Method and apparatus for producing a hollow log

Apparatus and method for the production of round logs for use in a log building, wherein the apparatus is a tubular sawing apparatus comprising at least one tubular cutter unit (101), by means of which a raw-wood log (81) is machined to produce at least one hollow log (82, 83) having a cavity inside it.

Fig. 6a
Description

[0001] The present invention relates to a log building as defined in the preamble of claim 1, comprising a separate load-bearing skeleton consisting of round logs. The invention also relates to a log as used in a log building and to a method and an apparatus for its manufacture. The building may be made from individual logs or from prefabricated elements.

[0002] At present, the walls of round-timber houses are built using dovetails from horizontal logs which are joined together by edge joints. The horizontal logs thus form the load-bearing structure of the building.

[0003] A drawback with present-day log houses is often the setting or sag of the log wall. In the case of a new log wall, the setting typically amounts to about 10-50 mm/m during the first two years. Therefore, it is necessary to provide a space e.g. in the upper part of the door and window openings to allow for setting, which space can be filled with thermal insulation material. Another drawback associated with this type of log houses is the high expenses and complexity of their production. Although e.g. the new industrial round-timber technology has led to serial production of building logs for solid-wood round-timber houses, it is currently not possible to prefabricate e.g. wall elements in factory, but houses are assembled from individual logs on the building site.

[0004] Patent specification 302905 presents a log framework system for a log building in which, instead of dovetails, upright logs are used at the corners. These vertical logs form a set of pillars. This set of pillars functions as a load-bearing structure of the log building. Placed at the corners of the building are upright solid-wood logs, and horizontal solid-wood logs forming the walls are joined to the upright logs via dovetail joints formed by the topmost and bottommost logs. In other words, in such a log building all load-bearing structures may consist of upright solid-wood logs and the non-load-bearing structures may consist of horizontal solid-wood logs.

[0005] A disadvantage associated with present-day solid-wood log houses is the relatively large weight of the wall logs, which causes setting. Moreover, the degree of utilization of the wood material is poor, and laminated timbers involve the drawback of complicated manufacture and consequent high manufacturing costs.

[0006] The object of the present invention is to eliminate the drawbacks of prior-art technology and to achieve a new type of log building in which at least the horizontal wall logs are hollow logs, which are round solid-wood logs with a cavity inside, made by removing the core of the log, thus allowing the core to be utilized for other purposes.

[0007] Another object of the invention is to achieve a new type of round log intended for use in a log building and consisting of a hollow log having a cavity inside and machined from a solid-wood log, as well as a method and an apparatus for the production of such logs.

[0008] The details of the features characteristic of the building and log of the invention and its production are presented in the claims below.

[0009] The invention makes it possible to utilize a raw-wood log by machining it, e.g. by sawing, so as to produce a hollow log, and additionally by further sawing the core to produce other sawn timber products. By using the invention, raw-wood logs can be utilized to a considerably higher degree than in prior-art technology as the logs need not be milled or rounded off on a lathe. In addition, the process of machining the raw-wood logs to produce hollow logs and planks etc. is relatively simple.

[0010] In addition, using the structure of the invention, it is possible to produce finished prefabricated elements in factory, thus making the construction work considerably faster and easier. The entire building can be constructed from hollow-log elements cored-out in factory, which are assembled on the building site.

[0011] Furthermore, e.g. electric conductors can be hidden inside the logs, allowing e.g. electric installations to be implemented in a very inconspicuous manner, which is of great importance in respect of interior decoration of log buildings.

[0012] In the following, the invention will be described by the aid of examples with reference to the attached drawings, wherein

Fig. 1 presents the skeleton of a log building according to the invention, comprising upright logs forming a set of pillars, roof beams and girders supporting the floor of a loft.

Fig. 2a a cross-section of the structure of a hollow-log wall.

Fig. 2b presents a lateral view of a wall structure implemented as a hollow-log prefabricated element and an upright log.

Fig. 2c presents a wall structure implemented as a hollow-log prefabricated element and an upright log as a horizontal section taken at the middle of the log.

Fig. 2d illustrates the joining of hollow-log prefabricated wall elements to a corner post by the middle of the log to be secured.

Fig. 2e presents a horizontal section illustrating the securing of hollow-log prefabricated elements to a corner post by the lower logs.

Fig. 3a illustrates the connection of a corner post to a concrete pillar as a horizontal section.

Fig. 3b illustrates the connection of a corner post to a concrete pillar in section C—C.

Fig. 4a presents a lateral view of a corner joint of a
multi-storey building

Fig. 4b presents a corner joint of a multi-storey building in section I - I,

Fig. 5a — 5c illustrate the production of hollow logs,

Fig. 6a and 6b present a tubular saw according to the invention in lateral view and in top view,

Fig. 6c presents the cutter of a tubular saw,

Fig. 6d presents the head of the cutter, and

Fig. 6e illustrates the sawing of a hollow log from a raw-wood log.

[0013] In the wall structure of a round-timber house according to the invention, all corners are implemented in the same way. An upright log pillar 1 (Fig. 1) is provided at each corner. Secured to these are horizontal solid-wood wall logs. The topmost tier of logs of the house can function as a structural fixing log. The tiers below it consist of logs freely piled on top of each other. The upright log 1 is secured to a concrete pillar in the basement. Fig. 1 presents a skeletal view of a round-timber house with upright logs 1 at the corners and between them as well as within the house, forming a set of pillars that functions as the load-bearing structure of the building. The logs 1 are secured to the basement of the building and to the roof rafters 3, which are fastened to the ends of the upright logs 1. The set of pillars is braced by the horizontal wall components, the horizontal timbers 5 supporting the floor of the loft and by the entire roof structure.

[0014] Fig. 2a presents a cross-section of the hollow-log wall structure of the invention, where the horizontal logs 2 have been piled on top or each other. The logs 2 are round logs with a hollow inside, produced by machining. The space inside the log is filled with insulating material 21. Fitted in the wall is a window 22 having a frame 23 fitted against the logs 2 and provided with insulating material. The floor comprises joists 24 fitted on the basement 4, with insulating material and flooring boards on the joists. The roof comprises a roof structure 26 fitted on rafters 25 and provided with insulating material, boarding and cladding. To allow for setting of the logs, there is a horizontal board 27 fixed on the topmost log 2 and side fillets 28 placed at the sides of the horizontal board. Correspondingly fastened to the roof structure are vertical side plates 29 outside the side fillets so as to allow the side fillets to slide between them through a distance corresponding to the amount of setting. The space between the plates is filled with insulating material.

[0015] Further, Fig. 2a and 2c present a structure in which the prefabricated wall element 31 consists of hollow logs 2 with insulating material inside. The logs are placed one over the other and fastened together with a bolting bar 32 extending through the entire element. In addition, each two logs placed one over the other can be tied together using dowels 33. The bolting bars 52 are passed through the logs in a region where the logs have been reinforced with lengths of core timber 34 placed inside them. In the topmost log 2, the piece of core timber 35 extends from the end of the log to a point beyond the bolting bar. In addition, the element is provided with an end fillet 36 extending across the entire height of the element and with edge fillets 37 for a groove to permit the element to be secured by fastening the topmost log with securing bolts while the logs below it are secured by means of a wooden tie rod 38 set in the upright log 1 (Fig. 2e).

[0016] Fig. 2d presents a more detailed illustration of the way in which the horizontal topmost hollow wall log 2 is secured to the massive upright log 1. C-profile parts 42 made of steel are fastened to the tie rod chases 41 in the pillar logs 1. The ends of the horizontal logs 2 are provided with bolts 43 placed at the center of the log so that their head is locked in the slot of the C-profile, and the threaded other ends are screwed fast in vertical pins 44. In this way, the topmost tier of logs is anchored on the pillar logs 1 by means of bolts. The anchorage permits unobstructed setting of the logs while stiffening the pillars and the horizontal logs of the wall as a single functional wall structure. The profiles may be secured using holding-down plates 46 fastened with screws 45 to the side of the upright log 1.

[0017] Fig. 3a and 3b illustrate the manner of securing the corner pillar 1 to the concrete pillar 4. The joint is implemented using an angle-iron bracket 51 which is secured to the concrete pillar 4 via a holding-down plate 52 placed under it and anchored in the concrete by means of anchor bars 53. The holding-down plate 52 is provided with a central hole. The angle-iron bracket 51 is provided with a corresponding hole, and the angle-iron bracket is secured to the holding-down plate 52 via a bolted joint 54. The angle-iron bracket is similarly fastened to the pillar log 1 with screws 55.

[0018] Fig. 4a and 4b present a system applicable for a multi-storey building. In this case, the upright log is a hollow log 61 with a steel tube 62 inside it, both being provided with holes 63, 64 for the securing bolts. Insulating material 65 may be provided between the steel tube and the hollow log. The steel tube 62 is secured to the basement. The log 61 is provided with a C-profile part 66 set in the log and fastened via a screw-and-nut joint 67 as described above, and the horizontal log 2 is fastened to the upright log via a threaded part 68 and a boss 69 according to the above description. For an intermediate floor, the structure comprises a floor supporting shelf 71 with a supporting plate 72, which are fitted e.g. in slots 73, 74 provided in the upright pillar and in the steel tube.

[0019] Fig. 5a — 5c illustrate the production of hollow logs. A raw-wood log 81 is sawn as described below by
means of a tubular saw via a single operation producing two hollow logs 82, 84 and a core timber 85, which can be sawn further to produce e.g. planks. Thus, a single raw-wood log used for the log building can yield hollow logs, floor boards as well as ceiling panels. The dimensions of the hollow logs may be for example: outer timber 82, diameter 260 mm, wall thickness 30 mm; inner timber 83, 182 mm, wall thickness 28 mm; and sawing allowance 9 mm. Thus, the core timber could have a diameter of 108, so it can be sawn further to produce planks and panels.

[0020] Fig. 6a — 6e present a tubular saw designed for the production of hollow logs, also illustrating its operating principle. The tubular saw comprises two identical cutter units 101, by means of which the raw-wood log 102 is sawn from both ends. The cutter units have been fitted on cutter carriages 103, which are moved along rails 104 by a drive mechanism as indicated by the arrows. Each cutter unit comprises an electric drive 105, an exhaust pipe 106 for the sawdust and a tubular cutter 107. The log 102 is held immovable between the cutter units by a holding unit 108. The cutter is a tubular three-blade cutter, consisting of three cutting tubes 111—113 one inside the other. At the end of the cutting tube there is a cutter collar 114 provided with oppositely oriented teeth 115 and cut-outs 116 between them to generate an air flow as indicated by the arrow. The sawing is performed as illustrated in Fig. 6e. As shown in Fig. 6e, air is circulated as indicated by the arrows so that a negative pressure A prevails between the outermost cutting tubes as well as in the central tube, while a positive pressure Y prevails between them, thus causing the sawdust to be removed via the exhaust pipe 105.

[0021] It is obvious to the person skilled in the art that different embodiments of the invention are not limited to the example described above, but that they may be varied within the scope of the claims presented below.

Claims

1. Method for the manufacture of a round log for use in a log building, characterized in that in the method a raw-wood log (81) is machined so as to produce at least one hollow log (82, 83) having a cavity inside it.

2. Method as defined in claim 1, characterized in that the machining is performed by sawing the raw-wood log so as to remove the core, from which is produced at least one hollow log and other timber, such as planks or the like.

3. Apparatus for the production of round logs for use in a log building, characterized in that the apparatus is a tubular sawing apparatus comprising at least one tubular cutter unit (101), by means of which a raw-wood log (81) is machined to produce at least one hollow log (82, 83) having a cavity inside it.

4. Apparatus as defined in claim 3, characterized in that the cutter unit has a cutter consisting of one or more cutting tubes (111-113) having a substantially collar-like cutter head, for the sawing of a raw-wood log.

5. Apparatus as defined in claim 3, characterized in that a negative pressure and/or a positive pressure can be generated in the cutting tube to remove the sawdust.