(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 774 553 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
21.05.1997 Bulletin 1997/21

(51) Int. Cl.[6]: **E04D 13/16**

(21) Application number: **96202323.0**

(22) Date of filing: **21.08.1996**

(84) Designated Contracting States:
BE DE GB IE NL

(30) Priority: **07.11.1995 NL 1001581**

(71) Applicant: **Gebroeders Kooy B.V.**
7545 MV Enschede (NL)

(72) Inventor: **Kooij, Albertus**
7535 CK Enschede (NL)

(74) Representative: **Schumann, Bernard Herman Johan et al**
Arnold & Siedsma,
Advocaten en Octrooigemachtigden,
Sweelinckplein 1
2517 GK Den Haag (NL)

(54) Roof finishing

(57) The invention relates to a roof finishing (1) arranged on a substantially horizontal roof surface (3), wherein a gradient is realized by varying the thickness of the roof finishing material. The roof finishing material comprises at least two types of insulating material (78) with mutually differing thermal conductivities. The insulating material (7) with the lowest thermal conductivity is preferably incorporated in the roof finishing (1) at least at the location where the roof finishing has a limited thickness. The insulating material (8) with the highest thermal conductivity is preferably incorporated in the roof finishing (1) at least at the location where the roof finishing (1) has a great thickness.

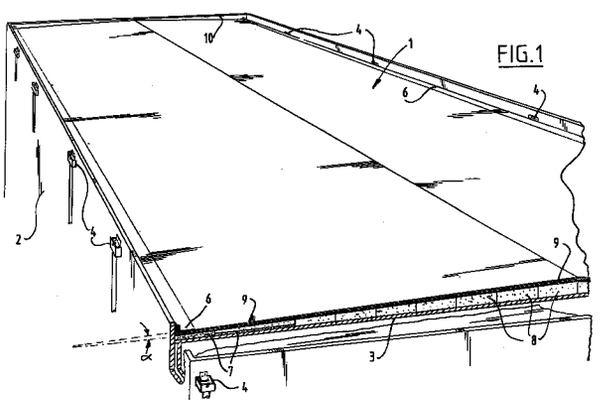


FIG.1

EP 0 774 553 A1

Description

The invention relates to a roof finishing arranged on a substantially horizontal roof surface, wherein a gradient is realized by varying the thickness of the roof finishing material.

For drainage of a roof it is necessary for a "flat roof" also to have a limited slope. In certain countries there is a building regulation relating a required minimum angle of slope; thus in The Netherlands the gradient requirement is 1.67 cm per meter. In order to obtain the desired slope it is for instance possible to arrange on the roof surface a layer of cement, the thickness of which varies. A drawback of such a cement layer is that, certainly in the case of larger roofs, it is very heavy.

The gradient can likewise be obtained by varying the thickness of the insulating material incorporated in a roof finishing. Because it is also necessary not to fall below determined values in respect of the heat resistance of the roof finishing, the insulating value of the roof finishing where it is thinnest will require at least a determined thickness of the insulation material. When for example polystyrene plates are used as insulating material (a relatively inexpensive insulating material), this means that the minimum thickness of the plates, in The Netherlands, is 90 mm. Because of the gradient requirement the thickness of the insulating material for a roof with a width of 10 metres will then increase to a thickness of almost 26 cm. An insulating material with a lower thermal conductivity can be applied in order to obtain a thinner insulation layer. Insulating material with a lower thermal conductivity is usually more expensive than insulating material with a higher thermal conductivity.

The object of the invention is to provide a relatively inexpensive roof finishing of the type stated in the preamble, with a limited thickness of the insulating material.

To this end the invention provides a roof finishing arranged on a substantially horizontal roof surface, wherein a gradient is realized by varying the thickness of the roof finishing material, characterized in that the roof finishing material comprises at least two types of insulating material with mutually differing thermal conductivities. The insulating material with the lower thermal conductivity is preferably incorporated in the roof finishing at least at the location where the roof finishing has a limited thickness, while the insulating material with the higher thermal conductivity is preferably incorporated in the roof finishing at least at the location where the roof finishing has a great thickness. By using at least two types of insulating material it is possible to keep relatively small the thickness of the insulating material at the location where the roof finishing has a limited thickness without falling below a minimum heat resistance, this by using comparatively expensive insulating material with a low thermal conductivity at this position. Where the insulating material has a greater thickness in respect of the minimum gradient requirement it is however unnecessarily expensive to use insulating material with a low thermal conductivity and this can be replaced by insulating material with a higher thermal conductivity. This option is possible because the thickness of the insulating material is not determined here by the minimum insulating value but by the minimum gradient requirement. The position where the different types of insulating material are mutually adjoining and the number of types of insulating material applied in a roof finishing depends on the local building regulations, the roof length and the price and quality of the insulating materials available. An advantage of the roof finishing in accordance with the invention is the low cost price of insulating material in the case of greater roof lengths. Another advantage is that the total volume of insulating material used can be limited by means of the invention, which is advantageous to the environment. The fixing means and the roof edges can also be embodied shorter respectively lower and thus less expensively. In the optimization of a roof finishing insulating materials from a number of manufacturers can be combined with each other, which considerably increases the possibilities for the purchasers of insulating material.

The insulating material is preferably anchored to the roof surface by means of fixing means or fixed to the roof surface by means of ballast placed on the roof finishing. A moisture-inhibiting layer, for example aluminium-coated polyethylane, is preferably also arranged between the insulating material and the roof surface. Corrosion occurs particularly where foam can come into contact with metals and when there is moisture. By using ballast and a moisture-inhibiting layer between the insulating material and the roof surface, which can for instance be a metal roof surface, the chance of corrosion is limited. It is recommended when employing fixing means to use corrosion-proof fixing means. By using ballast or fixing means to anchor the roof finishing it is possible in relatively simple manner to re-use the roof finishing material or dispose of it separately.

The insulating material with the lowest thermal conductivity is preferably polyurethane foam, polyisocyanurate foam or phenol foam. These high-grade insulating materials have a very low thermal conductivity, whereby the minimum thickness of the insulating material remains very limited.

The thinnest part of the roof finishing preferably also forms a gutter by arranging a flat plate over a width of for instance 60 cm. Through use of a gutter in the roof finishing the number of required downpipes and overflows can be limited. In the roof finishing of a row of houses use is often made of the costly valley rafter system wherein each separate house requires its own downpipe and overflow. By applying a gutter construction it is possible to arrange overflows only on the end side of the row of houses, which is less expensive and also provides a more attractive appearance of the row of houses.

The present invention will be further elucidated with

reference to the embodiments shown in the following figures. Herein:

Fig. 1 shows a perspective view of a partly cut away roof finishing in accordance with the invention, and Fig. 2 shows a detail of the roof finishing shown in fig. 1.

Fig. 1 shows a roof finishing 1 of for example a row of houses 2. The roof finishing 1 is arranged on a substantially horizontal roof surface 3. The upper side of roof finishing 1 is provided with an angle of slope α for good drainage of precipitation on roof finishing 1 to drain points 4. The upper side of roof finishing 1 comprises a relatively high edge 5, from which edge 5 the upper side of the roof finishing slopes downward to two sides at an angle α. The lowest position of roof finishing 1 formed by a flat insulating plate with a low thermal conductivity is situated close to a drain point 4. This flat plate creates a kind of gutter 6 whereby, if one of the drain points 4 becomes blocked, the water can diverge to an alternative drain point 4. At the same time the required overflows for instance on the end side of the roof 10 can serve for the whole roof surface, so that fewer overflows are required. It will be apparent that these gutters 6 can also be applied independently of the other aspects of this invention.

The roof finishing 1 is formed by insulating material 7, 8 which is placed on roof surface 3 with or without interposing of a moisture-inhibiting layer (not shown in fig. 1 and 2). The angle of slope α is created by varying the thickness of the insulating material 7, 8. A covering layer 9 is arranged on the insulating material 7, 8. Fig. 1 and 2 do not show how roof finishing 1 is fixed to the roof surface 3. This preferably takes place by fixing means or by placing ballast on covering layer 9 due to the good possibilities for re-use of the roof finishing material which this provides. Another possibility is to adhere roof finishing 1 to the roof surface.

As shown in detail in fig. 2, the insulating material 7 at the location where roof finishing 1 has a limited thickness is of a different quality from the insulating material 8 at the location where roof finishing 1 has a great thickness. The thickness of roof finishing 1 at the position of gutter 6 can remain very limited by using an insulating material 7 with a low thermal conductivity. The high-grade insulating material 7 in any case provides a sufficiently high insulating value. Where the thickness of roof finishing 1 is greater a lower grade insulating material 8 can provide sufficiently good insulation. The high-grade insulating material 7 is superfluous there. The combination of high-grade insulating material 7 and less high-grade insulating material 8 limits the total construction height of roof finishing 1, which provides a number of advantages as already stated above. In a determined part of roof finishing 1 the use of both high-grade insulating material 7 and less high-grade insulating material are mutually combined. Where this has taken place the insulating value of an insulating layer consisting of insulating material 8 is not yet sufficient for an adequate insulation. The use of insulating material 7 only is however superfluous; an unnecessarily good insulating value would hereby be obtained. In order to limit the costs a part of the high-grade insulating material 7 is therefore replaced by insulating material 8.

It will be apparent that instead of the combination of two types of insulating material 7, 8, more than two types of insulating material 7, 8 can be mutually combined in the same manner.

As will be apparent from fig. 1, a lower height of the roof finishing likewise requires less high roof edges 10 and the roof surface 3 of the row of houses 2 is loaded relatively little by the roof finishing 1, and a thinner roof finishing 1 will in any case weigh less than a thicker roof finishing 1.

Claims

1. Roof covering arranged on a substantially horizontal roof surface, wherein a gradient is realized by varying the thickness of the roof finishing material, **characterized in that** the roof finishing material comprises at least two types of insulating material with mutually differing thermal conductivities.

2. Roof finishing material as claimed in claim 1, **characterized in that** the insulating material with the lowest thermal conductivity is incorporated in the roof finishing at least at the location where the roof finishing has a limited thickness.

3. Roof finishing as claimed in claim 1 or 2, **characterized in that** the insulating material with the highest thermal conductivity is incorporated in the roof finishing at least at the location where the roof finishing has a great thickness.

4. Roof finishing as claimed in any of the foregoing claims, **characterized in that** the insulating material is anchored to the roof surface by means of fixing means.

5. Roof finishing as claimed in claims 1-3, **characterized in that** the insulating material is fixed to the roof surface by means of ballast placed on the roof finishing.

6. Roof finishing as claimed in any of the foregoing claims, **characterized in that** a moisture-inhibiting layer is arranged between the insulating material and the roof surface.

7. Roof finishing as claimed in claim 6, **characterized in that** the moisture-inhibiting layer is formed by aluminium foil.

8. Roof finishing as claimed in any of the foregoing claims, **characterized in that** the insulating mate-

rial with the lowest thermal conductivity is a polyurethane foam.

9. Roof finishing as claimed in any of the foregoing claims, **characterized in that** the insulating material with the lowest thermal conductivity is polyisocyanurate foam or phenol foam.

10. Roof finishing as claimed in any of the foregoing claims, **characterized in that** the thinnest part of the roof finishing forms a gutter part.

FIG.1

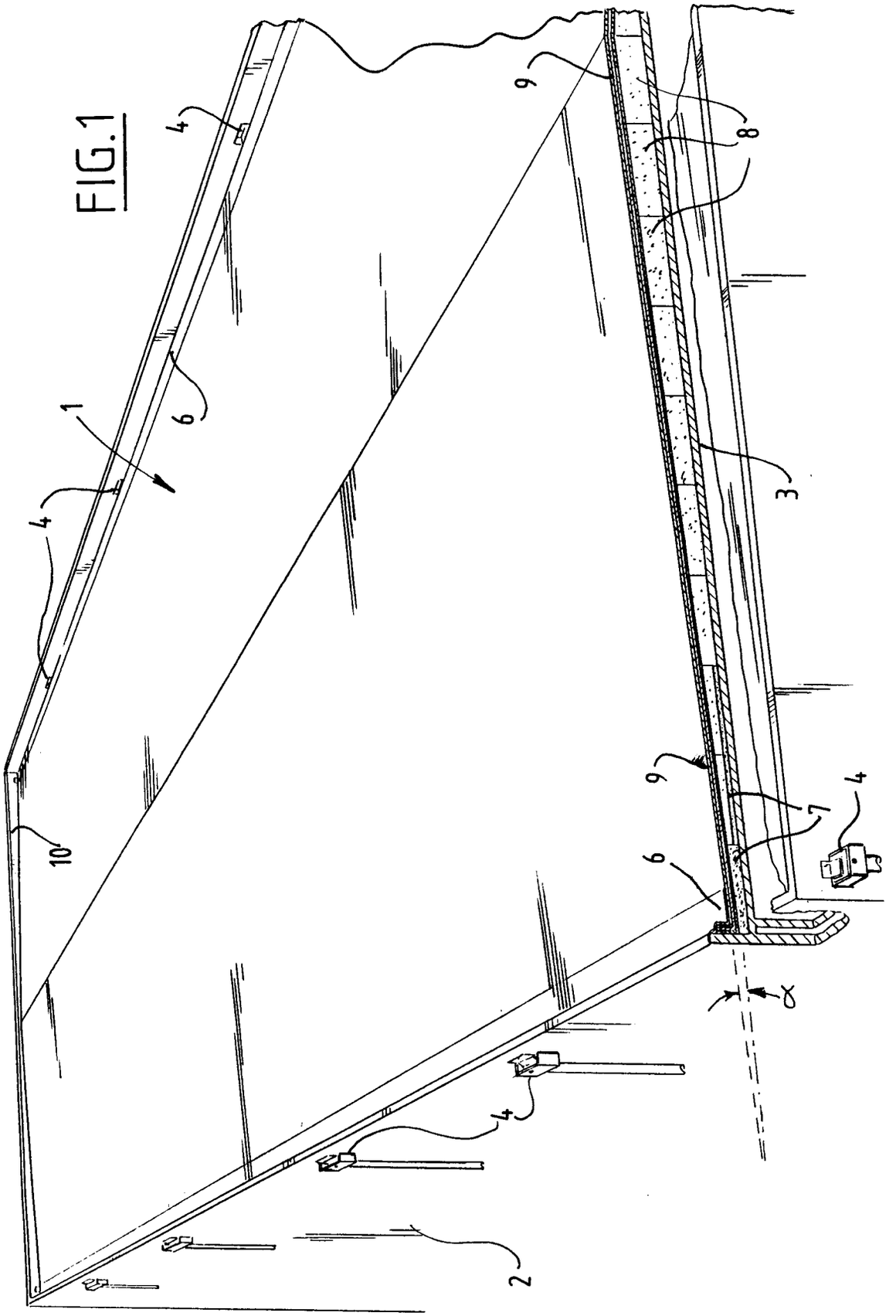
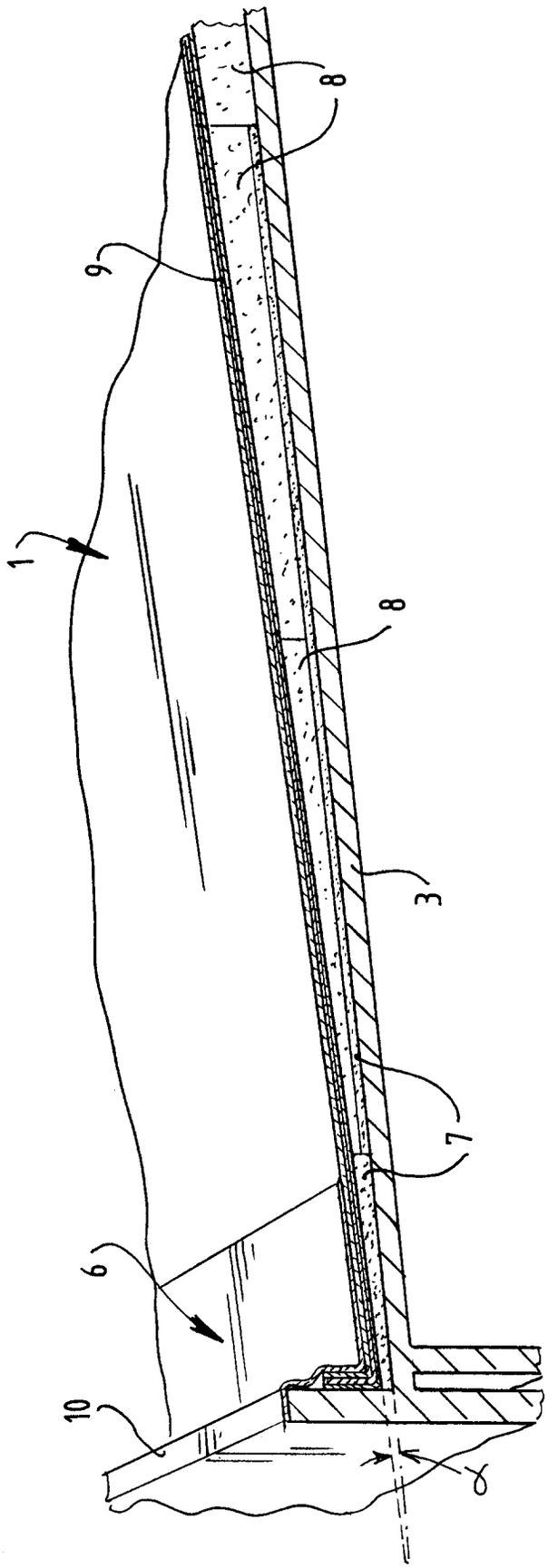


FIG.2



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 20 2323

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.6)
X Y	DE-A-25 02 374 (HEMPEL) 29 July 1976 * page 3, paragraph 1 * * page 4, paragraph 1 - page 4, paragraph 3 * * page 5 * * page 6 * * page 7 * ---	1-3,5,6 4,7-9	E04D13/16
Y	DE-U-92 13 220 (OTTO KREBBER GMBH) 3 December 1992 * page 6, line 4 - page 6, line 7 * * figure 6 * ---	4	
Y	DE-C-43 30 407 (BENDER) 20 October 1994 zie samenvatting * figure 1 * ---	7	
Y	DE-A-19 59 387 (GREFCO INC.) 3 June 1971 * claims 1,4 * ---	8,9	
X Y	DE-A-16 09 982 (HEMPEL) 19 February 1970 * page 4, paragraph 3 - page 4, paragraph 4 * * page 5, paragraph 3 - page 5, paragraph 5 * * claims 1,3 * * figures 1,2 * ---	1,6 2,3	TECHNICAL FIELDS SEARCHED (Int.Cl.6) E04D E04B
Y	DE-A-23 06 975 (HEMPEL) 22 August 1974 * page 1, paragraph 4 - page 1, paragraph 6 * * claim 1; figure 1 * ---	2,3	
A	DE-U-88 10 144 (FA. BRONK) 5 January 1989 * page 2, line 4 - page 2, line 11 * * page 2, line 26 - page 2, line 27 * * page 3, line 16 - page 4, line 12 * * figures 1,2 * --- -/--	21	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 December 1996	Hendrickx, X

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)

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 20 2323

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.6)
A	CSTB/BULLETIN MENSUEL DES AVIS TECHNIQUES, no. 279, May 1987, PARIS, pages 1-11, XP002005999 SECRÉTARIAT DE LA COMMISSION DES AVIS TECHNIQUES: "AVIS TECHNIQUE 5/86-588 ISOCAN" * page 6; figure 5 * * page 7; figure 8 * * page 9; figures 14,15 * -----	10	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 December 1996	Hendrickx, X

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)