

IMPROVEMENTS RELATING TO A CONCRETE MASONRY HOLLOW BLOCK.

TECHNICAL FIELD

- 5 This invention relates to a concrete masonry unit such as a building block, a construction with concrete masonry units, and a method of construction using these concrete masonry units.

BACKGROUND ART

- 10 It is known to use concrete hollow blocks for building. These are traditionally made from a very dry no-slump concrete being a cement and aggregate mixture. This mixture is compressed and/or vibrated while in a mould to an extent to be self-supporting, and then subsequently quickly removed from the mould and handled for curing and other treatment away from the mould.

- 15 Such traditional blocks also are traditionally used in construction by using a wet mortar bed on which each block is supported. Each block is adjusted in position by a skilled tradesman to be appropriately aligned, then the mortar is left to cure. Such cure can take such time that it may limit the number of blocks that can be located one above the other in a single session.

- 20 Costs associated with the construction then are driven by a need for skilled tradesman to prepare each mortar bed, apply end mortar where the block none the less is very heavy in most cases, and then adjust a final location for alignment of the block with other of the blocks already positioned.

A further challenge with traditional masonry concrete blocks is their appearance.

An object of this invention is to reduce at least to some extent one or more of the above difficulties.

Other objects and advantages of the present invention will become apparent from the following description, taken in connection with the accompanying
5 drawings, wherein, by way of illustration and example, an embodiment of the present invention is disclosed.

DISCLOSURE OF THE INVENTION

In one form of this invention there is proposed a building block having a body with three sets of opposing outer sides defining thereby a generally rectangular
10 outer shape, the body having at least one passageway having an upper open end at a top of the block and an open lower end at a bottom of the block, an inner part of the block being of a first material and a second different material from said first material surrounding the inner part providing thereby an at least substantially continuous outer surface of said second material, and a one side
15 of a one of the sets of opposing sides having at least one protrusion extending outwardly from a planar surface of the side, and at least one cavity in the further opposed side of the same set of opposed sides in a position and of a size to receive and effect an alignment of a further block having the same shape and size of this first defined block, by receiving a or the protrusions into
20 the cavity or cavities.

Preferably, the second material is denser than the first material.

Preferably, the second material is a cementitious material.

Preferably, the second material is made from a mix comprising at least in the main, cement, sand and water.

25 Preferably, the first material is a mixture of expanded plastic particles and a cementitious binder.

Preferably, the first material is a mixture including at least in the main, cement, sand, water and expanded polystyrene beads.

Preferably, the first material includes an additive to ensure that the expanded polystyrene particles or beads are compatible with the wet mixture, and be
5 mixable therewith.

Preferably, the additive is added to the water prior to the dry components being added to the same.

Preferably, the outwardly extending protrusion extends from an upper face of the block, and the cavity is formed in the bottom or underneath face of the
10 block, and wherein in use, the cavity is adapted to accept an outwardly extending protrusion of a further block for the purpose of joining and causing to be aligned the two building blocks.

Preferably, one or more slots divide the outwardly extending protrusion, so that a further block can register and nest therewith in either an overlapping or
15 fully coincident registering position.

Preferably, the protrusions are substantially rounded.

Preferably, in the alternative, the protrusions are of a substantially rectilinear shape

Preferably, the protrusions are orthogonally symmetrical with respect to the
20 block,

Preferably, there are two passageways extending between the top and bottom of the block, these being divided by a wall extending between side walls of the block so as to be integral therewith.

Preferably, the cavity is defined by a skirt extending around a lower perimeter of the block so as to be integral therewith.

In a further form, the invention may be said to reside in a building block of wet cast cement having, as integral portions, two oppositely positioned side walls and two oppositely positioned end walls which together define at least one inner passageway extending fully through the block from a bottom to a top thereof, an outer, uppermost perimeter of the block being substantially within a single plane, and a portion of the respective walls behind the outer uppermost perimeter being higher than the outer uppermost perimeter, an outer, lowermost perimeter of the respective walls together all being within a single plane, and a portion of the respective walls behind the outer lowermost perimeter being higher than the outer perimeter, and wherein said latter portion is positioned and shaped so that it provides a receiving shape, where an identical block, if resting on the first block so as to have aligned outer most side faces, would have its outer lowermost perimeter substantially coincide with the outer uppermost perimeter of the first block.

In a further form, the invention may be said to reside in a building block of wet cast cement having, as integral portions, two oppositely positioned side walls and two oppositely positioned end walls which together define at least one inner passageway extending fully through the block from a bottom to a top of the block, an outer uppermost perimeter of the respective walls together all being within a single plane, and a portion of the respective walls behind the upper outer uppermost perimeter being higher than the outer perimeter, an outer lowermost perimeter of the respective walls together all being within a single plane, and a portion of the respective walls behind the outer lowermost perimeter being higher than the outer perimeter, and wherein said latter portion is positioned and shaped so that it provides a receiving shape where an identical block, if resting on the first said block so as to have aligned outermost side faces, would have its outer lowermost perimeter substantially coincide with the outer uppermost perimeter of the first said block.

In a further form, the invention may be said to reside in a building block which is of substantively rectangular external shape with two oppositely positioned outer sides, two oppositely positioned outer ends and a top and bottom, a hollow passageway extending fully through the block from the top of the block through to the bottom of the block, a plurality of protrusions each extending
5 above a plane defined by a top of the block, each protrusion being located so as to have an inner side adjacent or adjoining to extend along a portion of a perimeter at a top of the hollow passageway, and one or more receiving cavities extending into the planar surface of the bottom of the block, the or
10 each cavity corresponding in shape and location so as to receive a one or more protrusions extending into the bottom surface, and where the respective protrusions and cavity or cavities are in respectively mutually corresponding positions.

In a further form, the invention may be said to reside in a construction in which
15 a first building block as described above, is positioned on a second, substantially identical block, the first block having upwardly directed protrusions engaging corresponding cavities within the underneath face of the second block.

Preferably, the respective blocks are held together by a building adhesive.

20 In a further form, the invention may be said to reside in an assembly of at least two blocks, each of which is as described above, where the dimensions and shape of a first of the blocks are substantially identical to the dimensions and shape of a second of the blocks, where the first of the blocks is positioned above and aligned to have a front and rear face of each define a common
25 plane and where the first block with its bottom face is resting on, directly aligned and adhering by a thin adhesive interface extending at least substantially between the two mating faces of the respective blocks.

The term "wet cast concrete" is used to distinguish this concrete as requiring somewhat longer in a mould before it can be released as compared to blocks using very dry no-slump concrete, which is compressed and/or vibrated into a compact mass that can be removed from a mould very promptly after such a
5 process, and can be cured out of the mould.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of this invention it will now be described with reference to preferred embodiments which shall be described with the assistance of drawings wherein:

10 FIG 1 is a perspective view of a first embodiment from above a block;

FIG 2 is a perspective view of the first embodiment from below the block;

FIG 3 is a perspective from above the block but viewing the block from an opposite side to the first view in FIG 1;

FIG 4 is a plan view of the same first embodiment;

15 FIG 5 is a side elevation of the first embodiment with a part cut away;

FIG 6 is an end view with a part cut away of the first embodiment;

FIG 7 is a perspective view of two blocks according to the first embodiment positioned in a supporting registration and including an adhesive therebetween;

FIG 8 is a cross sectional view of the two blocks one upon the other according
20 to a second embodiment;

FIG 9 is a cross sectional view in an opposite alignment of the two blocks as in FIG 8 one upon the other according to the second embodiment;

FIG 10 is a perspective view of blocks according to the second embodiment being joined to illustrate a construction assembly;

FIG 11 is a cross sectional view of a set of blocks according to the second embodiment arranged in an interlocking, joined and adhered arrangement;

5 FIG 12 is a cross sectional view of a block according to a third embodiment;

FIG 13 is a perspective view from above of a fourth embodiment;

FIG 14 is a perspective view of the same fourth embodiment when viewed from below;

10 FIG 15 is a cross sectional view of the blocks of the fourth embodiment in an assembled arrangement;

FIG 16 is a perspective view of a fifth embodiment;

FIG 17 is a perspective view of the same fifth embodiment when viewed from below;

FIG 18 is a cross sectional view of the blocks of the fifth embodiment; and

15 FIGS 19 and 20 are perspective views of a sixth embodiment.

DETAILED DESCRIPTION OF THE INVENTION

Now referring to the drawings in detail, Figures 1 through 7 refer to a first embodiment where there is a block 1 formed of a wet cast cement and having as integral portions, two oppositely positioned (i.e. opposing) side walls 2 and 3,
20 and two oppositely positioned (i.e. opposing) end walls 4 and 5 where each of these walls 2, 3, 4 and 5 are integrally molded.

The alignment of these respective walls 2, 3, 4 and 5 is such that there is defined therebetween, in this particular case a hollow passageway 6 in the one case, and 7 in the other.

5 An advantage of these passageways 6 and 7 is that they render the block 1 lighter than a block of equivalent size and composition would otherwise be. Moreover, these cavities provide an insulating effect, which can prove to be useful both from an energy saving perspective, but also in terms of fire resistance.

10 There is an intermediate joining wall 8 which extends transversely from wall 2 to wall 3 and is integrally molded therewith as well.

There is provided in this block an upper outermost perimeter 9 and this substantially defines a plan at 10. With reference to this plan 10 there is a portion of the block exemplified by the respective portions such as at 11, 12, 13 and 14 as examples, which provide a higher part (i.e. form a projection) which
15 is positioned so as to leave a surrounding border area 15 which is a part of the defined plan 10 and the higher portions are set back and, in this embodiment..

The higher portions (projections) 11 through 14 typically are raised but are separated by portions which leave an area consistent with the plan as in 10 and the purpose of these "slots" shown for instance at 17 and 18 is to allow for a
20 similar block to register and nest appropriately whether in an overlapping or fully coincident registering position.

Rounding these higher portions 11 through 14 as shown in Figures 1 through 12 is considered preferable, because these rounded shapes are more robust than higher portions having sharp edges, which have a greater propensity to
25 chip and break with use.

An advantage of the raised portions is that they implicitly provide a shape which is offset from an outer edge, but is raised therefrom and this implicitly acts as "a flashing" to retard access of moisture therepast.

This effect is to some extent prejudiced by the slots 17 and 18, but the area
5 provided by the slots is relatively small as compared to the overall length of the upper portions 11 through 14 so that the prejudice effect is relatively small.

Now looking at the underneath side as perhaps shown in Figure 2 but it is also shown in other of the Figures, there is a lowermost outermost perimeter 20 which defines a lowermost plan 21.

10 In this case, this then provides what might be termed a skirt, which fully surrounds the lowermost portion of the block 1 and inset from this plan 1 is a raised portion 22 the location of which and the height of which relative to the plan 21 is chosen so as to be coincident within several millimetres of the respective plan 10 and the raised portions typically 11 through 14.

15 In this particular case, the dimensions have been chosen so that the area provided by the lowermost plan 21, and to some extent the plan 10, are approximately the same as the area provided by the plan 22 and the plan 16.

When a first block is located on a second block, it can therefore be expected that there will be a sharing approximately equally of the load on face to face
20 contacts and, except to the extent that there is an adhesive in the construction technique in this case, the faces will engage closely one with the other and provide this support.

Further however, an advantage of having an approximately similar width is that the upper portions during handling are relatively sturdy, and the skirt portion
25 depending from a bottom of the block is also relatively sturdy and will be more resistant to being broken during conventional or even rough handling in a construction site.

It is noted that the underneath side of the block 1 does not attempt to provide separate portions which will fit within respective slots such as 17 or 18.

The construction of this block 1 is a wet cast construction technique which means that it will depend upon curing of the cement at least to some extent
5 before it can be self supporting and therefore able to be extracted from a die for its forming.

This is distinguished then from a conventional compressive masonry cast block system, where very dry or in terms of the trade no or negligible slump concrete is used and use of vibration and or pressure enables rapid extraction from a
10 die, so that it is only subsequent to extraction that any substantive curing of the cement would be expected and this can be achieved in appropriate ways for instance by steam curing or by any other conventional technique.

We are using in this particular embodiment and at least in relation to a substantive part of the application and the invention, portions of the block which
15 are of different characteristics.

An inner characteristic is of a concrete, which is formed with Portland cement, sand and polystyrene beads.

This has been found to be an effective material, which can provide adequate structural strength for the inner part of a block of this type, and an outer part of
20 the block is provided by a separate facing material, which is not including material such as expanded plastics.

It is known to treat polystyrene beads with an appropriate coating so that they will be mixable with wet cement especially Portland cement and it is proposed in this case that such a mixture should be used. The beads may be treated prior
25 to their addition to the mixture, or indeed the protective additive may be mixed in with the dry mix, or indeed with the water before the dry mix is added.

The advantage of using polystyrene beads is that there can be provided a lightweight concrete which can have an adequate compression strength but can also provide a block size which makes for economic handling and storage and indeed manufacture and by providing a facing material which can be of a conventional cement sand mix applied and integrated with the inner core material of the foam, sand or other aggregate, and cement, means that overall, the external face can be chosen to be decorative, or impermeable to moisture, or otherwise appropriate for other applications, while the inner body provides this adequate support strength and at the same time the bulk for the purpose needed.

A typical mixture for the inner core material can be as follows (per block):

Polystyrene: 6.5L to 7L

Cement: 4kg to 5kg

Sand: 5kg to 5.5kg

Water: 1.8L to 2.1L

Supa Plastecizer: 14mL to 20mL

Calcium chloride: 50mL to 65mL

Air entraining agent: 14mL to 20mL

Further to this, a typical outer layer mixture is (per block):

Sand 0.55kg to 0.58kg

Cement: 0.3kg to 0.4kg

Polystyrene beads that have been appropriately treated can be purchased from conventional suppliers.

There are features with this block 1 that assist in manufacture and use.

5 A first of these is that the inner passageway is defined by sides which are aligned to be tapering so that the sides for instance 21 and 22 which are oppositely positioned one with respect to the other and the sides 23 and 24 which are also oppositely positioned to each other are tapered so that they have a wider and broader upper mouth than the mouth at the lower end 25.

10 This allows for easier core extraction during manufacture namely subsequent to the block having been cast and ready to be extracted from the die.

This has the advantage of also assisting in die extraction but it also assists when one block is placed upon another in that this tapered shape acts as a lead in when the bottom of the block 1 is being brought over correspondingly shaped upwardly projecting portions of a similar block beneath it.

15 The degree of taper can lie within a significant range from as little as 1 or 2° up to 45° or more to the vertical.

The lowermost cavity shape is defined also by side walls such as at 28 and 29 and these are also then chosen to match the rounded shape of the upwardly projecting portions at 26 and 27..

20 The block 1 further includes on an outer uppermost edge, an aris 30 and on a lower outermost edge an aris 31.

In Figure 7, there are two blocks which are now referred to as 32 and 33 which replicate the block of the first embodiment and these are now shown one upon the other in a registered alignment where upwardly projecting portions such as
25 34 nest within correspondingly shaped cavities.

The two blocks have both upper and lower ariss at 35 and 36 and 37 which feature provides to some extent decorative as well as functional feature in minimising accidental chipping of the edge which could then be visually less preferred.

- 5 The two blocks in this case 32 and 33 are joined together by a building adhesive material; an appropriate material for this purpose is a conventional cementitious adhesive.

In order to join the two bricks or blocks together, a bead of the adhesive material is fed onto the respective meeting surfaces and the extent of this
10 spread is such that when the two meeting surfaces come together the adhesive will be caused to spread substantially fully through all of the respective surfaces so as to provide not only an adhesion between the respective surfaces and therefore adhering the blocks together, but also providing a sealing but as well against water ingress.

- 15 The amount of adhesive needed can be judged in practice and is chosen generally so that there is approximately a 2 millimetre separation gap between the meeting surfaces which is just enough to allow for an adhesive body of material and at the same time the dimensions of the respective mating surfaces are chosen to allow for this small separation.

- 20 The separation is chosen however so that in practice, once the blocks are positioned, they will be generally centrally aligned and will be sufficiently accurately aligned whether one upon the other or whether in overlapping or corner bonded locations to then need either negligible or no further adjustment in position.

- 25 Figure 8 is a cross sectional view through the assembled blocks as shown in Figure 7.

Figure 10 illustrates the same block as in the first embodiment when used in an overlapping arrangement to provide for a construction.

The blocks in each case in this instance are half overlapping and there is provided a quarter block 41 to fill the gap created by overlapping the blocks in
5 this fashion.

The blocks shown here as 40 have the same features as the block in the first embodiment and are held together in this case both by building adhesive as previously described.

The quarter block in this case 41 is made from a solid masonry concrete
10 material including in this case polystyrene beads and having an outer face consistent with the outer faces of the other blocks 40 which is made during a wet cast molding process to not be so embedded with polystyrene beads or the like.

A cross section of the construction as shown in Figure 10 is now shown in
15 Figure 11 an alternative to the cross sectional shape of the upwardly projecting portions in the block as shown in relation to the first embodiment can be altered and alternatives are now shown through the remainder of the embodiments which for instance is shown in Figure 12 where the upwardly projecting portions shown at 45 takes over as a majority of the interface support and there is a
20 much narrower edge at 46 providing the defining plan of the upper outermost edge.

Further, the side wall 47 is in case somewhat more extensively sloping.

The blocks otherwise include the polystyrene bead embedded masonry material at 48, an outer facing material formed in a wet cast method but in this
25 case without the embedded polystyrene beads as being shown at 49 and the blocks in this case are adhered together by a building adhesive material leaving

several millimetres separation gap at 50 but nonetheless such that this separation is incidental to the general dimensions of any construction.

Now referring to Figures 13, 14 and 15, these shown a different upward projecting portion where this is shown as a triangular cross sectional shape as
5 typically at 51.

This can then be centrally located along and a corresponding edge cavity 53 is in the bottom as shown specifically in Figures 14 and 15.

Figures 16, 17 and 18 illustrate an alternative shape where the upwardly projecting portions as in 55 with reference to an otherwise defining plan 56 is of
10 rectilinear shape in cross section.

This again has a matching cavity shape as shown in Figure 17 in particular at 57.

Finally there is shown in Figures 19 and 20, a further variant of the upwardly projecting interlocking shape as shown at 60 with reference to a defining plan
15 61 and a corresponding cavity shape 62 within the bottom of the block.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognised that departures can be made within the scope of the invention, which is not to be limited to the details described herein but is to be accorded the full scope
20 of the appended claims so as to embrace any and all equivalent devices and apparatus.

CLAIMS

1. A building block having a body with three sets of opposing outer sides defining thereby a generally rectangular outer shape, the body having at least one passageway having an upper open end at a top of the block and an open
5 lower end at a bottom of the block, an inner part of the block being of a first material and a second different material from said first material surrounding the inner part providing thereby an at least substantially continuous outer surface of said second material, and a one side of a one of the sets of opposing sides having at least one protrusion extending outwardly from a planar surface of the
10 side, and at least one cavity in the further opposed side of the same set of opposed sides in a position and of a size to receive and effect an alignment of a further block having the same shape and size of this first defined block, by receiving a or the protrusions into the cavity or cavities.
2. The building block as in claim 1, wherein the second material is denser
15 than the first material.
3. The building block as in claim 2, wherein the second material is a cementitious material.
4. The building block as in claim 3, wherein the second material is made from a mix comprising at least in the main, cement, sand and water.
- 20 5. The building block as in any one of the preceding claims, wherein the first material is a mixture of expanded plastic particles and a cementitious binder.
6. The building block as in claim 5, wherein the first material is a mixture including at least in the main, cement, sand, water and expanded polystyrene
25 beads.

7. The building block as in claim 6, wherein the first material includes an additive to ensure that the expanded polystyrene particles or beads are compatible with the wet mixture, and be mixable therewith.
8. The building block as in any one of the preceding claims, wherein the
5 outwardly extending protrusion extends from an upper face of the block, and the cavity is formed in the bottom or underneath face of the block, and wherein in use, the cavity is adapted to accept an outwardly extending protrusion of a further block for the purpose of joining and causing to be aligned the two building blocks.
- 10 9. The building block as in any one of the preceding claims, wherein one or more slots divide the outwardly extending protrusion, so that a further block can register and nest therewith in either an overlapping or fully coincident registering position.
- 15 10. The building block as in claim 9, wherein the protrusions are substantially rounded.
11. The building block as in claim 10, wherein the protrusions are orthogonally symmetrical with respect to the block.
12. The building block as in any one of the preceding claims, wherein there
20 are two passageways extending between the top and bottom of the block, these being divided by a wall extending between side walls of the block so as to be integral therewith.
13. The building block as in any one of the preceding claims, wherein the cavity is defined by a skirt extending around a lower perimeter of the block so as to be integral therewith.
- 25 14. A building block of wet cast cement having, as integral portions, two oppositely positioned side walls and two oppositely positioned end walls

which together define at least one inner passageway extending fully through the block from a bottom to a top thereof, an outer, uppermost perimeter of the block being substantially within a single plane, and a portion of the respective walls behind the outer uppermost perimeter being higher than the outer

5 uppermost perimeter, an outer, lowermost perimeter of the respective walls together all being within a single plane, and a portion of the respective walls behind the outer lowermost perimeter being higher than the outer perimeter, and wherein said latter portion is positioned and shaped so that it provides a receiving shape, where an identical block, if resting on the first block so as to

10 have aligned outer most side faces, would have its outer lowermost perimeter substantially coincide with the outer uppermost perimeter of the first block.

15. A building block of wet cast cement having, as integral portions, two oppositely positioned side walls and two oppositely positioned end walls which together define at least one inner passageway extending fully through

15 the block from a bottom to a top of the block, an outer uppermost perimeter of the respective walls together all being within a single plane, and a portion of the respective walls behind the upper outer uppermost perimeter being higher than the outer perimeter, an outer lowermost perimeter of the respective walls together all being within a single plane, and a portion of the respective walls

20 behind the outer lowermost perimeter being higher than the outer perimeter, and wherein said latter portion is positioned and shaped so that it provides a receiving shape where an identical block, if resting on the first said block so as to have aligned outermost side faces, would have its outer lowermost

perimeter substantial coincide with the outer uppermost perimeter of the first

25 said block.

16. A building block which is of substantively rectangular external shape with two oppositely positioned outer sides, two oppositely positioned outer ends and a top and bottom, a hollow passageway extending fully through the block from the top of the block through to the bottom of the block, a plurality

30 of protrusions each extending above a plane defined by a top of the block,

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each protrusion being located so as to have an inner side adjacent or adjoining to extend along a portion of a perimeter at a top of the hollow passageway, and one or more receiving cavities extending into the planar surface of the bottom of the block, the or each cavity corresponding in shape and location so as to receive a one or more protrusions extending into the bottom surface, and
5 where the respective protrusions and cavity or cavities are in respectively mutually corresponding positions.

17. A construction in which a first building block as characterised in any one of the preceding claims directed to a block, wherein the first block is
10 positioned on a second, substantially identical block, the first block having upwardly directed protrusions engaging corresponding cavities within the underneath face of the second block.

18. The construction as in claim 17, wherein the respective blocks are held together by a building adhesive.

15 19. An assembly of at least two blocks, each of which is characterised as in any one of the preceding claims to a block, where the dimensions and shape of a first of the blocks are substantially identical to the dimensions and shape of a second of the blocks, where the first of the blocks is positioned above and aligned to have a front and rear face of each define a common plane and
20 where the first block with its bottom face is resting on, directly aligned and adhering by a thin adhesive interface extending at least substantially between the two mating faces of the respective blocks.

20. A building block as described in the specification, with reference to and as illustrated in the accompanying representations.

25 21. A construction as described in the specification, with reference to and as illustrated in the accompanying representations.

22. An assembly of building blocks as described in the specification, with reference to and as illustrated in the accompanying representation.