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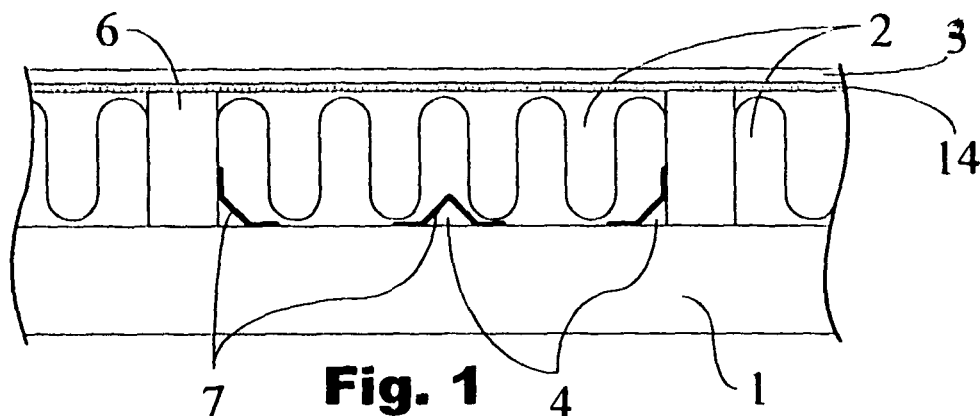
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(54) **Log wall structure**

(57) A log wall structure containing a log (1), an insulation layer (2) on the inner side of the log, and an inner wall surface (3) covering the insulation layer. According

to the invention, at the interface log-insulation, there are substantially vertical spaced air channels (4) for ventilating the wall structure.



Description

Technical field

[0001] The invention relates to a log wall structure defined in the preamble of Claim 1.

Background of the invention

[0002] In comparison with traditional logs hewed from one tree, in the industrial production of log structures, several different log and log wall constructions are currently used, intended for improving the heat insulation capacity of the wall structure. Naturally, the insulation capacity is effected by the log thickness, and thick durable logs also can be manufactured by gluing from several parts. As is generally known, in addition to increasing the thickness of the log, the insulation capacity also can be improved by increasing the additional insulation in the wall structure. By using a water vapour permeable insulation layer inside the log, the heat insulation capacity of the structure can be improved without losing its natural breathing. Usually, a wall structure like this additionally includes a moisture permeable air barrier layer or vapour barrier to be fastened to a separate battening inside the additional insulation layer, and the inner wall surface itself. Typically, as an inner surface of this kind a panel is used but, however, as the surface, also any board is suitable which, depending on the situation, can be painted or wallpapered. In addition to giving a high heat insulation capacity, the flexible use of different inner wall surfaces, also in log construction, is enabled by the log structure in question, as an alternative for traditional logs.

[0003] In suitable conditions it is possible that, from the outside of the building, moisture penetrates into the insulation layer through the log joints, or moisture escaping from the inside of the building condensates on the log surface facing to the additional insulation. If a situation like this occurs in practice, the water remaining in the wall can give rise to mould and structural damages.

Object of the invention

[0004] By utilising the invention, the drawbacks mentioned above shall be eliminated.

[0005] Particularly, it is an object of the invention to disclose a new kind of log wall structure, in which ventilation removing the moisture possibly condensing in the structure is realised in a very simple and advantageous way.

Summary of the invention

[0006] The log wall structure according to the invention is characterised by what is presented in the claims.

[0007] A log wall structure according to the invention includes logs on top of each other. The logs to be used are preferably square logs but also round logs can be

used. The structure also includes an insulation layer on the inner side of the log, and an inner wall surface covering the insulation layer. Additionally, the insulation layer may include a battening to which the inner wall surface has been fastened. In accordance with the invention, the construction contains essentially vertical spaced air channels at the interface log-insulation, for ventilating the wall structure.

[0008] The basic idea of the invention is a limited ventilation, that is, the air channels are not in contact with each other but, they clearly have a remarkable distance to each other. So, the log only is cold in the area of the air channels, and the heat insulation capacity of the log mainly remains unchanged. Air channels with appropriate spacing, however, are capable of sufficiently ventilating the inner log surface and to remove the excess moisture from the entire area thereof. Thus, the distances between the air channels preferably are in the range of 10 to 60 cm, e.g., approximately 30 cm, the width of the area free from air channels being in the same order, because the width of the air channel preferably is just a few centimetres.

[0009] A log wall structure according to the invention also can be realised using a totally or partially load-bearing battening, in other words, also so that the wall structure has a vertical frame, to which the log coating forming the outer surface has been fastened. Thus, in the invention, log denotes a structure thicker than a board or panel structure, having a significant meaning for the heat insulation capacity of the entire wall. Thus, log thicknesses more than 40 to 50 mm are usable for the invention.

[0010] Preferably, the wall structure also contains connecting channels extending from the interface log-insulation to the outer side of the wall, connecting the air channels with the air space on the outer side of the wall. In this way, the moisture possibly condensing in the wall structure can escape from the structure via air channels and connecting channels.

[0011] Preferably, for allowing free gravity ventilation, there are connecting channels both in the upper and lower parts of the wall. In a solution like this, gravity ventilation operates such that, in the air channels, a vertical flow is created by the temperature of the air channels deviating from the air outside the wall structure. However, forced flow also can be used for intensifying the ventilation.

[0012] Preferably, the connecting channel is passing through the log. The channel can be easily machined directly into the log with, and no channel-forming structures are needed for it, like a tube, since the log itself acts as a supporting structure forming a free channel. If needed, the opening of the connecting channel can be covered with a grid or a net preventing birds or small animals from getting into the channels. Naturally, it also is possible for the connecting channels to begin beneath the lowermost log from the outer space and/or to end up above the uppermost log in the outer space, thereupon not passing through the log.

[0013] The structure forming the air channel preferably includes a longish water vapour permeable strip set against the log and/or the vertical battening for the insulation layer. This strip, either alone or together with the log and/or battening surface, forms the air channel in question. The strip itself preferably is made of a water vapour permeable material. It also is possible to use some perforated, as such water vapour impermeable material. Preferably, the material of the strip also is so soft and elastic that, notwithstanding the possible lowering and deformations of the logs, the air channel remains non-plugged and non-broken. A preferable material is, for example, cardboard. Several strips forming an air channel also may be connected to a single board-like structure.

[0014] Preferably, the longish strip includes flanges for fastening thereof to the log and/or the battening, and an intermediate part between the flanges, together with the mounting base, forming an air channel. The cross-sectional form of the intermediate part can be angular or curved. It is essential that it is separated from the mounting base of the strip. The flanges preferably extend over the entire length of the strip. Thus, in addition to acting as a fixing point, they prevent the channel from being clogged, for example, upon applying loose insulation material by blowing or spraying.

[0015] The strip of material permeable for water vapour, tube or channel, no matter if having a closed or an open cross-section facing to the log, may have on square, triangle, round or whatsoever cross-section.

[0016] Furthermore, in a log wall structure according to the invention, between adjacent air channels, the horizontal groove at the joint of two logs on top of each other preferably is coated with a water vapour permeable strip. Thus, the groove covered by the strip forms an intermediate channel interconnecting the adjoining air channels. In this way, by arranging several intermediate channels in the structure, a network of horizontal and vertical ventilation channels may be provided.

[0017] At the surface of the board-like insulation to be mounted against the log surface, the structure forming the air channel also can contain a longish groove which, together with the log surface, forms the air channel. The groove also can be made as a chamfer in the edge of the insulation plate to be mounted against the juncture between the log surface and the battening, the air channel thereby being formed together by the chamfer, the log surface and the battening.

[0018] In a log wall structure according to the invention, the sizes and numbers of the air, connecting and intermediate channels may vary depending on the situation and the need for ventilation. When estimating the need for ventilation, empiric observations as well as physical modelling can be utilised.

[0019] The inventive log wall structure mainly has been developed for structures without water vapour barrier but nothing prevents using it also in structures provided with water vapour barrier, since moisture entering the struc-

ture is removed by the invention regardless of the direction in which the moisture enters. Thus, in the structure according to the invention, more or less breathing insulations may be used, like cellulose wool, glass wool, mineral wool, polyurethane, sawdust, other wood fibre insulations etc. It also is possible that, on the inner surface of the log, a breathing windshield is used, like paper or cardboard, on which the vertical air channels then are mounted. Likewise, on top of the insulation, on the inner side of the structure, the vapour barrier already mentioned or a water vapour permeable constructing cardboard may be used as an air barrier layer.

[0020] The inventive log wall structure has remarkable advantages over prior art. In the invention, providing the ventilation for the wall structure has been accomplished in a very simple way requiring only a few working steps and costs, which also is well applicable for do-it-yourself building. The strips and flaps forming the necessary air channels and intermediate channels may be present as a cardboard roll which is easy to handle and lightweight, from which they are cut to desired length. It also is possible to use sheets and strips of cardboard or other material already being provided with creases, so that in the mounting stage, the channel can easily be turned or bent to proper form. Additionally, the simplicity and the cheapness of the structure are increased by the fact that the channels extend at the surface of the log, in other words, there is no need for machining forms in the surfaces of the logs, required by the structure. So, for the inventive structure, all existing log frames and those manufactured by the modern techniques and know-how are applicable. Depending on the structures only, at the upper and lower ends of the wall, channels extending through the log may be necessary.

[0021] A log wall structure according to the invention also is very multipurpose. The solution according to the invention can be utilised both in a settling traditional log wall and a non-settling wall structure. Neither is the log profile critical, the logs may be both square and round logs. In a structure without vapour barrier, the most important feature required from the insulation is permeability for water vapour but, for the rest, insulations both inserted by blowing and board-like, may be used in the inventive log wall structure. So as to be suitable for each situation, the efficiency of the ventilation properly may be adjusted the by the size and number of the air channels, while considering the climate type in the region, the log and insulation thicknesses, and other physical properties, the conditions prevailing in the building, and other factors influencing to condensation of moisture and need for ventilation.

List of drawings

[0022] In the following, the invention is described in detail by means of embodiments, referring to the attached drawings, in which

Fig. 1 shows a horizontal cross-section of a log wall structure according to the invention, as seen from above or below,

Fig. 2 shows a vertical cross-section of a log wall structure according to the invention, seen in the direction of the wall,

Fig. 3 shows an alternative for a longish strip belonging to a structure forming the air channel,

Fig. 4 shows a vertical cross-section of a log wall structure according to the invention at the interface log-insulation, in the longitudinal direction of the wall, as seen from the side, and

Fig. 5 shows a board-like insulation belonging to a log wall structure according to the invention.

Detailed description of the invention

[0023] A log wall structure according to the invention contains as the outermost layer a log 1. On the inner side of the log, there is an insulation layer 2 and an inner wall surface 3 covering it. The material of the insulation material is water vapour permeable so as to guarantee breathing of the structure. As such an insulation material, for example, cellulose wool is used. On top of the insulation, that is, under the inner wall surface 3, there is an air barrier layer 14 permeable to moisture in this embodiment. Instead, also a water vapour barrier can be used, if required by the insulations and other wall structures employed. For maintaining the insulation in position and fastening the inner wall, the insulation layer also is provided with a battening 6. At the interface log-insulation, there are essentially vertically mounted strips permeable for water vapour, set against the log and/or the battening. Together with their mounting base, the strips form essentially vertical air channels 4 at the interface in order to ventilate the structure.

[0024] In the cross-section of Fig. 2 also an embodiment is shown for connecting channels 5 connecting the air space 4 with the air space on the outer side of the wall. From the interface log-insulation, they pass to the outer side of the wall straight through the logs 1. By using a solution according to the figure having connecting channels both in the upper and the lower parts of the wall, free gravity ventilation is enabled in the channels. The function is based on the fact that, in the air channels 4 inside the wall structure, the air has a different the temperature than the air on the outer side of the wall structure. By the gravity, a vertical air flow is then created in the channels, effectively transporting away moisture possibly condensed in the structure.

[0025] The alternative shown in Fig. 3 for the longish strip 7 belonging to the structure forming the air channel is provided with flanges 8 for fastening thereof to the log and/or to the vertical battening for the insulation layer.

Fastening can be accomplished, for example, by rivets or by gluing. The strip also includes an intermediate part 9 remaining elevated from the mounting base and forming therewith an air channels free from insulation. In the figure, a simple solution is shown, in which the folds of the strip form a channel structure with triangular cross-section. Other forms also are possible, the cross-section of the intermediate part 9 can be, for example, rectangular or curved. In the same way, the intermediate part 9 can be a closed tube as such without flanges 8 or provided with them. The strip 7 is set in place before the insulation. So, an insulation material in bulk, to be mounted, for example, by blowing or injecting can be used without clogging the air channel 4. For the flanges, it is not necessary to be as long as the entire strip but, by using strips with full length, the channels are more effectively protected against clogging.

[0026] The strip 7 is water vapour permeable. It can be made of a material as such permeable to water vapour, for example, cardboard but, in principle, also some perforated material as such impermeable to water vapour can be used. When manufacturing of cardboard, the strips also are lightweight, and they can be made to a roll easy to handle and requiring little space, from which it's easy to cut them to desired length on site. Several strips may also be joined to a single sheet-like structure allowing several air channels to be realised at once.

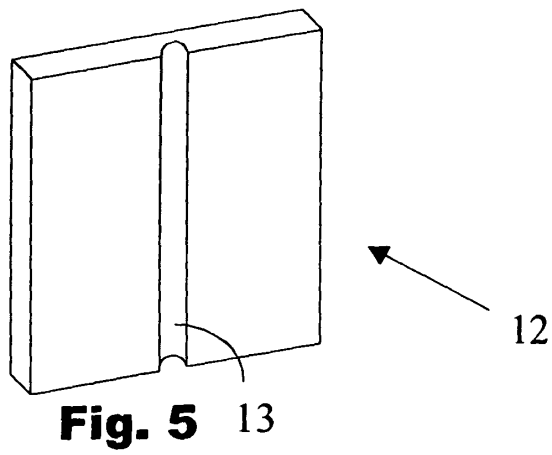
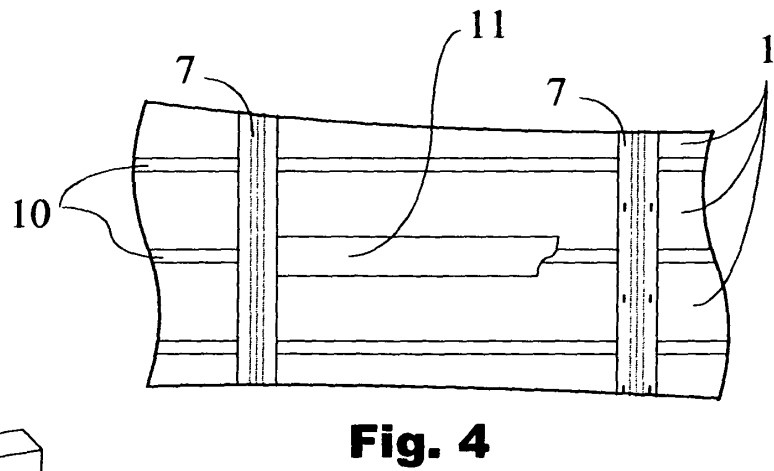
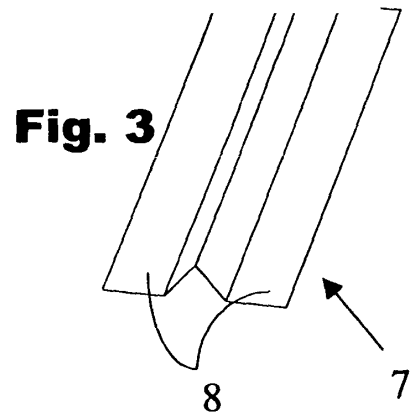
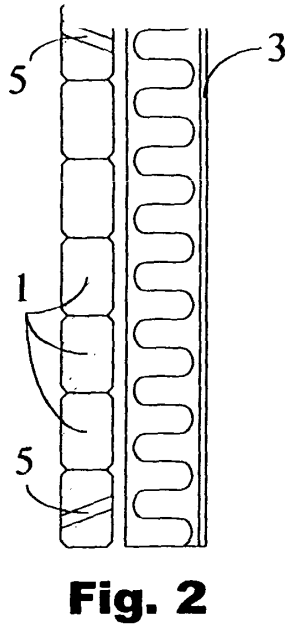
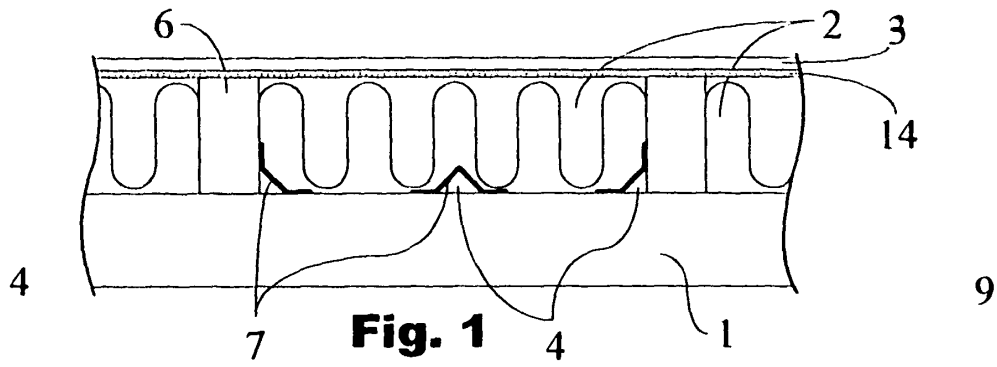
[0027] The embodiment according to the invention shown in Fig. 4 includes a water vapour permeable flap 11 covering the horizontal groove 10 at the joint of logs 1 on top of each other between the adjacent strips 7. In the figure, for the sake of exemplification, it only is drawn for a part of the distance. In Fig. 4, the air channels remain under the strips 7. Together with the groove at the joint between the logs, the flap 11 forms an intermediate channel connecting the air channels, free from insulation, remaining in Fig. 4 under the strip. By the intermediate channels, the ventilation is intensified and, by including them in the structure, an entire network of horizontal and vertical ventilation channels can be formed. In the figure, rivets also can be seen in the flanges of the right-hand strip used for fastening the strip to the logs 1.

[0028] As an alternative for the insulation layer 4, a board-like water vapour permeable insulation 12 is shown in Fig. 5, having a substantially vertical groove 13 at the surface to be mounted against the logs. Together with the log surface, the groove forms an air channel 4 required for ventilation. The groove also can be accomplished as a chamfer in the edge of the insulation board to be mounted against the joint between the log and the battening, the air channel then being formed together by the chamfer, the log and the battening.

[0029] The invention is not limited to the embodiments disclosed above but, several modifications are possible within the scope of the inventive idea.

Claims

1. A log wall structure including a log (1), an insulation layer (2) on the inner side of the log, and an inner wall surface covering the insulation layer, **characterised in that** the interface log-insulation contains substantially vertical spaced air channels (4) for ventilating the wall structure. 5
2. A log wall structure according to Claim 1, **characterised in that** the structure includes connecting channels (5) extending from the interface between the log (1) and the insulation (2) to the outer side of the wall, allowing the air channels (4) to communicate with the air space on the outer side of the wall structure. 10 15
3. A log wall structure according to Claim 2, **characterised in that** there are connecting channels (5) both in the upper and the lower parts of the wall in order to enable free gravity ventilation. 20
4. A log wall structure according to Claim 2 or 3, **characterised in that** the connecting channel passes through the log (1). 25
5. A log wall structure according to Claim 1, **characterised in that** the structure forming the air channel contains a longish water vapour permeable strip (7), on the side of the log open or closed, mounted against the log (1) and/or the vertical battening of the insulation layer. 30
6. A log wall structure according to Claim 5, **characterised in that** the strip includes flanges (8) for fastening it to the log and/or to the battening of the insulation layer, as well as an intermediate part (9) between the flanges elevated from the mounting base, forming an air channel together with the mounting base. 35 40
7. A log wall structure according to any of the claims 1 to 6, **characterised in that** the substantially horizontal groove (10) at the joint of two logs on top of each other, over the distance between the adjoining air channels, is covered by a water vapour permeable flap (11) in order to form an intermediate channel connecting the air channels. 45
8. A log wall structure according to Claim 1, **characterised in that**, at the surface of the board-like insulation (12) to be mounted against the log surface, the structure forming the air channel (4) includes a longish groove (13). 50 55
9. A log wall structure according to any of the claims 1 to 8, **characterised in that** the vertical air channels are spaced from each other 10 to 60, preferably 20 to 40, for example, approximately 30 cm.
10. A log wall structure according to any of the claims 1 to 9, **characterised in that**, between the air channels, there is a region free from air channels, having a multiple width, for example, 3 to 30 fold compared to the width of a single air channel.
11. A log wall structure according to any of the claims 1 to 10, **characterised in that**, on top of the insulation layer (2), depending on the insulation used, an air barrier layer (14) or a vapour barrier is to be provided.





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 01 2477

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 32 17 072 A1 (SONNLEITNER GOTTHARD) 10 November 1983 (1983-11-10)	1	INV. E04B2/70
Y	* page 4, line 27 - page 5, line 20; figure 1 *	2-4	
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Y	----- US 2 645 824 A (TITSWORTH EDWIN J) 21 July 1953 (1953-07-21) * the whole document *	2-4	
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A	----- FR 2 847 604 A1 (ALLAIS ANDRE [FR]) 28 May 2004 (2004-05-28) * abstract; figures 13-16 *	1	TECHNICAL FIELDS SEARCHED (IPC)
			E04B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 November 2006	Examiner Khera, Daljit
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 06 01 2477

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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