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(54) MINERAL WOOL INSULATION PRODUCT FOR FAçADE RENOVATIONS

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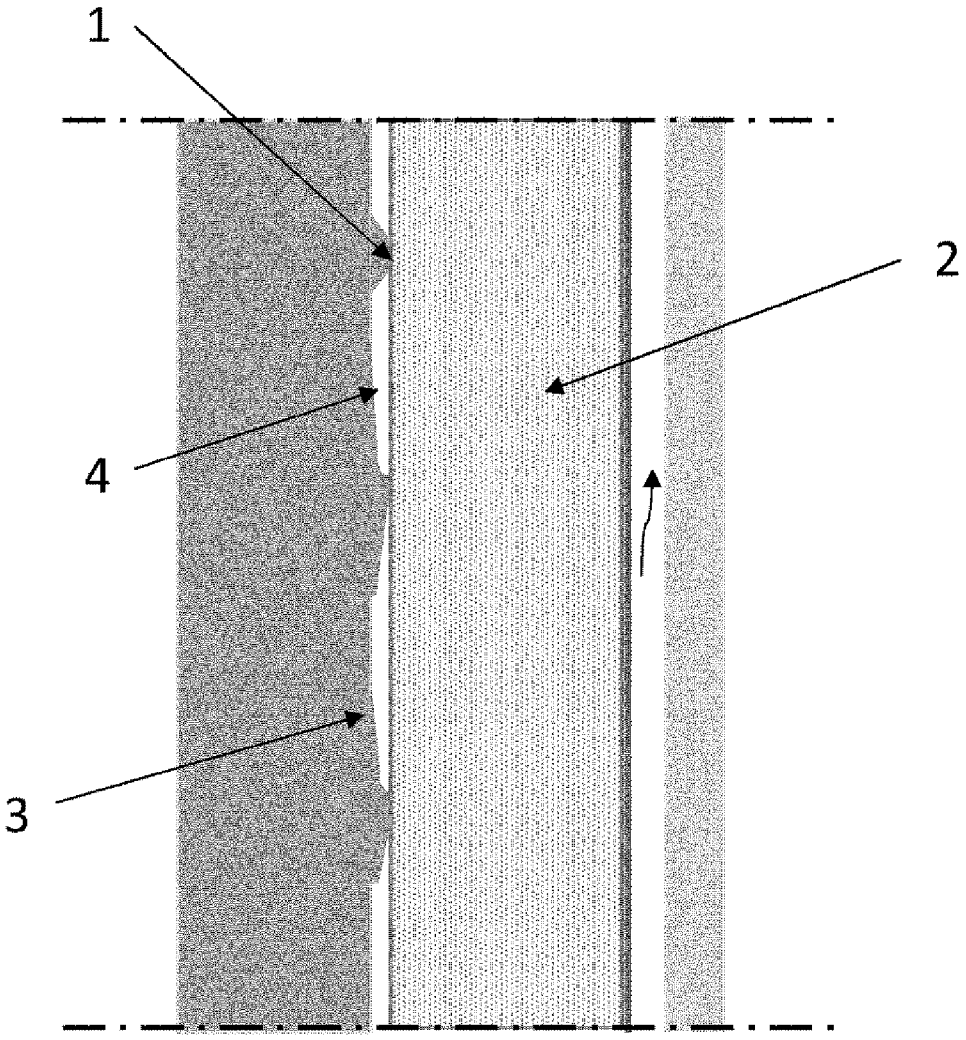
(57) **ABSTRACT**

The invention is directed to a mineral wool insulation slab for facade renovations, comprising a rigid insulation slab or lamella having and outer and an inner side, wherein the outer side of the slab comprises an outer layered surface and the innerside of the slab is a mechanically and/or chemically softened layer of the one and same insulation slab. The invention is further directed to a method for manufacturing of such an insulation slab.



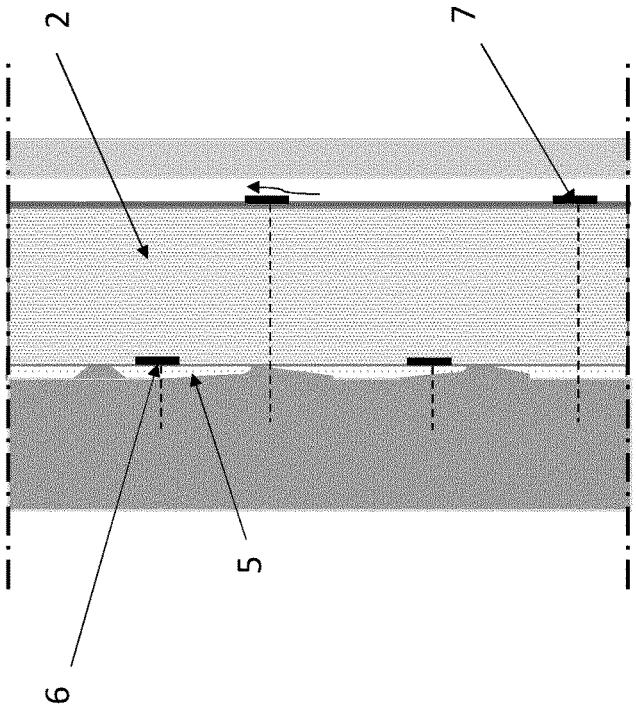


Fig. 2

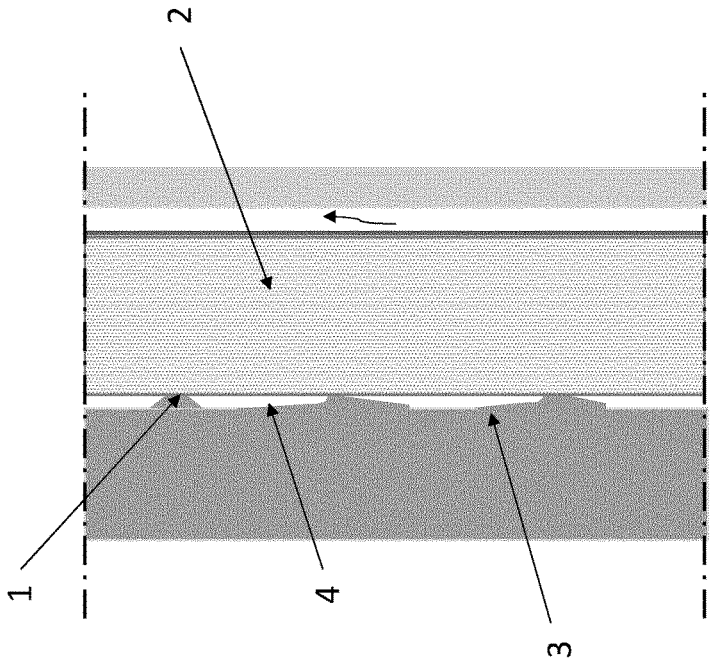


Fig. 1

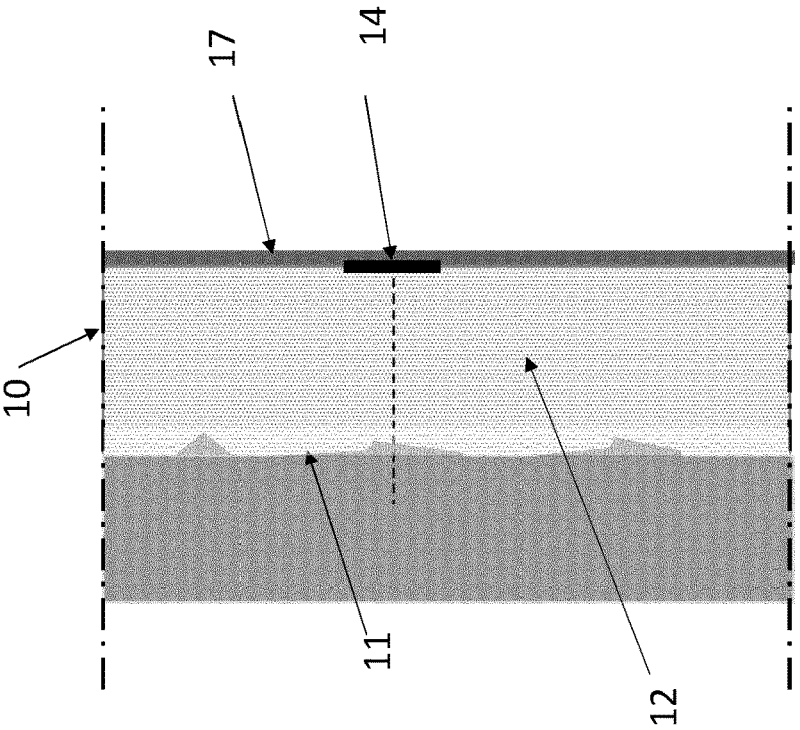


Fig. 4

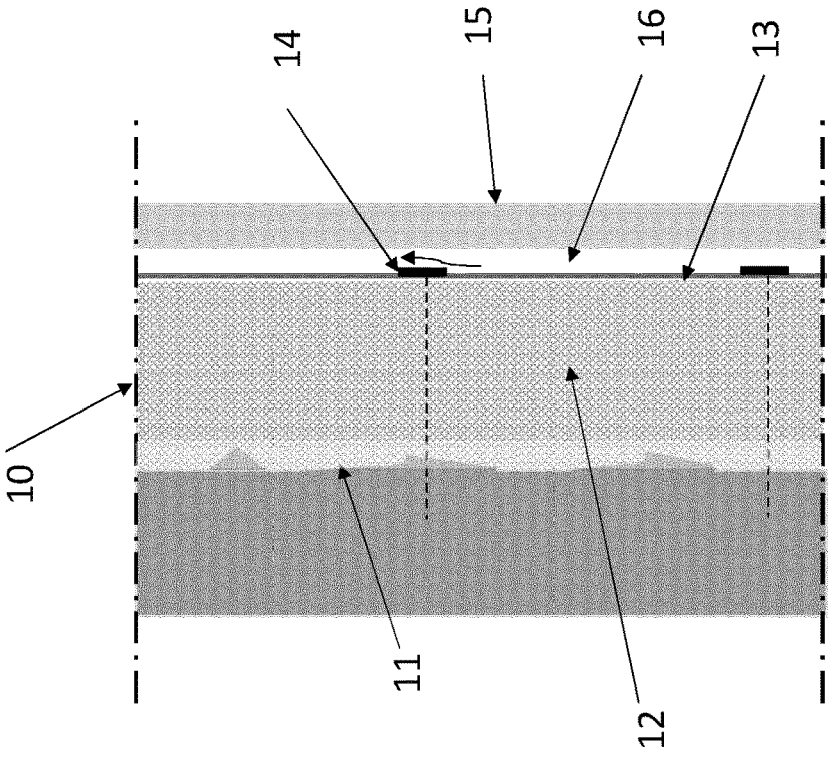


Fig. 3

Fig. 5a

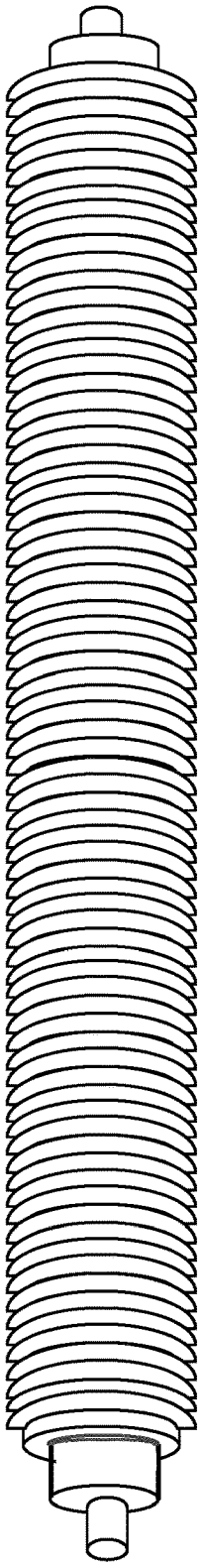


Fig.5b

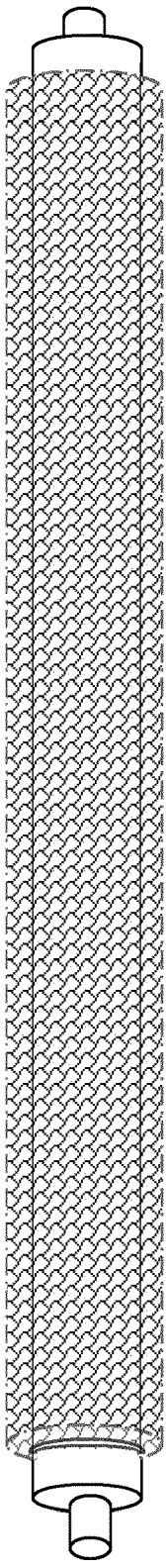


Fig. 5c

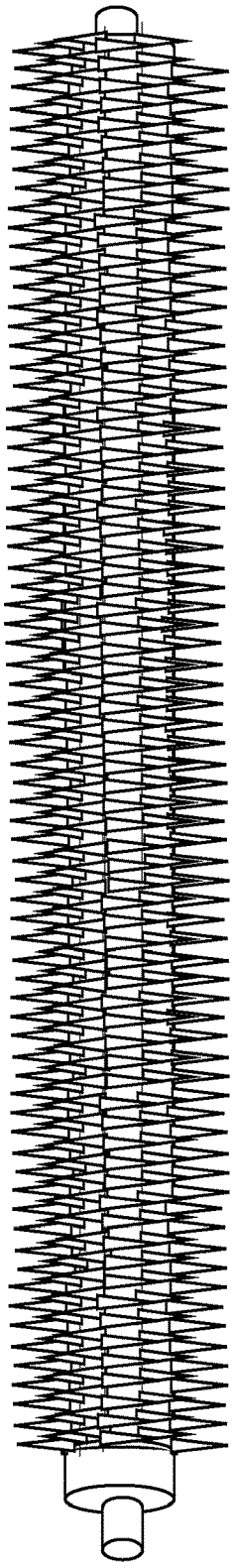
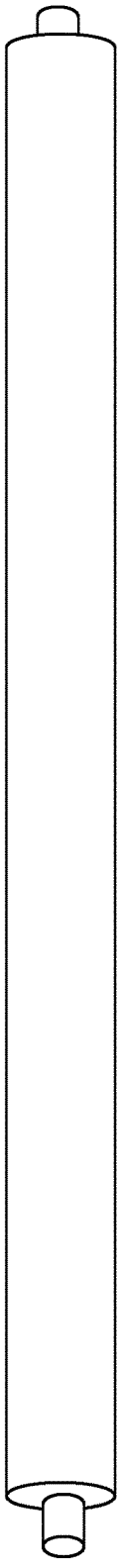


Fig. 5d



MINERAL WOOL INSULATION PRODUCT FOR FAçADE RENOVATIONS

FIELD OF THE INVENTION

[0001] The invention relates to a new building insulation product type suitable for use on facade or external wall surfaces, and especially uneven façade surfaces for example in renovation of facades of older buildings.

BACKGROUND OF THE INVENTION

[0002] It is very difficult to install rigid insulation slabs on the uneven façade surfaces with-out forming unwanted voids and air channels between the façade surface and the insulation slab. Voids and cavities inside the structure causes a risk for internal convection which weakens the insulation value of the whole construction. Therefore, a soft and thin insulation mat is usually installed first against the uneven surface to make the connection between the rigid insulation slab and the façade surface smoother to avoid any voids or cavities. Separate insulation layers require a lot of installation time, several fasteners as well as several different insulation products on site, which generates additional material and labour costs.

BRIEF DESCRIPTION OF THE INVENTION

[0003] The object of the present invention is to provide a mineral wool i.e. a stone wool or glass wool insulation product where at least one of the disadvantages of the prior art is eliminated or at least alleviated. The objects of the present invention are achieved with an insulation product, a method for manufacturing such a product and use of the product in façade renovations according to the characterizing portions of the independent claims.

[0004] The present invention is directed to a mineral wool insulation slab for façade renovations, comprising a rigid insulation slab or lamella, having a density of 20-120 kg/m^3, wherein the insulation slab or lamella has an outer and an inner side, wherein the outer side of the slab comprises an outer layered surface and the inner side of the slab is a mechanically and/or chemically softened layer, which is essentially softer than the rest of the slab. .

[0005] The invention is further directed to a method for manufacturing of a mineral wool insulation slab for façade renovations comprising a rigid insulation slab or lamella , having a density of 20-120 kg/m^3, wherein the insulation slab or lamella has and outer and an inner side wherein the method comprises the steps of softening of the inner side of the insulation slab mechanically or chemically, and adding an outer layered surface to the outer side of the insulation slab.

[0006] The preferred embodiments of the invention are disclosed in the dependent claims.

[0007] Herein, the term façade is used in its traditional sense as the outer surface of a building, but is here to be understood in a broader sense to also comprise the case when a wall is cleaned from the old insulation/old façade surface, i.e. when the inner concrete core is remaining.

BRIEF DESCRIPTION OF THE FIGURES

[0008] In the following the invention will be described in greater detail, in connection with preferred embodiments, with reference to the attached drawings, in which

[0009] FIG. **1** illustrates the problem occurring in façade renovations where an uneven façade surface may create air voids behind the insulation slab or lamella.

[0010] FIG. **2** illustrates a solution according to the state of the art wherein a soft insulation mat is installed on the façade surface under the insulation slab or lamella.

[0011] FIG. **3** illustrates one embodiment according to the invention where the insulation slab comprises a wind protective surface.

[0012] FIG. **4** illustrates another embodiment according to the invention where the insulation slab comprises a rendered façade coating on the outer surface.

[0013] FIG. **5** illustrates different examples of tools that may be used in the mechanical softening process according to the invention.

DETAILED DESCRIPTION OF SOME EMBODIMENTS

[0014] The following embodiments are exemplary. Although the specification may refer to "an", "one", or "some" embodiment(s), this does not necessarily mean that each such reference is to the same embodiment(s), or that the feature only applies to a single embodiment. Single features or different embodiments may be combined to provide further embodiments.

[0015] In the following, features of the invention will be described with a simple example of a device architecture in which various embodiments of the invention may be implemented. Only elements relevant for illustrating the embodiments are described in detail.

[0016] The present invention is directed to a building insulation product suitable for use in façade renovations. More specific the invention is directed to an insulation product or an insulation slab or lamella comprising a wind protective surface layer or coating, a thick and dense insulation layer and a softened back side. Especially if the surface of the wall to be insulated is uneven, an installation of an insulation slab or lamella directly on the surface may lead to a situation where air voids are created between the insulation slab and the uneven façade surface. This leads to a situation where there is a serious risk of internal convection which weakens the insulation value of the whole construction. Traditionally this has been solved by installing a separate soft insulation mat between the façade surface and the insulation slab. There is a need to simplify the current solutions which require several installation stages, and separate fasteners for the separate layers, which are time consuming to install and expensive.

[0017] A building insulation product according to the invention comprises a rigid insulation slab or lamella of mineral wool. The mineral wool slab may for example be a glass wool or stone wool slab. The core of the slab or lamella consists of a thick and dense insulation layer. On the outer surface, i.e. the side which is to be installed away from the wall surface of the building the insulation slab may comprise a wind protective surface or coating. Alternatively, the insulation slab may be used as base of a rendered façade surface. On the opposite side of the slab, on the so-called backside or on the inner surface i.e. the surface facing the wall of the building when installed, the insulation slab or lamella comprises a softened layer, which is part of the insulation slab itself but has been either mechanically or chemically softened. The inner side of the slab is a mechanically or chemically softened layer of the one and same

insulation slab, i.e. the inner side is not a softer layer glued to the rigid core layer of the insulation slab.

[0018] The present invention solves this problem by providing a 3-in-one insulation slab or lamella comprising a core of rigid, dense insulation material, with an outer surface comprising an outer layer and a softened backside. A softened backside of the insulation slab will allow the insulation slab to be installed in one piece on the façade surface, it may be installed as a single layer and it will prevent any air voids from being created, since the softened backside will be tightly pressed against the façade surface due to the lower density of it. The density of the insulation slab or lamella is 20-120 kg/m^3, preferably 40-100 kg/m^3. The density of the softened backside is essentially lover than the density of the slab itself. I.e. the backside is softened to a degree where stones, bulks or other uneven bumps in a façade surface will sink into the insulation slab when installed in the façade surface.

[0019] The density of the softened backside of the insulation slab or lamella is less than 108 g/m^3. According to a preferred embodiment the density of the softened layer is between 18 and 108 kg/m^3, and preferably between 30 and 80 kg/m3.

[0020] FIG. **1** describes the problem to be solved by the invention. In the figure it can be seen how bumps or dents **1** in a façade surface may prevent a rigid insulation slab **2** from being tightly closed against the façade surface **3**, thus creating air voids **4** between the insulation slab **2** and the façade surface **3**.

[0021] FIG. **2** describes a currently used solution. In this solution a separate soft insulation mat **5** is first installed at the façade surface in order to smoothen out the cavities and dents in the concrete. One example of a soft insulation mat used for this purpose is a product called UNM 37, which has a density of 26-45 kg/m3. The soft insulation mat is fastened with its own fasteners **6** before the rigid insulation slab **2** may be installed on top of the soft insulation mat **5**. The rigid insulation slab must be installed in a separate installation stage with separate fasteners **7** to those used to fasten the soft insulation mat. However, air voids are avoided but installation is time consuming and requires multiple fasteners.

[0022] FIG. **3** describes an embodiment of the invention wherein the insulation slab or lamella **10** according to the invention comprises a softened backside **11**, a rigid core **12** and a wind protective surface or coating **13** on the opposite side from the softened backside **11** of the insulation slab **10**. In this case one set of fasteners **14** may be used to install the 3-in-one insulation slab. The soft backside of the insulation slab may be tightly installed against the uneven façade surface, leaving no air voids between the surface and the slab. Alternatively, a separate façade surface **15** may be installed at the outer side of the insulation slab, preferably leaving a ventilation gap **16** between the new façade surface and the newly installed insulation layer.

[0023] FIG. **4** describes an alternative embodiment according to the invention. According to the embodiment a rendered façade surface or coating **17** may be applied directly on the outer surface of the insulation slab. Here, the insulation slab still comprises a softened backside **11** and a rigid core **12** of dense insulation material. The insulation slab may be fastened on the façade surface in one installation stage with a single set of fasteners **14**.

[0024] According to the invention the softened backside of the insulation slab may be achieved either by mechanical or chemical softening. It is also possible that both softening methods, the mechanical and chemical softening are used on the one and same insulation slab to soften the backside of the slab.

[0025] In case the backside is softened mechanically there are numerous options that may be used. The backside of the insulation slab may be cut with blades to create grooves in the slab. Another option is to use metal molds to cut a pattern in the backside of the slab. Using spikes or needles to stab the backside of the slab is another preferred option, which also will decrease the density of the material. The backside of the slab may also simply be mangled, which makes it softer than the rest of the rigid insulation slab.

[0026] The softening may be carried out as a step of the manufacturing process. As an insulation slab is produced on a factory line, the slab may as a last step at the line be fed over a cutting roll or mangle. The insulation slab may then be feed on the line where a cutting roll or mangle has been installed at the bottom of the line. The insulation slab is then fed over the cutting roll or mangle and is optionally pressed down toward the cutting roll or mangle. The cutting roll or mangle will then over the width of the insulation slab either cut or mechanically mangle the underside of the insulation slab, which underside will become the backside of the finished product.

[0027] In one preferred embodiment a cutting roll of FIG. **5***b* is used. The cutting roll comprises blades along the perimeter of the axis of the cutting roll. The blades will, when an insulation slab is fed over the cutting roll, cut into the insulation slab creating cuts in the direction of the line over the entire length of the insulation slab.

[0028] Preferably the distance between the cuts is 0.5 cm-2.5 cm, more preferably 1 cm-2 cm. The cuts are preferably 10-100 mm deep, more preferably 20-50 mm deep.

[0029] FIG. **5***c* shows a cutting roll used in another preferred embodiment. The cutter roll comprises around its axle multiple metal molds placed next to each other preferably covering the entire surface of the cutter roll. In other words, the metal molds form a grid on the surface of the cutter roll. As an insulation slab is fed over the cutter roll the roll will turn about its axle and the metal molds will cut into the underside of the insulation slab. Preferably the metal molds form a dense pattern thereby creating a pattern in the insulation slab where the distance between to cuts is preferably less than 5 cm, more preferably less than 2.5 cm. The cuts are preferably 10-100 mm deep, more preferably 20-50 mm deep.

[0030] Yet another preferred embodiment of a cutting roll is illustrated in FIG. **5***d*. According to this embodiment the cutting roll comprises spikes or needles covering its surface. When an insulation slab is fed over the cutter roll, the spikes or needles will cut into the surface of the insulation slab, thus softening it and lowering its density. Preferably the spikes or needles on the roll are 2 cm-5 cm long and at a distance of 0.5-2 cm apart from each other.

[0031] According to yet another preferred embodiment a mangle, which can be seen in FIG. **5***a*, is used for softening of the backside of the insulation slab. An insulation slab is fed over the mangle and pressed against it. The mangling softens the surface of the rigid insulation slab, thus creating a softened backside of the product.

[0032] According to one embodiment of the invention the softening of the back side of the insulation slab may be made

by chemical softening. In this case a chemical agent may be added to the backside of the insulation slab during manufacturing. Another option is to add less binding agent to the back side of the insulation slab during manufacturing, which would result in a softer layer at the surface of the insulation slab.

[0033] According to one embodiment of the invention the density of the softened backside is 5-70% less than that of the core of the rigid insulation slab, preferably 7-50% less and most preferably 10-30% less.

[0034] Examples of insulation slabs or lamellas that may be used as a base for manufacturing of a insulation slab according to the invention are Cortex One, with a density of 50-65 kg/m^3, WAS **35** with a density of 70-85 kg/m^3, or Linio 80 which is a lamella, with a density of 75-85 kg/m^3. Of course, other product already on the market may be used, as well as insulations slabs or lamellas designed and manufactured especially for the cause may be used.

[0035] According to one embodiment of the invention an outer layered surface is added to the outer side of the insulation slab during manufacturing. The adding of the outer layer may comprise gluing or spraying a wind protective surface or coating or a rendered surface to the insulation slab.

[0036] It is apparent to a person skilled in the art that as technology advances, the basic idea of the invention can be implemented in various ways. The invention and its embodiments are therefore not restricted to the above examples, but they may vary within the scope of the claims.

1. A mineral wool insulation slab for façade renovations, comprising:

a rigid insulation slab or lamella, a core having a density of 20-120 kg/m^3, the insulation slab or lamella has an outer side and an inner side, wherein

the outer side of the slab comprises an outer layered surface and

the inner side of the slab is a mechanically, mangled or rolled, and/or chemically softened layer, said softened layer being essentially softer than the rest of the slab,

wherein the density of the softened layer of the slab is between 18 and 108 kg/m^3.

2. The insulation slab of claim **1**, wherein the density of the slab is between 40 and 100 kg/m^3.

3. The insulation slab of claim **1**, wherein the density of the softened layer of the slab is less than 108 kg/m^3.

4. The insulation slab of claim **1**, wherein the depth of the softened layer is 10-100 mm.

5. The insulation slab of claim **1**, wherein the insulation slab is of stone wool or glass wool.

6. The insulation slab of claim **1**, wherein the outer side of the insulation slab comprises a wind protective surface or coating.

7. The insulation slab of claim **1**, wherein the outer side of the insulation slab comprises a rendered façade coating,

8. A method for manufacturing of a mineral wool insulation slab for façade renovations comprising a rigid insulation slab or lamella, having a density of 20-120 kg/m^3 which insulation slab or lamella has an outer side and an inner side wherein the method comprises the steps of:

softening of the inner side of the insulation slab mechanically, by rolling or cutting, or chemically, and

adding an outer layered surface to the outer side of the insulation slab, wherein the density of the softened layer of the slab is between 18 and 108 kg/m^3.

9. The method of manufacturing of an insulation slab of claim **8**, wherein the softening is made mechanically by feeding the insulation slab on a manufacturing line over a rollable mangle or cutting roll.

10. The method of manufacturing of an insulation slab of claim **9**, wherein the cutting roll comprises blades along the perimeter of the axis of the cutting roll, which will when the insulation slab is fed over the cutting roll, create cuts in the direction of the line over the entire length of the insulation slab.

11. The method of manufacturing of an insulation slab of claim **10**, wherein the distance between the blades is between 0.5 and 2.5 cm.

12. The method of manufacturing an insulation slab of claim **11**, wherein the cutting roll comprises metal molds for cutting into the insulation slab.

13. The method of manufacturing of an insulation slab of claim **9**, wherein the cutting roll comprises spikes or needles.

14. The method of manufacturing of an insulation slab of claim **8**, wherein the softening is made chemically by adding less binding agent to the back side of the insulation slab or by adding a chemical agent to the back side of the insulation slab.

15. The method of manufacturing of an insulation slab of claim **8**, wherein the adding of an outer layered surface comprises gluing or spraying a wind protective surface or coating or a rendered surface or coating to the insulation slab.

16. The method of manufacturing of an insulation slab of claim **8**, wherein the insulation slab is of stone wool or glass wool.

17. (canceled)

18. The insulation slab of claim **1**, wherein the density of the softened layer of the slab is between 30-80 kg/m^3.

19. The insulation slab of claim **4**, wherein the depth of the softened layer is 20-50 mm.

20. The method of manufacturing of an insulation slab of claim **8**, wherein the density of the softened layer of the slab is between 30-80 kg/m^3.

* * * * *