less than that of said half-beams and sandwiched between said half-beams wherein one edge of said half-beams is formed with a groove which extends along their length and the other edge of said half-beams adjacent said face is formed with a timber tongue extending outwardly in alignment with

the respective groove of that half-beam and wherein said central panel is formed with an outwardly extending tongue along one edge adjacent the grooves of said half-beams and an inwardly extending groove along its other edge inwardly spaced from said tongue of said half-beams.

4. The invention of claim 3 wherein said central panel is formed of foam plastic material.

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JOHN E. MURTAGH, Primary Examiner

U.S. CL. X.R.