

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 1 280 966 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

29.09.2004 Bulletin 2004/40

(21) Application number: **01928138.5**

(22) Date of filing: **08.05.2001**

(51) Int Cl.7: **E04B 1/74**, F01N 1/24,
B29C 33/38, F01N 3/28,
D04H 1/00, D04H 3/07,
D04H 3/14

(86) International application number:
PCT/IB2001/000776

(87) International publication number:
WO 2001/086084 (15.11.2001 Gazette 2001/46)

(54) INSULATING PREFORM AND METHOD OF MANUFACTURE

VORFORMLING FÜR DIE ISOLIERUNG UND VERFAHREN ZU SEINER HERSTELLUNG

PREFORME ISOLANT ET PROCEDE DE FABRICATION

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**

(30) Priority: **09.05.2000 IT BO200265**

(43) Date of publication of application:
05.02.2003 Bulletin 2003/06

(73) Proprietor: **Amadio, Filippo
I-63040 Folignano (AP) (IT)**

(72) Inventor: **Amadio, Filippo
I-63040 Folignano (AP) (IT)**

(74) Representative: **Dall'Olio, Giancarlo
INVENTION s.a.s.,
Via delle Armi, 1
40137 Bologna (IT)**

(56) References cited:

EP-A- 0 531 767	EP-A- 0 692 616
WO-A-92/16785	WO-A-98/24615
US-A- 4 569 471	US-A- 4 774 985

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 280 966 B1

Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to thermal and acoustic insulation obtained by means of continuous glass fiber.

DESCRIPTION OF THE PRIOR ART

[0002] It is known that continuous glass fiber can be used without any decay in a temperature range of 950°C to 1150°C; a "softening" phase begins only at about 1300°C and continues until 1520°C: after having reached this temperature, the glass begins to melt.

[0003] Thus, this material can be used in fields in which medium-low working temperatures are reached as e.g. electrical appliances (stoves, refrigerators or generally motor powered devices), boilers, mufflers for internal combustion engines, etc.

[0004] According to a known system for thermal insulation of a hot body (so as to prevent it from dispersing heat) or for keeping a body cold, or for sound insulation between adjacent walls, the body to be insulated is wrapped with a surrounding preform with thermal and sound insulating properties.

[0005] The preform is obtained by two processes:

- according to a first process, countless filaments forming the glass fiber are oriented; then they are soaked with phenol starch, so as to maintain the desired volume (i.e. maintain the capability for keeping air, which is the actual thermal insulator) and density, and finally they are glued onto a paper or aluminium support (according to the intended use), so as to allow them to be handled and applied;
- according to a second process, basaltic rock is melted to obtain many filaments. The so obtained filaments are excessively fragile and do not keep their own volume, so they are impregnated with phenolic resins to obtain either preformed blocks, which matches the cavities and fill them thus giving them insulating properties, or mats of various thickness and density, which are placed in a desired position.

[0006] The methods used so far do not allow to obtain filaments of exact and selected diameter neither from the glass wool nor from rock wool, actually filaments of 10, 6 and also 2 µm are obtained.

[0007] These filaments are not continuous, but they can break forming separated filaments resembling needles.

[0008] It is to be pointed out that EEC regulations have put these articles into the class II, because they can leave particles smaller than 2 µm, which are breathable, irritating and consequently cancerogenous.

[0009] Another disadvantage of the above methods results from the necessity to use phenolic resins for making the articles suitable for handling; the resins not only emit exhalations, which are sometimes toxic, but also increase the production costs, since they require annealing of the treated article.

[0010] From the publication WO-A-98/24615 a molded insulation product is known produced by means of a process for forming a thermal insulation layer which include advancing a multi-filament strand of continuous filaments through a nozzle, to separate the filaments from each other to form a continuous filament wool, applying a binder to the filaments, placing a charge comprising the wool in a mold and molding the charge to form the insulation layer. In a preferred embodiment, the charge comprises a container formed from a polymer film.

[0011] From another publication, EP-A-531767 it is known a device for adsorption of acoustic and/or hydrodynamic waves, in which a conical, wedge-shaped or pyramidal external circumferential surface, which is constructed as a network, knitted or knotted from a weatherproof material such as rubber or glass fibre, is filled with a fibrous material. The external surface takes the form of a wedge or a pyramid to provide an acoustic dampening effect.

SUMMARY OF THE INVENTION

[0012] The object of the present invention is to propose a heat and sound insulating preform, which can have different conformation in relation to its use.

[0013] Another object of the present invention is to propose a preform, which is not harmful to people.

[0014] A further object of the present invention is to propose a preform obtained by using only one component, i.e. glass.

[0015] The above objects are obtained by a method according to claim 1 and a device according to claim 3.

[0016] The characteristic particular to the invention are set forth in the following description of two preferred embodiments of the proposed shell.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0017] The used glass fiber is formed by various filaments having diameter in the range of 6 to 25 µm (in relation to the product used), put together to form one strand having weight in the range of 136 to 4800 Tex (grams x Km = Tex).

[0018] During the productive process, the glass fiber is covered with a silane starch to allow its workability as well as for shipment and storage needs.

[0019] A tool, obtained by the Applicant using the air-cushion generated by a suitable ejecting nozzle, manages to "inflate" the strand of glass fiber, thus forming a mass of glass fiber resembling wool with highly insulating properties.

[0020] It is to be pointed out that the so obtained glass wool is formed by innumerable continuous threads, having their own elasticity. These continuous threads do not release particles in the air and do not have any "needle" effect while being touched.

[0021] More precisely, more than 5000 continuous threads of diameter equal to 25 μm forming the strand, are separated.

[0022] The separation is not regular, i.e. it does not form paired parallel threads but the threads are disposed in a curvilinear or straight way, so that they intersect each other producing maximum volume. Each thread keeps its own elasticity (though reduced because it is proportional to the cross-sectional area) thus giving the flock a particular softness because of the repeated elastic reaction movement following a compression exerted by any mechanical action thereon (either caused by a human hand or by the metallic structure of a machine).

[0023] Consequently, an extreme bulking of the continuous fiber glass, is obtained, that means that the volume of the glass fiber is increased as much as possible.

[0024] Excellent from the acoustic point of view, a vibrating wall is dampened by a more or less thick flock with any possible shape; handling a glass fiber flock does not require for the operator any safety care by means of particular anti-pollution devices.

[0025] The glass thread is continuous and therefore does not have any needle-like part. The thickness of the glass thread is 25 μm , does not spread in the ambient air and therefore is not inhaled, does not produce chemical vapors or exhalation of any type.

[0026] This softness property obtained with an homogeneous capillary fabric performs the task of keeping air within small spaces and prevents the underlying surface from scattering heat (in other words it prevents temperature drops and the necessity to spend energy to re-integrate it).

[0027] The melting temperature of the glass fiber is about 1.200°C, therefore it can be easily used at temperatures below this value thus allowing a large number of applications.

[0028] In order to give a support to the insulating glass wool, a net has been made from non-bulked glass strand to form a kind of container or false wall. In this way it is possible to form mats with the desired dimension using only glass.

[0029] Advantageously, some applications in the field of exhaust pipe mufflers production for motorcars would not allow to insert the insulating glass wool in accordance with the density requirements, since not all the insulating walls are available.

[0030] Actually, while producing compression molded mufflers, the operator necessarily has to gain access therein by keeping one of the shells raised. Any material introduced therein which has not been previously given a stable shape will tend to come out of the seat where it was placed.

[0031] Blowing in the glass wool through a glass net makes it possible to obtain any desired density and, at the same time, to create a false wall defined by that part of glass net which does not match any real wall. This false wall keeps the otherwise free-flowing material.

[0032] Consequently, the above mentioned net takes a selected spatial arrangement.

[0033] In case this arrangement is too complex, the net can be stiffened with a selected substance, starch for instance, at least in the external part forming the false wall.

[0034] The net can be compacted until it becomes like a woven material.

[0035] To optimize the insulating property of the proposed preform, a layer of material, preferably metallic such as aluminum, may be applied at least to the surface of the shell which does not match with any wall, so as to avoid any air passage from inside the shell to outside, and vice versa. In this way, a shield is obtained which keeps the air within the preform.

[0036] In all those cases in which a glass wool preform was used, from now on the following will be used instead:

- a preform which has not any needle-like parts, so that operators will not have to face any risk;
- a preform which does not release any part smaller than 3 μm ; an environment in which health is not endangered is thus obtained and the device provided with this new kind of filled insulation do not present any problem deriving from spreading particles in the ambient;
- a preform is obtained which is not impregnated with chemical additives, which does not cause exhalations inside heated environments, with possible problems connected with the toxicologic characteristics of the product.

[0037] As far as other applications in which pre-molded blocks of rock wool are to be used, the advantages deriving from the presence of false walls and bulked glass are as follows:

- recesses filled with glass only, no exhalations because of resins;
- no more storage expenses due to hundreds of different pre-formed blocks;
- an insulating product which, not only does not release hazardous particles, but it also does not release anything even after some time (the product includes continuous threads) thus obtaining a longer life of the silencer devices.

[0038] As a final consideration, the preform proposed

includes glass wool and a net, made of the same material as the glass wool, which are held together to form geometrical shapes without the use of any glue and/or impregnating substances.

[0039] It should be understood that the above description is by way of unlimited example only, inasmuch as constructional and practical modifications remain decidedly within the scope of the protection afforded to the present invention as claimed below.

Claims

1. A method for producing an insulating preform including a mass of glass fibers resembling wool, said glass wool obtained by extreme bulking of glass fiber in form of increasing the volume of the glass fiber as much as possible, and a support for holding the glass wool, the method including the steps of:

inflating a strand of glass fiber by means of the air jet generated by a nozzle, thus forming said mass of glass fibers;

providing said support for the inflated glass fiber; the method being **characterized in that** the support is formed by a net made of the same material as the glass wool and defined by a strand of non-bulked glass in the form of a strand of glass fibers, the mass of glass fibers and the net being held together to form geometrical shapes without any help from glue and/or impregnating substances, the support giving the preform a conformation corresponding to its use, and **in that** the preform is obtained by blowing in the glass wool through the net made of fiber glass strands.

2. A method according to claim 2, wherein the net is stiffened by means of a starch.

3. An insulating preform as obtainable by the method of claim 1 or 2, including a mass of glass fibers resembling wool, obtained by extreme bulking of glass fiber in form of increasing the volume of the glass fiber as much as possible, and a support for holding the glass wool, the insulating preform being **characterized in that** the support is formed by a net made of the same material as the glass wool and defined by a strand of non-bulked glass in the form of a strand of glass fibers, the mass of glass fibers resembling wool and the net being held together to form geometrical shapes without any help from glue and/or impregnating substances, so that the conformation of the preform corresponds to its use, and **in that** the preform has been obtained by blowing in the glass wool through the net made of fiber glass strands.

4. A preform as in claim 3, **characterized in that** the net is compacted to define a cloth.

5. A preform as in claim 3, **characterized in that** at least the part of the net that does not match any real wall is stiffened by means of a selected substance.

6. A preform as in claim 3, **characterized in that** at least the part of the net that does not match any real wall is coated with a layer of material such as to prevent air passage from inside the preform to outside and vice-versa.

7. A preform as in claim 6, **characterized in that** the layer of material is metallic.

Patentansprüche

1. Verfahren zur Herstellung eines isolierenden Vorformlings, der eine Masse aus Wolle entsprechenden Glasfasern umfasst, wobei die Glaswolle durch extreme Volumenvergrößerung der Glasfasern durch Erhöhen des Volumens der Glasfasern so viel wie möglich erhalten wurde, und einen Träger zum Halten der Glaswolle aufweist, mit den folgenden Schritten:

Aufblasen eines Stranges der Glasfasern mit Hilfe eines von einer Düse erzeugten Luftstrahles, um auf diese Weise die Masse der Glasfasern zu bilden;

Vorsehen des Trägers für die aufgeblasenen Glasfasern;

dadurch gekennzeichnet, dass der Träger von einem Netz gebildet wird, das aus dem gleichen Material wie die Glaswolle hergestellt ist und von einem Strang aus nicht-volumenvergrößertem Glas in der Form eines Stranges aus Glasfasern gebildet wird, wobei die Masse der Glasfasern und das Netz ohne Hilfe eines Klebers und/oder von imprägnierenden Substanzen zur Ausbildung von geometrischen Formen zusammengehalten werden und wobei der Träger dem Vorformling eine seiner Verwendung entsprechende Gestalt verleiht, und dass der Vorformling durch Blasen in die Glaswolle durch das aus den Glasfasersträngen hergestellte Netz erhalten wird.

2. Verfahren nach Anspruch 2, bei dem das Netz mit Hilfe von Stärke versteift wird.

3. Isolierender Vorformling, der durch das Verfahren nach Anspruch 1 oder 2 erhältlich ist und eine Masse aus Wolle entsprechenden Glasfasern umfasst, die durch extreme Volumenvergrößerung von Glas-

fasern durch Erhöhen des Volumens der Glasfasern so viel wie möglich erhalten wurde, und einen Träger zum Halten der Glaswolle aufweist, **dadurch gekennzeichnet, dass** der Träger aus einem Netz geformt ist, das aus dem gleichen Material wie die Glaswolle hergestellt ist und von einem Strang aus nicht-volumenvergrößertem Glas in der Form eines Stranges von Glasfasern gebildet wird, wobei die Wolle entsprechende Masse der Glasfasern und das Netz ohne Hilfe von Kleber und/oder imprägnierenden Substanzen zur Ausbildung von geometrischen Formen zusammengehalten werden, so dass die Gestalt des Vorformlings seiner Verwendung entspricht, und dass der Vorformling durch Blasen in die Glaswolle durch das aus den Glasfasersträngen hergestellte Netz erhalten wurde.

4. Vorformling nach Anspruch 3, **dadurch gekennzeichnet, dass** das Netz zur Ausbildung eines textilen Materials kompaktiert ist.

5. Vorformling nach Anspruch 3, **dadurch gekennzeichnet, dass** mindestens der Teil des Netzes, der keiner wirklichen Wand entspricht, mit Hilfe einer ausgewählten Substanz versteift ist.

6. Vorformling nach Anspruch 3, **dadurch gekennzeichnet, dass** mindestens der Teil des Netzes, der keiner wirklichen Wand entspricht, mit einer Materialschicht bedeckt ist, um einen Austritt von Luft aus dem Inneren des Vorformlings nach außen und umgekehrt zu verhindern.

7. Vorformling nach Anspruch 6, **dadurch gekennzeichnet, dass** die Materialschicht metallisch ist.

Revendications

1. Procédé de fabrication d'une préforme isolante incluant une masse de fibre de verre ressemblant à de la laine, ladite laine de verre étant obtenue par un gonflage extrême de la fibre de verre afin d'augmenter le plus possible le volume de la fibre de verre, et un support de maintien de la laine de verre, le procédé incluant les étapes consistant à :

- gonfler un brin de fibre de verre au moyen du jet d'air généré par une buse, formant ainsi ladite masse de fibres de verre ;
- fournir ledit support pour la fibre de verre gonflée ;

le procédé étant **caractérisé en ce que** le support est formé par un filet réalisé dans le même matériau que la laine de verre et est défini par un brin de verre non gonflé sous la forme d'un brin de fibres de verre,

la masse de fibres de verre et le filet étant maintenus ensemble pour obtenir des formes géométriques sans l'aide de colle et/ou de substances d'imprégnation, le support conférant à la préforme une conformation correspondant à son utilisation, et **en ce que** la préforme est obtenue en soufflant la fibre de verre dans le filet constitué de brins de fibre de verre.

2. Procédé selon la revendication 2, dans lequel le filet est renforcé par un amidon.

3. Préforme isolante pouvant être obtenue par le procédé selon la revendication 1 ou 2, incluant une masse de fibres de verre ressemblant à de la laine, obtenue par gonflage extrême de la fibre de verre afin d'augmenter le plus possible le volume de la fibre de verre, et un support de maintien de la laine de verre, la préforme étant **caractérisée en ce que** le support est formé par un filet réalisé dans le même matériau que la laine de verre et est définie par un brin de fibres de verre non gonflé sous la forme d'un brin de fibres de verre, la masse de fibres de verre ressemblant à de la laine et le filet étant maintenus ensemble pour obtenir des formes géométriques sans l'aide de colle et/ou de substances d'imprégnation de sorte que la conformation de la préforme correspond à son utilisation et **en ce que** la préforme a été obtenue en soufflant la laine de verre dans le filet réalisé à partir de brins de fibres de verre.

4. Préforme selon la revendication 3, **caractérisée en ce que** le filet est compacté pour obtenir un tissu.

5. Préforme selon la revendication 3, **caractérisée en ce qu'**au moins la partie du filet qui ne s'adapte à aucune paroi réelle est renforcée par une substance choisie.

6. Préforme selon la revendication 3, **caractérisée en ce qu'**au moins la partie du filet qui ne s'adapte à aucune paroi réelle est recouverte d'une couche de matière de façon empêcher le passage de l'air de l'intérieur de la préforme vers l'extérieur et vice versa.

7. Préforme selon la revendication 6, **caractérisée en ce que** la couche de matière est métallique.