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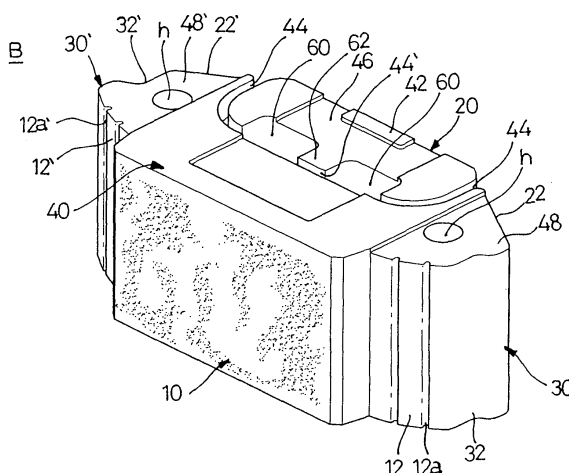
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(54) **A block for constructing reinforced earth wall**

(57) Disclosed is a block for the construction of a reinforced soil segmental retaining wall. The block includes a front surface (20), a rear surface (20), left and right lateral surfaces (30 and 30'), an upper surface (40) having a pair of left and right reinforcement insertion grooves (44), and a lower surface (50) opposite to the upper surface (40). A pair of anchor pin insertion bores (h) extend vertically at left and right sides of the upper and lower surfaces (40 and 50) so that anchor pins (P) are inserted therethrough to connect vertically neighbouring blocks. Also, a pair of through-passages (60) extend vertically from the upper surface (40) to the lower surface (50) to be laterally spaced apart from each other by interposing

a partition (52). The through-passages (60) are located to lock the anchor pins (P) inserted through the anchor pin insertion bores (h) of overlying blocks. The reinforcement insertion grooves (44) are located at opposite sides of the through-passages (60) so that the leading end of the reinforcement (80) is directly fitted through the insertion grooves (44) while coming into contact with front ends of the through-passages (60). Another reinforcement insertion groove (44') is formed along the front end of the partition (62) so that the middle portion of the reinforcement (80) is fitted to allow the reinforcement (80) to extend rearward through the reinforcement insertion grooves (44).

FIG. 1



Description

Technical Field

[0001] The present invention relates to a block for use in the construction of a reinforced-soil segmental retaining wall, which has a plurality of advantages as follows: firstly, the block enables the segmental retaining wall to be conveniently constructed using machinery or equipment instead of being constructed in a conventional ineffective labour-intensive manner; secondly, the block does not suffer from shear cracks even when it confronts uneven subsidence of ground; thirdly, the block allows a leading end of a reinforcement to be directly connected thereto without using a separate anchor; fourthly, a mono-layer, dual-layer, or multiple-layer blocks can be evenly stacked one upon the other and side-by-side in a staggered-stacking manner or in a vertically-aligned stacking manner to achieve various retaining wall patterns without causing an excessive gap between the adjacent blocks and at the same time preventing the blocks from being individually protruded or recessed from the exposed side of the retaining wall; and fifthly, the block allows for easy partial repair of damaged block(s) when the blocks are constructed in a vertically-aligned stacking manner.

Background Art

[0002] Various technologies in association with reinforced-soil segmental retaining walls using blocks or panels and their combinations and methods for constructing the retaining walls have been conventionally known in the art. However, the known conventional technologies have the following several problems.

[0003] For example, to construct a conventional reinforced-soil segmental retaining wall, a plurality of small blocks must be manually lifted one by one and stacked one upon the other and side-by-side. This is a labour intensive undertaking that also results in ineffective slow construction of the retaining wall. Moreover, when it is desired to construct the retaining wall within a short time, it requires an extensive mobilization of manpower, resulting in an excessive increase in labour costs and other various problems.

[0004] Problems of a conventional panel-type reinforced-soil segmental retaining wall are that the retaining wall does not allow the growth of plants thereat and is less aesthetic as compared to the block-type retaining wall, although the panel-type retaining wall can be constructed much more quickly by the use of equipment with low labour requirements. Thus, the panel-type retaining wall lacks harmony with the natural environment.

[0005] To solve the above-described problems of both the conventional block-type and panel-type reinforced-soil segmental retaining walls while developing advantages of both the retaining walls, the applicant of the present invention has filed Korean Patent Application Nos. 2004-37835, 2004-65998, 2004-81576,

2004-89152, and 2005-4044, which disclose reinforced-soil segmental retaining walls in which blocks having a relatively large size are vertically stacked one upon the other, and also disclose the blocks for use in the construction of the same and retaining wall construction methods using the same. The present invention is an improvement of the foregoing applications.

Technical Problem

[0006] Therefore, the present invention has been made in view of the above problems, and it is a first object of the present invention to provide a block for use in the construction of a reinforced-soil segmental retaining wall, which enables convenient and rapid construction of the segmental retaining wall by the use of equipment without causing various problems made by manual operations.

[0007] It is a second object of the present invention to provide a block for use in the construction of a reinforced-soil segmental retaining wall, which can prevent the sliding of blocks upon uneven subsidence of the ground, thereby preventing the generation of shear cracks and damage to L-shaped angled portions.

[0008] It is a third object of the present invention to provide a block for use in the construction of a reinforced-soil segmental retaining wall, which can allow a leading end of a reinforcement to be directly connected to the block without using a separate anchor, thereby enabling the simplified connection between the reinforcement and the retaining wall and preventing the leading end of the reinforcement from relaxing and being exposed to the outside.

[0009] It is a fourth object of the present invention to provide a block for use in the construction of a reinforced-soil segmental retaining wall, in which a mono-layer, dual-layer, or multiple-layered blocks can be evenly stacked one upon the other and side-by-side in a staggered-stacking manner or in a vertically-aligned stacking manner, thereby achieving various retaining wall patterns without causing an excessive gap between the adjacent blocks and at the same time preventing the blocks from being individually protruded or recessed from the exposed side of the retaining wall, and allowing for easy partial repair of damaged block(s) when the blocks are constructed in a vertically-aligned stacking manner.

Technical Solution

[0010] In accordance with an aspect of the present invention, the above and other objects can be accomplished by the provision of a block for constructing a reinforced soil segmental retaining wall, comprising: a front surface to form an exposed face of a retaining wall; a rear surface to come into contact with reinforced soil backfill; left and right lateral surfaces to come into at least partial contact with neighbouring blocks; an upper surface having a pair of left and right reinforcement insertion grooves for the insertion of a reinforcement or reinforce-

ment connection anchor; and a lower surface opposite to the upper surface, a pair of left and right anchor pin insertion bores extending vertically through the block from the upper surface to the lower surface at left and right ends of the upper and lower surfaces so that anchor pins are inserted through the respective anchor pin insertion bores to connect vertically neighbouring blocks to each other, wherein a pair of left and right substantially rectangular through-passages extend vertically from the upper surface to the lower surface of the block so that, when blocks are stacked one upon the other in a staggered-stacking manner, the anchor pin, inserted through the left anchor pin insertion bore of the block, is inserted into the right through-passage of an underlying left block, and the anchor pin, inserted through the right anchor pin insertion bore of the block, is inserted into the left through-passage of an underlying right block, and wherein the left and right reinforcement insertion grooves are located at opposite sides of the through-passages so that a leading end of the reinforcement is directly fitted through the insertion grooves, each of the reinforcement insertion grooves having a trailing end ending at the rear surface of the block and a leading end ending at a front end of an associated one of the through-passages. An auxiliary reinforcement insertion groove may be formed at the upper surface of the block along a front end of a partition between the through-passages so that the reinforcement is fitted from one of the insertion grooves to the other insertion groove. In a fitted state, the middle portion of the reinforcement is located in the auxiliary reinforcement insertion groove and the leading and trailing ends of the reinforcement extend rearward from the rear surface of the block.

Advantageous Effects

[0011] According to the present invention, as a result of forming a partition between left and right through-passages, it is possible to reduce the weight of a block while achieving strong structural strength. Also, according to the present invention, a pair of anchor pin insertion bores, located at opposite sides of the through-passages, are aligned on an imaginary line that extends from front ends of the through-passages. With this arrangement, when blocks are vertically stacked one upon the other in a staggered-stacking manner to form a straight or curved retaining wall, lower ends of anchor pins, which have been inserted through a block, can be inserted into the corresponding through-passages of two underlying blocks to be supported by the front ends of the through-passages. This effectively prevents the sliding of blocks caused by the forwardly-acting pressure of the reinforced-soil back-fill.

[0012] To allow a band-type reinforcement to be directly coupled to the block without a separate anchor, reinforcement insertion grooves are formed at the upper surface of the block to have a gentle radius of curvature, in order to prevent the concentration of stress at a par-

ticular location.

[0013] Furthermore, an upper surface of the block is partially dented at centre, left and right locations thereof to form external-force absorption recesses. When blocks are vertically stacked one upon the other in a staggered-stacking manner, the external-force absorption recesses serve to absorb horizontal displacement of the blocks to allow lower ends of opposite lateral surfaces of an upper block to be inclined, thereby preventing a shear force of a block from being concentrated at a junction of two underlying blocks when a constructed retaining wall confronts uneven subsidence of ground. This has the effect of preventing the centre of the block from being broken by the shear force, and also preventing damage to lower corners of the upper block (i.e. L-shaped angled portions).

Drawings

[0014] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a front perspective view illustrating a block for use in the construction of a retaining wall in accordance with a first embodiment of the present invention;

FIG. 2 is a rear perspective view illustrating the retaining wall block in accordance with the first embodiment of the present invention;

FIG. 3 is a plan view illustrating the retaining wall block in accordance with the first embodiment of the present invention;

FIG. 4 is a bottom view illustrating the retaining wall block in accordance with the first embodiment of the present invention;

FIG. 5 is a plan view illustrating a straight retaining wall constructed by the use of the block in accordance with the first embodiment of the present invention;

FIG. 6 is a plan view illustrating a curved convex retaining wall constructed by the use of the block in accordance with the first embodiment of the present invention;

FIG. 7 is a plan view illustrating a curved concave retaining wall constructed by the use of the block in accordance with the first embodiment of the present invention;

FIG. 8 is a plan view illustrating a junction of straight and curved sections of a retaining wall constructed by the use of the block in accordance with the first embodiment of the present invention;

FIG. 9 is a front perspective view illustrating the staggered-stacking construction of dual-layer type retaining wall blocks, circle illustrating the important part of the block in enlarged scale;

FIG. 10 is a rear perspective view illustrating the re-

retaining wall of FIG. 9;

FIG. 11 is a front view illustrating the retaining wall which is constructed in a staggered-stacking manner by the use of the dual-layer blocks;

FIG. 12 is a side sectional view illustrating the retaining wall of FIG. 11;

FIG. 13 is a rear perspective view illustrating the staggered-stacking construction of mono-layer type retaining wall blocks;

FIG. 14 is a front view illustrating the retaining wall which is constructed in a staggered-stacking manner by the use of the mono-layer blocks;

FIG. 15 is a side sectional view illustrating the retaining wall of FIG. 14;

FIG. 16 is a front perspective view illustrating the retaining wall which is constructed in a vertically-aligned stacking manner;

FIG. 17 is a side sectional view illustrating the retaining wall of FIG. 16;

FIG. 18 is a perspective view illustrating the partial repair of a retaining wall;

FIG. 19 is a front perspective view illustrating a block for use in the construction of a retaining wall in accordance with a second embodiment of the present invention;

FIG. 20 is a rear perspective view illustrating the retaining wall block in accordance with the second embodiment of the present invention;

FIG. 21 is a plan view illustrating the retaining wall block in accordance with the second embodiment of the present invention;

FIG. 22 is a bottom view illustrating the retaining wall block in accordance with the second embodiment of the present invention;

FIG. 23 is a plan view illustrating a straight retaining wall constructed by the use of the block in accordance with the second embodiment of the present invention;

FIG. 24 is a plan view illustrating a curved convex retaining wall constructed by the use of the block in accordance with the second embodiment of the present invention;

FIG. 25 is a plan view illustrating a curved concave retaining wall constructed by the use of the block in accordance with the second embodiment of the present invention;

FIG. 26 is a plan view illustrating a junction of straight and curved sections of a retaining wall constructed by the use of the block in accordance with the second embodiment of the present invention;

FIG. 27 is a front perspective view illustrating the staggered-stacking construction of dual-layer type retaining wall blocks, circle illustrating the important part of the block in enlarged scale;

FIG. 28 is a rear perspective view illustrating the retaining wall of FIG. 27;

FIG. 29 is a front view illustrating the retaining wall which is constructed in a staggered-stacking manner

by the use of the dual-layer blocks;

FIG. 30 is a side sectional view illustrating the retaining wall of FIG. 29;

FIG. 31 is a rear perspective view illustrating the staggered-stacking construction of mono-layer type retaining wall blocks;

FIG. 32 is a front view illustrating the retaining wall which is constructed in a staggered-stacking manner by the use of the mono-layer blocks;

FIG. 33 is a side sectional view illustrating the retaining wall of FIG. 32;

FIG. 34 is a front perspective view illustrating the retaining wall which is constructed in a vertically-aligned stacking manner;

FIG. 35 is a side sectional view illustrating the retaining wall of FIG. 34; and

FIG. 36 is a perspective view illustrating the partial repair of a retaining wall.

[0015] Now, preferred exemplary embodiments of the present invention, which are not intended to limit the scope of the present invention, will be explained in detail with reference to the accompanying drawings.

[0016] FIGS. 1 to 18 illustrate a block and a retaining wall constructed by the use of the block in accordance with a first embodiment of the present invention.

[0017] First, referring to FIGS. 1 to 4, a block for use in the construction of the retaining wall in accordance with the first embodiment of the present invention is illustrated. As shown in FIGS. 1 to 4, the block B of the present embodiment includes: a front surface 10 to form an exposed face of a retaining wall; a rear surface 20 to come into contact with reinforced soil backfill; left and right lateral surfaces 30 and 30' to come into partial contact with neighbouring blocks; an upper surface 40 having a pair of left and right reinforcement insertion grooves 44 for the insertion of a reinforcement or reinforcement connection anchor; and a lower surface 50 opposite to the upper surface 40. A pair of left and right anchor pin insertion bores h extend vertically from the upper surface 40 to the lower surface 50 at left and right ends of the upper and lower surfaces 40 and 50. An anchor pin P (shown in FIGS. 5 and 12) is inserted through a respective one of the anchor pin insertion bores h to connect vertically neighbouring blocks to each other. A pair of left and right substantially rectangular through-passages 60 extend vertically from the upper surface 40 to the lower surface 50 of the block B so that they are laterally spaced apart from each other by interposing a partition 62. When blocks are stacked one upon the other in a staggered-stacking manner, the anchor pin P, inserted through the left anchor pin insertion bore h of a block, is inserted into the right through-passage 60 of an underlying left block, and the anchor pin P, inserted through the right anchor pin insertion bore h of the upper block, is inserted into the left through-passage 60 of an underlying right block. The left and right reinforcement insertion grooves 44 are located at opposite sides of the through-passages 60 so

that the leading end of a reinforcement 80 (shown in FIG. 5) is directly fitted through the insertion grooves 44. Each of the reinforcement insertion grooves 44 has a trailing end ending at the rear surface 20 of the block B and a leading end ending at a front end of an associated one of the through-passages 60. An auxiliary reinforcement insertion groove 44' is formed at the upper surface 40 of the block B along a front end of the partition 62 between the through-passages 60. With this configuration, the single reinforcement 80 is fitted from one of the insertion grooves 44 to the other insertion groove 44' so that the middle portion of the reinforcement 80 is fitted in the auxiliary reinforcement insertion groove 44'. After being completely fitted, the leading and trailing ends of the reinforcement 80 extend rearward from the rear surface 20 of the block B.

[0018] In the block B of the present embodiment, the front surface 10 forms a forwardly protruding rectangular face of the block B, and is split to have the texture of natural stone. A pair of curved surfaces 12 and 12' are formed between the protruding front surface 10 and both the lateral surfaces 30 and 30'. The curved surfaces 12 and 12' have elongated vertical slots 12a and 12a', respectively.

[0019] As shown in FIG. 3, the left and right anchor pin insertion bores h formed at the upper surface 40 of the block B according to the present embodiment are generally located close to the centre line running along the width of the block B, to facilitate the coupling of blocks which are stacked one upon the other in a staggered-stacking manner. Thereby, the anchor pin insertion bores h are aligned on an imaginary line L that is aligned with the front ends 61 of the through-passages 60. With this arrangement, when blocks are vertically stacked one upon the other in a staggered-stacking manner to form a straight or curved retaining wall, lower ends of the anchor pins P, which have been inserted through a block, can be inserted into the corresponding through-passages 60 of underlying two blocks to be supported by the front ends 61 of the through-passages 60. This effectively prevents the sliding of blocks caused by the forward-acting earth pressure of the reinforced-soil backfill pushing against the rear surface of the wall.

[0020] The above-described anchor pin supporting structure can effectively prevent the upper block from being pushed forward and falling downward when blocks are stacked one upon the other without any supporting structure behind them.

[0021] Referring to FIGS. 3 and 4 illustrating the block B in plan view and bottom view, and FIG. 12 illustrating the constructed retaining wall in sectional view, each of the anchor pin insertion bores h includes: an upper expanded portion h1, a lower reduced portion h2, and an intermediate tapered portion h3. This configuration allows for easy insertion of the anchor pin P while effectively preventing the falling thereof, and restricts sliding and overturning of blocks.

[0022] As shown in FIG. 12, when blocks are stacked

one upon the other, the anchor pin P, which is inserted through the anchor pin insertion bore h of a block, is located close to the front end 61 of the through-passage 60 of an underlying block. Also, the fabric reinforcement 80, which is fitted through the reinforcement insertion grooves 44 and 44' of the underlying block, is located in front of the anchor pin P inside the through-passage 60 of the underlying block. Thus, the fabric reinforcement 80 is connected to both the reinforcement insertion grooves 44 and 44' of the underlying block as well as the anchor pin P of the upper block. This eliminates the need to mount the reinforcement 80 to every block, and consequently, can minimize the consumption of fabric reinforcements within a permitted design limit.

[0023] As stated above, the left and right reinforcement insertion grooves 44 of the block B according to the present embodiment extend forward from the rear surface 20 of the block B to the centre of the block B by passing through the through-passages 60, while drawing a gentle curve. The left and right reinforcement insertion grooves 44 are connected with the intermediate auxiliary reinforcement insertion groove 44' formed at the partition 62 to have a U-shaped reinforcement insertion groove. The leading end of the reinforcement 80 is fitted into the U-shaped insertion groove after being folded once to have a width substantially half of the original width of the reinforcement 80. The reinforcement insertion grooves 44 and 44' of the block B continuously maintain the reinforcement 80, fitted therein, in the folded state. This prevents the relaxation of the reinforcement 80 and also prevents the reinforcement 80 from being exposed from above or in front of the block B, allowing for effective stacking of blocks.

[0024] The upper surface 40 of the block B is partially dented or recessed at centre, and left and right locations thereof to form external-force absorption recesses 46, 48 and 48'. When blocks are vertically stacked one upon the other in a staggered-stacking manner, the external-force absorption recesses 46, 48 and 48' serve to prevent a shear force of a block from being concentrated to a junction of underlying two blocks when a constructed retaining wall confronts uneven subsidence of ground and to prevent damage to L-shaped angled portions at a lower surface of the upper block.

[0025] In particular, the external-force absorption recess 46, which is formed at the centre of the upper surface 40, is opened to the outside from the rear surface 20 of the block B, to form a gap between two vertically stacked blocks. When a lever is inserted into the external-force absorption recess 46, the seating position of the upper block can be delicately adjusted by maneuvering the lever.

[0026] The external-force absorption recess 46 is centrally formed with a supporting protrusion 42 at the rear side thereof so that the supporting protrusion 42 is level with the rest of the upper surface 40 of the block B. When blocks are stacked one upon the other to construct a straight or curved retaining wall, the supporting protrusion

sion 42 of a block is located so as not to come into contact with a lower surface of an overlying block. This allows for vertically stacked blocks to be maintained in a much more stable manner when dual-layer retaining wall blocks are stacked in a vertically-aligned stacking or staggered-stacking manner.

[0027] In the first embodiment of the present invention, a pair of inclined surfaces 22 and 22' are provided between the rear surface 20 and both the lateral surfaces 30 and 30' of the block B. The inclined surfaces 22 and 22' are symmetrical to the curved surfaces 12 and 12'. Thus, the block B of the present invention has a boat shaped cross section having tapered stem and stern.

[0028] As stated above, the front surface 10 of the block B forms a forwardly protruding rectangular face of the block B, and is at least partially split to have the texture of natural stone. Thus, a retaining wall constructed by the use of this kind of blocks looks as if it is made of natural stone, thereby not having the bleak feeling of a concrete retaining wall.

[0029] A method for constructing a retaining wall by the use of the block having the above described configuration will now be explained.

[0030] FIGS. 5 to 8 illustrate the staggered-stacking of upper and lower blocks and the coupling of anchor pins and reinforcements in detail.

[0031] When blocks are stacked one upon the other in a staggered-stacking manner to construct a straight retaining wall, as shown in FIG. 5, an upper block B2 is substantially vertically stacked on the centre of two lower blocks B1 (i.e. the centre of the upper block B2 is substantially aligned with the region where the two lower blocks B1 are joined together). In this case, the anchor pins P, which are inserted through the left and right anchor pin insertion bores P of the upper block B2, are inserted into the right through-passage 60 of the lower left block B1 and the left through-passage 60 of the lower right block B1, respectively, to prevent forward sliding of the upper block B2 relative to the lower blocks B1.

[0032] The lower ends of the anchor pins P, inserted through the upper block B2, are located close to the front ends 61 of the corresponding through-passages 60 of the lower blocks B1. Also, the folded reinforcement 80, fitted through the reinforcement insertion grooves 44 and 44' of the lower blocks B1, is located in front of the anchor pins P. As a result, the anchor pins P substantially come into close contact with the front ends 61 of the through-passages 60 of the lower blocks B1, thereby preventing the forward sliding and overturning of the upper block B2.

[0033] As stated above, although the reinforcement 80 is kept folded in the reinforcement insertion grooves 44 and 44', the leading and trailing ends of the reinforcement 80, extending rearward from the lower blocks B1, are unfolded. Thus, the reinforcement 80 can be embedded into the reinforced soil backfill after recovering their original width.

[0034] When blocks are stacked one upon the other in a staggered-stacking manner to construct a curved con-

vex retaining wall, as shown in FIG. 6, the two lower blocks B1 are arranged to draw a curve, and the upper block B2 is staggered with respect to the lower blocks B1. In this case, the anchor pins P of the upper block B2 are inserted into the corresponding through-passages 60 of the lower blocks B1 so that they are moved slightly inward to the centre of the respective lower blocks B1 as compared to the case for the straight retaining wall. Such a movement of the anchor pins P effectively prevents the generation of an excessive gap between adjacent blocks, and allows the upper block B2 to be evenly aligned with the lower blocks B2 without being individually protruded or recessed, even for different radii of curvature of the convex retaining wall.

[0035] Also, when blocks are stacked one upon the other in a staggered-stacking manner to construct a curved concave retaining wall, as shown in FIG. 7, the anchor pins P of the upper block B2 are inserted into the corresponding through-passages 60 of the lower blocks B1 so that they are slightly moved outward away from the centre of the respective lower blocks B1 as compared to the straight retaining wall. Such a movement of the anchor pins P effectively prevents the generation of an excessive gap between adjacent blocks, and allows the upper block B2 to be evenly aligned with the lower blocks B2 without being individually protruded or recessed, even for different radii of curvature of the convex retaining wall.

[0036] Referring to FIG. 8, at a junction of straight and curved sections of a retaining wall, similarly, the anchor pins P of the upper block B2 can move leftward or rightward in the corresponding through-passages 60 of the lower blocks B1 (as indicated by the arrows). Thus, there is no generation of an excessive gap between adjacent blocks and the adjacent blocks can construct an even retaining wall having an aesthetically pleasing appearance.

[0037] FIGS. 9 to 12 illustrate the staggered-stacking construction of dual-layer type retaining wall blocks, which is suitable to construct a visually grand retaining wall. In this kind of construction, two or four blocks are lifted at a time by use of equipment, achieving high construction efficiency,

[0038] A construction method for stacking dual-layer type retaining wall blocks in a staggered-stacking manner will now be explained. The dual-layer type retaining wall block takes the form of a block unit U formed by vertically overlapping two blocks and integrating the overlapped blocks by the use of the anchor pins P. Thereby, two blocks are transported and lifted at a time by use of a crane. The construction method comprises the steps of: vertically stacking at least two blocks one upon the other and integrating them by use of the anchor pins P to form a first plurality of block units U; lifting the first block units U one by one to arrange the plurality of first block units U on a concrete foundation C to form a first lower course of the first block units U; placing the reinforced-soil backfill 70 behind the first lower course of the first block units U; connecting the reinforcements 80 to the respective first

block units U to be placed on the reinforced-soil backfill 70 and then, compacting the reinforced-soil backfill 70; again stacking at least two blocks one upon the other and integrating them by use of the anchor pins P to form a plurality of second block units U; stacking the second block units U on the lower course of the first block units U so that the upper course of the second block units U are staggered to the lower course of the first block units U; placing the reinforced-soil backfill 70 behind the upper course of the second block units U; and connecting the reinforcements 80 to the respective second block units U to be placed on the reinforced-soil backfill 70 and then, compacting the reinforced-soil backfill 70. In accordance with the height of a desired retaining wall, the above described method can be repeatedly performed to form additional courses of the block units U.

[0039] In the construction method as shown in FIGS. 9 to 12, a drainage filter 100, made of non-woven fabric, is mounted behind a respective course of the block units U. The non-woven fabric drainage filter 100 serves to drain water contained in the reinforced soil backfill 70 via the front side of a retaining wall while preventing movement of the reinforced soil backfill 70 to the front side of the retaining wall.

[0040] The reinforcements, which are embedded in the reinforced soil backfill along with the block units, are a band type fabric reinforcement having a relatively narrow width (approximately 40 to 50mm). The Korean Patent Application Nos. 2004-29493 and 2004-111929, filed by the applicant of the present invention, disclose a detailed shape of the fabric reinforcement and a method for connecting the fabric reinforcement to a block, which are employed in the present invention. The disclosed band type fabric reinforcement is designed to be directly connected to a block without using a separate anchor, differently from conventional reinforcements. As shown in FIGS. 9 and 10, the band type fabric reinforcement 80 is inserted through the reinforcement insertion grooves 44 and 44' formed at the upper surface of the block unit U, so that the leading and trailing ends of the reinforcement 80 extend rearward from the block unit U to be placed on the reinforced soil backfill 70 by a relatively long length. Subsequently, an overlying course of the block units U are staggered onto the reinforcements 80.

[0041] The reinforcements 80 may be continuously connected to each other in a zigzag pattern as shown in the drawings, or may be independently connected to every block units U.

[0042] Of course, the block of the first embodiment can be used to construct various curved retaining walls having different radii of curvature as well as the straight retaining wall as shown in FIGS. 9 to 12.

[0043] FIGS. 13 to 15 illustrate the staggered-stacking construction of mono-layer type retaining wall blocks into multiple courses of the blocks B1 to B4. This kind of construction is well known in the art, and thus, no detailed description thereof is given.

[0044] Also, the coupling of the anchor pins and the

installation of the reinforcements in the staggered-stacking construction of mono-layer type retaining wall blocks as shown in FIGS. 13 to 15 are identical to those of FIGS. 9 to 12, and thus, no detailed description thereof is given.

[0045] FIGS. 16 and 17 illustrate the retaining wall which is constructed in a vertically-aligned stacking manner. FIG. 18 is a front perspective view illustrating the partial repair of the retaining wall of FIG. 16.

[0046] As shown in FIGS. 16 and 17, the retaining wall constructed in a vertically-aligned stacking manner has no interference between horizontally neighbouring blocks when the retaining wall confronts uneven subsidence of ground. Thus, the retaining wall is free from shear of blocks or distortion at the surface of the retaining wall, and can be repaired when part thereof is damaged by an external force. For example, if the block B3 of the retaining wall is damaged as shown in FIG. 18, blocks B4 above the damaged block B3 on the same column are separated one by one to remove the damaged block B3, and after that, new blocks are successively stacked to fill the column. This repair work can be performed without effecting the adjacent blocks and the reinforced soil backfill, resulting in a reduction in labour costs and repair time.

[0047] In the vertically-aligned stacking construction of blocks as shown in FIGS. 16 and 17, since the anchor pins P of a block are inserted into the pin insertion bores h of an underlying block differently from the above described staggered-stacking construction manners, the damaged block can be replaced by a new one without interference with adjacent blocks.

[0048] FIGS. 19 to 22 illustrate a block for use in the construction of a retaining wall in accordance with a second embodiment of the present invention. The block of the present embodiment has the substantially same structure as that of the first embodiment except for an outer appearance thereof. Now, the block of the present embodiment will be explained schematically.

[0049] Similar to the first embodiment, the block of the present embodiment includes: a front surface 10 to form an exposed face of a retaining wall; a rear surface 20 to come into contact with the reinforced soil backfill; left and right lateral surfaces 30 and 30' to come into partial contact with neighbouring blocks; an upper surface 40 having the pair of left and right reinforcement insertion grooves 44 for the insertion of a reinforcement or reinforcement connection anchor; and a lower surface 50 opposite to the upper surface 40. A pair of left and right anchor pin insertion bores h are vertically perforated from the upper surface 40 to the lower surface 50 at left and right ends of the upper and lower surfaces 40 and 50. The anchor pin P is inserted through a respective one of the anchor pin insertion bores h to connect vertically neighbouring blocks to each other. A pair of left and right substantially rectangular through-passages 60 extend vertically from the upper surface 40 to the lower surface 50 of the block so that they are laterally spaced apart from each other by interposing a partition 62. When blocks are stacked one upon the other in a staggered-stacking manner, the

anchor pin P, inserted through the left anchor pin insertion bore h of the block, is inserted into the right through-passage 60 of an underlying left block, and the anchor pin P, inserted through the right anchor pin insertion bore h of the block, is inserted into the left through-passage 60 of an underlying right block. The left and right reinforcement insertion grooves 44 are located at opposite ends of the through-passages 60 so that the leading end of a reinforcement 80 is directly fitted through the insertion grooves 44. Each of the reinforcement insertion grooves 44 has the trailing end ending at the rear surface 20 of the block and the leading end ending at a front end of an associated one of the through-passages 60. The auxiliary reinforcement insertion groove 44' is formed at the upper surface 40 of the block along the front end of the partition 62 between the through-passages 60. With this configuration, a single reinforcement 80 is fitted from one of the insertion grooves 44 to the other insertion groove 44 so that the middle portion of the reinforcement 80 is fitted in the auxiliary reinforcement insertion groove 44'. After being completely fitted, the leading and trailing ends of the reinforcement 80 extend rearward from the rear surface 20 of the block B.

[0050] According to the present embodiment, a pair of laterally protruding wings 34 and 34' are formed at rear ends of both the lateral surfaces 30 and 30' of the block. The wings 34 and 34' have cutting slots 35 and 35' formed at their rear corners connected to the rear surface 20 of the block, respectively. Thereby, when blocks are stacked one upon the other to construct a curved convex retaining wall, as shown in FIG. 24, the wings 34 and 34' can be cut away along the cutting slots 35 and 35' so that the lateral surfaces 30 and 30' of horizontally neighbouring blocks come into close contact with each other.

[0051] The block of the present embodiment further includes a pair of second through-passages 60', which are symmetrically formed at opposite rear locations, to reduce the weight of the block.

[0052] FIGS. 23 to 26 are views corresponding to FIGS. 5 to 8 of the above-described first embodiment. As will be easily understood from FIGS. 23 to 26, similar to the first embodiment, the block of the second embodiment can be evenly stacked to form a straight retaining wall or curved convex or concave retaining wall without causing an excessive gap between adjacent blocks or between straight and curves sections of the retaining wall while preventing the blocks from being individually protruded or recessed. Thus, no detailed description thereof is given.

[0053] FIGS. 27 to 30 are views illustrating the staggered-stacking construction of dual-layer type retaining wall blocks in accordance with the second embodiment of the present invention as shown in FIGS. 19 to 22 for the first embodiment. FIGS. 31 to 33 are views illustrating the staggered-stacking construction of mono-layer type retaining wall blocks in accordance with the second embodiment of the present invention. These drawings show that the block of the second embodiment can take the

form of a mono-layer or dual-layer block unit and can be vertically staggered in the same manner as the block of the first embodiment.

[0054] FIGS. 34 and 35 illustrate the retaining wall which is constructed in a vertically-aligned stacking manner by the use of the block in accordance with the second embodiment of the present invention. FIG. 36 is a view illustrating the partial repair of the retaining wall shown in FIG. 34. These drawings show that the block of the second embodiment enables blocks to be vertically aligned and be partially repaired in the same manner as the block of the first embodiment.

[0055] The block in accordance with the second embodiment of the present invention is identical to that of the first embodiment in the coupling of vertically neighbouring blocks by the use of the anchor pins and the connecting structure and method of the reinforcements except for the outer appearance thereof, and thus, no detailed description thereof is given.

Industrial Applicability

[0056] As apparent from the above description, the present invention provides a block for use in the construction of a retaining wall having the following several advantages.

[0057] Firstly, the block of the present invention can be stacked in a convenient manner by the use of equipment instead of a labour-intensive manner, thereby resulting in a considerable reduction in extensive mobilization of manpower.

[0058] Secondly, since a mono-layer, dual-layer, or multiple-layer blocks can be evenly stacked one upon the other and side-by-side in a staggered-stacking manner or in a vertically-aligned stacking manner, it is possible to achieve various retaining wall patterns.

[0059] Thirdly, since a reinforcement can be maintained in a stable manner in insertion grooves formed at the block in a folded state, it is possible to prevent the reinforcement from protruding from above or in front of the block or from being relaxed. This completely eliminates the swell of the retaining wall, enabling the construction of high-quality retaining walls.

[0060] Fourthly, when blocks are stacked to be vertically aligned, the block exhibits high resistance against uneven subsidence of ground, and allows for easy partial repair of damaged block(s) without interference with adjacent blocks and reinforced soil backfill behind thereof.

[0061] Fifthly, according to the present invention, in association with the construction of a straight or curved retaining wall, it is possible to prevent the generation of an excessive gap between vertically or horizontally adjacent blocks and to prevent the blocks from being individually protruded or recessed from the exposed side of the retaining wall, thereby enabling the construction of a visually stable retaining wall.

[0062] Sixthly, anchor pins, inserted through a block, are adapted to come into close contact with front ends

of through-passages of underlying blocks. This has the effect of preventing the sliding or overturning of the blocks made by the earth pressure of reinforced-soil backfill after completing the construction of the retaining wall. Also, the present invention has the effect of continuously maintaining the blocks in a much more stable state during construction. Thus, the block of the present invention is much safer to use.

[0063] Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope of the invention as disclosed in the accompanying claims.

Claims

1. A block for constructing a reinforced soil segmental retaining wall, comprising:

a front surface (10) to form an exposed face of a retaining wall; a rear surface (20) to come into contact with reinforced soil backfill;

left and right lateral surfaces (30 and 30') to come into at least partial contact with neighbouring blocks;

an upper surface (40) having a pair of left and right reinforcement insertion grooves (44) for the insertion of a reinforcement or reinforcement connection anchor;

a lower surface (50) opposite to the upper surface (40); and

a pair of left and right anchor pin insertion bores (h) extending vertically through the block from the upper surface (40) to the lower surface (50) at left and right ends of the upper and lower surfaces (40 and 50) so that anchor pins (P) can be inserted through the respective anchor pin insertion bores (h) to connect the block to a vertically adjacent block;

wherein a pair of left and right substantially rectangular through-passages (60) extend vertically from the upper surface (40) to the lower surface (50) of the block so that, when the block is stacked on top of other blocks in a staggered-stacking manner, an anchor pin (P), inserted through the left anchor pin insertion bore (h) of the block, can be inserted into the right through-passage (60) of an underlying block, and an anchor pin (P), inserted through the right anchor pin insertion bore (h) of the block, is inserted into the left through-passage (60) of an underlying block,

wherein the left and right reinforcement insertion grooves (44) are located at opposite sides of the through-passages (60) so that a leading end of the reinforcement (80) is directly fitted through

the insertion grooves (44), each of the reinforcement insertion grooves (44) having a trailing end ending at the rear surface (20) of the block and a leading end ending at a front end of an associated one of the through-passages (60).

2. The block as set forth in claim 1, wherein the pair of through-passages (60) are horizontally spaced apart from each other by interposing a partition (62); an auxiliary reinforcement insertion groove (44') is formed at the upper surface (40) of the block along a front end of the partition (62) between the through-passages (60); and the single reinforcement (80) is fitted from one of the insertion grooves (44) to the other insertion groove (44) so that the middle portion of the reinforcement (80) is fitted in the auxiliary reinforcement insertion groove (44') and the leading and trailing ends of the reinforcement extend rearward from the rear surface of the block.
3. The block as set forth in claim 1 or claim 2, wherein the upper surface (40) of the block is partially recessed at centre, left and right locations thereof to form external-force absorption recesses (46, 48, and 48').
4. The block as set forth in claim 3, wherein the external-force absorption recess (46), which is formed at the centre location of the upper surface (40), is opened to the outside from the rear surface (20) of the block.
5. The block as set forth in claim 4, wherein the external-force absorption recess (46), which is formed at the centre location of the upper surface (40), has a supporting protrusion (42) at the centre of the rear side thereof so that the supporting protrusion (42) is level with the upper surface (40) of the block, the supporting protrusion (42) being located so as not to come into contact with a lower surface (50) of an overlying block when blocks are stacked one upon the other to construct a straight or curved retaining wall.
6. The block as set forth in any preceding claim, wherein each of the anchor pin insertion bores (h) includes: an upper expanded portion (h1) having a diameter and a lower reduced portion (h2) having a diameter that is smaller than the diameter of the upper expanded portion.
7. The block as set forth in claim 6, wherein a tapered portion (h3) is provided between the expanded portion (h1) and the reduced portion (h2).
8. The block as set forth in any preceding claim, where-

in the left and right reinforcement insertion grooves (44) extend forward from the rear surface (20) of the block to the centre of the block by passing through the through-passages (60) while drawing a gentle curve.

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9. The block as set forth in any preceding claim, wherein a pair of laterally protruding wings (34, and 34') are formed at rear ends of both the lateral surfaces (30 and 30') of the block, the wings (34 and 34') having cutting slots (35 and 35') formed at their rear corners connected to the rear surface (20) of the block, respectively.

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FIG. 1

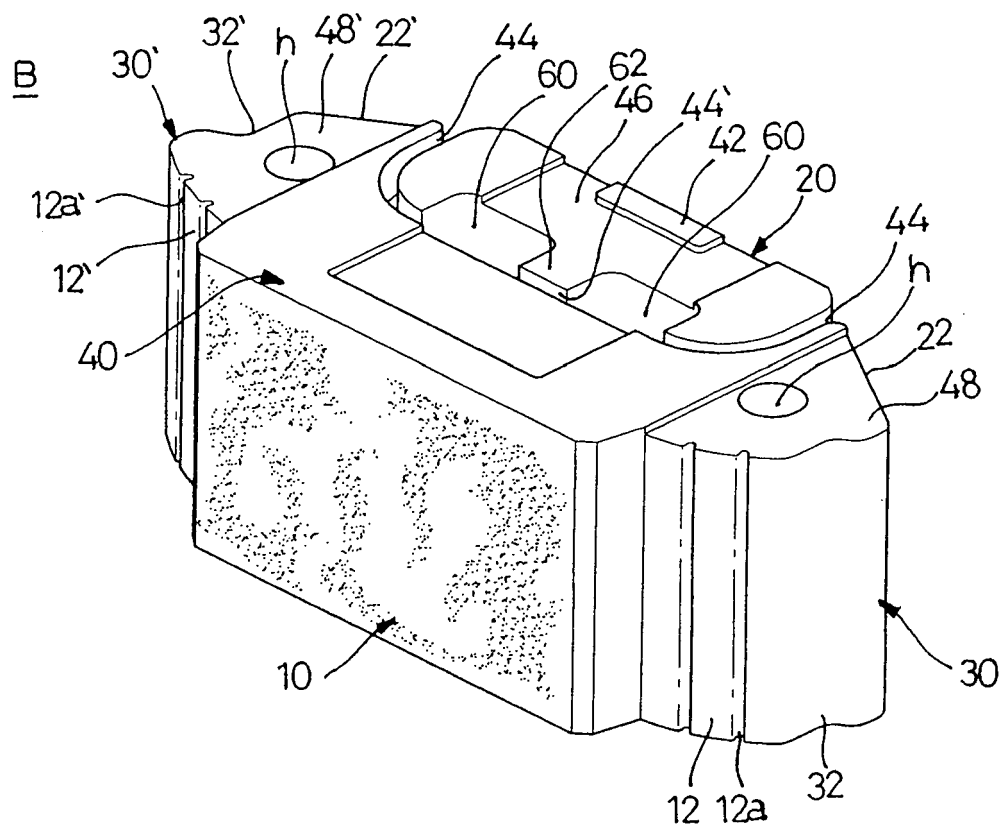


FIG. 2

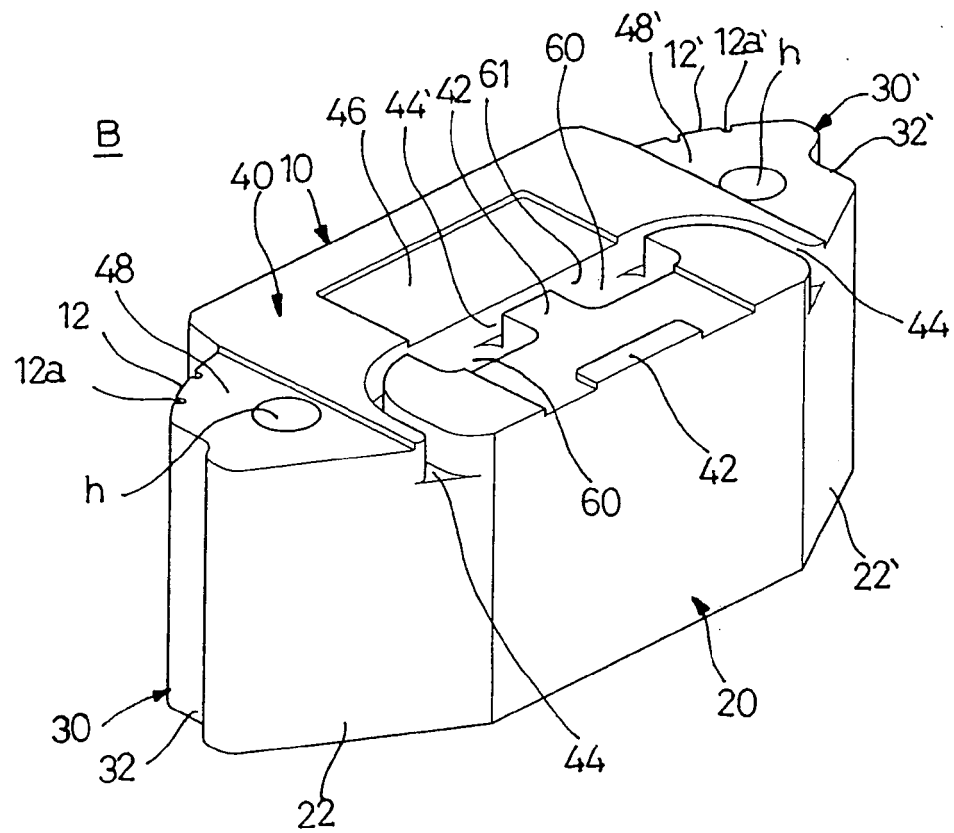


FIG. 3

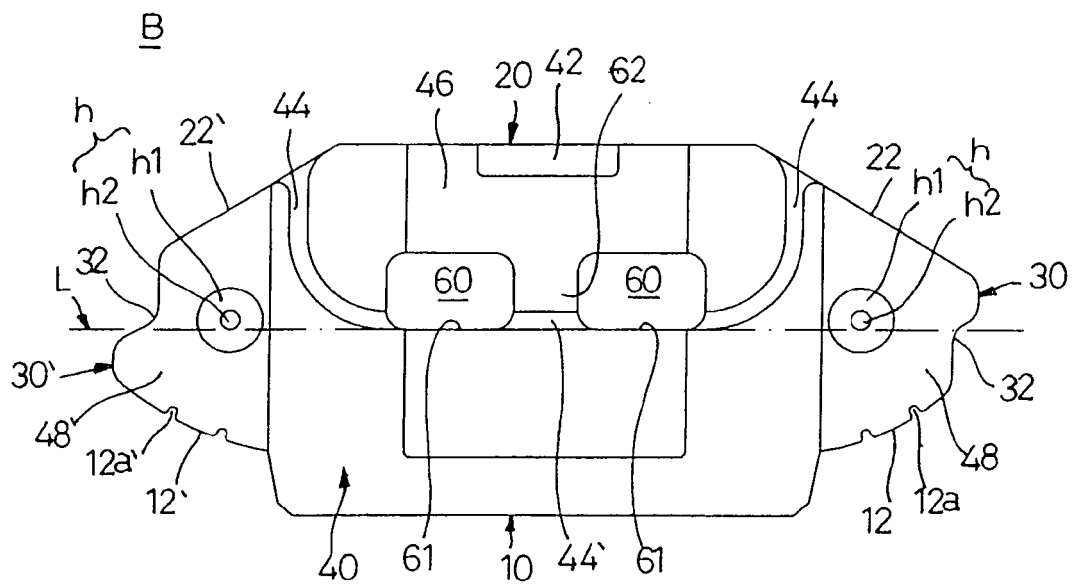


FIG. 4

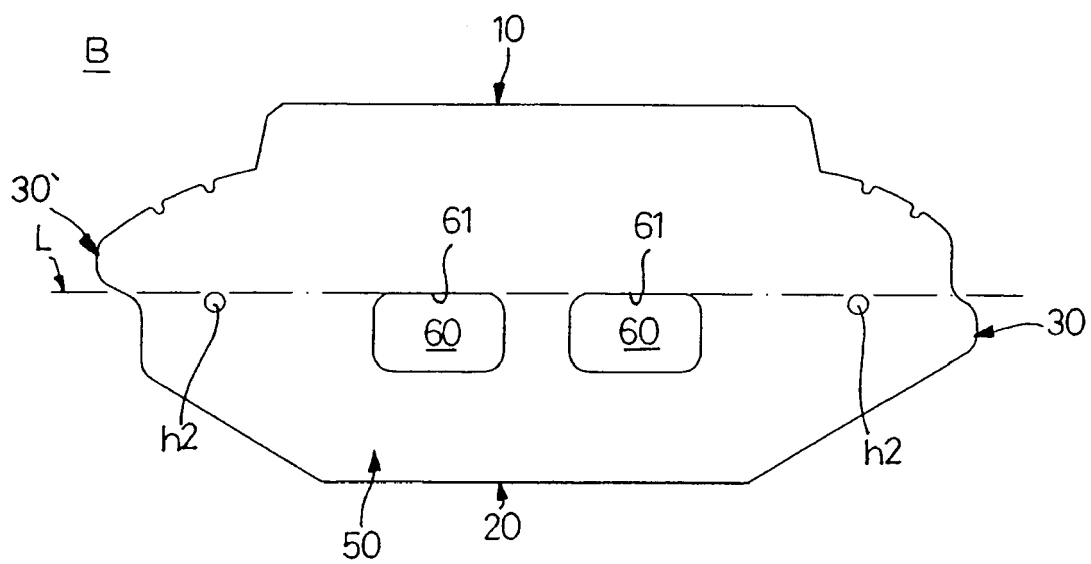


FIG. 5

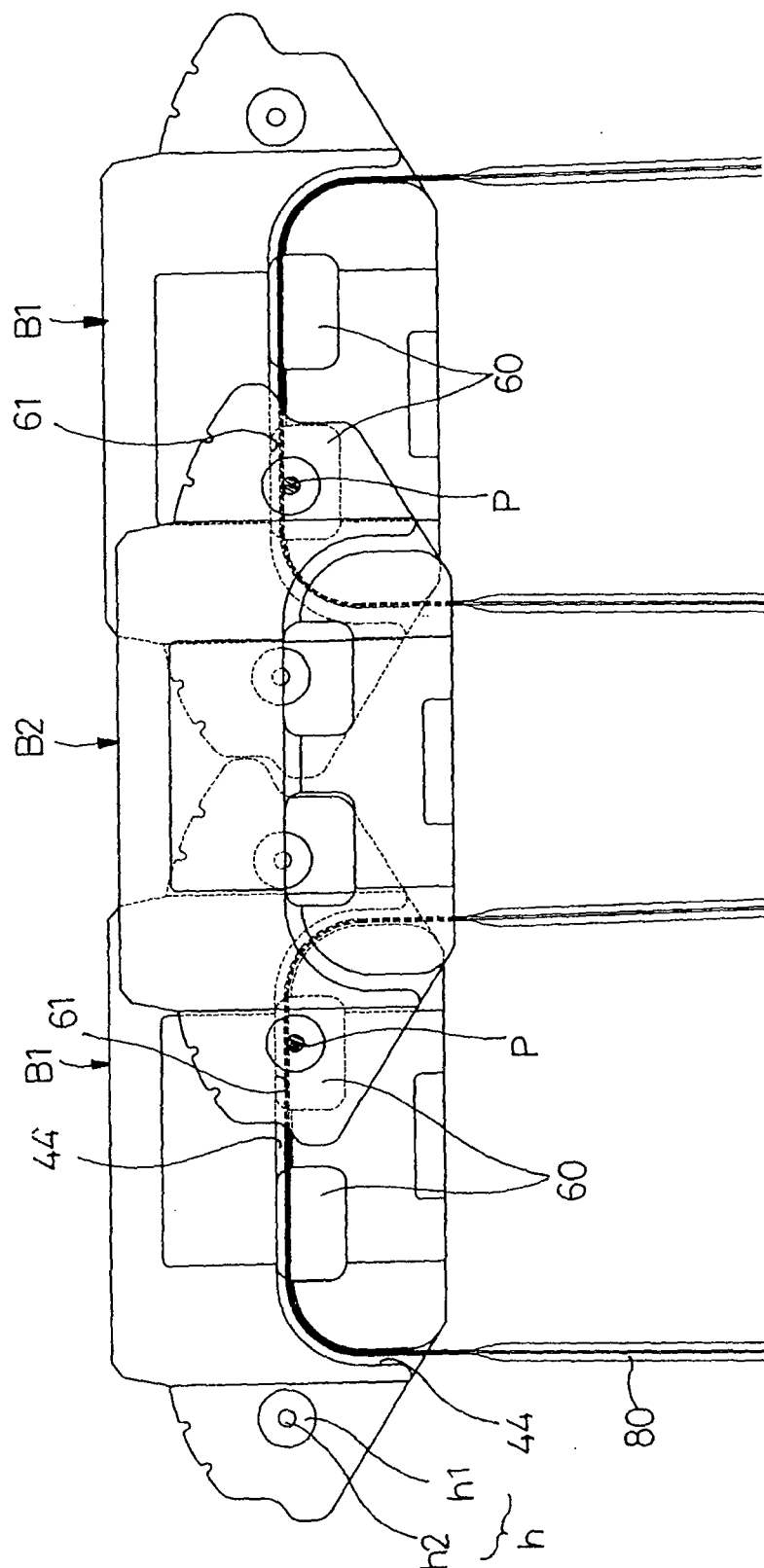


FIG. 6

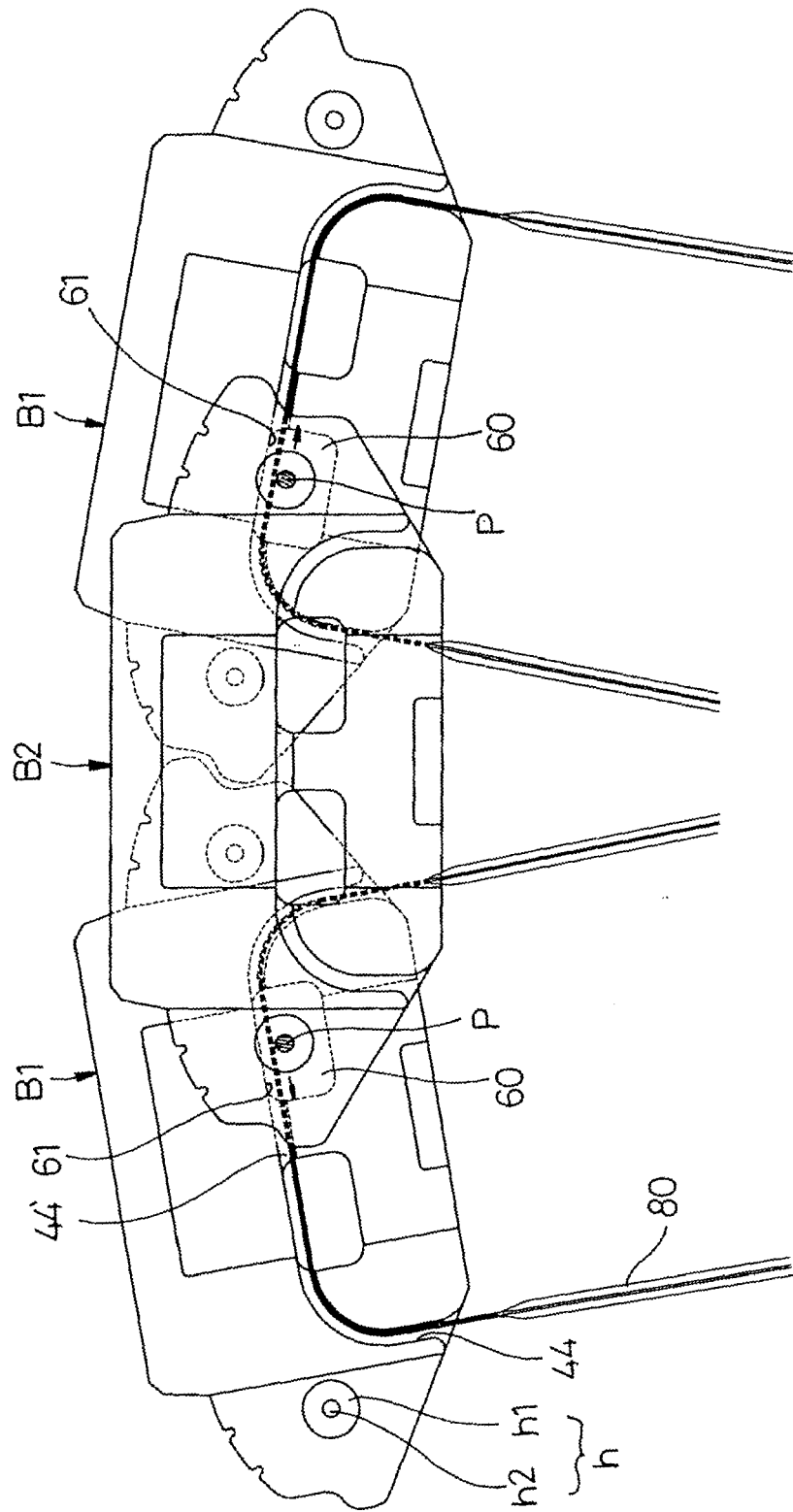


FIG. 7

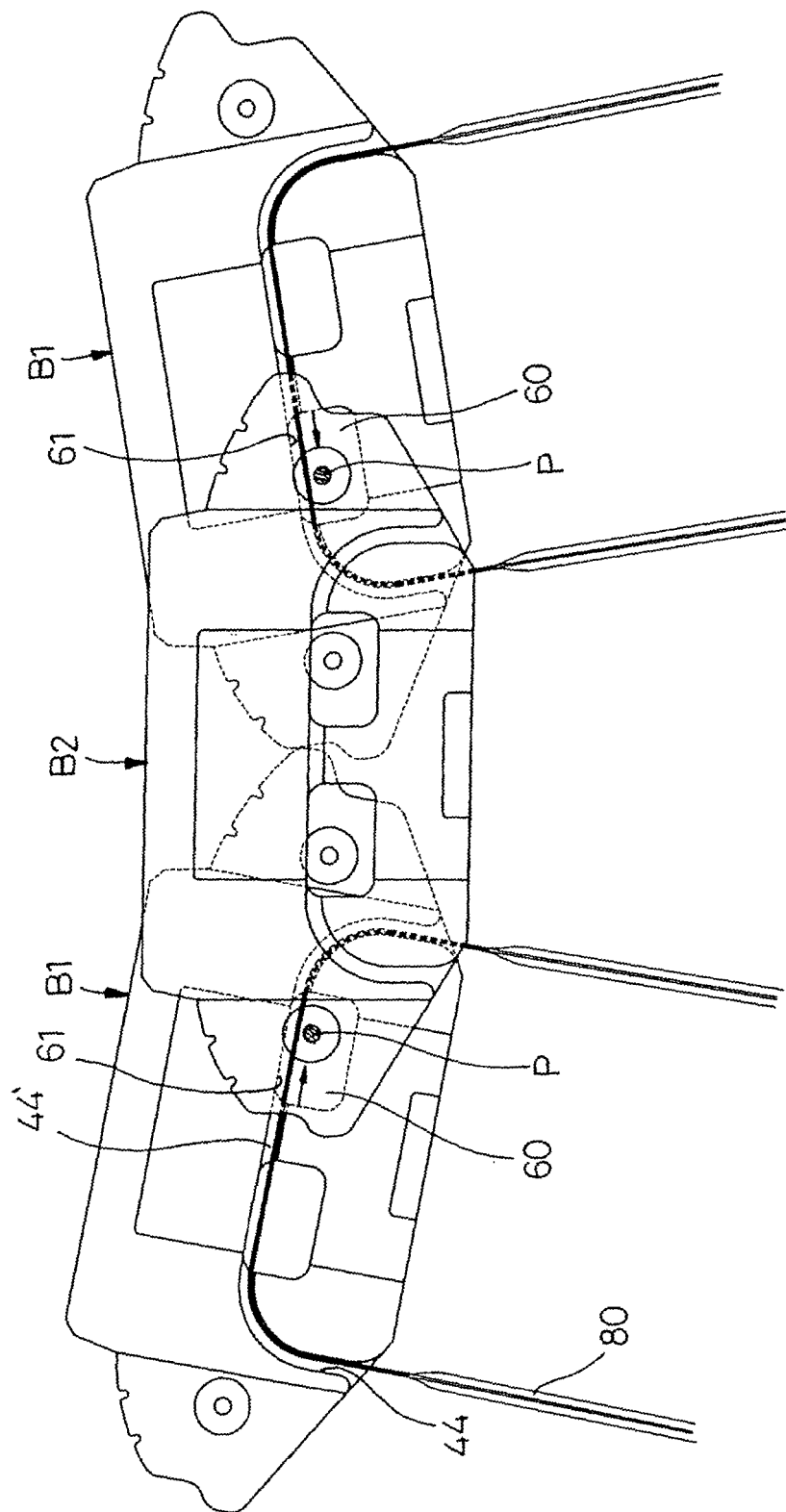


FIG. 8

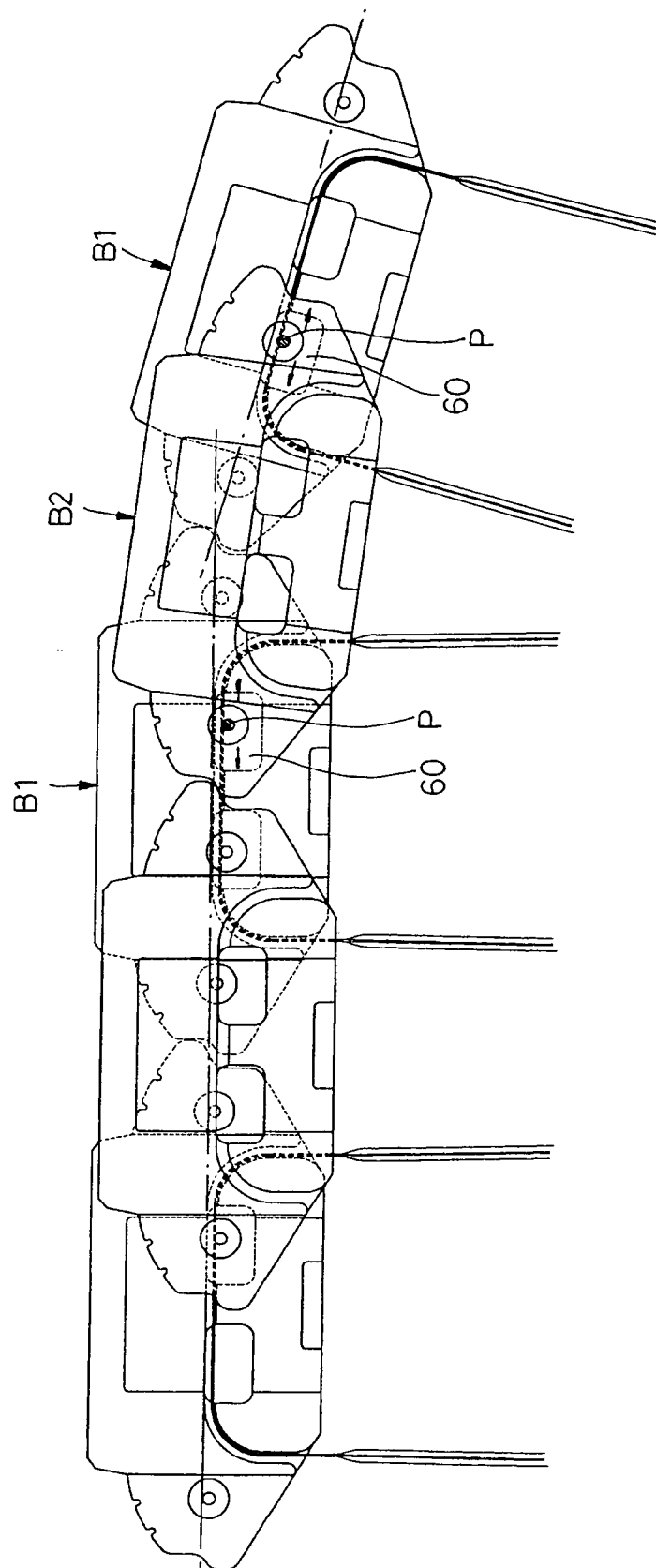


FIG. 9

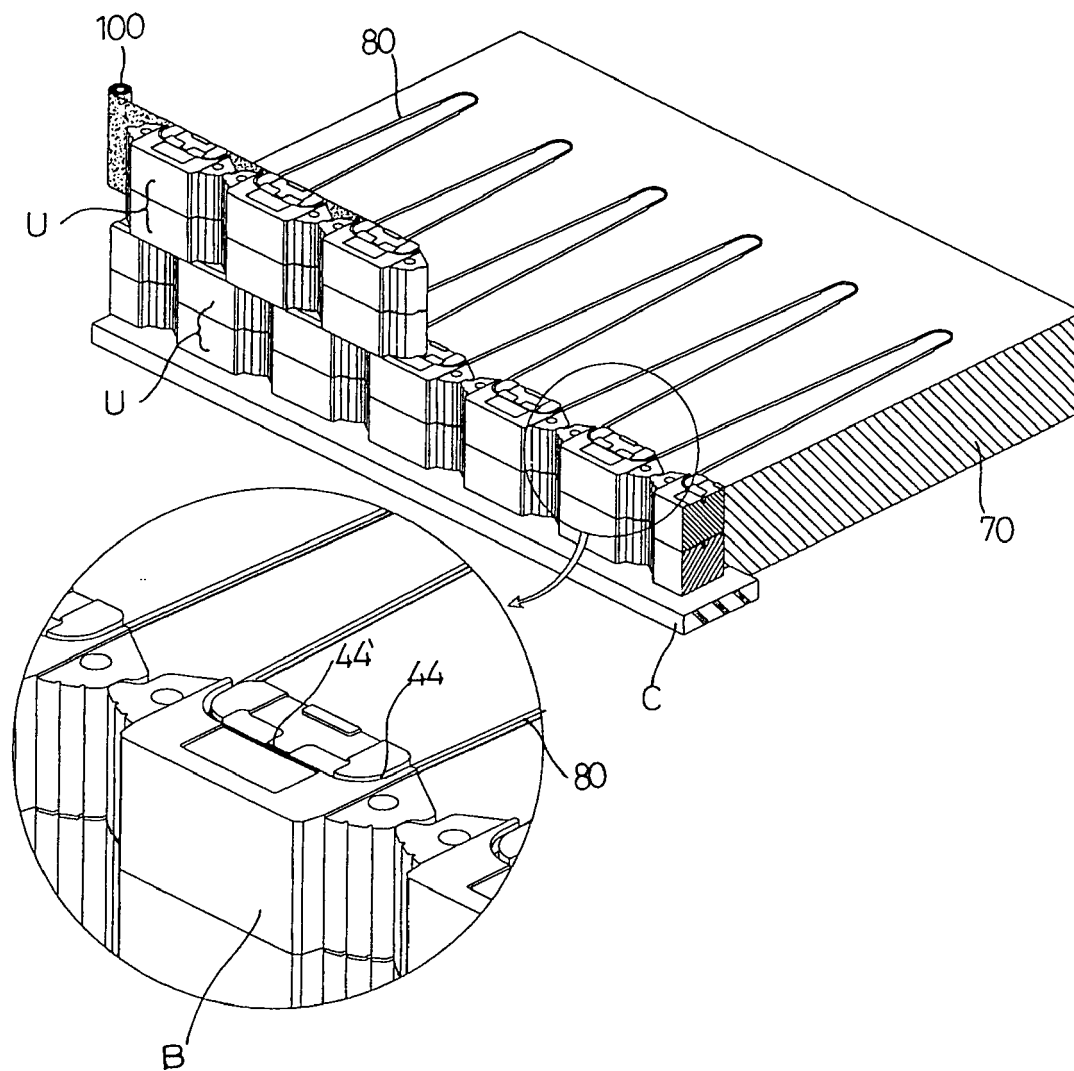


FIG. 10

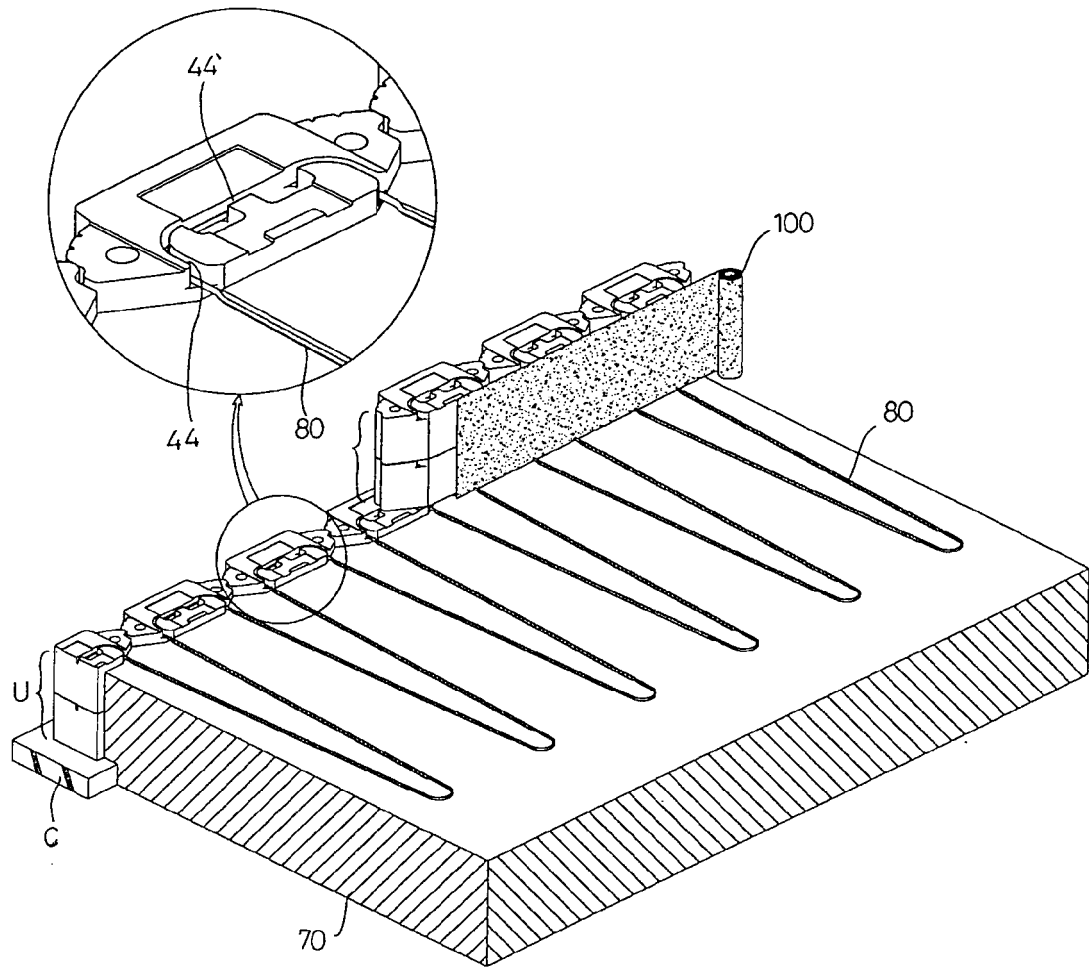


FIG. 11

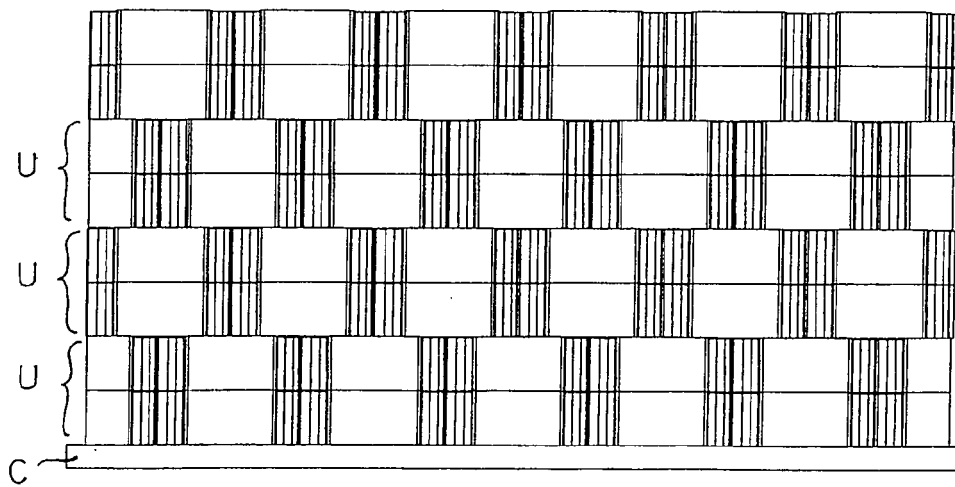


FIG. 12

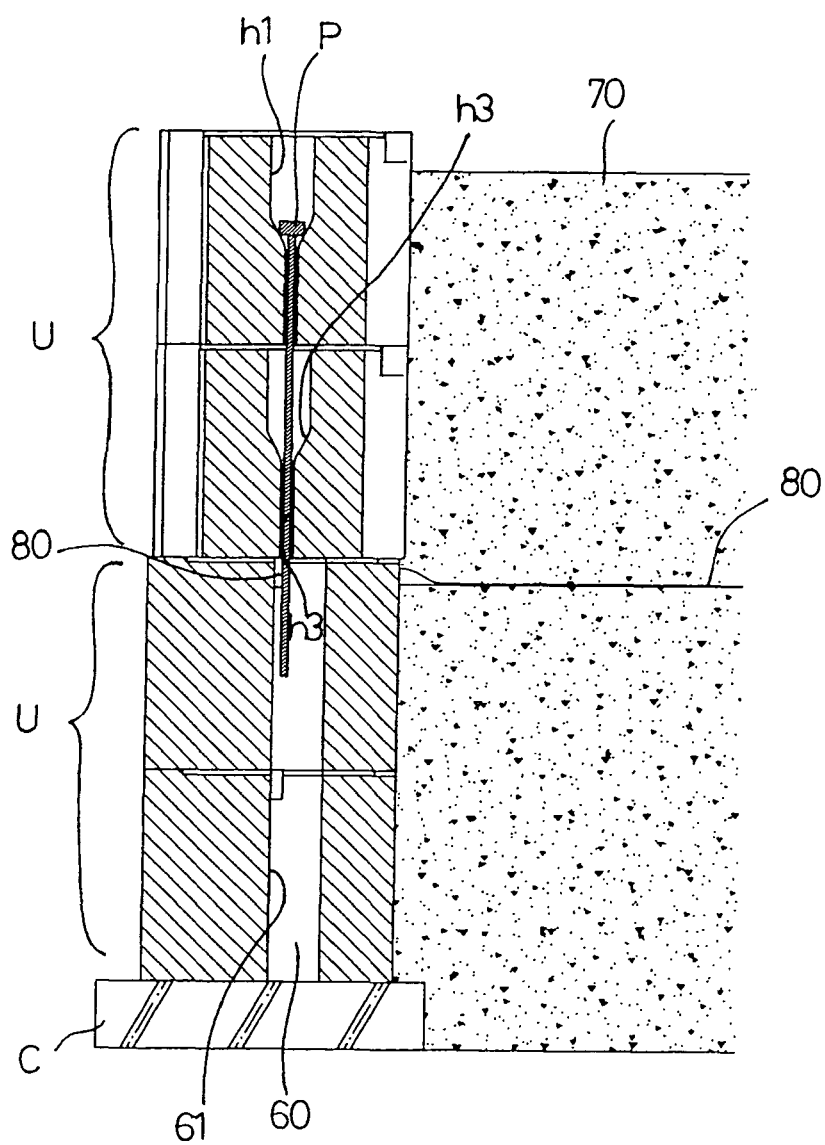


FIG. 13

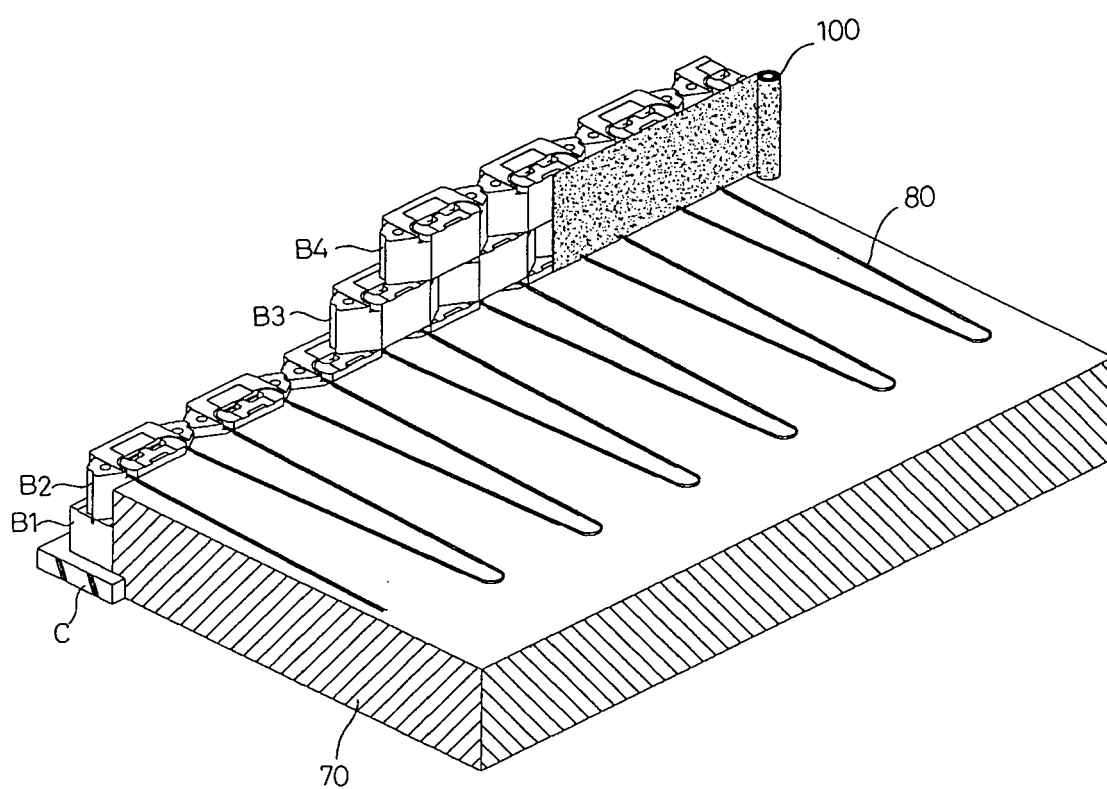


FIG. 14

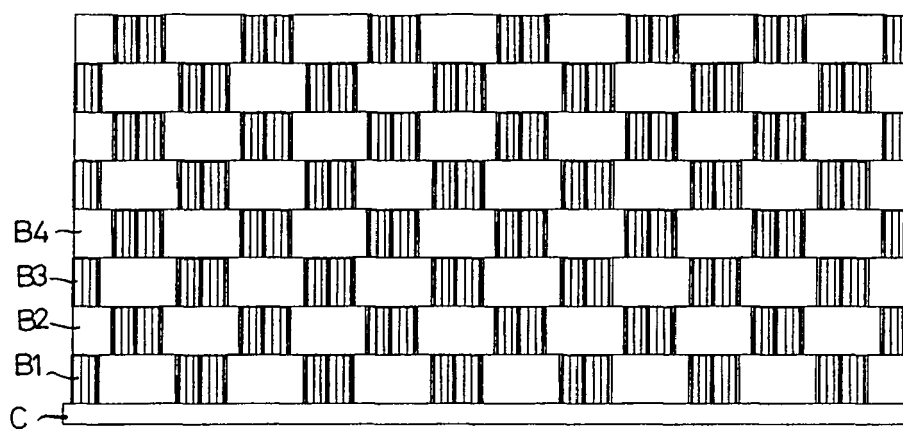


FIG. 15

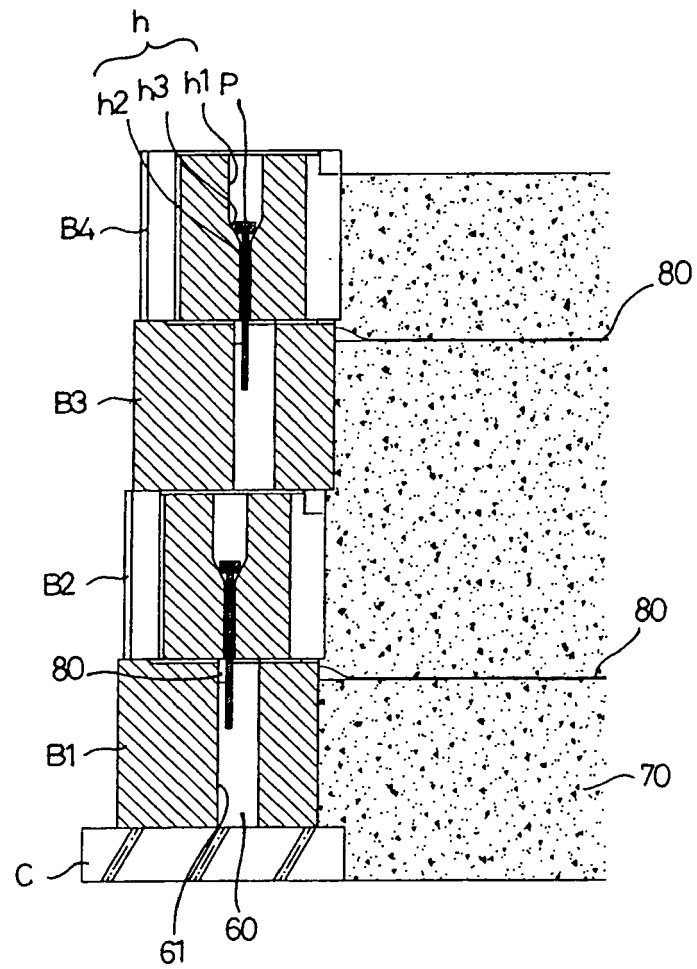


FIG. 16

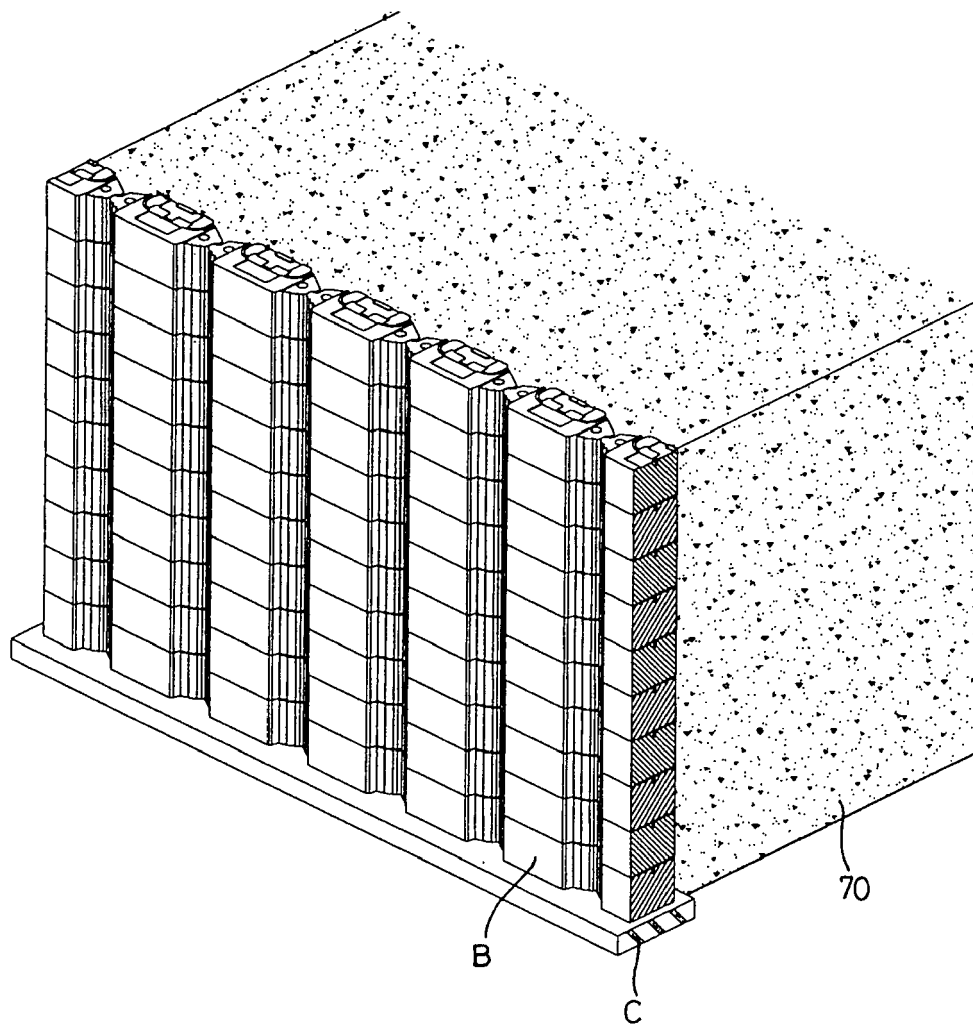


FIG. 17

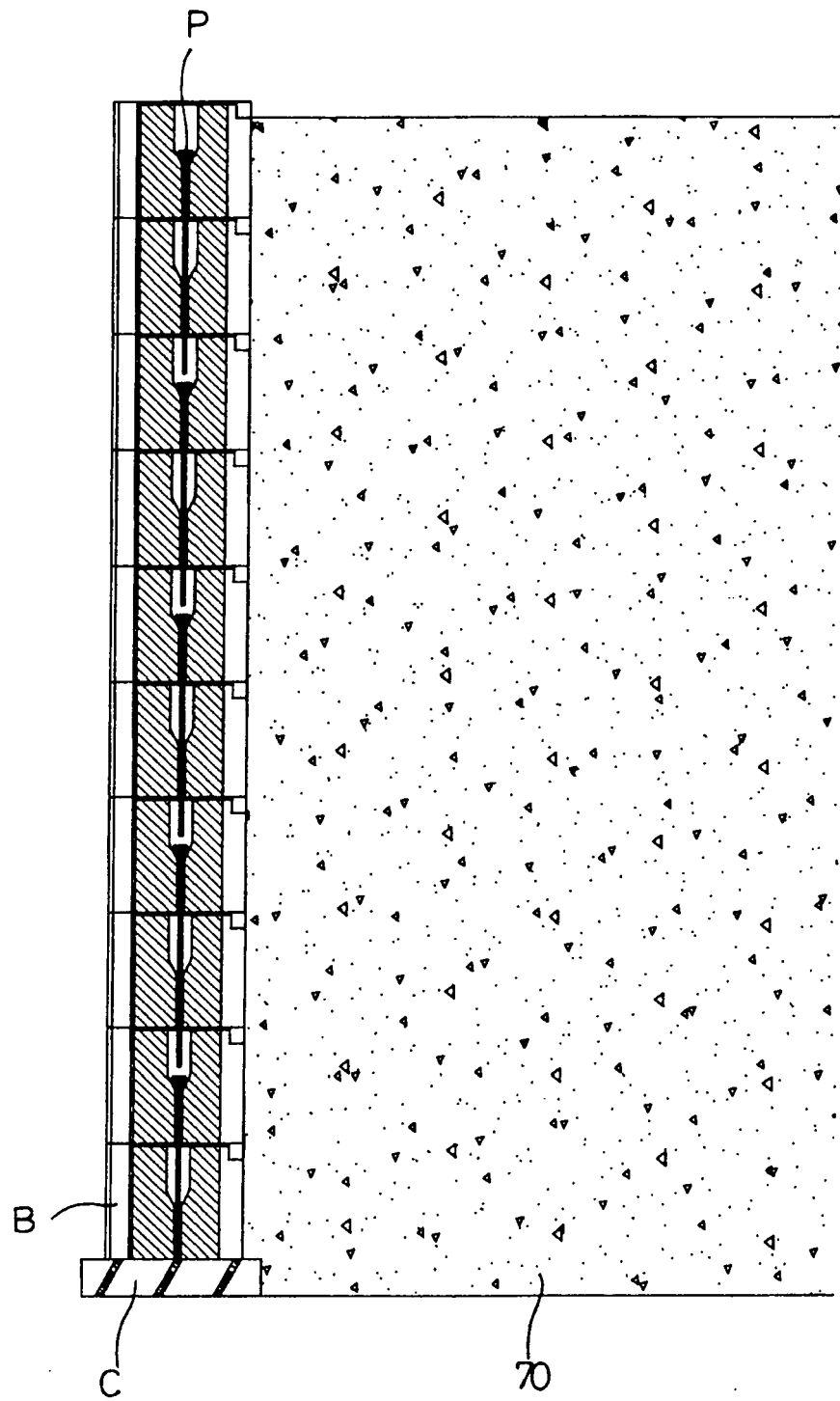


FIG. 18

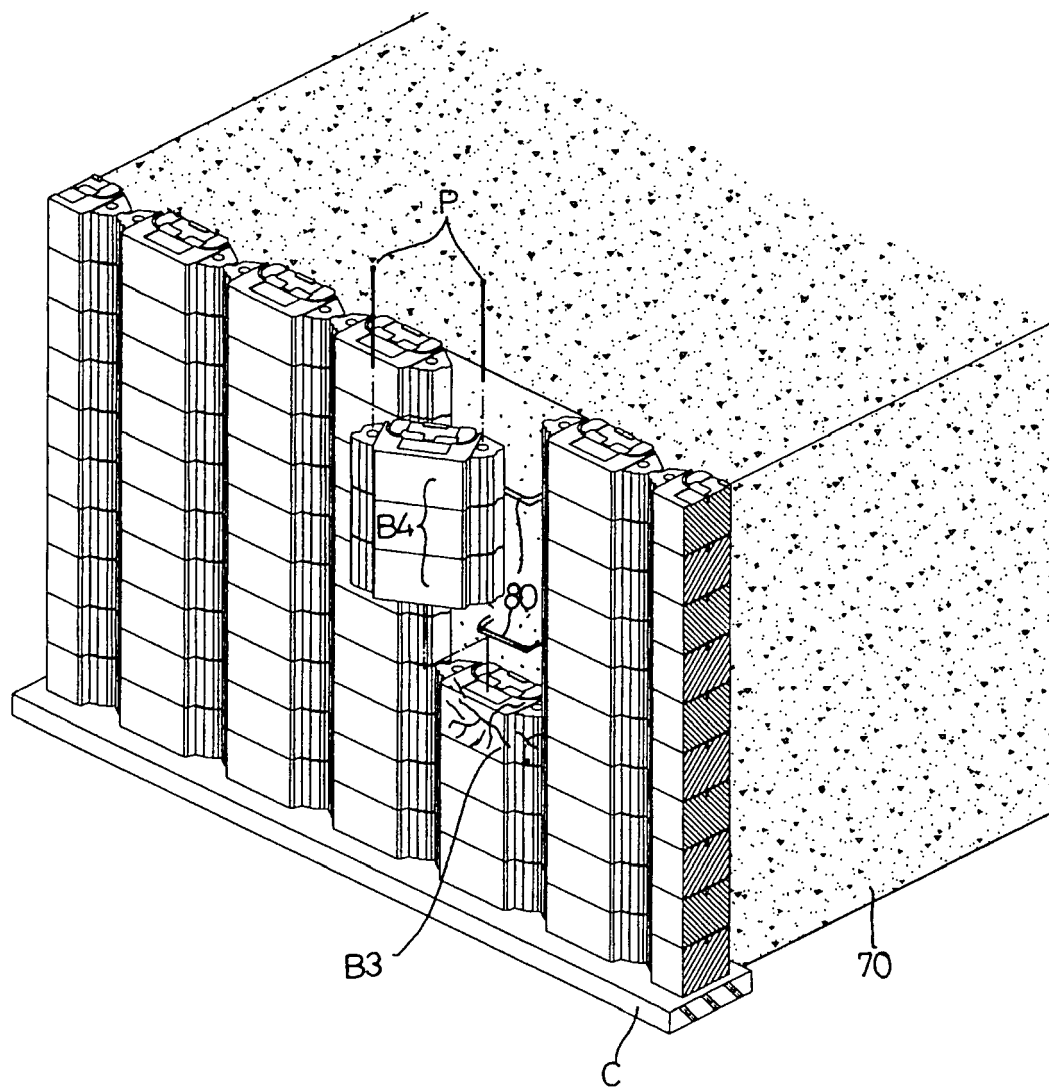


FIG. 19

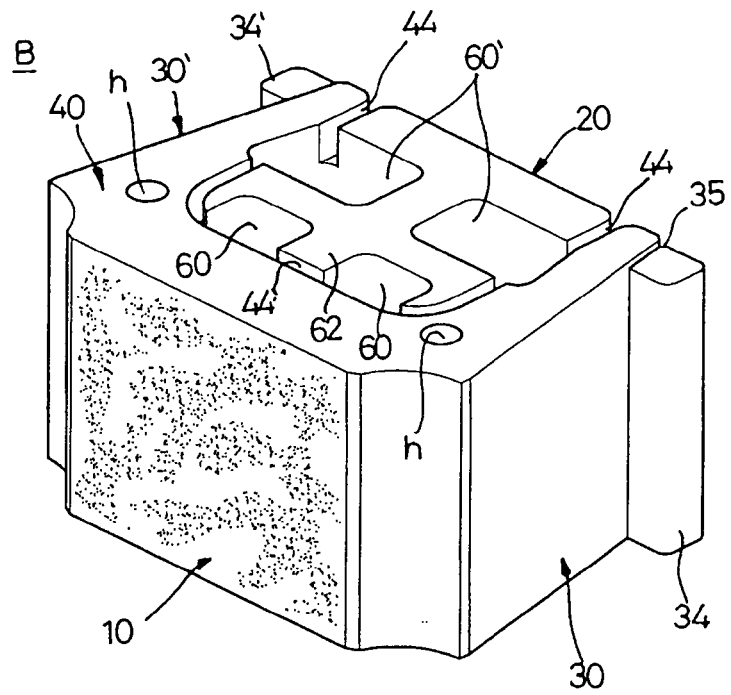


FIG. 20

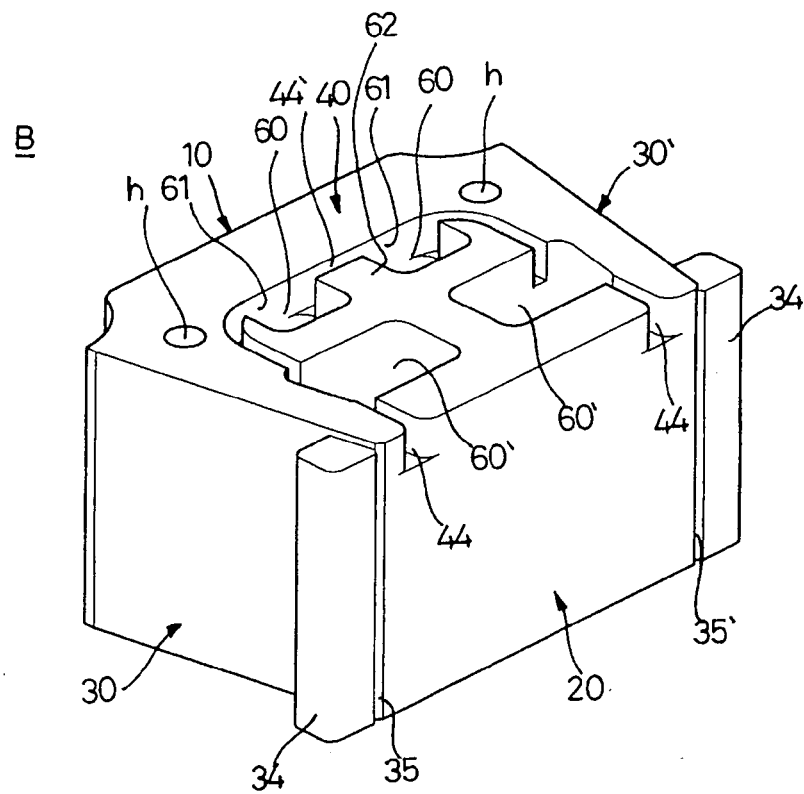


FIG. 21

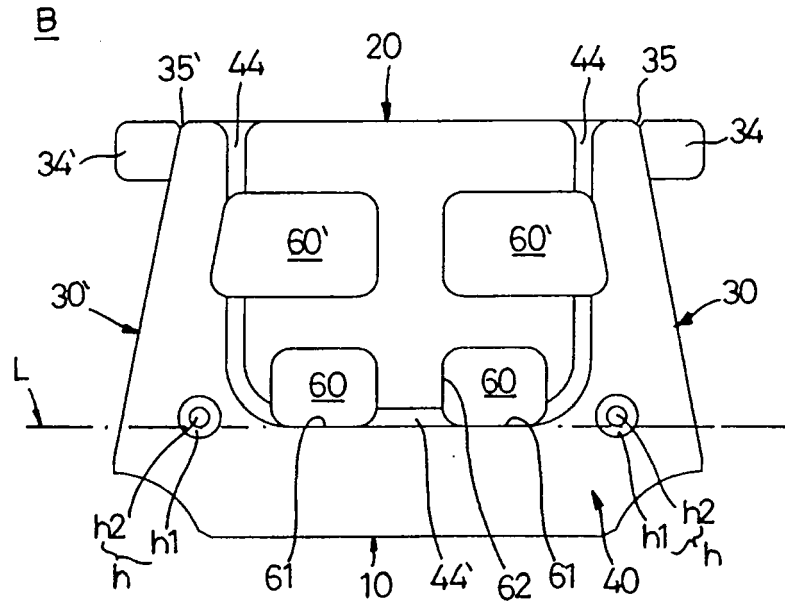


FIG. 22

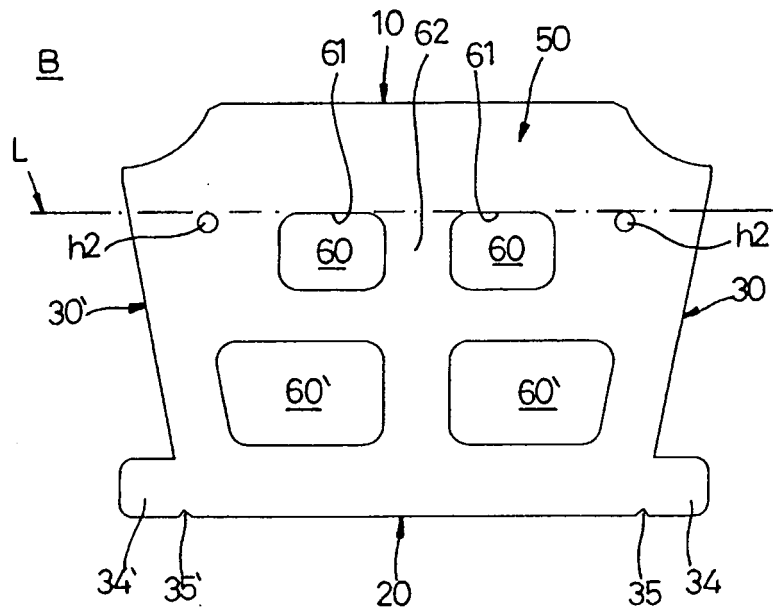


FIG. 23

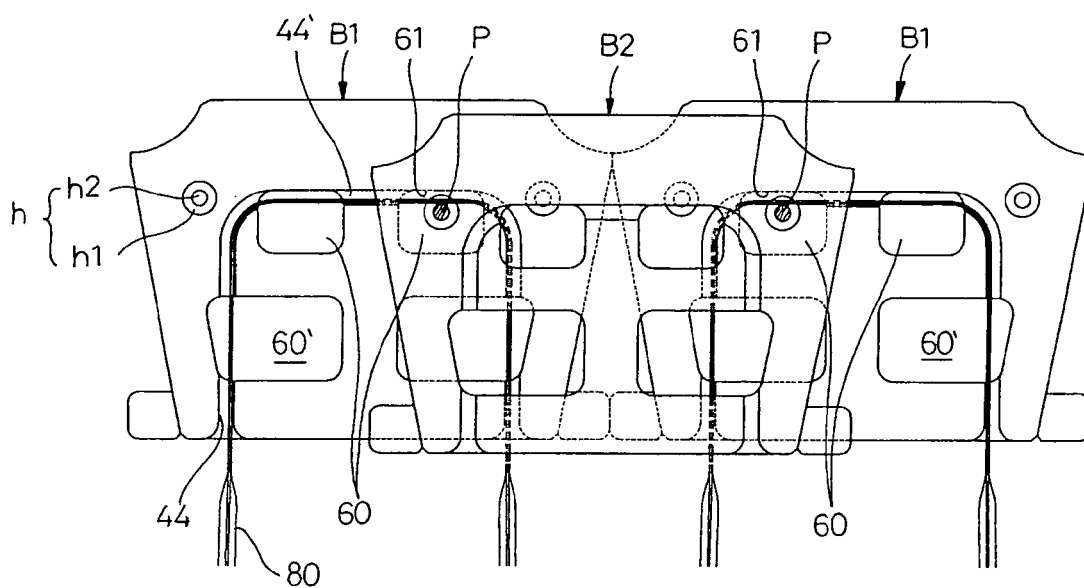


FIG. 24

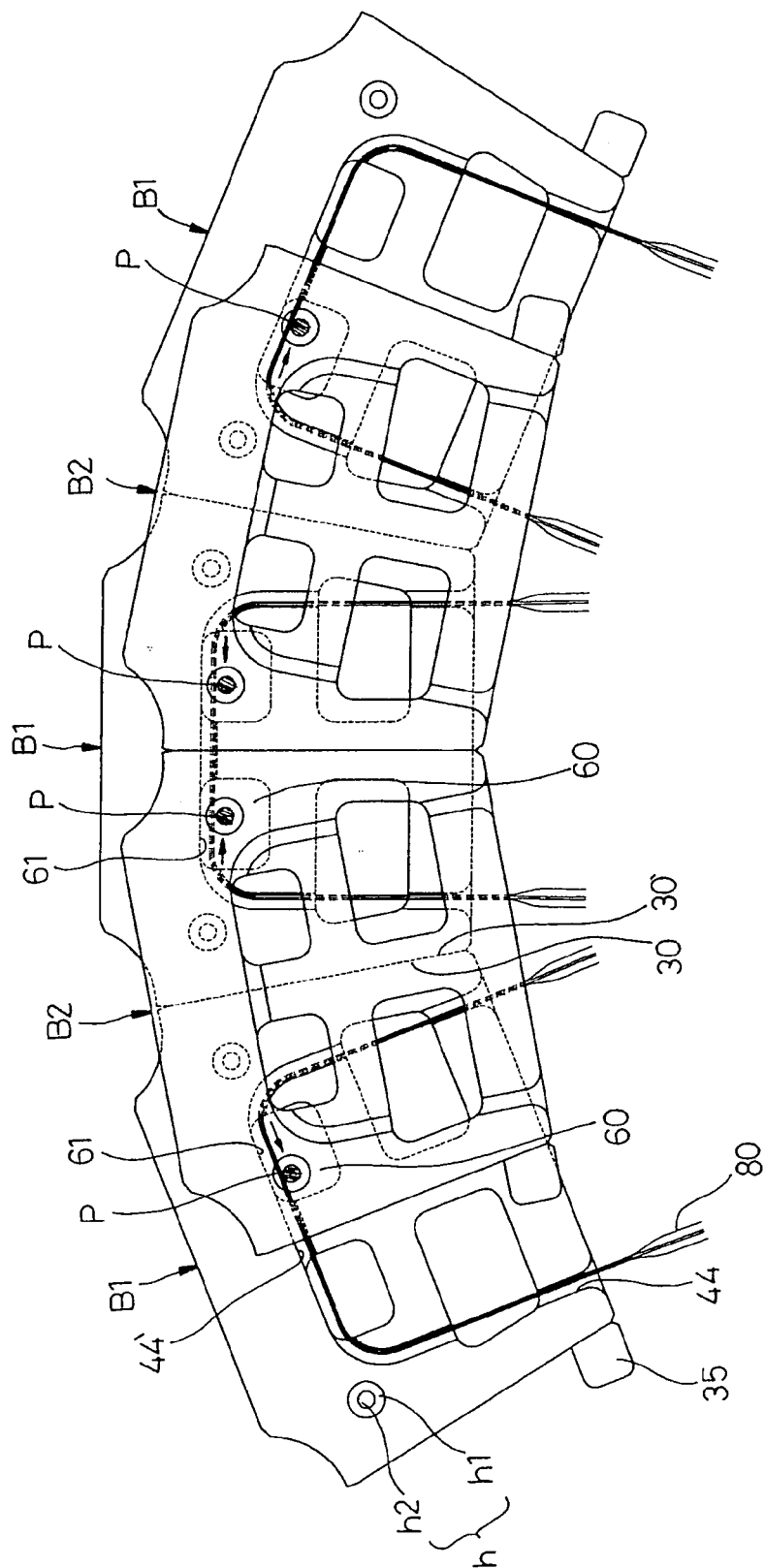


FIG. 25

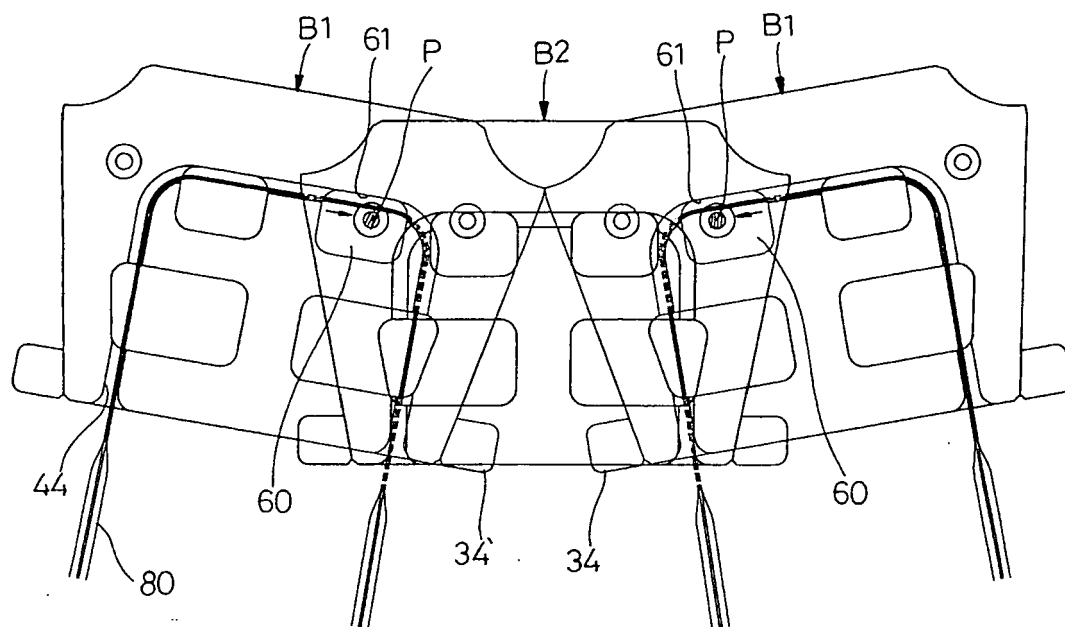


FIG. 26

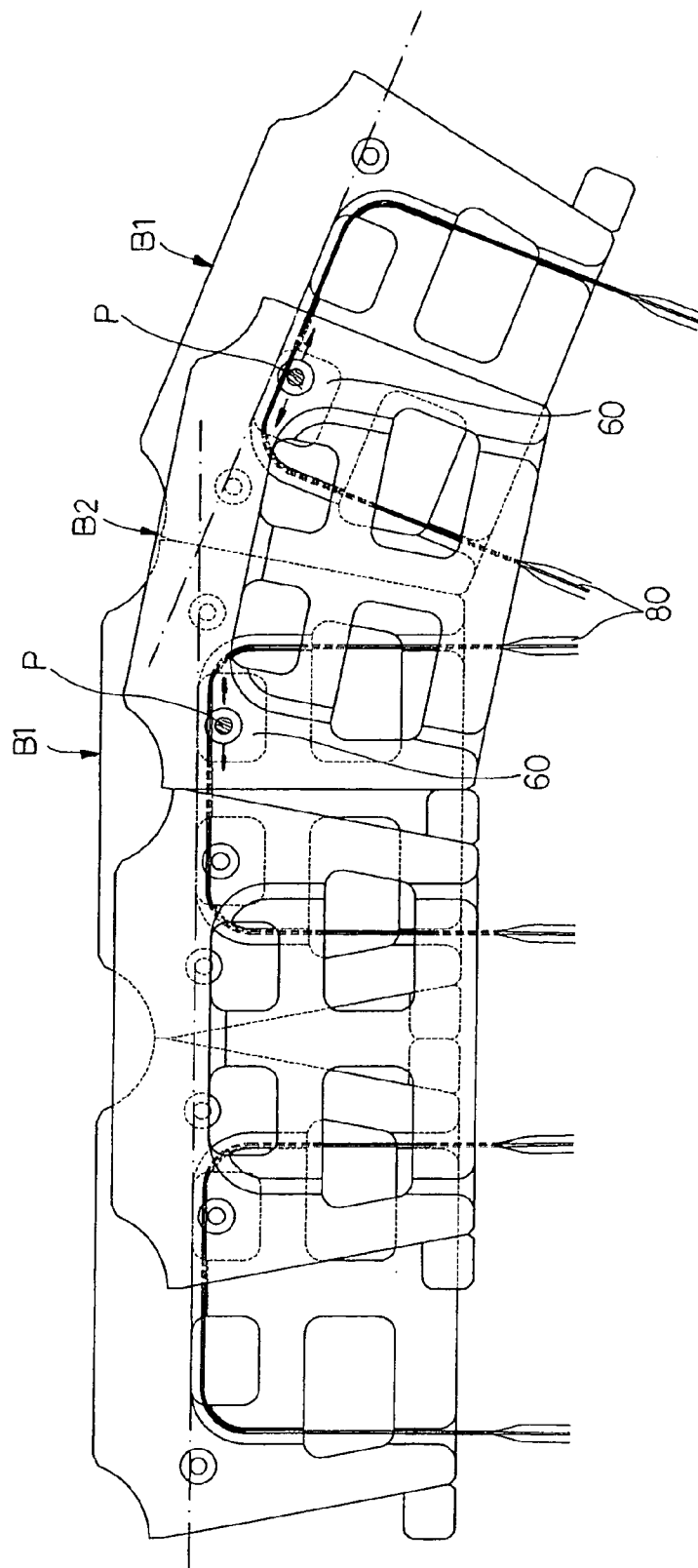


FIG. 27

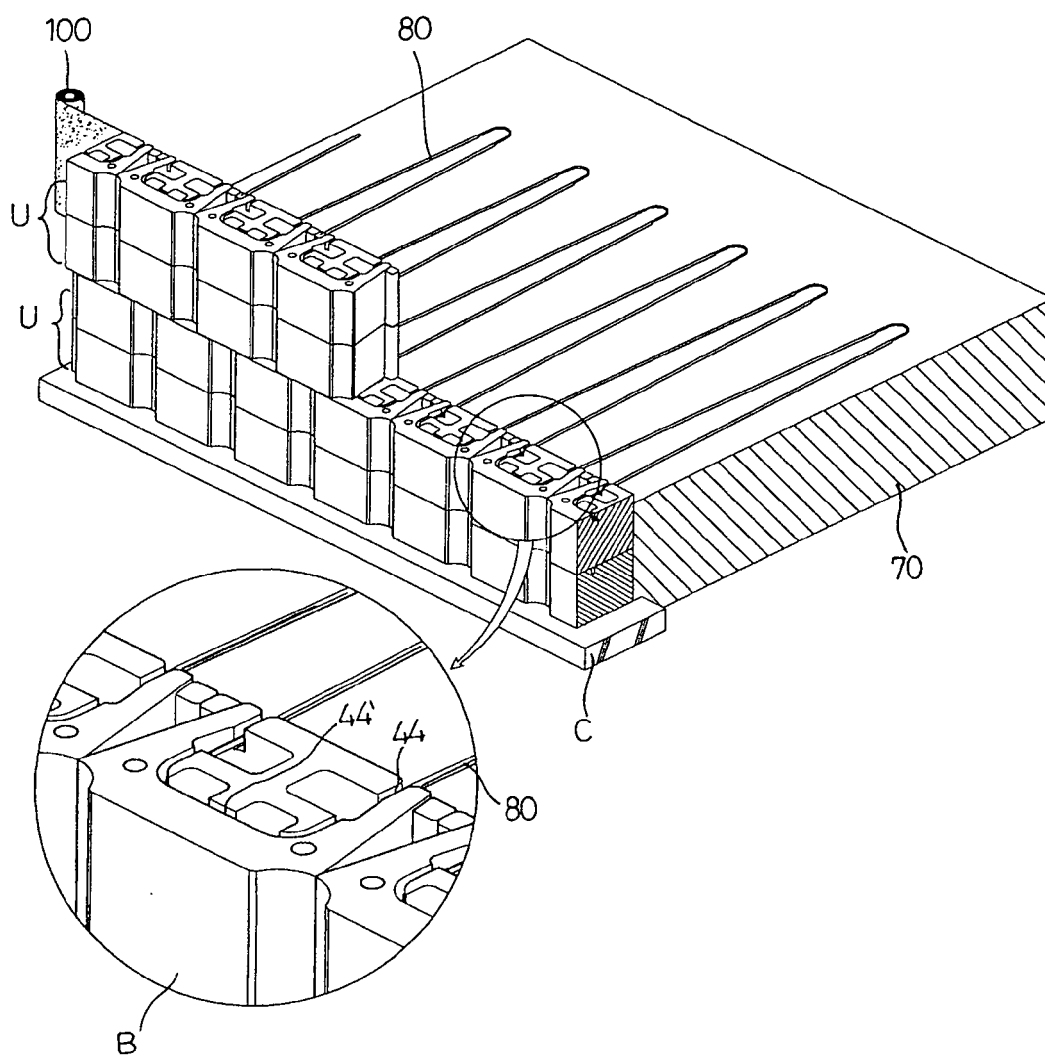


FIG. 28

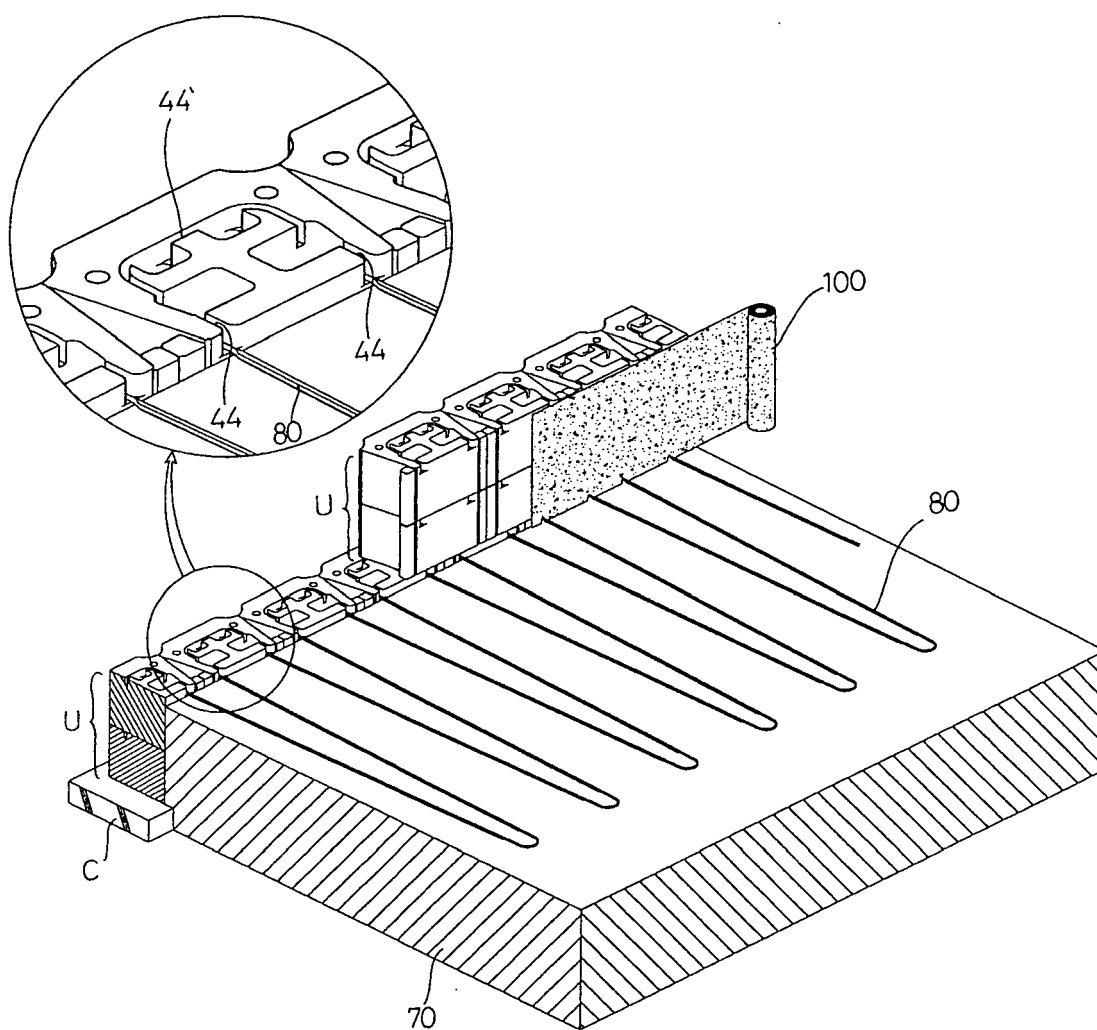


FIG. 29

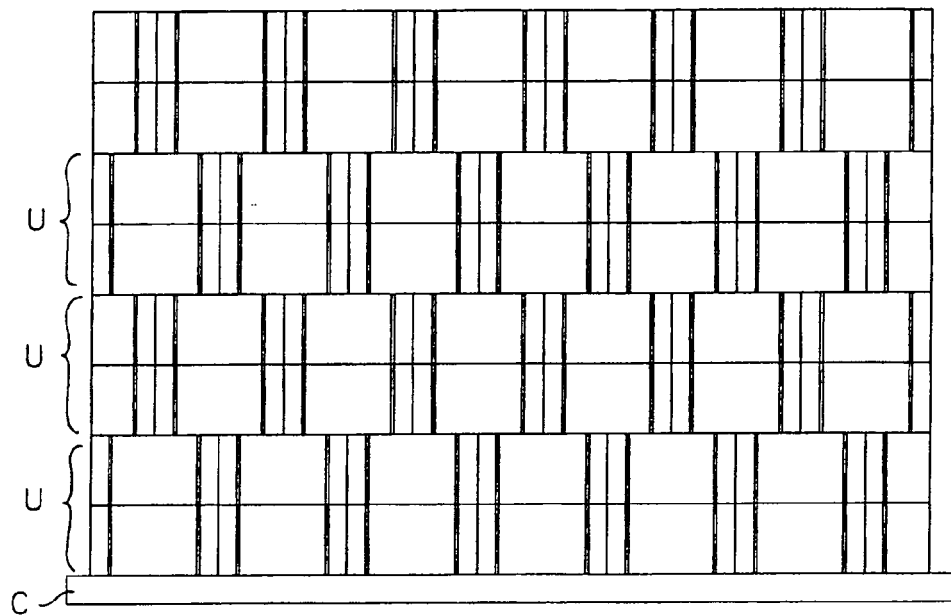


FIG. 30

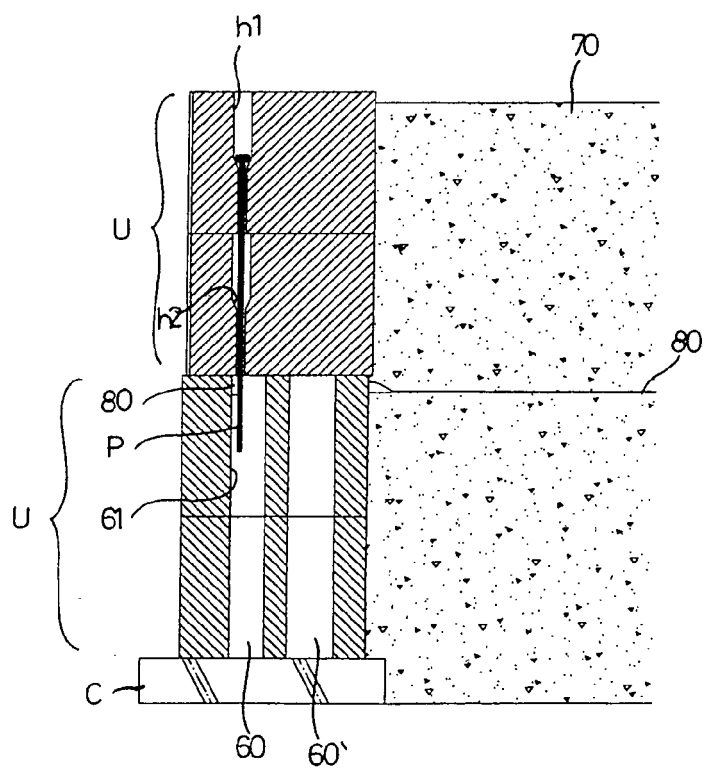


FIG. 31

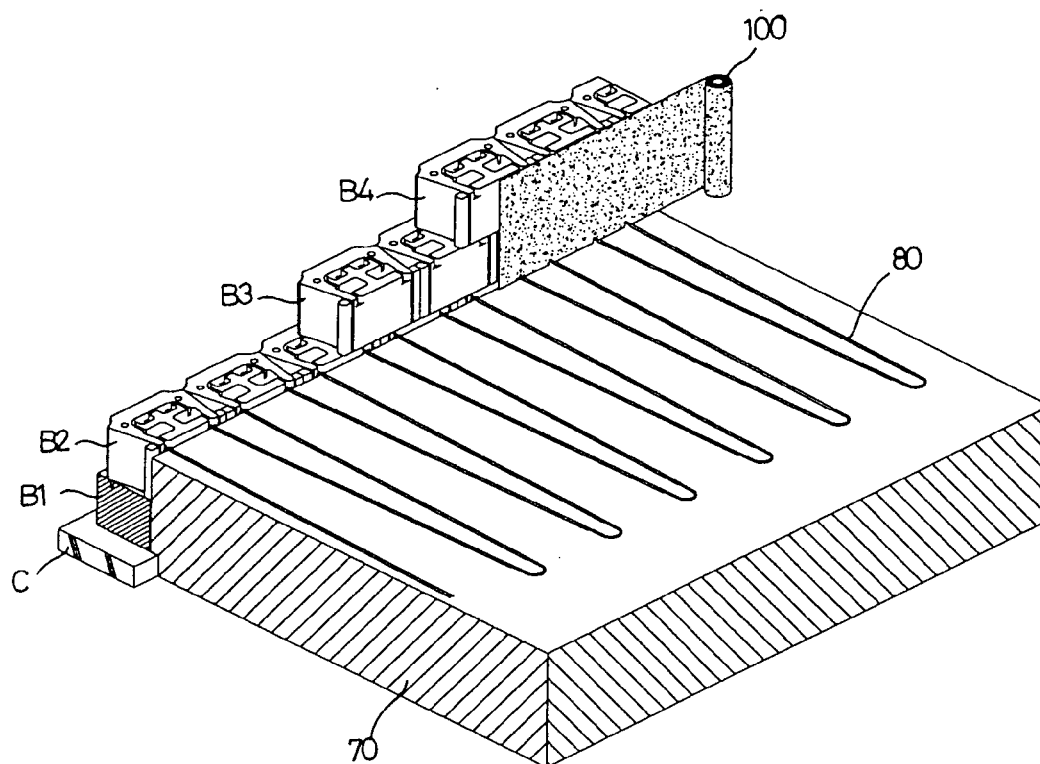


FIG. 32

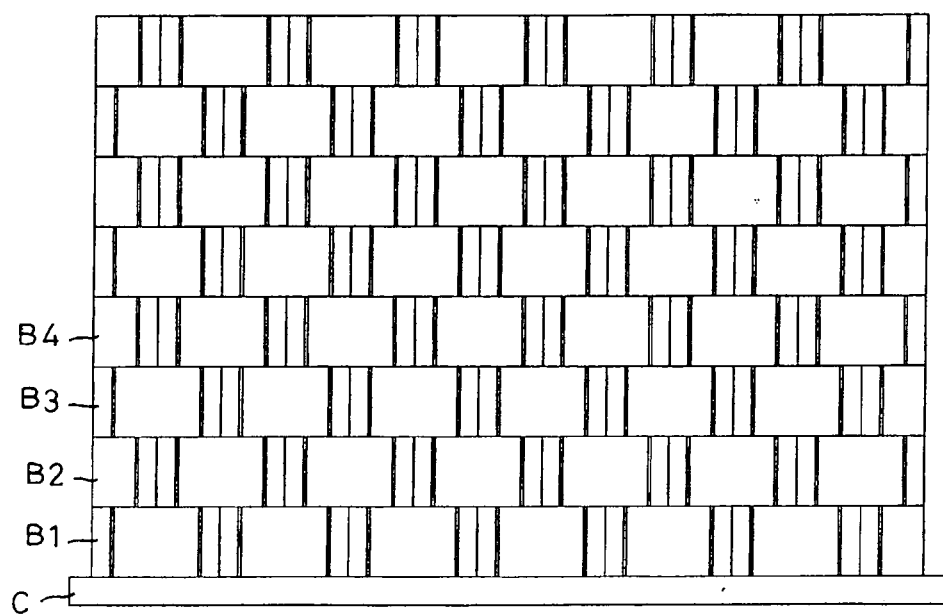


FIG. 33

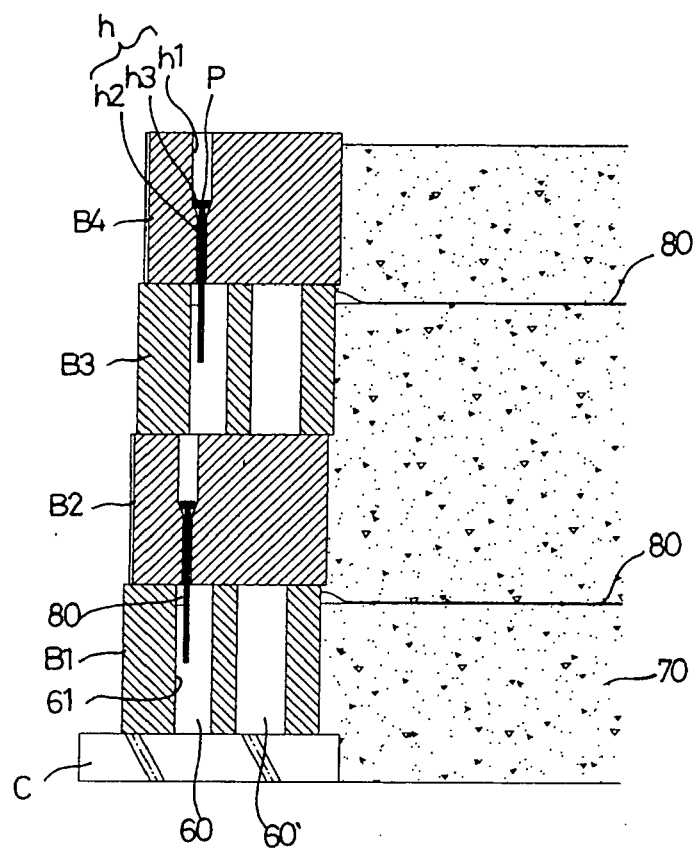


FIG. 34

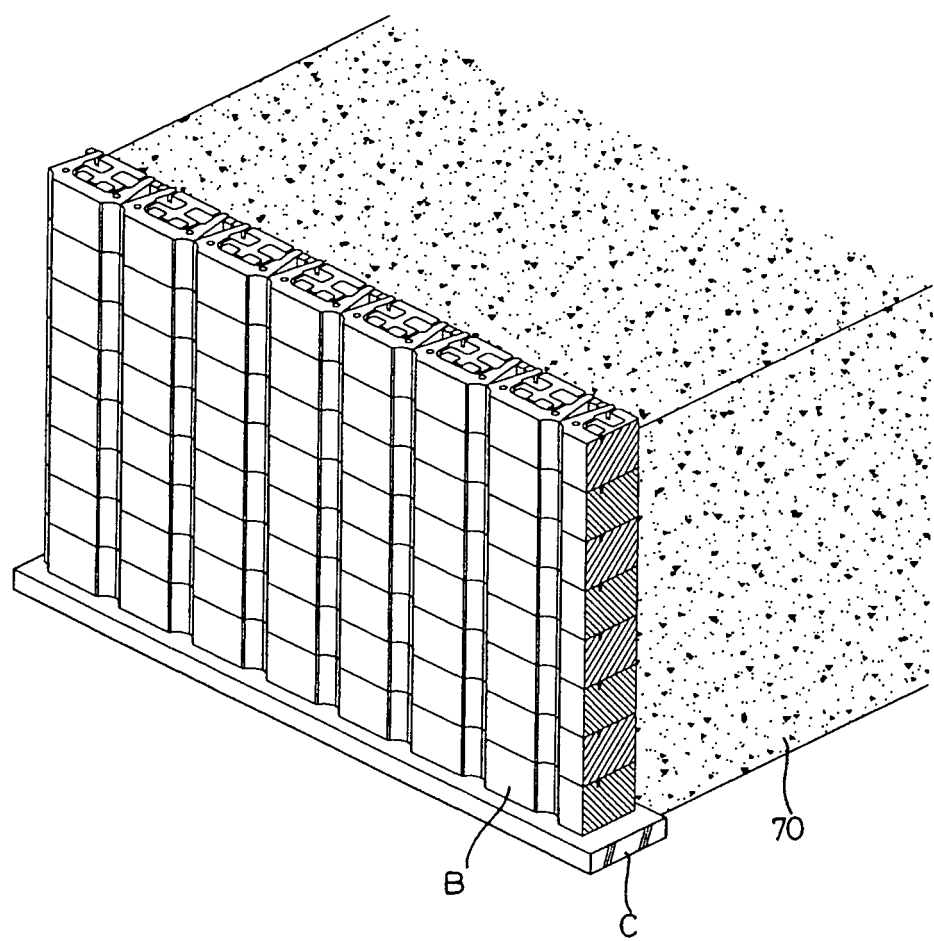


FIG. 35

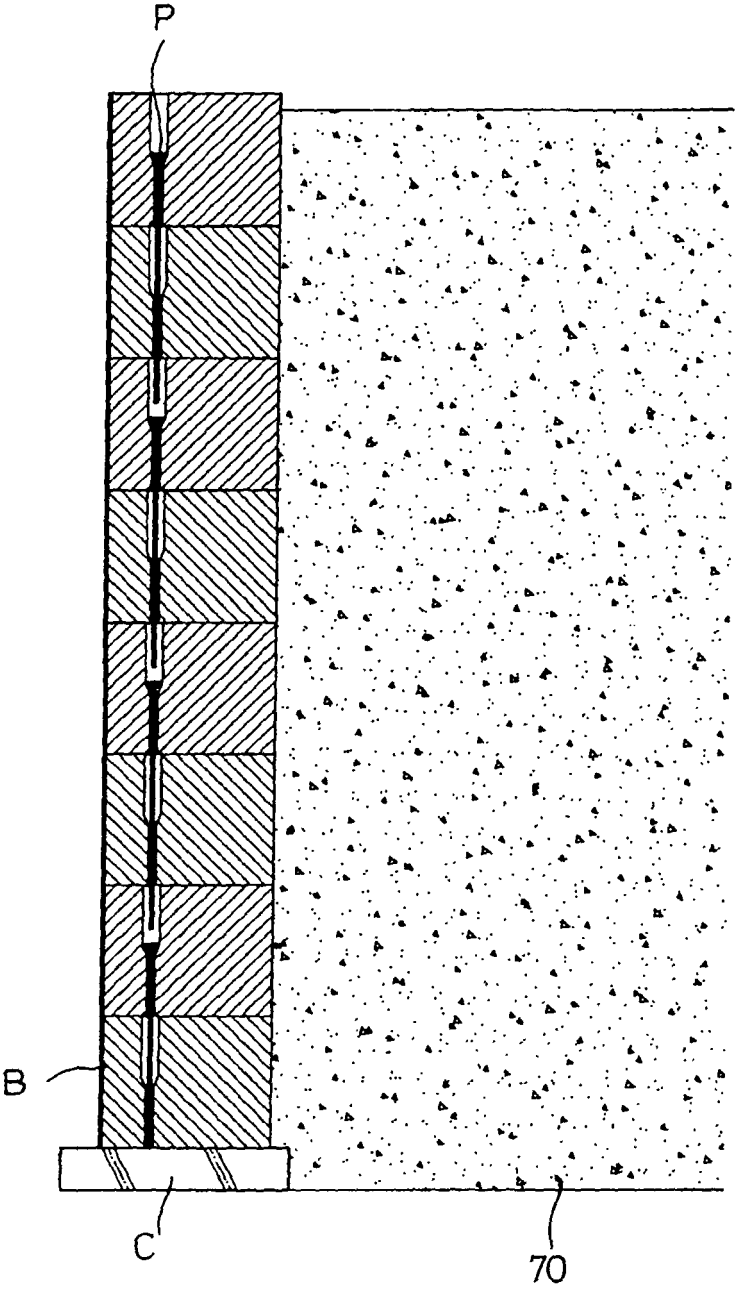
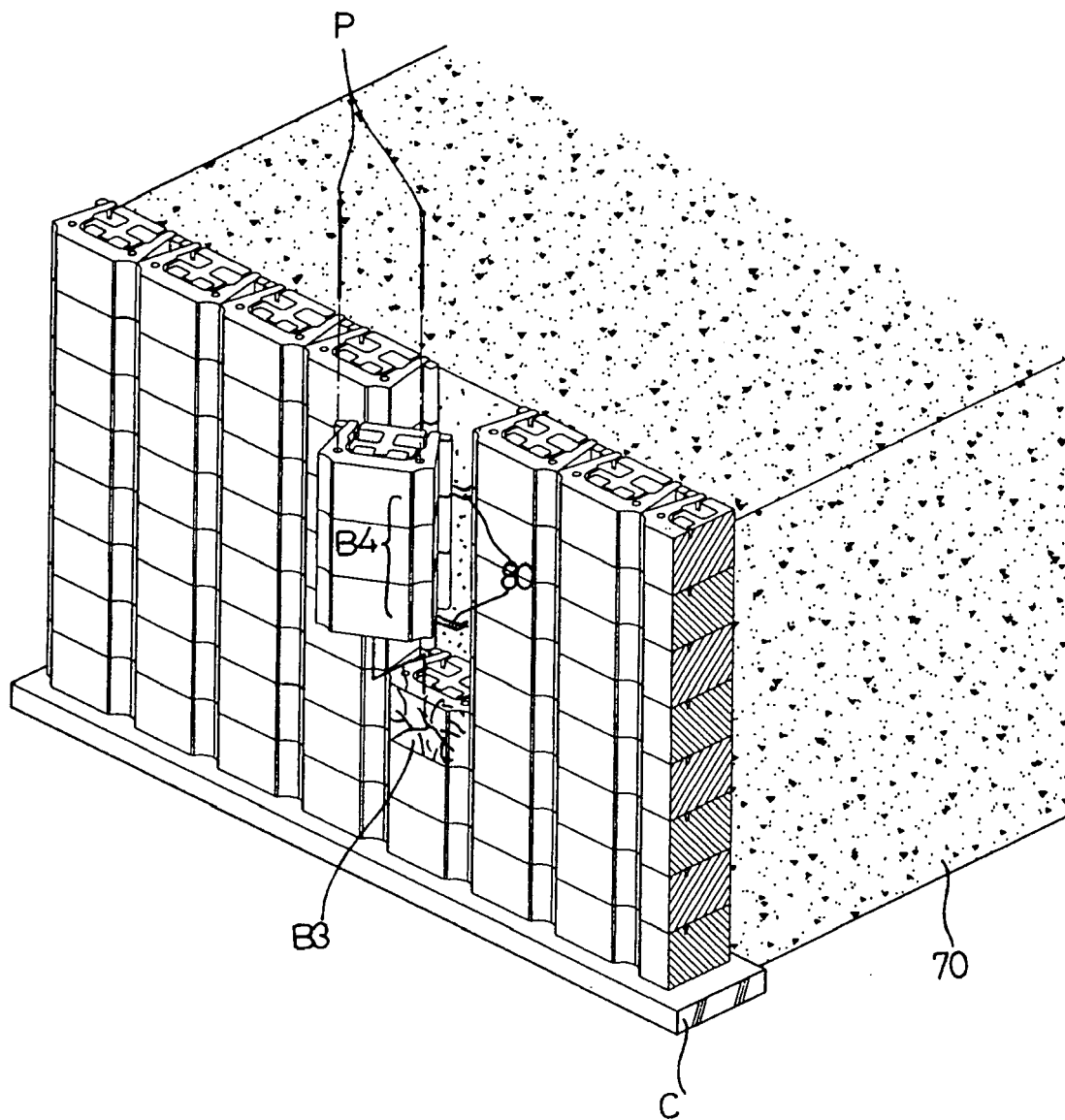


FIG. 36



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- KR 200437835 [0005]
- KR 200465998 [0005]
- KR 200481576 [0005]
- KR 200489152 [0005]
- KR 20054044 [0005]
- KR 200429493 [0040]
- KR 2004111929 [0040]