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

(72) Inventors:
- **Wiegerinck, Hendrikus Johannes Petrus Paulus**
  7103 GW Winterswijk (NL)
- **Jetten, Frederik Rudolf**
  7103 WH Winterswijk (NL)

(74) Representative:
Prins, Adrianus Willem et al
Vereenigde,
Nieuwe Parklaan 97
2587 BN Den Haag (NL)

(54) Method and apparatus for providing a roofing on a roof of a building

(57) A method and an apparatus for providing a roofing on a roof of a building, whereby a layer of insulating material (2) is provided on the roof surface (3) and then a watertight covering layer (1) is provided on the layer of insulating material (2), whereby as watertight layer (1) at least one covering layer consisting of plastic material is used; in the covering layer openings (7) are cut at regular intervals with a cutting tool (30) suitable for the purpose; subsequently, via the resulting openings, screws (20) are screwed into the insulating material (2), which screws (20) are made of plastic, have a shank with a very coarse screw thread (21) and a thin disk-shaped head (23), the diameter of which is larger than that of the openings (7) in the covering layer (1), and which is provided with engagement (24) means for a screw-in tool.

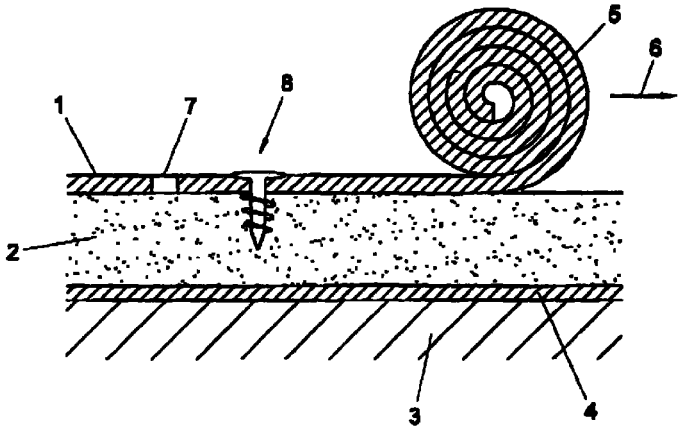

Fig. 1

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Description

[0001] The invention relates to a method for providing a roofing on a roof of a building, whereby a layer of insulating material is provided on the roof surface and then a watertight covering layer is provided on the layer of insulating material.

[0002] Such a method has been known from practice for many years. On the layer of insulating material, which may consist, for instance, of plates of polystyrene foam or polyurethane foam or another suitable insulating material, there may be provided according to the known technique, for instance, a vapor pressure distributing layer of perforated bituminous roofing material unwound from a roll. On that layer a so-called fire roll may be unrolled, whereby the lower side of the fire roll material is heated with a burner, so that the fire roll adheres to the insulating material via the perforations.

[0003] Since the use of burners increasingly often meets with objections, other roofing materials have meanwhile been developed, which consist of a non-perforated plastic covering layer, which may or may not be provided with a reinforcing material.

[0004] The object of the invention is to provide a method whereby such a plastic layer can be rapidly and reliably provided on a roof surface first provided with a layer of insulating material, with retention of the vapor pressure distributing properties.

[0005] To this end, a method of the above-described type is therefore characterized according to the invention in that as watertight covering layer at least one layer consisting of plastic material is used, that in the layer openings are cut at regular intervals with a cutting tool suitable for the purpose, that subsequently, via the resulting openings, screws are screwed into the insulating material, which screws are made of plastic, have a shank with a very coarse screw thread and a thin disk-shaped head, the diameter of which is larger than the diameter of the openings in the plastic covering layer, and which is provided with engagement means for a screw-in tool.

[0006] It is observed that screws suitable for use in the method according to the invention are already known per se from practice. An example of such screws is described and shown in applicants' Netherlands patent application 10 07503, which describes the use of similar screws for fastening a renovation layer to existing roofing.

[0007] The invention further relates to a cutting tool for cutting openings in a covering layer lying on the roof, without damaging the subjacent insulating material. Such an apparatus is characterized according to the invention by a shaft drivable for rotation, which is connected with a cutting element, which cutting element is placed in a housing having on the lower side a substantially flat supporting surface, which is provided with a central opening, and which can be placed on the roofing layer, whereby the cutting element and the drivable shaft are attached to the housing for up and down movement and the cutting element can be brought into engagement with the roofing layer through the central opening, so as to cut an opening in the roofing layer until a previously adjustable depth.

[0008] The invention will hereinafter be described in more detail with reference to the accompanying drawings in which

Fig. 1 diagrammatically shows the provision of a plastic roofing layer on a layer of insulating material;
Fig. 2 diagrammatically shows an example of a screw to be used;
Fig. 3 diagrammatically shows, in top view, a part of a roof provided with a roofing layer fixed with screws according to the invention;
Fig. 4 diagrammatically shows, partly in cross-section, a view of an example of an apparatus according to the invention for cutting openings in a plastic roofing layer.

[0009] Fig. 1 diagrammatically shows the provision of a plastic roofing layer 1 on a layer of insulating material 2 provided on a roof surface 3. In this example, the roof surface is a horizontal roof surface, but the roof surface may also be an inclined roof surface. The insulating material is connected with the roof surface in one of the manners known for the purpose, for instance through an adhesive layer 4 or mechanical fastening means.

[0010] The roofing layer is conventionally fed on rolls, which may be unrolled on the roof surface. Fig. 1 shows at 5 such a roll, which is unrolled in the direction of the arrow 6. The covering layer is a watertight weatherproof layer, which is commercially available in different thicknesses. In a practical situation, the thickness may be, for instance, 1 to 2 mm.

[0011] The roofing layer is fixed according to the invention with a special plastic screw 20 having a tapered coarse screw thread 21 and a large flank depth. The shank 25 has a sharp point 22, so that the screw easily penetrates the insulating material. The screw further has a flat head 23 having a relatively large diameter and a substantially flat lower side, so that the head comes to lie properly flat on the plastic roofing layer.

[0012] The head is further provided with means with which a tool for screwing in the screw can engage. Preferably, these means comprise a hexagonal bore 24, into which an Allen wrench fits. The point 22 of the screw is sufficiently sharp to render it possible with the screw itself to prick a hole in the roofing layer, into which the screw can then be tightened. It has been found, however, that in such a method of operation the plastic roofing layer is wrinkled around the screw head. Such wrinkles can adversely affect the watertightness and make the roofing locally susceptible to damage.

[0013] According to the invention, wrinkle formation around the fastening screws can be prevented by first cutting an opening in the roofing layer. The diameter of

the opening is preferably larger than the diameter of the shank of the screw, but may be smaller than the largest diameter of the screw thread.

[0014] Fig. 1 shows at 7 such a pre-cut opening and at 8 an opening in which a screw 20 is provided. Experiments have shown that screws of the type shown may have a pull-out force of some tens of kilos, for instance 50 to 60 kg.

[0015] Fig. 3 diagrammatically shows, in top view, a part of a roof surface provided with bands 10, 11 of a top layer, fixed with screws 20 along the edges. In a number of the openings 7 in the top layer, no screw is provided yet.

[0016] Although the openings 7 can basically be provided in different manners, for instance with a knife, and further need not necessarily be circular, the openings are preferably provided such that the risk of damage to the covering layer and/or the insulating material is as low as possible.

[0017] Mostly, the openings are provided along one edge of a band of roofing material, but in broad bands a row of openings may also be made in the center.

[0018] According to the invention, therefore, a purpose-developed tool is preferably used, with which round holes can be cut in the covering layer without damaging the covering layer or the subjacent insulating material.

[0019] Fig. 4 diagrammatically shows a practical example of such a tool 30, which, in this example, is designed to be placed in the conventional chuck of a drilling machine. The drilling machine is preferably an electric drilling machine, but the use of a drilling machine to be driven by hand is conceivable. By way of alternative, the tool could form part of a hand- or motor-driven apparatus.

[0020] In the example shown, the tool 30 comprises a drill head 31 in the form of a hollow tube fastened to a holder 32. The holder is rotatable and secured in a housing 33 for up and down movement. In the example shown, the housing has a substantially cylindrical form with an upper plate 34 and a lower plate 35. In the condition of use, the upper plate and the lower plate have a lowered and a raised collar 36, 37, respectively. In this example, the collars 36 and 37 are connected together by a number of bars 38. In the lower plate 35, a bore 39 is provided, via which the drill head 31 located in the housing can be moved outwardly. Provided above the lower plate 35 is a thrust bearing 47, which also forms a stop for a fastening ring 40 for the drill head. The drill head is adjustably secured in the fastening ring by means of a number of radial socket bolts 41. The fastening ring 40 is connected via bars 42 with a crown plate 43 of the holder 32, which crown plate is located below the upper plate of the housing. The crown plate 43 is connected with a driving shaft 44 via a central bore in the upper plate 34. At a distance above the upper plate 34 the driving shaft 44 has a radial shoulder 45, below which is located a compression spring 46 resting on the upper plate.

[0021] The driving shaft can be clamped in the chuck of a drilling machine. When the described tool is placed on the covering layer and the shaft 44 is pressed downwardly against the spring force of the spring 46, the drill head 31 comes to lie against the foil. When the shaft 44 is driven, the drill head cuts a round hole in the covering layer until a depth determined by the distance between the lower side of the fastening ring 40 and the upper side of the thrust bearing 47. By means of the socket bolts the drill head can be accurately adjusted to the desired level, which corresponds to the thickness of the covering layer.

[0022] It is observed that the described embodiment of the cutting tool is only an example and that many other embodiments with alternative fastening and adjusting means for the drill head and alternative embodiments of the housing and the holder are conceivable.

[0023] After screw-in openings have been provided in the covering layer with the described tool or with another suitable tool, the screws 20 can be screwed in. In principle, this can be done manually by means of an Allen wrench. Preferably, however, a driven screw-in apparatus is used, such as, for instance, a drilling machine with a socket bit in the chuck. More preferably, the screw-in apparatus is of such design that the screws can be screwed in, while the person working the apparatus can remain standing erect. Such an apparatus is described in applicants' simultaneously filed Netherlands patent application .....

[0024] It is observed that with respect to the foregoing different variants and modifications are conceivable. Thus, for instance, it is possible to previously provide the screw openings in the covering layer, for instance during the manufacture of the plastic covering layer. This and similar modifications are deemed to fall within the scope of the invention.

Claims

1. A method for providing a roofing on a roof of a building, whereby a layer of insulating material is provided on the roof surface and then a watertight covering layer is provided on the layer of insulating material, **characterized** in that as watertight layer at least one covering layer consisting of plastic material is used; that in the covering layer openings are cut at regular intervals with a cutting tool suitable for the purpose, that subsequently, via the resulting openings, screws are screwed into the insulating material, which screws are made of plastic, have a shank with a very coarse screw thread and a thin disk-shaped head, the diameter of which is larger than that of the openings in the plastic covering layer, and which is provided with engagement means for a screw-in tool.

2. A method according to claim 1, **characterized** in that a covering layer is used, which has been previously provided with openings.

3. A method according to claim 1 or 2, **characterized** in that the screws are screwed in with a motor-driven screw-in apparatus, which is provided with screw-in means cooperating with the engagement means.

4. A method according to claim 3, **characterized** in that the screw-in apparatus comprises a conventional drilling machine with a chuck, whereby in the chuck a screw-in bit suitable for cooperation with the engagement means is provided.

5. A method according to any of the preceding claims, **characterized** in that a cutting tool is used, which comprises a shaft to be driven for rotation, which is connected with a cutting element connected with the shaft, which cutting element, in the condition of rest, is located in a housing and, in the operating condition, can be pushed outwardly through an opening on the lower side of the housing until a previously adjusted cutting depth.

6. A method according to claim 5, **characterized** in that as cutting tool a hollow tube-shaped cutting element is used.

7. A method according to any of the preceding claims, **characterized** in that the diameter of the openings is larger than the maximum diameter of the screw thread.

8. A cutting tool for cutting openings in a covering layer lying on a roof, **characterized** by a shaft drivable for rotation, which is connected with a cutting element, which cutting element is placed in a housing having on the lower side a substantially flat supporting surface, which is provided with a central opening, and which can be placed on the covering layer, whereby the cutting element and the drivable shaft are fastened to the housing for up and down movement and the cutting element can be brought into engagement with the covering layer through the central opening, so as to cut an opening in the covering layer until a previously adjustable depth.

9. A cutting tool according to claim 8, **characterized** in that between the assembly of drivable shaft and cutting element, on the one hand, and the housing, on the other hand, at least one pull-back spring is operative.

10. A cutting tool according to claim 8 or 9, **characterized** in that the shaft is connected with a mounting disk for the cutting element and that in the housing below the mounting disk there is mounted a thrust bearing, which serves as a stop for the mounting disk and therefore confines the cutting depth.

11. A cutting tool according to claim 10, **characterized** in that the cutting tool is fastened to the mounting disk so as to be adjustable for height.

12. A cutting tool according to any of claims 8 - 10, **characterized** in that the housing comprises an upper plate with a central bore for the drivable shaft and a lower plate with the central bore for the cutting element, whereby the upper plate and the lower plate are connected together by a number of bars.

13. A cutting tool according to any of claims 8 - 12, **characterized** in that the drivable shaft has a collar lying above the upper plate, whereby between the upper plate and the collar a compression spring is mounted.

14. A cutting tool according to any of claims 8 - 13, **characterized** in that the drivable shaft is connected with a disk-shaped crown plate lying below the upper plate, which crown plate is connected via a number of bars with a lower lying mounting disk for the cutting element.

15. A cutting tool according to any of claims 8 - 14, **characterized** in that the drivable shaft is coupled with a hand- or motor-driven apparatus.

16. A cutting tool according to any of claims 8 - 14, **characterized** in that the drivable shaft is arranged to be clamped in the chuck of a drilling machine.

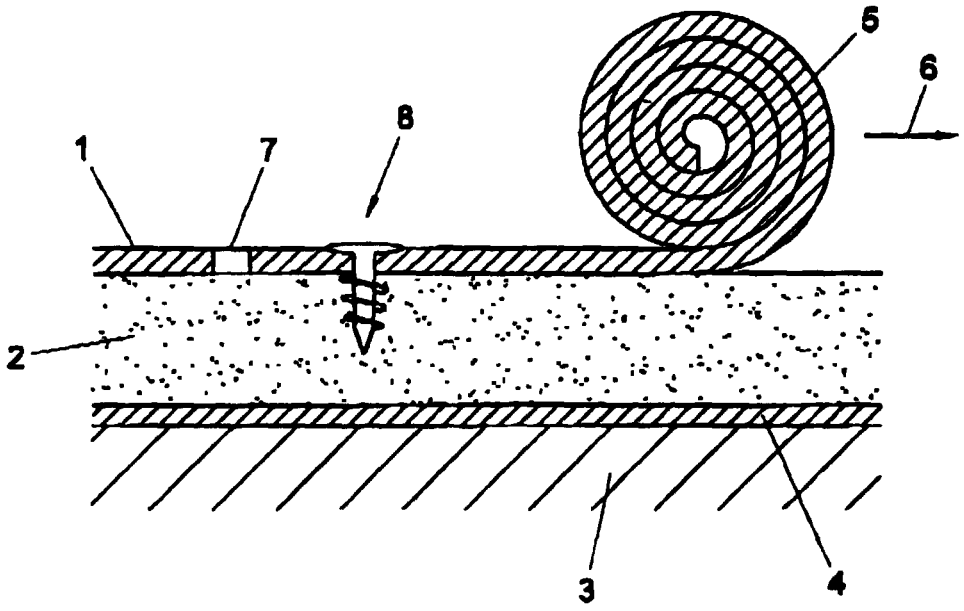

Fig. 1

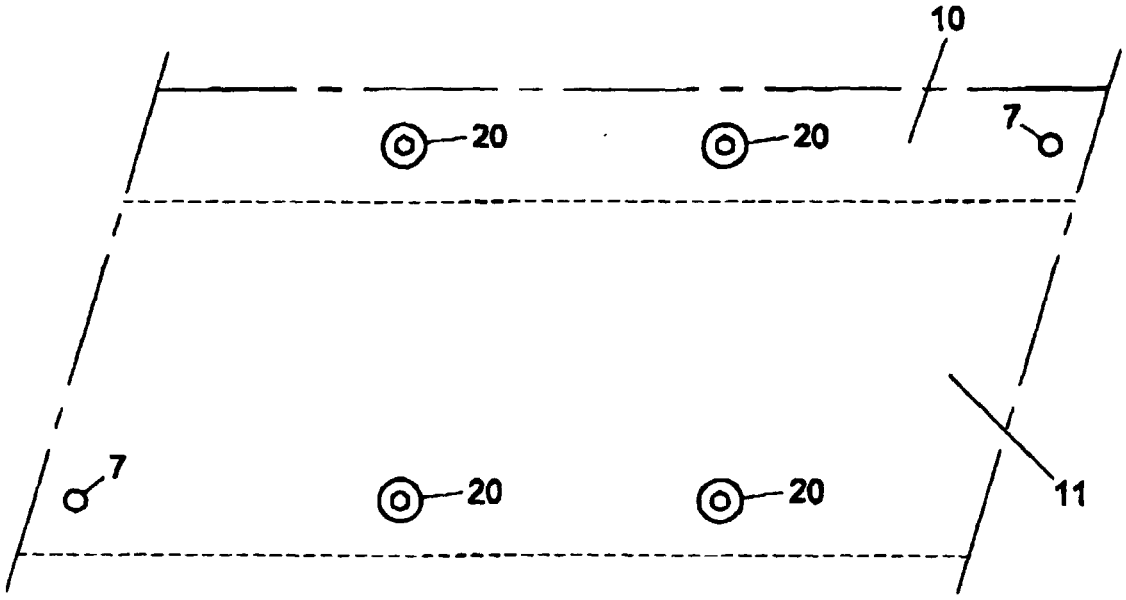

Fig. 3

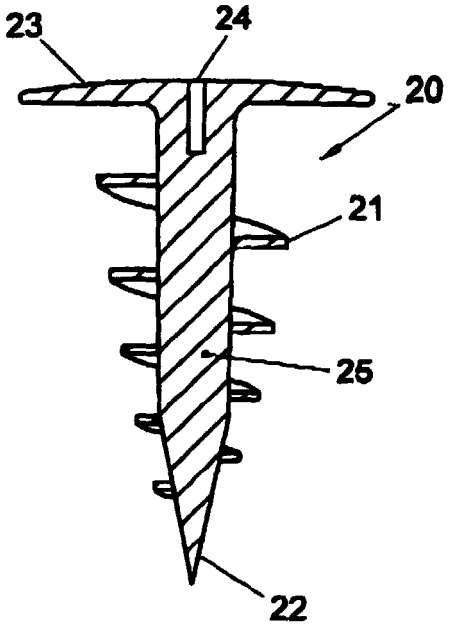
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Fig. 2

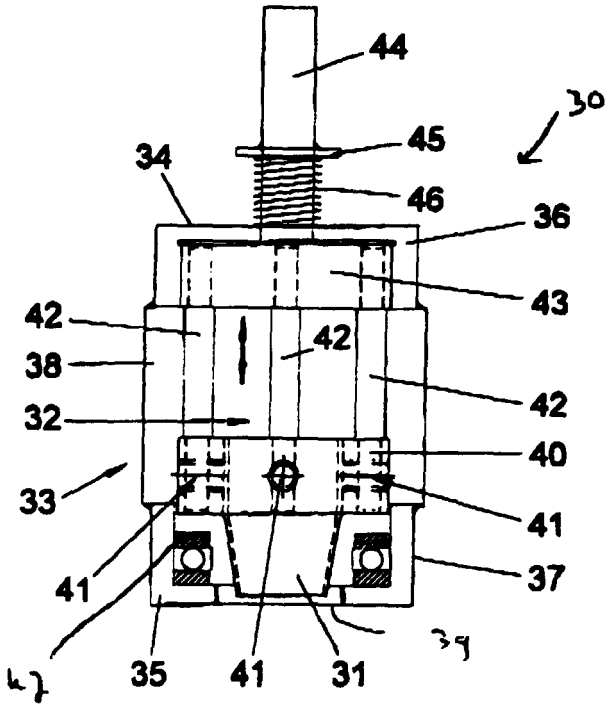
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Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 00 20 1906

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	25 July 2000	Demeester, J

CATEGORY OF CITED DOCUMENTS

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EUROPEAN SEARCH REPORT

Application Number
EP 00 20 1906

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