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(56) Documents Cited
**GB 2262547 A** **GB 2202874 A** **GB 2088923 A**
**GB 2086447 A** **US 4478021 A** **US 3999349 A**

(58) Field of Search
UK CL (Edition N ) **E1D DCH DF193 DLEHW DLEQWNT**
INT CL$^6$ **E04B , E04C**

## (54) Insulated building blocks

(57) A building block (2) for use in cavity wall constructions comprises a main body (4) of cementitious material provided on one face with a pad (6) of insulating material, preferably polystyrene. The pad comprises an inner face adjoining a face of the main body and an outer face which is offset relative to the inner face. The pad is offset in two directions substantially perpendicular to each other such that when a wall is built by laying the blocks in broken bond there is overlap of insulating material between adjacent blocks. The overlap between the insulation provides the requisite amount of tolerance to maintain the integrity of the thermal barrier even if there is some misalignment of the blocks during laying.

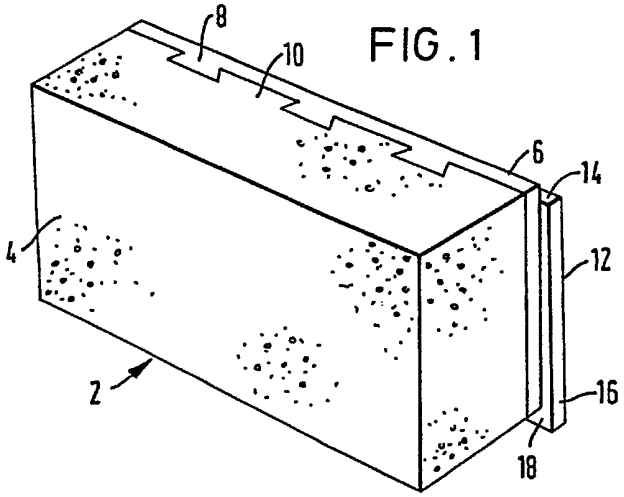


FIG. 1

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FIG. 1

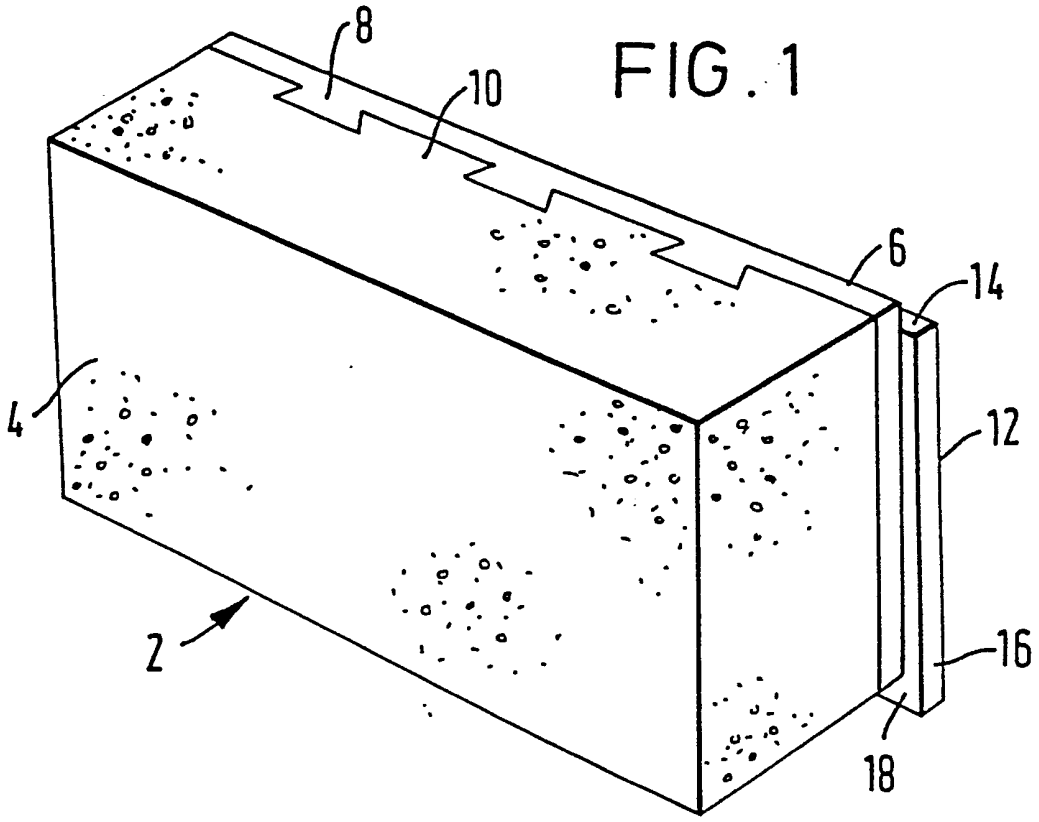



FIG. 2

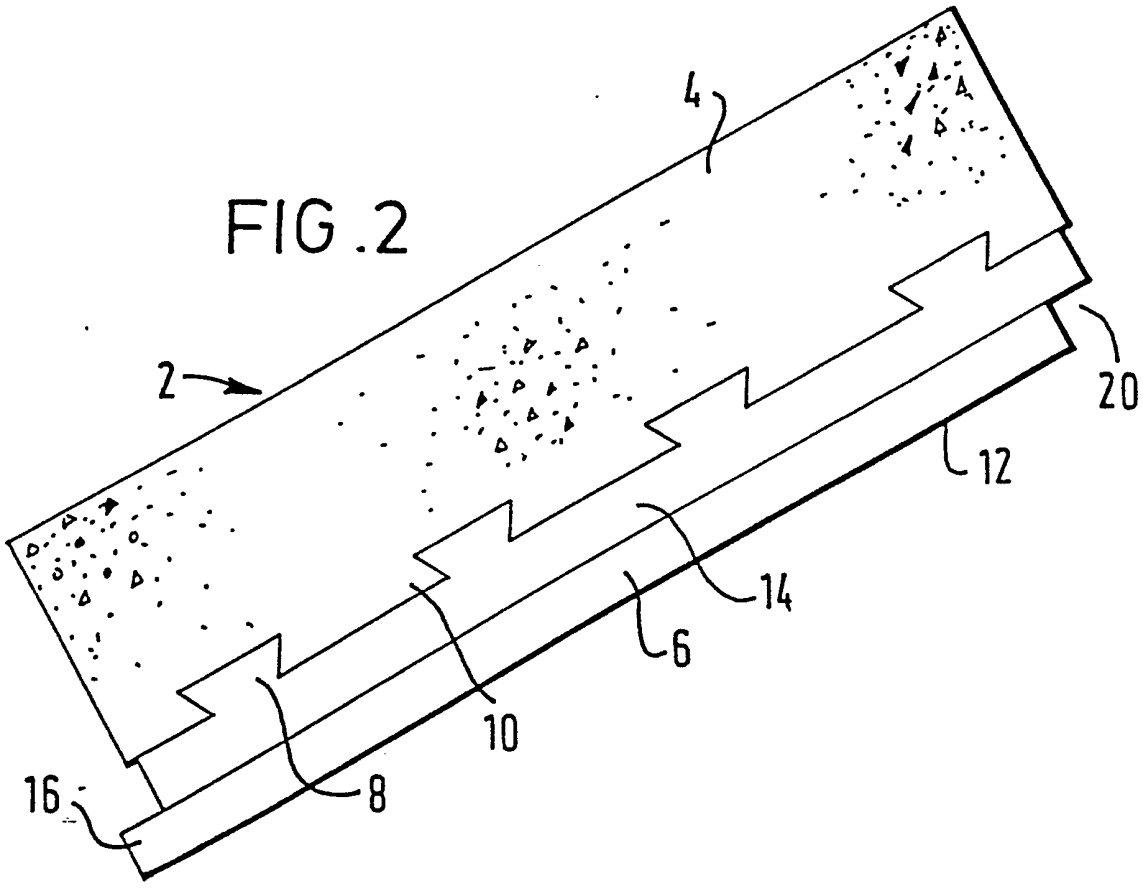


FIG. 3

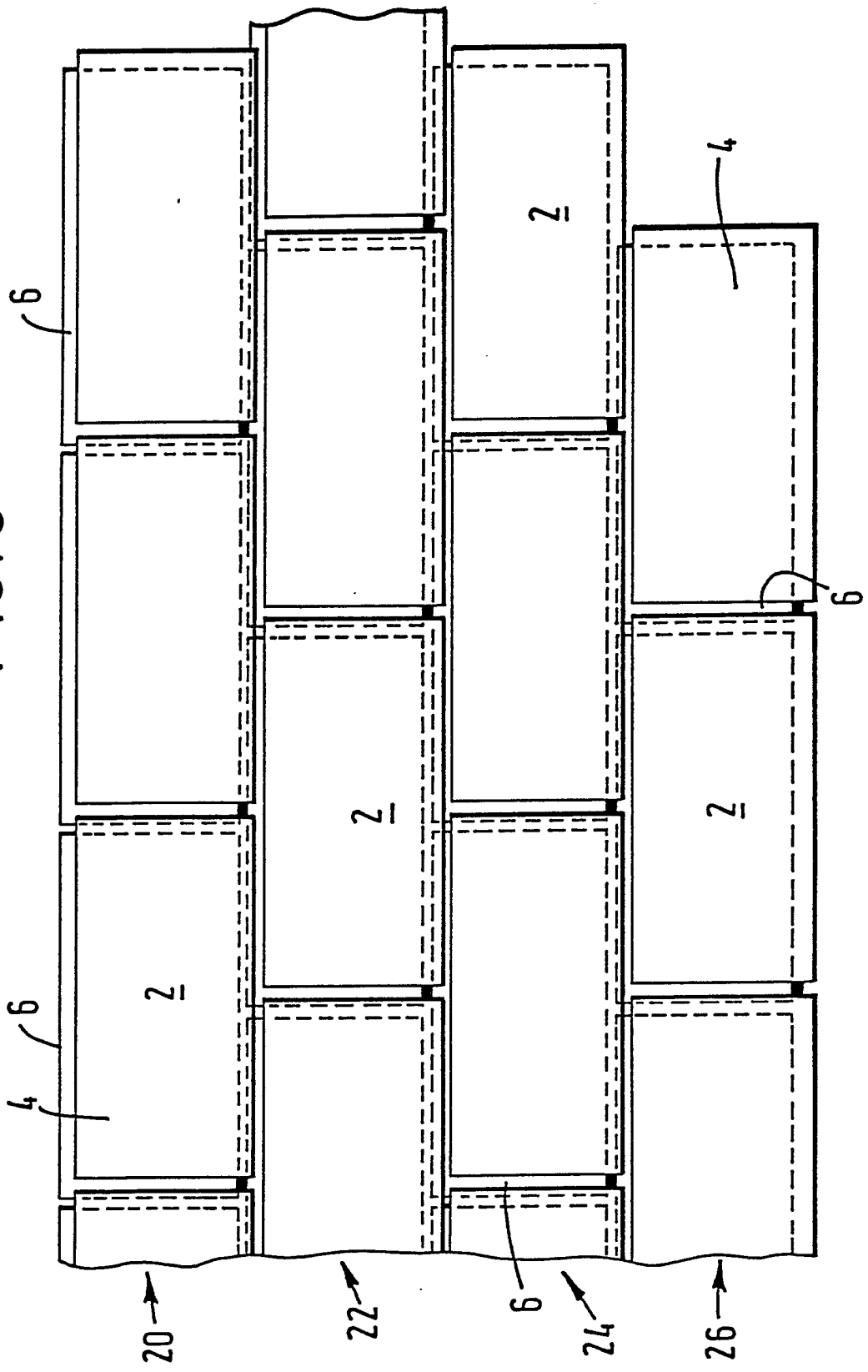
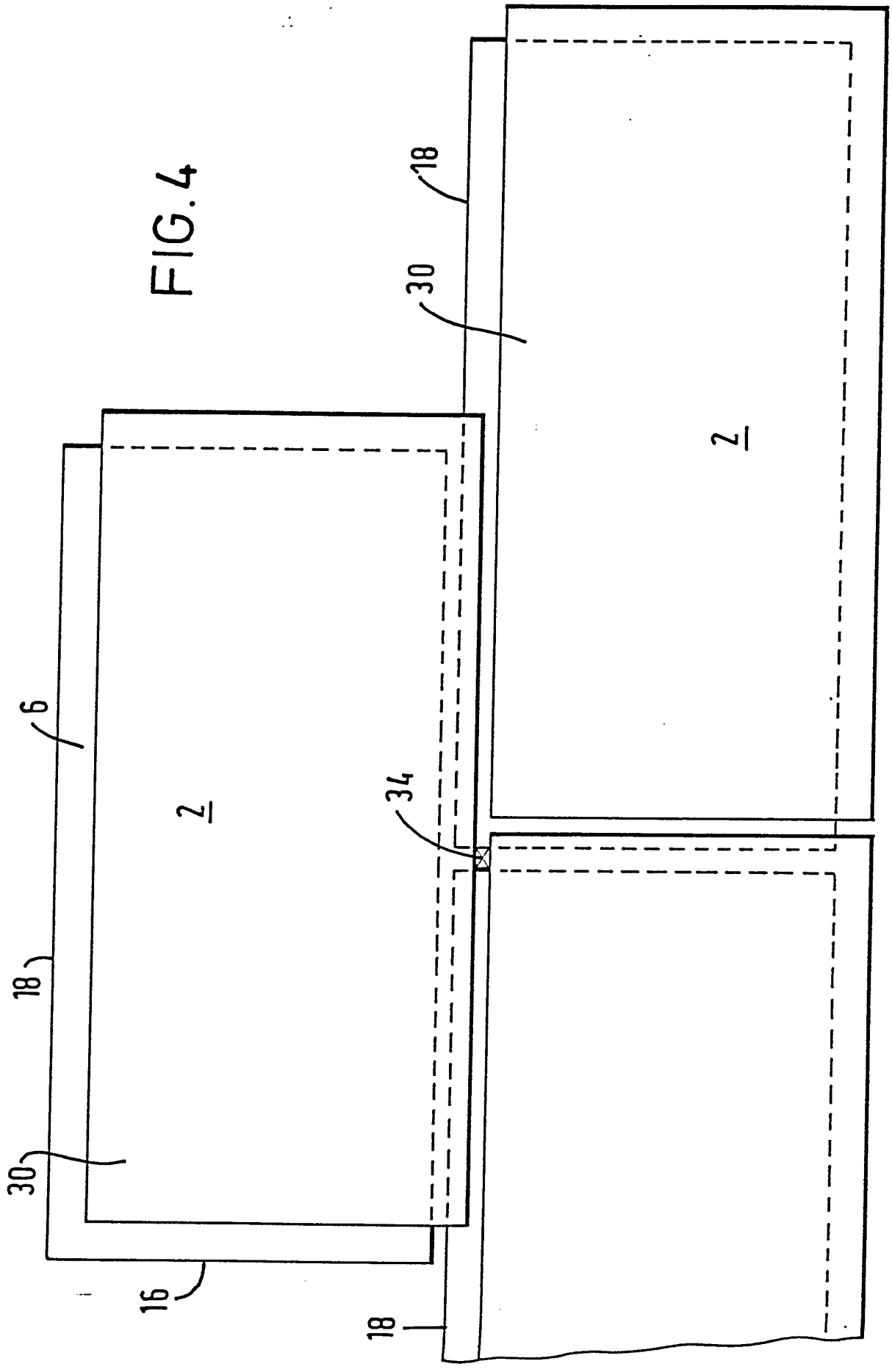


FIG.4



# INSULATED BUILDING BLOCKS

This invention relates to insulated building blocks and more particularly but not exclusively to building blocks made of a cementitious material such as concrete and carrying on at least one surface thereof a facing layer of insulating material such as for example polystyrene.

Building Regulations are constantly under review and, on 1st April 1990, a revision of Part L Schedule I to the Building Regulations became effective requiring substantially improved thermal performance from walls, roofs and for the first time floors in all types of building.

With this in mind, the applicants designed a building block for forming the inner leaf of a cavity wall to satisfy the requirements of the Building Regulations with regard to conservation of fuel and energy, in addition to any structural performance. Thus applicants have produced a building block of the kind disclosed in UK patent specification Nos. 2086447 and 2088923 having a main body which is made of normal materials such as concrete but which is dovetailed during manufacture on at least that face which is the outer face in use to form a key for a pad-like layer of insulating material of high density polystyrene which faces the outer leaf of blocks forming the cavity wall. The insulating layer is formed with complementary dovetailing so as to be mechanically joined to the main body without the need of adhesives. This product is currently sold under the trade mark "Forticrete 45" and has met with considerable commercial success.

However, in view of forthcoming further revisions to Part L of the Building Regulations, which will require that "the effect of any cold bridges in the construction, eg of timber studding, joists or mortar joints" must be taken into consideration, the view has been expressed that although there is not a great deal of difference in performance between the material of the block and mortar, there are obviously drastic differences between the insulant and the mortar which inevitably becomes sandwiched between the insulant and the mortar when the block is laid.

There are many alternatives to building blocks having mechanically keyed layers of insulant, namely:-

a) Blocks with varying types of insulation materials but stuck by adhesives to the outer face of the main body of the block. (eg, see Fig 1 of UK Patent specification No.2086447). Changes have to be made where such face insulated blocks are produced. Other manufacturers have the option to thicken or change the insulation in order to meet the requirements. The disadvantages of these other products are that they rely on adhesive to fix the pad of insulating material to the main body of the block, which is not always secure as the insulant can fall off the main body of the block during construction or during the life of the product.

b) Partial or full cavity fill insulation is probably the most widely used way of satisfying the Building Regulations. However, cavity fill is fraught with dangers. Full cavity fill is now banned by the NHBC in the UK in many areas of the country due to rain penetration into the cavity. Partial cavity fill is now subject to retaining a 50mm clear cavity thus increasing overall construction thickness. Partial cavity fill is also very dependent on standards of workmanship to retain, with special clips, insulant board in the correct position. Failure to do so can result in rain penetration.

c) Insulated plaster board is fixed to the outer surface of the inner leaf of a cavity wall construction. Although insulated plaster board is popular in some regions of the country, its use is somewhat limited.

Thus, in order to satisfy the forthcoming changes to the Building Regulations applicant carried out research into new products which would solve the problem of heat loss through the mortar joints occurring with insulated building blocks like Forticrete 45 building blocks.

US Patent No 4,478,021 discloses a building block in which the insulant is mechanically keyed to the main body of the block although in this instant the insulant forms the inner (room) surface of the wall construction and a wooden furring member is incorporated

into the construction to enable room fittings to be fixed to the inner wall with minimal damage the insulant. In this specification, the mortar joints are bridged by the use of a larger layer of insulant, the insulant on two adjacent sides of the block being extended so that the side surfaces of the insulant layers of adjacent blocks abut, thereby bridging the mortar joints. However, this construction suffers from the disadvantages, if used for a cavity wall construction that there is still a line of communication between the abutting insulation and the mortar joints so that the thermal insulation achieved would not be up to the expected requirements. Moreover, the abutting of the insulant layers does not provide the necessary tolerance to compensate for poor workmanship in laying, thus in practice, there may be many gaps left by the workmen which are of sufficient width to cause unacceptable heat loss.

UK Patent specification No. 2262547 discloses a plastered and insulating building block in which an insulant is either mechanically keyed or is adhesively bonded on one face to the main body of the block and on another face to a layer of plaster. The insulant is provided with complementary tongues and grooves along its oppositely facing edges whereby the mortar joints are bridged by the engagement of the tongues in the respective grooves. Whilst this construction does not suffer from disadvantages of the block disclosed in the US patent, it does have the disadvantage of relying upon the use of the plaster layer to maintain the integrity of the outer walls of the grooves which would otherwise easily be broken off during transport and laying. Also there is the problem during laying of having to "fit" the tongues into the grooves which would slow down laying. Also, if the tongues and grooves do not properly match, it may preclude laying with some blocks thereby increasing wastage and expense. But the main problem with such a tongued and grooved insulating layer is that there is no laying tolerance thus making such blocks practically unsuitable. If there are any slight variations in the alignment of such building blocks (which are always laid in broken bond), the blocks do not have the built in tolerances to enable the workman to compensate. At the extreme, this could mean that the workman actually slices off the tongue with his trowel, thereby nullifying the insulating effect aimed at. Moreover, the production of such blocks even if there was no plaster layer would be more expensive than applicants Forticrete 45 building blocks.

Accordingly, the main object of the present invention is to provide a building block having a main body made from a structural, load bearing material and a pad of an insulating material fixed to at least one face of the main body, in which the aforesaid disadvantages of existing insulated building blocks are minimised or at least substantially avoided.

From one aspect, the present invention consists in a building block, eg for use in the construction of a cavity wall, in which a pad of insulating material is fixed to one face of the block, characterised in that the pad is offset in two directions that are substantially perpendicular to each other to provide overlapping joints of insulating material which bridge when adjacent blocks are laid in broken bond to form a construction.

Expressed in another way, the invention resides in a building block in which a pad of insulating material is fixed to one face of the block, characterised in that the pad comprises an inner face adjoining the block and an outer face which is offset relative to the inner face in two directions substantially perpendicular to each other such that when adjacent blocks are laid in broken bond to form a construction there is overlap of insulating material between adjacent blocks.

By means of offsetting the pad to produce overlapping joints of insulating material when a block construction is laid, not only are the mortar joints bridged at least substantially to eliminate thermal losses therethrough, but also the overlapping joints provide the requisite amount of tolerance to maintain the integrity of the thermal barrier even if there is some misalignment of the blocks during laying.

The inner face of the insulating pad is preferably co-extensive with the face of the main body of the block to which the pad is joined. In other words, the inner face of the insulating pad is the same size or approximately the same size as the face of the block to which the pad is fixed such that the entire face of the block is covered with the insulation. Furthermore, in order to provide maximum tolerance should the blocks be misaligned during laying, the outer face of the insulating pad preferably has the same dimensions as the face of the main body to which the pad is affixed.

The offset inner and outer faces of the insulating pad may be joined by side edges which are substantially planar, such that the pad is generally rhomboid in cross-section. Preferably, the inner and outer faces of the insulating pad are joined by side edges which have a stepped configuration.

In addition to being less prone to damage, a further advantage produced by offsetting of the insulation pad in a stepped configuration as opposed to continuously sloping (ie planar) side edges is that the joints of insulating material follow a sinuous path, thereby making it virtually impossible for the wet mortar to enter the sinuous gaps between the projections and recesses and thereby destroy the integrity of the thermal barrier.

A yet further advantage of a stepped configuration is that when the blocks are laid in broken bond to form a construction, there remains a gap between adjacent blocks in the same row at the place where the block in the next row bridges the adjacent blocks. This gap is generally sufficiently small to have a negligible effect on the insulating properties of the construction, while at the same time is sufficiently large to accommodate a cavity wall tie. Hence the construction makes it possible to incorporate cavity wall ties without fear of damaging the insulation.

For simplicity of construction, the offset is preferably in two directions along the respective transverse and longitudinal centre lines of the block to produce two mutually substantially perpendicular recesses and two mutually substantially perpendicular projections whereby when the blocks are laid in broken bond to form a block construction such as a wall, the inner surfaces of the projections extend along the outer surfaces of the recesses.

The invention may also be expressed in terms of providing overlapping joints of insulating material at the mortar joints of a building block construction such as to provide a thermal barrier when the blocks are laid in broken bond to form a block construction.

The offsetting of the inner and outer faces of the insulating pad is generally such as to

produce complementary overlapping portions. In a preferred embodiment, the recesses are of L-shaped cross-section and the projections are of complementary shape and extend into the recesses. Thus even if the projections and recesses do not fully abut on all sides, which they would not if there are any variations in alignment by the work persons who laid the blocks, the thermal integrity of the overlapping joints is maintained.

As the advantages of mechanically fixed insulating pads are well proven as opposed to the use of an adhesive, the insulating pad is preferably mechanically joined to the main body of the block as by dovetailing for example.

From another aspect, the present invention consists in method of producing an insulated building block having a pad of an insulating material on one face of the block, said method comprising the step of offsetting the insulating material of the pad in two substantially mutually perpendicular directions.

Preferably, the step of offsetting in two substantially mutually perpendicular directions is performed along the central plane of the pad resulting in a pad in which half the thickness of the pad is offset.

By means of the preferred method of the invention, there are formed two projections along two adjacent sides of the pad and two L-shaped in cross-section recesses which are complimentary in shape to respective ones of the projections.

The material used to form the pads may be any suitable insulating material. Polystyrene, especially expanded polystyrene, is particularly preferred for its combination of good insulating properties together with ease of manufacture.

Manufacture of the insulating pads can be by moulding or by extrusion, in the latter case, the extrudate being cut appropriately at regular intervals to produce the required offset between inner and outer faces in use of the pad.

Thus it is possible by means of the invention simply to modify the production of the

existing pads produced for the aforementioned Forticrete 45 building blocks which enables a saving in costs.

The invention also consists in a building block construction such as a wall in which a plurality of any of the building blocks defined hereinabove are laid in broken bond with the offset insulating material of the pads of adjacent blocks overlapping one another in the regions of the mortar joints.

In order the that the invention may be more readily understood, embodiments in accordance therewith will now be described by way of example with reference to the accompanying drawings, in which:-

Figure 1 is a perspective view from one side (the inner, room- side in use) of an insulated building block, made in accordance with the invention;

Figure 2 is a plan view from above of an insulated building block also in accordance with the invention;

Figure 3 is a front elevation (inner, room-side in use) of a construction made from an assembly of insulated building blocks according to the invention; and

Figure 4 is an enlarged front elevation of part of the construction of Figure 3.

Referring firstly to Figure 1, a building block 2 is comprised of a main body 4 made from a lightweight aggregate and Portland cement, and an insulating pad 6 made from expanded polystyrene. The insulating pad 6 is provided on its inner face (not visible) with dovetail ridges 8 and the main body 4 with dovetail channels 10 to mechanically fix the pad 6 to the main body 4.

The outer face 12 of the pad 6 is offset in two mutually perpendicular directions relative its inner face to provide two L-shaped recesses (only one recess 14 visible) and two complementary projections 16, 18.

Figure 2 is a plan view from above of a building block 2 substantially similar to that shown in Figure 1 except in respect of the number and position of dovetail ridges and channels 8, 10. Two mutually perpendicular recesses 14, 20 are visible, together with projection 16. Projection 18 is not visible from the angle shown.

A construction showing several courses 20, 22, 24, 26 of blocks 2 laid in broken bond is provided in Figure 3. The main bodies 4 of the blocks 2 are slightly spaced from each other in both the horizontal and vertical directions owing to mortar (not shown) lying therebetween. However, it can be seen that the offset insulating pads 6 overlap with pads 6 on adjacent blocks 2 thereby eliminating any cold bridging between the insulant and the mortar.

Figure 4 shows an enlarged partial view of a construction according to Figure 3. The visible faces 30 of the main bodies of the blocks 2 are those which lie on the inner, room-side of the cavity wall. The rear faces (not visible) of the main bodies are fixed to and covered by the inner faces (not visible) of the insulating pads 6. A small gap 34 is created between the blocks by the projections 16, 18 and the recesses 14, 20 to provide a suitable position for the insertion of cavity wall ties (not shown).

While particular embodiments have been described, it should be appreciated that various modifications may be made without departing from the scope of the invention. For example, Figures 1 to 4 show only stretcher blocks, but it will be understood that the invention applies to other conventional components used to construct the inner leaf of cavity walls, such as corner units, coursing blocks and double and single reveals.

# CLAIMS

1. A building block for use in the construction of a cavity wall comprising a main body having a pad of insulating material provided on at least one surface thereof, wherein the pad comprises an inner face adjoining the block and an outer face which is offset relative to the inner face in two directions substantially perpendicular to each other such that when adjacent blocks are laid in broken bond to form a construction of such blocks there is overlap of insulating material between adjacent blocks.

2. A building block according to claim 1, wherein the inner and outer faces of the insulating pad are joined by substantially planar side edges such that the pad is generally rhomboid in cross-section.

3. A building block according to claim 1, wherein the inner and outer faces of the insulating pad are joined by side edges having a stepped configuration.

4. A building block according to any preceding claim, wherein the pad is offset in two directions along the respective transverse and longitudinal centre lines of the block to produce two mutually perpendicular recesses and two mutually perpendicular projections.

5. A building block according to claim 4, wherein the recesses and projections are of complementary shape.

6. A building block according to claim 5, wherein the recesses are of L-shaped cross-section.

7. A building block according to any preceding claim, wherein the insulating pad is mechanically joined to the main body.

8. A building block according to claim 7, wherein the insulating pad is joined to the main body by dovetailing.

9. A building block according to any preceding claim, wherein the inner face of the insulating pad is substantially co-extensive with the face of the main body to which the pad is joined.

10. A building block according to any preceding claim wherein the outer face of the insulating pad has substantially the same dimensions as the face of the main body to which the pad is joined.

11. A building block construction comprising a plurality of building blocks as claimed in any preceding claim wherein the blocks are laid in broken bond to produce overlapping joints of insulating material which bridge mortar joints between the main bodies of the blocks.

12. A construction according to claim 11 when dependent on claim 3, wherein a gap is provided between adjacent blocks in the same row at the place where a block in the next row bridges the adjacent blocks and through which a cavity wall tie may be accommodated.

13. A building block for use in the construction of a cavity wall comprising a main body having a pad of insulating material fixed to one face of the block, characterised in that the pad is offset in two directions that are substantially perpendicular to each other to provide overlapping joints of insulating material which bridge when adjacent blocks are laid in broken bond to form a construction of such blocks.

14. A method of producing an insulated building block having a pad of insulating material on one face of the block comprising the step of offsetting the insulating material of the pad in two substantially mutually perpendicular directions.

15. A method according to claim 14, wherein the offsetting is performed along the central plane of the pad to produce a pad in which half its thickness is offset.

16. A method according to claim 13 or 14, wherein the offsetting is performed to

produce two projections along two adjacent sides of the pad and two recesses complementary in shape to the respective projections along another two adjacent sides of the pad.

17. A method according to claim 16 wherein the recesses are L-shaped in cross-section.

18. A method according to any of claims 13 to 17 wherein the insulating pad is formed by extrusion and the extrudate is cut at regular intervals to produce the required offset.

19. A building block substantially as hereinbefore described with reference to or as illustrated in Figures 1 and 2 of the accompanying drawings.

20. A building block construction substantially as hereinbefore described with reference to or as illustrated in Figures 3 and 4 of the accompanying drawings.

Patents Act 1977

**Examiner's report to the Comptroller under Section 17 (The Search report)**

Application number
GB 9512869.0

**Relevant Technical Fields**

(i) UK Cl (Ed.N) E1D (DCH, DF193, DLEHW, DLEQWNT)

(ii) Int Cl (Ed.6) E04B, EO4C

Search Examiner
D LOVELL

Date of completion of Search
27 JULY 1995

**Databases** (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii)

Documents considered relevant following a search in respect of Claims :-
1-20

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**A:** Document indicating technological background and/or state of the art.

**P:** Document published on or after the declared priority date but before the filing date of the present application.

**E:** Patent document published on or after, but with priority date earlier than, the filing date of the present application.

**&:** Member of the same patent family; corresponding document.

| Category | Identity of document and relevant passages | | Relevant to claim(s) |
|---|---|---|---|
| Y | GB 2262547 A | (PREMACO) | 1-8, 13-17 |
| Y | GB 2202874 A | (OTFORD EPS LTD) | 1-6, 13-17 |
| Y | GB 2088923 A | (BARNES) | 7, 8 |
| Y | GB 2086447 A | (ECC QUARRIES LTD) | 7, 8 |
| Y | US 4478021 | (PERSON) | 7, 8 |
| X | US 3999349 | (MIELE) | (X) 13<br>(Y) 1-8, 14-17 |

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