

SPECIFICATION

TITLE OF THE INVENTION

Block assembly

FIELD OF THE INVENTION

This invention relates to a block assembly, and more particularly to a block assembly providing plane blocks with coupling concave portions and joint blocks with coupling convex portions which are successively coupled each other to assemble not only a plane body but also a three-dimensional solid body.

PRIOR ART

There has been a block assembly as a toy and so on which can be assembled by coupling component blocks successively. For example, a block assembly which forms a plane body or a solid body comprises rectangular blocks of which each top surface is provided with joint column protrusions, and on each bottom surface are formed joint recesses.

PROBLEMS TO BE SOLVED

Such a conventional block assembly is nothing but bricks which can be readily coupled so that each component brick has a certain thickness which restricts the freedom in forming a solid body.

Thus a solid body should be formed by heaping up blocks for assembly so that the resultant solid body has no resemblance to a model body due to disadvantages such as a lack of the freedom of the shape, a certain thickness of each block, and so on.

To solve the above problems, there has been a demand for blocks for assembly which have various shapes with no need for being heaped up in forming a solid body, and can be easily and accurately formed into any desired hollow three-dimensional shape with a close resemblance to a model body, with the

assembled solid body being structurally stout.

There has been further demand for a block assembly which is suitable for a decoration such as a chandelier or an ornament on a desk etc. which is more advanced than a toy.

Then the present invention provides a block assembly which is of practical use.

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is a plane view showing one example of a regular triangular plane block in Embodiment 1.

Fig. 2 is a sectional view taken along line A-A' of Fig. 1 in Embodiment 1.

Fig. 3 is a perspective view showing one example of a square plane block in Embodiment 1.

Fig. 4 is a perspective view showing one example of a regular triangular plane block in Embodiment 1.

Fig. 5 is a perspective view showing one example of a joint block in Embodiment 1.

Fig. 6 is a perspective view showing one example of a joint block in Embodiment 1.

Fig. 7 is a sectional view of Fig. 6 in Embodiment 1.

Fig. 8 is a perspective view of Fig. 6 in Embodiment 1.

Fig. 9 is a sectional view taken along line B-B' of Fig. 10 in Embodiment 1.

Fig. 10 is a perspective view showing one example of a joint block in Embodiment 1.

Fig. 11 is a sectional view taken along line C-C' of Fig. 12 in Embodiment 1.

Fig. 12 is a perspective view showing one example of a joint block in Embodiment 1.

Fig. 13 is a perspective view showing one example of a joint block in Embodiment 1.

Fig. 14 is a sectional view taken along line D-D' of Fig. 13 in Embodiment 1.

Fig. 15 is a perspective view and a sectional view taken along line E-E' showing one example of a joint block in Embodiment 1.

Fig. 16 is a sectional view of alternative Embodiment 1.

Fig. 17 is a perspective view showing one example of a square plane block in Embodiment 2.

Fig. 18 is a perspective view showing one example of a regular triangular plane block in Embodiment 2.

Fig. 19 is a sectional view taken along line F-F' of Fig. 17 in Embodiment 2.

Fig. 20 is a perspective view showing one example of a joint block in Embodiment 2.

Fig. 21 is a perspective view showing one example of a joint block in Embodiment 2.

Fig. 22 is a perspective view showing one example of a joint block in Embodiment 2.

Fig. 23 is a perspective view showing one example of a joint block in Embodiment 2.

Fig. 24 is a perspective view showing one example of a joint block in Embodiment 2.

Fig. 25 is a perspective view and a sectional view taken along line G-G' showing a plane block and a joint block coupled together in Embodiment 2.

Fig. 26 is a sectional view of alternative Embodiment 2.

Fig. 27 is an assembly drawing showing one example of a square plane block in Embodiment 3.

Fig. 28 is a perspective view showing one example of a square plane block in Embodiment 3.

Fig. 29 is a perspective view showing one example of a regular triangular plane block in Embodiment 3.

Fig. 30 is an assembly drawing showing one example of a regular triangular plane block in Embodiment 3.

Fig. 31 is a perspective view showing one example of a joint block in Embodiment 3.

Fig. 32 is a perspective view showing one example of a joint block in Embodiment 3.

Fig. 33 is a perspective view showing one example of a joint block in Embodiment 3.

Fig. 34 is a perspective view showing one example of a joint block in Embodiment 3.

Fig. 35 is a perspective view showing one example of a joint block in Embodiment 3.

Fig. 36 is a perspective view and a sectional view taken along line H-H' showing a square plane block and a joint block coupled together in Embodiment 3.

Fig. 37 is a sectional view of alternative Embodiment 3.

Fig. 38 is a perspective view showing a finished block assembly of a penguin.

Fig. 39 is a perspective view showing a finished block assembly of a beetle.

Fig. 40 is a perspective view showing a finished block assembly of a helicopter.

Fig. 41 is a perspective view showing a finished block assembly of a small sphere.

Fig. 42 is a perspective view showing a finished block assembly of a big sphere.

Fig. 43 is a perspective view showing a finished block assembly of a box.

Fig. 44 is a perspective view showing a finished block assembly of a box.

Fig. 45 is a perspective view showing a finished block assembly of a triangular prism.

Fig. 46 is a perspective view showing a finished block assembly of a sphere.

EMBODIMENT

Fig. 1 through Fig. 46 show Embodiment 1 through Embodiment 3 and alternative Embodiment 1 through alternative Embodiment 3 of blocks for assembly and block assemblies relating to the present invention.

Fig. 1 through Fig. 15 show Embodiment 1 of the block assembly; Fig. 16 shows alternative Embodiment 1; Fig. 17 through Fig. 25 show Embodiment 2 of the block assembly; Fig. 26 shows alternative Embodiment 2; Fig. 27 through Fig. 36 show Embodiment 3 of the block assembly; Fig. 37 shows alternative Embodiment 3; and Fig. 38 through Fig. 46 show finished block assemblies.

Fig. 1 through Fig. 4 show plane block 1 used in Embodiment 1; Fig. 5 through Fig. 15 show joint block 2 used in Embodiment 1.

Fig. 16 shows an explanatory view of alternative Embodiment 1.

Fig. 17 through Fig. 19 show plane block 30 used in Embodiment 2; Fig. 20 through Fig. 24 show joint block 32 used in Embodiment 2; Fig. 25 shows plane block 30 and joint block 32 coupled together in Embodiment 2.

Fig. 26 shows an explanatory view of alternative Embodiment 2.

Fig. 27 through Fig. 30 show plane block 40 used in Embodiment 3; Fig. 31 through Fig. 35 show joint block 42 used in Embodiment 3; Fig. 36 shows plane block 40 and joint block 42 coupled together in Embodiment 3.

Fig. 37 shows an explanatory view of alternative Embodiment 3.

Fig. 38 through Fig. 46 show finished block assemblies according to the present invention.

Plane block 1 shown in Fig. 1, Fig. 2 or Fig. 4 is regular triangular plane block 11 having coupling recesses 12.

Regular triangular plane block 11 shown in Fig. 1 and square plane block 13 shown in Fig. 3 have a uniform thickness A, and each regular polygonal plane shape of plane block 11 and 13 has a specified side length B.

The shown embodiment shows a regular triangle and a square as a plane shape of plane block 1, however, any regular polygon such as a regular pentagon, a regular hexagon or a regular octagon may be adopted for another embodiment of

the present invention.

Coupling recess 12 of plane block 1 is notched toward the center of regular polygon in the center of each side of regular polygon with a uniform thickness C and with a specified same shape, in the embodiment, with a helmet shape as a plane shape.

Coupling recess 12 of plane block 1 may be any plane shape such as a spindle, a rectangle, a bell, or a pentagon, in fine, any shape with a same size and a same shape with these of coupling protrusion 21 of joint block 2 stated below.

Fig. 5 through Fig. 15 show joint block 2.

Joint block 2 shaped as a prism with a uniform thickness A may have a height B corresponding to a side length of plane block, or may have a height shorter than B, and has coupling protrusions 21 with a specified same shape corresponding to that of coupling recess 12, a helmet shape in a plane shape in the shown embodiment, in the center of each longer side of two or three opposite or adjacent side faces, coupling protrusion 21 comprising a pair of pinch members spaced each other by a distance C and projecting outwardly.

Joint block 2 may be a joint block with side faces shaped as square 23 (shown in Fig. 6, Fig. 7 and Fig. 8), rectangle 24 (shown in Fig. 5), isocetes trapezoid 25 (shown in Fig. 9 and Fig. 10) or right scalene trapezoid 26 (Fig. 11 and Fig. 12) which is provided with coupling protrusion 21 at each shorter side (a,c) of two opposite side faces.

Joint block 2 may be a joint block with side faces shaped as square 27 (shown in Fig. 13 and Fig. 14) which is provided with coupling protrusion 21 in each of adjacent two side faces, or a joint block with side faces shaped as square 28 (shown in Fig. 15) which is provided with coupling protrusion 21 on each of three side faces.

Coupling recess 12 has fitting rib 12a on each top and bottom surface thereof in parallel with an outer side of regular polygon spaced by a distance D.

Coupling protrusion 21 has fitting groove 21a on each inner surface of the pinch members in parallel with a longer side of a prism spaced by a distance D.

In assembling of penguin 81 shown in Fig. 38, beetle 32 shown in Fig. 39, helicopter 83 shown in Fig. 40, triangular prism 88 shown in Fig. 45, or sphere 89 in Fig. 46, fitting rib 12a and fitting groove 21a are engaged each other with a click or a snap so that users can realize that blocks have been coupled.

It is especially epoch-making that sphere 89 can be prepared with blocks.

Fig. 16 shows an explanatory view of alternative Embodiment 1.

In this alternative Embodiment 1, structure and figure are almost the same as these of the above Embodiment 1 except the thickness of joint block 2.

It is possible to select more thick or more thin thickness than plane block 1's thickness A as thickness T of joint block 2, but it is necessary to adjust center line L of each plane block 1 with center line ℓ of each joint block 2 at the same position.

Hereafter further embodiment of Embodiment 1 (not shown) will be described.

The present invention can favorably adopt the another embodiment that coupling recesses of a plane block respectively is formed as a groove which is hollowed toward the center of regular polygon with a uniform thickness C and with a specified same shape in spite of providing coupling recess 12 in the center of each side of regular polygon of plane block 1, and coupling protrusions of a joint block formed as a tongue, in spite of the shape of coupling protrusion 21 of joint block 2 described above, with a same shape corresponding to that of the coupling recess and with a thickness C respectively is provided in the center of each longer side of two or three opposite or adjacent side faces of prism and projects outwardly.

In this embodiment, a fitting groove is provided on each top and bottom face of the coupling recess in parallel with an outer side of regular polygon spaced by a distance D, and a fitting rib is provided on each surface of the coupling protrusion in parallel with a longer side of a prism spaced by a distance D.

Embodiment 2 will be described below.

Plane block 30 shown in Fig. 17 is square plane block 31 with a specified thickness A and with a uniform side length B, having coupling grooves 34 with a uniform thickness C.

Regular triangle plane block 33 shown in Fig. 18 has a uniform thickness A and a specified side length B, and coupling groove 34 has a uniform thickness C.

The shown embodiment shows a regular triangle and a square as a plane shape of plane block 30, however, any regular polygon such as a regular pentagon, a regular hexagon or a regular octagon may be adopted for another embodiment in the present invention.

Coupling groove 34 of plane block 30 is notched toward the center of regular polygon in the center of each side of a polygon with a uniform thickness C and with a specified same shape, in the embodiment, with a square shape as a plane shape.

Fitting groove 35 is provided in the interior portion of coupling groove 34 spaced by a distance D from an outer side of regular polygon.

Coupling groove 34 of plane block 30 may have plane shape such as a spindle, a rectangle, a bell, or a pentagon, in fine, any shape with a same size and a same shape with these of coupling pinch portion 37 of joint block 32 stated below.

Fig. 20 through Fig. 24 show joint block 32.

Joint block 32 shaped as a prism with a uniform thickness A may have a height B corresponding to a side length of plane block, or may have a height shorter than B, and has coupling pinch portions 37 with a specified shape for engaging with coupling grooves 34 in the center of each longer side of two or three opposite or adjacent side faces.

In the shown embodiment, coupling pinch portion 37 with a square shape as a plane shape comprises a pair of pinch members spaced each other by a distance C and projecting outwardly.

At the tip of coupling portion 37 are provided fitting bulges 39 facing

inwardly which engage fitting grooves 35 to ensure the coupling in coupling of coupling groove 35 of plane block 30 and coupling pinch portion 37 of joint block 37.

Joint block 36(A) shown in Fig. 20 is a joint block with square side faces which is provided with coupling pinch portion 37 at each shorter side (a,c) of two opposite side faces.

Joint block 36(B) shown in Fig. 21 is a joint block with square side faces which is provided with coupling pinch portion 37 at each shorter side (a,b) of two adjacent side faces.

Joint block 38 shown in Fig. 22 is a joint block with isocetes trapezoidal side faces which is provided with coupling pinch portion 37 at each shorter side (a,c) of two opposite side faces.

Joint block 36(C) shown in Fig. 23 is a joint block with square side faces which is provided with coupling pinch portion 37 at each shorter side (a,b,c) of three side faces.

Joint block 36(D) shown in Fig. 24 is a joint block with square side faces which is provided with coupling pinch portion 37 at each shorter side (a,b,c,d) of four side faces.

By coupling of coupling pinch portion 37 and coupling groove 34 as shown in Fig. 25, plane block 30 and joint block 32 is assembled successively into penguin 81 shown in Fig. 38, beetle 32 shown in Fig. 39, helicopter 83 shown in Fig. 40, or solid bodies 85, 86 shown in Fig. 42 and Fig. 43 with a click or a snap so that users can realize that blocks have been coupled.

Fig. 26 shows an explanatory view of alternative Embodiment 2.

In this alternative Embodiment 2, structure and figure are almost the same as these of the above Embodiment 2 except the thickness of joint block 32.

It is possible to select more thick or more thin thickness than plane block 31's thickness A as thickness T of joint block 32, but it is necessary to adjust center line L of each plane block 31 with center line ℓ of each joint block 32 at the same position.

Embodiment 3 will be described below.

Plane block 40 shown in Fig. 27 and Fig. 28 is square plane block 41 with a uniform thickness A and with a specified side length B having coupling sockets 44 with a thickness C.

Regular triangle plane block 42 shown in Fig. 29 and Fig. 30 has a uniform thickness A and a specified side length B, and coupling socket 44 has a thickness C.

The shown embodiment shows a regular triangle and a square as a plane shape of plane block 40, however, any regular polygon such as a regular pentagon, a regular hexagon or a regular octagon may be adopted for another embodiment in the present invention.

Coupling sockets 44 of plane block 40 are composed of upper plate 40A and lower plate 40B.

In the center of upper plate 40A is formed fitting portion 40C, in the center of a recess of lower plate 40B is formed concave portion 40D, and in the center of each side of upper plate 40A and lower plate 40B is formed notch portion 40E. Upper plate 40A and lower plate 40B are put together to form plane block 40 so that opposite notch portions 40E are put together to form coupling sockets 44.

Alternatively, concave portion 40D may be formed at upper plate 40A, then fitting portion 40C is formed at lower plate.

Fitting groove 45 is provided in the interior portion of coupling socket 44 spaced by distance D from an outer side of regular polygon.

Coupling socket 44 of plane block 40 may be any plane shape such as a spindle, a rectangle, a bell, a pentagon and so on, in fine, any shape with a same size and a same shape with these of coupling plug 46 of joint block 42 stated below.

Fig. 31 through Fig. 35 show joint block 42.

Joint block 42 shaped as a prism with a uniform thickness A may have a height B corresponding to a side length of plane block, or may have a height

shorter than B, and have coupling plug 46 with a specified same shape engaging with coupling socket 44 in the center of each longer side of two or three opposite or adjacent side faces.

In the shown embodiment, coupling plug 46 with a thickness C projects outwardly.

At the tip of coupling plug 46 is provided fitting bulge 47 which engages fitting groove 45 to ensure the coupling of coupling socket 44 of plane block 40 and coupling plug 46 of joint block 42.

Joint block 42(A) shown in Fig. 31 is a joint block with square side faces which is provided with coupling plug 46 at each shorter side (a,c) of two opposite side faces.

Joint block 42(B) shown in Fig. 32 is a joint block with square side faces which is provided with coupling plug 46 at each shorter side (a,b) of two adjacent side faces.

Joint block 42(C) shown in Fig. 33 is a joint block with square side faces which is provided with coupling plug 46 at each shorter side (a,b,c) of three side faces.

Joint block 43 shown in Fig. 34 is a joint block with isocetes trapezoidal side faces which is provided with coupling plug 46 at each shorter side (a,c) of two opposite side faces.

Joint block 42(D) shown in Fig. 35 is a joint block with square side faces which is provided with coupling plug 46 at each shorter side (a,b,c,d) of four side faces.

By coupling of coupling plug 46 and coupling socket 44 as shown in Fig. 36, plane block 40 and joint block 42 is assembled successively into penguin 81 shown in Fig. 38, beetle 32 shown in Fig. 39, helicopter 83 shown in Fig. 40, or solid bodies 84, 87 shown in Fig. 41 and Fig. 44 with a click or a snap so that users can realize that blocks have been coupled.

Fig. 37 shows an explanatory view of alternative Embodiment 3.

In this alternative Embodiment 3, structure and figure are almost the same

as these of the above Embodiment 3 except the thickness of joint block 42.

It is possible to select more thick or more thin thickness than plane block 40's thickness A as thickness T of joint block 42, but it is necessary to adjust center line L of each plane block 40 with center line ℓ of each joint block 42 at the same position.

In the present invention, thermal plastic resin, thermosetting resin, wood, ceramic, metal and so on can be generally used as a material for a block assembly.

Chandelier, ornament, furniture, etc. can be made of a block assembly if the block assembly is moulded out of at least one synthetic resin chosen from acrylic resin, styrene resin or ABS resin.



CLAIMS

1. A block assembly which comprises plane blocks with coupling recesses and joint blocks with coupling protrusions:

the plane blocks being provided by some kinds of regular polygonal blocks with a uniform thickness A and with a plane shape of any regular polygon which has a specified side length B;

the coupling recess of a specified same shape being notched toward the center of regular polygon in the center of each side of regular polygon with a uniform thickness C;

the joint blocks being shaped as a prism with a uniform thickness T;

the coupling protrusion of a specified same shape corresponding to that of the coupling recess in the center of each longer side of opposite or adjacent two or three side faces of the joint blocks comprising a pair of pinch members with a thickness $\{(A - C) \times 1/2\}$ spaced each other by a distance C and projecting outwardly; and

the center line L of the plane blocks being adjusted with the center line l of the joint blocks.

2. A block assembly as set forth in claim 1, wherein said plane blocks are square blocks or regular triangle blocks.
3. A block assembly as set forth in claim 1 or 2, wherein said joint blocks have side faces shaped as a square, a rectangle or an isocetes trapezoid and have the coupling protrusion on each shorter side of opposite side faces.
4. A block assembly as set forth in claim 1, 2 or 3, wherein said joint blocks have square side faces and have the coupling protrusion on each of three side faces.
5. A block assembly as set forth in claim 1, 2, 3 or 4, wherein said joint blocks have right scalene trapezoidal side faces and have the coupling protrusion on each of opposite or adjacent two side faces with nonparallel sides.
6. A block assembly as set forth in claim 1, 2, 3, 4 or 5, wherein said coupling recess is provided with a fitting rib on each top and bottom surface



thereof in parallel with an outer side of regular polygon spaced by a distance D, and said protrusion is provided with a fitting groove on each inner surface of the pinch members in parallel with a longer side of prism spaced by a distance D.

7. A block assembly which comprises plane blocks with coupling recesses and joint blocks with coupling protrusions:

the plane blocks being provided by some kinds of regular polygonal blocks with a uniform thickness A and with a plane shape of any regular polygon which has a specified side length B;

the coupling recess of a specified same shape being hollowed toward the center of regular polygon in the center of each side of regular polygon with a uniform thickness C;

the joint blocks being shaped as a prism with a uniform thickness T;

the coupling protrusion of a specified same shape corresponding to that of the coupling recess with a uniform thickness C in the center of each longer side of opposite or adjacent two or three side faces of the joint blocks projecting outwardly; and

the center line L of the plane blocks being adjusted with the center line ℓ of the joint blocks.

8. A block assembly as set forth in claim 7, wherein said plane blocks are square blocks or regular triangle blocks.

9. A block assembly as set forth in claim 7 or 8, wherein said joint blocks have side faces shaped as a square, a rectangle or an isoceles trapezoid and have the coupling protrusion on each opposite shorter side of side faces.

10. A block assembly as set forth in claim 7, 8 or 9, wherein said joint blocks have square side faces and have the coupling protrusion on each of three side faces.

11. A block assembly as set forth in claim 7, 8, 9 or 10, wherein said joint blocks have right scalene trapezoidal side faces and have the coupling protrusion on each of opposite or adjacent two side faces with nonparallel



sides.

12. A block assembly as set forth in claim 7, 8, 9, 10 or 11, wherein said coupling recess is provided with a fitting groove on each top and bottom face thereof in parallel with an outer side of regular polygon spaced by a distance D, and said coupling protrusion is provided with a fitting rib on each surface thereof in parallel with a longer side of prism spaced by a distance D.

13. A block assembly which comprises plane blocks with coupling grooves and joint blocks with coupling pinch portions:

the plane blocks being provided by some kinds of regular polygonal blocks with a uniform thickness A and with a plane shape of any regular polygon which has a specified side length B;

the coupling groove of a specified same shape being notched toward the center of regular polygon in the center of each side of regular polygon with a uniform thickness C;

the joint blocks being shaped as a prism with a uniform thickness T;

the coupling pinch portion of a specified same shape corresponding to that of the coupling groove in the center of each longer side of opposite or adjacent two or three side faces of the joint blocks comprising a pair of pinch members spaced each other by a distance C and projecting outwardly; and

the center line L of the plane blocks being adjusted with the center line ℓ of the joint blocks.

14. A block assembly as set forth in claim 13, wherein said plane blocks are square blocks or regular triangle blocks.

15. A block assembly as set forth in claim 13 or 14, wherein said joint blocks have side faces shaped as a square, a rectangle or an isocetes trapezoid and have the coupling pinch portion on each opposite shorter side of side faces.

16. A block assembly as set forth in claim 13, 14 or 15, wherein said joint blocks have side faces shaped as a square and have the coupling pinch portion on each of three side faces.

17. A block assembly as set forth in claim 13, 14, 15 or 16, wherein said joint



blocks have square side faces and have the coupling pinch portion on each of four side surfaces.

18. A block assembly as set forth in claim 13, 14, 15, 16 or 17, wherein said coupling groove is provided with a fitting groove on each top and bottom surface thereof in parallel with an outer side of regular polygon spaced by a distance D, and said coupling pinch portion is provided with fitting bulges on inner tip surfaces of the pinch members in parallel with a longer side of prism spaced by a distance D.

19. A block assembly which comprises plane blocks with coupling sockets and joint blocks with coupling plugs:

the plane block being provided by some kinds of regular polygonal blocks with a uniform thickness A and with a plane shape of any regular polygon which has a specified side length B;

the plane block comprising an upper plate and a lower plate;

one of the plates having a concave portion in the center of a recess on one surface thereof;

the other plate having a fitting portion in the center of one surface thereof;

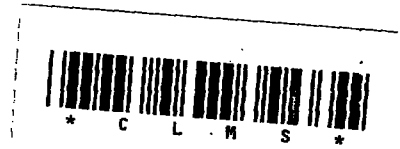
the coupling socket of a specified same shape being notched toward the center of regular polygon in the center of each side of regular polygon with a uniform thickness C;

the joint blocks being shaped as a prism with a uniform thickness T;

the coupling plug with a thickness C and with a specified same shape corresponding to that of the coupling socket having a fitting bulge at the tip and projecting outwardly in the center of each longer side of opposite or adjacent two or three side faces of the joint blocks; and

the center line L of the plane blocks being adjusted with the center line ℓ of the joint blocks.

20. A block assembly as set forth in claim 19, wherein said plane blocks are square blocks or regular triangle blocks.



21. A block assembly as set forth in claim 19 or 20, wherein said joint blocks have side faces shaped as a square, a rectangle or an isocoles trapezoid and have the coupling plug on each shorter side of opposite side faces.
22. A block assembly as set forth in claim 19, 20 or 21, wherein said joint blocks have square side faces and have the coupling plug on each of three side faces.
23. A block assembly as set forth in claim 19, 20, 21 or 22, wherein said joint blocks have square side faces and have the coupling plug on each of four side surfaces.