Nov. 26, 1968 C. E. RICHES 3,412,502

HOLLOW REINFORCED NESTABLE BUILDING BLOCK

Filed June 2, 1966

Fig. 1

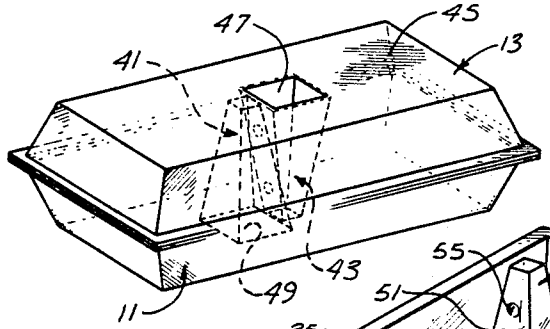


Fig. 2

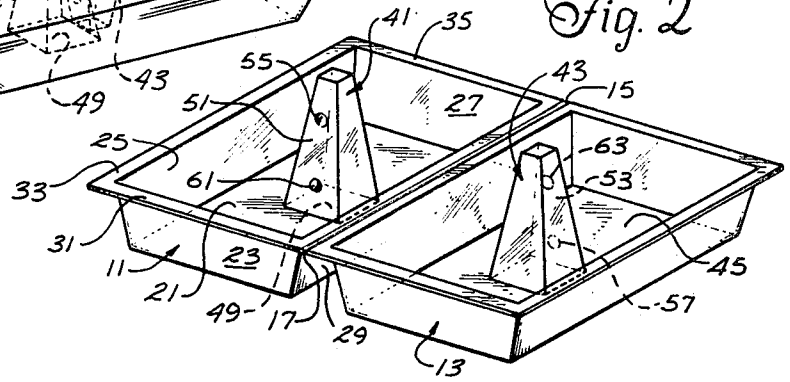


Fig. 3

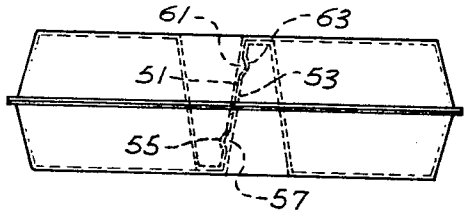


Fig. 4

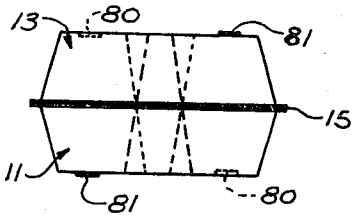


Fig. 5

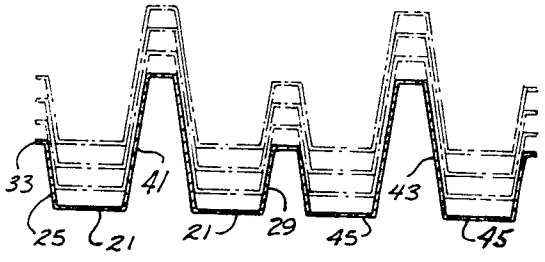


Fig. 6

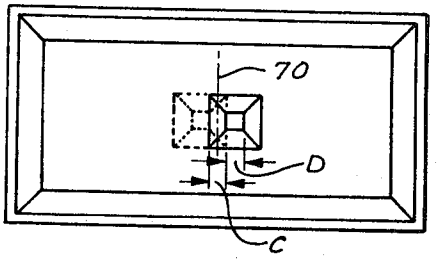
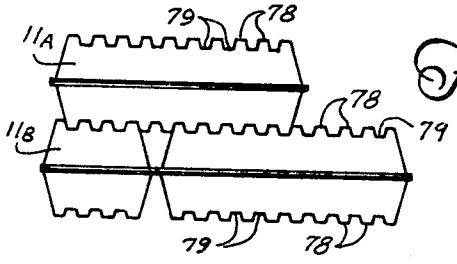


Fig. 7



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HOLLOW REINFORCED NESTABLE BUILDING BLOCK

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The present invention relates to an improved hollow nestable reinforced building block. It has particular application to blocks for play, i.e., toy building blocks, preferably made of translucent or transparent plastic materials suitable for use by children, but it may also relate to structural building blocks of other materials such as glass, etc., and to a more permanent and useful type of block units suitable for building permanent or semipermanent structures.

In the prior art, numerous hollow blocks have been made for children. Building blocks which can be assembled to make various structures are still among the favorite toys for children of various ages. Larger children, however, often will quickly tire of small cubic building blocks, partly because they can build only small structures. Moreover, if these small conventional blocks, hollow or solid, are used in any substantial number, they take up a lot of space and may interfere with other normal activities around the home or play area. Larger children generally prefer larger units so that they can make larger structures. In fact, building blocks are very popular with larger children when of a size comparable to bricks or other real adult structural materials. In fact, the blocks can be made still larger than bricks, if desired. With a few such blocks a child can build enclosures or structures large enough to surround himself or to climb on and thus begin to simulate actual structural buildings of real utility.

While larger building blocks are desirable, they also consume an enormous amount of space. The average home or play room cannot tolerate any large number of such devices. It is therefore highly desirable to make the blocks nestable. Hollow building blocks of various nonuniform sizes have been made in the past which can be nested, one within another, so that the smallest block is in the center, surrounded progressively by larger and larger units until the largest is on the outside. Such a set of blocks makes a very convenient package for storage and has some real advantages. Such blocks are usually made of paper or light weight wood or plastic materials and usually are not very strong. Moreover, they cannot be used conveniently for many types of building structures, especially where repetitive structural units of like size and shape are required, because each block in the nested type ordinarily is smaller or larger than the next in the series.

A particular object of the present invention is to make large hollow blocks which are of similar size, and shape, interchangeable and reversible, and which still can be nested. This is accomplished by making the blocks of a two part hinged construction. They are preferably provided with a central strut, or ap air of reinforcement elements which serve not only to give strength to the structure of the individual block and allow placing of substantial weight thereon without crushing, but also are designed to provide interlocking means for holding the hinged unit in closed position while it is being used for building or structural use.

Blocks of this type may be made of various materials. They are preferably formed from strong and fairly rigid material, polyethylene plastic being a suitable one, although other plastics such as polypropylene, vinyl, materials such as molded paper pulp, fiberboard, and other fibrous or fiber-reinforced plastics can be used quite

satisfactorily. The blocks are preferably made of strong material with some flexibility to absorb shock without breaking, but they should not be so flexible as to be structurally unsuitable for building purposes. They are preferably made, for simplicity of manufacture, of material which can be extrusion molded or cast in simple molds without reentrant portions. By this way they can be readily produced by simple machinery without requiring complicated molding operations.

The invention will be more fully understood by reference to specific examples illustrated in the attached drawing.

In said drawing,

FIG. 1 shows a closed block unit made of two tray-like parts hinged together and centrally reinforced by frustopyramidal struts.

FIG. 2 shows a unit like that of FIG. 1 in open position. FIG. 3 is a side elevational view of a closed unit illustrating more clearly the interlocking mechanism and the general structure in outline. FIG. 4 is an end view of a block, such as in FIG. 3, with slight modifications for interengagement or interlock between successive building elements.

FIG. 5 shows in sectional elevation the nesting arrangement of a plurality of block structures like the one shown in FIG. 2. FIG. 6 is a plan view of a block as in FIG. 1, showing the congruent arrangement of the reinforcement elements. FIG. 7 is a small scale diagrammatic view showing how units are designed for convenient assembly in groups for structural use.

Referring first to FIGS. 1 and 2 the structure of an individual block is shown. It is composed of two similar and congruent tray-like elements **11** and **13** hinged together along a central line **15**. The hinge element is here shown in the form of a flexible web which can be folded many times without breaking. In this form, it is simply a thinned web part of the tray structures, joining them together. Material such as polyethylene, polypropylene, poly-C_2–C_3, and the like, is quite suitable for this purpose, although there are other plastics such as some of the vinyl and acrylonitrile derivatives which are about equally suitable and in some cases may be superior. On the other hand, the two structural tray units **11** and **13** may be made separately and may be connected by a flexible strip of suitable plastic or fabric material which may be adhesively or otherwise secured to the two units. In this case, they may be made of wood, glass or various moldable materials, which may include fibers for structure or for reinforcement. Preferably the two trays are cast side by side, with connecting web, in a single operation, and are made of material which is self-flexible in thin cross-sections. The thin cross-section of web **15** is shown better at **17**, FIG. 2.

Each tray has four outwardly and upwardly sloping walls projecting from its base or bottom. Thus tray **11** has an essentially flat bottom surface **21** with gently outwardly sloping side wall surfaces **23**, **25**, **27** and **29**. Preferably each wall surface **23**, **25** and **27** terminates in a rim or lip element **31**, **33**, **35**, etc. See FIG. 2. When the two hinged tray parts are closed together, as in FIGS. 1 or 3, the lip elements **31**, etc. of tray **11** and similar parts of tray **13**, FIG. 2, rest on each other. This lip or rim element is broad enough to give substantial support when weight is applied to the closed block, so that one tray will not force its wall elements into the other when a force is applied as might occur if the thin wall elements did not have a lip or rim. See also FIG. 4.

The structure thus is such that when the two trays are closed together for use as a building block, there are firm and reasonably broad supporting surfaces between the two hinged parts on at least three sides, besides the hinged element **15** itself.

Each tray is formed with a strut or post located near its center, in the form of an upstanding pyramid structure or frustopyramid, as indicated at **41** in tray **11** and at **43** in tray **13**. See especially FIG. 2. These strut elements are sufficiently strong and rigid to lend very substantial vertical support to the top wall member **45**, as seen in FIG. 1, which is the bottom wall of tray **13** as in FIG. 2. The frustopyramidal elements **41**, **43** are formed preferably at a single blow molding operation, integral with the tray base, so as to leave an opening **47** in the base wall **45** of tray **13**, for example, and an opening **49** in the base wall **21** of tray **11**. The strut elements are also positioned so that each double tray or block unit, FIG. 2, is congruous with every other while each tray or half block is congruous with the other half. In other words, another unit like that of FIG. 2, in opened position, can be placed right on the unit shown therein, nesting into it, so that the frustopyramids will stack in alignment on top of one another regardless of the relative position in horizontal rotation of trays **11** and **13**. That is to say, that when stacking or nesting is to be done, as shown diagrammatically in FIG. 5, one need not pay any attention to the particular orientation of the trays, because the frustopyramidal struts **41**, **43** upstanding from the respective trays, are located in such position that the trays can always be stacked as long as the long edges or similar wide walls are parallel to each other. This has definite advantages. It facilitates putting the blocks away when they are not in use, so that this can be done even by a small child without requiring any particular skill for stacking or nesting.

The angle of taper or slope of the walls, as well as the frustopyramidal struts **41**, **43**, is such that the units can be conveniently nested together. This angle is wide enough for easy assembly in groups, but not so broad that the block walls are weak, too flexible, or otherwise unsuitable for building purposes. Preferably, the side wall angle is in the neighborhood of about 15° from the vertical, and the same is true of the frustopyramidal elements. This angle may be, more broadly, between about 12 and 25°. The latter, incidentally, may be made frustoconical instead of frustopyramidal, if desired, but there is a particular reason for having at least one pair of flat faces meeting each other, as shown in FIG. 3.

Here the opposed faces **51**, **53**, of frustopyramidal strut elements **41** and **43**, respectively, are provided with interacting indentations and protrusions, i.e., extruded buttons or knob elements, so that when the block is folded in closed position its parts are locked in place. In other words, an indentation **55** on a flat surface **51**, FIG. 3, cooperates with a protrusion **57** on the opposed and mating flat surface **53** of the other frustopyramidal element **43**. Likewise, protuding point or button **61** near the base of frustopyramid **41** cooperates with an indentation **63** near the top of the frustopyramidal element **43**. Obviously, these parts may be interchanged so that the protrusions are near the top of the pyramid, and the indentations near the bottom, or otherwise as desired, as long as the parts interlock. In either case, these elements are so formed that when the block is closed by flexure along the hinge, the locking elements snap into place, due to the resilient material of which the block is made, and due to the fact that two flat faces come into close mating contact. Thus, the pyramidal elements give the closed block structure some lateral support and guidance as well as vertical support. The height of the pyramidal or frustopyramidal elements is such that the top of each strut bears against the bottom of the other tray, i.e., of the other half of the block when the unit is in the closed position, as seen in FIGS. 3 and 4.

FIG. 6 shows in plan the congruent but relatively reversed relationship between the two tray elements and their struts when the block is in closed position. Obviously, it does not matter which way the blocks are oriented so far as nesting is concerned, as long as the trays in successive blocks are parallel. It will be understood that in this situation, the visible frustopyramidal element **43** is seen in the top or base wall **45** of the tray **13**, that is, it projects downwardly, leaving a hole or opening of corresponding shape in the top of the building block. Likewise, the other element **41** projects upwardly from the base **21** of the other tray as it is seen in FIG. 2, for example, and its top rests against the tray base **45** of tray **13** when the unit is closed. With this arrangement, there are in effect two struts or posts located adjacent each other and near the center, that is on either side of the center line of each closed block. The center line is indicated at **70**, FIG. 6 and the sloping configuration of the frustopyramidal elements preferably is such that the projection from the side slope, indicated at C, is equal to the width D of the top of the frustopyramid. In other words the base of each frustopyramid is three times as long and three times as wide as its top; preferably both the base and the top are square, although this is not absolutely necessary. They may be rectangular, if desired.

As previously indicated, the strut elements also may be made frustoconical in shape, but they do not give quite as good reinforcement to the device and at least the mating faces, as seen in FIG. 3 at line **51**, for example, should be flat and adapted to confront each other smoothly and snugly for giving the best support to the block. The other elements of the strut may be angular or rounded as desired, but the angular structure is normally preferred. When the material is transparent, the units are attractive, with their various reflective surfaces. They may be colored, dyed, or printed, as desired, or left plain.

The dimensions of the blocks can be varied, but preferably they each have a length that is a multiple of the width, preferably double. Thus, as shown in FIG. 6, the block is essentially twice as long as it is wide when closed. This makes possible the convenient building of wall structures, as is typically done with conventional brick which are twice as long as their width. The blocks **11A**, **11B**, can be provided with alternate surface depressions and projections **78**, **79**, waffle fashion, as shown in FIG. 7, and can be put together in stable stacks and/or rows with overlapping joints or corners as is common in bricklaying practice. With a reasonable number of these blocks, large "forts" and other structures may readily be built by children. By using heavier materials for blocks, permanent or semipermanent structures may be made. The units also may be cemented together if desired.

For stability of structure, the waffle surfaces of FIG. 7 or fewer projections as shown in FIG. 4 may be employed for surface interlocking elements on the trays. Thus indentations **80**, **81** are formed in top and bottom respectively, and cooperating slight protrusions **82**, **83**, are so positioned, and of such number, that whether the blocks are laid in alignment one above the other, or staggered half joints, or set at right angles to form corners or a turn, the appropriate parts will interlock properly. This will be obvious to those skilled in the art.

As shown in FIG. 5, multiple open units can be stacked quite compactly, so that a large number of open blocks take only a moderate amount of space, not too much larger than the space taken by one or two closed blocks. With such an arrangement, a reasonably large number of blocks can be stored conveniently, and can be stacked and unstacked by children. In use, they are snapped together, as shown in FIGS. 3 and 4, with suitable interlocking action to hold them closed. They can be stacked or otherwise used, limited only by the imagination and ingenuity of the user.

It will be understood that various modifications may be made in shape, design, proportions, sizes, etc., without departing from the spirit of the invention. It is intended by the claims which follow to cover the structures shown and their obvious equivalents and the sort of variations which might readily occur to those skilled in the art,

and it is intended to cover the invention as broadly as the prior art properly permits.

What is claimed is:

1. A unitary building block comprising two similar congruous tray elements side walls and having substantially flat bottom walls, united by a flexible hinge along a common boundary line, said tray elements having substantially the same overall dimensions, each tray element being provided with an upstanding structural hollow strut element less than twice the height of said side walls to give support to the bottom wall of the other tray element when said two tray elements are folded together.

2. A block according to claim 1 wherein the walls are sloped to an appropriate angle for nesting and compact storage of multiple blocks.

3. A block according to claim 1 wherein the walls are sloped and the struts are also sloped to an angle appropriate for nesting of multiple blocks.

4. A block according to claim 1 wherein the side walls of the trays are sloped and the struts are also sloped to an angle appropriate for nesting and wherein the struts

have mutually engageable surfaces provided with interlocking means to hold the block closed.

5. A block according to claim 4 wherein the angle is about 12 to 25°.

6. A unit according to claim 1 which has a length which is a multiple of its width when in closed position.

7. A plurality of units according to claim 1 nested together into a compact package in the open hinged position.

8. A block according to claim 1 having alternate interblocking projections and depressions in its top and bottom surfaces.

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