The present invention relates to a surface structure, on which protuberances and slots are configured so that the protuberances interlock organically with the slots to secure stable combination between the blocks of a block toy when the blocks are stacked up, combined laterally or combined at right angles to each other.
FIG 6

FIG 7
SURFACE STRUCTURE FOR COMBINING BLOCK OF BLOCK TOY HAVING MAGNET INSIDE

TECHNICAL FIELD

[0001] The present invention relates to a surface structure for combining blocks, with a magnet internally embedded, of a block toy and, more specifically, to a surface structure, on which protuberances and slots are configured so that the protuberances interlock organically with the slots to secure stable combination between the blocks of a block toy when the blocks are stacked up, combined laterally or combined at right angles to each other.

BACKGROUND ART

[0002] A block toy comprises a plurality of and a set of small blocks that are typically plastic so that the blocks are to be assembled to construct a solid shape.

[0003] Self-assembly toys, as a kind of block toys, have been marketed for which it is required to interlock the protuberances and slots configured in each block to complete the toy. As such an self-assembly toy, it is, however, also required to forcefully plug each protuberance into each slot corresponding to the protuberance in each block and, even after the assembly is completed, it is not very easy to disassemble the blocks to construct another solid shape.

[0004] Block toys have also been marketed comprising blocks with magnets embedded inside so that the blocks are easily combined by means of magnetism when brought proximately to each other. As for such a block toy with magnets, although it is convenient to combine blocks with each other by means of magnetism and also convenient to disassemble after the assembly is completed, the form may be broken down with a rather slight impact because, in most cases, the edges of the blocks are rounded and, correspondingly, the binding between the blocks is not firm.

DISCLOSURE OF INVENTION

Technical Problem

[0005] The present invention is to provide a surface structure, on which protuberances and slots are configured so that the protuberances interlock organically with the slots to secure stable combination between the blocks of a block toy when the blocks are stacked up, combined laterally or combined at right angles to each other.

Technical Solution

[0006] The present invention provides a surface structure for combining blocks, with a magnet internally embedded, of a block toy on a block I that comprises a top frame 11 and a bottom frame 12 that are combined by fitting protuberances 13 and fitting slots 14 resulting in a quadrate panel with a hollow at the center, wherein a magnet holder 15 is prepared at the internal center of each of the four sides of the top frame 11 and the bottom frame 12 to hold a cylindrical magnet 16, that lies parallel to the side, in the internal space of the magnet holder 15 so that the magnet 16 may rotate; on the external surface of the top frame 11 and the external surface of the bottom frame 12, between the fitting protuberance 13 and the fitting slot 14 with a predetermined distance, with the center of each side as the center, a plurality of left horizontal protuberances 21 are spread to the left while right horizontal protuberance(s) 21-1 are spread to the right, the number of which is one less than the number of the left horizontal protuberances 21, parallel to and along the side with a certain distance from the edge of the side; a top slope 22 is configured along the edge of the top frame 11 and, from the top slope 22, a top cliff 23 extends downward while a bottom slope 24 is configured along the bottom frame 12, and from the bottom slope 24, a bottom cliff 25 extends upward; on the top slope 22, with the center of each side as the center with a predetermined distance from the center, a plurality of grooves 26 are spread to the left and tongues 27 as many as the grooves are spread to the right while, on the bottom slope 24, with the center of each side as the center with a predetermined distance from the center, tongues 27 as many as the grooves 26 on the top slope 22 are spread to the left and grooves 26 as many as the tongues 27 on the top slope 22 are spread to the right; and in the top cliff 23, with the center of each side as the center with a predetermined distance from the center, a furrow 28 is grooved on the left and an insert 29 protrudes on the right while, in the bottom cliff 25, with the center of each side as the center with a predetermined distance from the center, an insert 29 protrudes on the left and a furrow 28 is grooved on the right.

[0007] Meanwhile, the block I, for which the top frame 11 and the bottom frame 12 are combined, has a length or width ranging from 60 to 70 mm and a thickness ranging from 6 to 9 mm while the horizontal protuberances 21, 21-1 have a height ranging from 0.25 to 0.35 mm.

[0008] In addition, the grooves 26 and the tongues 27 have a depth and a height, respectively, ranging from 0.25 to 0.35 mm while the furrow 28 and the insert 29 have a depth and a height, respectively, ranging from 0.4 to 0.6 mm.

Advantageous Effects of Invention

[0009] The present invention provides a surface structure for combining blocks, with a magnet internally embedded, of a block toy on which protuberances and slots are configured so that the protuberances interlock organically with the slots to secure stable combination between the blocks of a block toy when the blocks are stacked up, combined laterally or combined at right angles to each other.

[0010] In addition, the surface structure according to the present invention provides a solid form as an assembly of the blocks of a block toy with structural stability so that the form resists an impact to a certain extent.

DESCRIPTION OF DRAWINGS

[0011] FIG. 1 is a perspective view of a block, with a magnet internally embedded, of an existing block toy.

[0012] FIG. 2 is a perspective view of a block the present invention provides.

[0013] FIG. 3 is a disassembled perspective view of a block the present invention provides.

[0014] FIG. 4 illustrates a status of blocks stacked up according to the present invention.

[0015] FIG. 5 is a cross-sectional view taken along the line A-A of FIG. 4.

[0016] FIG. 6 illustrates a status of blocks that are to be combined laterally according to the present invention.

[0017] FIG. 7 is a cross-sectional view of blocks combined laterally according to the present invention.

[0018] FIG. 8 illustrates a status of blocks that are to be combined at right angles according to the present invention.
FIG. 9 is a cross-sectional view of blocks combined at right angles according to the present invention.

MODE FOR INVENTION

Embodiment

[0021] As illustrated in FIGS. 2 and 3, a block 1, with a magnet internally embedded, of the present invention comprises a top frame 11 and a bottom frame 12 that are combined by fitting protuberances 13 and fitting slots 14 resulting in a quadrangle panel with a hollow at the center, wherein a magnet holder 15 is prepared at the internal center of each of the four sides of the top frame 11 and the bottom frame 12 to hold a cylindrical magnet 16, that lies parallel to the side, in the internal space of the magnet holder 15 so that the magnet 16 may rotate. The block 1, with a length or width ranging from 60 to 70 mm and a thickness ranging from 6 to 9 mm, comprising the top frame 11 and the bottom frame 12, may be required to assume the shape of a quadrangle panel with a hollow at the center because, if the length or width is less than 65 mm and the thickness is less than 6 mm the block becomes excessively small as a block for a block toy, whereas if the length or width is more than 70 mm and the thickness is more than 9 mm the block becomes excessively large as a block for a block toy. A block 1 comprising the top frame 11 and the bottom frame 12 as provided by Embodiment of the present invention has a length or width of 65 mm and a thickness of 7 mm, and assumes the shape of a quadrangle with a hollow at the center while each or the four sides of the block has a width of 11 mm. On the external surface of the top frame 11 and the external surface of the bottom frame 12, horizontal protuberances 21, 21-1 are arrayed parallel to and along the side with a certain distance from the edge of the side. The horizontal protuberances 21, 21-1 may be required to have a height ranging from 0.25 to 0.35 mm because, if the horizontal protuberances 21, 21-1 have a height that is less than 0.25 mm, engaging becomes too weak to retain the combination between the horizontal protuberances of the top frame 11 and the bottom frame 12 whereas, if the horizontal protuberance 21, 21-1 have a height that is more than 0.35 mm, such a protrusion causes inconvenience to use. In this Embodiment, the horizontal protuberances 21, 21-1 have a height of 0.3 mm, and, on the external surface of the top frame 11, with the center of each side as the center, with a predetermined distance in between, three columns of the horizontal protuberances 21 are spread to the left and two columns of the horizontal protuberances 21-1 are spread to the right while, on the external surface of the bottom frame 12, with the center of each side as the center, with a predetermined distance in between, two columns of the horizontal protuberances 21-1 are spread to the left and three columns of the horizontal protuberances 21 are spread to the right.

[0022] A top slope 22 is configured along the edge of the top frame 11 and, from the top slope 22, a top cliff 23 extends downward while a bottom slope 24 is configured along the bottom frame 12, and from the bottom slope 24, a bottom cliff 25 extends upward.

[0023] On the top slope 22, with the center of each side as the center, with a predetermined distance in between, three steps of grooves 26 are spread to the left and three steps of tongues 27 are spread to the right while, on the bottom slope 24, with the center of each side as the center, with a predetermined distance in between, three steps of tongues 27 are spread to the left and three steps of grooves 26 are spread to the right. It may be required for the grooves 26 and the tongues 27 to have a deep and a height, respectively, ranging from 0.25 to 0.35 mm because if the depth and the height, respectively, are less than 0.25 mm, engaging becomes too weak to retain the combination between, for example, the tongues 27 of the top slope 22 and the grooves 26 of the bottom slope 24 whereas, if the depth and the height, respectively, are more than 0.35 mm, such a protrusion causes inconvenience to use. In this Embodiment, the depth of each of the grooves 26 and the height of each of the tongues 27 is 0.3 mm.

[0024] In the top cliff 23, with the center of each side as the center with a predetermined distance from the center, a furrow 28 is grooved on the left and an insert 29 protrudes on the right while, in the bottom cliff 25, with the center of each side as the center with a predetermined distance from the center, an insert 29 protrudes on the left and a furrow 28 is grooved on the right. It may be required for the furrow 28 and the insert 29 to have a height ranging from 0.4 to 0.6 mm because the height of the furrow 28 and the insert 29 is less than 0.4 mm, engaging becomes too weak to retain the combination between, for example, the furrow 20 of the top cliff 23 and the insert 29 of the bottom cliff 25 whereas, if the height of the furrow 28 and the insert 29 is more than 0.6 mm, such a protrusion causes inconvenience to use. In this Embodiment, the furrow 28 and the insert 29 have a height of 0.5 mm.

[0025] Such a configuration is identically applied to all the four sides and edges of the block 1, which assumes the shape of a quadrangle, of the present invention.

[0026] As for combination modes, the blocks 1 according to the present invention may be stacked up, combined laterally, or combined at right angles to each other.

[0027] FIG. 4 illustrates a status of blocks stacked up according to the present invention and FIG. 5 is a cross-sectional view taken along the line A-A of FIG. 4. On the external surface of the bottom frame of each of the four sides of an upper block 2, with the center of each side as the center, with a predetermined distance in between, two columns of the horizontal protuberances 21-1 are spread to the left and three columns of the horizontal protuberances 21 are spread to the right while, on the external surface of the top frame of each of the four sides of a lower block 3, with the center of each side as the center, with a predetermined distance in between, three columns of the horizontal protuberances 21 are spread to the left and two columns of the horizontal protuberances 21-1 are spread to the right.

[0028] If the upper block 2 and the lower block 3 are stacked up, the horizontal protuberances 21, 21-1 of the upper block 2 interlock with the horizontal protuberances 21, 21-1 of the lower block 3. In other words, for example, as illustrated in FIG. 5, the two horizontal protuberances 21-1 that are spread to the left of the upper block 2 interlock with the three horizontal protuberances 21 that are spread to the left of the lower block 3 so that the two blocks 2, 3 thus stacked up maintain stable vertical binding even if one applies lateral force onto each block in the opposite direction to each other.

[0029] FIG. 6 illustrates a status of blocks that are to be combined laterally according to the present invention and FIG. 7 is a cross-sectional view of blocks combined laterally according to the present invention. On the top cliff 23 in the
posterior edge 4-1 of an anterior block 4, with the center of the side as the center, with a predetermined distance in between, an insert 29 protrudes on the left and a furrow 29 is grooved on the right while, on the bottom cliff, with the center of the side as the center, with a predetermined distance in between, an insert 28 protrudes on the left and a furrow 29 is grooved on the right. On the top cliff 23 in the anterior edge 5-1 of a posterior block 5, with the center of the side as the center, with a predetermined distance in between, an insert 29 protrudes on the left and a furrow 29 is grooved on the right while, on the bottom cliff, with the center of the side as the center, with a predetermined distance in between, an insert 28 protrude on the left and a furrow 29 is grooved on the right.

If the anterior block 4 and the posterior block 5 are combined laterally, the insert 28 and the furrow 29 of the posterior edge 4-1 of the anterior block 4 and the anterior edge 5-1 of the posterior block 5, respectively, interlock with each other so that the two blocks 4, 5 thus combined laterally maintain stable lateral binding even if one applies vertical force onto each block in the opposite direction to each other. FIG. 8 illustrates a status of blocks that are to be combined at right angles according to the present invention and FIG. 9 is a cross-sectional view of blocks combined at right angles according to the present invention. On the bottom slope 24 in the anterior edge 6-1 of a lateral block 6, with the center of the side as the center, with a predetermined distance in between, three steps of tongues 27 are spread to the left and three steps of grooves 26 are spread to the right while, on the bottom slope 24 in the upper edge 7-1 of a vertical block 7, with the center of the side as the center, with a predetermined distance in between, three steps of tongues 27 are spread to the left and three steps of grooves 26 are spread to the right.

The bottom slope 24 is inclined at an angle of 45° so that the lateral block 6 and the vertical block 7 are combined at an angle of 90° in between or at right angles to each other. If the lateral block 6 and the vertical block 7 are combined at right angles, the grooves 26 interlock with the tongues 27 to secure stable binding at right angles to each other.

Maximum compression load was measured on regular hexahedrons configured by the blocks of the present invention provides in order to scientifically verify the strength that maintain the vertical binding.

COMPARATIVE EXAMPLE

Block toys, with magnets internally embedded, manufactured by Magformers and currently marketed were used in Comparative Example. A block 8 of the Magformers block toy assumes, as illustrated in FIG. 1, the shape of a quadrangle panel with a hollow at the center and a cylindrical magnet 16 is embedded at the internal center of each of four sides of the block 8 so that the magnet may rotate.

The block 8 has a length or width of 65 mm and a thickness of 7 mm, assumes the shape of a quadrangle panel.

Each of the four sides has a width of 11 mm and the tip of the edge of the block is rounded.

Two of the blocks 8 were stacked up, combined laterally or combined at right angles according to the method applied to Embodiment. Because the tip of the edge of the blocks were rounded, the two blocks 8 thus stacked up were broken down with ease when lateral force was applied onto each of the blocks in the opposite direction to each other, and the two blocks 8 thus combined laterally were broken down with ease when rotational force was applied onto each of the blocks in the opposite direction to each other.

The two blocks 8 thus combined at right angles were broken down with ease under a slight impact. Maximum compression load was measured on regular hexahedrons configured by the blocks 8 in order to scientifically verify the strength that maintain the vertical binding.

EXPERIMENTAL EXAMPLE

Compression tests were implemented on regular hexahedrons configured by the blocks 8, the edge tips of which were rounded, manufactured by Magformers and the blocks 1 provided by the present invention, respectively.

A vertical compression load at a velocity of 5 mm/min was applied onto the regular hexahedrons mounted in a material testing machine to obtain maximum compression load values. Related Certificates of Analysis were issued on Jul. 25, 2014 by the Korea Testing Laboratory. According to the Certificates of Analysis, the maximum compression load was 20 N for the regular hexahedron configured by the blocks 8 manufactured by Magformers and 87 N for the blocks 1 provided by the present invention, which indicates a significant increase of the maximum compression load by 335% in the blocks 1 provided by the present invention compared to the blocks 8 manufactured by Magformers.

Embodiment of the present invention provides a quadrate block 1 but the shape of the block must not be limited thereto but may include a variety of shapes such as rectangle, triangle, hexagon, octagon, etc.

An embodiment of the present invention has been described thus far. However, the present invention must not be limited to the embodiment thus described but may be changed or modified in a plurality ways within the scope and the technical thoughts of the Claims. Therefore, all the changes and modifications, and equivalents, especially change and modification in the length, height, distance, etc. of the configuration of the protuberance, insert, groove, slot, furrow and tongue according to the change in the dimension of the block that assume the shape of a panel must be interpreted to be included in the scope of the present invention.

REFERENCE NUMERALS

[0044] 1: Block of the present invention
[0045] 2: Upper block
[0046] 3: Lower block
[0047] 4: Anterior block
[0048] 4-1: Posterior edge of an anterior block
[0049] 5: Posterior block
[0050] 5-1: Anterior edge of a posterior block
[0051] 6: Lateral block
[0052] 6-1: Anterior edge of a lateral block
[0053] 7: Vertical block
[0054] 7-1: Upper edge of a vertical block
[0055] 8: Block of Magformers block toy
[0056] 11: Top frame
[0057] 12: Bottom frame
[0058] 13: Fitting protuberance
[0059] 14: Fitting slot
[0060] 15: Magnet holder
[0061] 16: Magnet
[0062] 21: Horizontal protuberances (three columns)
[0063] 21-1: Horizontal protuberances (two columns)
[0064] 22: Top slope
[0065] 23: Top cliff
[0066] 24: Bottom slope
What is claimed is:

1. A surface structure for combining blocks, with a magnet internally embedded, of a block toy on a block that comprises a top frame and a bottom frame that are combined by fitting protuberances and fitting slots resulting in a quadrane panel with a hollow at the center,

   wherein a magnet holder is prepared at the internal center of each of the four sides of the top frame and the bottom frame to hold a cylindrical magnet, that lies parallel to the side, in the internal space of the magnet holder so that the magnet may rotate;

   on the external surface of the top frame and the external surface of the bottom frame, between the fitting protuberance and the fitting slot with a predetermined distance, with the center of each side as the center, a plurality of left horizontal protuberances are spread to the left while right horizontal protuberance(s) are spread to the right, the number of which is one less than the number of the left horizontal protuberances, parallel to and along the side with a certain distance from the edge of the side;

   a top slope is configured along the edge of the top frame and, from the top slope, a top cliff extends downward while a bottom slope is configured along the bottom frame, and from the bottom slope, a bottom cliff extends upward;

   on the top slope, with the center of each side as the center with a predetermined distance from the center, a plurality of grooves are spread to the right while, on the bottom slope, with the center of each side as the center with a predetermined distance from the center, tongues as many as the grooves on the top slope are spread to the left and grooves as many as the tongues on the top slope are spread to the right; and

   in the top cliff, with the center of each side as the center with a predetermined distance from the center, a furrow is grooved on the left and an insert protrudes on the right while, in the bottom cliff, with the center of each side as the center with a predetermined distance from the center, an insert protrudes on the left and a furrow is grooved on the right.

2. The surface structure for combining blocks, with a magnet internally embedded, of a block toy of claim 1, wherein the block, for which the top frame and the bottom frame are combined, has a length or width ranging from 60 to 70 mm and a thickness ranging from 6 to 9 mm.

3. The surface structure for combining blocks, with a magnet internally embedded, of a block toy of claim 1, wherein the horizontal protuberances have a height ranging from 0.25 to 0.35 mm.

4. The surface structure for combining blocks, with a magnet internally embedded, of a block toy of claim 1, wherein the grooves and the tongues have a depth and a height, respectively, ranging from 0.25 to 0.35 mm.

5. The surface structure for combining blocks, with a magnet internally embedded, of a block toy of claim 1, wherein the furrow and the insert have a depth and a height, respectively, ranging from 0.4 to 0.6 mm.