Oct. 5, 1971 G. B. MUSE 3,609,926

BLOCK STRUCTURE

Filed Feb. 26, 1969 2 Sheets-Sheet 1

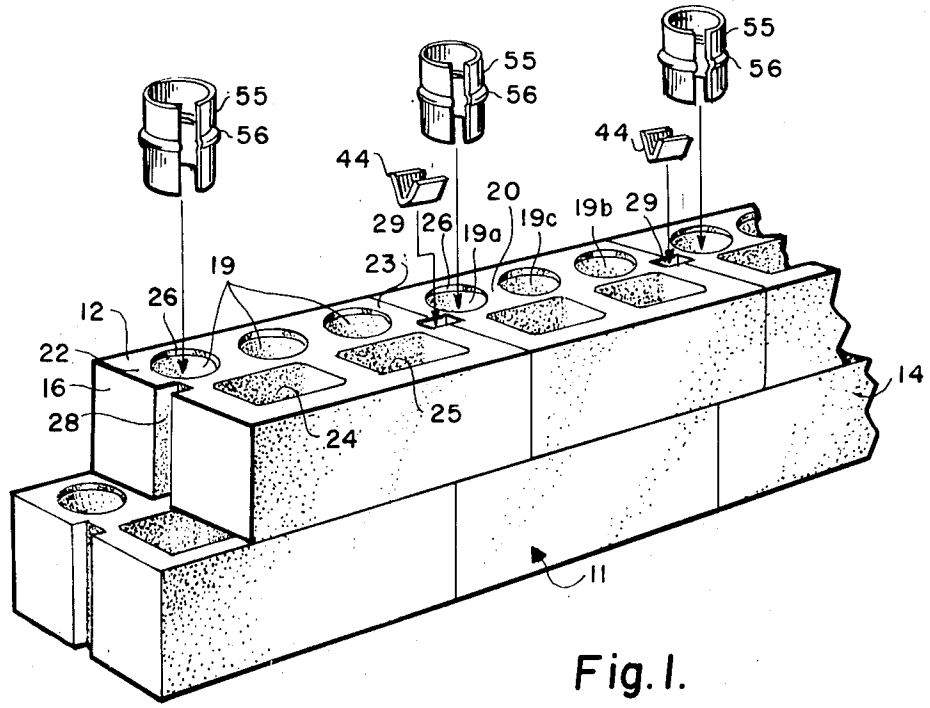


Fig. 1.

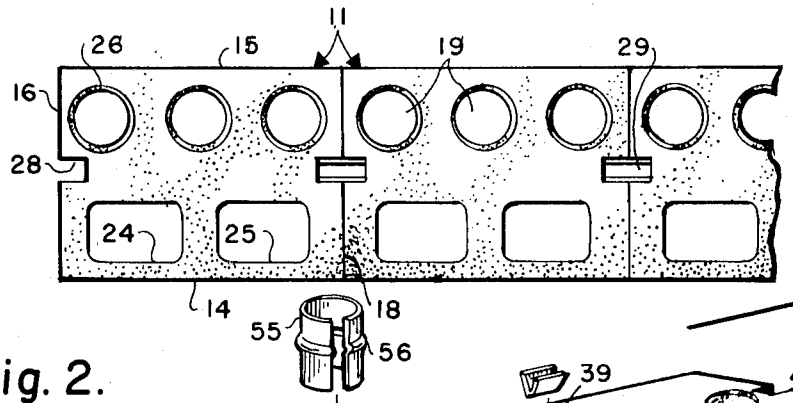


Fig. 2.

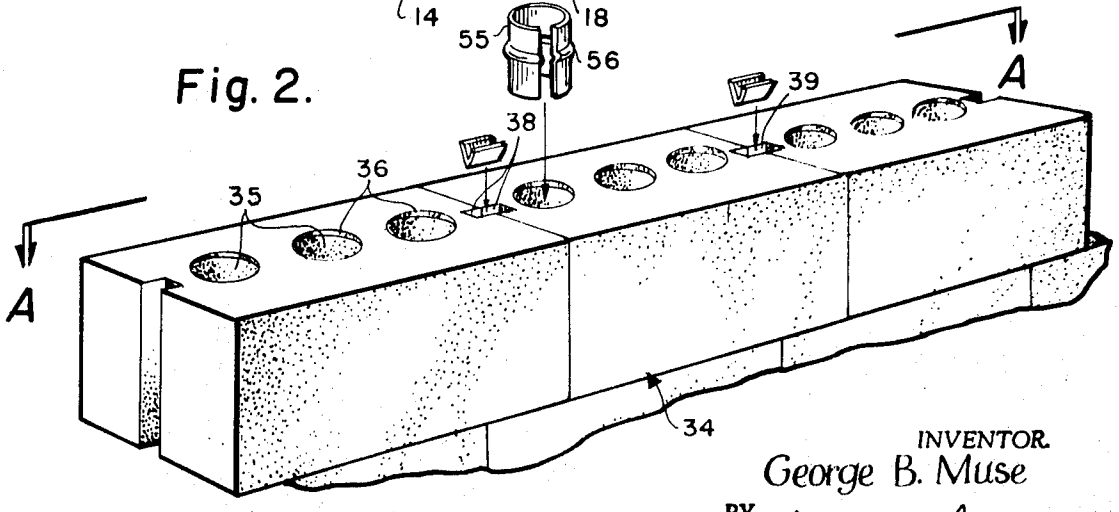


Fig. 3

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BLOCK STRUCTURE

Filed Feb. 26, 1969 2 Sheets-Sheet 2

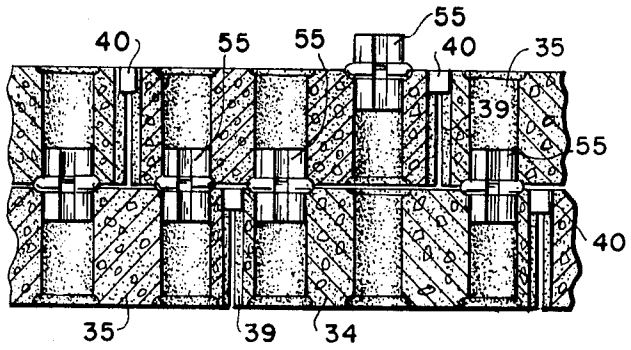


Fig. 4.

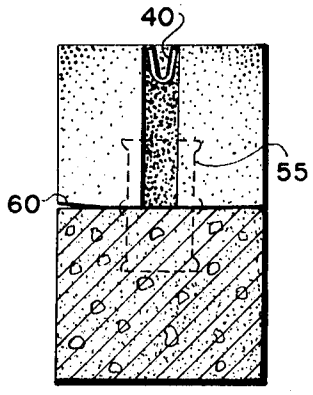


Fig. 5.

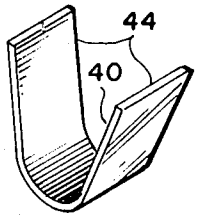


Fig. 6.

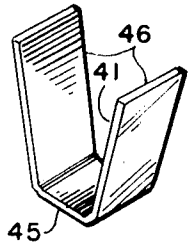


Fig. 7.

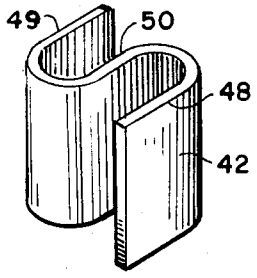


Fig. 8.

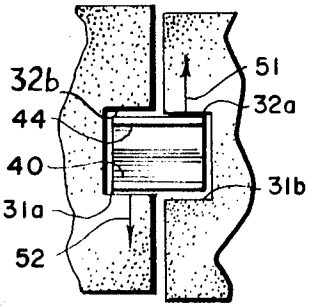


Fig. 9.

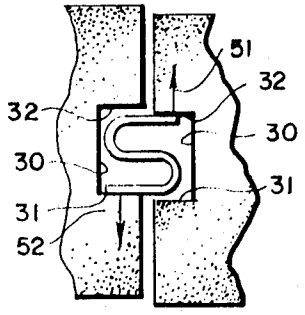


Fig. 10.

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3,609,926

BLOCK STRUCTURE

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Continuation-in-part of applications Ser. No. 658,524, Aug. 4, 1967, and Ser. No. 730,727, May 21, 1968. This application Feb. 26, 1969, Ser. No. 802,450

Int. Cl. E04b 1/48

U.S. Cl. 52—438 17 Claims

ABSTRACT OF THE DISCLOSURE

A building block defining a series of apertures extending therethrough from the top wall surface to the bottom wall surface, and vertically extending grooves defined in each end wall surface. Expandable positioning sleeves are insertable into each aperture so as to project from the block, and a similar block is positionable on top of the first block with its apertures inserted over the positioning sleeves. The end grooves of abutting blocks mate with each other to form slots, and wedge members are insertable into the slots to positively align the abutting blocks. Mortar is poured down through the aligned apertures and sleeves of the blocks to positively lock the blocks together to form a rigid structure.

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of application Ser. No. 658,524, filed Aug. 4, 1967, now Pat. No. 3,479,782, and of application Ser. No. 730,727, filed May 21, 1968, abandoned.

BACKGROUND OF THE INVENTION

It has been customary to connect brick or concrete blocks to each other in a wall structure by spreading layers of mortar over and around the sides of blocks and then positioning other blocks upon or adjacent the first blocks. This manner of assembling blocks has been utilized over the years and is a time-tested method upon which few improvements have been made. This old method of assembling concrete blocks is time consuming, requires great skill in properly aligning the blocks with one another to form a level and straight wall, requires a ready supply of wet mortar to be maintained at the hand of the mason throughout the entire period in which the blocks are being assembled to form a wall, and requires special tools to be constantly maintained at hand and used in the construction of the wall. Furthermore, the walls and other structures assembled by the conventional process of the mason are usually poorly constructed in that the blocks frequently are positioned in improper overlying positions with respect to the blocks of an adjacent course of blocks, the amount of mortar between courses of blocks and between blocks in a single course varies and is sometimes inadequate and excessive, and the walls are frequently built out of plumb.

While many attempts have been made to construct building blocks in interlocking shapes so that the blocks could be assembled as a wall without the use of wet mortar, the connection of the blocks with each other required the blocks to be formed in a complicated shape so that they were expensive to manufacture, and the very best method of applying wet mortar to the blocks after assembling the wall of blocks has never proven satisfactory.

SUMMARY OF THE INVENTION

Briefly described, the present invention comprises a building block structure which is suitable for assembling a wall of blocks without the use of mortar and with little attention to the alignment of the blocks with each other. Expandable sleeves are insertable into aligned openings

defined in adjacent blocks, and the sleeves function to connect the blocks of adjacent courses of blocks to each other and to properly position the blocks of adjacent courses of blocks in proper overlying relationship with respect to each other. The blocks define grooves in their end walls which are mated with the grooves of adjacent abutting blocks in a course of blocks, so that the grooves form slots between adjacent blocks. Wedge members are inserted into the slots and function to positively align the blocks in each course of blocks with each other. After the wall structure has been assembled, mortar is poured down through the aligned openings and sleeves to bond the blocks together.

Thus, it is an object of this invention to provide a block structure suitable for use in building walls, or the like, initially without the use of mortar, and mortar subsequently can be applied to all of the blocks in a short period of time to individually lock each block to an adjacent block.

Another object of this invention is to provide building blocks which include means for locking the blocks together in a single course of blocks.

Another object of this invention is to provide building blocks which automatically align themselves with each other in both vertical and horizontal directions when a wall or similar structure is being formed from the blocks.

Another object of this invention is to provide the combination of building blocks and expansible aligning elements that can be inserted into apertures and grooves defined by the building blocks, to align the building blocks with one another both in adjacent courses of blocks and in the same course of blocks.

Another object of this invention is to provide apparatus for constructing walls or the like that is labor saving, time saving, convenient in use, economical to manufacture, and which is simple in design.

Other objects, features and advantages of the present invention will become apparent upon reading the following specification, when taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an exploded, perspective view of a portion of a wall which is constructed with the block structure.

FIG. 2 is a top view of a plurality of the blocks placed in abutting, end-to-end relationship.

FIG. 3 is an exploded, perspective view of a plurality of blocks of modified shape placed in end-to-end relationship.

FIG. 4 is a side cross-sectional view of a plurality of assembled blocks of modified shape, taken along the centerline of FIG. 3.

FIG. 5 is an end cross-sectional view of a pair of assembled blocks of modified shape, taken normal to the centerline of FIG. 3.

FIG. 6 is a perspective view of an aligning wedge utilized with the blocks shown in FIGS. 1–5.

FIG. 7 is a perspective view of an alternate aligning wedge.

FIG. 8 is a perspective view of another alternate aligning wedge.

FIGS. 9 and 10 are schematic representations of the forces imparted to the building blocks by the aligning wedges.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now in more detail to the drawing, in which like numerals indicate like parts throughout the several views, FIGS. 1 and 2 show a plurality of building blocks

which are assembled in abutting, end-to-end relationship, and in courses of blocks which overlap or overlie the blocks in adjacent courses. Each block **11** includes top wall surface **12**, side wall surfaces **14** and **15**, a bottom wall surface (not shown), and end wall surfaces **16** and **18**. The building block is generally rectangular in shape, and its top and bottom wall surfaces are identical, as are their side wall surfaces **14** and **15**, and their end wall surfaces **16** and **18**. The width of each block is approximately twice its height, and the length of each block is approximately three times the height. These proportions are considered as the most convenient and practical to work with. As presently used, the dimensions of each block are approximately four inches in height, eight inches in width, and twelve inches in length. Of course, the particular dimensions of the blocks are not critical, and it is anticipated that various other arrangements might be utilized.

A series of three circular or cylindrical openings or apertures **19** extend vertically through each block **11** and are in parallel alignment with each other along the length of the block, and are centrally located in one-half the width of the block. The end apertures **19***a* and **19***b* are spaced closer to end wall surfaces **16** and **18** of the block than they are to middle aperture **19***c*. The portions **20** and **21** of block **11** between apertures **19***a* and **19***c* and between apertures **19***b* and **19***c* are approximately twice the thickness as portions **22** and **23** of block **11** between end apertures **19***a* and **19***b* and their respective end surfaces **16** and **18**, respectively. Thus, when a series of blocks **11** are placed in end-to-end relationship as shown in FIGS. 1 and 2, apertures **19** of the series of blocks will be in equally spaced relationship along the length of the wall or other structure formed by the series of blocks. Of course, when a plurality of blocks are spaced in end-to-end relationship in forming a wall, a certain amount of dead space is defined between adjacent ones of the blocks since it is virtually impossible to place a pair of blocks in absolute perfect abutting relationship. The dead space must be anticipated in order to place apertures **19** in equally spaced relationship in a line of blocks. Thus, the length of block **11** is slightly foreshortened, and the portions **22** and **23** of the block between end apertures **19***a* and **19***b* and their respective end surfaces **16** and **18** are slightly less in thickness than one-half the thickness of portions **20** and **21**.

Block **11** also defines non-circular openings **24** and **25** which are positioned in the other half of the width of the block. Non-circular openings **24** and **25** can be of any shape or configuration, even of circular configuration; however, the most effective shape utilized has been a rectangular shape as shown in the drawing. The primary function of non-circular openings **24** and **25** is to create an air space in block **11** for insulation purposes. The length of non-circular openings **24** and **25** should preferably be as long as practical, in keeping with proper strength characteristics of the block, so as to create an air gap in the block substantially throughout its entire length. The width of non-circular openings **24** and **25** is not critical, but is preferably as large as practical in order to reduce the weight of the block. Non-circular openings **24** and **25** are positioned so that they overlap portions **20** and **21** between apertures **19***a* and **19***c*, and **19***c* and **19***b*, respectively. With this arrangement, the heat or moisture transferred through the block must travel in a tortuous path or labyrinth which hinders its passage through the block.

Each circular opening of the blocks **11** is formed with counter-bores or annular grooves **26** at both the top and bottom wall surfaces. Both end wall surfaces **16** and **18** of block **11** define a vertically extending groove **28** which is located centrally of the width of the block. The grooves **28** are formed so that when the blocks are placed in end-to-end abutting relationship, the grooves will mate with each other to form slots **29**. Grooves **28** each comprise inner wall surface **30** (FIGS. 9 and 10), and side wall surfaces **31** and **32**. The slots **29** formed by the grooves are generally rectangular in cross-section.

As is shown in FIG. 3, the alternate form of the invention comprises a block **34** which is similar to one-half of block **11**, the half including cylindrical openings **19**. The length of block **34** is approximately three times its height and width. Block **34** includes openings **35**, and counter-bores **36** are defined at the top and bottom wall surfaces about openings **35**. Vertically extending grooves **38** are centrally defined in each end wall of block **34**, and grooves **38** of abutting blocks mate together to form rectangular slots **39**, in a manner similar to the arrangement of blocks **11**.

As is shown in FIGS. 6–8, various aligning members or wedges **40**, **41**, and **42** are insertable in slots **29** and **39**. Wedge **40** is fabricated from a strip of resilient material, such as metal or plastic, and is generally V-shaped in configuration. Legs **44** of wedge **40** generally taper in an outward direction. Wedge **41** is similar to wedge **40**, but is generally more U-shaped in configuration in that it includes a more definte bottom leg **45** together with its tapered side legs **46**. Wedge **42** is generally S-shaped in configuration and includes side legs **48** and **49** and central leg **50**.

As is shown in FIGS. 1 and 3, wedges **44** are insertable into slots **29** and **39**. As illustrated in FIG. 9, when a wedge such as wedge **44** is received in a slot **29**, its tapered legs **44** are compressed and exert an outward force against the side wall surfaces **31** and **32** of grooves **28**. If the blocks are in perfect alignment with each other, grooves **28** will also be in perfect alignment with each other and the side walls **31** and **32** will be co-extensive with each other; however, if the blocks **11** are in some misalignment, the side walls **31** and **32** of grooves **28** will also be in misalignment. When in this condition, side wall surfaces **31***a* and **32***a* will be moved closer together while side wall surfaces **31***b* and **32***b* will be moved away from each other. When a wedge **40** is inserted into the slot formed by the grooves of a pair of misaligned blocks, the tapered legs **44** will be more fully compressed by side wall surfaces **31***a* and **32***a*, which has the effect of forming a narrower slot on a wedge member. Thus, the tapered legs **44** of the wedge member will be more fully compressed and will urge against side wall surfaces **31***a* and **32***a* with forces similar to that indicated at **51** and **52**. Forces **51** and **52** tend to move blocks **11** with respect to each other until the side walls **31** and **32** of the grooves are in alignment with each other and the slot formed by the grooves is rectangular. When the slots are in alignment with each other, side walls **32***a* and **32***b* and side walls **31***a* and **31***b* will be in alignment with each other, and the tapered legs **44** of wedge **40** will be urged against all four side walls with an equal force, thus tending to keep the grooves and their respective blocks in alignment with each other.

As is shown in FIG. 10, S-shaped wedge **42** is inserted into the slot formed by the grooves of the blocks so that outer legs **48** and **49** are biased against the side walls of the grooves, which tends to align the side walls with each other.

As is illustrated in FIGS. 1 and 3, expandable sleeves **55** are insertable into circular apertures **19** and **35**. Sleeves **55** are each broken along their length, and are compressible. Each sleeve is fabricated with an outwardly extending annular bead or protrusion **56** which is located intermediate its ends. Sleeves **55** are compressible so that they can be inserted into apertures **19** or **35**, until outwardly extending annular protrusion **56** engages counterbore **26** or **36**. With this arrangement, the lower half of the sleeve will be received in one block, and another block can be fitted over the upper half of the sleeve. The bead **56** prevents the sleeve from being inadvertently pushed down into the lower block as the upper block is telescoped down onto the sleeve. The expansible nature of the sleeve allows it to be compressed as it is being inserted into the

lower block, and when it is released, it expands to fit and hold itself in the aperture.

As is shown in FIGS. 4 and 5, blocks **34** are placed in abutting, end-to-end relationship in each course of blocks. Wedges **40** are inserted in the slots **39** formed by the end grooves **38** of the blocks. Sleeves **55** are inserted in apertures **35**. Sleeves **55** can be inserted in each one of the apertures **35**, or some of the apertures can be left vacant. Under normal circumstances, one sleeve **55** will be inserted into at least one aperture of each block. When the blocks of the second course of blocks are placed upon the first course of blocks, the sleeves **55** will protrude up into the apertures **35** of the upper course of blocks. After the structure has been completely assembled, the workman can survey the structure and make whatever adjustments might be necessary. Once the workman is satisfied with the shape and alignment of the wall structure, motar can be poured down through the aligned openings **19** or **35**, to rigidly connect the blocks together. The mortar will flow through sleeves **55**. Sleeves **55** are of a length slightly shorter than the height of the blocks, so that the mortar will have ample area on the inside surface of apertures **19** and **35** to which to bond. Once the mortar hardens, sleeves **55** become virtually incompressible since the column of mortar extending through the sleeves prevents any contraction thereof. Thus, sleeves **55** function to impart superior strength characteristics to the structure since the use of mortar alone does not have high shear strength properties, while the shear strength of the sleeves is high.

As is shown in FIGS. 4 and 5, wedge members **40** and sleeves **55** function to tie each block to adjacent blocks in the same course of blocks and to adjacent blocks in the next adjacent courses of blocks. Sleeves **55** function to positively position each block in proper overlying position with the block next below, and wedges **40** function to positively position the end of each block in alignment with the next adjacent abutting block in the same course of blocks. Furthermore, if one of the blocks happens to be improperly formed so that its upper or lower surface is not perfectly flat, as indicated at **60** in FIG. 5, wedges **40** function to keep the malformed block or the block resting on a malformed block from leaning or sloping out of a true vertical position. Wedges **40** and sleeves **55** function to provide a three position connection for each block as each block is placed on the structure. Of course, when another course of blocks is added to the structure, the blocks in the lower courses of blocks have a four point connection in the wall structure. When the mortar is subsequently poured through the aligned openings of the blocks of the wall structure, the mortar will usually be poured through all of the openings, so that a block having three apertures therein will be even more positively and firmly held in the structure. Thus, any malformed blocks, such as the blocks shown in FIG. 5, will not cause the wall structure to be crooked or improperly formed.

While the wdeges of FIGS. 6, 7, and 8 have been shown in detail, it should be understood that various other wedge shapes and materials can be utilized. It is only necessary to align the grooves that form the slots between adjacent abutting blocks. The materials utilized can be sheet metal, plastic, rubber, or various other substances. The shape of the wedges can be as shown in the drawings, or can be a true wedge shape, or can be formed in a number of other configurations. Also, the wedge can be made longer so as to extend more deeply into the slots, to more positively align the blocks, if necessary. The wedges illustrated in the drawing have been chosen because of their simplicity in design and because they are so easy to store and use.

While this invention has been described in detail with particular reference to preferred embodiments thereof, it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described hereinbefore and as defined in the appended claims.

I claim:

1. In a wall structure comprising a plurality of substantially similar blocks arranged in horizontal courses and in abutting end-to-end relationship with the blocks of each course overlying the blocks in the next adjacent course, the improvement therein of each block defining a plurality of circular openings extending therethrough from the top wall surface to the bottom wall surface at equally spaced intervals along each course of blocks and with the openings of the blocks in each course in alignment with the openings of the blocks in the next adjacent courses, an expansible sleeve inserted into at least some of the aligned openings and extending into adjacent blocks of adjacent courses of blocks, a vertically extending groove defined in each end wall of each block and positioned to mate with a groove of an abutting block to form vertically extending slots between each block in each course of blocks, and a wedge member inserted into each slot.

2. The invention of claim **1** and wherein the grooves of each block are shaped to include an inner wall surface and opposed side wall surfaces and mate with the groove of an abutting block to form a slot which is rectangular in cross-section, and wherein said wedge members comprise a strip of resilient material folded to engage the opposed side wall surfaces of the slots formed by the grooves of the blocks.

3. The invention of claim **1** wherein said wedge member comprises a resilient member sized and shaped to fit in a compressed condition into the slots formed by the grooves of the blocks.

4. The invention of claim **2** wherein said wedge members comprise a strip of material folded into a substantially V-shaped configuration with the legs of the V-shaped strip engaging the opposed side wall surfaces of the slots.

5. The invention of claim **1** wherein said wedge member is constructed and arranged to urge the grooves of a slot into alignment with each other.

6. In combination, at least two courses of building blocks arranged in overlying relationship with the blocks of each course arranged in juxtaposed end-to-end relationship, the blocks of each course defining vertical openings aligned with the openings of the blocks of the next adjacent course, and expandable approximately cylindrical tubular members extending between and partially through at least some of the aligned ones of the vertical openings of the overlying blocks and expanded into engagement with the openings of the blocks, a body of solidified cementitious substance at least partially filling said expandable tubular members, and aligning members positioned at the ends of at least some of the blocks for aligning the ends of the blocks in a course of blocks.

7. The invention of claim **6** and further including vertical slots defined in the ends of each block, and wherein said aligning members comprise wedges inserted into said vertical slots.

8. The invention of claim **6** and wherein said expandable tubular member comprises a sleeve member defining a slot along its length from end-to-end whereby said sleeve member is expandable and contractable.

9. The invention of claim **6** and wherein said building blocks define counter bores at the end of said aligned openings, and said expandable tubular member comprises a protrusion extending into said counter bores.

10. The invention of claim **6** and wherein said body of solidified cementitious substance comprises mortar.

11. The invention of claim **6** and wherein said expandable tubular member is of a length less than the height of a building block.

12. A wall structure or the like comprising a plurality of courses of blocks with the blocks in the courses of blocks arranged in juxtaposed end-to-end relationship and overlying the blocks in the next adjacent course of blocks, each of said blocks defining openings therein with at least some of the openings of each block being aligned with an opening of a block in the next adjacent course of blocks,

an expandable tubular member extending between and partially through at least some of the aligned openings of adjacent ones of the overlying blocks, a body of non-compressible substance at least partially filling said expandable tubular members, and aligning members positioned at the ends of at least some of the blocks for aligning the ends of the blocks in a course of blocks.

13. The invention of claim **12** and wherein said expandable tubular members each comprise a substantially cylindrical sleeve defining a slot generally along its length from end-to-end and a protrusion extending around its diameter, and said blocks defining counter bores about their openings for receiving the protrusions of said sleeves.

14. The invention of claim **12** and wherein said body of non-compressible substance comprises hardened mortar.

15. In a wall structure, the combination of a plurality of substantially identical rectangular blocks each defining top, bottom, side and end wall surfaces, three generally vertical circular openings substantially centrally positioned along one-half its width in each one-third portion of its length, each of said blocks also defining two generally vertical rectangular openings positioned along the other one-half of its width in each one-half of its length, and each of said blocks defining a vertical groove centrally positioned in each end wall surface and extending from the top wall surface to the bottom wall surface, said blocks being positioned in substantially abutting end-to-end relationship in horizontal courses of blocks with the blocks of each course of blocks overlying the blocks in the next adjacent course of blocks by one-third portions of their lengths with the substantially circular openings of the blocks of each course of blocks being aligned with the substantially circular openings of the blocks in the next adjacent course of blocks and the vertical grooves of abutting blocks forming rectangular openings, and expandable sleeves of a length less than the height of said blocks inserted into and extending between at least some of the

aligned ones of the substantially circular openings of the blocks in adjacent courses of blocks, and expandable aligning members inserted into at least some of the rectangular openings formed by the vertical grooves of abutting blocks.

16. The invention of claim **15** and further including a column of mortar extending through at least some of said sleeves and substantially circular openings.

17. The invention of claim **15** wherein the substantially circular openings define counter bores at the top and bottom surfaces of the blocks, and said expandable sleeves include substantially annular protrusions intermediate their ends of a size and shape suitable to be received in the counter bores of said block.

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FRANK L. ABBOTT, Primary Examiner

U.S. Cl. X.R.

52—503, 586, 604