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(72) Inventor: **IBAÑEZ DE VELASCO, FRANCISCO BURGOS (ES)**

(74) Representative: **Arsuaga Santos, Elisa**
Sauces 14, 22. Urb. Montepincipe
28660 Boadilla del Monte (Madrid) (ES)

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EPC.

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(71) Applicant: **Bloques Barruca, S.L.**
09001 Burgos (ES)

(54) **MULTI CAVITY CONCRETE CONSTRUCTION ELEMENT**

(57) A multi cavity concrete construction element, having hollow cells with a rectangular cross section, said construction element comprising a side surface which is tucked and a side surface which has a protrusion.

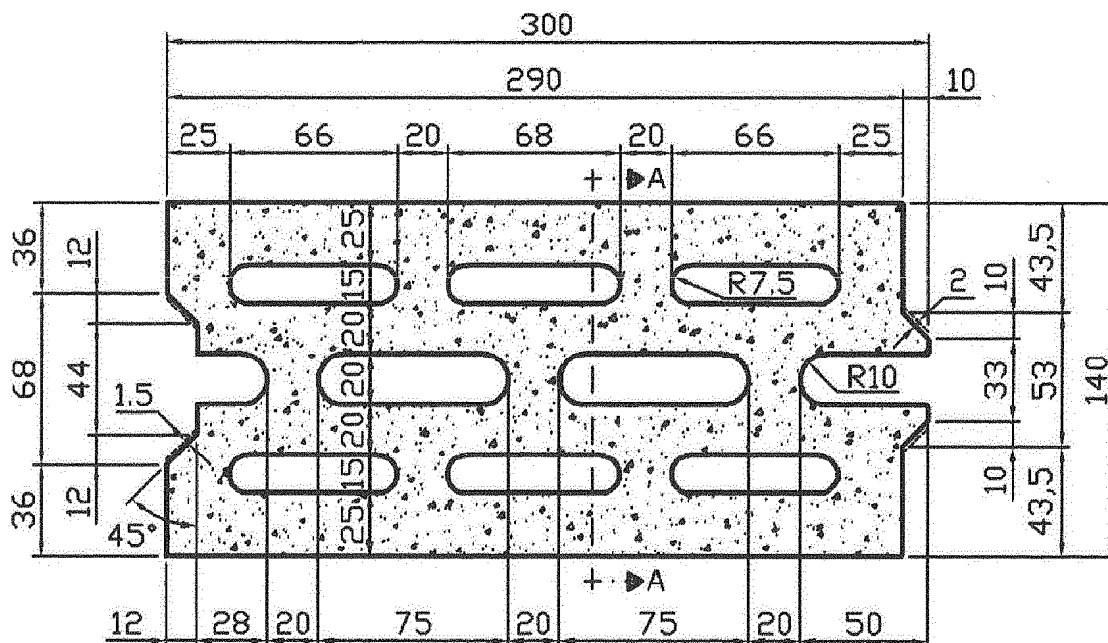


Fig. 1

Description

FIELD OF INDUSTRIAL APPLICATION

[0001] The scope is building with concrete blocks, especially where the objective is to achieve, in addition to sound insulation, high strength and workability, great thermal insulation.

STATE OF THE PRIOR ART

[0002] The traditional facade system performs both structural and enclosure of the building outside functions, so the ability to open holes for light and ventilation has been limited to the bearing capacity of the forming element. The evolution of this development facade consisted of a technological race to get these holes. This is why many manufacturers have seen the need to modify the characteristics of products modifying the traditional elements to achieve an improvement in the quality inside the building -demand contemporary architecture.

[0003] The ventilated façade cladding system of building walls leaves a ventilated chamber between the coating and insulation of the building, eliminating thermal bridges and many diseases caused by condensation, in a search for suitable system excellent thermal-hygrometric behavior of building.

[0004] Therefore there will be two sheets in the same constructive solution inner and outer leaf, and each with missions and relations with the building completely different. The inner sheet can be a carrier sheet in the case of buildings not very high where height can be performed by load-bearing walls with larger cross section, or may be of enclosure, where his main task will be to a stabilizing support of the outer sheets, which do not need a wall of large section.

[0005] Due to the above and thanks to the evolution of technology this new system has been developed to be used in ventilated facades as interior non-bearing sheet.

[0006] There are many inventions similar to ours. Between them we highlight the US4905439, "Structural building elements": American patent which claims monolithic concrete blocks with openings between their faces, which are filled with certain synthetic materials. The CN101260714, "Multi-row hole aligned thermal insulation concrete building blocks", which is a Chinese patent based in blocks with at least 3 rows of holes, taking the middle row of different width and length than the outer rows. The FR2455141, "Bloc, notamment en béton, pour la construction de murs et procédé analogues ou de construction de murs à l'aide d'un tel bloc", in which the parallelepiped block has a non-symmetrical geometry with hollow and semi-alveolus of different widths, some of which pass through the block and others are completely closed at one end and can be filled with insulating material. The FR2622229, "Bloc modulaire de construction" claims a concrete block, which gets thermal and sound insulation made of different geometries, including cylin-

drical and semi-cylindrical slots, sockets and transverse triangular cavities, with the particularity required lightweight concrete composite ground silico-calcareous sand, expanded clay gravel certain particle sizes and high performance cement. The CN201172909, patent High thermal insulation concrete building block air Having isolation layer ", which is between 2 and 30 parallel rows of vertical hollow sections, each of which has a width of between 5 and 100 mm. The CN201176657, "Multi-row aligning hole type thermal insulation concrete building block ", in which the relationships between its various parts are described, for example the thickness of the middle row (at least have to have 3 rows) of holes is the sum of the thicknesses the 2 outer rows. And finally and perhaps most similar to ours we should mention the international PCT patent number WO2015 / 01903 owned OCCITANIE PIERRES, French and entitled "Procédé de fabrication d'un bloc de construction en pierre isolant alvéolé reconstituée ou naturelle, bloc réalisé Réalise et mur avec un tel bloc, "which claims the process of manufacturing a block made of stone, concrete or brick and block. It can have various forms of alveolar hollow and can be filled with any insulating substance. It can include various designs asymmetrical cells and the rows are staggered from them. Alveolar holes are drilled from one side with a suitable tool and communicate with each other within the same plane.

EXPLANATION OF THE INVENTION

[0007] It is presented as an evolution of traditional concrete block. In search of a masonry element that would improve the known benefits, innovation has resulted in this block, which offers designers and construction companies have a material with the following advantages:

- Improved design: the multi cells section allows a better response to the demands on energy efficiency, acoustic insulation and fire resistance, established by the Technical Building Code.
- Item further optimized: the dovetailing and groove facilitates handling by installers, increasing yields over the usual execution.
- The blocks are 100% recyclable and made from recycled gravels of waste concrete, without prejudice to the performance of the block.
- Versatility to adapt and constitute a major element in many constructive sections of masonry walls and interior partitions.

[0008] This system focuses on a block geometry such that their cavities or cells are of trapezoidal section in the height direction at varying distances from the front and rear surfaces, and the separation between them and their width and length are also variable.

[0009] The arrangement of these cells modify the technical characteristics of the final finish such as block density, weight, compressive strength, the transmittance of

the block, fire resistance, resistance of tensile anchors, break resistance to bending, resistance to shear adhesion, acoustics, the possibility of grooves and the execution performance, and manufacture.

[0010] The blocks consist of plain concrete, can differentiate into the dosages used (light or heavy gravels, etc., possible use of special binders, additives which improve some functionality of concrete, etc.) In this way, all the advantages that provides concrete, derived mainly from its density, as more and better material that reconciles the different regulatory requirements.

[0011] The transmittance of the block, seeks uniformity in heat flux from the inner to the outer surface.

[0012] The conductivity of the concrete is much higher than that of the air chambers, whereby a configuration is sought suitable in which the arrangement of the cells and the thickness of these configure the balance in the design to obtain the desired characteristics. There are no sores. As for the tensile strength of the anchors, the arrangement of the cells have available a greater surface adhesiveness with little studs getting mixed results in a random arrangement in the block surface. It is available in a variety of colors and surface textures for use. It can be used as concrete masonry wall in interior partitions and in facades.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Figure 1 is a view of the geometry of the blocks and placement of the cells, along with its dimensions. Figure 2 shows the lateral surfaces of the blocks and a detail of tolerances. Figure 3 is a section along the A-A' line shown in Figure 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0014] One of the key features of this construction system is the thermal uniformity, ie thanks to its geometry same temperature gradient is achieved over the entire wall surface. The conductivity of the concrete is much greater than that of the air chambers, whereby an ideal configuration in which the arrangement of the cells and the thickness of these configure the balance in the design to obtain the desired characteristics sought.

[0015] Therefore, this system focuses on defining a geometry of the concrete blocks that constitute it, ie the arrangement of the cells, cavities or cells disposed within the block and its shape and dimensions.

[0016] As mentioned in the brief explanation of the invention, the geometry of the blocks is such that:

- Its cavities are of rectangular section rounded at their ends in the base dimension
- Its cavities are of trapezoidal section at its height dimension
- The width and length of them are variables
- The distances of the cells respect to front and rear

surfaces of the block are variable

- The separation between cells are variable also.

[0017] In figure 1 the design and arrangement of the multi cells are shown for a constant temperature gradient across the face of the wall, in the preferred embodiment.

[0018] The cavities or cells are of rectangular section with rounded ends, on its surface. Their lengths in this embodiment are 66, 68 and 75 mm, and its width, 15 and 20 mm. The separations between them, in this case 20 mm. And the gaps between the cells and the walls of the block, 25 mm.

[0019] The width of the cells and its section, in the corresponding height dimension, as shown in Section A-A' in Figure 3, are trapezoidal, not rectangular. In this figure are indicated the specific dimensions of the preferred embodiment which are: on top of the block, widths of the cells of 15 and 20 mm; 20 mm separation between them and 25 mm between the cells and block walls. At the bottom the cells widths are 12 and 17 mm, the separation between them of 23 mm and the separation between the cells and block walls, 26.5 mm.

[0020] These data are the result of a lengthy investigation on R & D, which does not mean that the protection of this patent with any other data placement or thickness of the cells shown in this embodiment cannot be asked.

[0021] All with the mentioned objective of the heat transfer through each portion of concrete and cavities, along all possible block sections in order to achieve thermal uniformity across the wall surface.

[0022] In Figures 1 and 2 it can be seen the special design of the side surfaces for contiguous dovetail. Its shape is obtained cutting the block at the desired length, 290 mm in this case, in a way to obtain in the left side a tucked formed by a trapezoidal section finished by a semicircular shape, coinciding with the central part of the cavity, of 28 mm in this case; and in the right side two protruding ridges starting from the lateral sides of the central cavity jutting out 50 mm from the starting of the interior of the cavity, as it can be seen in figure 1. Thus the blocks can be arranged side by side, as seen in figure 2.

[0023] With this design, the placement of the blocks is done bone, thereby eliminating the wound and allowing dry coupling, with the advantage of speed and continuity placement in the final finish.

[0024] Figure 2 details also the tolerance of the side walls of the blocks for perfect fit between them, of 1,5 and 2 mm in this preferred embodiment.

[0025] In the manufacturing of these building blocks, which is performed with mould and counter mould, are important: the docility of fresh material, the vibration, the filling time of the mould, the cement hydration and the hardening time, which can be adapted in each particular case. With varying proportions of components: cement, water and aggregate and different pressures in manufacturing, different densities are achieved. But it is important in the manufacture of these elements that arlita or expanded clay aggregate not used, being used recy-

bled aggregate from waste concrete or other recycled, without impact to the performance of the block.

Claims

1. Multi cavity concrete construction element manufactured by molding mass concrete base to be used as wall concrete facades and interior partitions, **characterized by**

- Its geometry with cells of rectangular section with rounded ends at its base and a trapezoidal section at its height
- The design of its side surfaces with a tucked on the left side and a protruding ridges on the right, with a tight tolerance
- The use of recycled aggregates

2. Multi cavity concrete construction element according to claim 1, **characterized by** its cells, rectangular with rounded ends on its surface, and lengths 66, 68 and 75 mm and widths 15 and 20 mm, with spacing between them of 20 mm and the gaps between the cells and block walls 25 mm.

3. Multi cavity concrete construction element according to claim 1, **characterized by** its cells, having trapezoidal section on its height dimension, with dimensions on the top of the block 15 and 20 mm width of the cells, 20 mm separation between them, and 25 mm separation with the walls, while at the bottom the cavities are 12 and 17 mm wide, 23 mm separation between them and 26.5 separation with the block walls.

4. Multi cavity concrete construction element according to claim 1, **characterized by** the configuration of its lateral sides, the left a tucked section formed by a trapezoidal finished in a matching semicircular shape with a central socket part 28mm and the right with two protruding ridges from a widening of the side walls of the central socket on that side, protruding 50 mm from the inside top of the alveolus.

5. Multi cavity concrete construction element according to claim 1, **characterized by** tolerance at the junction of the side walls of the blocks, of 1.5 and 2 mm.

6. Multi cavity concrete construction element according to claim 1, **characterized by** the use in the manufacture of recycled aggregates coming from concrete or other origins.

Amended claims in accordance with Rule 137(2) EPC.

1. Multi cavity concrete construction element to be used as a block in concrete construction for facades and interior walls, being mass concrete a base component of the element manufacturing. The element is **characterized by** its geometry, having cells of rectangular section with rounded ends at its surface and a trapezoidal section at its height.

2. Multi cavity concrete construction element, according to claim 1, **characterized by** the geometry of its surface cells, said cells being rectangular with rounded ends and lengths of 66, 68 and 75 mm and widths of 15 and 20 mm, with spacing between them of 20 mm and the gaps between the cells and block walls being 25 mm.

3. Multi cavity concrete construction element according to claim 1, **characterized by** its cells having a trapezoidal section on its vertical dimension. Said cells have 15mm and 20mm widths on their top dimension, with a 20mm separation between them, and 25 mm separation to the walls, while at their lower dimension the cells are 12 and 17mm wide, with 23mm separation between them and 26.5mm separation to the block walls.

4. Multi cavity concrete construction element, according to claim 1, **characterized by** the element's right side surface having a protrusion, said protrusion having two edges extending from the side walls of the central socket on that side, said edges protruding 50 mm measured from the inside edge of the alveolus.

5. Multi cavity concrete construction element, according to claim 1, **characterized by** the element's left side surface being tucked, said surface having a trapezoidal geometry in a matching shape to the protruding edges on the right side and with a depth of 12mm measured from the element's side.

6. Multi cavity concrete construction element, according to claims 4 and 5, **characterized by** the dry coupling of elements (without the need of using a connection agent) side by side with a tolerance of 1.5 to 2 mm.

7. Multi cavity concrete construction element, according to claim 1, characterized because the element contains, as one of its components, recycled aggregates in the concrete mass coming from recycled concrete or other origins.

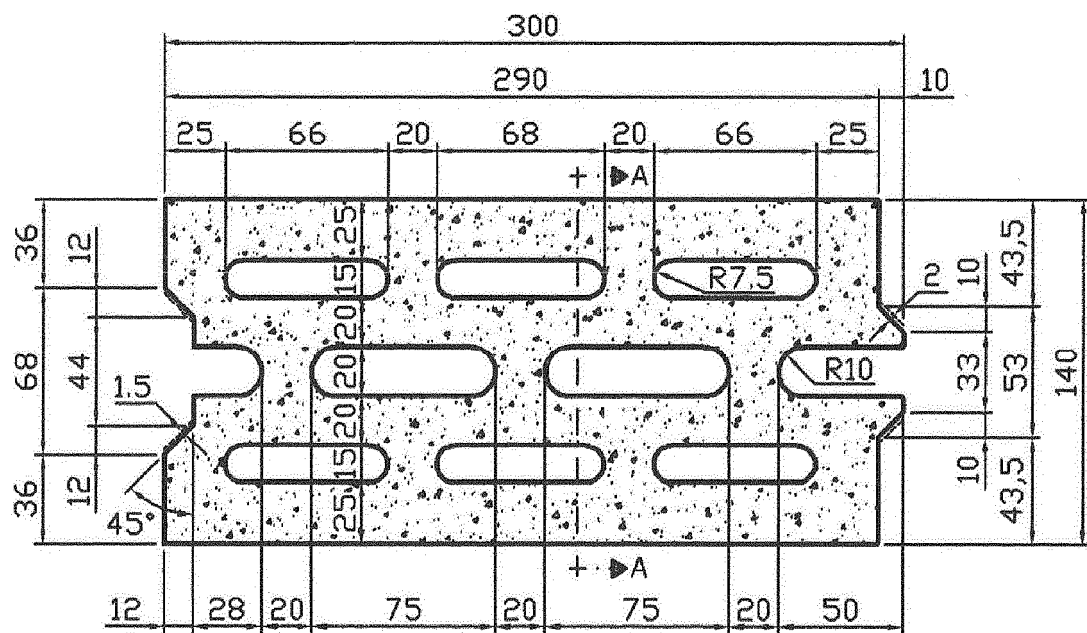


Fig. 1

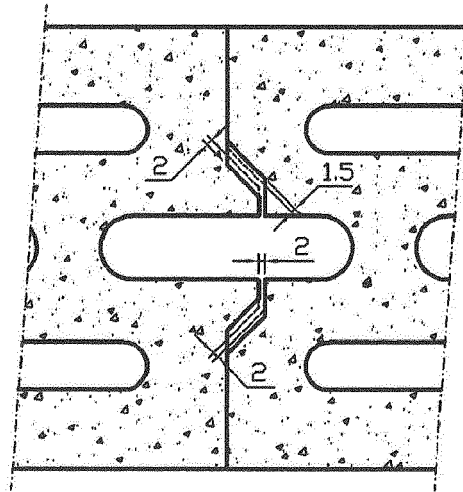


Fig. 2

A-A SECTION

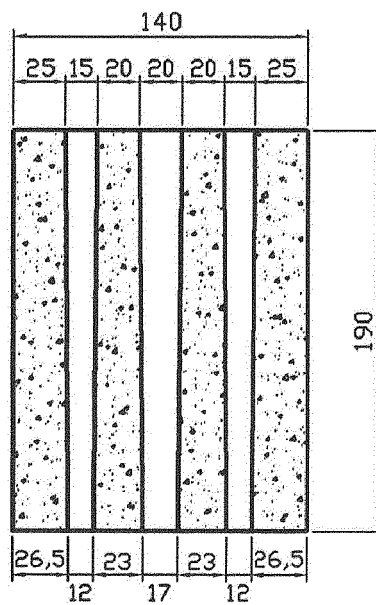


Fig. 3

**PARTIAL EUROPEAN SEARCH REPORT**

Application Number

under Rule 62a and/or 63 of the European Patent Convention.
This report shall be considered, for the purposes of
subsequent proceedings, as the European search report

EP 16 16 8759

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 1 559 579 A (DAMIANI ETS) 23 January 1980 (1980-01-23) * page 2, left-hand column, lines 54-56; figure 2 *	1	INV. E04C1/00 E04B2/46 E04B2/50
X,D	FR 2 622 229 A1 (ANPEL FRANCE SARL [FR]) 28 April 1989 (1989-04-28) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04C E04B

INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC so that only a partial search (R.62a, 63) has been carried out.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

Reason for the limitation of the search:

see sheet C

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Place of search	Date of completion of the search	Examiner
Munich	14 November 2016	Valenta, Ivar
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 (P04E07)



INCOMPLETE SEARCH SHEET C

Application Number

EP 16 16 8759

Claim(s) searched incompletely:

1

Claim(s) not searched:

2-6

Reason for the limitation of the search:

Claim 1

1.1 The features "manufactured by molding mass concrete" in the apparatus claim 1 relate to a method of using the apparatus rather than clearly defining the apparatus in terms of its technical features. The intended limitations are therefore not clear from this claim, contrary to the requirements of Article 84 EPC.

1.2 The expression "concrete base" is not clear, since it is not clear whether is meant:

- the construction element comprises a base, or
- mass concrete is base of the construction element.

1.1 Due to the expression "its" geometry, it is not clear whether is meant:

- the geometry of construction element is characterised by having cells, or
- the wall concrete facades are characterised by having cells, or
- the concrete base is characterised by having cells.

The same objection applies mutatis mutandis to the same expression in line 7 of claim 1.

1.1 The expression "a protruding ridges" is not clear.

1.2 The expression "a tight tolerance" is vague and moreover no technical feature.

1.3 The expression "the use" in line 8 is not clear, since claim 1 relates to an apparatus and not to a use.

For the reasons referred to under point 3 clarity, no such opinion can be established in respect of claims 1-6 as filed.

This search report has not been established with respect to the filed claims, because they do not comply with the prescribed requirements to such an extent that no meaningful search can be carried out. Moreover, a clear interpretation on basis of the remaining application documents was due to the following reasons at present not possible: The claims are as a whole not in compliance with the provisions of clarity and conciseness, as explained under Item VIII. Due to the formal deficiencies, compare Item VII, neither the drawings, nor the description or their combination can add to a solution of the fundamental clarity defects in the claims. Claim 1 contains a multitude of clarity deficiencies. The examiner attempts to understand the subject-matter of claim 1 exclusively for the purpose of the examination.

As a search could not be established with respect to the filed claims, it was based on the subject-matter that, as far as can be understood, appear to be essential for the filed subject-matter, namely:

A multi cavity concrete construction element, having hollow cells with a rectangular cross section, said construction element comprising a side surface which is tucked and a side surface which has a protrusion.

This subject-matter is not new over the following documents:

D1: figure 1 and page 2, left column, lines 53-56

D2: figure 3 and claim 9.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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FR 2622229	A1	28-04-1989	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- CN 101260714 [0006]
- FR 2455141 [0006]
- FR 2622229 [0006]
- CN 201172909 [0006]
- CN 201176657 [0006]
- WO 201501903 A [0006]