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C. B. SLOOP ET AL

3,496,670

HOLLOW CONSTRUCTION TOY WITH HINGED CONNECTOR

Filed Jan. 18, 1968

3 Sheets-Sheet 2

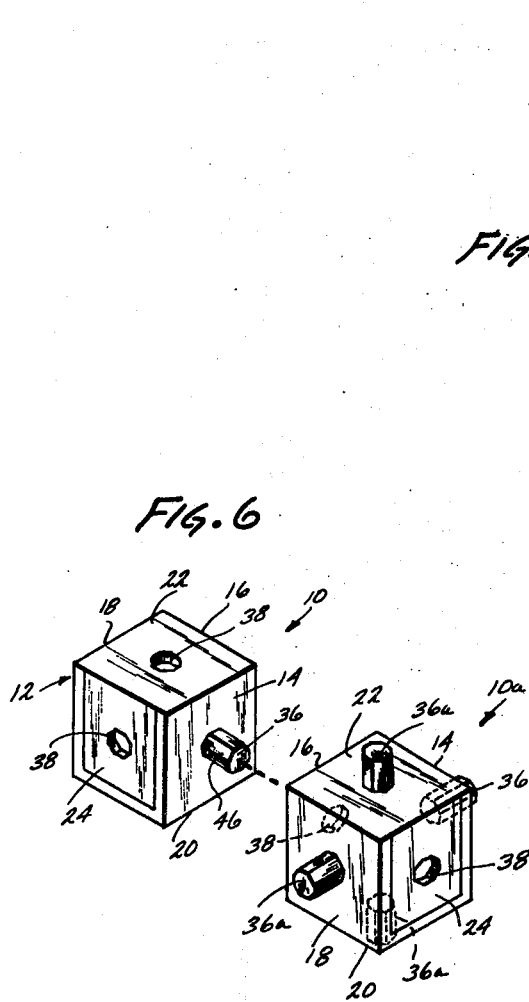


FIG. 6

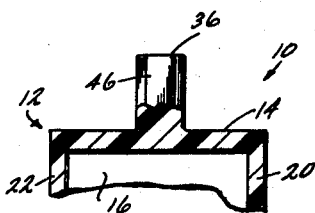


FIG. 9

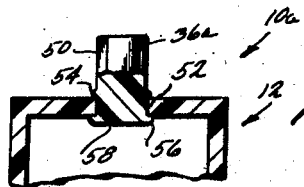
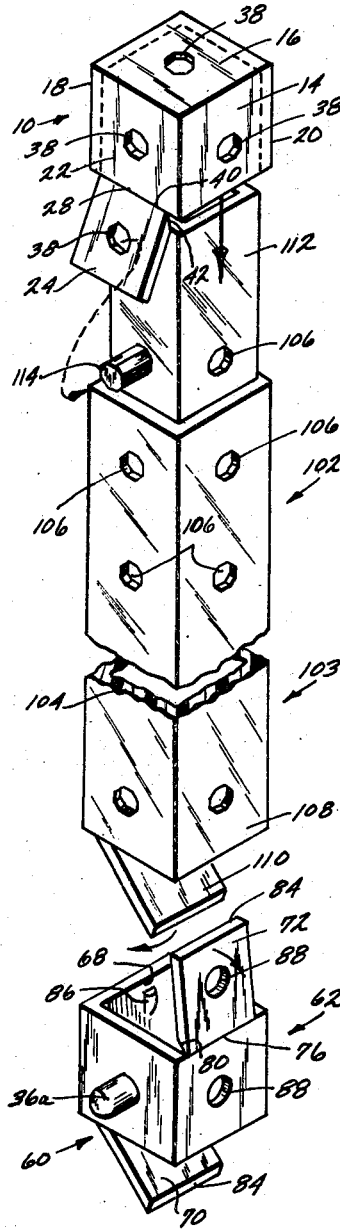


FIG. 10

FIG. 8



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FIG. 11

FIG. 12

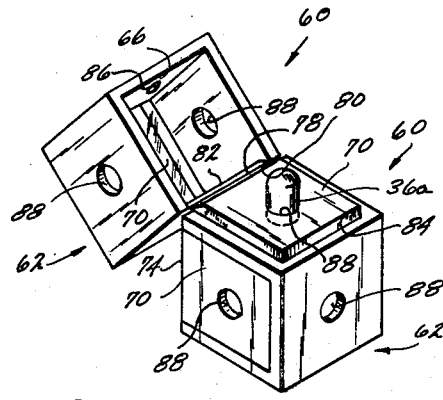
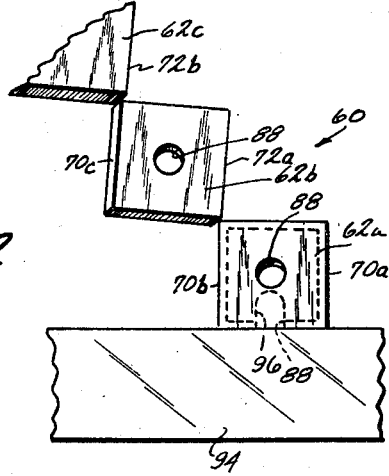
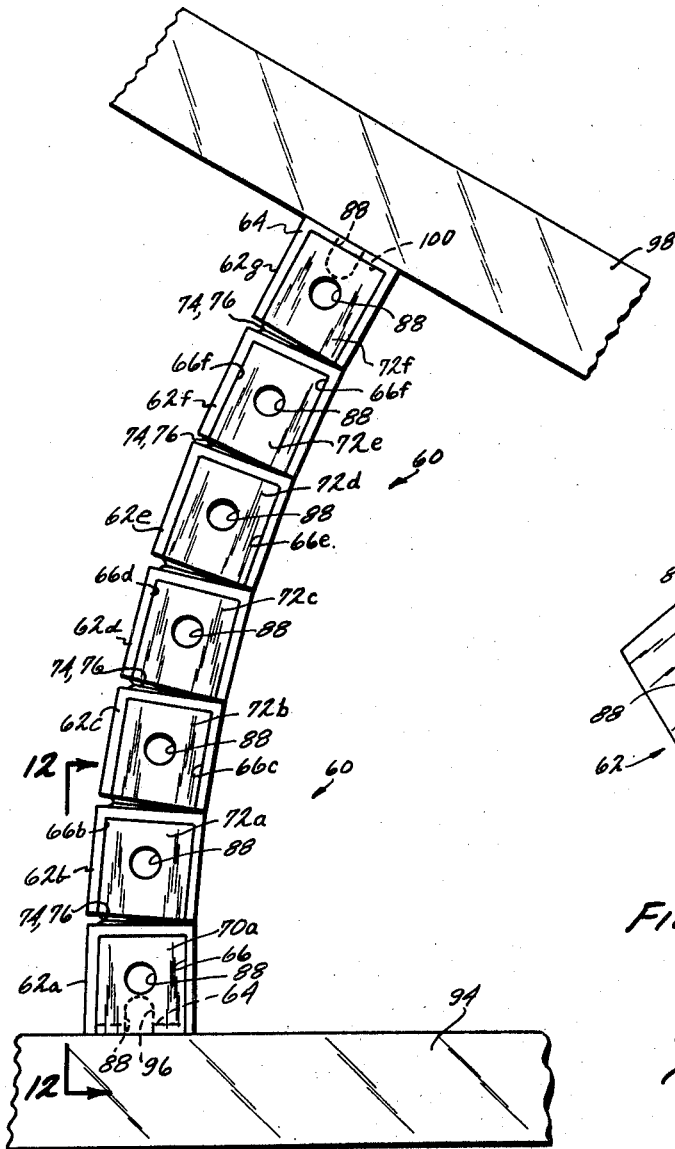


FIG. 13

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**HOLLOW CONSTRUCTION TOY
WITH HINGED CONNECTOR**

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Continuation-in-part of application Ser. No. 631,810,
Apr. 18, 1967. This application Jan. 18, 1968, Ser.
No. 703,506

Int. Cl. A63h 33/08

U.S. Cl. 46-25

9 Claims

ABSTRACT OF THE DISCLOSURE

A hollow, cubical toy building block has at least one face hingedly connected to a block open end so that a plurality of blocks may be connected together by engaging the hinged face of one block in the corresponding open end of another block. Some of the faces of each block may carry pins and other faces may be provided with apertures engageable by pins on other blocks.

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of our co-
pending application, Ser. No. 631,810, filed Apr. 18,
1967, and now abandoned.

BACKGROUND OF THE INVENTION

The background of the invention is set forth in two parts:

Field of the invention

The present invention pertains generally to the field of construction toy elements and more particularly to such elements having improved connector means. The elements include hollow, mating blocks each having at least one face hingedly connected to a block open end so that a plurality of blocks may be connected together by engaging the hinged face of one block in the corresponding open end of another block.

Description of the prior art

Construction toy elements in the form of hollow, mating blocks are known from such prior United States patents as Croy Patent No. 1,604,391 and Duggar Patent No. 3,254,440. One disadvantage with the blocks disclosed in these patents resides in the fact that they are comparatively expensive to manufacture because of the labor involved in first forming them in flat sheets and then folding them into the shape of a block. Another disadvantage resides in the fact that the connector means included on the blocks limit use of the blocks primarily to block-stacking activities.

The labor involved in folding a flat sheet into the shape of a block may be reduced somewhat by injection molding a block in two halves. However, such blocks still have the disadvantage that even this small amount of labor increases the cost of the block too much for present marketing conditions.

SUMMARY OF THE INVENTION

In view of the foregoing factors and conditions characteristic of construction toy elements, it is a primary object of the present invention to provide a new and useful construction toy element not subject to the disadvantages enumerated above and having an improved connector means especially designed for facilitating economical manufacture of the construction toy element while simultaneously improving the play-value of the toy.

Another object of the present invention is to provide a construction toy element which includes hollow, mat-

ing blocks each having at least one face hingedly connected to a block open end so that the blocks may be connected together by engaging the hinged face of one block in the corresponding open end of another block.

Yet another object of the present invention is to provide a construction toy element in the form of a cubical, hollow block having at least one face hingedly connected to the block and having all of the block faces provided with connecting means in the form of apertures or pins.

A further object of the present invention is to provide a block of the type described having five faces provided with octagonal apertures and one face provided with an octagonal pin.

According to the present invention, construction toy elements having improved connector means are provided. Each toy element includes wall means forming a tubular member having an encompassing side wall and at least one open end. This member may comprise a cube having six equal faces with one of the faces comprising a plate means hingedly connected to the tubular member at its open end, thereby forming a swingable face or plate means.

This swingable face may be used to close the open end or, alternatively, it may be engaged in the open end of another member to connect two members together. Suitable stop means is provided inside each tubular member for supporting the free end of the swingable face when it is in position in an open end. Some of the faces of each member may carry pins and other faces may be provided with apertures engageable by pins on other members. The pins and apertures may be of any octagonal shape, if desired.

The members, which will be sometimes referred to hereinafter as "blocks," may be made from suitable plastic materials employing injection-molding techniques. The mold is arranged in such a manner that the swingable face is formed integrally with the remaining portion of the block and is connected thereto by a portion having a reduced cross section for forming the hinge means. The block is formed with the swingable face lying in an open position so that the finished block may be readily removed from the mold. Thus, the construction toy element of the present invention overcomes the prior art disadvantage of requiring additional labor to assemble different parts of the block together after the molding operation.

The hinge means has sufficient flexibility for permitting the swingable face to be flexed or twisted somewhat so that a plurality of blocks may be connected together in the form of an arch, or the like.

The blocks may also be connected to other construction toy elements having suitable connector means provided thereon. For example, a beam may be inserted into the open end of a block with the swingable face thereof swung to a position approximately 180° from a closed position. The swingable face may be provided with an aperture which engages a pin located on the beam adjacent the end which is inserted into the block. Also, a beam may be provided with a swingable plate means matching the swingable faces provided on the blocks for connecting a block to the beam by engaging its swingable plate means in the open end of the block.

If desired, some of the blocks may be provided with a pair of swingable faces and with removable pins.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The present invention, both as to its organization and manner of use, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in connection with accompanying drawings in which like reference characters refer to like elements in the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a perspective view of a construction toy element in the form of a cubical block having one swingable faces and constituting a first embodiment of the present invention;

FIGURE 2 is a perspective view of the block of FIGURE 1 showing its swingable face in an open position;

FIGURE 3 is a cross-sectional view taken along line 3—3 of FIGURE 2;

FIGURE 4 is a perspective view of a construction toy element in the form of a cubical block having two swingable faces and constituting a second embodiment of the present invention;

FIGURE 5 is a cross-sectional view taken along line 5—5 of FIGURE 4;

FIGURE 6 is an exploded, perspective view of a block of FIGURE 1 in combination with a block like that shown in FIGURE 1 which has been modified by adding a plurality of connector pins thereto;

FIGURE 7 is an enlarged, cross-sectional view showing a pair of blocks of the type shown in FIGURE 4 connected together by engaging the swingable face of one block in the open end of another block;

FIGURE 8 is an enlarged, exploded perspective view of the blocks of FIGURES 1 and 4 in association with a beam-type construction toy element;

FIGURE 9 is an enlarged, partial cross-sectional view showing one type of pin employed on the blocks shown in FIGURES 1—8;

FIGURE 10 is an enlarged, partial cross-sectional view of another pin which may be employed on the blocks shown in FIGURES 1—8;

FIGURE 11 is a partial elevational view of a structure which may be made by connecting a plurality of blocks of the present invention together by engaging a swingable face of one block in the open end of another block and by twisting the flexible faces slightly to form an arch;

FIGURE 12 is a cross-sectional view taken along line 12—12 of FIGURE 11; and

FIGURE 13 is a perspective view showing a pair of blocks of the type shown in FIGURE 4 connected together by engaging the swingable face of one block with the connector pin of the other block.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring again to the drawings and more particularly to FIGURES 1—3, a construction toy element constituting a first embodiment of the present invention, generally designated 10, includes a block 12 which is shown for purposes of illustration, but not of limitation, in the shape of a cube having six faces 14, 16, 18, 20, 22 and 24. The block 12 is hollow so that the faces 14—22 comprise wall means forming a tubular member having an encompassing sidewall and at least one open end, as shown at 26 in FIGURES 2 and 3. The open end 26 may be closed by the face 24 which is swingably connected to the face 22 by a hinge means 28. Thus, the face 24 constitutes a swingable plate means for covering the open end 26. Alternatively, the swingable face 24 may be used to connect one block 12 to another block 12 by engaging it in the open end of said other block. A stop means 30 is provided on the inside surface 32 of face 20 for supporting the free end 34 of the swingable face 24 in open end 26. It should be noted that the swingable face 24 serves both to close the open end 26 of a particular block and as a connecting means to connect one block to another block.

The construction toy element 10 also includes connecting means 36 comprising a pin extending from face 14. An aperture 38 is provided in each of the remaining faces for receiving pins 36 provided on other blocks 12 to connect them together.

The construction toy element 10 is preferably made in a single molding operation from suitable plastic materials,

such as polypropylene, employing injection-molding techniques. This may be accomplished by molding element 10 with swingable face 24 in an open position. The hinge means 28 is formed during the molding operation by reducing the cross-section of the plastic material to form a thin web 40 and mitred edges 42, 44. After the element 10 is removed from the mold, the swingable face 24 may be moved to a closed position (FIGURE 1) with the edges 42, 44 abutting each other so that swingable face 24 forms a right angle with face 22. The stop member 30, the apertures 38 and the connecting means 36 are also formed during the molding operation.

Referring now to FIGURES 6, 9 and 10, each connector means 36 may be provided with eight longitudinally-extending faces 46 for minimizing turning of the connector means 36 in an associated aperture 38, which is of the octagonal shape required to receive connector means 36. The construction element 10 may be modified as shown at 10a in FIGURE 6 by providing it with additional connector means 36a of a removable type which may be inserted into any of the apertures 38. Each connector means 36a includes a body portion 50 and a shank portion 52. An annular flange 54 is provided on the body portion 50 adjacent shank 52 and a deformable flange 56 is provided on the lower end 58 of shank 52. The deformable flange 56 may be deflected sufficiently to permit insertion of shank 52 into an aperture 38 until the annular flange 54 is seated against block 12. At this time flange 56 resumes its original shape and engages block 12 for securing connector means 36a thereto.

Referring now more in particular to FIGURES 4, 5 and 7, a construction toy element constituting a second embodiment of the present invention, generally designated 60 includes a tubular member or hollow block 62 having an encompassing sidewall 64, a first open end 66 and a second open end 68 which may be closed by swingable faces or panel means 70, 72, respectively. The faces 70, 72 are connected to the sidewall 64 by hinge means 74, 76, respectively, each of which includes a thin web 78 and mitred edges 80, 82. Each plate means 70, 72 may be swung to a closed position closing an associated open end 66, 68 by swinging its free end 84 into engagement with an associated stop member 86 provided inside block 62. The plate means 70, 72 may also be swung to open positions and inserted into the open ends 68, 66, respectively, of other blocks 62 for connecting them together. Thus, the plate means 70, 72 serve the dual roles of closing associated open ends 66, 68, respectively, and of serving as connector means for connecting a plurality of blocks 62 together.

The construction toy element 60 also includes a connector means 36a, which may be of the removable type shown in FIGURE 10, and is provided with a plurality of apertures 88 engageable by connector means 36a provided on other blocks for connecting a plurality of blocks 62 together.

Each construction toy element 60 may be made from a suitable plastic material, such as polypropylene, by single injection-molding step with the swingable plate means 70, 72 in an open position for facilitating removal of the element 60 from the mold and for permitting the formation of webs 78 and mitred edges 80, 82.

FIGURE 7 shows an example of the swingable plate means 70, 72 being used as a connector means. In this example, a base plate 90 is provided with an upstanding pin 92 which may be engaged by the aperture 88 in a swingable cover 72 on a lower block 62 with the swingable plate 72 in a closed position wherein its free end 84 engages the stop member 86. The swingable plate means 70 on the lower block 62 has been swung in a clockwise direction, as viewed in FIGURE 7, approximately 180° from a closed position to an open position exposing open end 66. The swingable plate 72' on an upper block 62' has also been swung in a clockwise direction 180° exposing the open end 68' of the upper block 62'. The swing-

able plate 72' may then be inserted into the open end 66 of the lower block 62 while the swingable plate 70 of the lower block 62 may be inserted into the open end 68' of the upper block 62' for connecting both blocks together as shown. The flexible nature of the hinge means 74, 76' permits limited swinging of the upper block 62' with respect to the lower, fixed block 62, as indicated by the broken lines in FIGURE 7. Alternatively, the swingable plate means 70 on one block 62 may be swung open and engaged with the pin 36a on another block 62, as shown in FIGURE 13. This produces a hinging connection between the two blocks. In addition, the upper block 62' may be twisted along hinge means 74', 76' a small amount, as will be more fully explained hereinafter in connection with FIGURES 11 and 12, which will now be described.

The construction toy elements 60 may be used to construct arches and the like by connecting a plurality of blocks 62 together as shown in FIGURE 11 wherein a stationary beam 94 is provided with an upstanding pin 96 engageable in an aperture 88 provided in sidewall 64 of a base block 62a having its swingable plate means 70a closed. The swingable plate means 72a of the base block 62a is then engaged in the open end 66b of the next higher block 62b which, in turn, has its swingable plate means 70b, which was swung downwardly from open end 66b so that swingable plate means 72a from block 62a could be inserted into open end 66b, inserted into the opening left in block 62a when its swingable plate means 72a was swung upwardly and positioned in open end 66b of block 62b. The swingable plate means 72b from block 62b may be swung upwardly and engaged in the open end 66c of the next higher block 62c, in the opening created when its swingable plate means 70c was swung downwardly to engage the opening provided in block 62b when its plate means was swung upwardly and engaged in open end 66c of block 62c. Additional blocks 62d, 62e, 62f and 62g may be connected together in like manner and the assembly may be twisted to form an arch by taking advantage of the flexible nature of the several hinge means 74, 76. The upper block 62g may then be connected to a fixed beam 98 by engaging a depending pin 100, provided thereon, in an aperture 88 provided in the encompassing sidewall 64 of the block 62g. If desired, the pins 36a may be removed from the blocks 62 so that the sidewalls 64 of the several blocks 62 will present a smooth surface uninterrupted by protuberances or projections, as shown in FIGURE 11.

Referring now to FIGURE 8, a construction toy element constituting a third embodiment of the present invention, generally designated 102, is shown for purposes of illustration, but not of limitation, as being combined with one construction toy element 10 and one construction toy element 60. The construction toy element 102 comprises a tubular member 103 having a substantially square cross section formed by an encompassing sidewall 104 which may be provided with spaced-apart apertures 106 substantially throughout its length. The member 103 includes a first open end 108 which carries a swingable plate means 110 corresponding in size and type to the swingable plate means 24, 70 and 72 which serve the dual functions of closing open end 108 and of forming a connector means for engaging any of the open ends 32, 66 or 68 for connecting elements 10 or 60 to member 103. The member 103 also includes a necked down end 112 which may be inserted inside blocks 12 and 62 by opening their associated swingable plate means 24 and 70, 72, respectively. The blocks 12 or 62 may be secured in position on end 112 by engaging the apertures 38 or 88, respectively, with a pin 114 carried by member 1-3 adjacent end 112.

In all of the embodiments illustrated and described herein, it is to be noted that the hinged cover or closure is substantially the same shape and dimension as the

opening in which it seats. Actually, the distance from the hinge axis to the opposite edge of the closure member, measured along the outer surface thereof, is substantially equal to the corresponding dimension of the related opening and since the side walls of the blocks and the cover itself are of substantial thickness, it is necessary to force the closure or cover into the opening, to closed position and to remove the same therefrom, the resiliency of material from which the blocks are made permits some flexure to achieve this result. Stated differently, the distance from the hinge axis to the edge corner of the closure at the opposite edge thereof and at the inner surface is actually a diagonal dimension (when viewing the cover in section) and is greater than the distance from the hinge axis to the opposite edge of the cover as measured along the outer surface thereof. Since the latter dimension is substantially equal to the corresponding dimension of the opening, then it is apparent that the diagonal dimension referred to is somewhat greater than the width of the opening and it is thus necessary to force the closure edge of the cover past the edge of the opening to get it into closed position or to open the same from closed position. This results in somewhat of a snap action and is present whether the closure is being seated in the corresponding opening of its own block or in the corresponding opening of a parent block, as shown in FIGURE 7. Thus, when assembled in the manner shown in FIGURES 7, 8, 11, 12 and 13, the fit of the closure within the selected opening securely fastens the two adjacent blocks together. This could be referred to as a snug frictional fit, but in any event, it is a securement against accidental removal and releasably seats the closure in the selected opening. The described snap action, due to the greater length of the diagonal dimension referred to, results from the structure described, which might also be referred to as resilient means releasably holding the closure in its opening.

While the particular construction toy element herein shown and described in detail are fully capable of attaining the objects and providing the advantages hereinbefore stated, it is to be understood that they are merely illustrative of the presently preferred embodiments of the invention.

We claim:

1. A construction toy element having improved connector means, comprising:

a one-piece, hollow toy building block having substantially flat sides integrally joined at adjacent edges;

at least one face of said block being open and having a substantially flat closure seated and releasably retained therein to completely close the same;

integral hinge means connecting one edge of said closure to an adjacent edge of an adjacent side;

said block being an integral molding of resilient material, said sides and closure being of substantial thickness, said closure having its edge faces, other than said one edge, substantially perpendicular to its outer surface, the transverse dimensions of said closure being substantially equal to the corresponding dimensions of said opening whereby said closure may be snapped into and out of said opening, the edge faces of said closure in engagement with adjacent sides constituting cooperating resilient means for releasably holding said closure in said opening and whereby said closure may be selectively positioned in said opening to define one face of said block or positioned and releasably held in a similar open side of another block to connect said blocks together.

2. A toy as defined in claim 1 wherein said integral hinge means is substantially coplanar with the outer face of said closure and comprises a relatively thin portion of said resilient material.

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3. A toy as defined in claim 1 wherein said hinge means is biased to normally urge said closure toward open position.

4. A toy as defined in claim 1 wherein at least one of said sides is provided with an aperture therethrough and another of said sides is provided with pin means projecting therefrom for frictional engagement in a similar aperture in another block.

5. A toy as defined in claim 4 wherein said aperture is in said closure and said pin means is on said adjacent side in position to engage in said aperture when said closure is swung to a position overlying said adjacent side.

6. A toy as defined in claim 1 wherein said block comprises a cube having six equal sides.

7. A toy as defined in claim 6 wherein two opposing sides of said block comprise an opening and cooperating closure.

8. A toy as defined in claim 1 wherein said block defines an elongated structure, said at least one side being one end of said elongated structure.

9. A toy as defined in claim 8 wherein the other end

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of said elongated structure is of reduced transverse dimensions, corresponding to the dimensions of said opening, and a laterally extending pin projecting from said structure adjacent to but spaced from said other end.

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U.S. Cl. X.R.

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