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(71) Applicant: **Aspen Aerogels, Inc.**
Northborough MA 01532 (US)

(72) Inventor: **TOGNON, Francesco**
35137 Padova (IT)

(74) Representative: **Weist, Stefan**
Kraus & Weisert
Patentanwälte PartGmbB
Thomas-Wimmer-Ring 15
80539 München (DE)

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(54) **MAT CONTAINING AEROGEL**

(57) A method for providing a mat containing aerogel, comprising the steps of immersing a ribbon (11) of fabric or non-woven fabric, unwound from a reel (12), in a solution (13) containing aerogel in suspension, drying the ribbon impregnated with aerogel solution (14), winding the dried ribbon (15) containing aerogel onto a rewinding reel (16).

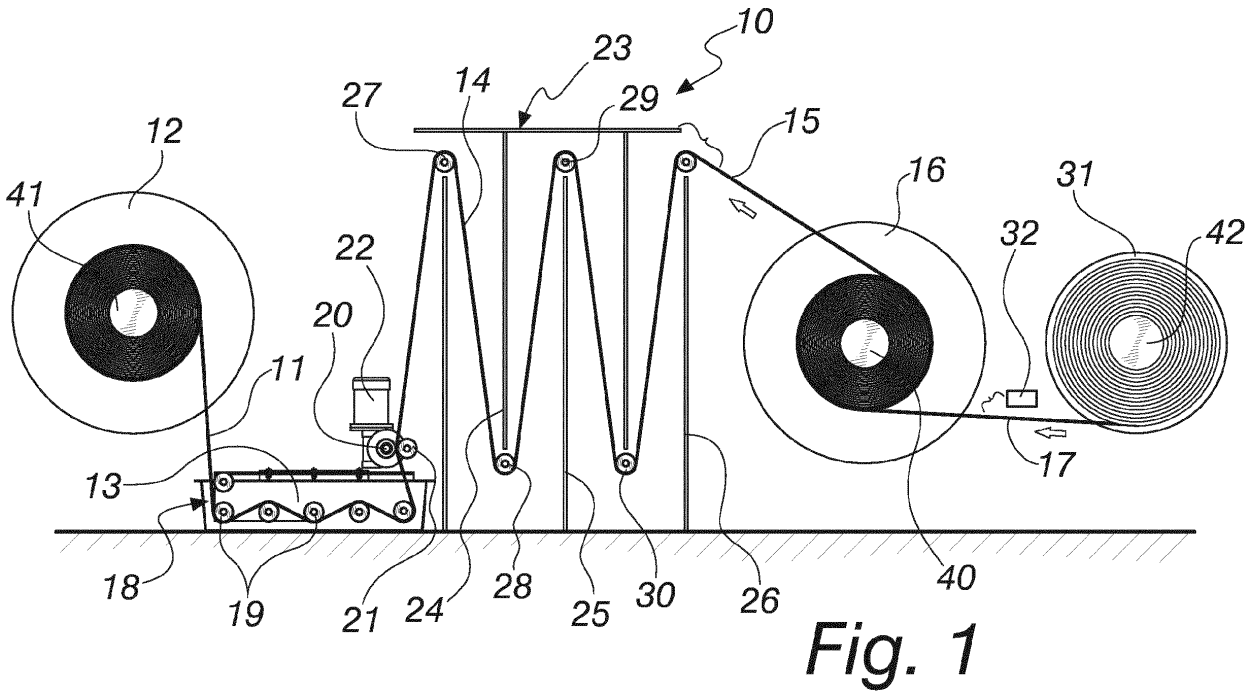

Fig. 1

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Description

[0001] The present invention relates to a method for providing a mat containing aerogel.

[0002] The invention also relates to an apparatus for implementing such method.

[0003] Nowadays the use of prefabricated panels is widespread for improving the thermal insulation of outer walls, ceilings and floors, the thickness of which is selected depending on the insulation requirements, optionally adapted with affixing systems that also make them convenient in terms of quick application and practicality of use.

[0004] Such prefabricated insulating panels are generally composed of a plurality of layers, and among the most widespread materials for the insulating layer are high-density rock wool and polystyrene-based and polyurethane-based materials.

[0005] The insulating layer is typically thickest in the package of layers which form the panel, the more so if such insulating layer is constituted by rock wool; the thickness of the insulating layer is often penalizing by the cubic shape of the spaces in which it is applied in order to form an inner covering.

[0006] Although widespread and appreciated, such conventional prefabricated insulating panels do not fully meet the requirements of the market, for which the need is increasingly felt to further improve both performance and compactness.

[0007] To fulfil this need of the market, the Applicant who submitted the present application has devised an insulating panel for the construction industry, which is described and claimed in PCT/EP2013/052776, and is characterized in that it comprises a shell made of fiberglass, the inner space of which contains insulating material that is at least partially constituted by aerogel.

[0008] In particular, at least one mat of material impregnated with aerogel is introduced into such shell.

[0009] Such mat is obtainable by using slabs or panels containing aerogel, of a conventional type, which however cannot be used in a process for producing the aforementioned panels in which the fiberglass shell is provided by pultrusion, and in which the mat with aerogel is inserted into the shell at the same time as it is produced by pultrusion.

[0010] The aim of the present invention is to devise a method for providing a mat containing aerogel, which can be wound on a reel and used for the continuous production of insulating panels for the construction industry.

[0011] Within this aim, an object of the invention is to provide a method for the production of a mat that can be used not only for construction, but also in other sectors in which it is necessary to produce an optimal insulation with encumbrances reduced to the minimum.

[0012] Another object of the invention is to provide a method that can be implemented with conventional technologies.

[0013] This aim and these and other objects which will become more evident hereinafter are achieved by a method for providing a mat containing aerogel, comprising the steps of:

- immersing a ribbon of fabric or non-woven fabric, unwound from a reel, in a solution of water and ethanol containing aerogel in suspension,
- drying said ribbon impregnated with aerogel solution,
- winding said dried ribbon containing aerogel onto a reel.

[0014] Further characteristics and advantages of the invention will become more apparent from the description of a preferred, but not exclusive, embodiment of the method according to the invention, which is illustrated by way of non-limiting example in the accompanying drawing wherein:

Figure 1 is a schematic side view of a method, and of a corresponding apparatus for implementing it, according to the invention.

[0015] With reference to the figure, a method for providing a mat containing aerogel according to the invention comprises the following operations:

- immersing a ribbon 11 of fabric or non-woven fabric, unwound from a reel 12, in a solution 13 containing aerogel in suspension,
- drying the ribbon impregnated with aerogel solution 14,
- winding the dried ribbon containing aerogel 15 onto a rewinding reel 16.

[0016] The method can comprise a final step of rewinding onto a reel, in which the rewinding is accompanied by the covering of the dried ribbon 15 with a film 17 which acts as a separator or has other functionalities before winding onto the rewinding reel 16.

[0017] Such separator film 17 separates the various windings of ribbon on the reel of the rewinding reel 16.

[0018] The solution 13 containing aerogel in suspension comprises water and ethanol, or other similar and equivalent solvents, in order to facilitate its evaporation.

[0019] The ribbon 11 is, for example, made of pile fabric, but it is understood that it can also be made of another similar and equivalent material.

[0020] Alternatively the ribbon 11 is made of glass wool.

[0021] Between the step of immersion in the solution 13 and the step of drying, the method includes a step of wringing in order to recover the excess solution 13 absorbed by the ribbon 11.

[0022] The drying occurs at a temperature of between 70°C and 80°C.

[0023] The method according to the invention ensures that the ribbon of fabric or non-woven fabric 11 loaded with aerogel by means of the solution in which the aerogel is in suspension can be used as an element with high

insulating capacity, for example in order to provide panels for the construction industry, and being wound on a reel, and thus capable of being unwound from a reel, it lends itself to being used in continuous methods of production of insulating panels.

[0024] An apparatus for implementing a method according to the invention as described above, is generally designated with the reference numeral 10.

[0025] Such apparatus 10 comprises, in addition to the reel 12 for the ribbon 11, a vat 18 for the solution 13, with internal redirection rollers 19 that are adapted to form a path for the immersed ribbon 11 which is longer than the length of the vat 18; in this manner a vat can be provided which has a contained length 18 with respect to the length of the path that the ribbon 11 travels when it is immersed in the solution 13.

[0026] The ribbon 11, as shown in the figure, first passes below the first redirection roller 19 and then above the adjacent second redirection roller, to then pass below the third redirection roller.

[0027] The wringing step is performed by a pair of wringing presser rollers 20 and 21, of which a first roller 20 is actuated by a corresponding electric motor 22.

[0028] The drying step occurs in a climate chamber 23.

[0029] Such climate chamber 23 has inner walls 24, 25 and 26 which form, in cooperation with corresponding redirection rollers 27, 28, 29 and 30, a sinusoidal path that extends predominantly downward from above and vice versa.

[0030] In this manner a climate chamber 23 is provided, the floor space occupation of which is greatly reduced, but which is capable of making the ribbon being dried 14 take a path that is conveniently long and such as to ensure its prearranged drying.

[0031] The climate chamber 23 comprises means for drying for the impregnated ribbon 14.

[0032] Such means for drying can be constituted, for example, by radiating panels, for example with electric resistors, arranged on the walls of the climate chamber 23.

[0033] Alternatively, inside the climate chamber 23, in place of the radiating panels using electric resistors, there can be high frequency heating means, or other systems of heating that are similar and equivalent.

[0034] The means for drying of the climate chamber 23 are associated with means for dehumidification, which should be understood as being of a known type.

[0035] The apparatus also comprises means for separation of the windings of ribbon with aerogel 15, for a better use of the ribbon itself at the time of use.

[0036] Such means for separation are constituted for example by a reel of separator film 17.

[0037] Optionally interposed between the reel 31 of separator film 17 and the rewinding reel 16 is a bonding agent dispenser 32, if this should become necessary for covering the ribbon with aerogel 15 with the separator film 17.

[0038] In the apparatus 10, the shaft 40 of the rewinding reel 16 is the drive shaft, whereas the shaft 41 of the reel of the ribbon of initial fabric or non-woven fabric 14 is idle, as is the shaft 42 of the reel 31 of separator film 17.

[0039] In practice it has been found that the invention fully achieves the intended aim and objects.

[0040] In particular, with the invention a method is devised for providing a mat containing aerogel, which can be wound on a reel and used for the continuous production of insulating panels for the construction industry.

[0041] Moreover, with the invention a method is devised for the production of a mat that can be used not only for construction, but also in other sectors in which it is necessary to provide an optimal insulation with encumbrances reduced to the minimum.

[0042] Last but not least, with the invention a method is devised, and a corresponding apparatus for implementing it, which can be implemented with conventional technologies.

[0043] The present invention is further defined by the following items:

1. A method for providing a mat containing aerogel, comprising the steps of:

- immersing a ribbon (11) of fabric or non-woven fabric, unwound from a reel (12), in a solution (13) containing aerogel in suspension,
- drying said ribbon impregnated with aerogel solution (14),
- winding said dried ribbon (15) containing aerogel onto a rewinding reel (16).

2. The method according to item 1, characterized in that it comprises a final step of rewinding onto a reel (16), in which the rewinding is accompanied by the covering of the dried ribbon (15) with a film (17) which acts as a separator or has other functionalities before winding onto the rewinding reel (16).

3. The method according to the preceding items, characterized in that said solution (13) containing aerogel in suspension comprises water and ethanol, or other similar and equivalent solvents, in order to facilitate its evaporation.

4. The method according to the preceding items, characterized in that said ribbon (11) is, for example, made of pile fabric or other similar and equivalent material.

5. The method according to the preceding items, characterized in that between the step of immersion in the solution (13) and the drying step there is a step of wringing the impregnated ribbon (14) to recover the excess solution (13) absorbed by the ribbon (11).

6. An apparatus for providing a method according to one or more of the preceding items, characterized in that it comprises a vat (18) containing said solution (13), for the immersion of said ribbon (11), a pair of wringing presser rollers (20, 21), a climate chamber (23) for drying, and means for separating the wind-

ings of ribbon with aerogel (15),

7. The apparatus according to item 6, characterized in that said climate chamber (23) has inner walls (24, 25, 26), which form, in cooperation with corresponding redirection rollers (27, 28, 29, 30), a sinusoidal path that extends predominantly downward from above and vice versa.

8. The apparatus according to one or more of items 6 and 7, characterized in that said vat (18) for the solution (13) contains on the inside redirection rollers (19) which are adapted to define a path for the immersed ribbon (11) which is longer than the length of the vat (18).

9. The apparatus according to one or more of items 6 to 8, characterized in that a bonding agent dispenser (32) is interposed between a reel (31) of a separator film (17) and a rewinding reel (16) for the ribbon with aerogel (15).

[0044] The invention, thus conceived, is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims. Moreover, all the details may be substituted by other, technically equivalent elements.

[0045] In practice the materials employed, provided they are compatible with the specific use, and the contingent dimensions and shapes, may be any according to requirements and to the state of the art.

[0046] The disclosures in Italian Patent Application No. PD2012A000065 from which this application claims priority are incorporated herein by reference.

[0047] Where technical features mentioned in any claim are followed by reference signs, such reference signs have been inserted for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. An aerogel mat, comprising:
a ribbon of fabric impregnated with an aerogel in suspension.

2. The aerogel mat of claim 1, wherein the aerogel in suspension comprises water and ethanol.

3. The aerogel mat of claim 1 or claim 2, wherein the ribbon comprises a non-woven fabric.

4. The aerogel mat of claim 1 or claim 2, wherein the ribbon comprises glass wool.

5. The aerogel mat of any of claims 1-4, wherein the mat is wound on a reel.

6. The aerogel mat of any of claims 1-5, further comprising a separator.

7. The aerogel mat of any of claims 1-6, wherein the mat is dried.

8. A composite comprising at least two layers of the aerogel mat of claims 1-7, further comprising a separator film between at least two of the layers.

9. A mat containing aerogel, comprising:
a ribbon of fabric immersed in a suspension of aerogel.

10. The aerogel mat of claim 9, wherein the suspension further comprises water and ethanol.

11. The aerogel mat of claim 9 or claim 10, wherein the ribbon comprises a non-woven fabric.

12. The aerogel mat of claim 9 or claim 10, wherein the ribbon comprises glass wool.

13. The aerogel mat of any of claims 9-12, wherein the ribbon is wound on a reel.

14. The aerogel mat of any of claims 9-13, further comprising a separator.

15. The aerogel mat of claim 9, wherein the mat is dried.

16. A composite comprising at least two layers of the aerogel mat of claims 9-15, further comprising a separator film between at least two of the layers.

17. An insulating panel comprising the mat of any preceding claim.

18. The insulating panel of claim 17, further comprising a shell, wherein the mat is contained within an inner space of the shell.

19. The insulating panel of claim 17, wherein the shell is made of fiberglass.

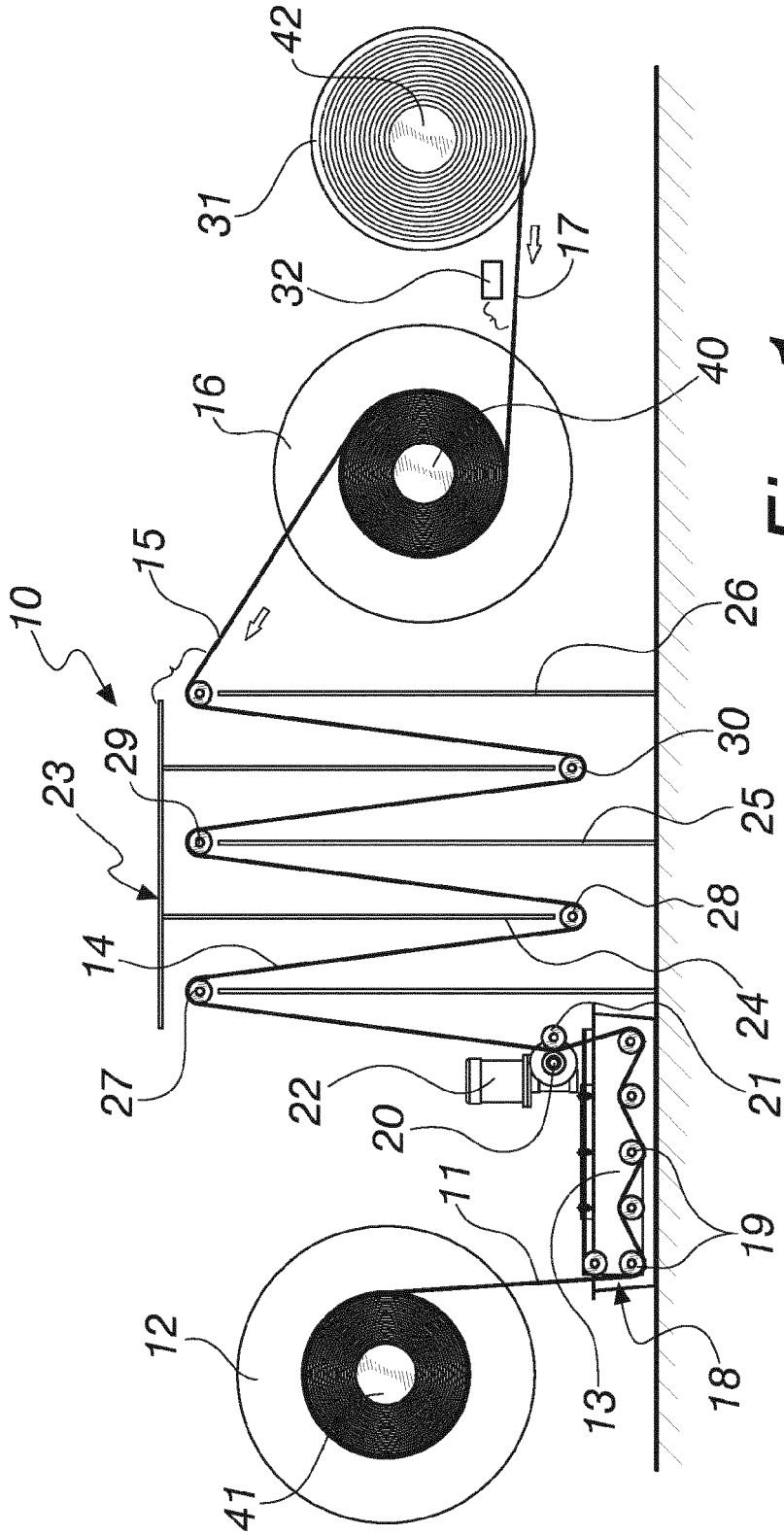
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Fig. 1

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EUROPEAN SEARCH REPORT

Application Number
EP 21 19 5075

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B32B
E04B
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1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 December 2021	Uhlig, Robert

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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