May 6, 1969 W. LANZ 3,442,991

METHOD FOR PRODUCING AEROCONCRETE BUILDING BLOCKS

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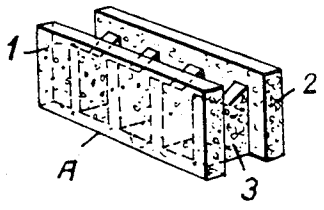
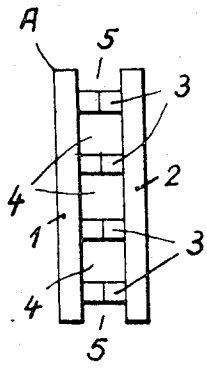
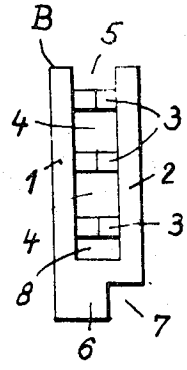


FIG. 1





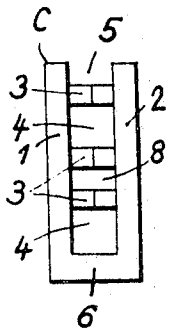


FIG. 2 FIG. 3 FIG. 4

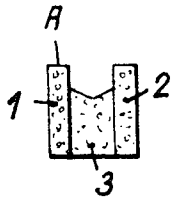


FIG. 5

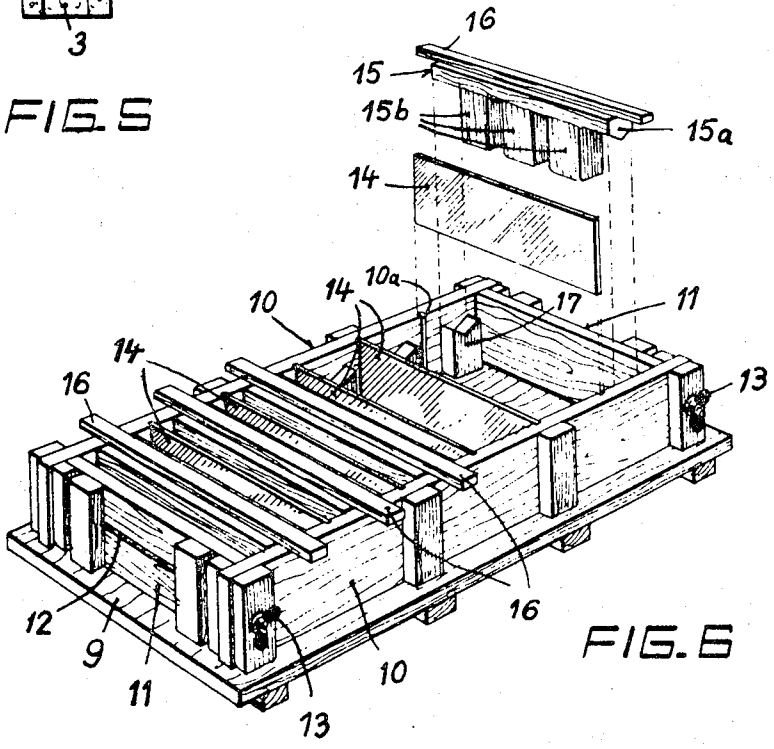


FIG. 6

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METHOD FOR PRODUCING AEROCONCRETE BUILDING BLOCKS

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Claims priority, application Switzerland, Dec. 31, 1962, 15,305/62
Int. Cl. B28b 7/18, 7/28
U.S. Cl. 264—42 2 Claims

ABSTRACT OF THE DISCLOSURE

The method of making building blocks of aeroconcrete, each having a medially disposed and lengthwise extending horizontal channel intersecting with end and intermediate vertical chanels so that when piled with the vertical channels in alignment, reinforcing rod and concrete may be poured therein to form, through the horizontal and vertical channel network, a monolithic wall of great strength and yet possessing excellent heat insulating characteristics.

This application is a continuation of Ser. No. 333,578, filed Dec. 26, 1963, now abandoned.

This invention relates to a method for manufacturing an inorganic profilated brick or stone having high sound and heat isolating properties and adapted for making monolithic walls. Hollow profilated bricks or stones have been used for making monolithic walls, whereby a number of stones have been assembled with their hollow spaces in vertical alignment, whereafter reinforcing irons have bene inserted into the vertical canals formed by the hollow spaces of the stones and such canals have been filled with cast concrete in order to anchor the reinforcement in the stones.

In a prior profilated stone of concrete horizontal grooves are provided in the upper and lower bearing or contact surfaces, such grooves being filled with cast concrete for securing adjacent stones against relative horizontal displacement, whereby a particularly strong monolithic structure is obtained.

Construction by means of profilated stones or bricks in the manner explained above has the advantage over concrete walls that no sheathing is required. However the walls constructed with prior prefabricated profilated stones required the application of additional heat and sound isolating coatings to the wall surfaces because of the low heat and sound isolating properties of such stones.

On the other hand, unprofilated bricks or stones made of aeroconcrete have been used. While the heat and sound isolating properties of such elements is sufficient the strength of walls constructed with such elements is insufficient for most applications. Experiments have also been made with profilated hollow stones made or gritted material mixed with an adhesive and pressed in moulds, such stones having a high porosity providing for heat isolation. However, it has been found that the heat isolation of such stones is still insufficient.

Large size multilayer profilated stones have also been known, provided with an isolating coating of organic material at the outer surface of each stone. The isolating properties of such stones are sufficient but the stones are very expensive and the isolating coating is mechanically weak. Further, the isolating coating of organic material tends to internal action due to differences in humidity in spite of plaster coatings so that cracks are formed in the plaster.

It is a first object of this invention to provide a method for manufacturing an inorganic brick or stone of high sound and heat isolating properties and adapted for making monolithic walls, this stone preventing the above drawbacks of prior stones or bricks. The brick or stone according to this invention is made of aeroconcrete and comprises a longitudinal hollow space open at one bearing or contact side and at least at one end face of the stone, and hollow spaces extending from said longitudinal hollow space to the other bearing or contact side of the stone.

It is another object of this invention to provide a method for making the above profilated stone, this method comprising casting the liquid concrete components mixed with a gas-developing agent into a frame-shaped die having a depth corresponding to the thickness of the stone to be cast and supported on a flat bottom structure, the mixture being cast into the die immediately after the end of the mixing process to a portion of the depth of the die corresponding to the proportion between the volume of the liquid mixture and the volume of the aeroconocrete produced therefrom, uniformly distributing the mixture within the die frame and then inserting a core of the form of the hollow spaces to be formed in the stone, securing the core against lateral displacement thereof, applying the lower horizontal end surface of the core onto the said flat bottom structure by displacing the mitxure, maintaining the core in this position during the expansion of the aeroconcrete with the upper end surfaces of the core in a common horizontal plane with the upper rim of the die frame, scraping off excess areoconocrete raising above the said common horizontal plane and removing the core when the aeroconcrete is stabilized, and removing the die frame by disassemblage thereof after complete setting of the aeroconcrete.

It is another obejct of this inventon to utilize a die for putting into practice the above method, this die comprising a flat bottom structure, a rectangular frame having side walls and end walls disengageably assembled and positioned on said bottom structure, the depth of the frame corresponding to the desired thickness of the stones to be formed, and core means adapted for insertion into the said frame, said core means comprising at least one unity for forming the hollow spaces of at least one stone, said core unity including a longitudinal core member and core members extending laterally from said longitudinal core member, the effective height of the core unity being equal to the depth of the frame so that the end surfaces of said laterally etxending core members contact said bottom structure and the end surface of said longitudinal core member is in a common plane with the upper edge of the frame when the core unity is inserted into the frame.

The attached drawing illustrates, by way of example, three embodiments of the profilated stone such as an embodiment of the die according to this invention, the above method being explained with reference to the illustration of the die.

FIG. 1 is a perspective view of the first embodiment of the hollow profilated stone,

FIG. 2 is a top view of the first embodiment,

FIG. 3 is a top view of the second embodiment,

FIG. 4 is a top view of the third embodiment,

FIG. 5 is an end view of the stone illustrated in FIGS. 1 and 2 and

FIG. 6 is a perspective view of a die or mould for producing the stones illustrated in FIGS. 1, 2 and 5.

The large-size profilated stones shown in the drawing are suitable for making monolithic walls and are made of aeroconcrete. For domestic building stones of the type shown in FIGS. 2 and 4 are preferably used.

The stone of type A shown in FIGS. 1, 2 and 5 has a size in the order of 25 x 25 x 75 cm. It has two vertical side walls 1 and 2 with four webs 3 at right angles to and between walls 1 and 2. The dimensions and distance between webs 3 is such that three vertical canals or hollow spaces 4 of square cross section are formed between

the webs, the cross section of such canals or apertures being in the order of 12 x 12 cm. for the above dimensions of the stone. The canals **4** are open at both bearing or contact surfaces formed by the upper and lower end surfaces of walls **1** and **2**. A recess **5** of rectangular cross section and having a size in the order of 12 x 6 cm. for the above overall dimensions of the stone is provided at each end of the stone, recesses **5** being substantially parallel to the spaces **4**. The recesses **5** are open at both bearing or contact sides and also at the end faces of the stone. The upper surfaces of the webs **3** are at a distance from the upper edge surfaces of walls **1** and **2** so that a longitudinal horizontal recess or hollow space **40** (best seen in FIG. 5) is formed extending throughout the length of the stone and open at the upper bearing side and at the ends of the stone. The canals **4** and recesses **5** communicate with the longitudinal recess or hollow space **40**. The upper surface of webs **3** is V-shaped, this particular form being due to a corresponding shape of the mould or die wherein the stones are cast. The depth of the said longitudinal recess or hollow space **40** measured from one upper inner edge of wall **1** or **2** to the intersecting line of the inner wall surface with the V-shaped upper surface of a web **3** is in the order of half the width of this space, that is the distance between the inner surfaces of walls **1** and **2**. This stone or brick shown in FIGS. 1, 2 and 5 is the standard type.

The modified form B shown in FIG. 3 is a fixing stone allowing attachment of door or window frames and the like, and the modified form C shown in FIG. 4 is a corner stone, both made of aeroconcrete. These stones B and C have side walls **1** and **2**, webs **3** and hollow spaces or recesses **4** and **5**. However, one end surface of stones B and C is closed so that the upper longitudinal hollow space of these stones is only open at one end where it communicates with the one recess **5**.

Stone B which has preferably the same length as stone A has a recess **7** of square cross section in its closed end wall **6**, recess **7** serving for receiving a door frame or window frame not shown in the drawing. It has only three webs **3** and two hollow spaces **4**, but another hollow space **8** adjacent end wall **6** open at both bearing sides of the stone and having a cross section substantially corresponding to the cross section of recess **5**.

The stone of type C is somewhat shorter than the stones of type A and B, for instance in the order of 60 cm. It has a straightend wall **6** and a narrow hollow space **8** between the outer hollow spaces **4**.

Due to the arrangement of the webs and the hollow spaces formed between them as shown in the drawing and as set out above, continuous vertical canals will be formed in a wall made of stones piled upon each other, such canals taking up the vertical reinforcement and the cast concrete. Similarly, continuous horizontal canals are formed in the upper portion of stones arranged horizontally side by side, such horizontal canals ending only at an end, a corner or at an opening of the wall where stones of type B or C are used. The continuous horizontal canals serve for accommodation of the horizontal reinforcements and they will be filled with cast concrete so that a monolithic wall structure is obtained.

The stones may be made of any suitable aeroconcrete without organic fillers, having sufficient heat and sound isolating properties for domestic buildings and having an expanding or gas-developing time sufficiently long for the manufacturing method described below. The aeroconcrete mixture disclosed in Swiss Patent 360,332 is particularly suiable for this purpose. Other suitable mixtures well known in the art may also be used, the composition of the mixture being not an object of this invention.

The die or mould shown in FIG. 6 is suitable for simultaneously forming six profilated stones of type A shown in FIGS. 1, 2 and 5. The die has a bottom structure **9** preferably made of boards glued together by means of a water-resistent glue and having a plane top surface. A frame of rectangular form having two vertical side walls **10** and two end walls **11** inserted between side walls **10** is supported on the bottom structure **9**. The side and end walls **10** and **11** are removably assembled by means of tie rods **12** passing through bores of the outer reinforcing blocks of end walls **11** and through bores of the side walls **10** and having wing nuts **13** at their outer ends. The depth of the frame corresponds to the thickness or height of the stone to be produced in the die.

For subdivision of the frame into individual compartments corresponding to the volume of one stone five separating walls **14** having a width corresponding to the depth of the frame are removably inserted into vertical grooves **10***a* of the side walls **10**.

For forming the upper longitudinal hollow space **40** and the hollow spaces **4** of the stone, six similar core units **15** are provided having each a longitudinal core member or carrier **15***a* and three core members **15***b* extending at right angles from carrier **15***a*, of square cross section and a distance from each other corresponding to the thickness of the webs **3** of the stone to be formed. The total height of the core units **15** is equal to the depth of the frame so that the end faces of core members **15***b* will contact the bottom structure **9** and the upper horizontal surface of the carrier **15***a* will be in a common plane with the upper edge surface of frame walls **10** and **11** when the core portion is inserted into the frame. In order to facilitate handling of the core units a strip **16** is fixed at the upper horizontal surface of each core member **15***a*, said strip **16** having a width inferior to the width of the core member **15***a* and extending from the ends of the core unit beyond the outer surface of the frame walls **10**.

For forming the hollow spaces or recesses **5** at the ends of each stone A the side walls **10** have core portions **17** fixed to their inner surface between adjacent separating walls **14** and between the outer separating walls and the end walls **11** respectively, such core portions serving equally for preventing displacement of the core units inserted into the die in longitudinal direction that is, parallel to the side walls **10**. To this end the upper end surfaces of core portions **17** have a V-shaped profile wherein the corresponding V-shaped profile of the core member **15***a* will closely engage when the core unit is inserted into the die frame.

The dies or moulds for producing stone types B (FIG. 3) and C (FIG. 4) are not shown in the drawing, because the modifications of the die illustrated in FIG. 6 for obtaining these stone types will be obvious. Core members **17** will be omitted at one sidewal of the frame and the core member **15***a* of each core unit will be shortened to the desired length of the longitudinal hollow space to be formed at the top side of the stone. Further the cross section and arrangement of the core members **15***b* is adapted to the cross section and arrangement of the hollow spaces **4** and **8** to be formed. For forming the corner recess **7** of stone type B core members of a shape corresponding to the recess **7** are provided instead of core members **17** in one corner of each die compartment.

Of course, the die may be of a size allowing simultaneous production of more or less than six stones.

Casting of the stones by means of the die shown in FIG. 6 will now be explained. Prior to each casting or moulding process the surfaces of the die which will be contacted by the aeroconcrete are coated with a fatty substance having little or no water contents, or with paraffin or the like. The frame is now put onto the bottom structure **9** while the core units and separating walls are not inserted into the frame.

The components of the concrete such as water, cement sand, a gas-developing agent and a stabilizer if desired are mixed in a mixing device to a mixture which may b cast into the die frame. Immediately after the end of the mixing process the mixture is cast into the die frame to a level required by the proportion of the volume of

the stones to be formed from the expanded mixture and the unexpanded mixture cast into the frame. As an example, if the mixture disclosed in Swiss Patent 360,332 is used, the frame is filled to the half of its full height. In order to properly fill all the corners of the die it is necessary to thoroughly distribute the mixture in the die by means of a trowel or the like and the level or surface of the mixture should be flat and parallel to the top surface of the bottom structure **9**. Immediately after casting and properly distributing the mixture the separating walls **14** are inserted into the frame and are pressed downwards thereby displacing the mixture until the lower edge surfaces of the separating walls contact the top surface of the bottom structure **9**. The separating walls are anchored in the grooves **10***a* and their upper edge surface is in a common plane with the upper edge surfaces of walls **10** and **11**.

As soon as possible the core units **15** are now inserted into the compartments of the die. The core members **15***b* are pressed into the mixture until their lower end face contacts the top surface of the bottom structure, whereby the level of the mixture slightly rises due to the displacement of mixture by the core members **15***b*. The roof-shaped lower surface of the carrier **15***a* engages the V-shaped recesses of he core members **17** without yet contacting the mixture, whereby the core units are secured against longitudinal displacement in the die. After insertion of the die units the upper surface of core members **15***a* are in the said common plane comprising the the upper edge surfaces of the frame. When all core units are properly inserted into the die compartments suitable weights uniformly acting onto all strips **16** of the core units, such as iron profiles or rails or the like are applied, whereby upward displacement of the core units due to the action of the new expanding mixture is prevented. Of course, the core units may be scured against vertical displacement by means of suitable closing or spanning means.

As mentioned above, insertion of the separating walls and core units should be effected as soon as possible after casting the mixture and before the developement of gas in the mixture starts. With the mixture disclosed in Swiss Patent 360,332 development of gas starts within 5–7 minutes.

Subsequently the mixture starts to expand and fills the die volume. When the unexpanded mixture is filled to a proper level, the fully expanded and stabilized mixture will slightly rise above the upper rim of the die frame. The mixture disclosed in Swiss Patent 360,332 stabilizes after about 2 hours.

In this state of the mixture the excess mixture rising above the die rim is scraped off by means of a spattle or a slide, of which the scraping edge is guided along the upper plane surfaces of adjacent longitudinal core members **15***a* or the upper edge surface of an end wall **11** respectively, whereby smooth and plane upper bearing surfaces of the stones are formed. The other plane bearing surface of the stone is formed by the plane top surface of the bottom structure **9**.

When all excess mixture is scraped off, the core units **15** are removed whereafter the die remains unchanged for a period in order of three days for fully setting the aeroconcrete. The frame is then disassembled after removal of the wing nuts **13**, and the stones and separating walls are lifted off from the bottom structure. The times indicated relate to a minimum temperature of the mixture and of the treating room of 180° C.

I claim:

1. A method for producing aeroconcrete building blocks, which comprises,

providing a rectangular confining space having a flat bottom, an open top presenting edges parallel to said bottom, and a depth corresponding to the height of the building block,

preparing a mixture of liquid concrete containing a gas-developing agent,

casting said mixture into said confining space in an amount ultimately to expand and fill such space but before any substantial degree of mixture expansion has taken place,

uniformly distributing the mixture within the confining space before any substantial degree of mixture expansion has taken place and to a depth therein substantially below said edges of the open top,

subdividing said confining space into a series of rectangular sub-spaces each open at the top but isolated from each other, and inserting a core structure into each sub-space to fill and block off a horizontal channel extending uninterruptedly and completely between opposite ends of the confining space and into the open top thereof to a depth less than the depth of the confining space and above said mixture and to fill and block off a vertical channel merging with and extending downwardly from the horizontal channel to project into the mixture, displacing same upwardly to a level below said horizontal channel, and down to the bottom of the confining space, but before any substantial degree of mixture expansion has taken place,

maintaining the core structure in place until the mixture has fully expanded,

striking off excess expanded mixture on either side of said horizontal channel in each sub-space at the level of said edges of the open top of the confining space,

removing the subdividers and the core structures after the expanded mixture has become stabilized and self-supporting but before complete setting thereof,

and then removing the building blocks from the confining space after the stabilized mixture has set.

2. The method according to claim **1** wherein said confining space is of a width to accommodate a plurality of building blocks, and including the step of subdividing said confining space into a series of rectangular subspaces each open at the top but isolated from each other, said subdividing being performed substantially immediately after the distributing step.

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PHILIP E. ANDERSON, *Primary Examiner.*

U.S. Cl. X.R.

249—63, 176; 264—333