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(54) Title: THERMAL INSULATION QUILT


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Declaration under Rule 4.17:
— if inventorship (Rule 4.17(iv))

Published:
— with international search report

(57) Abstract: A multi-layer, thermal insulation quilt (1) comprises two spaced apart, outer layers (2, 3) at least one of which is a reflective thermal insulation layer, between which outer layers there is provided at least one inner layer (4) of thermal insulation, characterised in that the outer layers (2, 3) secured together by a non-metallic, common restraining tag (5) of such length, that the tag (5) determines the maximum separation of the outer layers (2, 3) but effects no compressive loading on the or each thermal insulation layer (4).
Title of the Invention

Thermal insulation quilt

Field of the Invention

This invention relates to a thermal insulation quilt for use particularly, but not exclusively, in the building industry for the lining of roofs, walls etc either as a new build installation, or as part of property renovation or improvement.

Background of the Invention

Thermal insulation quilts are known comprising a multi-layered materials having differing thermal insulation or reflective properties. One known membrane comprises multiple layers of polyester fibre, metallised polyester, extruded polyethylene, and aluminium foil, the number of layers usually being determined to meet the various thermal insulation standards for the particular installation involved. In practice, the multiple layers have been secured together by stitching and although efficient this results in the disadvantageous compression of the various insulating layers and resultant loss of thermal insulation, such that cold "spots" are created along the line of stitching, along which line the intended thermal insulation properties may not be achieved.

Object of the Invention

A basic object of the invention is to provide an improved multi-layer quilt.

Summary of the Invention

According to the present invention there is provided a multi-layer, thermal insulation quilt comprising two spaced apart, outer layers at least one of which is a reflective thermal insulation layer, between which outer layers there is provided at least one inner layer of thermal insulation, characterised in that the outer layers are secured
together by an array of non-metallic restraining tags of selected length, whereby the tags determine the maximum separation of the outer layers but effect no compressive loading on the or each thermal insulation layer.

**Advantages of the Invention**

With the avoidance of stitching and the securing by the tags, the linear cold spots of prior art multi-layer quilts are avoided, as the securing technique in accordance with the invention results in no compression of the e.g. fibrous inner layer.

After installation the tags can, if required, be removed (for example by cutting), thereby allowing the inner layer(s) to bag out further - either naturally, following slight compression by the tags, and/or under gravity, trapping more air and provide greater thermal insulation properties.

**Preferred or Optional Features**

Both outer layers are of reflective thermal insulation.

The or each outer layer of reflective thermal insulation is a foil.

The or each outer layer of reflective thermal insulation is aluminium foil.

The or each outer layer of reflective thermal insulation is metallic polyester foil.

The outer surface of the aluminium foil is provided with a coating to prevent, or reduce, oxidation.

The coating is of nitrocellulose.

The or each outer, aluminium foil layers is/are reinforced by a grid of fibreglass fibres.

The thermal insulation layer(s) is/are compressible.

The thermal insulation layer(s) is/are fibrous.
The quilt comprises multiple fibrous insulation layers, at least some of which are separated by metallised layers and/or extruded polyethylene foil layers.

The quilt comprises six fibrous insulation layers and five separating layers.

The separating layers, being enclosed within the quilt, and hence not subjected to abrasion etc during transportation, handling and installation, are of a non-reinforced kind.

The tags are of nylon.

The tags are of monofilament nylon.

The tags are of cotton.

Each tag comprises an abutment, an enlargement, or a head at each end adapted to engage the external surface of the adjacent outer layer.

The abutment etc is an orthogonal bar of T-like form.

The abutment etc, at least at one end of the tag, is circular etc to provide an enlarged abutment surface.

The tags are of a contrasting colour compared with the outer layers, such that the location of each tag is readily identifiable should it be required to release or remove the tags e.g. by cutting the tag with scissors after installation, to permit expansion or bagging of the quilt, which provides further improved thermal insulation properties.

The quilt is such that, after manufacture, it can be rolled up for ease of transportation and storage.

The tags are installed at suitable longitudinal and transverse spacing such that when a say 1.5m wide quilt is cut to size or fit, a sufficient number of tags remain in place to maintain the integrity of the quilt along suitable connection lines whether straight or zig-zag.
The connection lines are at least adjacent peripheral edges of the quilt.

A specific example of quilt in accordance with the invention comprises 15 layers, being:

1. foil insulation - shiny side facing out;
2. polyester wadding;
3. metallised polyester;
4. extruded polyethylene;
5. extruded polyethylene;
6. metallised polyester;
7. polyester wadding;
8. metallised polyester;
9. polyester wadding;
10. metallised polyester;
11. extruded polyethylene;
12. extruded polyethylene;
13. metallised polyester;
14. polyester wadding;
15. foil insulation - shiny side facing out.

**Drawings**

One example of a multi-layer membrane in accordance with the invention is shown in the accompanying diagrammatic drawings, in which:

Figure 1 is a section through a portion of a quilt where a tag is located;

Figure 2 details the tag of Figure 1;

Figure 3 is a view of a portion of quilt showing an array of tags; and
Figure 4 details a 15 layer quilt which is exploded to illustrate the various layers.

In the drawings, a multi-layer thermal insulation quilt 1 comprises two spaced-apart, outer layers 2, 3 at least one of which is aluminium foil with the shiny side of the foil facing outwardly and provided with a protective coating (as known in the industry). Between the outer layers 2, 3 are multiple inner layers 4 of thermal insulation such as polyester wadding, separated by layers 11 of metallised polyester, and layers 12 of extruded polyethylene.

In accordance with the invention, the outer layers 2, 3 are secured together by an array of retaining tags 5 of nylon having an enlarged head or abutment 6, 7 at each opposite end, and a relatively thin connecting strand 8.

Figure 2 details the so-called "Kimble" tag(s) 5 of Figure 1, which tag(s) 5 is a proprietary item used for instance in the clothing industry and insertable by a gun.

Figure 3 is a plan view of quilt 1 showing how the tags 5 may be inserted in straight lines 9, or in zig-zag lines 10 along the quilt 1, with the lines being at selected spacings e.g. 450mm apart. Clearly other patterns of tag insertion may be employed, if considered desirable.
CLAIM

1. A multi-layer, thermal insulation quilt (1) comprising two spaced apart, outer layers (2, 3) at least one of which is a reflective thermal insulation layer, between which outer layers there is provided at least one inner layer (4) of thermal insulation, characterised in that the outer layers (2, 3) secured together by an array of non-metallic restraining tags (5) of such length, and in that the tags (5) determines the maximum separation of the outer layers (2, 3) but effect no compressive loading on the or each thermal insulation layer (4).

2. A quilt as claimed in Claim 1, characterised in that both outer layers (2,3) are of reflective thermal insulation.

3. A quilt as claimed in Claim 1 or Claim 2, characterised in that the or each outer layer (2,3) of reflective thermal insulation is a foil.

4. A quilt as claimed in any preceding claim, characterised in that the or each outer layer (2,3) of reflective thermal insulation is aluminium foil.

5. A quilt as claimed in any one of Claims 1 to 3, characterised in that the or each outer layer (2,3) of reflective thermal insulation is metallic polyester foil.

6. A quilt as claimed in Claim 4, characterised in that the aluminium foil has an outer surface which is provided with a coating to prevent, or reduce, oxidation.
7. A quilt as claimed in Claim 6, characterised in that the coating is of nitrocellulose.

8. A quilt as claimed in Claim 4 and any claim appendant thereto, characterised in that the or each outer, aluminium foil layers (2,3) is/are reinforced by a grid of fibreglass fibres.

9. A quilt as claimed in any preceding claim, characterised in that the thermal insulation layer(s) (4) is/are compressible.

10. A quilt as claimed in any preceding claim, characterised in that the thermal insulation layer(s) (4) is/are fibrous.

11. A quilt as claimed in any preceding claim, characterised in that the quilt comprises multiple fibrous insulation layers (4), at least some of which are separated by metallised layers (11) and/or extruded polyethylene layers (12).

12. A quilt as claimed in any preceding claim, characterised in that the quilt comprises six fibrous insulation layers (4) and five separating layers (11,12).

13. A quilt as claimed in Claim 12, characterised in that the separating layers (11,12), being enclosed within the quilt (1), and hence not subjected to abrasion etc during transportation, handling and installation, are of a non-reinforced kind.
14. A quilt as claimed in any preceding claim, characterised in that the tags (5) are of nylon.

15. A quilt as claimed in any preceding claim, characterised in that the tags (5) are of monofilament nylon.

16. A quilt as claimed in any one of Claims 1 to 14, characterised in that the tags (5) are of cotton.

17. A quilt as claimed in any preceding claim, characterised in that each tag (5) comprises an abutment, an enlargement, or a head (6,7) at each end adapted to engage the external surface of the adjacent outer layer (2,3).

18. A quilt as claimed in Claim 17, characterised in that the abutment etc (6,7) is an orthogonal bar of T-like form.

19. A quilt as claimed in Claims 17 or 18, characterised in that the abutment etc (6,7), at least at one end of the tag (5), is circular etc to provide an enlarged abutment surface.

20. A quilt as claimed in any preceding claim, characterised in that the tags (5) are of a contrasting colour compared with the outer layers (2,3), such that the location of each tag (5) is readily identifiable should it be required to release or remove the tags.
e.g. by cutting the tag with scissors after installation, to permit expansion or bagging of the quilt (1).

21. A quilt as claimed in any preceding claim, characterised in that the quilt (1) is such that, after manufacture, it can be rolled up for ease of transportation and storage.

22. A quilt as claimed in any preceding claim, characterised in that the tags (5) are installed at suitable longitudinal and transverse spacing such that when a say 1.5m wide quilt is cut to size or fit, a sufficient number of tags (5) remain in place to maintain the integrity of the quilt (1) along suitable connection lines whether straight or zig-zag.

23. A quilt as claimed in Claim 22, characterised in that the connection lines are at least adjacent peripheral edges of the quilt (1).

24. A quilt as claimed in any preceding claim, comprising 15 layers, being:

1. foil insulation (2) - shiny side facing out;
2. polyester wadding (4);
3. metallised polyester (11);
4. extruded polyethylene (12);
5. extruded polyethylene (12);
6. metallised polyester (11);
7. polyester wadding (4);
8. metallised polyester (11);
9. polyester wadding (4);
10. metallised polyester (11);
11. extruded polyethylene (12);
12. extruded polyethylene (12);
13. metallised polyester (11);
14. polyester wadding (4);
15. foil insulation (3) - shiny side facing out.

25. A multi-layer, thermal insulation quilt, substantially as herein before described with reference to the accompanying drawings.
INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2007/004166

A. CLASSIFICATION OF SUBJECT MATTER

INV. E04B1/78
F16L59/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

EO4B F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Category</th>
<th>Citation of document, with indication, where appropriate of the relevant passages</th>
<th>Relevant to claim No</th>
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Further documents are listed in the continuation of Box C

See patent family annex

Date of completion of the international search

4 February 2008

Date of mailing of the international search report

14/02/2008

Name and mailing address of the ISA/
European Patent Office, P B 5818 Patentaalan 2 NL - 2280 HV Rijswijk
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Authorized officer

Porwol I, Hubert
This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. **Claims Nos.: 25**
   - Because they relate to subject matter not required to be searched by this Authority, namely:
     - Claim 25 contravenes Rule 6.2(a) PCT.

2. **Claims Nos.:**
   - Because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. **Claims Nos.:**
   - Because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

This International Searching Authority found multiple inventions in this international application, as follows:

1. **As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.**

2. **As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.**

3. **As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:**

4. **No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:**

**Remark on Protest**
- **The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.**
- **The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.**
- **No protest accompanied the payment of additional search fees.**
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