Aug. 8, 1933. R. S. FROBISHER 1,921,518

INSULATING BLOCK

Filed Feb. 19, 1930

Fig. 1

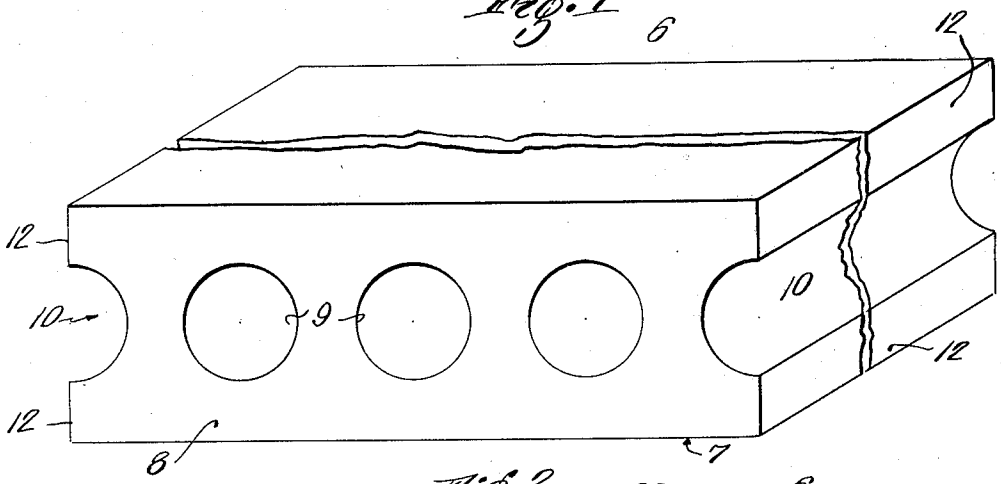


Fig. 2

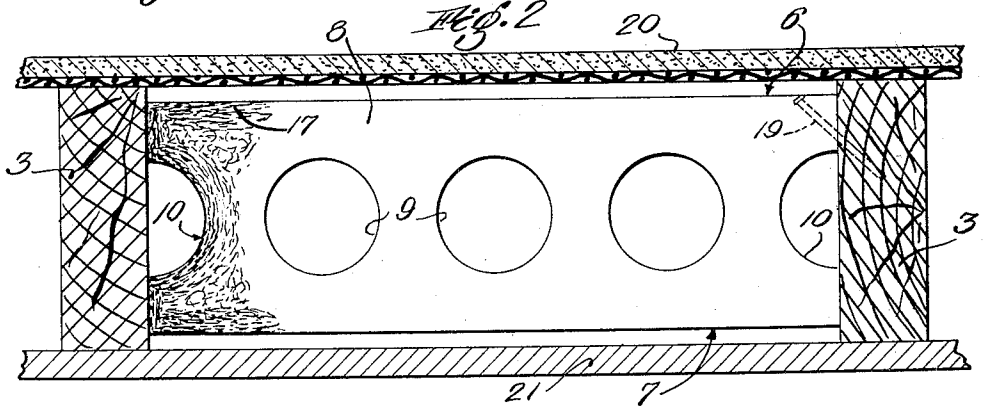


Fig. 3

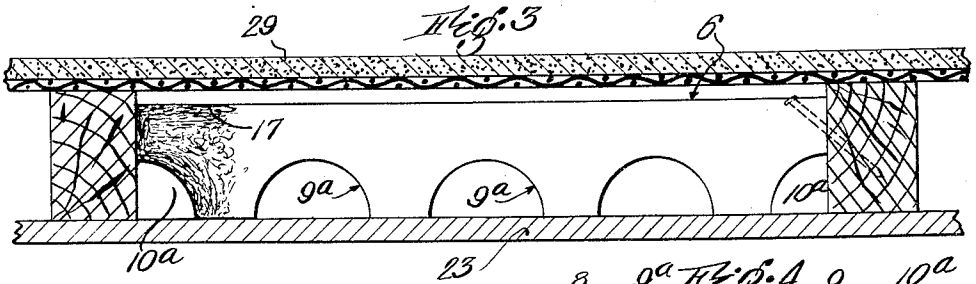


Fig. 5

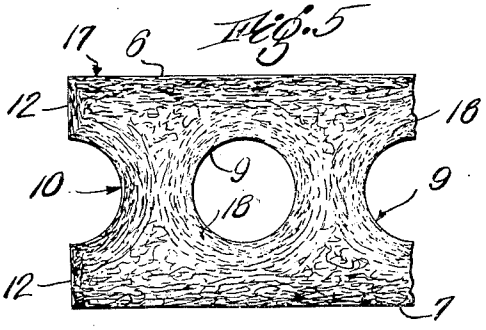
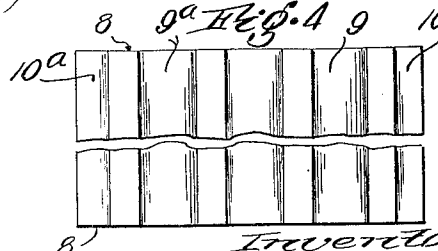


Fig. 4



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UNITED STATES PATENT OFFICE

1,921,518

INSULATING BLOCK

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Application February 19, 1930. Serial No. 429,607

5 Claims. (Cl. 20—4)

This invention relates to a new building block and more particularly to a block of this character which is formed of fibers suspended in a liquid such as water to compose a pulp analogous to that used in the manufacture of paper or fiber board. A further aspect of the invention relates to the combination of such a block with the elements of a wall structure or the like.

In accordance with the present invention, comparatively fine fibers such as those ordinarily employed in the manufacture of fiber board as well as various vegetable fibers such as bagasse, sesbanium, flax, corn stalks, or many other fibers which may be suspended in water, may be formed into a large block which is particularly satisfactory for providing heat insulation and/or sound insulation in walls and roofs. Heretofore fiber boards have been manufactured from a suspension of fibers in water by depositing upon a suitable moving screen. The thickness of such material has been definitely limited, due to the ineffective filtering of the water through the fibrous mass as the same became greater in thickness; accordingly the commercial limit upon the thickness of board of this character has become well recognized in the trade and it was believed that the only feasible method of providing thicker layers of this material with high insulating ability necessitated the employment of superimposed layers of fiber board. Since the production of each of these fiber board laminæ would entail a separate manufacturing operation, such an arrangement woud be prohibitive in cost when a thick, highly effective insulating layer was desired.

The present invention affords a block which may have a much greater thickness than that attainable with the process of manufacturing felted fiber board heretofore employed, and which accordingly may be dimensioned substantially to fill spaces in walls between opposite layers of building material, such as sheathing, lathing and plaster, or the like as the same are ordinarily employed in commercial building construction. For example, fiber boards heretofore formed by the depositing of a water pulp upon a screen have ordinarily had a thickness of one inch or less, while the present invention permits the ready formation of a block which may have a thickness of six or eight inches. In order to permit this desirable result I provide a block which contains a plurality of core openings that are effective in permitting the suitable depositing of the fibrous material and the drainage of the liquid therefrom, so that the thickness of any given portion of the fibrous mass is so determined that drainage therefrom to a suitable surface may readily take place as permitted by the filtering qualities of particular materials employed.

In accordance with this invention therefore, a block is provided which may be bulky and yet which may be relatively light, being provided with the internal core openings which not only permit the effective formation of a thick and relatively bulky block of felted fibers, but which also enhance the lightness of the completed block and which are effective in aiding insulation. A block of this character may be manufactured in a suitable form by passing the pulp into the same and permitting the drainage of water from the exterior walls of the form. Apparatus of the type suitable for manufacturing a block of this character is disclosed in my copending application, Serial No. 453,993, filed May 20, 1930. Preferably the movement of pulp into the form and the movement of water from the same not only is effective through gravity but under the action of a differential in pneumatic pressure, which if desired may be continued after the movement of the pulp itself into the form has been terminated.

Preferably the perforated, tubular core members which permit the passage of liquid may be rotated and may be arranged to feed the pulp to the interior of the form. This arrangement results, due to the rotation of the cores, in the disposition of the fibers adjoining the core openings in a direction which tends preponderantly to be tangential to the cores, thus affording strength particularly in a direction radially of the openings and affording a strong arch-like structure. The felting of the fibers in this manner permits the formation of a block which is light and contains numerous minute air cells; accordingly the material may have a specific gravity in the vicinity of 0.20 to 0.25 when wood pulp is employed. The movement of the air and liquid toward the exterior drainage surfaces or foraminous walls of the form results in a thicker deposit adjoining these surfaces which accordingly may be relatively dense and tough and wherein the fibers may tend to extend parallel to said surfaces, while the block gradually becomes more porous adjoining the core openings. Furthermore a block of this character is ordinarily somewhat yieldable or compressible so that especially accurate cutting of the same is not necessary, and so that if the same is cut or formed slightly over-size it may in many

instances be readily wedged or tightly fitted between frame members such as studs, joists or purlins.

Preferably in order to permit a block to have more satisfactory disposition of its constituent material to afford the maximum structural strength and yet to permit the effective draining of the water from the pulpy mass, grooves which may be substantially semi-circular may be provided at the ends of marginal portions of the blocks which are parallel to the axes of the core openings.

In the accompanying drawing:

Fig. 1 is a perspective view of a portion of a block formed in accordance with this invention;

Fig. 2 is a sectional view showing the manner in which the block may be secured to the frame elements of a wall, roof or the like;

Fig. 3 is a section somewhat similar to Fig. 2 showing the manner in which a split block may be assembled in a wall not only to afford a thick insulating layer but also to cooperate with the outer layers of building material in providing dead air pockets and additional insulating effectiveness;

Fig. 4 is a broken elevational view of the split block shown in Fig. 3; and

Fig. 5 is a sectional portion of the block showing the manner in which the fibers are disposed and distributed in the same.

Referring to the accompanying drawing, a block formed in accordance with the present invention may be of generally rectilinear form with plane faces 6 and 7 and marginal faces 8 at right angles thereto, at least one and preferably a plurality of core openings 9, which may be cylindrical, extend through the block from one of the faces 8 to the other thereof. Preferably the remaining marginal faces of the block may be provided with recesses or continuous grooves 10, which may be substantially semi-cylindrical and parallel the core openings. The marginal faces 12 of the block at either side of each groove 10 may be substantially in the same plane and at right angles to the faces 6 and 7. The arrangement of the core openings 9 and the grooves 10 permits the effective depositing of material from a water pulp, which for example may compose at least 95% water and 5% or less of the fibers. The fibers may be of any sort, whether vegetable fibers, mineral fibers or a mixture of the same, that are adapted to be felted by being water-laid or deposited from a liquid pulp, thus to permit their felting or firm entanglement without the necessity of an additional binder.

The arrangement of the core openings and the marginal grooves permits the effective manufacture of a relatively thick block of this character despite the definite limitations upon filtering of water from the pulpy mass which have heretofore necessitated the manufacture of articles from this type of material with comparatively thin dimensions. Since the felting of the fibers occurs in a stationary form rather than upon a moving screen, it is possible to make the thickness of the fibrous material between the core openings and the exterior surface greater than that of a fiber board made upon the conventional moving screen, for example, the distance between the core openings and the exterior faces of the block may be of the order of two or two and a half inches when wood pulp is employed. During the felting of the fibers they are more closely deposited adjoining the exterior surfaces and tend to lie somewhat parallel to the same, thus providing a somewhat more dense structure, designated 17 (Fig. 5) adjoining these surfaces while the greater resistance to the movement of fluid through the felted mass results in a lighter, more porous structure adjoining the core openings.

The core members, if rotated, tend to cause the adjoining fibers to lie more or less in the direction of rotation, accordingly the material adjoining the core openings tends to have a preponderant disposition of fibers in a direction which is substantially concentric to the openings, as designated by numeral 18, thereby enhancing the strength of the arch-like structure of this lightly felted portion of the block.

In use a block of this character may be arranged, as shown in Fig. 2, between frame elements 3 such as studs, joists, or purlins, and due to its slightly yieldable nature the block may be molded or cut substantially to dimensions and then wedged between the frame elements, or if desired nails 19 or the like may be employed to aid in holding the block in place. If desired, the block may be located in spaced relation to the outer layers of building material, which are designated by numerals 20 and 21, thus providing air pockets adjoining each of these layers.

In many instances a thick block of this character may be cut to form two blocks by severing the original block in the plane of the axes of the core openings. Such a block is shown in Fig. 4 and is characterized by one plane face 6 and a plurality of grooves 9^a and 10^a. The plane aligned faces which are formed by sawing may be juxtaposed to a layer of building material, such as sheathing 23, the grooves 9^a and 10^a, cooperating therewith in providing insulating pockets, while the opposite face 7 of the block may be spaced from the other layer 29 of building material, which as illustrated in Fig. 3, may for example comprise lathing and plaster. A block of this character may be wedged and/or nailed in place in the same general manner as has been described with reference to Fig. 2.

From the foregoing it will be evident that a block of the character disclosed herein may be relatively thick and bulky, while permitting the effective employment of material of the type which is formed by the felting of a water pulp and the drainage of the water, thereby permitting the employment of this material in thick layers to afford excellent insulating qualities, while not entailing high cost or necessitating the separate assembly of a plurality of fiber board sheets with consequent high cost of manufacture. Material of this character may readily be cut as by sawing and may be nailed if desired, and it is provided with a surface which permits the ready application of plaster or stucco directly thereto. A suitable water resistant agent such as a rosin size may be included in the basic pulp, if desired.

I claim:

1. An insulating block for building construction comprising a light mass of fibers felted to provide material having many minute air cells, the fibers being of the type which may be deposited from a water pulp, said block having exterior faces including opposite plane faces, said block having a core opening spaced from its exterior surfaces and extending through the block, the fibers adjoining said opening having a preponderant direction of extent which is tangential to the opening.

2. An insulating block for building construction comprising a light mass of fibers felted to provide

material having many minute air cells, the fibers being of the type which may be deposited from a water pulp, said block having exterior faces including opposite plane faces, said block having a core opening spaced from its exterior surfaces and extending therethrough, the fibers adjoining said opening having a preponderant direction of extent which is tangential to opening, the portions of said block adjoining exterior surfaces being characterized by a fibrous distribution which is relatively more dense than that of the interior thereof.

3. An insulating block for building construction comprising a light mass of fibers felted to provide material having many minute air cells, the fibers being of the type which may be deposited from a liquid pulp, said block having exterior faces including opposite plane faces, said block having a core opening spaced from its opposite plane exterior surfaces and extending through the block, the fibers adjoining said opening having a preponderant direction of extent which is tangential to the opening, the fibers being more closely disposed adjoining exterior surfaces of the block and being gradually less closely disposed adjoining the opening whereby the structure of the block adjoining the opening is characterized by a lightly felted arrangement of fibers which are disposed tangentially of the opening.

4. In a building, frame elements, outer parallel layers of building material secured thereto, an insulating block of felted fibrous material between said layers with a plane face spaced from one of the same to provide a dead air pocket, and a groove adjoining the opposite layer cooperating therewith in providing an air pocket.

5. An insulating block for building construction comprising a light mass of fibers felted to provide material having many minute air cells, the fibers being of the type which may be deposited from a water pulp, said block having exterior faces including opposite plane faces, said block having a core opening, the felting of the fibers being more dense adjoining the exterior surfaces of the block, and being relatively less dense adjoining the core opening, the relatively densely felted portion adjoining the exterior surfaces gradually merging into the less densely felted portion adjoining the core opening.

RALPH S. FROBISHER.