COMMONWEALTH OF AUSTRALIA  
Patents Act 1952-1976  
CONVENTION  
APPLICATION FOR A PATENT

We HANOTA HOLDINGS S.A., a Body Corporate organized and existing under the laws of Belgium, of 37, rue Notre-Dame, Luxembourg, Principality of Luxembourg.

hereby apply for the grant of a Patent for an invention entitled

"building block set and method for building with such a block set."

which is described in the accompanying complete specification.

This application is made under the provisions of Part XVI of the Patents Act 1952-76 and is based on an application for a patent or similar protection made

in Belgium on 2nd September, 1976 (845779)
in "  
on 1st March, 1977 (PV 0/175359)

Our address for service is: F. B. Rice & Co., 101 Mort St., Balmain, NSW 2041

Dated this 31st day of AUGUST, 1977

HANOTA HOLDINGS S.A.

by   

Patent Attorney

To: The Commissioner of Patents,  
Commonwealth of Australia.
A CONVENTION APPLICATION FOR A PATENT
or ADDITION

In support of the Convention Application made by
HANOTA HOLDINGS S.A.

for a patent for an invention entitled
"Building block set and method for building with such a block set"

We, CHARLES SCHMIT & THEO KASS, Directors, of and of care of the applicant company,
do solemnly and sincerely declare as follows:

(1) We are authorised by HANOTA HOLDINGS S.A. to make this declaration on its behalf.

(2) The basic application as defined by Section 142 of the Act were made in:
1) Belgium on 2nd September, 1976
2) Belgium on 1st March, 1977.

by
1) Gerard De Waele
2) Hanota Holdings S.A.

Gerard De Waele of 88, Leistraat, Heistergem, Belgium.

is the actual inventor of the invention and the facts upon which Hanota Holdings S.A. is entitled to make the application are as follows: The present applicant company is the assignee of the invention from the said actual inventor.

The basic application referred to in paragraph 2 of this Declaration in the first application made in a Convention country in respect of the invention the subject of the application.

Declared at Brussels this 31st day of August, 1977

HANOTA HOLDINGS S.A.

E. SCHMIT, Director

T. KASS, Director

F. B. RICE & CO.,

To: The Commissioner of Patents
Commonwealth of Australia

Patent Attorneys,
Sydney.
Building block set comprising hollow blocks which can be dry-assembled and inside which a binder notably concrete, can be poured, which comprises at least two block types formed by base blocks and/or joined base blocks comprised of a united combination of identical or different base blocks, a first base block having a portion in the shape of a straight rectangular parallelepiped which is extended at the one end thereof by two flanges each extending in the extension of a side surface of said portion over a distance substantially equal to a fraction of the length of said portion, the parallelepiped-shaped portion having a hollow volume extending through the block over the whole height thereof, a second base block the horizontal cross-section of which
is fork-shaped, particularly U-shaped, the flange length of said second block being substantially equal to the flange length of the first base block, the tolerances allowed for the above-defined lengths and distances being substantially equal to the thickness of the walls of the parallelepiped-shaped portion, the lower and upper edges of each block type being substantially flat to allow laying the blocks without anchoring on top of one another in any relative position whatsoever.
The following statement is a full description of this invention including the best method of performing it known to u:-
This invention relates to a set of building blocks comprising hollow blocks which can be dry-assembled and inside which a binder notably concrete can be poured.

The principle of dry-laying rows of hollow blocks, arranged on top of one another and the filling of said blocks by means of concrete to make same integral is known for ages and there are a very high number of patents relating to building blocks of special shape for the application of such a principle.

However in practice it has been noticed that the art of dry-laying hollow blocks and filling same with concrete has found little application and is generally limited to underground masonry for which the requirements from an accuracy and aesthetic consideration are less stringent than for visible masonry.

This invention has for object to provide a set of building blocks which allows to extend the art of dry-laying as defined above to visible or above-ground masonry to make any construction such as houses, with or without upper storeys, industrial buildings, etc, in a very rational and economically-viable way.

A deep study of the dry-laying art has led to the conclusion that at least four conditions are to be met if such an art is to be substituted to the conventional masonry according to which the blocks are bound together with mortar. Said conditions are as follows:

1°) it should be possible to lay loosely at least five rows of blocks with a height of 20 cm on top of one another with enough stability to be able to fill same in one operation with concrete,
without requiring the use of an inner reinforcement to avoid the blocks breaking under the pressure resulting from the concrete drop, so as to make the method industrially competitive with the conventional masonry methods.

2°) the complete filling with concrete should be insured and there can be no slits either in the vertical direction or in the horizontal direction, between the blocks after such filling, in such a way that the blocks should be bound both through the cross-wise walls thereof and through the horizontal walls thereof by means of the filling concrete in whatever structure of walls or wall combination.

3°) all of the wall combinations which can occur in a structure, such as corner junctions, T-shape junctions and X-shape junctions, should be possible with but a minimum number of different blocks and this independently of the size and relative positions of the wall parts and of the wall thicknesses.

4°) the shape of the blocks should be as simple as possible to be manufacturable with enough accuracy (as small as possible a tolerance), on an industrial scale and with a large enough throughput capacity. Moreover, the block shape should be such that the blocks have sufficient mechanical strength to allow same to be handled and conveyed with conventional means.

A construction block which does not fulfill even but one of the above conditions, is not suitable for the application of the dry-laying art on location and thus does not have any practical value for the object as contemplated by the present invention.

It has been noticed that with the known
building blocks as defined above, at least one of the above conditions is not fulfilled.

The most usual problems which occur with the known blocks appear to be the danger of breaking when pouring the concrete and the impossibility of making all of the wall combinations which can be encountered in a conventional structure with a minimum number of different block types (conditions 1 and 3).

The invention lies in providing a set of building blocks in which a number of specific features are combined, some of which are possibly applied singly on known blocks, which allow due to the interaction thereof to fulfill the recited conditions and thus to bring a solution to the art of dry-laying as defined above in all of the conditions which can occur when erecting buildings.

For this purpose the block set comprises at least two block types formed by base blocks and/or joined base blocks comprised of a united combination of identical or different base blocks, a first base block having a portion in the shape of a straight rectangular parallelepiped which is extended at the one end thereof by two flanges each extending in the extension of a side surface of said portion over a distance substantially equal to a fraction of the length of said portion, the parallelepiped-shaped portion having a hollow volume extending through the block over the whole height thereof, a second base block the horizontal cross-section of which is fork-shaped, particularly U-shaped, the flange length of said second block being substantially equal to the flange length of the first base block, the tolerance allowed for the above-
defined lengths and distances being substantially equal to the thickness of the walls of the parallelepiped-shaped portion, the lower and upper edges of each block type being substantially flat to allow laying the blocks without anchoring on top of one another in any relative position whatsoever.

Advantageously that parallelepiped-shaped portion of the first base block is provided at the end thereof opposite to the one bearing the flanges, with an overthickness which is fittable between the free ends of another block flanges, the back of the second U-shaped base block being provided with an overthickness similar to the overthickness of said first block, to allow forming an anchoring between two blocks laid in extension of one another, said overthickness being so designed that a free space in which the binder can flow remains between the flanges of the one block and the overthickness of another block cooperating with said flanges.

The invention also relates to a particular building method making use of said block set.

Said method which lies in first laying blocks loosely on top of one another and next to one another to form walls through which extend downwards shafts and then pouring the binder in the hollow block spaces of the top row to said shafts, comprises arranging the blocks relative to one another so as to form vertical shafts which at least every third block row open sidewise towards an adjacent shaft, along a continuous slanting channel letting the binder fed to the shaft concerned flow out partly by overflowing substan-
tially under the weight thereof, towards the adjacent shaft or shafts which are not yet filled with binder, with such a speed and flow rate which are at most equal to the allowable speed and flow rate as determined by the block pressure strength.

Other details and features of the invention will stand out from the description given below by way of non-limitative example and with reference to the accompanying drawings in which:

Figure 1 shows a block set according to a first embodiment of the invention.

Figure 2 is a plan view on a smaller scale of a block set according to a second embodiment of the invention.

Figure 3 is a plan view of a particular block type of a set according to the invention.

Figures 4 to 7 show other variations of united combinations of blocks according to figure 1.

Figure 8 is a plan view of two wall portions forming a corner.

Figure 9 is an elevation view with parts broken away and in cross-section along line IX-IX in figure 8.

Figure 10 is an elevation view with parts broken away and in cross-section along line X-X in figure 8.

Figures 11 and 12 show plan views of specific junctions of wall portions.

In the various figures, the same reference numerals pertain to similar elements.

There should first be noted that even if the
lower and upper surfaces of the blocks in some particular set should be as smooth and flat as possible and in parallel relationship with one another, while lying at right angle to the side surfaces thereof, the tolerances allowed for the block and block portion lengths correspond substantially to the thickness of the walls thereof. This will appear more clearly from the description given hereinafter of the building method with the use of such blocks.

Figure 1 shows a building block set that comprises two types of base blocks 1 and 2. The first type is comprised of a block 1 having a portion 3 in the shape of a straight rectangular parallelepiped which is extended at the one end thereof with two flanges 5 and 6 which extend each in the extension of the one side surface, 7 and 8 respectively, over a distance which is substantially equal to a fraction of the length of said portion 3 which in the embodiment as shown in figure 1, is one half of said length. The other end of block 1 is provided with an overthickness 4 which is fittable between the free ends of flanges 5 and 6 of another block.

That portion in the shape of a parallelepiped has a hollow space 10 having as large a horizontal cross-section as possible, also in the shape of a parallelepiped, which goes through the block over the whole height thereof, said block thus being open on both bottom and top surfaces.

The second type of blocks 2 is in the shape of a "U", the back 13 of which is provided with an overthickness similar to the one of the block 1 and with the length of the flanges 5 and 6 substantially equal to the one of the flanges 5 and 6 of block 1.
The side surfaces 7 and 8 as well as the outer surfaces of the flanges 5 and 6 are substantially flat to allow building walls both sides of which are substantially flat.

The bottom and top edges of each block type are substantially flat and in parallel relationship with one another, so as to allow laying the blocks on top of one another in any relative position whatsoever.

The invention also relates to a block set which comprises a jointed combination of blocks of one and the same base type or from two different base types.

Such embodiments have been shown in figures 2, 4, 5, 6 and 7. Figure 2 shows base blocks 1 and 2 which are associated by way of example, to blocks 20 and 21. Block 20 can be considered as a combination of a block 1 with a block 2, while block 21 can be considered as a combination of two blocks 2 with the ends of flanges 5 and 6 joined to form an unit.

Figure 4 shows the association in the same direction of two blocks 2. Figure 5 shows a block comprised of two blocks 1. Figure 6 shows a set of blocks 1 with a block comprised of the association of one block 1 with a block 2. Finally figure 7 is a combination of two blocks 1 laid side to side.

It must be understood that other combinations are possible. It is for instance possible to provide combinations of two or more blocks 1, etc.

Figure 3 shows a variation of a relatively large block 1 which is mostly useful when making foundation
walls.

To avoid any danger of breaking such large blocks when filling same with a binder, normally concrete, the inner corners of portion 3 in the shape of a parallelepiped are reinforced. For this purpose according to the invention, the side walls 7 and 8 of portion 3 are preferably widened on the inner side thereof towards the adjacent corners as clearly shown in figure 3.

Such a reinforcement is also advantageously provided on the inner side of flanges 5 and 6 and this independently from the block size. Said flanges thus get progressively wider from the free end thereof towards the bottom, so as to give a horizontal cross-section which has substantially the shape of a rectangular trapezium.

Block type 2 can comprise a plurality of variations as regards the length of the flanges for making the junctions in two or more walls with the same thickness or different thicknesses.

In a particular embodiment the flange length can be substantially equal to the sum of the flange length on the first block type 1 and of the wall thickness in portion 3 thereof.

In another particular embodiment, the flange length for block 2 is substantially equal to the length of one block 1 as measured at right angle to the flanges.

In still another embodiment of block 2, the flange length is substantially equal to the difference between the length of one block 1 and the sum of the flange length thereof and the width of one block 1.
Finally, the flange length for a block 2 can also be equal to the difference between length and width of a block 1.

To make junctions at right angle between walls with different thicknesses, it might be useful to provide blocks 2 having the width of the one wall and a flange length depending on the width of the blocks used for the other wall. Consequently, the different variations in the blocks 2 as described above can be applied to combinations of walls with different thicknesses.

In a preferred embodiment of the set as shown in figure 1, the length of block 1 is substantially equal to three times the width thereof.

At least one of the cross-wise walls in the blocks of the set according to the invention is provided on at least one edge thereof, with a recess.

In the block set as shown in figure 1, most of the blocks 1 have such a recess 12 in the cross-wise wall 11 and a similar recess 15 in wall 13. In the same way, it would be possible to provide a similar recess in the wall 13 of some of the blocks 2.

It is however of importance that all of the blocks 1 and 2 do not have a recess 15 in wall 13. For instance, the blocks to be used in right-angle corners cannot be provided with such a recess 15. To the contrary, all of the blocks can be provided with recess 12 in wall 11.

The benefit of the provision of such recesses will be defined hereinafter when describing the building method used according to the invention.
In some cases, for example for relatively wide blocks, it would even be possible to dispense with the overthickness 4. The same is true for recess 12.

The building method according to the invention lies in first arranging the blocks from a particular set loosely on top of one another and in the extension of one another, so as to form walls inside which extend down shafts and then in pouring the binder, which is normally concrete, into the hollow spaces of the top row blocks so as to fill up said shafts.

This method has for feature that said blocks 1 of the first type are laid in rows and on top of one another, in such a way that the flanges of said blocks face along the laying direction 16 of the blocks and that a specific block in a row be set back relative to the block on which it bears mainly in the preceding row, over a distance (b) which is substantially equal to the flange length of said block in the preceding row. The blocks 2 of the second type are mostly used when starting walls or wall portions, to allow adjusting the laying of blocks of the first type in the above-described way, and at the ends of walls or wall portions, so as to terminate same substantially vertically. Moreover, the pouring of the binder into the blocks thus assembled is made by filling one by one, partly at least, along the laying direction thereof, the blocks in the top row.

The application of this method is clearly shown in figures 8 and 9 for the building of a corner c between two walls by means of blocks from the set as shown in figure 1, in which the length of block 1 is substantially
equal to three times the width thereof. There is thus obtained inside the walls, the formation of step-like channels as shown by arrows 22, the steps of which are formed by the volume 9 bounded by flanges 5 and 6.

The cut-away in figure 9 shows the advantage of providing recesses 12 and 15. As it may be noted, the blocks are so laid as to direct said recesses downwards.

The function of recess 12 is somewhat different from the one of recess 15.

Indeed when filling a series of superposed block rows forming a wall or wall portion, the pouring of said binder begins at the starts of said walls or wall portions, for example from a corner, to then fill in sequence and partly at least the hollow spaces of the top row along the laying direction 16 thereof. After filling the corners proper, the filling of the other blocks occurs along slanting channels in which the filling material 17 flows with a rather complex movement, by first filling the voids 9 between the flanges 5 and 6 of the blocks and then by overflowing with a cascading turbulent movement over the stairway steps thus formed, the succeeding hollow spaces 10 which also lie step-like, which thus causes a vibrating of the binder poured both in the preceding channel and in the succeeding layers of the channel concerned during the filling proper, by expelling air through the following channel which is not yet filled with binder.

This complex movement thus insures both the required slowing-down of the binder pouring to avoid breaking the blocks and a complete filling over the whole height
of the wall or wall portion which is filled during one and the same filling operation.

When considering the path followed by binder 17 inside a channel formed in rows of superposed blocks, it is noted that said channel has narrow portions shown in 18, that is between two succeeding rows, in front of the lower edge of the cross-wise wall 11 of blocks 1. Due to the presence in this location, of recess 12, which can be of relatively small size, the danger of clogging is substantially lowered for the binder on the downwards movement thereof.

When now considering wall 13 of a block 1 used for making a wall, it is noted that said wall lies above wall 11 of a block 1 in the preceding row.

To avoid that for example due to some irregularity of one of the blocks, a crack might remain between both said superposed walls, which crack would not be filled with binder, a recess 15 has been provided for insuring the filling with binder of any void between the edges of both said walls during the binder pouring into those channels formed inside walls or wall portions.

The binder is preferably poured into the block hollow spaces by means of a pump having a flow rate lying between 10 and 20 m³/h. Said pump can for example be connected to a hose 19 mounted on a hydraulically-operated support and which is movable above the site where the building should be erected.

As results from the above, the laying of the blocks in a wall portion begins according to the invention, generally in such a corner by directing the flange free ends
along the laying direction or in other words by laying the blocks in such a way that overthickness 4 be facing the corner concerned. The end of a thus built wall portion for example at a door or window opening, is completed with blocks 2 along a substantially vertical side, as shown in figure 8, and a "U"-shaped shuttering 33 surrounding said wall end allows pouring the binder.

As shown in figure 10, to join two portions of one and the same wall extending in the extension of one another, use is made of a shuttering 39 comprising two panels 40 and 41 applied on either side of that space 28 provided between said wall portions, against the facing ends thereof, by means of fasteners passing through said space to form a vertical shaft which is somewhat similar to the shaft bounded by the "U" shuttering in figure 9.

The blocks according to the invention which might possibly be considered as shuttering for the binder, can be made from any material, for instance a material having insulating properties both as regards heat and sound.

One of the main advantages of the invention relative to what is known, is the possibility of monitoring at any time the block filling as the binder flowing down the slanting channels is visible.

Moreover the height of a wall portion which can be filled in a single operation with binder without any danger of breaking blocks is theoretically unlimited even if in practice, notably as regards the scaffolding, there is a limit corresponding to the sequence filling of superposed wall portions with 5 to 7 block rows.
The blocks possibly be used as lost shuttering to form lintels as shown in figure 12.

Finally figure 11 shows a particular block arrangement for the building of a cross-like wall junction.

For relatively wide blocks, the anchoring of succeeding blocks might possibly be dispensed with.

A reinforcement and pipes might be arranged inside the shafts and channels before filling the blocks. The height of blocks 1 is advantageously substantially equal to half the width thereof.

It must be understood that the invention is in no way limited to the above embodiments and that many changes can be brought therein without departing from the scope of the invention as defined by the appended claims.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Building block set comprising hollow blocks which can be dry-assembled and inside which a binder notably concrete, can be poured, which comprises at least two block types formed by base blocks and/or joined base blocks comprised of a united combination of identical or different base blocks, a first base block having a portion in the shape of a straight rectangular parallelepiped which is extended at the one end thereof by two flanges each extending in the extension of a side surface of said portion over a distance substantially equal to a fraction of the length of said portion, the parallelepiped-shaped portion having a hollow volume extending through the block over the whole height thereof, a second base block the horizontal cross-section of which is fork-shaped, particularly U-shaped, the flange length of said second block being substantially equal to the flange length of the first base block, the tolerances allowed for the above-defined lengths and distances being substantially equal to the thickness of the walls of the parallelepiped-shaped portion, the lower and upper edges of each block type being substantially flat to allow laying the blocks without anchoring on top of one another in any relative position whatsoever.

2. Block set as defined in claim 1, in which that parallelepiped-shaped portion of the first base block is provided at the end thereof opposite to the one bearing the flanges, with an overthickness which is fittable between the free ends of another block flanges, the back of the second U-shaped base block being provided with an overthickness similar to
the overthickness of said first block, to allow forming an anchoring between two blocks laid in extension of one another, said overthickness being so designed that a free space in which the binder can flow remains between the flanges of the one block and the overthickness of another block cooperating with said flanges.

3. Block set as defined in either one of claims 1 and 2, in which the length of the first base block is substantially equal to three times the width thereof.

4. Block set as defined in any one of claims 1 to 3, in which the length of the parallelepiped-shaped portion thereof is substantially equal to twice the flange length thereof.

5. Block set as defined in any one of claims 1 to 4, in which the flanges of each one of said block types widen inwardly of the blocks, progressively from the free end thereof towards the base thereof, so as to have a horizontal cross-section substantially in the shape of a rectangular trapezium.

6. Block set as defined in any one of claims 1 to 5, in which those edges lying on the same side, of both cross-wise walls of some blocks of the first type are provided with a recess.

7. Block set as defined in any one of claims 1 to 6, in which cross-wise slits are provided in the edges of the side walls of some at least of the blocks, for the fastening of anchoring hooks.

8. Building method by means of a block set as defined in any one of claims 1 to 7, comprising first
laying blocks loosely on top of one another and next to one another to form walls through which extend downwards shafts and then pouring the binder in the hollow spaces of the top row to fill said shafts, which comprises arranging the blocks relative to one another so as to form vertical shafts which at least every third block row open sidewise towards an adjacent shafts, along a continuous slanting channel letting the binder fed to the shaft concerned flow out partly by overflowing substantially under the weight thereof, towards the adjacent shaft or shafts which are not yet filled with binder, with such a speed and flow rate which are at most equal to the allowable speed and flow rate as determined by the block pressure strength.

9. Method as defined in claim 17, in which the blocks of the first base type are laid in rows on top of one another in such a way that the flanges thereof be facing in the same direction for one and the same wall portion and a specific block in a row be laid in a recessed position relative to that block on which it bears mainly in the preceding row, over a distance which is substantially equal to the flange length of said block in said row, the blocks of the second base type being substantially used for starting walls or wall portions so as to allow adjusting the laying of the first-type blocks in the above-described way and at the ends of walls or wall portions to terminate same substantially vertically, base blocks may be replaced by jointed base blocks.

10. Method as defined in either one of claims 8 and 9, in which two portions of one and the same
wall in the extension of one another and in which the horizon-
tal components of the resultant along which the binder
will flow through the respective channels in each wall por-
tion are directed towards one another, are joined by a
shuttering comprising two panels applied on either side
against the facing ends of both wall portions, so as to form
between said portions and the panels, a shaft through which
the binder can flow to make both wall portions integral with
one another.


HANOTA HOLDINGS S.A.

Patent Attorneys for the Applicant.
F.B. RICE & CO.