A block and a block connector capable of easily constructing a concrete retaining wall in relatively short time are provided. A block 10 comprises a plane front side 18 and a plurality of fixing portions 12 formed on the rear side of the front side 18 to project from the block 10. A block 20 comprises a plane front side 28 slanted toward a rear side thereof and a plurality of fixing portions 22 formed on the rear side of the front side 28 to project from the block 20. A block connector 50 comprises a connecting member 51 having a predetermined length and holding members 52 that are detachably jointed to joint portions 51a on both sides of the connecting member 51. The fixing portions 12 and 22 of the blocks 10 and 20 arranged with their rear sides opposed to each other are held by holding portions 52d of the block connector 50, thereby connecting the blocks 10 and 20 at a predetermined interval therebetween.
BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a block and a block connector used in construction of a concrete retaining wall built on a relatively small uneven ground such as a construction site for houses.

[0003] 2. Description of the Related Art

[0004] When a concrete retaining wall is constructed on uneven ground, a process is often employed in which a pair of opposed wall structures are formed by stacking concrete blocks on the ground of execution, and then concrete is poured between the wall structures.

[0005] An example of a concrete block used in construction of the above concrete retaining wall is a concrete block for filling concrete provided with a means for connecting a pair of blocks arranged in parallel, which is disclosed in Unexamined Japanese Utility Model Publications No. 6-74705 and No. 6-79915, for example.

[0006] Both of the concrete blocks described in the above two publications need two connectors as connecting means. Thus, the connecting operations take more time, which may prolong the whole construction period. Furthermore, since the connecting means are connected by inserting a part of the connector into a concave receiving groove formed on the block to tightly engage the connector with the receiving groove, if earth and sand or the like adhere to the inside of the receiving groove, insertion of the connector becomes difficult, hindering the operation.

[0007] Accordingly, earth and sand or the like must be completely removed from the receiving groove before inserting the connector into the receiving groove, which takes time. In particular, in the receiving groove of the concrete block disclosed in Unexamined Japanese Utility Model Publications No. 6-79915 having a closed end in a longitudinal direction, earth and sand or the like adhere easily and accumulate in the groove, and it is also difficult to remove such accumulated earth and sand.

[0008] Moreover, in the above-described concrete blocks, when the connector cannot easily be inserted into the receiving groove due to earth and sand or the like adhering to the inside of the receiving groove, a worker sometimes tries to forcibly insert the connector into the groove by beating or pressing the connector. Then, the connector functions as a wedge to crack or break the block, often resulting in complete destruction of the block.

[0009] In addition, as an end surface of the receiving groove is opened on a top surface of the block, after stacking another block on the block, the connector can no longer be inserted into the receiving groove of the lower block. Therefore, the blocks have to be connected in making every tier and then stacked, requiring a large amount of labor and time for the construction.

[0010] Besides the above, in the concrete block described in Unexamined Japanese Utility Model Publication No. 6-74705, where a pair of connected blocks are stacked as one unit, the blocks tend to be misaligned in relation to the adjacent blocks.

SUMMARY OF THE INVENTION

[0011] An object of the present invention is to provide a block and a block connector capable of easily constructing a concrete retaining wall in relatively short time.

[0012] In an aspect of the present invention, in a block for forming a wall structure by arranging a plurality of the blocks to tightly contact with each other in vertical and horizontal directions, the block comprises a plane front side to form a continuous flat surface on an outside of the wall structure, and at least one fixing portion for receiving a block connector, the fixing portion being formed on a rear side of the front side at a predetermined interval and projecting from the block.

[0013] According to the above structure, a plurality of the blocks of the present invention are arranged with the rear sides of the blocks being opposed to each other at an interval therebetween and stacked to tightly contact with each other in vertical and horizontal directions while connecting the fixing portions in opposite positions using the connectors, thereby forming two wall structures opposed to each other with the interval therebetween. Then, concrete is poured between the wall structures and hardened to form a concrete retaining wall. Thus, this method does not require highly experienced reinforcing-bar placers or formwork experts and makes for easy construction of a concrete retaining wall in relatively short time.

[0014] If a plurality of the fixing portions for receiving the connectors are provided at a predetermined interval, the blocks arranged to position the rear sides being opposed to each other are connected on a plurality of points, which secures and stabilizes the connecting conditions. It is preferable that the plurality of the fixing portions may be arranged in a horizontal direction at a predetermined interval therebetween.

[0015] Preferably, joint means for jointing the plurality of the blocks to prevent transverse displacement of the blocks relative to the adjacent block may be formed on a top, bottom, right side, and left side surfaces of the block. With the joint means, when constructing a wall structure by stacking the blocks to tightly contact with each other in vertical and horizontal directions, the blocks can be jointed to prevent transverse displacement relative to the adjacent block. Accordingly, not only can the operability and accuracy in arrangement when stacking the blocks in vertical and horizontal directions be improved, but also the degree of security can be intensified. Furthermore, with the above joint means, joint cement is unnecessary, resulting in reduction of work and materials necessary for application of joint cement. In addition, it is not necessary to wait cement to be hardened, which leads to shorter construction periods.

[0016] In the above structure, preferably, the joint means may be a concave groove or a convex line that can be engaged with the convex line or the concave groove formed as the joint means of the adjacent block, respectively. With the concave groove or the convex line, when stacking the blocks in vertical and horizontal directions, the blocks can be securely jointed simply by engaging the convex line or the concave groove with the concave groove or the convex line of the adjacent block, respectively.

[0017] Preferably, on a part of a periphery of the front side of the block, a cut-out portion extending to the rear side may
be formed. With the cut-out portion, when pouring concrete to a rear side of a wall structure constructed by stacking a plurality of the blocks in vertical and horizontal directions, the cut-out portion penetrating from an outside to the rear side of the wall structure functions as a passage for discharging air, thereby removing residual air from the concrete. Therefore, strength reduction of the retaining wall due to the residual air can be prevented.

[0018] When the concrete poured to the rear side of the wall structure reaches the position of the cut-out portion, some water contained in the concrete leaks through the cut-out portion. Thus, it can be confirmed that the concrete is poured to the height where water is leaking from the cut-out portion, resulting in secure execution of the retaining wall free from deficient filling.

[0019] Preferably, the front side of the block may be slanted leaning toward the rear side of the block. With this configuration of the front side, when stacking the blocks in vertical and horizontal directions to form a wall structure, the blocks layered on the other are aligned in vertically set back relationship by a predetermined distance so that the slanted front sides of the blocks can form a slanted continuous flat surface, thereby constructing a wall structure having a slant outer surface leaning toward the rear side of the wall structure as a whole.

[0020] Accordingly, when constructing a gravity concrete retaining wall, which requires a form with an outer surface of one of a pair of wall structures opposed to each other being slanted toward the center of the wall structure, the gravity concrete retaining wall can be constructed without a mould form. Therefore, frame materials and formwork experts are not necessary, and the construction period can be shortened.

[0021] In another aspect of the present invention, a block connector of the present invention comprises a holding portion for detachably holding the above-described fixing portion of the block and a connecting member having a predetermined length, the holding portion being provided on both ends of the connecting member. By this structure, the fixing portions of the blocks positioned with the rear sides thereof opposed to each other are simply held by the holding portion provided on both ends of the connecting member to joint the blocks with each other. Thus, the operability is largely improved, and the construction period can also be shortened.

[0022] Here, preferably, a plurality of the holding portions may be provided on each of both ends of the connecting member at a predetermined interval. This enables only one block connector to hold the block on a plurality of points, which leads to further securing connecting conditions. It is also possible to hold the fixing portion of the block in a manner straddling the adjacent blocks, which prevents displacement of the adjacent blocks.

[0023] Preferably, the interval between the above plurality of the holding portions may be set to be substantially the same as the interval between the plurality of the fixing portions provided on the block of the present invention. By this structure, the plurality of the fixing portions can be accurately held by each of the holding portions to obtain secure connecting conditions, improving operability of the connecting work.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] In the accompanying drawings:

[0025] FIG. 1 is a plan view illustrating a block of a first embodiment according to the present invention;

[0026] FIG. 2 is a front view of the block in FIG. 1;

[0027] FIG. 3 is a bottom view of the block in FIG. 1;

[0028] FIG. 4 is a rear view of the block in FIG. 1;

[0029] FIG. 5A is a left side view of the block in FIG. 1;

[0030] FIG. 5B is a right side view of the block in FIG. 1;

[0031] FIG. 6 is a plan view illustrating a block of a second embodiment according to the present invention;

[0032] FIG. 7 is a front view of the block in FIG. 6;

[0033] FIG. 8 is a bottom view of the block in FIG. 6;

[0034] FIG. 9 is a rear view of the block in FIG. 6;

[0035] FIG. 10A is a left side view of the block in FIG. 6;

[0036] FIG. 10B is a right side view of the block in FIG. 6;

[0037] FIG. 11 is a perspective view illustrating a block connector of an embodiment according to the present invention;

[0038] FIG. 12 is an exploded perspective view of the block connector in FIG. 11;

[0039] FIG. 13 is a perspective view illustrating a state in which the block in FIG. 1 is connected to the block in FIG. 6 with the block connector in FIG. 11;

[0040] FIG. 14 is a perspective view illustrating a state in which the block in FIG. 1 is connected to the block in FIG. 6 with the block connector in FIG. 11;

[0041] FIG. 15 is a perspective view illustrating a state in which the block in FIG. 1 is connected to the block in FIG. 6 with the block connector in FIG. 11;

[0042] FIG. 16 is a perspective view illustrating a state in which the block in FIG. 1 is connected to the block in FIG. 6 with the block connector in FIG. 11;

[0043] FIG. 17 is a side view illustrating a retaining wall constructed by connecting the block in FIG. 1 to the block in FIG. 6 with the block connector in FIG. 11;

[0044] FIG. 18 is a front view of the retaining wall in FIG. 17;

[0045] FIG. 19 is a front view illustrating a retaining wall of another embodiment;

[0046] FIG. 20 is a side view illustrating a state in which a concrete retaining wall is being constructed;

[0047] FIG. 21 is a vertical sectional view illustrating a concrete retaining wall after completion; and

[0048] FIG. 22 is a vertical sectional view illustrating a concrete retaining wall after completion.
DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0049] Referring to the accompanied drawings, embodiments of the present invention will be explained below. FIG. 1 is a plan view illustrating a block of a first embodiment according to the present invention; FIG. 2 is a front view of the block in FIG. 1; FIG. 3 is a bottom view of the block in FIG. 1; FIG. 4 is a rear view of the block in FIG. 1; FIG. 5A is a left side view of the block in FIG. 1; and FIG. 5B is a right side view of the block in FIG. 1.

[0050] A block 10 in a first embodiment is, as illustrated in FIGS. 17 and 18 described later, a concrete block for forming a wall structure 30 having a vertical outer surface 31 by arranging a plurality of the blocks 10 to tightly contact with each other in vertical and horizontal directions. The block 10 comprises a plane front side 18 for constituting a continuous flat surface to form the outer surface 41 of the wall structure 40, and a plurality of fixing portions 22 for receiving a block connector that are formed on a rear side of the front side 18 and projecting from the block 10. The plurality of the fixing portions 12 are formed of a part of a flat plate body 11 provided on the rear side in parallel to the front side 18. The fixing portions 12 are arranged on the rear side of the block 10 in a horizontal direction at predetermined intervals therebetween.

[0051] Furthermore, as joint means for forming the plurality of the blocks 10 to prevent transverse displacement of the block 10 relative to the adjacent block 10 when stacking the blocks 10 in vertical and horizontal directions, a convex line 13 is formed in parallel to the front side 18 on a top and a right side of the block 10 in a position close to the front side 18, and a concave groove 14 for receiving the convex line 13 is formed on the left side and a bottom of the block 10 in a position close to the front side 18.

[0052] As shown in FIGS. 1 and 3, a hole 15 is formed in the center of the block 10 in parallel to the front side 18 penetrating the block 10 in a vertical direction. On each of the right and left sides of the block 10, a U-shaped groove 16 is formed, respectively, with a longitudinal direction thereof in parallel to the front side 18. As shown in FIG. 5, on each of the top and the bottom of the block 10, a U-shaped cut-out portion 17 is formed, respectively. The block 10 can be manufactured using a conventional block machine.

[0053] Next, referring to FIGS. 6 to 10, a block 20 of a second embodiment of the present invention will be explained below. FIG. 6 is a plan view illustrating a block of a second embodiment according to the present invention; FIG. 7 is a front view of the block in FIG. 6; FIG. 8 is a bottom view of the block in FIG. 6; FIG. 9 is a rear view of the block in FIG. 6; FIG. 10A is a left side view of the block in FIG. 6; and FIG. 10B is a right side view of the block in FIG. 6.

[0054] The block 20 of the second embodiment is, as illustrated in FIG. 17 described later, a block for forming a wall structure 40 having a slanted outer surface 41 leaning toward a rear side of the block 20 as a whole by arranging a plurality of the blocks 20 to tightly contact with each other in vertical and horizontal directions. The block 20 comprises a plane front side 28 for constituting a continuous flat surface to form the outer surface 41 of the wall structure 40, and a plurality of fixing portions 22 for receiving a block connector that are formed on the rear side of the front side 28 and projecting from the block 20.

[0055] The front side 28 of the block 20 is slanted in a direction leaning toward the rear side of the block 20. The plurality of the fixing portions 22 is formed of a part of two flat plate bodies 21 provided on the rear side of the block 20 in parallel to the front side 28. The fixing portions 22 are arranged on the rear side of the block 20 in a horizontal direction at predetermined intervals therebetween.

[0056] Furthermore, as joint means for forming the plurality of the blocks 20 to prevent transverse displacement of the block 20 relative to the adjacent block 20 when stacking the blocks 20 in vertical and horizontal directions, a convex line 23 is formed in parallel to the flat plate bodies 21 on a top of the block 20 in a position close to the front side 28 and on the left side of the block 20, and a concave groove 24 for receiving the convex line 23 is formed on the bottom of the block 20 in a position close to the front side 28 and on the right side of the block 20.

[0057] As shown in FIGS. 6 and 8, on the rear side of the front side 28 and on right and left sides of the block 20, four of U-shaped grooves 25 and 26 are formed, respectively, with longitudinal directions thereof in parallel to the flat plate body 21. As shown in FIGS. 6, 7 and 9, on the top of the block 20, four of cut-out portions 27 that extend to the rear side of the block 20 are formed. The transverse sectional view of each of the cut-out portions 27 has substantially a V-shape. Two of the four cut-out portions 27 positioned on right and left ends of the block 20 extend to the U-shaped grooves 26, respectively, and the remaining two cut-out portions 27 positioned close to a center of the block 20 extend to the U-shaped grooves 25, respectively. The block 20 can also be manufactured using a conventional block machine.

[0058] Next, referring to FIGS. 11 and 12, a block connector 50 of a third embodiment of the present invention will be explained below. FIG. 11 is a perspective view illustrating a block connector of an embodiment according to the present invention; and FIG. 12 is an exploded perspective view of the block connector in FIG. 11.

[0059] As shown in FIGS. 11 and 12, the block connector 50 of the third embodiment comprises a connecting member 51 having a predetermined length that is formed by bending a band-shaped material at both ends thereof toward a same direction to form an L-shape, and holding members 52 that are detachably jointed to joint portions 51a formed on both ends of the connecting member 51. A body 52a of the holding member 52 has a substantially elongated shape in a plan view and is provided with a pocket 52e at a center thereof. The pocket 52e is formed by bending a tongue 52b extending from a part of the body 52a at an angle of 180 degrees upwardly to be opposed to the body 52a. On each end of the body 52a of the holding member 52, a holding portion 52d having a substantially square horseshoe shape with its lower side open is provided.

[0060] Each of the joint portions 51a on the both ends of the connecting member 51 is detachably inserted into the pocket 52e of each of the holding members 52, respectively, thereby joining the connecting member 51 and the holding members 52. In this operation, a distal end of the tongue 52b
is formed to be bent toward a direction parting from the body 52a so that the joint portion 51a can be easily guided to an inside of the pocket 52c. In addition, a bent portion 52b having an obtuse angle is formed on the body 52a at each end of a portion opposed to the tongue 52b, which prevents displacement of the joint portion 51a inserted into the pocket 52c in a direction toward the holding portion 52d.

[0061] Here, the method of forming the pocket 52c is not limited to the above-described method, that is, the method to bend the tongue 52b extending from a part of the body 52a at an angle of 180 degrees upwardly to be opposed to the body 52a. As another method, for example, a band-shaped material having the same width as the tongue 52b is folded to form a member having an S-shape or Z-shape in a side view, and the member is attached to the center of the body 52a formed without the tongue 52b, or to a portion between the two bent portions 52c, to provide the pocket 52c for inserting the joint portion 51a.

[0062] When a plurality of the connecting members 51 having different lengths are prepared, block connectors with various intervals between a pair of the holding members 52 can be obtained by optionally selecting the connecting members 51. In this manner, the block connector 50 can be applied to different intervals between the block 10 and the block 20 arranged.

[0063] An opening 52e of the holding portion 52d has a thickness that is approximately the same as or slightly less than the thicknesses of the fixing portions 12 and 22 of the blocks 10 and 20. As the connecting members 51 and the holding member 52 are both made of elastic materials, the joint portion 51a inserted into the pocket 52c is held by an elastic force of the tongue 52b, and an elastic force of the holding portion 52d holds the fixing portions 12 and 22 of the blocks 12 and 22.

[0064] Referring to FIGS. 13 to 16, a mechanism for connecting the block 10 to the block 12 using the block connector 50 will be explained below. All of FIGS. 13 to 16 are perspective views illustrating states in which the block 10 is connected to the block 20 with the block connector 50.

[0065] As shown in FIG. 13, the fixing portions 12 and 22 of the blocks 10 and 20 with their rear sides arranged to be opposed to each other are held by the holding portions 52d of the block connector 50, thereby connecting the blocks 10 and 20 to have a predetermined interval therebetween. In this case, two of the fixing portions 12 that are provided close to the center of the block 10 are held by two of the holding portions 52d of the holding members 52 on one side of the block connector 50, and two of the fixing portions 22 that are provided close to the center of the block 20 are held by two of the holding portions 52d of the holding member 52 on the other side of the block connector 50.

[0066] As described above, after arranging the blocks 10 and 20 with their rear sides opposed to each other, a simple operation to hold the fixing portions 12 and 22 with the holding portions 52d of the block connector 50 enables connection of the blocks. Therefore, the operability is greatly improved, and the construction period can be shortened when constructing a concrete retaining wall which will be described below. The state in which the fixing portions 12 and 22 are held by the holding portions 52d is similar to a state in which shoulders of a human body are gripped with hands, which realizes a secure fixing state. Furthermore, as the fixing portions 12 and 22 have a projecting form, earth and sand or the like are less likely to adhere to or accumulate on the fixing portions 12 and 22. Even if earth and sand should adhere, they could easily be removed. In addition, if a pressure is loaded on the fixing portions 12 and 22, there is no danger of cracking or breaking the blocks 10 and 20.

[0067] As two of the holding portions 52d are provided at a predetermined interval on each end of the connecting member 51 of the block connector 50, the blocks 10 and 20 can be held at two points each by the single block connector 50, leading to a secure connecting state. It should be noted that the holding portions 12 and 22 are not necessarily held at the positions close to the center by the two holding portions 52d as shown in FIG. 13, but can be held at two positions close to the sides of the blocks 10 and 20.

[0068] As shown in FIG. 15, the block connector 50 can be mounted on a position bordering the adjacent blocks 10 and 20 so as to hold the fixing portions 12 and 22 of the blocks 10 and 20 straddling the adjacent blocks 10 and 20. By arranging the block connector 50 as shown in FIG. 15, displacement of the blocks 10 and 20 relative to the adjacent blocks 10 and 20 can be prevented.

[0069] As shown in FIG. 16, it is also possible to hold the fixing portion 12 on the right side of the block 10 with one of the holding portions 52d on one end of the block connector 50 while holding the two fixing portions 22 close to the center of the block 20 with both holding portions 52d on the other end of the block connector 50. By positioning the block connector 50 in this way, as illustrated in FIG. 19 explained below, the blocks 10 and 20 stacked in a staggered position can also be securely connected.

[0070] In the present embodiment, the interval between the two holding portions 52d provided on both sides of the block connector 50 is substantially identical with the interval between the fixing portions 12 formed on the block 10 and the interval between the fixing portions 22 formed on the block 20. Therefore, the plurality of the fixing portions 12 and 22 formed on the blocks 10 and 20 can be selectively held by the holding portions 52d. Accordingly, the positioning of the block connector 50 can be optionally set depending on conditions of construction, resulting in excellent workability. Moreover, the two fixing portions 12 and 22 are held exactly by the two holding portions 52d, which leads to a secure connecting state.

[0071] Next, referring to FIGS. 17 to 22, a concrete retaining wall constructed by the blocks 10 and 20 and the block connectors 50 will be explained below. FIG. 17 is a side view illustrating a retaining wall constructed by connecting the blocks 10 and 20 with the block connector 50; FIG. 18 is a front view of the retaining wall in FIG. 17; FIG. 19 is a front view illustrating a retaining wall of another embodiment; FIG. 20 is a side view illustrating a state in which a concrete retaining wall is being constructed; FIGS. 21 and 22 are vertical sectional views illustrating the concrete retaining wall after completion.

[0072] As shown in FIG. 17, the blocks 10 and 20 are arranged with their rear sides being opposed to each other at a predetermined interval therebetween, and a tier of the blocks 10 and 20 is consecutively overlaid on a top of the
other tier of the blocks 10 and 20, respectively. In the arrangement, the block 10 is stacked in a right vertical direction while the block 20 is layered on the other blocks 20 below to be aligned in a vertically setback relationship toward the rear side, or the side of the block 10, by a regular distance so that the slanted front sides 28 of the blocks 20 can form a slanted continuous flat surface.

(0073) Then, while staking the blocks 10 and 20, the blocks 10 and the blocks 20 opposed to each other are connected with the block connectors 50. In this case, the number and position of the block connector 50 can be optionally set depending on conditions of construction. According to this step, a wall structure 30 having a vertical surface and a wall structure 40 having an outer surface leaning toward the rear side as a whole can be constructed.

(0074) The block connector 50 can be attached to or detached from the fixing portions 12 and 22 of the blocks 10 and 20 after the blocks 10 and 20 are vertically stacked. Thus, the block connectors 50 can be added or reduced, and also the position of the block connector 50 can be changed so as to be applicable to various conditions of construction.

(0075) The wall structures 30 and 40 are opposed to each other with the interval therebetween gradually narrowing down upwardly. In this structure, depending on conditions of construction, the blocks 10 and 20 can be arranged either in a grid pattern as shown in FIG. 18 or in a staggered pattern as shown in FIG. 19.

(0076) Concrete is poured into a gap between the wall structures 30 and 40 as structured above and hardened to form a gravity concrete retaining wall. Accordingly, this method does not require highly experienced reinforcing-bar placers or formwork experts and is capable of easily constructing a concrete retaining wall in relatively short time.

(0077) With the convex lines 13 and 23 and the concave grooves 14 and 24 provided on the blocks 10 and 20, respectively, the blocks 10 and 20 are jointed so as to prevent transverse displacement of the blocks relative to the adjacent blocks 10 and 20. Thus, when stacking the blocks 10 and 20 to tightly contact with each other in vertical and horizontal directions to construct the wall structures 30 and 40, the blocks 10 and 20 do not displace transversely to the adjacent blocks 10 and 20, which leads to higher operability and execution accuracy when stacking the blocks 10 and 20 in vertical and horizontal directions as well as increasing safety.

(0078) With the convex lines 13 and 23 and the concave grooves 14 and 24 as described above, joint cement becomes unnecessary, resulting in omission of work and materials necessary for application of joint cement. In addition, it is not necessary to wait for the cement to harden, which leads to shorter construction periods.

(0079) On the top of the block 20, a plurality of the cut-out portions 27 extending to the rear side of the block 20 are formed. When pouring concrete to a rear side of the wall structure 40 constructed by stacking a plurality of the blocks 20 in vertical and horizontal directions, the cut-out portions penetrating from the outer surface to the rear side of the wall structure 40 function as passages for discharging air, thereby removing residual air from the concrete poured between the wall structures 30 and 40. Therefore, the strength reduction of the concrete retaining wall due to the residual air can be prevented.

(0080) When the concrete poured to the rear side of the wall structure 40 reaches the position of the cut-out portions 27, some water contained in the concrete leaks through the cut-out portions 27. Thus, it can be confirmed that the concrete is poured to the height where water is leaking from the cut-out portions 27, resulting in secure execution.

(0081) In actual construction sites, as shown in FIG. 20, cobbles stones 62 are disposed on flat ground opened by breaking natural ground 61, and concrete is poured thereon to form a concrete bed 63. The blocks 10 and 20 are stacked on the concrete bed 63 in a manner illustrated in FIG. 17.

(0082) In this case, the blocks 10 and 20 are stacked by each tier and connected with the block connector 50 (not shown). In order to prevent the blocks 10 stacked in a vertical direction from falling during an operation, a vertical supporting member 41, a slant stay 42, and a horizontal stay 43 can be provided. A supporting member 44 with an extension mechanism can also be disposed in a slanted manner between the blocks 20 and 10 in order to prevent the blocks 20 stacked in setback positions from falling in the leaning direction.

(0083) The supporting member 44 comprises a turnbuckle type extension member 44a and a supporting tube 44b, which are connected to each other. Preparing several kinds of the supporting tubes 44b having different lengths, the most appropriate one can be selected depending on the height of the block 20 to be supported by the supporting tube 44b.

(0084) After constructing the wall structures 30 and 40, concrete 48 is poured through openings indicated by arrows 45, 46 and 47. Then, a gap between the blocks 10 and 20 is filled with the poured concrete along the arrow 46. The concrete poured along the arrow 45 flows downward through the hole 15 and the U-shaped groove 16 while pouring through the U-shaped cut-out portion 17 in a horizontal direction. The concrete poured along the arrow 47 flows downward and into the rear side through the U-shaped grooves 25 and 26 of the block 20.

(0085) After the thus poured concrete is hardened, the vertical supporting member 41, the slant stay 41, and the horizontal stay 43 are dismantled to complete construction of a concrete retaining wall 60. It is followed by filling original earth and sand between the natural ground 61 and the concrete retaining wall 60, and thus all construction work is finished.

(0086) In the concrete retaining wall 60 shown in FIG. 21, the slanted wall structure 40 formed by the blocks 20 contacts with the natural ground 61. However, the structure is not limited to this structure, but the vertical wall structure 30 formed by the blocks 10 can contact with the natural ground 61.

(0087) While there has been described what is at present considered to be a preferred embodiment of the invention, it will be understood that various modifications may be made thereto, and it is intended that the appended claims cover all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:
1. A block for forming a wall structure by arranging a plurality of the blocks to tightly contact with each other in
vertical and horizontal directions, the block comprising a plane front side to form a continuous flat surface on an outside of the wall structure, and at least one fixing portion for receiving a block connector, the fixing portion being formed on a rear side of the front side at a predetermined interval and projecting from the block.

2. A block according to claim 1 further comprising joint means for joining the plurality of the blocks to prevent transverse displacement of the block relative to the adjacent block, the joint means being formed on a top, bottom, right side, and left side surfaces of the block.

3. A block according to claim 2, wherein the joint means is a concave groove or a convex line which can be engaged with the convex line or the concave groove that is the joint means of the adjacent block, respectively.

4. A block for forming a wall structure by arranging a plurality of the blocks to tightly contact with each other in vertical and horizontal directions, the block comprising a plane front side to form a continuous flat surface on an outside of the wall structure, at least one fixing portion for receiving a block connector, the fixing portion being formed on a rear side of the front side at a predetermined interval and projecting from the block, and a cut-out portion extending to the rear side formed on a part of a periphery of the front side of the block.

5. A block according to claim 4 further comprising joint means for joining the plurality of the blocks to prevent transverse displacement of the block relative to the adjacent block, the joint means being formed on a top, bottom, right side, and left side surfaces of the block.

6. A block according to claim 5, wherein the joint means is a concave groove or a convex line which can be engaged with the convex line or the concave groove that is the joint means of the adjacent block, respectively.

7. A block for forming a wall structure by arranging a plurality of the blocks to tightly contact with each other in vertical and horizontal directions, the block comprising a plane front side to form a continuous flat surface on an outside of the wall structure, and at least one fixing portion for receiving a block connector, the fixing portion being formed on a rear side of the front side at a predetermined interval and projecting from the block, and the front side being slanted leaning toward the rear side of the block.

8. A block according to claim 7 further comprising joint means for joining the plurality of the blocks to prevent transverse displacement of the block relative to the adjacent block, the joint means being formed on a top, bottom, right side, and left side surfaces of the block.

9. A block according to claim 8, wherein the joint means is a concave groove or a convex line which can be engaged with the convex line or the concave groove that is the joint means of the adjacent block, respectively.

10. A block for forming a wall structure by arranging a plurality of the blocks to tightly contact with each other in vertical and horizontal directions, the block comprising a plane front side to form a continuous flat surface on an outside of the wall structure, at least one fixing portion for receiving a block connector, the fixing portion being formed on a rear side of the front side at a predetermined interval and projecting from the block, and a cut-out portion extending to the rear side formed on a part of a periphery of the front side of the block, the front side being slanted leaning toward the rear side of the block.

11. A block according to claim 10 further comprising joint means for joining the plurality of the blocks to prevent transverse displacement of the block relative to the adjacent block, the joint means being formed on a top, bottom, right side, and left side surfaces of the block.

12. A block according to claim 11, wherein the joint means is a concave groove or a convex line which can be engaged with the convex line or the concave groove that is the joint means of the adjacent block, respectively.

13. A block connector for connecting a block for forming a wall structure by arranging a plurality of the blocks to tightly contact with each other in vertical and horizontal directions, the block comprising a plane front side to form a continuous flat surface on an outside of the wall structure, and at least one fixing portion for receiving the block connector, the fixing portion being formed on a rear side of the front side at a predetermined interval and projecting from the block, the block connector comprising a holding portion for detachably holding the fixing portion of the block and a connecting member having a predetermined length, the holding portion being provided on both ends of the connecting member.

14. A block connector claimed in claim 13, wherein a plurality of the holding portions are provided on each of the both ends of the connecting member at a predetermined interval.

15. A block connector claimed in claim 14, wherein the interval between the plurality of the holding portions is substantially the same as the interval between the plurality of the fixing portions provided on the block.