



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
15.11.2000 Bulletin 2000/46

(51) Int Cl.7: **E04D 13/16, E04G 23/02**

(21) Application number: **99201463.9**

(22) Date of filing: **10.05.1999**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(72) Inventor: **Blaauw, Jan Alle**
9606 PZ Kropswolde (NL)

(74) Representative: **Ottevangers, Sietse Ulbe et al**
Vereenigde,
Postbus 87930
2508 DH Den Haag (NL)

(71) Applicant: **Ecotherm Beheer B.V.**
7102 JH Winterswijk (NL)

(54) **Method for renovation of insulated roofs and renovation plate for renovation of insulated roofs.**

(57) A method for renovation of insulated roofs whose top sides are provided with a roof-covering comprising a layer of insulating material (3,4,5) covered with at least one water-repellent covering layer (6), wherein on the existing roof-covering, a new layer of insulating

material (10,11) is provided, wherein the new layer is covered with a water-repellent top layer (12) and wherein the top layer (12) is attached with screws (20) extending at least through the new layer of insulating material (10,11) and beyond the water-repellent covering layer (6) of the existing roof-covering.

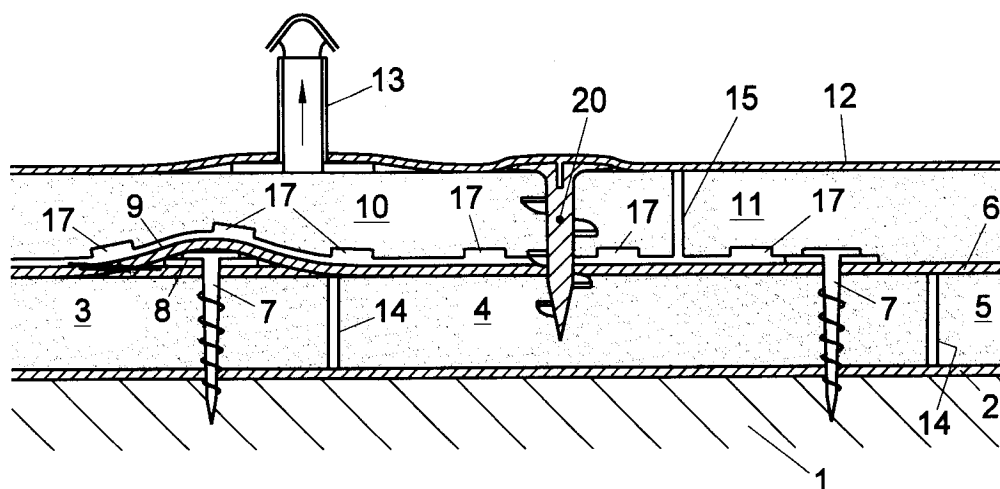


Fig. 1

Description

[0001] The invention relates to a method for renovation of insulated roofs whose top sides have been provided with a roof-covering comprising a layer of insulating material covered with at least one water-repellent covering layer. The invention further relates to a renovation plate for use in roof renovation, and to a building having a renovated roof.

[0002] In course of time, roofs whose top sides have been provided with insulating material often develop a reduced insulation action. This may for instance be caused by damage to the layer of water-repellent material provided on the insulation plates, which layer typically consists of one or more layers of bituminous roofing material or plastic material, as is commercially available in rolls. The insulating layer may consist of plates of a suitable foam material, such as for instance polyurethane foam, which may have a protective layer, for instance a thin, gritted layer of bitumen, applied to the top and/or bottom sides thereof. However, the insulating layer may also consist of woodwool cement plates, polystyrene (EPS), extruded polystyrene (XPS), rock wool, glass wool, foam glass, bonded perlite, etc. Often, a vapor-inhibiting layer underlies the insulating layer, which vapor-inhibiting layer in turn overlies the roof boarding.

[0003] Normally, the water-repellent layer is mounted mechanically by means of steel bolts screwed through the water-repellent layer, the insulating layer and the vapor-inhibiting layer into the roof boarding. The roof boarding may for instance consist of concrete, wood or steel plate. Plates are placed under the bolt heads to support the bolt heads, and the bolt heads are normally covered by an overlapping edge of an adjoining strip of roofing material. The bolts constitute a thermal bridge. It is possible that from the bottom side, along the bolts, condensed water and/or water vapor reaches the insulation material through the vapor-inhibiting layer. Such processes are even reinforced if the roofing material gets damaged, for instance when the roof is walked upon carelessly.

[0004] These and other causes have as a consequence that in course of time, insulated roofs are renovated. Such other causes are, for instance, that the roof-covering is in need of replacement and/or that the used insulation material no longer meets the modern standards. For this, the conventional working method consists in removing the complete existing roof-covering and subsequently providing once again a vapor-inhibiting layer, insulation plates and a water-repellent layer.

[0005] A major drawback of this method is that it involves a substantial amount of waste material, which has to be discharged and is hardly fit for reuse, if at all. Moreover, the fastening bolts often prove to be so tight that they are impossible to unscrew and break off. As a result, and also due to sticking phenomena, it is usually not possible to remove the existing insulation plates as complete plates or at least in large pieces. More often

than not, the old roof-covering comes off in smaller pieces and bits of insulation material mixed with pieces of vapor-inhibiting or water-repellent material. This material must be moved from the roof to ground level, involving a substantial chance of parts blowing away and polluting the surroundings. These last problems also occur if the existing roof-covering is not fixed by bolts, but by gluing.

[0006] After removal of the old roof-covering, all (parts of) bolts that are still stuck in the roof boarding must as yet be removed, and only after that can one start applying a new vapor-inhibiting layer, followed by insulation plates and a water-repellent layer. Hence, this known method does not only result in much waste material and a chance of pollution of the surroundings, but is also highly labor-intensive and time-consuming. The object of the invention is to provide an improved method for renovation of insulated roofs, which generally enables an insulated roof to be renovated in a fast, efficient and reliable manner, and in which method the above-mentioned drawbacks occur to a highly reduced extent, if at all. To this end, according to invention, a method of the type described is characterized in that a new layer of insulating material is provided on the existing roof-covering, that the new layer is covered with a water-repellent top layer and that the top layer is mounted by screws extending at least through the new layer of insulating material and beyond the water-repellent covering layer of the existing roof-covering.

[0007] A renovation plate suitable for use in the method according to the invention is characterized in that on the side of the plate that is to be used as bottom side, a relief is provided, enabling vapor transport.

[0008] Hereinafter, the invention will be further described with reference to the accompanying drawing.

Fig. 1 schematically shows, in section, an example of a part of a roof renovated according to the invention;

Fig. 2 schematically shows the bottom side of an example of a renovation plate suitable for use in a method according to the invention; and

Fig. 3 schematically shows an example of a fastener for use in a method according to the invention.

[0009] Fig. 1 schematically shows, in vertical section, an example of a part of a roof renovated according to the invention. Although a flat roof is shown, the invention is also applicable to inclined roofs. By 1, a roof boarding is indicated, which may consist of any suitable material, for instance concrete, wood, corrugated steel sheet, etc. On the roof boarding there lies a conventional vapor-inhibiting layer 2 having provided thereon a layer of insulation plates 3, 4, 5, usually having a lower and an upper covering layer, which insulation plates are in turn covered by a water-repellent layer 6. The water-repellent layer, the insulation panels and the vapor-inhibiting layer can be glued onto the roof boarding or mounted

thereon by screws 7, two of which are shown. Underlying the heads of the screws 7 are washer plates 8 and the screws are screwed into the roof boarding after holes have been pre-drilled therein, if necessary. Usually, the heads of the screws are covered by an overlapping edge of an adjoining strip of the water-repellent layer 6, as shown at 9.

[0010] If, in course of time, the insulating effect decreases or disappears, or the roof-covering is in need of replacement and/or is leaking, renovation is needed. The insulating effect may for instance decrease in that water and/or water vapor gathers in and on and/or under the insulation plates. This may be caused by leaks in the water-repellent layer. It is also possible that via the holes created by the screws 7 in the vapor-inhibiting layer, condensed water and/or humid air creeps in and under the insulation material.

[0011] If renovation is needed, the existing roof-covering, i.e. the water-repellent layer, the insulation plates and usually also the vapor-inhibiting layer, are normally removed and replaced by new material. In practice, it proves to be difficult to remove the existing material. Often, the screws 7 can no longer be unscrewed on account of corrosion or the like, the water-repellent layer sticks and can only be removed in small pieces, and the insulation plates likewise break into small pieces. The chance of parts of the pulled-loose material blowing away is substantial. Moreover, all the material removed must be moved to the ground level and be discharged. Reuse is usually not possible.

[0012] Hence, according to the invention, the existing roof-covering of an insulated roof to be renovated is maintained. New insulation plates 10, 11 are readily fitted on the existing roof-covering and covered with a second water-repellent layer or top layer 12.

[0013] If so desired, vent pipes 13, conventional as such, may be provided through the second water-repellent layer, for discharging vapor released from the moist, original roof-covering. That vapor can reach the top side of the new insulation plates 10, 11 via the lateral edges of the roof and via seams, as indicated at 14, between the old insulation plates, and subsequently through additionally provided openings, if any, in the old water-repellent layer 6 and through seams 15 and the like.

[0014] Between the new water-repellent top layer, fastened only locally (as is also the case with the old water-repellent layer) in a manner to be described hereinbelow, and the top side of the insulation plates, the vapor can finally reach the pipes 13 and escape.

[0015] Hence, the old insulation plates can dry up in the course of time and again contribute to the insulating effect. During this process, however, the insulating effect of the new layer of insulation plates is already operative all the time.

[0016] To promote the vapor discharge and a proper vapor pressure distribution between the new insulation plates and the old roof-covering, additional holes can be pierced in the old roof-covering, as observed. In addition,

use can advantageously be made of new insulation plates whose bottom sides are provided with a suitable relief, for instance in the form of slots forming vapor-guiding channels. Such slots are schematically shown in Fig. 1 at 17. Preferably, the slots are open at the lateral edges of the insulation plates, to create a connection with the seams between the plates. Preferably, the slots or another relief pattern are provided in such a manner that between the channels formed by adjoining plates, a connection is created.

[0017] Fig. 2 schematically shows the bottom side of a special insulation plate 10, 11 suitable for use in a method according to the invention, provided with a kind of wafer pattern, so that intersecting channels 18, 19 are created.

[0018] Such a plate can for instance be manufactured by foaming the insulation material on a substrate of a suitable sheet, such as for instance aluminum foil, provided with a wafer pattern or other desired relief. Such plate having relief on the bottom side is highly suitable for use on existing insulating layers containing relatively much moisture. If this is not the case, the usual plates without special relief can be used as well.

[0019] The attachment of the renovation plates can in principle take place in the same manner as the attachment of the old roof-covering, i.e. by long screws fixed through the old and the new roof-covering and in the roof boarding. For a first renovation, this is indeed advantageous, because the old roof-covering need not be removed, yet for a second or next roof renovation, the above-outlined problems may as yet occur. The use of such screws entails other drawbacks as well, as explained in applicant's older Dutch patent application 1006947, which, in so far as is deemed necessary, is considered to be inserted herein by reference.

[0020] In accordance with a further elaboration of the inventive concept, the renovation panels are therefore secured with special screws, as is shown schematically at 20 in Figs. 1 and 3.

[0021] The screws 20 have a coarse screw thread 21 of relatively great pitch, steep flanks and a relatively deep screw thread, i.e. a great difference between the outside diameter and the core diameter of the shank of the screw. The screws further have a sharp point 22 and a flat head 23 of a large diameter. The head is provided with engagement means 24 for a screwing tool, for instance a screw driver or a socket wrench.

[0022] The sharp point enables the screw to be manually pushed through the water-repellent layer and/or the upper protective layer of an insulation plate and partially screwed into the roof-covering. Fixing can then take place with a suitable tool. A screw of the type described finds a hold in the old insulation layer 5, 6, which is in turn retained by the screws 7.

[0023] The screws 20 are also described in applicant's above-cited older Dutch patent application 1006947 and are commercially available in different versions. A major advantage of the use of such screws is

that they find a good hold in the old roof-covering. This applies to both the water-repellent layer and the insulation material. Tests have shown that even if the old water-repellent layer has been removed, the screws find more than sufficient hold in the old insulating layer to enable a reliable attachment of the new roof-covering. The screws can be made of plastic and need not bore through the vapor-inhibiting layer 2. Further, such screws can be unscrewed again without any problem, also after a longer period.

[0024] In applicant's older Dutch patent application 1001549, there are described insulation plates provided, at some distance from the top face, with at least one embedded fiber layer in which screws similar to those described hereinabove can find a hold for securing a water-repellent layer on the insulation plates. Particularly with relatively thick (> 60 mm) insulation plates, such fiber layer has as a side effect an increased stability of the insulation plates. The renovation plates for use in a method according to the invention may also be provided with one or more of such fiber layers, although this is not required. A fiber layer may consist of a fibrous web or a net or open fabric. The fibers may comprise glass fibers or synthetic fibers, but the use of natural fibers (for instance wool, jute, paper, flax, etc.), optionally in combination with other fibers, is conceivable. If the old roof-covering comprises insulation plates having such a fiber layer, the screws 20 may find an additional hold in that fiber layer. These and similar modifications will readily occur to anyone skilled in the art.

Claims

1. A method for renovation of insulated roofs whose top sides are provided with a roof-covering comprising a layer of insulating material covered with at least one water-repellent covering layer, **characterized in that** on the existing roof-covering, a new layer of insulating material is provided, that the new layer is covered with a water-repellent top layer and that the top layer is attached with screws extending at least through the new layer of insulating material and beyond the water-repellent covering layer of the existing roof-covering.
2. A method according to claim 1, **characterized in that** screws of a highly coarse screw thread are used, engaging the insulating material and finding a firm hold in the material of the existing roof-covering.
3. A method according to claim 2, **characterized in that** the screws are manufactured from plastic.
4. A method according to claim 2 or 3, **characterized in that** the screws have a sharp point and a head of a relatively large diameter.
5. A method according to any one of claims 2-4, **characterized in that** the screw thread has a large diameter relative to the core of the shank of the screws.
6. A method according to any one of the preceding claims, **characterized in that** the water-repellent top layer is provided with a number of vent pipes extending through the water-repellent top layer.
7. A method according to any one of the preceding claims, **characterized in that** new insulation plates are used, whose bottom sides are provided with a relief enabling vapor transport.
8. A method according to claim 7, **characterized in that** the relief comprises a number of intersecting slots.
9. A method according to claim 7 or 8, **characterized in that** the relief comprises a wafer pattern.
10. A method according to claim 7, 8 or 9, **characterized in that** the relief is a pattern pressed into a lowermost covering layer of the insulation plates.
11. A method according to claim 10, **characterized in that** the lowermost covering layer is a metal foil.
12. An insulation plate used for renovation of insulated roofs, **characterized in that** a relief enabling vapor transport is provided on the side of the plate that is to be used as bottom side.
13. An insulation plate according to claim 12, **characterized in that** the relief comprises a number of intersecting slots.
14. An insulation plate according to claim 12 or 13, **characterized in that** the relief comprises a wafer pattern.
15. An insulation plate according to claim 12, 13 or 14, **characterized in that** the relief is a pattern pressed into a lowermost covering layer of the insulation plates.
16. An insulation plate according to claim 15, **characterized in that** the lowermost covering layer is a metal foil.
17. A building provided with a renovated roof obtained by a method according to any one of claims 1-11.

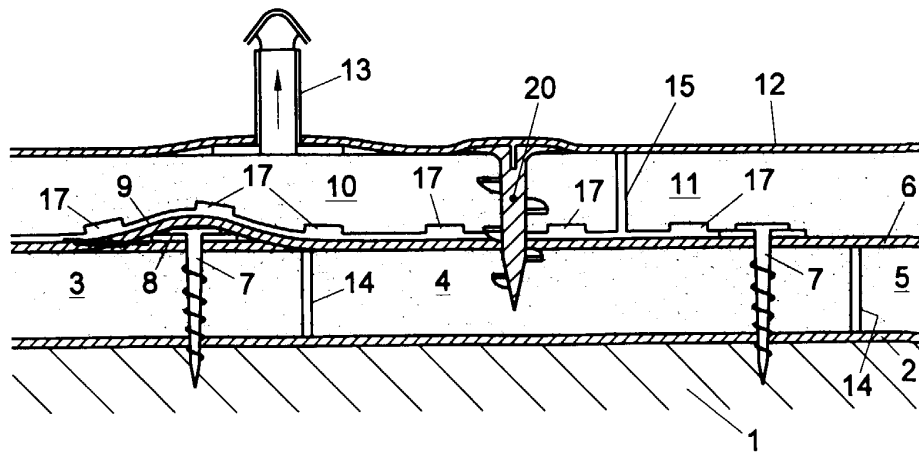


Fig. 1

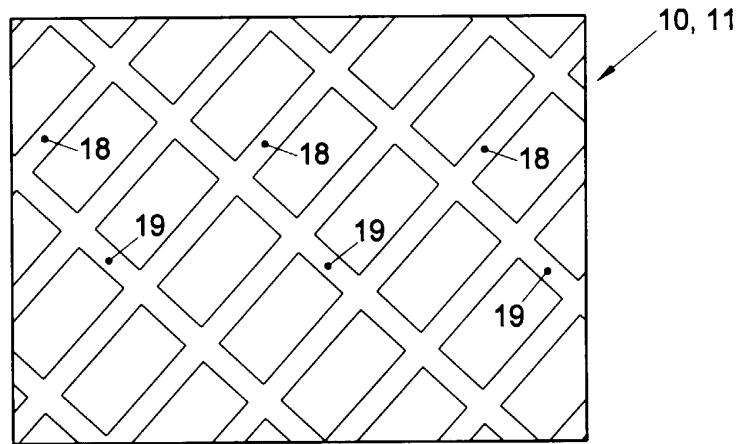


Fig. 2

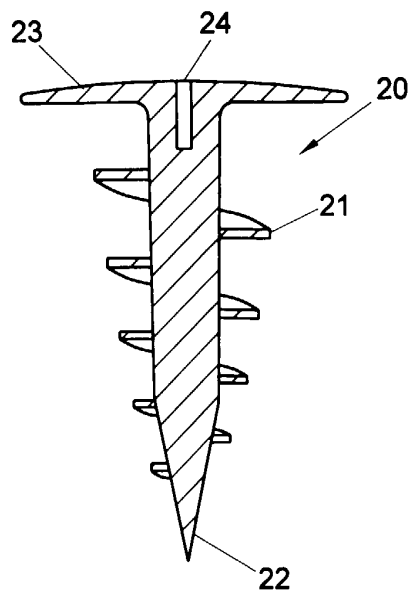


Fig. 3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 20 1463

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	"Dakisolatiesysteem" BOUWWERELD, vol. 78, no. 14, 9 July 1982 (1982-07-09), page 35 XP002072038 Doetinchem ---	1,6-9, 12,17	E04D13/16 E04G23/02
A	DE 296 08 334 U (SK-FASTENING LTD.OY) 2 October 1996 (1996-10-02) * page 1, line 8 - page 2, line 4; figures 1,2 *	1-4	
A	DE 20 52 919 A (SKENE) 13 May 1971 (1971-05-13) * figures 1,2,6 *	10,12-15	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			E04D E04G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 17 September 1999	Examiner Mysliwetz, W
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 20 1463

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-09-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 29608334 U	02-10-1996	FI 2049 U	03-08-1995
		BE 1009395 A	04-03-1997
		NL 1003066 C	11-11-1996
DE 2052919 A	13-05-1971	CA 875810 A	20-07-1971
		CH 518421 A	31-01-1972
		FR 2068385 A	20-08-1971
		GB 1336152 A	07-11-1973
		JP 50006101 B	11-03-1975