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(54) **METHOD FOR MANUFACTURING INSULATING PARTS, AND INSULATING PART THUS OBTAINED**

(57) The present invention relates to a method for manufacturing insulating parts, in particular thermal and acoustic insulation parts; the method comprising the mixing of: bicomponent polyester staple fibres with a low melting point (Bico fibres), wood fibres, and recycled textile fibres from garments or fabrics with a flame-resistant treatment; - the opening of said fibres; the addition of

phenolic resin fibres or thermoplastic fibres to the mixture, - the precuring of the felt by heating thereof in a furnace, - the cutting into sheets or the rolling into coils of the precured felt and the shaping of insulating parts by moulding the precured felt. The invention further comprises the insulating part thus obtained.

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Description

Technical sector

[0001] The present invention relates to a process for manufacturing insulating parts, applicable as thermal and acoustic insulation, mainly in the automobile industry, in household appliances such as washing machines, refrigerators, microwaves and dishwashers, and in other machines that require soundproofing, such as compressor motors or the like. These insulating pieces are also applicable in the agricultural sector in order to protect small trees from frost.

State of the Art

[0002] There are currently different materials on the market used as acoustic and thermal insulation in various sectors and mainly in the construction sector.

[0003] These insulation products are mostly based on mineral wool. Products based on glass or rock fiber are widely used, in particular those whose fibers are in the form of mineral wool, which have thermal and/or acoustic insulation properties.

[0004] These insulation products are manufactured from mineral fibers obtained by different procedures, for example, according to the well-known technique of fiber formation by internal or external centrifugation.

[0005] The internal centrifugation technique consists in particular in introducing the molten material (generally glass or a rock) into a centrifugal device comprising a multitude of small holes, the material being projected towards the peripheral wall of the device under the action of centrifugal force and escaping in the form of filaments.

[0006] At the outlet of the centrifugal device, the filaments are stretched and dragged by a gas flow having a high temperature and speed, towards a receiving element in order to form a layer of fibers. To ensure the assembly of the fibers among themselves and to allow the layer to have cohesion, a sizing composition containing a thermosetting resin, most often a phenolic resin, is sprayed onto the fibers at the outlet of the centrifugal device.

[0007] The coated fiber layer of the sizing composition is submitted to a heat treatment in order to carry out the polycondensation of the resin and to obtain a thermal and/or acoustic insulation product with specific properties, in particular dimensional stability, resistance to traction, thickness recovery after compression and a homogeneous color.

[0008] In certain applications where the insulation product is exposed to high temperatures (household appliances, heating ducts) or must meet strict standards (ships, public buildings, particularly in relation to roofs), it is essential that the product also has an optimal resistance to fire.

[0009] In these cases, the solution used consists of adding a fire retardant agent to the gluing composition.

Said agent may be a phosphorous compound, a halogenated compound, a nitrogenous compound, a metal hydroxide, a carboxylic acid metal salt or a boron-containing compound.

[0010] The applicant for the invention is unaware of the existence of thermally and acoustically insulating pieces that are obtained by the method of this invention, that incorporate a high percentage of recycled materials and that also provide an optimal resistance to flames.

Explanation of the invention

[0011] The manufacturing process of the present invention has technical features aimed at achieving the objectives mentioned above.

[0012] To this aim, the manufacturing process of soundproofing insulating pieces, object of the present invention, comprises:

- the provision of: low melting point bicomponent polyester staple fibers (Bico fibers); wood fibers, and recycled textile fibers with a flame resistance treatment;
- the mixing and opening of said fibers
- the addition to the mixture of phenolic or thermoplastic resin fibers
- the introduction of the mixture of fibers and resin in a machine that re-positions and distributes the fibers throughout the width and length forming a homogeneous felt, with preselected parameters of weight and thickness per square meter,
- the pre-curing of the felt and the welding of the fibers together, by heating them in an oven,
- slicing or coiling of pre-cured felt;
- finally, the conformation of insulating pieces by means of the molding, whether cold or hot, of the plates of pre-cured felt.

[0013] The addition of recycled textile fibers with a flame resistance treatment to the felt increases the flame resistance of the pieces made with said felt, without the need to use retardants of the type mentioned above.

[0014] It is envisaged that recycled textile fibers may come from garments with a flame resistance treatment, for example, from garments used by firefighters, in foundries, or in any other task in which operators work in areas exposed to high temperatures. In this case, the process of the invention allows these textile fibers to be reused which, as they have a flame-resistance treatment, are difficult to destroy when they are discarded together with other waste that does not have any special treatment.

[0015] The bicomponent staple fibers of polyester, known as Bico fibers, have a sheath and a core with a low melting point, which contributes to the bonding of the different fibers during the baking of the felt, and the subsequent molding of insulating pieces in hot steel molds.

[0016] The wood fibers incorporated in the felt contribute to providing resistance and insulation, both thermal

and acoustic, to the insulating pieces formed with said felt.

[0017] According to the process of the invention, the fibers to be mixed preferably include percentages by weight between:

- 5% - 15% Bico fibers;
- 40% - 50% wood fibers.
- 35% - 45% recycled textile fibers with flame resistance treatment; the recycled textile fibers comprising at least 75%, and preferably around 80%, of cotton fibers with a flame resistance treatment, the remaining percentage being made up of fibers of various materials depending on the source fabric or garment of the same.

[0018] According to the process of the invention, the amount of resin added to the fiber mixture is between 20% and 30% of the total weight of said fiber mixture.

[0019] Depending on the type of resin used, the molding of the felt plates to obtain insulating parts can be done cold or hot, introducing them into a hot steel mold at a temperature between 180 and 200 degrees Celsius in the latter case.

[0020] This invention also includes an insulating part; in particular of thermal and acoustic insulation, obtained with the procedure described above.

[0021] Said insulating piece is made up of a thermosetting felt, hot-moulded, comprising a mixture of: bicomponent polyester staple fibers, with a low melting point (Bico fibers); - wood fibers, - recycled textile fibers from garments or fabrics with a flame-resistance treatment, and phenolic or thermoplastic resin.

[0022] In said insulating piece, the percentages by weight of the fibers are between: 5% - 15% of low melting point bicomponent polyester staple fibers (Bico fibers); 40% - 50% wood fibers, and 35% - 45% recycled textile fibers; the weight of phenolic or thermoplastic resin being between 20% and 30% of the total weight of the fiber mixture.

[0023] According to the tests carried out, this combination of percentages provides the insulating piece with optimal acoustic and thermal insulation properties for its application in the aforementioned sectors, and additionally provides other suitable properties for its use in said sectors, specifically a density between 700 and 1000 kg/m³; greater rigidity than other pieces with the same percentage of resin and weight; no mold growth after 150 hours at 38°C and 95% relative humidity, or a flammability test of less than 100 mm/min.

[0024] In a preferred embodiment of the invention, the insulating piece comprises the following percentages by weight of the fibers: 10% bicomponent polyester staple fibers, low melting point (Bico) fibers; 45% wood fibers and 40% recycled textile fibers; the weight of phenolic or thermoplastic resin included therein being 25% with respect to the total weight of the fiber mixture.

[0025] Once the nature of the invention has been suf-

ficiently described, as well as a preferred embodiment, it is stated for the appropriate purposes that the materials, shape, size and arrangement of the elements described may be modified, as long as this does not imply an alteration of the essential characteristics of the invention that are claimed below.

Claims

1. Manufacturing procedure of insulating parts; in particular thermal and acoustic insulation, **characterized in that** it comprises:

- the provision of: low melting point bicomponent polyester staple fibers (Bico fibers); wood fibers, and recycled textile fibers with a flame resistance treatment;
- the mixing and opening of said fibers
- the addition to the mixture of phenolic or thermoplastic resin fibers
- the introduction of the mixture of fibers and resin in a machine that repositions and distributes the fibers throughout the width and length forming a homogeneous felt, with preselected parameters of weight and thickness per square meter,
- the pre-curing of the felt and the welding of the fibers together, by heating them in an oven,
- slicing or coiling of pre-cured felt;
- finally the conformation of insulating pieces by means of the molding, cold or hot, of the pre-cured felt plates.

2. Method, according to claim 1, **characterized in that** the mixture of the percentages by weight of fibers is between:

- 5% - 15% Bico fibers;
- 40% - 50% wood fibers.
- 35% - 45% recycled textile fibers.

3. Procedure, according to any of the preceding claims; **characterized in that** the recycled textile fibers comprise at least 75% and preferably around 80% of cotton fibers with a flame resistance treatment.

4. Procedure, according to any of the previous claims; **characterized in that** the amount of resin added to the fiber mixture is between 20% and 30% of the total weight of the fiber mixture.

5. Insulating piece; in particular for thermal and acoustic insulation, **characterized in that** it is made up of a hot-molded thermosetting felt, comprising a mixture of:

- low melting point bicomponent polyester staple

fibers (Bico fibers); - wood fibers, - recycled textile fibers from garments or fabrics with a flame-resistance treatment, and - phenolic or thermoplastic resin.

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6. Insulating piece, according to claim 5, **characterized in that** the percentages by weight of the fibers are between: 5% -15% of low melting point bicomponent polyester staple fibers (Bico fibers); 40% - 50% wood fibers and 35% - 45% recycled textile fibers; the weight of phenolic or thermoplastic resin being between 20% and 30% of the total weight of the fiber mixture.

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7. Insulating piece, according to claim 6, **characterized in that** the percentages by weight of the fibers are: 10% bicomponent polyester staple fibers with a low melting point (Bico fibers); 45% wood fibers and 40% recycled textile fibers; and the weight of phenolic or thermoplastic resin is 25% total weight of the fiber mixture.

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

D04H1/58 (2012.01)*D04H1/54* (2012.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D04H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, INVENES, WPI, XPESP

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
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| A | WO 2005042859 A1 (FORMFIBER DENMARK APS ET AL.) 12/05/2005, claims 1-2; claim 10. | 1-7 |
| A | ZACH, J. et al.. Environmentally efficient thermal and acoustic insulation based on natural and waste fibers. J Chem Technol Biotechnol, 2016, Vol. 91, pages 2156-2161 Apartado COMPOSITION AND PRODUCTION OF SPECIMENS | 1-7 |
| A | ISLAM S. et al.. Environmentally-friendly thermal and acoustic insulation materials from recycled textiles. Journal Of Environmental Management, 12/2019, Vol. 251, N° 1, pages 1-21 | 1-7 |
| A | WO 2011057641 A1 (FORMFIBER DENMARK APS ET AL.) 19/05/2011, claim 11. | 1-7 |

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Information on patent family members

| Patent document cited in the search report | Publication date | Patent family member(s) | Publication date |
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Form PCT/ISA/210 (patent family annex) (January 2015)