July 20, 1954 W. KRAUSE 2,683,980

INSULATED BUILDING STRUCTURE

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FIG. 1.

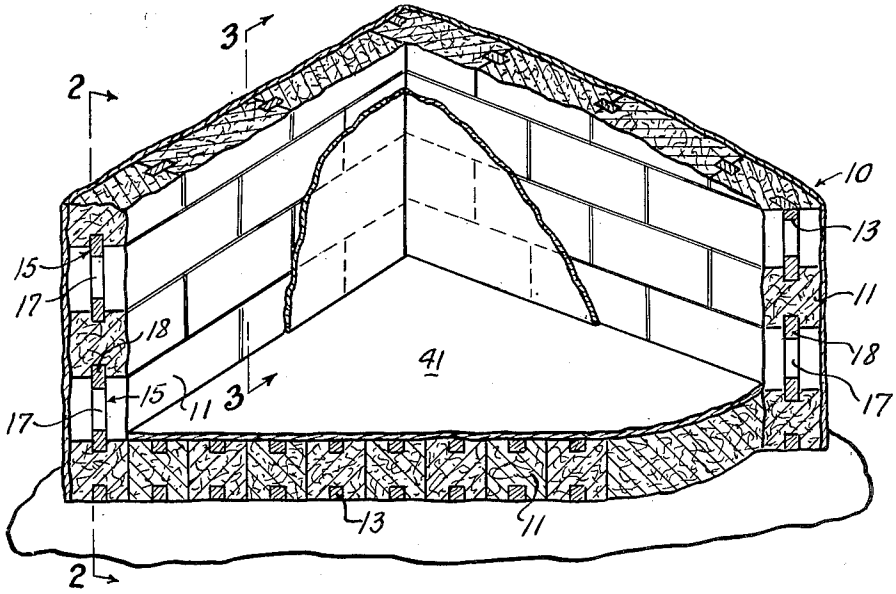
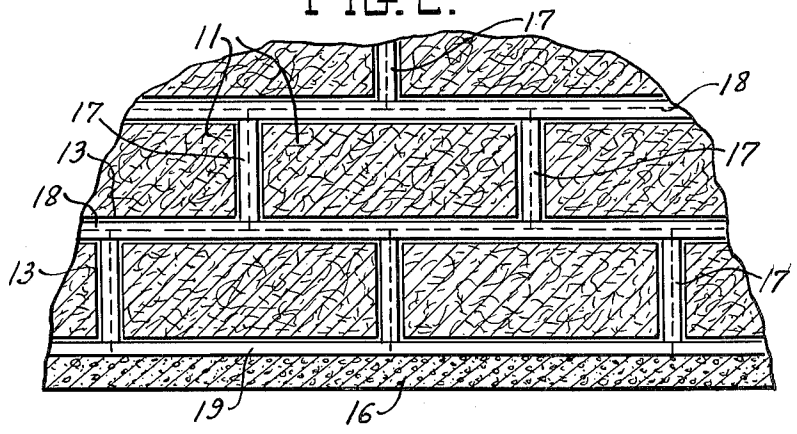



FIG. 2.



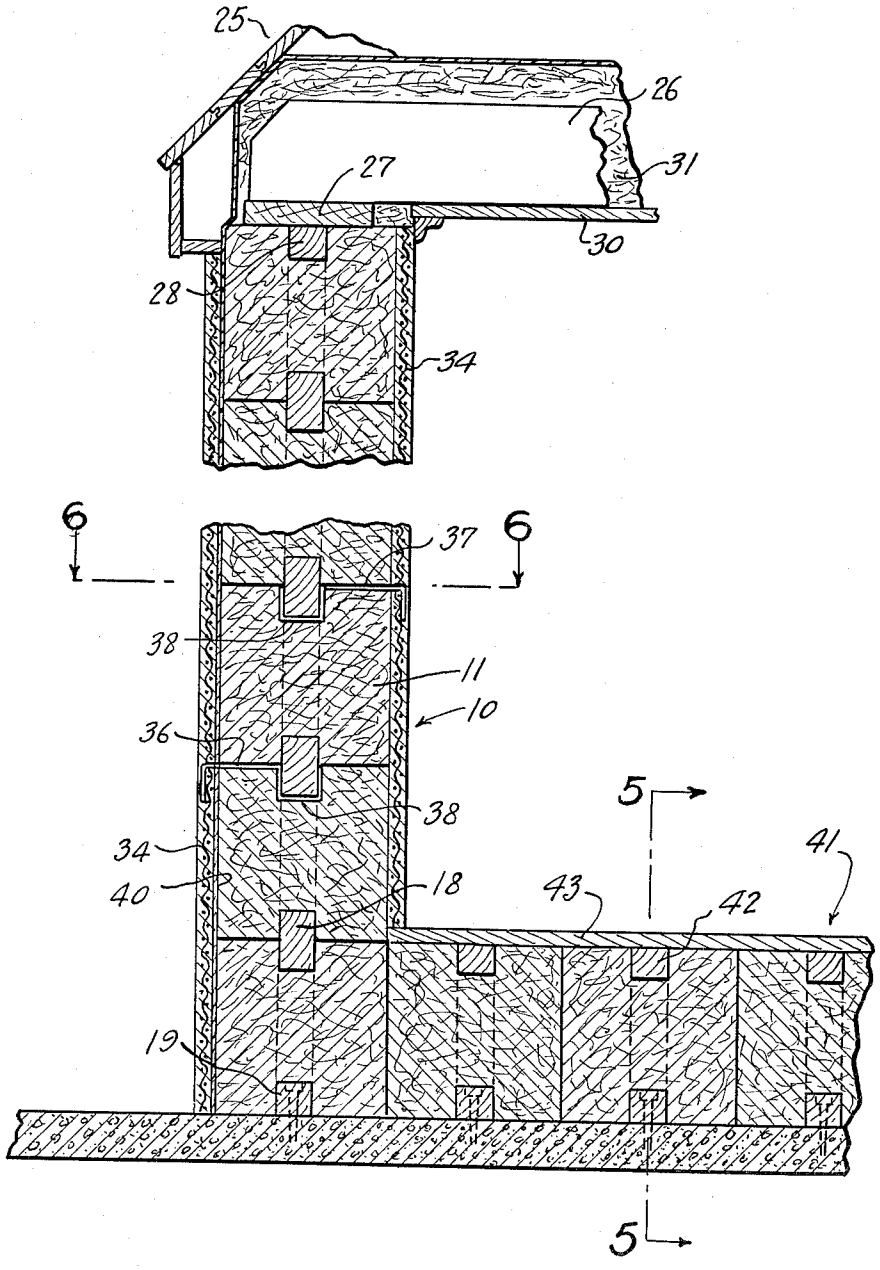

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FIG. 3.




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FIG. 4.

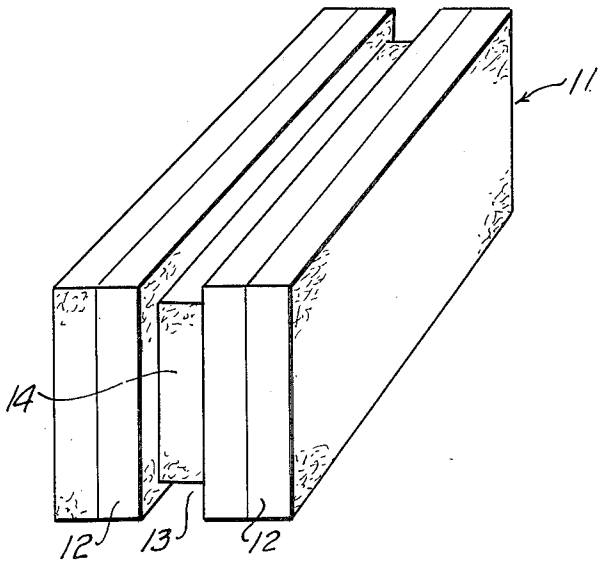



FIG. 6.

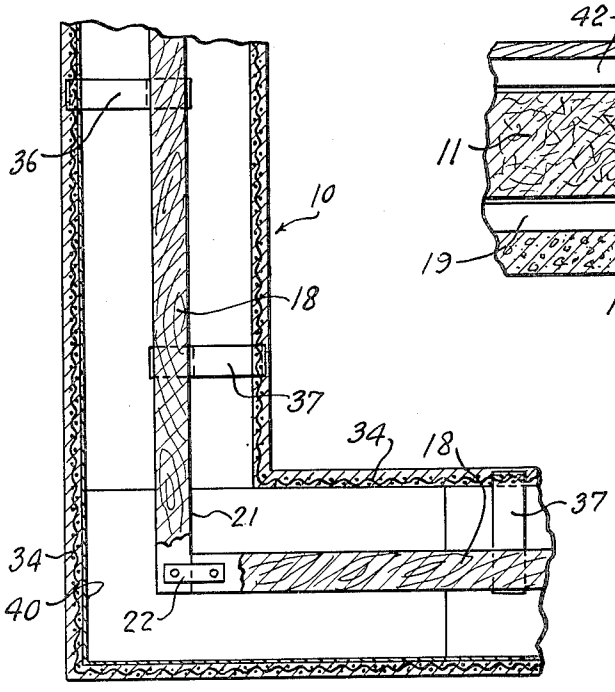
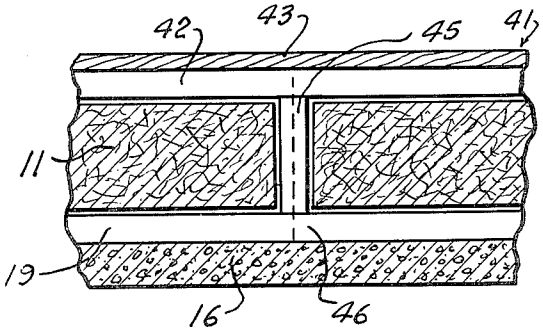



FIG. 5.




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# UNITED STATES PATENT OFFICE

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## INSULATED BUILDING STRUCTURE

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Application December 21, 1945, Serial No. 636,536

6 Claims. (Cl. 72—45)

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This invention relates to insulating walls for storage buildings or compartments and also refers to an improved construction of building block or slab employed in the fabrication of such walls.

In fabricating insulating walls for buildings or storage compartments difficulty has been experienced in securing the insulating material to the supporting framing without having structural elements extend through the wall and provide a path for the conduction of heat or vapor. Such a path, even though highly restricted, is objectionable, because it enables relatively free transmission of heat through the wall and results in a loss in efficiency. It is especially troublesome in low-temperature insulated structures such as freezing lockers where resulting moisture condensation and the formation of ice in the insulation not only impairs the efficiency but even shortens the life of the insulation and the insulated structure.

One of the objects of this invention is to overcome the above objections by providing an insulated compartment, room, or house having no framing or supporting members extending through the insulation. The present invention comprises a relatively simple load bearing frame having structural members assembled in the wall in a manner to transfer loads on the wall to the foundation independently of the insulating material forming the wall.

Another object of this invention is to provide an insulating wall built up of standard sized preformed structural units or blocks of insulating material. The blocks have registering grooves or channels along their edges for receiving the structural members of the load bearing frame. The structural members not only serve to support loads independently of the blocks or units, but in addition, cooperate with the grooves in the blocks to key them together.

A further object of this invention is to provide insulating blocks of the above general type capable of being laid in juxtaposition to form an insulating floor with the grooves in alignment for receiving furring strips to which flooring may be attached.

A still further object of this invention is to provide an insulating structural block that may be assembled with like blocks without cutting or fitting to build up a wall of insulation.

Still another object of this invention is to provide an insulating block that may be formed merely by laminating a plurality of standard size sheets or boards of insulation.

The foregoing as well as other objects will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawing, wherein:

Figure 1 is a fragmentary perspective view of an insulated building structure embodying the features of this invention;

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Figure 2 is a vertical sectional view showing the frame structure employed in the wall of the invention and taken on the line 2—2 of Figure 1;

Figure 3 is a cross section through a part of the wall and floor of the invention taken on the line 3—3 of Figure 1;

Figure 4 is a perspective view on an enlarged scale of one type of building block;

Figure 5 is a sectional view taken on the line 5—5 of Figure 3; and

Figure 6 is a horizontal sectional view taken on the line 6—6 of Figure 3.

The present invention may be advantageously used in fabricating walls, partitions, compartments or buildings where it is highly desirable to reduce heat transfer through the walls to a minimum. Examples of such applications are cold storage rooms, freezing lockers, and like compartments, buildings or other enclosures within which it is essential to maintain low temperatures.

With the above in view, reference is made to Figure 1 of the drawings, wherein the reference character 10 designates a wall comprising prefabricated blocks or structural units 11 formed of an insulating material and capable of being laid in courses in accordance with accepted masonry practice. Although the invention is not limited to any specific type of insulating material, nevertheless it is preferred to use a fibrous mineral material such, for example, as slag, rock or glass wool. Particularly satisfactory results are obtained by using a glass fibrous material of the type wherein the fibers are bonded together by a thermosetting resin, as disclosed, for instance, in Bergin and Simison Patent No. 2,252,157. An insulating material formed of interbonded glass fibers not only lends itself to economical manufacture, but in addition has superior insulating qualities and weathering characteristics.

In any case the density of the insulating material is sufficient to impart the requisite strength to the blocks, and for ordinary applications, densities of fibrous glass of about four pounds per cubic inch to nine or more pounds per cubic inch are suitable. The thickness of the blocks may vary from three inches or less to twelve inches or more, depending upon the use to which the blocks are to be put. The length and width of the blocks may vary substantially and are more or less determined by the size that may be conveniently handled. A block about six by twelve by thirty-six inches has been found one very convenient size although others may be used as found most suitable in certain applications.

The blocks may be cut from a single piece of interbonded fibrous material of the specified thickness or they may be formed in the manner

shown in Figure 4 of the drawing by laminating together a plurality of relatively thin boards 12 of the insulating material. In the latter case, the boards or laminations 12 are integrally joined in juxtaposition in conventional way by a suitable moisture-resistant adhesive such, for example, as asphalt.

Each of the blocks 11 is formed on its four edge faces with grooves 13 extending continuously around the perimeter of the blocks. In instances where the blocks are formed of one piece construction, the grooves 13 are formed by cutting or routing the edge faces of the blocks and in cases where the blocks are formed from a plurality of laminated boards of insulating material, one of the intermediate boards or laminations 14 may be made sufficiently smaller than the adjacent laminations 12 to form the grooves 13.

In constructing the wall 10, the blocks 11 are laid in courses with the grooves 13 in adjacent blocks in registration and the blocks are united by applying an adhesive on the inter-engaging edge faces thereof. Hot asphalt, asphalt base compounds or materials having similar characteristics may be satisfactorily used for the above purpose by brushing, mopping or troweling a thick film, say ⅛ to ¼ inch thick, onto one or both of the inter-engaging faces.

As the courses are built-up, structural members 15 of wood, metal or other material are inserted in the registering grooves of the blocks and not only accurately position the blocks relative to each other, but also assist the adhesive in holding the blocks in place. In detail, as the first row of blocks is laid on the foundation 16 in a bed of asphalt or the like if desired, vertical stud members 17 are inserted in the registering vertical grooves in opposite edges of the blocks, and a horizontal lintel member 18 is inserted in the aligned grooves in the top faces of the blocks.

The second row or course is laid on the first row in accordance with conventional masonry practice with the vertical edge faces offset from the corresponding vertical faces of the first row. The thickness of the lintel members 18 approximates the combined depth of the registering grooves in the blocks, so that as the second row of blocks is laid on the first row, the grooves in the bottom edge faces of the blocks receive the upper portions of the lintel members 18. As in the first course, studs 17 are inserted in the registering grooves formed in adjacent vertical edges of the blocks in the second row and not only cooperate with the lintels 18 to position the blocks in the second row in a common plane with the blocks in the first row, but in addition, assist in securing the blocks together. The above procedure is followed in laying succeeding rows of block, so that upon completion of the wall the structural members cooperate to form a load bearing frame having the studs 17 vertically supporting the lintels 18 in spaced apart relation, the whole frame resting on the foundation 16. If desired, key strips 19 may be secured to the foundation 16 by lag-screws to aid in positioning the first course of insulating blocks on the foundation. When the key strips are provided the first course of studs 17 rests upon these key strips, as shown in Figure 2.

The ends of the lintels in adjoining side walls may be connected together as shown in Figure 6. Here the lintel 18 in one side wall is extended into proximity to the lintel 18 in the adjoining wall, as by cutting a groove 21 in the insulating block at the end of the wall, and the ends of the lintels are tied together by a metal strap 22 nailed or screwed to the two lintels.

The frame of studs and lintels is concealed in the wall and not only supports and ties together the blocks but is also adapted to support roof or ceiling loads independently of the blocks. The construction of the present invention is such that no part of the load bearing frame projects through the wall and, as a result, no direct path exists through the wall for the conduction of heat or vapor.

As illustrative of the manner in which the roof may be supported by the walls, there is shown in Figure 3 a roof structure 25 of conventional form and that includes rafters 26 resting on bearing plates 27, the bearing plates being supported on lintels 28 received in the grooves in the upper edge of the blocks 11 of the top course. A ceiling 30 may be suitably suspended from the rafters 26 and backed up with insulation material 31.

Either or both surfaces of the walls may be covered with plaster, cement or some other type of wall finish. Finishing material of the above type is usually applied to wire lath or mesh 34 and the latter is attachable to the wall surfaces by metal clips 36 and 37. As shown in Figure 3 of the drawing, the clips 36 are U-shaped at the inner ends to provide channel-shaped portions 38 of a size to enable inserting the same in the grooves at one edge of the blocks with the channels opening upwardly to receive the lintels 18. The ends of the clips 36 project outwardly between the surfaces of adjacent blocks and the free ends extend through the wire mesh 34 on the outer surface of the wall where they may be bent over to secure the mesh or lath in place.

The clips are, of course, placed in the respective grooves in the blocks as the latter are laid in courses and before the lintels are inserted in the grooves, so that the clips are firmly held in place by the lintels. The clips 37 are identical to the clips 36 and are assembled with the wall in the same manner. The clips 37 project inwardly beyond the inner surface of the wall for attaching wire mesh 34 or wire lath to the latter surface of the wall. In practice, care is preferably taken to avoid assembling the clips 36 and 37 in the same groove in proximity to each other to thereby avoid a circuitous heat-conducting path through the wall. Between the wire mesh and the outer surface of the wall of insulating material there is provided a suitable vapor barrier 43 of asphalted paper mopped with a suitable bitumen and held to the wall by the wire mesh aided, if desired, by a coating of asphalt or the like mopped or brushed onto the outer surface of the wall before the asphalted paper is applied.

In Figures 1 and 3 of the drawings, insulating blocks are shown as being laid side by side on the foundation 16 to form an insulating floor 41. The blocks are laid with the grooves in the top edges in alignment and furring strips 42 are inserted in the grooves. Suitable flooring 43, such for example, as hard wood strips may be readily secured to the furring strips, and the weight of the flooring is transmitted to the foundation 16 through stud members 45 inserted in the registering grooves formed in adjacent vertical edges of the blocks. Key strips 46 similar to the furring strips 42 may be secured by lag-screws or the like to the foundation to aid in aligning the insulating blocks, although these key strips are usually not necessary.

Various modifications may be made within the

spirit of the invention and the scope of the claims.

I claim:

1. A building structure comprising a plurality of preformed insulating blocks having grooves extending continuously around the perimeter of the blocks intermediate opposite side surfaces of the blocks and laid in courses to form a wall with the grooves in adjacent blocks in registration, the registering grooves in the horizontal edges of adjacent superposed blocks cooperating to form vertically spaced channels which extend continuously throughout the length of the wall and the registering grooves in the vertical edges of said blocks cooperating to form vertical channels staggered with respect to each other, and a load bearing frame structure having rigid tension members disposed in the horizontal channels and having rigid compression members disposed in the vertical channels, said members making abutting contact at their points of intersection and supporting said blocks.

2. A building structure comprising a plurality of preformed relatively thick blocks of mineral wool insulating material having grooves extending continuously around the perimeter of the blocks intermediate opposite side surfaces of the blocks and laid in courses to form a wall with the grooves in adjacent blocks in registration, the registering grooves in the horizontal edges of adjacent superposed blocks cooperating to form vertically spaced channels which extend throughout the length of the wall and the registering grooves in the vertical edges of alternate rows of blocks cooperating to form aligned vertical channels offset with respect to the corresponding vertical channels in the adjacent rows of blocks, and an independent load bearing frame structure having rigid tension members disposed in the horizontal channels and having load supporting compression members disposed in the vertical channels, said members making abutting contact at their points of intersection and supporting substantially all the weight of said blocks.

3. A building structure comprising a plurality of preformed blocks of fibrous insulating material laid in courses to form a wall and having registering grooves intermediate opposite side surfaces, a load bearing frame structure associated with said blocks and supporting the weight thereof including rigid frame members respectively disposed in the registering grooves of adjacent blocks and abuttingly associated to form a continuous frame structure, and attaching means for wall surfaces including clips having channel portions seated in certain of said grooves and held in place by the frame member in the latter grooves.

4. A building structure comprising a plurality of preformed insulating blocks having grooves extending continuously around the perimeter of the blocks intermediate opposite side surfaces of the blocks and laid in courses to form a wall with the grooves in adjacent blocks in registration, a load bearing frame structure on which said blocks are supported, said structure including frame members disposed in the registering grooves of adjacent blocks and abuttingly contacting each other at their points of intersection, attaching clips anchored in certain of the grooves by the frame members in the latter and projecting between adjacent edges of the blocks beyond one side of the wall, and a wall surface supporting structure secured to the projecting ends of the clips.



5. A building structure for forming hot or cold storage rooms comprising preformed blocks of fibrous insulating material laid end to end and having registering grooves in the top and end surfaces, furring strips disposed in the grooves in the top surfaces of the blocks, and vertical load supporting struts disposed in the registering grooves at the ends of the blocks cooperating with the furring strips to provide a frame for absorbing the load on the structure.

6. A building structure comprising a plurality of preformed insulating blocks of fibrous matter having grooves extending continuously around the perimeter of the blocks intermediate opposite side surfaces of the blocks and laid in courses to form a wall with the grooves in the horizontal edges of adjacent superposed blocks cooperating to form vertically-spaced horizontal channels which extend continuously throughout the length of the wall and registering grooves in the vertical edges of said blocks cooperating to form horizontally-spaced vertical channels, the vertical channels in adjacent levels of said blocks being staggered with respect to each other, and a load-bearing frame structure having rigid horizontal members disposed in the horizontal channels and rigid compression members disposed in the vertical channels, whereby said blocks are aligned both horizontally and vertically, said horizontal members being connected at their points of intersection to hold said blocks and members against lateral displacement within said building structure, said compression members abuttingly contacting the horizontal members between which they are disposed to effect a bearing of the load of the upper level of horizontal members which such horizontal members contact, whereby said frame structure supports all the weight of each of said blocks separately.


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