Aug. 8, 1933. W. L. HODGES 1,921,524

METHOD OF MAKING INSULATING BLOCKS

Filed Aug. 27, 1930 2 Sheets-Sheet 1

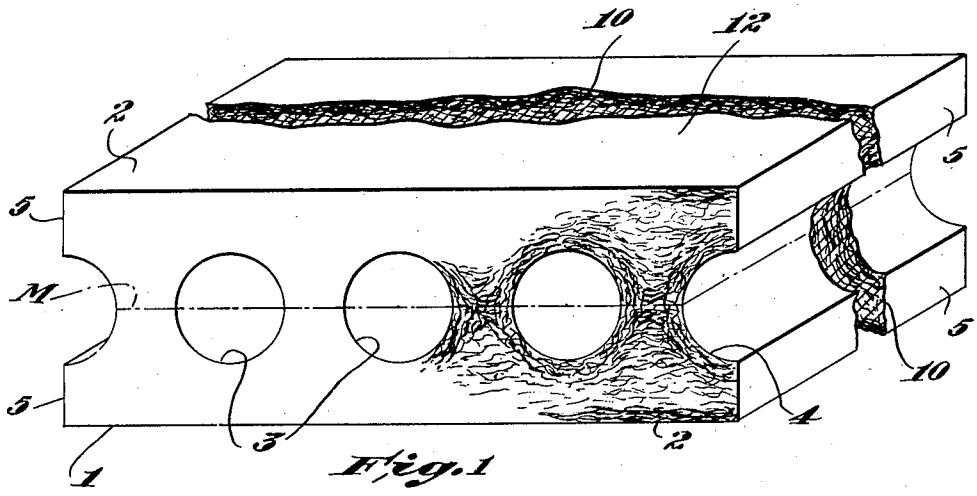


Fig. 1

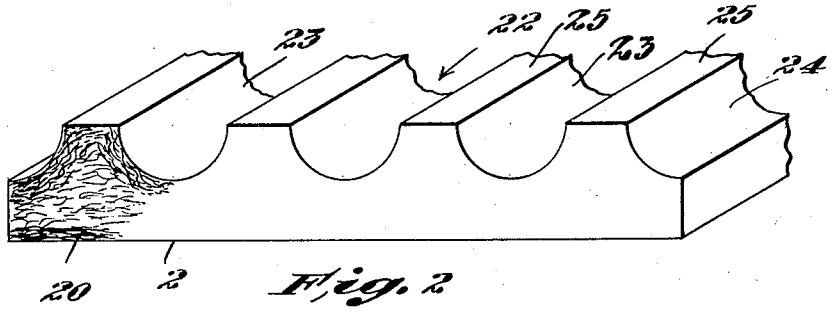


Fig. 2

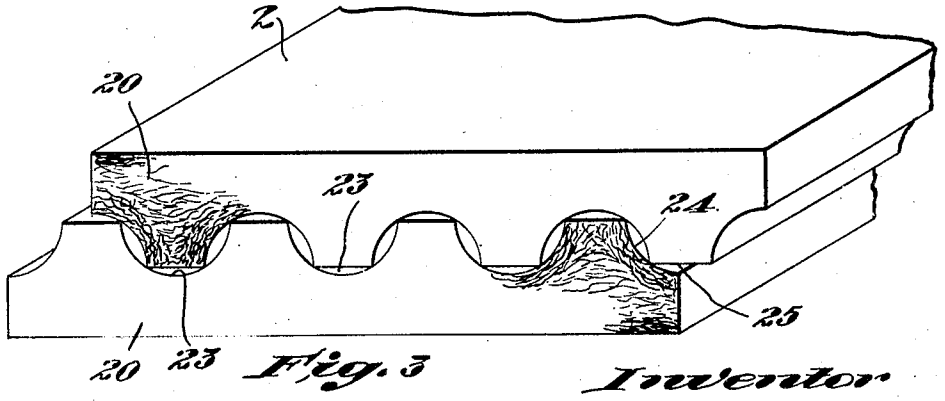


Fig. 3

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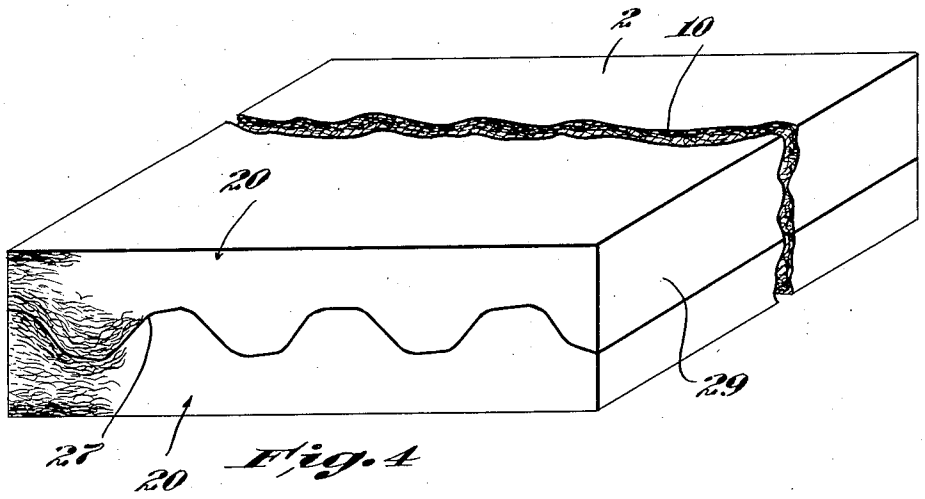


Fig. 4

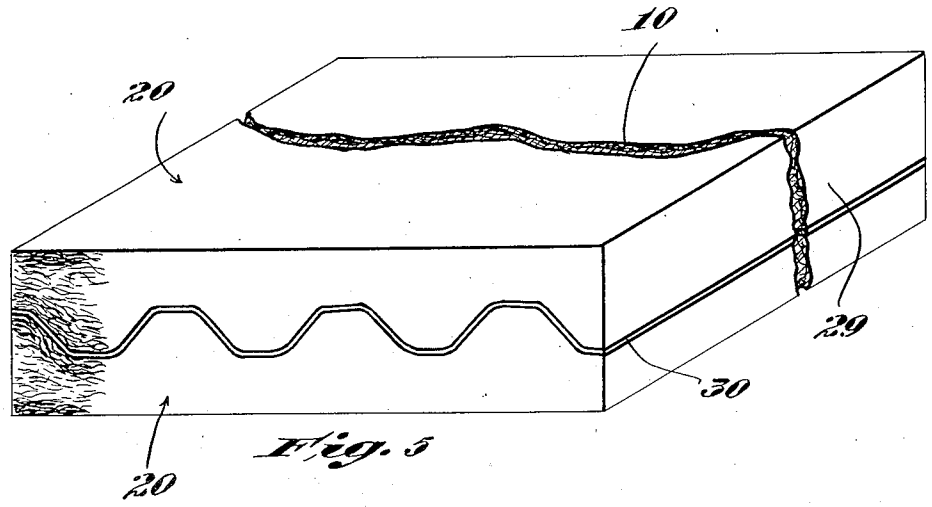


Fig. 5

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METHOD OF MAKING INSULATING BLOCKS

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Application August 27, 1930. Serial No. 478,125

2 Claims. (Cl. 154—28)

This invention relates to an improved type of insulating block and particularly to a substantially solid, relatively bulky, block formed of felted fibrous material, such as felted wood or vegetable fibers and to a process of making the same. The copending application of Ralph S. Frobisher Serial No. 453,993, filed May 20, 1930, discloses a method and apparatus for producing a comparatively thick integral block of porous or lightly felted fibrous material which is felted from a water pulp. For this purpose a plurality of perforated cores are disposed within a foraminous casing, which in turn is located in a vacuum jacket, and pulp is introduced through the cores and collects about the same and between the same and the jacket to provide a block of relatively great thickness, having a plurality of parallel core openings extending therethrough. The copending application of Ralph S. Frobisher, Serial No. 429,607, filed February 19, 1930, is directed more particularly to a block of the character just described.

Blocks of the character disclosed in the above-identified copending applications are advantageous since they may be relatively thick and yet light in weight. For example, under conditions of commercial production it has been found impractical to manufacture fiber boards upon a felting or making screen with a thickness substantially over one inch, while in accordance with the above-identified applications a block may be provided having a thickness of as much as eight inches at a cost much lower than that which would be involved by the superimposition of a plurality of separate fiber board laminæ to provide a block of corresponding thickness or heat insulating ability.

The present invention is more particularly directed to the provision of a relatively thick block which may be formed of the units or blocks such as are provided in the above-identified Frobisher applications, which however will be free from the core openings that characterize the blocks shown in these applications, and accordingly will afford material having especially high heat insulating ability, since even the limited, but in some cases objectionable, heat conduction resulting from convection currents in the core openings may be avoided by the present invention. On the other hand, this invention permits the provision of a block having a given thickness or a given heat non-conductive capacity at a much lower cost than that which would be involved were a plurality of ordinary fiber board laminæ to be combined to attain a similar result.

In accordance with the present invention, a block of the character disclosed in the copending Frobisher application is split or cut into two similar slabs, the plane of cutting being substantially defined by the parallel central axes of the core openings. Thus each of the original blocks provides a pair of similar slabs which are characterized by having a plurality of substantially semi-circular grooves or recesses upon one face which are separated by rib portions having substantially plane faces in alignment with each other. The recessed faces of the slabs are then brought into mutual juxtaposition with the protuberant portions or ribs of one slab engaging the recesses of the other slab, and suitable pressure is employed to force the faces of the slabs into mutual engagement or close juxtaposition so that a substantially solid block is provided. The lightly felted fibrous material is particularly advantageous in permitting this desirable result and in permitting the semi-circular recesses and the plane surfaces therebetween to be deformed and to conform to the face of the adjoining slab, so that a tortuous joint is provided between the slabs which has substantially the form of a sinusoidal curve. The slabs as thus pressed into engagement may be held together in any suitable manner. For example the recessed faces of the slabs may be coated with a suitable agglutinant before they are pressed into engagement.

I have found it particularly advantageous however to interpose a sheet of fibrous material, such as cardboard or paper between the recess faces of the slabs, securing the paper by suitable adhesive or agglutinant to both of the recessed faces. Not only does the paper aid the bonding of the slabs, but it also provides a wall separating minute irregularities which normally occur upon the faces of the core openings, thus tending to minimize any local convection currents which might otherwise be set up, and occasionally preventing depressions upon adjoining slab faces from combining to form a crevice of appreciable size. In most cases, after the slabs are combined in this manner, their edges provide margins or overlapping extensions which in effect form rabbets at the ends of the block; preferably these parts of the block may be trimmed off, thus providing a block of substantially rectilinear form with plane faces upon all sides.

Referring to the accompanying drawings,

Fig. 1 is a broken perspective view of an original block having a plurality of core openings extending therethrough;

Fig. 2 is a perspective view of an end portion of

a slab which is formed by cutting a block of the type shown in Fig. 1 along a median plane;

Fig. 3 is a perspective view of portions of a pair of slabs with their protuberant and recessed parts in mutual registration, showing the manner in which the slabs are originally brought into engagement;

Fig. 4 is a view of a block which may be formed by pressing the slabs of Fig. 3 into firm adhesive engagement, and trimming the ends of the slabs; and

Fig. 5 is a similar view showing such a block with a flexible fibrous sheet interposed between the slabs.

Referring to the accompanying drawings, and first more particularly to Fig. 1 thereof, which is a broken perspective view of a block such as is disclosed in the copending applications referred to above, it may be seen that such a block is provided with opposite planar surfaces 2, and a plurality of intermediate core openings 3 which are disposed in parallelism to the planar surfaces 2 and substantially halfway therebetween; also the block may be provided with end grooves 4 which preferably are of semi-circular form, the grooves having the same general dimensions as the intermediate core openings 3, and the planar edge surfaces 5 extending from these grooves to the main planar surfaces 2. Similarly the ends of the block may be planar with the openings 3 extending from one end to the other. A block of this character ordinarily is characterized by a somewhat closer aggregation of the fibers, designated by numeral 10, adjoining the outer faces of the block, this denser structure resulting from the tendency of the fibers to move toward the outer foraminous lining of the making form under the action of vacuum and liquid head. Inwardly of its outer faces the block is characterized by a looser felting of the fibers, and is accordingly more readily compressible, possessing however considerable resilience or tendency to regain its original shape after compression. Adjoining the core openings, particularly if rotary cores are employed, there is a tendency for the fibers to lie in directions preponderantly tangential to the opening, thus providing an arch-like arrangement of the fibers in this part of the block.

A block of the character just described is more fully disclosed and described in the copending application Serial No. 429,607 referred to above, and is particularly referred to as the material from which the products of the present invention are made.

While under some conditions it may be desirable to sever a planar layer or laminae from the outer portions of the original block to provide a fiber board having the additional strength of the surface layer or skin of the original block, and thus leave a block of the same general shape as shown in Fig. 1, but with outer faces which are relatively soft and yieldable, under most conditions I prefer to employ an original block as manufactured with its relatively more dense and stronger structure adjoining the outer faces, and particularly the planar faces 2.

The first step of the process of manufacturing a solid block of an original block shown in Fig. 1, comprises the cutting of the original block 1 along a median plane, (indicated by dot and dash lines and designated by the symbol M in Fig. 1) which extends through the central axes of the core openings. The block may be cut in any suitable manner, as for example by a band saw. The original block is thus divided into two slabs, one of which, designated by numeral 20, is illustrated in Fig. 2. Each of these slabs is characterized by having a planar face 2 and an opposite recessed face, designated in general by numeral 22, which may have a plurality of parallel recesses or grooves 23 which preferably are of semi-circular form. At each end of the slab is a partial recess 24 which defines the surface of a quarter of a cylinder corresponding to the semi-cylindrical surfaces of the recesses 23. Between each of the recesses 23 and between each recess or groove portion 24 and the adjoining recess 23, is a planar surface 25 formed by the cutting of the original block into separate slabs.

A pair of substantially similar slabs 20, which are formed in this manner, may then be brought into juxtaposition, as shown in Fig. 3, with their grooves and intervening ribs in mutually staggered and interfitting relation, so that the recessed portions 23 of each slab receive the planar face portions 25 of the other slab, while the remaining planar face portion 25 of each slab engages a quarter cylindrical groove 24 at the end of the other slab. The slabs as thus brought into contact are then pressed into firm engagement with each other, for example with material having a specific gravity of substantially 0.15 to 0.25, a pressure of between 10 to 75 pounds per square inch, and preferably between 25 and 50 pounds per square inch may be employed to distort the recessed faces of the slabs, so that they are in substantially continuous mutual contact throughout, as illustrated for example in Fig. 4. Due to the yieldability and elasticity of the felted fibrous material, the pressure which is thus imposed upon the slabs and which is effective in distorting their recessed faces, does not necessarily result in material permanent compression of the felted fibrous structure, except adjoining the tortuous joint between the slab. In other words, when the pressure is released the thickness of the material which has been somewhat decreased by the imposed pressure, will again increase so that the material nearly regain its original degree of porosity and heat insulating ability.

It is thus evident that felted fibrous material of this character is particularly advantageous in permitting the firm, substantially continuous, engagement of its recessed and ribbed faces in the manner just described, without necessitating any substantial permanent reduction in porosity or marked increase in weight per unit volume. The slabs as pressed into engagement may be retained in this position to form an integral, substantially solid block by any suitable means. For example, as shown in Fig. 4, a layer of agglutinant 27 may be disposed between the faces of the block, the opposite recessed faces preferably being coated with the agglutinant before the pressure is applied to the slabs. Any suitable agglutinant, such as silicate of soda composition, a casein or animal glue, or the like may be employed for this purpose. Obviously the length of time during which pressure is applied to the block depends upon the setting characteristics of the agglutinant and may vary between a few minutes and several hours.

Blocks when formed in this manner originally will have oppositely projecting extensions or rabbeted end portions, which however ordinarily are trimmed off to provide continuous planar side surfaces 29, as shown in Figs. 4 and 5.

As shown in Fig. 5, I have obtained somewhat more satisfactory results by imposing a sheet of flexible fibrous material, such as paper, designated

by numeral 30 between the faces of the slabs. Preferably the opposite sides of this paper are coated with the agglutinant and it is disposed between the faces of the slabs before they are brought into juxtaposition, as shown in Fig. 3. The employement of the paper layer 30 is particularly advantageous not only in affording a strong joint between the slabs, but also in separating small irregularities which ordinarily occur in the core openings, so that such irregularities upon the opposite slabs do not combine to provide larger openings which might involve some heat loss due to convection currents. The paper automatically adjusts itself to the density and exact shape of the adjoining surfaces of the slabs and forms a suitable anchoring medium to which the relatively soft distorted material is firmly secured, while in the case of substantially registering recesses upon the adjoining faces of opposite slabs, the paper layer separates these recesses and thus cuts down the possible heat loss due to convection currents.

A block of the character disclosed herein is advantageous for many purposes, as for example in buildings, refrigerators, refrigerator cars, or the like, where excellent heat insulating ability is a prime desideratum. Furthermore, such blocks may be readily handled since they are light in weight, although comparatively bulky, so that the installation of heat insulating material of this character may be readily accomplished. Furthermore, the outer skins or denser surface layers 10 provide the block with considerable form-retaining ability despite the relative softness and porous nature of its core. A block of this character may be manufactured in a thickness, for example of four to six inches, at a cost much lower than would be involved if separate fiber board laminæ were to be secured in superposed relation, while an unusually high heat insulating ability is provided. For example, the coefficient of heat conduction of material of this character may be substantially as high as that of granulated cork board.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. Method of making substantially solid insulating blocks out of original blocks formed of yieldable material with a plurality of core openings extending therethrough and having their central axes in a common plane, which comprises cutting each original block substantially in the plane of the axes to provide a pair of slabs each having similar recesses separated by aligned plane surface portions, interfitting the recesses and aligned plane surface portions of a pair of slabs, and pressing the slabs together until their recessed faces are substantially in continuous contact and adhesively securing the slabs in their interfitting relationship.

2. Method of making substantially solid insulating blocks out of original blocks formed of yieldable material, which have a plurality of core openings extending therethrough with their central axes in a common plane, which comprises cutting each original block substantially in the plane of the axes to provide a pair of slabs with similar recesses separated by aligned plane surface portions, disposing a flexible sheet of material between the recessed faces of a pair of slabs while interfitting the recesses and plane face portions of the slabs, and adhesively securing the recessed faces of the slabs to opposite faces of the sheet while applying pressure to the slabs to cause their substantially continuous surface contact with the sheet.

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