ABSTRACT OF THE DISCLOSURE

A wall construction is provided in which standard block units having a central body portion and opposite end shoulder portions are interconnected to form a continuous wall. The end shoulder portions of adjacent blocks are interconnected by metal rods extending through apertures therein to form vertical support columns, and the blocks may be pivoted about the metal rods to form zig-zag or straight wall configurations. Vertical spaces between the central body portions of adjacent blocks may be provided by extending the height of the end shoulder portions or by using separate extension elements, and the blocks may be integrally fabricated or assembled from prefabricated parts.

BACKGROUND OF THE INVENTION

Field of the invention

The present invention relates to wall constructions and units therefor, and more particularly to garden type wall constructions in which standard block units of masonry or other appropriate composition are assembled to form a continuous vertical wall.

Description of the prior art

Many types of materials are widely known and used for fence enclosures for homes, gardens and the like. Some of the more popular materials include chain-link material, wood, and masonry block units such as the well-known concrete block. Such materials have various advantages and disadvantages depending upon factors such as the reason for erecting a fence and the purpose which the fence is to serve. Many home owners for example prefer a fence or wall constructed of masonry blocks because of its greater permanence, durability, eye appeal, and the privacy which it affords. Unfortunately, most conventional masonry block walls or fences require that each individual block be carefully set in place using a bonding and weight distributing media such as mortar, a task which is beyond the capability of most amateur, do-it-yourself type of individuals. A professionally installed masonry wall on the other hand is relatively expensive, about two-thirds of the total cost of such wall frequently being represented by the labor involved in erecting it.

In view of the problems involved in conventional masonry block and mortar construction, a number of different blocks have been developed which enable the individual to build a reasonably uniform wall requiring a minimum of skill and requiring little or no mortar or other cementitious material. Such blocks, however, leave much to be desired. Despite the simplicity of construction afforded by such materials, it is still difficult in many instances for the average individual to construct a wall having a uniform and workmanlike appearance. In those constructions where mortar or grout is required, the blocks are frequently not bonded in a satisfactory manner. Furthermore, since mortar if properly applied serves to evenly distribute the weight of the various wall elements on one another, constructions which eliminate such cementing materials frequently simplify the ease of erection only at the expense of weight distribution problems. Since standard mass producing block making machinery can only produce units having a limited degree of dimensional exactness and surface smoothness, the resulting unequal block heights and irregular surfaces frequently result in the cracking or other deterioration of the block units when such units are stacked directly on top of one another.

Other disadvantages are also present in a number of the conventional block constructions. While a number of such constructions do not require mortar at the joints between the blocks, they do require that reinforcing rods be placed through cells in the blocks at intervals along the length of the wall, and that the cells be filled with grout, again complicating the construction and placing it beyond the capability of many unskilled amateurs. Moreover, the end shoulder portions and the central body portions have substantially flat and parallel tops and not be easily handled by one or even several individuals having average or less than average physical strength and stamina. The weight per block can, of course, be reduced to a practical level by considerably reducing the size of the individual blocks. However, while a smaller block is more easily handled by a single individual, the small size necessitates considerably more labor to erect a wall of given size because of the greater number of blocks required.

Ideally, a block for fence and wall construction, which is to be usable by the nonprofessional individual or home handyman as well as others, should be light enough in weight so that a single individual can easily handle it, yet be large enough in size so as to make the erection of large sections of wall feasible. Such blocks should be capable of fabrication by conventional block making machinery so that they can be easily mass produced and sold at a reasonable price. More importantly, the blocks should provide for easy erection of a wall by an amateur or non-skilled individual using little or no bonding material such as mortar at the various joints, and should provide for a reasonably uniform and workmanlike appearance when so constructed. The blocks should be capable of distributing the weight and providing adequate lateral support with a minimum of grinding or other close finishing of such blocks.

BRIEF SUMMARY OF THE INVENTION

In brief, the present invention provides for blocks or units which may be easily assembled by the nonprofessional or unskilled amateur to form a garden fence or wall having a reasonably uniform and workmanlike appearance. Blocks in accordance with the invention include a relatively thin central body portion at adjoining end shoulder portions of substantially greater lateral thickness. The relatively thin central body portion substantially reduces the weight of a block of given size so that relatively large blocks are easily handled by a single individual, and in addition allows adjacent mating blocks to be rotated relative to one another to form desired wall arrangements. The end shoulder portions are mated with one another in vertical alignment to form vertical support columns for the fence or wall. Such portions provide substantially all of the support required for the gravity load, and their relatively great lateral dimension is chosen so as to provide adequate lateral support for a fence or wall of given height. In addition, the relatively great lateral thickness of the end shoulder portions of the blocks, and the adjacent ends of the central body portion enable adjacent blocks to be pivoted relative to one another throughout a wide range of angles providing great versatility in the different wall arrangements which may be had. For example, a zig-zag configuration may be used to provide increased lateral stability and other desirable features. Both the end shoulder portions and the central body portions have substantially flat and parallel top and
bottom surfaces, the surfaces of the end shoulder portions mating with the end shoulder portions of adjacent blocks to support the wall. If the height of the end shoulder portions of one-half the height of the central body portion, the resulting disposition of the central body portion top and bottom surface of adjacent blocks in close proximity to or in contact with one another provide a substantially continuous wall surface if desired.

A further alignment of the end shoulder portions are enhanced by positioning an elongated support element such as a steel reinforcing rod through central apertures in the end shoulder portions. Such rods also provide a pivoting axis whereby adjacent blocks can be disposed at different angles relative to one another to form a zig-zag or other wall effect. For ease of construction, a conventional steel rod is disposed within the central apertures of a given support column and driven a suitable distance into the ground. Alternatively, threaded pipe sections of desired length may be used, the various sections within a given column being held together by threaded joints and buried in the ground or in a concrete footing as desired. Shear tubes may be placed at the joints between the end shoulder portions of adjacent blocks to prevent lateral movement therebetween, and leveling nuts threaded to the pipe can be located to adjust the height of the lowest tier of blocks in the wall arrangement.

In accordance with the invention, the block end shoulder portions are selectively formed at the top or bottom of the central body portion ends and are provided with a height relative to the central body portion height, such that desired stacking arrangements may be had. In one preferred embodiment, the end shoulder portions are made approximately half the height of the central body portion so that the central body portions of vertical columns of blocks lie adjacent one another to form a substantially continuous wall surface when assembled. The end shoulder portions may be disposed relative to the body portion, one shoulder portion residing along the upper part of one end of the body portion and the other shoulder portion residing along the lower part of the opposite body portion end. Alternatively, both shoulder portions may be disposed such that one surface of each is substantially continuous with a common surface of the body portion.

In accordance with a further preferred embodiment of the invention, the end shoulder portions may be provided with a height which is greater than half but less than the full height of the central body portion. When the end shoulder portions of such blocks are vertically aligned with those of adjacent blocks, the central body portions of adjacent blocks are appreciably vertically spaced apart, providing a pleasing screen effect. The screen effect can alternatively be provided using blocks, the end shoulder portions of which are approximately half the height of the central body portion. Extension elements which are placed between the end shoulder portions of adjacent blocks and which have a cross-section similar to that of the end shoulder portions providing substantially all of the vertical spacing between the block central body portions.

In accordance with further aspects of the invention, the end shoulder portions may be generally cylindrical in shape, the exposed parts of the central body portion ends being circular in cross-section and having the same curvature as the end shoulder portions. Such central body portion end surfaces receive part of the cylindrical end shoulder portions of adjacent blocks, and the adjacent blocks may be pivoted about the steel reinforcing rods to various desired angles. Alternatively, each end shoulder portion may have a plurality of flat vertical surfaces tangent to a common imaginary cylinder having its central axis along the axis of the aperture. In such instance, the exposed part of each body portion end is made with at least one flat surface to receive one of the vertical surfaces of the end shoulder portions of an adjacent block, thereby positioning the adjacent blocks at a selected angle relative to one another.

In accordance with further aspects of the invention, the blocks may be fabricated of any appropriate material as an integral unit. Alternatively, where block sizes or shapes pose problems with respect to conventional block making machinery, the component parts of the blocks, such as the central body portion and the end shoulder portions, can be fabricated separately and bonded together to form the complete block.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features of this invention, as well as the invention itself, both as to its organization and method of operation, may best be understood when considered in the light of the following description, when taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of a preferred form of block or unit used for garden fence or wall construction in accordance with the invention;
FIG. 2 is a fragmentary perspective view of a straight wall arrangement using the block form shown in FIG. 1;
FIG. 3 is a fragmentary perspective view of a rigid-wall arrangement using the block form shown in FIG. 1;
FIG. 4 is a plan view of an alternative rigid-wall arrangement in accordance with the invention;
FIG. 5 is a perspective view of another preferred form of a block for garden fence or wall construction in accordance with the invention;
FIG. 6 is a fragmentary perspective view of a straight wall arrangement using the block form shown in FIG. 5;
FIG. 7 is a perspective view of another preferred embodiment of a block in accordance with the invention;
FIG. 8 is a fragmentary perspective view of a wall arrangement having a screen-like effect;
FIG. 9 is a perspective view of an end shoulder portion used as a filter plug in the wall arrangement of FIG. 8;
FIG. 10 is a perspective view of an alternative embodiment of an end shoulder portion in accordance with the invention;
FIG. 11 is a perspective view of an integrally fabricated unit comprising an end shoulder portion and part of a central body portion;
FIG. 12 is a perspective view of two of the units of FIG. 11 bonded together to form a complete block;
FIG. 13 is a perspective view of an integrally fabricated unit comprising part of a central body portion;
FIG. 14 is a perspective view of an integrally fabricated unit comprising opposite end portions and part of a central body portion;
FIG. 15 is a perspective view of the units of FIGS. 13 and 14 bonded together to form a complete block;
FIG. 16 is a perspective view of an integrally fabricated unit comprising a complete central body portion;
FIG. 17 is a perspective view of one arrangement of a complete block formed by bonding the end shoulder portions of FIG. 9 to the opposite ends of the central body portion of FIG. 16;
FIG. 18 is a perspective view of another arrangement of a completed block formed by bonding the end shoulder portions of FIG. 9 to the opposite ends of the central body portion of FIG. 16;
FIG. 19 is a sectional view of a portion of a wall showing one particular reinforcing rod arrangement in accordance with the invention;
FIG. 20 is a sectional view of a portion of a wall showing an alternative reinforcing rod arrangement;
FIG. 21 is an elevational view of one particular embodiment of a shear tube which may be used in the arrangement of FIG. 20;
FIG. 22 is an elevational view of an alternative embodiment of a shear tube;
FIG. 23 is an elevational view of a further alternative embodiment of a shear tube; and
FIG. 24 is a sectional view of a portion of a wall showing an alternative reinforcing rod arrangement.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

One preferred embodiment of a block for garden fence and wall construction which is shown in FIG. 1 serves as a useful example of the general construction and configuration of blocks in accordance with the invention. The block 10 includes a generally rectangular central body portion 12 having left and right end shoulder portions 14 and 16 respectively at the opposite ends thereof. The central body portion 12 has substantially flat and parallel top and bottom surfaces 18 and 20, and is illustrated for simplicity and clarity as having substantially flat front and rear surfaces 22 and 24. The generally cylindrically shaped end shoulder portions 14 and 16 include substantially flat and parallel top and bottom surfaces 26, 27 and 28, 29 respectively between which extend central vertical apertures 30 and 31. The opposite ends 32 and 34 of the central body portion 12 adjacent the left and right end shoulder portions 14 and 16 respectively comprise the vertical surfaces of circular cross-section. The surfaces 32 and 34 have the same general curvature as the cylinders 14 and 16 and accordingly receive a portion of the end shoulder portions of adjacent blocks in a wall construction. In the particular embodiment of FIG. 1 the top surface 26 of the left-hand end shoulder portion 14 is substantially continuous with the top surface 18 of the central body portion 12, and the corresponding surface 29 of the right-hand end shoulder portion 16 is substantially continuous with the bottom surface 20 of the central body portion 12. The height of both end shoulder portions 14 and 16 is substantially greater than the half height of the central body portion 12. It will be noted that the lateral thickness of the end shoulder portions 14 and 16 (in a direction normal to the general plane of the block) is substantially greater than the lateral thickness of the central body portion 12 between the front and rear surfaces 22 and 24. The large but relatively thin central body portion 12 provides considerable surface area for the wall while at the same time adding little weight to the overall weight of each block. The end shoulder portions 14 and 16 on the other hand are vertically aligned and mated with end shoulder portions of adjacent blocks as shown in FIG. 2 to provide support for the wall construction. The end shoulder portions support practically all of the gravity load of the wall, and their lateral thickness is chosen to provide adequate lateral support for a wall of given height. The relatively great lateral thickness of the end shoulder portions allows a large range of angular rotation of one block relative to an adjacent block at the same level, and provides considerable lateral stability for the various angles of rotation within such range.

As shown in FIG. 2 an elongated reinforcing element or steel reinforcing rod 40 is inserted through the apertures 30 and 31 of a vertical column of end shoulder portions to hold such portions in alignment and to provide a hinge for pivoting action between adjacent columns of blocks forming the wall. In the particular arrangement of FIG. 2, the various blocks 10 are arranged to lie substantially in the same plane forming a generally planar or straight wall. By pivoting adjacent blocks 10 about the steel rods 40 and adjacent columns of end shoulder portions are disposed on opposite sides of a single vertical plane, a zig-zag type wall arrangement is provided as shown in FIG. 3. The zig-zag arrangement of FIG. 3 requires more blocks 10 for a given length of wall, but at the same time provides a pleasing appearance and increased lateral support. It may be that in some installations a wall of given height when arranged in the straight or planar configuration of FIG. 2 will not have adequate support from the end shoulder portion columns. In such instances the zig-zag arrangements of FIG. 3 or the alternate zig-zag arrangement of FIG. 4 may be used to overcome this problem. In FIG. 3 each end shoulder portion column is disposed on the opposite side of a vertical plane from the adjacent end shoulder portion columns. In FIG. 4 however, adjacent pairs of end shoulder portion columns are disposed on the opposite sides of a single vertical plane, one vertical array of blocks being disposed substantially parallel to the vertical plane, and the adjacent vertical arrays of blocks crossing the vertical plane are disposed substantially parallel to the vertical plane.

It will be appreciated that walls constructed using blocks such as those of FIG. 1 offer a number of distinct advantages particularly to the non-professional or unskilled individual. The relatively thin central body portion 12 of the blocks enables relatively large blocks to be made having a weight such that they are easily handled by a single individual. Adequate lateral support for the wall is provided by the relatively wide end shoulder portions 14 and 16, the wall being arranged in a straight or planar configuration as shown in FIG. 2 or alternatively in the zig-zag configurations of FIGS. 3 or 4 in the event the additional lateral support or eye appeal of such arrangements is desired. While the top surfaces 18 and 20 of each central body portion are positioned close to or in contact with the bottom and top surfaces of the immediately upper and lower blocks respectively as shown in FIGS. 2, 3 and 4 such relationship is to provide a neat and uniform visual appearance only, and little or no reliance is placed upon the central body portion 12 for support. Instead, support is had by carefully mating the top and bottom surfaces 26, 27 and 28, 29 of each end shoulder portion with the bottom and top surfaces of the end shoulder portions of adjacent blocks. The blocks can be fabricated using conventional block making machinery without the necessity for very close tolerances. In most instances, the end shoulder top and bottom surfaces 26, 27, 28 and 29 are sufficiently smooth so as to provide the support needed when joined together. Where walls of relatively great height are to be constructed, the end shoulder top and bottom surfaces may be ground level and bonded with an adhesive material such as epoxy, or alternatively they may be joined using small amounts of mortar to allow for unequal heights. In any event, extensive grinding or the use of large quantities of mortar are not required.

With the elimination of mortar or other cemented joints for most applications, the blocks 10 are easily assembled into a completed wall by interlocking the end shoulder portions 14 and 16 into vertical columns. Alignment of the end shoulder portions is enhanced by the use of the steel rods 40 which may be inserted through the apertures 30 and 31 only, or alternatively driven into the ground to provide additional support as desired. The close interlocking relationship between the various parts of adjacent blocks provides a uniform and neat appearance, while at the same time increasing the strength of the completed wall. For example, the residing of a part of each of the end shoulder portions 14 and 16 within the curved end surfaces 32 and 34 of the central body portions 12 not only improves the appearance of the wall but adds some structural support as well.

An alternative form of block in accordance with the invention is illustrated in FIG. 5. The block 44 of FIG. 5 is similar to the block 10 of FIG. 1 except for the location of the end shoulder portions 14 and 16. Instead of disposing the end shoulder portions diagonally relative to the central body portion 12 as in FIG. 1, the FIG. 5 arrangement places the end shoulder portions such that corresponding surfaces 26 and 29 of both are substantially continuous with the bottom surface 20 of the central body portion. As shown in FIG. 6 the blocks of FIG. 5 interlock with one another in a manner similar to that of the arrangements of FIGS. 2 and 3 to provide any.
desired type of wall arrangement. Although FIG. 6 illustrates the blocks of FIG. 5 used in a straight or planar wall arrangement, it will be understood that zig-zag arrangements such as those of FIGS. 3 and 4 may be used by pivoting adjacent vertical arrangements of the blocks 44 about the steel rods 40 at desired angles. FIG. 7 illustrates an alternative arrangement of a block in accordance with the invention, the block 46 which is so illustrated being useful to provide a screen-type wall arrangement. The block 46 of FIG. 7 is similar to the block 44 of FIG. 5 except that the height of the end shoulder portions 14 and 16 is selected to be greater than half but less than the full length of the central body portion 12. As a result, when the end shoulder portions 14 and 16 are stacked on top of one another to form the vertical columns, vertical spaces 48 are formed between the central body portions of adjacent blocks 46 as shown in the right-hand portion of FIG. 8. Such spaces 48 may be desired in some wall constructions for reasons of eye appeal or to allow air space for wind to circulate through the fence and into the enclosure which the fence defines. In addition, they provide the type of tortuous path required by certain vine-like plants if it is desired that such plants be grown on the wall.

While the blocks 46 of FIG. 7 are designed specifically to provide a screen-effect wall having the open spaces 48, the same effect can be provided using the blocks 44 of FIG. 5 in combination with separate end shoulder portions 50 which are used as filler plugs from which are shown in the left-hand portion of FIG. 8. The end shoulder portions 50, which are shown in detail in FIG. 9, are generally cylindrical in configuration and have a horizontal cross-section similar to that of the cylindrical end shoulder portions 14 and 16. Central apertures 52 in the filler plugs 50 allow alignment of the apertures 30 and 31 in the adjacent end shoulder portions to receive the steel rods 40. The filler plugs 50 may have any desired height, the height of such plugs substantially determining the vertical space 48 between the central body portions of adjacent blocks. Again, it will be appreciated that, although the screen-effect wall is illustrated in FIG. 8 as being straight or generally planar, the zig-zag effect of FIGS. 3 and 4 can also be had.

As mentioned above, the generally cylindrical end shoulder portions 14 and 16 reside within and move freely past the curved end surfaces 32 and 34 of the central body portion 12. The surfaces 32 and 34 engage the corresponding end shoulder portions to provide some additional lateral support. However, such surfaces do not limit the pivoting movement of the corresponding end shoulder portion, but rather only limit such portions to pivot freely about the steel rod. In some instances it may be desirable to define a particular angle or angles between blocks positioned side by side and to provide some means for holding such blocks in a desired angular relationship. FIG. 10 illustrates one example of a particular end shoulder portion configuration for accomplishing this. Instead of having a cylindrical configuration as in the arrangements of FIGS. 1, 3, and 7, the blocks 60 of FIG. 10 include an end shoulder portion 62 having a plurality of flat vertical surfaces 64 extending between substantially flat and parallel top and bottom surfaces 66 and 68. The various vertical surfaces 64 are all tangent to an imaginary cylinder centrally disposed within the end shoulder portion 62. As a result, a central aperture 70 extends between the top and bottom surfaces 66 and 68. Since the aperture 70 is centrally disposed within the end shoulder portion 62, the axis thereof coincides with the longitudinal axis of the imaginary cylinder to which the various surfaces 64 are tangent, and a symmetrical arrangement is produced. The central body portion 74 are substantially flat vertical surfaces which are adapted to receive one of the surfaces 64 from an adjacent end shoulder portion 62. In the particular arrangement of FIG. 10 the end shoulder por-

section 62 is illustrated as being octagonal in cross-section, the planes of each adjacent pair of the surfaces 64 intersecting at 45° angles. It will be understood however that any number of the surfaces 64 can be used to dispose the various blocks at different angles such as 20° or 30° relative to one another. With a steel reinforcing rod 40 positioned within the central apertures 70 of the end shoulder portions 62, a selected one of the surfaces 64 from an adjacent block is positioned against the end surface 72 of the block 60 maintaining the desired angular relationship between the blocks.

The various blocks or units illustrated thus far are capable of manufacture using conventional block making machinery. Such blocks can be fashioned of any appropriate material such as wood or metal, concrete generally being preferred for most wall or fence installations. Because of the weight reduction provided by the relatively thin central body portion, blocks which are relatively large in size can be fabricated having a weight such that they are easily handled by a single individual. For example, one block constructed in accordance with the invention comprises a central body portion which is 16" long, approximately 12" high, and approximately 1¾" thick at its opposite ends. The end shoulder portions of such blocks are cylinders which are approximately 6" high and 4" in diameter. The total arrangement provides a block which is 1' high, 2' long, and 20" between the central apertures of the opposite end shoulder portions. Yet such block is easily cast or fabricated as a single integral unit, the absence of sharp re-entrant angles or surfaces making the fabrication of such blocks easier than that of most conventional units. Moreover, the central body portion of the block may have its front and rear surfaces provided with any desire configuration and the lateral thickness is kept relatively small at the opposite ends adjacent to the end shoulder portions. Such surfaces which are shown as being generally planar in FIGS. 1 through 10 may be fabricated as smooth surfaces, as rough surfaces, or as any type of surface finish having one or more designs configured therein.

Occasionally, it may be desirable or necessary to assemble a block from prefabricated component parts rather than casting or fabricating the block as an integral unit. Such assemblage may be dictated for example where existing machinery is not capable of making integral blocks of the size desired. In such situation individual component parts of the block may be separately fabricated, then bonded together to form the completed block. The size of the assembled block will of course depend to a considerable extent on the machinery being used.

FIG. 11 illustrates a right-hand end shoulder portion 16 which is integrally formed with the lower half 80 of the central body portion. Two such units may be assembled to form a complete block by bonding the upper substantially flat surface 82 of the lower body portion half 80 to the corresponding surface of a similar unit, the position of the end shoulder portions 16 being such as to dispose the end shoulder portions at opposite ends of the completed block as shown in FIG. 12. Any appropriate bonding material, such as epoxy, may be used to join together the prefabricated parts.

In FIG. 13, a central body portion half 80 is fabricated without end shoulder portions, while in FIG. 14 the same body portion half 89 is integrally formed with end shoulder portions 14 and 16 on the opposite ends thereof. By bonding the lower surface 84 of the body portion half 80 to the upper surface 82 of the unit of FIG. 14, a completed block unit similar to that of FIG. 5 is provided as shown in FIG. 15. In FIG. 16, a complete central body
portion 86 is fabricated independently. As shown in FIG. 17, a pair of the end shoulder portions 50 shown in FIG. 9 are bonded to diagonally opposite ends of the central body portion 86 to form an arrangement similar to that of FIG. 1. An arrangement similar to that of FIG. 5, as shown in FIG. 18, may be provided by bonding a pair of the end shoulder portions 50 to the opposite ends of the central body portion 86 such that the bottom surfaces of the end shoulder portions 50 are substantially continuous with the bottom surface of the central body portion 86. The end shoulder portions 86 and the halves 88 thereof are illustrated in FIGS. 11 through 18 as having varying thicknesses, such portions increasing uniformly in thickness from the opposite ends to the center to present two substantially flat surfaces both at the front and at the rear thereof. Such configurations are shown for purposes of illustration only, and it should be understood that the central body portion or its halves may have any appropriate configuration.

The use of the steel reinforcing rods 40 will, in most instances, suffice to hold the end shoulder portions in vertical alignment. The weight of the blocks is normally sufficient to maintain good mating contact. For walls of relatively short height, the lateral thickness of the end shoulder portions and a moderate zig-zag configuration will, in most instances, provide all the lateral support that is needed for the wall, and the steel reinforcing rods 40 may be placed within the central apertures 30 and 31 of the end shoulder portions without the need for being driven into the ground or buried in the ground or other media used to support the wall. Wherever it is possible, however, the lower ends of the reinforcing rods 40 should be sunk into the ground a suitable distance to provide additional lateral support for the wall and to prevent any shifting of the blocks relative to each other and with respect to the wall.

The reinforcing rods 40 are located at a sufficient depth within the ground 100, such as by driving them in with a sledge hammer or other appropriate tool. The rods 40 may be driven into the ground prior to the assembling of the wall, in which instance the blocks 10 are positioned over the top ends of the rods and slid into position. Alternatively, the blocks 10 may be first assembled to form the wall, after which the rods 40 are inserted through the central apertures 30 and driven into the ground 100 until the top ends are generally flush with the top of the wall. The central apertures 30 and 31 within the end shoulder portions of the blocks have a uniform diameter for at least a portion of the end shoulder portion height which is very slightly greater than that of the rods to provide some tolerance during the assembling of the wall. Although the central apertures 30 and 31 may have a uniform diameter along the entire length thereof, such apertures are illustrated in FIG. 19 and hereafter as flaring into a small portion of greater diameter so as to accommodate the shear tubes or threaded couplings to be described hereafter.

For some wall installations, it may be desirable to provide a more permanent type of reinforcing rod arrangement. One such arrangement is shown in FIG. 20 wherein one or more shafts 90, at least the ends of which are threaded, are used instead of the conventional steel reinforcing rod 40. The threaded shafts 102 may be solid as shown or they may have a hollow interior as desired. One shaft 102 is ground 100 by a concrete footing 104. A leveling nut 106 is then secured to such shaft at a desired vertical position and a washer 108 of substantial diameter is positioned on top of the leveling nut 106 to support the end shoulder portion of the first block. The leveling nut 106 may be adjusted to different axial positions along the threaded shaft 102 until the desired elevation is attained, after which the space between the lower surface of the end shoulder portion and the concrete footing 104 is filled with a grout 110 to secure the nut 106 and washer 108 in place and to provide additional support for the first block. Alternate ones of the joints between adjacent end shoulder portions include
a lateral thickness substantially greater than the lateral thickness of the central body portion at the opposite ends thereof, each of the end shoulder portions being of lesser height than the central body portion, said end shoulder portions having substantially flat top and bottom surfaces for mating with the surfaces of corresponding end shoulder portions of adjacent blocks and having a central, substantially vertical aperture extending therethrough between the top and bottom surfaces to receive a rigid support element, said central body portion having substantially flat and parallel top and bottom surfaces, and one of the top and bottom surfaces of each end shoulder portion being generally continuous with one of the top and bottom surfaces of the central body portion.

2. A block in accordance with claim 1, wherein the top surface of one end shoulder portion is generally continuous with the top surface of the central body portion, and the bottom surface of the other end shoulder portion is generally continuous with the bottom surface of the central body portion.

3. A block in accordance with claim 2, wherein the central body portion comprises a separate pair of generally rectangular-shaped members of approximately equal height having substantially flat and parallel top and bottom surfaces, the top of one of the members bonded to the corresponding surface of the other member to form the central body portion, one of the end shoulder portions being integral with and extending from one end of one of the members, said one of the end shoulder portions having a height approximately the same as the height of said one of the members, and the other end shoulder portion being integral with and extending from the opposite end of the other member, said other end shoulder portion having a height approximately the same as the height of said other member.

4. A block in accordance with claim 1, wherein the bottom surface of each end shoulder portion is generally continuous with the bottom surface of the central body portion.

5. A block in accordance with claim 1, wherein the central body portion comprises a separate pair of generally rectangular-shaped members of approximately equal height having substantially flat and parallel top and bottom surfaces, the top of one of the members being bonded to the bottom of the other member to form the central body portion, and both of the end shoulder portions being integral with and extending from the opposite ends of one of the members, and having a height approximately equal to the height of said one of the members.

6. A block in accordance with claim 1, wherein the height of each end shoulder portion between its top and bottom surfaces is greater than one-half but less than the full height of the central body portion between its top and bottom surfaces, and wherein the bottom surfaces of both end shoulder portions are generally continuous with the bottom surfaces of the central body portion.

7. A block in accordance with claim 1, wherein the central body portion comprises a separate member having generally vertical end surfaces which are circular in cross-section and the end shoulder portions comprise separate generally cylindrical members which are bonded to portions of the opposite surfaces of the separate central body portion member.

8. A wall construction comprising a plurality of interconnected units of substantially uniform size extending end-to-end in a horizontal tier arrangement to define the length of the wall and having a plurality of the tiers vertically arranged to define the height of the wall, each of said units comprising a central body member having substantially flat and parallel top and bottom surfaces and an end member at each of the opposite ends thereof, said end members having a lateral dimension in a direction normal to the general plane of the wall which is substantially greater than the lateral dimension of the central body member at its opposite ends, each of said end members being of lesser height than the central body member and having substantially flat top and bottom surfaces and a central aperture extending therethrough between the top and bottom surfaces, one of the top and bottom surfaces of each end member being generally continuous with one of the top and bottom surfaces of the central body member, each of said end members being engaged with and in vertical alignment with an end member of at least one adjacent unit to form vertical support columns for the wall, and a rigid support element extending through the central apertures of the end members forming each vertical support column.

9. A wall construction in accordance with claim 8, further including separator elements having a horizontal cross-section similar to that of the end members and selectively disposed vertically between at least some of the end members of adjacent units.

10. A wall construction in accordance with claim 8, further including at least one shear tube positioned about the outside of the rigid support element for preventing lateral movement between an adjacent pair of end members in the vertical support column formed thereby.

References Cited

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Date</th>
<th>Inventor</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,391,119</td>
<td>6/1921</td>
<td>Hastings</td>
<td>52—585 X</td>
</tr>
<tr>
<td>1,514,081</td>
<td>11/1924</td>
<td>Hahn</td>
<td>52—585 X</td>
</tr>
<tr>
<td>1,557,323</td>
<td>10/1925</td>
<td>Hahn</td>
<td>52—585 X</td>
</tr>
<tr>
<td>2,441,364</td>
<td>5/1948</td>
<td>Maynard</td>
<td></td>
</tr>
<tr>
<td>2,603,456</td>
<td>7/1952</td>
<td>Ruopp</td>
<td>256—65 X</td>
</tr>
<tr>
<td>2,683,968</td>
<td>7/1954</td>
<td>Budd</td>
<td></td>
</tr>
<tr>
<td>3,204,608</td>
<td>9/1965</td>
<td>Parr et al.</td>
<td>256—26 X</td>
</tr>
<tr>
<td>3,343,301</td>
<td>9/1967</td>
<td>Adelman</td>
<td>52—585 X</td>
</tr>
<tr>
<td>3,504,168</td>
<td>8/1974</td>
<td>Viebrock et al.</td>
<td>256—24</td>
</tr>
</tbody>
</table>

FOREIGN PATENTS

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Date</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>705,627</td>
<td>3/1931</td>
<td>France</td>
</tr>
<tr>
<td>818,547</td>
<td>6/1937</td>
<td>France</td>
</tr>
<tr>
<td>976,265</td>
<td>10/1950</td>
<td>France</td>
</tr>
<tr>
<td>1,226,359</td>
<td>2/1960</td>
<td>France</td>
</tr>
</tbody>
</table>

DENNIS L. TAYLOR, Primary Examiner

U.S. Cl. X.R. 256—24