June 7, 1949. J. G. BLACKINTON 2,472,363

BUILDING BLOCK

Filed May 22, 1944

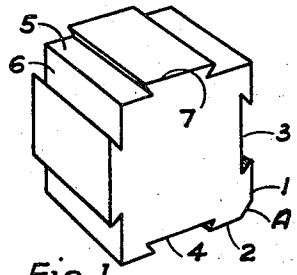

Fig. 1

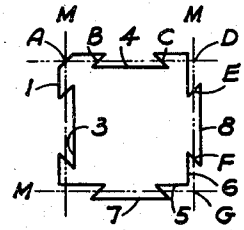

Fig. 4

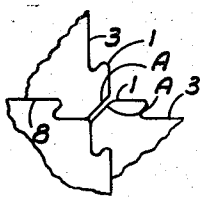

Fig. 5

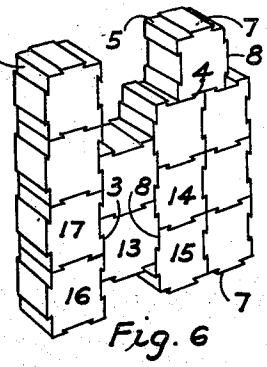

Fig. 6

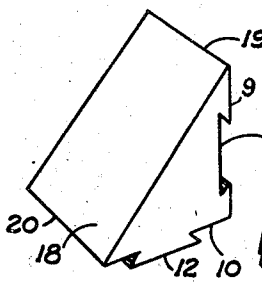

Fig. 2

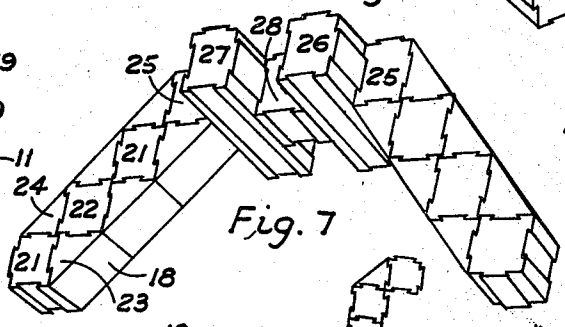

Fig. 7

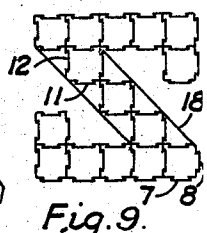

Fig. 9

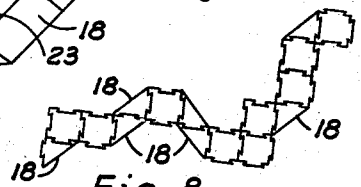

Fig. 8

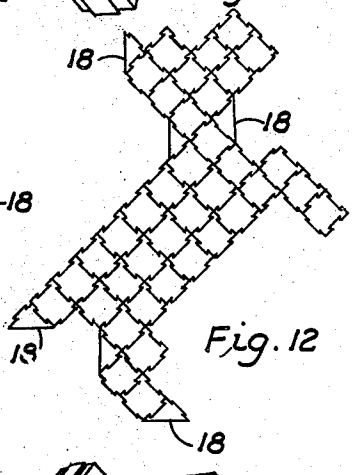

Fig. 12

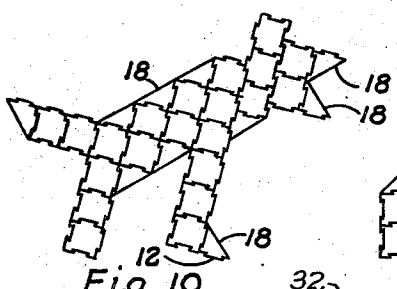

Fig. 10

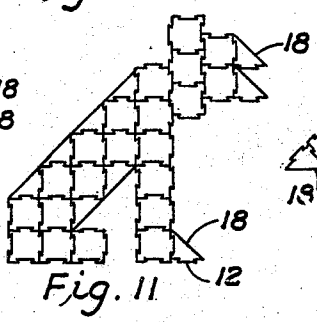

Fig. 11

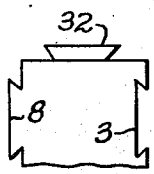

Fig. 15.

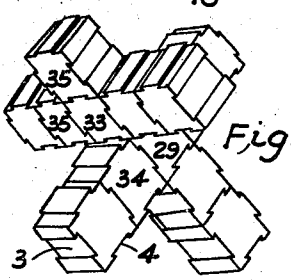

Fig. 14

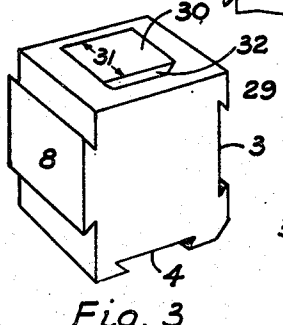

Fig. 3

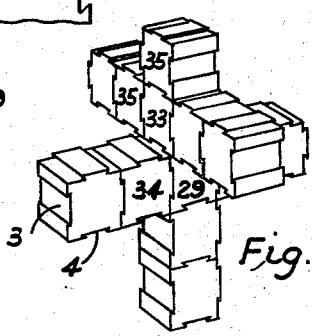

Fig. 13

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2,472,363

BUILDING BLOCK

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Application May 22, 1944, Serial No. 536,718

4 Claims. (Cl. 46—25)

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This invention relates to toy building blocks having interlocking dove-tail ribs and grooves on their sides; and it pertains more particularly to such blocks whose cross-sectional contour gives to the various faces certain new and useful geometrical characteristics whereby the principal objects of my invention are attained.

A primary object of the invention is to induce the user to employ originality and imagination in creating unusual and interesting designs by putting the blocks together and shifting them about to modify the structure; to induce him to become interested and hence use mental and visual concentration, to alter or improve his work as he goes along. This is accomplished by block sets made according to my invention, having each type block interchangeable as to its faces with the complemental faces of blocks of other types.

Ordinarily toy building blocks have been made for constructing walls, that is to say, line blocks. Other sets of blocks have included corner blocks that enable two walls to be placed at right angles to each other or for laterally offsetting any part of the structure from another part.

According to my improvement the possible combinations are greatly multiplied, because of unusual interchangeability of the rib-and-groove connections in my square-type block. When a second type block is employed, called the triangular or semi-block, an astonishing number of designs and structures in addition to walls can be assembled, and while they are in process, or after they are finished, blocks can be removed and replaced from the assembly, thus altering the design again and increasing the interest of the user. Finally, a third block, termed the corner block, can be used to adapt the set to assemblies that extend in all three cardinal directions.

It will be apparent that the problem here concerns result of cooperative combination of block elements rather than a question of degree of effect of a single element. From my combination of such elements new and useful results are derived, and in addition those results have required invention to bring them about, as will be understood from the following statement and specifications.

Primarily, my set is intended not only for use by children, but for handicapped persons and convalescents who require the degree of concentrated interest and manual activity supplied by these blocks, yet without creating ill effects such as the exasperation experienced when a structure falls apart just before it is completed.

Any ordinary block structure that is top-heavy becomes unstable, whereas the interchanged faces of the special blocks according to my improvement are combined in such manner that even a complicated structure can be picked up and carried, set down in its original position or on its side, or upside down, without likelihood of coming apart. In fact when such a structure is set down in tilted or askew position it becomes more tightly fastened together on account of the increased friction in its dove-tail joints, thereby differing in this important respect from ordinary tongue and groove blocks.

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The user's interest is further maintained because of the adaptability of this set to enable figures of animals or persons to be constructed so they will stand at various angles and in different poses with respect to the floor.

The foregoing explanation will be sufficient to indicate the usefulness of my invention in the fields of amusement and rehabilitation to which it is especially adapted.

With the foregoing and certain other objects in view, which will appear later in the specifications, the invention is found in the novel construction, arrangement and combination of means illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood, however, that the claims are not intended to be limited to the form of the parts illustrated and described further than a limitation to the described form is necessary to distinguish them from the prior art.

In the drawings,

Fig. 1 is a perspective view of a square-section block having a dove-tail groove on each of two sides and on each of the other two sides having two corresponding dove-tail ribs;

Fig. 2 is a perspective view of a block triangular in section, termed a semi-block, having one dove-tail groove and one rib;

Fig. 3 is a corner block for lateral-offsetting, similar to Fig. 1, but with a square lug on one of its faces instead of the dove-tail rib;

Fig. 4 is a diagrammatic end view of the block, Fig. 1, showing the geometric modulus for square-section blocks;

Fig. 5 is a fragmentary detail, enlarged, showing a corner arrangement of three blocks assembled;

Fig. 6 is a perspective view of an apertured wall panel built of the blocks, Fig. 1;

Fig. 7 is a perspective view of a diagonal self-sustaining truss assembly made principally of blocks illustrated in Fig. 1 and Fig. 2;

Fig. 8 is a side view of a structure made of the

blocks Figs. 1 and 2, giving a suggestion of serpentine motion;

Figs. 9, 10, 11, 12 are side views of various wall or panel structures made of square-section line blocks, Fig. 1 and the semi-blocks, Fig. 2;

Fig. 13 is a perspective view of a three-direction self-sustaining type of beams and column structure, standing upright and made with the block units shown in Figs. 1 and 3; and

Fig. 14 is a view of the structure shown in Fig. 13 as it appears when tilted and self-sustaining on three of its corners and resting on a flat surface.

Fig. 15 is an end view of the upper part of the block shown in Fig. 3.

The drawings illustrate a typical embodiment of the invention. Obviously, it is characterized in each of its phases by structural simplicity, strength, and ability to hold together when picked up by the top or any other place around its periphery.

Like characters of reference indicate like parts in all figures of the drawings.

In the drawings, numerals **1** and **2**, Figs. 1 and 4, designate two contiguous faces, the first being dove-tail grooved at **3**, the second at **4**. Numerals **5** and **6** designate edge portions at the junction of the two other faces which have the dove-tail ribs **7** and **8** respectively.

The dove-tail grooves **3**, **4** and ribs **7**, **8**, arranged on the four sides of the blocks, Figs. 1 and 3, enable the blocks to be assembled in varied designs, patterns and shapes. This relationship is illustrated geometrically in Fig. 4, where four broken lines, designated by letter M, form a hypothetical square or modulus that represents, when used in any given assembly, the size, shape and displacement of an assumed equivalent block bounded by all flat faces.

Lines M—M intersect the ribs **7**, **8** at half-height, and also intersect the grooves **3**, **4** at half-depth.

The width of the ribs, measured on modulus line M—M, is substantially equal to the width of the grooves, being appropriate for an easy sliding fit. Relative dimensions for lay-out purposes are as follows:

AB=CD=DE=FG
BC=EF
AB=one-half BC
AD=DG

By the foregoing arrangement and proportioning of the several features of the block, Figs. 1 and 4, every rib can be received in any groove of any block. Moreover, two blocks can be joined by being slipped in from either side, permitting a great variety of structural combinations and designs with very few blocks. The overall dimensions of the assembly will be in multiples of the dimensions of the hypothetical block defined by the size of the modulus, thus giving accuracy to the dimension of the finished structure.

It will be observed that at point A the longitudinal corner formed by contiguous faces **1** and **2** is beveled off, the purpose being to enable two blocks to be adjoined as shown in Fig. 5 with their parts A—A together. The bevel at A also gives possibilities that allow numerous novel assembly arrangements to be made with other blocks, thus adding to the selective possibilities of the set for creating structures of widely varied designs. The improvement at A affects the operation of the other elements and thereby improves the usefulness of the set of blocks as a whole.

The versatility of sets of blocks made according to my invention is due to a large extent to the fact that all four sides, **1**, **2**, **5**, **6** of the square-type block Fig. 1 and the two perpendicular sides **9**, **10** of the semi-block Fig. 2, and at least three sides of the block Fig. 3, are occupied by the dove-tail grooves **3**, **4**, **11**, and the ribs **7**, **8**, **12** of Figs. 1, 2, 3. That is to say, none of the perpendicular faces are blank, except the faces at the ends of the blocks.

In Fig. 4 the upper left-hand corner A of the modulus boundary coincides with a corner of the main body of the block; the lower left-hand corner of the modulus is outside; the lower right-hand corner G of the modulus area is outside of the block, and the upper right corner D is outside.

Also, in Fig. 4, the lower right corner of the block is located upward and to the left, at an angle of 45 degrees from the corner G of the modulus. The same is true at the upper right corner D and at the lower left corner of the modulus.

Ribs. **7** and **8** are located, not in the middle, but somewhat off center on the left faces **5**, **6** of the block, as can be seen in Figs. 2, 3, 4. But they are centered on the sides AD, DG of the modulus. By that arrangement my square block, Fig. 4, and the diagonal block, Fig. 2, have been given a unique capacity for combining with other blocks to make different patterns in quantities far beyond any geometric system of blocks known to me.

The foregoing analysis will enable those skilled in the art of arranging blocks in patterns to make and use the blocks, Figs. 1, 2, 3 and to realize how their described contours cooperate to produce the results set forth.

My improvement is more than a duplication of grooves and ribs, for it makes possible the peculiar arrangement of the corners of the block in relation to the corners of the modulus as above described, and it is that and other relationships of like effect which make possible the types of combinations shown in the drawings Figs. 5 to 14 and hundreds of others.

It is obvious that any rib may be inserted either end foremost into any groove of any other block; also into a groove made by two adjoined blocks, thus approximately doubling the entire number of combinations otherwise possible.

The foregoing explanation will make it clear that the possibilities for interchange and novel arrangement with this set of blocks far surpass the earlier sets of building blocks heretofore known to the trade.

It follows that there is a corresponding increase in the value of these sets of blocks for purposes of amusement and for rehabilitating handicapped persons.

The wall or panel shown in Fig. 6 employs only the block type Fig. 1. It shows how staggered interlocking joints are formed between adjacent vertical and horizontal rows of blocks, and how openings can be left in the wall, and blocks can be added or removed from such openings. This is possible because of the dimensioning formulated above when applied to the actual blocks.

Structural stability of the assembly is obtained through effective mutual interlocks of blocks upwardly, downwardly, and sidewise, in order that any completed structure may be rugged enough to be picked up, handled, inverted, or stood in any position without risk of falling apart, provided the structure is not tipped too far sidewise. An example of such interlock is shown in Fig. 6 where a block **13** has its rib **8** interlocked with a

groove defined by the dove-tail edges of two ribs on two adjoining blocks 14 and 15. Similarly, with two other blocks 16, 17 where groove 3 of block 13 receives a rib defined by the two grooves of blocks 16 and 17. The foregoing relates principally to the Fig. 1 block.

In Fig. 2 is shown the second type block of the augmented set, termed the semi-block. It is of triangular section, having the two perpendicular contiguous faces 9, 10 with a groove 11 and a complementary rib 12 and an oblique face 18 which connects the remote edges 19, 20 of the faces 9 and 10. The block shown in Fig. 2 comprises exactly one-half of the block of Fig. 1 sectioned by a hypothetical plane which includes the modulus points A and G of the square modulus A, D, G in Fig. 4.

Fig. 7 illustrates an interesting structural use of line blocks, Fig. 1, plus the semi-blocks, Fig. 2, in combination.

A series of line blocks 21, 22 with their long diameters alined as shown, are filled in between their divergent faces with semi-blocks 23 and 24 whose oblique faces 18 present a series of smooth alined facets.

All the blocks just mentioned are mutually interlocked and produce a rigid unitary column of considerable strength.

Two such members are shown at the right and left, Fig. 7. They are supporting members convergent upwardly and inclined from the horizontal at about forty-five degrees. The topmost block 25 is joined to a horizontal platform made up of two extra long blocks 26 and 27 joined together for purposes of illustration by a central block 28 of standard length, Fig. 1.

This typical structure, Fig. 7, can be inverted. The two abutment members will then spread obliquely upward and outwardly like strong rigid wings or girders. Additional blocks can be added to them in any way desired.

Fig. 8 shows the blocks Figs. 1 and 2 in a sinuous arrangement, cartooning a serpent.

In Fig. 9 the semi-block is again employed in making a letter, such as Z, its top and bottom parts being made of square-section line blocks, Fig. 1, and the diagonal bar being made of the parts shown in Figs. 1 and 2 combined, as was done in Fig. 7.

Figs. 10, 11, and 12 show line blocks, Fig. 1 and semi-blocks, Fig. 2, for the body of the design. Here they are used for the purpose of creating artistic or geometric effects of different kinds, unusual in building blocks. For instance, in Fig. 10 such cartoon-like effects are produced at the tail, the front foot, and the mouth of the figure, as well as at the throat and body portion. It will be observed that the semi-block at the front foot raises the front part of the figure slightly and illustrates how slight changes of inclination can be introduced into the pose of the image.

In Fig. 11 the expression at the mouth has been changed by merely inverting the upper semi-block from its position Fig. 10. Identical quantities of block types, Figs. 1 and 2, are shown in Figs. 10 and 11, being merely interchanged to produce the two different appearances.

Another effect of like nature typifying a still greater number of variations in use of the two pieces Figs. 1 and 2, is illustrated in Fig. 12, where different combinations can be used to vary the pose.

The special features of block type Fig. 3 will now be explained. It is designated in Figs. 13 and 14 by numeral 29. It is of the same general type shown in Fig. 1, but has a square lug 30, Fig. 3, whose length 31 is equal to the width of a standard rib 7 and whose marginal edge 32 can be slid into any groove of any other block.

In Figs. 13 and 14 blocks 29 and 33 are interlocked so that their smooth ends are situated in planes perpendicular to each other. Likewise, block 33 and the other blocks secured to it, such as 35, 35, have their smooth ends in planes perpendicular to the smooth ends of 29.

Block 29 and another block 34 are situated with their smooth ends parallel and in the same plane. Hence it is obvious that the block 29 can be interlocked with another block 33 whose direction is either parallel with or perpendicular to the direction of block 29, as may be desired. For that reason the block 29, Fig. 3, is termed a corner block.

When the corner block, Fig. 3, is used as an element of a set made up of block types Figs. 1 and 2, the addition of type Fig. 3 further multiplies the number of assemblies that can be made, and provides a set of three-type blocks that is almost universal in its application for the purposes of this invention.

When the rib and groove joints are subjected in use to load stresses that are askew, as in Fig. 14, or as would be the case in the structure Fig. 7 if it were laid on its side, the assembly will remain strong and rigid under load, because the transverse forces at the slip joints tend to lock the blocks together more tightly when the load on the structure is increased.

It is obvious that the user may commence building by putting a few blocks together at random. The resultant structure can be laid on a table in any position, then turned upside down, laid flat, or tilted. Soon its appearance will suggest converting it into a building, an animal, machine, or something that attracts his interest. He adds more blocks with that in mind, and soon finds himself working to a definitely conceived plan; he adds, subtracts, or substitutes blocks as his fancy dictates to get the desired effect. The creative imagination of the user can thus be exercised in developing forms that possess individuality and life-like characteristics.

This set of blocks may be used for many purposes other than those alluded to herein—for instance, they are used as displays, signs, etc., in stores; and by architects and builders as an aid in the preliminary or try-out stages of designing structures wherein it is required to keep the overall design on a "modulus" unitary basis so that the overall dimensions of the assembled structure or feature shall be in multiples of the modulus unit.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a set of building blocks the combination of a plurality of line blocks, semi-blocks and corner blocks; each line block having on each of two contiguous faces a dove-tail groove extending the length of the block, there being on two other faces complementary dove-tail ribs; an edge portion of said line block formed by contiguous faces bearing said grooves being beveled throughout its length; each semi-block having on each of two mutually perpendicular faces a dove-tail groove and a complementary dove-tail rib respectively, and having an oblique plane face extending from edge to edge of said two faces; each corner block having a dove-tail groove ex-

tending the length of each of two faces and on a third face a complementary dove-tail rib; a fourth face being provided with a lug square in plan and having dove-tail marginal edges, said lug adapted to be inserted slidingly into a groove of any other block of the set to thereby establish the said corner block at will either at right angles to such groove or parallel therewith.

2. A building block adapted to mutually interfit with other like blocks for creating a great variety of differently designed structures; said block having on each of two faces a dove-tail groove and having on each of two other faces a dove-tail rib; the modulus defined by said faces being a square; each rib and groove having its middle located at the middle of a side of said square modulus; the distance from the intersection of two modulus lines to the point where the modulus line intersects the dove-tail edge of a groove or rib being equal to one-half the width of said groove or rib measured along said modulus line; a longitudinal edge of the block defined by contiguous faces being cut away to provide a beveled face whose plane includes the intersection of two moduli.

3. In a set of building blocks, the combination of a plurality of blocks, each having on each of two contiguous faces a dove-tail groove extending the length of the block, there being on two other faces complementary dove-tail ribs; an edge portion of one of said blocks formed by contiguous faces bearing said grooves being beveled throughout the length; another of said blocks having on each of two mutually perpendicular faces a dove-tail groove and a complementary dove-tail rib respectively, and having an oblique plane face extending from edge to edge of said two faces; another of said blocks having a dove-tail groove extending the length of each two faces

and on a third face a complementary dove-tail rib; a fourth face of the last mentioned block being provided with a lug substantially square in plan and having dove-tail marginal edges, said lug adapted to be inserted slidingly into a groove of any other block of the set to thereby establish the last mentioned block at will either at right angles to such groove or parallel therewith.

4. A tongue-and-groove type building block of the class described wherein the tongues and grooves are situated on an assumed modulus defining the size and shape of an equivalent plane-face block; each tongue and each groove being located with its mid-depth substantially coinciding with a line of said modulus; the length of the tongue or groove as measured along said modulus line being equal to one-half the length of said line; the mid-width of the tongue or groove being situated at the middle of said line; a longitudinal corner A at the intersection of two grooved faces presenting a beveled face that includes in its plane a corner of the modulus.

JAMES G. BLACKINTON.

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