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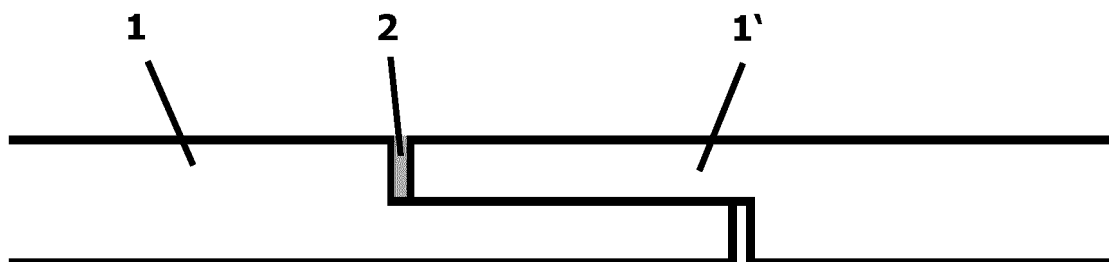
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(54) **WALL SETUP FOR IMPROVED FIRE RESISTANCE OF BONDED DRYWALLS**

(57) The present invention is concerned with plasterboards having a stepped single lap joint on at least two opposing edges thereof, wherein the respective steps at the opposing edges are arranged with a touching transition to the respective opposing main faces of the plasterboard. The present invention is further concerned with a drywall construction, which is prepared with respective

plasterboards, and thereby provide improved fire resistance to the drywall. The present invention is furthermore concerned with a process of producing a respective drywall construction and a use of stepped single lap joint in a plasterboard for improving the fire resistance of a drywall construction.

Figure 2



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Description

[0001] The present invention is concerned with plasterboards having a stepped single lap joint on at least two opposing edges thereof, wherein the respective steps at the opposing edges are arranged with a touching transition to the respective opposing main faces of the plasterboard. The present invention is further concerned with a drywall construction, which is prepared with respective plasterboards, a process of producing a respective drywall construction and a use of stepped single lap joint in a plasterboard for improving the fire resistance of a drywall construction.

State of the art

[0002] In a conventional bonded drywall plasterboards, which may be constituted from gypsum (possibly including fibers) or concrete, are mounted on a core or skeleton under construction, which is usually a wooden or metal truss. Such plasterboards regularly have slightly curved or shaped edges, so that the mounted boards in the drywall have small gaps or butt joints between them. To cover these gaps, in drywall production, a putty or filler is applied into the gap to fill the same. In addition, often, a reinforcing tape is applied onto the putty filled gaps, which is again covered by a thin layer of putty, before the surface of the drywall is smoothened by sanding.

[0003] A problem, which arises when such drywalls are exposed to a fire, is that the face of the drywall, which is exposed to the fire first expands due to the heat and after that experience some shrinking due to the drying effect. This motion of the drywall boards leads to the formation of cracks in the butt joints, so that a channel is opened and the heat and fire can much more easily enter the inside of the drywall, where the truss is provided. If such truss is made from wood, the truss will immediately start to burn. If the truss is made from metal, the heated metal will transfer the thermal energy to the other side of the wall. If the plasterboards are attached to the truss by means of an adhesive, the adhesive on the side which is distal to the fire will then also be heated up to a level where the plasterboards start to become detached from the drywall. In the event, that a stream of water is then applied to the drywall, the wall can easily collapse, as either the truss has been decomposed by the fire or the boards are no longer bonded to the truss. This represents a certain danger for firefighters who are trying to extinguish the fire or try to stop the fire from spreading further.

[0004] A possible solution to the problem of providing a more fire safe drywall construction is the preparation of a drywall with two layers of plasterboards, where the respective layer are positioned such that the gaps, which are formed from the butt joints of the plasterboards, which are directly attached to the truss, are covered by plasterboards which are applied in a second layer. As at the same time, the butt joints in the second layer at their bottom are closed by the first layer, even if cracks are

formed in the butt joints of the second layer, the fire cannot directly access the interior of the drywall, where the truss is positioned.

[0005] A disadvantage of such constructions is on the other hand, that the production of drywalls with two layers of plasterboards increases costs and production effort of the construction and is comparatively inflexible as plasterboards are usually only available in certain thickness grades.

[0006] There is therefore a need for the provision of drywalls with enhanced fire-protection performance, which can more easily be fabricated with only a single layer of plasterboards.

[0007] The present application addresses this need.

Description of the invention

[0008] In the investigation, which are underlying the present invention, it has been found that the provision of a plasterboard with a stepped edge single lap joint on at least two opposing edges therefore allows the formation of a butt joint of the plasterboards, where an occurrence of a crack does not open a direct path into the inside of the dry wall construction. Whereas with such construction a crack may still form, the underlying stepped edge of the board blocks such direct path, especially, when the extended part of the stepped edge for the upper plasterboard is on the inside of the wall construction.

[0009] In contrast to a construction with notches in one plasterboard and corresponding extensions in an adjacent plasterboard (as is known e.g. from laminate floors), a construction as a stepped edge allows the extended part to be thicker, which is beneficial for the resilience of the plasterboard edge towards breaking.

[0010] Accordingly, in a first aspect, the present invention pertains to a plasterboard having a stepped single lap joint on at least two opposing edges thereof, wherein the respective steps at the opposing edges are arranged at with touching transition to the respective opposing main faces of the plasterboard.

[0011] In the respective plasterboards, the indication "wherein the respective steps at the opposing edges are arranged at with touching transition to the respective opposing main faces of the plasterboard" is intended to denote that the step at one edge of the board has the same level as one main face of the plasterboard on one side and on the other side does not extend to the main face of the plasterboard. On the opposing edge, the arrangement is vice versa, i.e. the step at one edge of the board has the same level as the main face of the plasterboard which is on the opposite side of the one main face. In this manner, the respective steps of the edges can be arranged with an overlap, where the respective steps are positioned on top of each other.

[0012] To illustrate the difference of this configuration to a conventional arrangement of plasterboards in a drywall, reference is made to Figures 1 and 2, where Figure 1 illustrates a conventional arrangement of two

plasterboards (1, 1') forming a butt joint, which is covered with a filler 2. In Figure 2 a configuration of an overlay of inventive plasterboards is illustrated, where the plasterboards 1, 1' have stepped edges and where the plasterboards are arranged with an overlay of the step to provide a joint with a Z-form.

[0013] Whereas the inventive idea of forming plasterboard joints, which are not affected to a relevant extent by a shrinking of the plasterboards in its two main dimensions is made use of by providing the plasterboard with respective stepped edges on only two opposing sides, it is preferred that the inventive plasterboards have stepped edges on all (four) edges thereof. In this manner, a drywall can be produced, where all board joints are provided with an overlap of edge steps.

[0014] It terms of stability of the plasterboards it preferred that the steps on the edges have a thickness, which is in the range of about half of the thickness of the plasterboard. In addition, to be able to provide a substantially even joint, it is expedient that the combined thickness of the steps on the respective opposing edges is about the same as the thickness of the board. Accordingly, it is preferred that the step of the plasterboard at one edge has a thickness in the range of 50 to 65% of the thickness of the plasterboard, preferably in the range of 50 to 60%, and on the respective opposing edge has a thickness of 100% of the thickness of the plasterboard - the thickness of the step at the one edge. In some cases, it is possible that the respective thicknesses do not add up to 100%, such as to 80% or more only (in particular 90% or more), which leaves a small gap for the application of an adhesive to attach the boards to one another.

[0015] To provide for sufficient fire resistance and flexibility of positioning of the boards, it is further preferred that the step has a length (= extension away from the boards main body) of at least 1.5 cm. More preferably, the step has a length of 2 cm to 6 cm and even more preferably of 2.5 to 5.0 cm.

[0016] It is further preferred that the extension of the step and/or the edge, where the extension connects to the main face of the boards at the side without touching transition to the main face of the plasterboard, is rounded. If the step is rounded, this has the advantage that the danger of injury or cutting to an artisan, who is building a wall from the board, is minimized. If the edge is rounded this provides the advantage of improved resistance of the edge towards breaking, as a point which is especially susceptible to breaking is eliminated. The rounded step and/or edge in this case preferably has a radius of from 2 to 7 mm, more preferably of from 3 to 6 mm and even more preferably of from 4 to 5 mm.

[0017] A plasterboard with rounded steps and edges is schematically shown in Figure 3, where 1A designated the main body of the board, 1B designates the step at the edge of the board, and 3 designates the rounded edge. In the drawing of figure 3 r designated the radius in the above description.

[0018] For the plasterboards in terms of sufficient sta-

bility of the stepped edge therein, it is furthermore preferred that it has a thickness in the range of 10 to 25 mm and preferably 12 to 20 mm. If the thickness of the plasterboard is less than 10 mm, the edge may become more prone to breaking of, whereas when the thickness of the board exceeds 25 mm the board will become increasingly heavy and more difficult to process.

[0019] The plasterboard can be provided without any coating or cover on the plaster, but in most cases will have a coating of paper or cardboard on at least one of the main faces thereof. Preferably, the plasterboard has a paper or cardboard coating on both main faces thereof. In addition, to improve fire resistance of the board or a paper or cardboard coating thereof, the plasterboard and/or the respective coating may have a fire retardant applied thereon or impregnated therein.

[0020] As noted above, the inventive plasterboards can suitably be arranged to a drywall construction, which provides improved resistance against fire passing the construction via joint cracks, which occur when the wall is exposed to fire from one side thereof. Accordingly, in a further aspect, the present application pertains to a drywall construction, which comprises comprising a wooden or metal truss and a plurality of plasterboards as described above, which arranged on the truss in an overlapping manner, so at the overlap a step of a first plasterboard is arranged at the proximal side of the truss and is covered by at least 80% by a step of a second plasterboard on the distal side of the truss.

[0021] The truss in such construction is regularly provided with wooden or metal poles, which extend from a ceiling to a floor, and may have cross-braces to stabilize the truss, which are positioned between the poles. If the truss is prepared from metal, the poses suitably are provided as hollow profiles.

[0022] In a preferred embodiment, the drywall construction comprises a plurality of plasterboards, which are arranged on the truss in an overlapping manner, so that the overlap a step of a first plasterboard is arranged at the proximal side of the truss and is covered by at least 90% and preferably at least 95% by a step of a second plasterboard on the distal side of the truss. In this way, the area, which has to be filled with a filler to provide an overall even outer surface, is minimized.

[0023] The respective plasterboards may be attached to the truss with any attachment means, which is known to the skilled practitioner, including conventional attachment means such as nails or screws. Alternatively, it is possible that the attachment of the plasterboards to the truss is via an adhesive, in particular a mounting adhesive. In a preferred embodiment, the connection of the plasterboards to the truss by an adhesive is combined with an attachment of the respective plasterboards between one another and where the same adhesive is used for the plasterboard/truss attachment and the plasterboard/plasterboard attachment.

[0024] In terms of fire safety an arrangement of the plasterboards in the drywall, where the space directly

behind the gap formed by the point of the plasterboards is free of posts of the truss in preferred, as even in case the fire passes the joint there will not be direct heating of the posts, which may lead to the above mentioned adverse effects on the drywall construction.

[0025] In terms of fire safety further an arrangement of the plasterboard in the drywall, where the stepped edges on the walls outer surface point upwards is preferred. In this case, even if a crack forms in the joint between the boards the fire and heat has to travel downwards to enter the inside of the wall, which given that heat is usually going upwards provides a significant barrier.

[0026] For the inventive drywall construction, it is furthermore preferred that it comprises a truss and two layers of plasterboards, which are provided on both main faces of the truss. Preferably, the respective layers on both main faces are formed as single layers. For illustration, a respective drywall construction is shown in Figure 4. In this construction, 1 and 1' denote the respective plasterboards, from which the outer surfaces of the drywall is constructed. 2 denoted a filler, which is used to cover and close small gaps between the plasterboards. 4 denotes the posts of the truss, which has plasterboard layers on both main faces thereon by means of an adhesive 5. In Figure 4, the edges of the plasterboards face in the horizontal direction and o posts are arranged in the space, which is directly adjacent to the gap between the plasterboards 1 and 1'.

[0027] In a yet further aspect, the present application concerns a process for the production of a drywall construction as described above, wherein the process comprises the following steps:

- Providing a wooden or metal truss;
- Attaching a first plasterboard as described above to the truss;
- Attaching at least one subsequent plasterboard as described above to the truss in a manner, that the respective steps of the plasterboards overlap each other in a closed fit of the steps.

[0028] In the process, the last step is preferably repeated so often that the full surface of the drywall is covered by receptive plasterboards as described above.

[0029] Whereas as noted above, the attachment of the plasterboards to the truss or between one another can be accomplished by any available attachment means, in a preferred embodiment the attachment of the plasterboards to the truss and/or the attachment of the plasterboards to one another via the stepped edges is provided by an adhesive and preferably by the same adhesive.

[0030] Further, as noted above, the provision of plasterboards with a stepped single lap joint provides particular advantages for drywalls, which have to be specifically resistant towards exposure of fire, as the stepped single lap joint significantly impedes the transgression of

fire into the interior of the drywall. Accordingly, in a yet further aspect, the present invention also pertains to a use of a stepped single lap joint in a plasterboard for improving the fire resistance of a drywall construction, wherein the plasterboards are arranged with respective overlapping lap joint steps to form a continuous surface of the drywall at the transitions of one plasterboard to a subsequent plasterboard.

Claims

1. Plasterboard having a stepped single lap joint on at least two opposing edges thereof, wherein the respective steps at the opposing edges are arranged at with touching transition to the respective opposing main faces of the plasterboard.
2. Plasterboard according to claim 1, having stepped single lap joints on all edges thereof.
3. Plasterboard according to claim 1 or 2, wherein the step at one edge has a thickness in the range of 50 to 65% of the thickness of the plasterboard, preferably in the range of 50 to 60%, and on the respective opposing edge has a thickness of 100% of the thickness of the plasterboard - the thickness of the step at the one edge - a space of up to 5% of the thickness of the board.
4. Plasterboard according to any one of claims 1 to 3, wherein the step has a length of at least 1.5 cm, preferably in the range of 2 cm to 6 cm and more preferably in the range of 2.5 to 5 cm.
5. Plasterboard according to any one of the preceding claims, wherein the stepped single lap joint has a radius of 2 to 7 mm, preferably 3 to 6 mm and more preferably 4 to 5 mm.
6. Plasterboard according to any one of the preceding claims, wherein the plasterboard has a thickness in the range of from 10 to 25 mm and preferably 12 to 20 mm.
7. Plasterboard according to any one of the preceding claims, wherein the plasterboard has a paper or cardboard coating on at least one major face thereof, preferably on both major faces thereof.
8. Plasterboard according to claim 7, wherein the paper or cardboard coating has a fire retardant integrated therein, preferably wherein a fire retardant is impregnated into the paper or cardboard coating.
9. Drywall construction comprising a wooden or metal truss and a plurality of plasterboards according to any one of claims 1 to 8, which arranged on the truss

in an overlapping manner, so at the overlap a step of a first plasterboard is arranged at the proximal side of the truss and is covered by at least 80% by a step of a second plasterboard on the distal side of the truss.

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10. Drywall construction according to claim 9, wherein a plurality of plasterboards is arranged on the truss in an overlapping manner, so at the overlap a step of a first plasterboard is arranged at the proximal side of the truss and is covered by at least 90% and preferably at least 95% by a step of a second plasterboard on the distal side of the truss. 10
11. Drywall construction according to claim 9 or 10, wherein the plasterboards are connected to the truss and/or to one another by means of an adhesive, preferably wherein the connection to the truss and between the plasterboards is by means of the same adhesive. 15
12. Drywall construction according to any one of claims 9 to 11, wherein the dry wall has layers of plasterboards on both main faces of the truss, preferably a single layer of plasterboards on both main faces. 20
13. Process for the production of a dry wall construction according to any one of 9 to 12, which comprises the following steps: 25
 - Providing a wooden or metal truss; 30
 - Attaching a first plasterboard according to any one of claims 1 to 8 to the truss;
 - Attaching subsequent plasterboard according to any one of claims 1 to 8 to the truss in a manner, that the respective steps of the plasterboards overlap each other in a closed fit of the steps. 35
14. Process according to claim 13, wherein the attachment of the plasterboards to the truss and/or the attachment of the plasterboards to one another via the stepped edges is provided by an adhesive and preferably by the same adhesive. 40
15. Use a stepped single lap joint in a plasterboard for improving the fire resistance of a drywall construction, wherein the plasterboards are arranged with respective overlapping lap joint steps to form a continuous surface of the drywall at the transitions of one plasterboard to a subsequent plasterboard. 45

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Figure 1

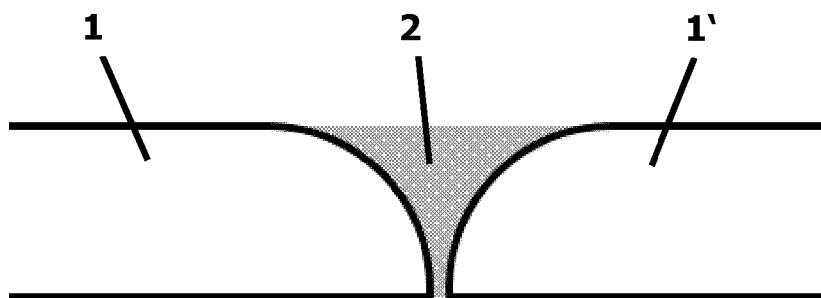


Figure 2

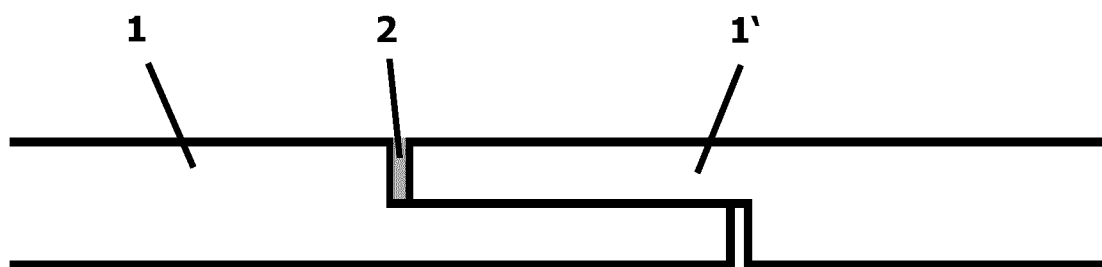


Figure 3

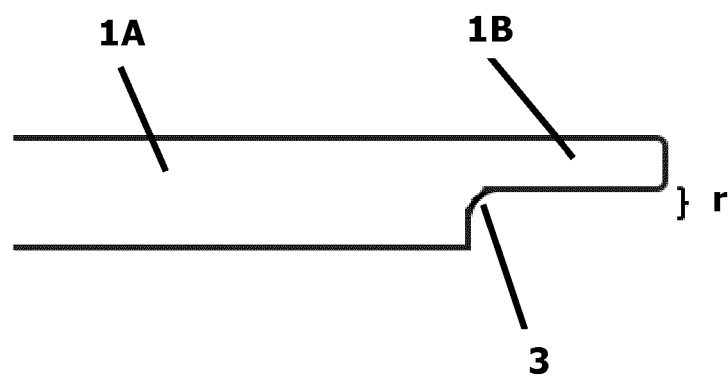
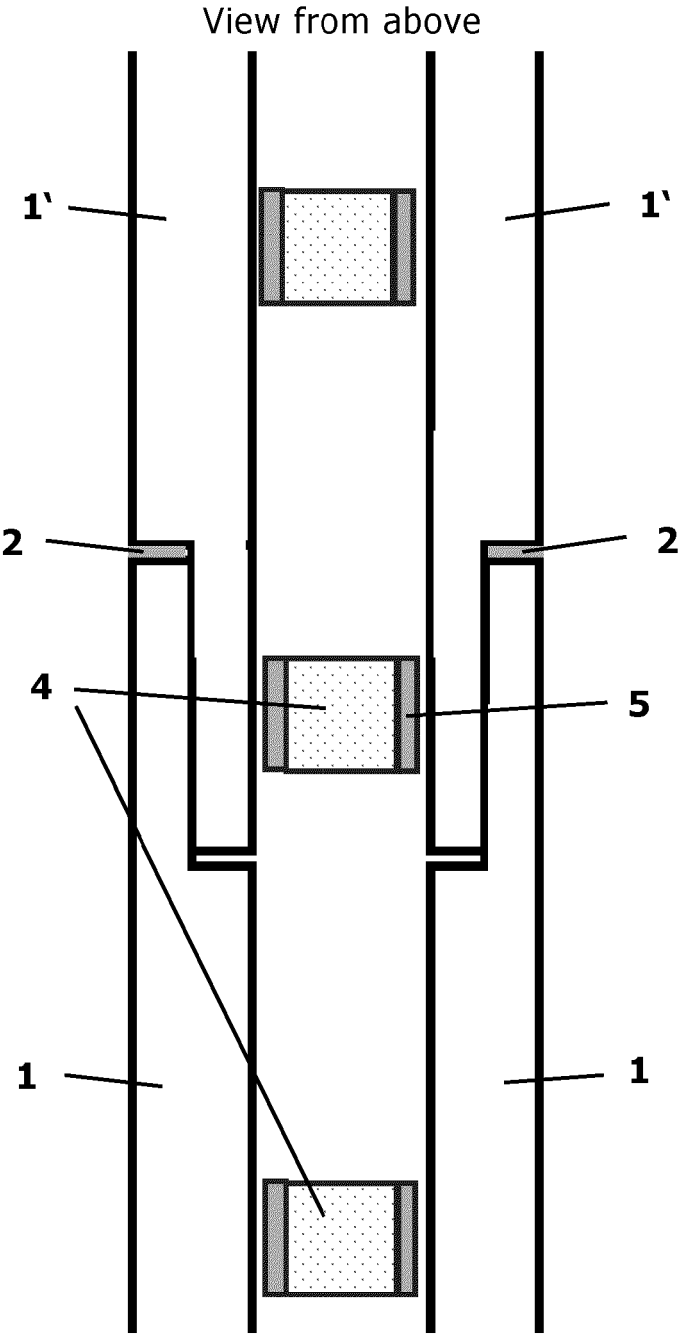


Figure 4





EUROPEAN SEARCH REPORT

Application Number

EP 24 21 2205

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	US 11 851 874 B2 (CERTAINTED GYPSUM INC [US]) 26 December 2023 (2023-12-26) * columns 42-43,30; figures 1,42,45 * -----	1-15	INV. E04C2/04
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			TECHNICAL FIELDS SEARCHED (IPC)
			E04C
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		16 April 2025	Saretta, Guido
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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