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 [21] Appl. No. **776,607**
 [22] Filed **Nov. 18, 1968**
 [45] Patented **Aug. 10, 1971**
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 [32] Priorities **Nov. 29, 1967; Feb. 3, 1968**
 [33] **Denmark; Germany**
 [31] **5973;
P 16 78 326.9**

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[54] **TOY BUILDING SET**
 7 Claims, 2 Drawing Figs.

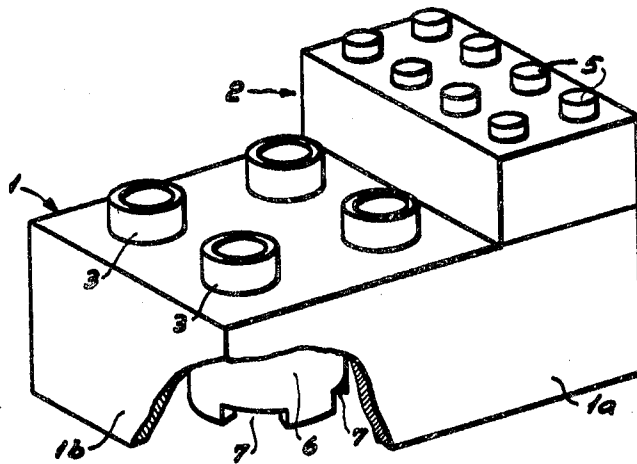
[52] U.S. Cl. 46/25
 [51] Int. Cl. A63h 33/08
 [50] Field of Search..... 46/25

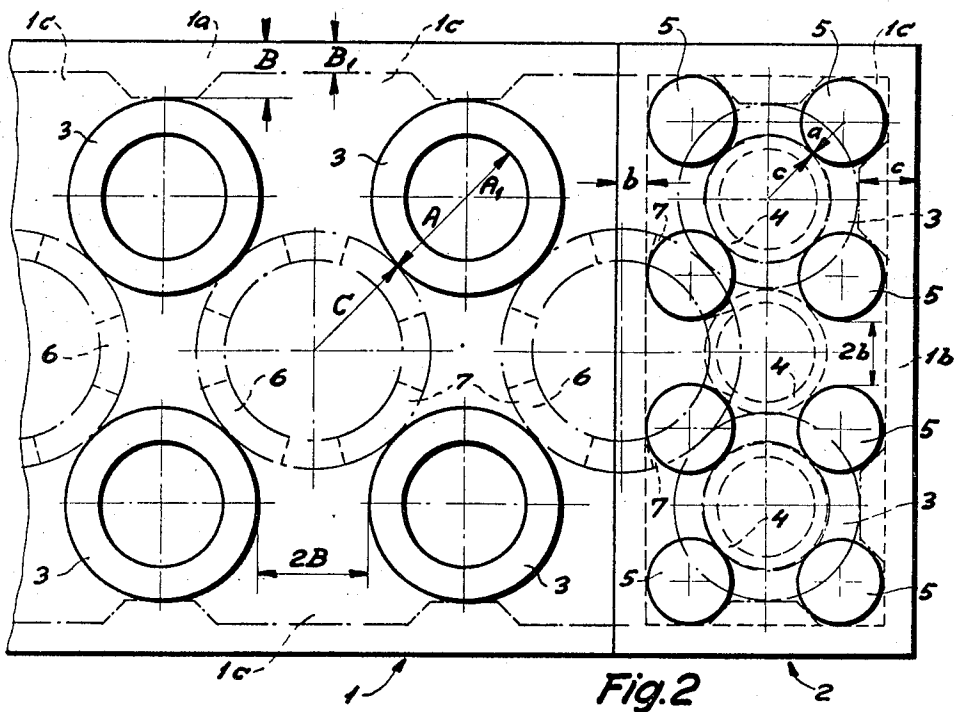
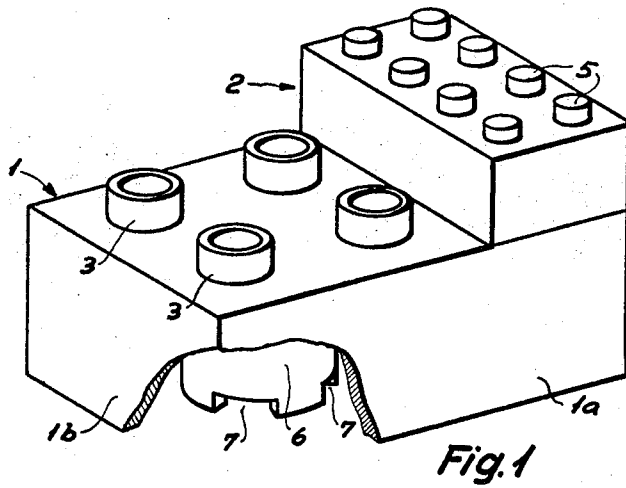
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ABSTRACT: This application discloses toy building blocks of similar shape but constructed to different modules. They are buildable together and, to this end, the inner protrusions of the smaller blocks coact with the outer projections of the larger blocks differently from the coaction within the module which is disclosed in U.S. Pat. No. 3,005,282.





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TOY BUILDING SET

This invention relates to a toy building set of the type comprising downwardly open, box-shaped building elements, each of which is provided on the upper surface with coupling studs serving to couple the element to a corresponding element by engagement between the sidewalls of the latter element. Such building sets are constructed so that the dimensions of each building element is an integral multiple of a given basic module, but so that the said coupling studs have the same dimensions and are spaced equally in all the elements, which thus simply have different numbers of such coupling studs according to their size.

When making a building structure from such elements it may in certain cases be of interest to use larger elements than the normal, i.e. elements which are both of greater height and of greater width than the normal elements. Also to arouse the interest of smaller children it may be an advantage that they can start playing with a building set with larger elements which are easier to handle for small children, who may then later on become interested in more advanced and detailed structures composed of smaller elements. It is therefore the object of the present invention to provide a toy building set which is constructed to permit small and large elements to be combined, and this has been achieved by a building set which, besides base elements of a given basic module with respect to external dimensions, and dimensions and positioning of the coupling studs, comprises elements the module of which is an integral multiple of the said basic module. By dimensioning the elements like this it has been rendered possible to couple small elements to large elements, and the elements may be joined in any desired combination so that for instance a structure commenced with large elements may be continued and modified by adding small elements.

The invention is particularly concerned with building sets where the base element, besides the said coupling studs, the primary studs, have secondary studs within the hollow space of the element for engagement between 4 primary studs disposed in the corners of a square, which ensures a particularly efficient coupling, and in order that this coupling may be effective both between large elements alone, between small elements alone and between large and small elements, the building set according to the invention may comprise elements the module of which is twice the said basic module and which are provided with tubular primary studs the internal diameter of which corresponds to the external diameter of the secondary studs of the base element. In this manner the secondary studs of the small elements will engage the tubular primary studs of the large elements and thus ensure an efficient coupling.

In a specific embodiment of the invention which is based on the theoretically correct relation between the dimensions of the primary and secondary studs, the ratio of the outer radius "A" of the said tubular primary studs to the radius "a" of the primary studs of the base element and its wall thickness "b" is substantially as follows:

$$A = a + (a+b)(2-\sqrt{2}),$$

though suitable tolerance must be taken into account so that the required friction may be provided between engaging members when the elements are joined. Moreover it will be expedient to make the secondary studs of the large elements slightly shorter than the height of the sidewalls so that these secondary studs will not be in the way of the primary studs of a small element coupled to the underside of the large element.

The same effect, however, may be achieved according to the invention by providing the secondary studs of the large element with recesses in the outermost edge of the studs and to dimension these recesses so that they just afford space enough for the primary studs of a small element joined to the underside of a large element.

To further ensure an efficient coupling where a small element is made to engage the underside of a large element, the

inner face of the sidewalls of the large element of a building set according to the invention may be provided with recesses for receiving the primary studs of the small elements.

By defining the ratio of the stud radii as stated above it will be possible to make building sets not only with elements in two different sizes but virtually, if desired, in a great number of sizes, though the various sizes will not automatically become proportional. If it is desired to have elements in a larger number of sizes it will be expedient to dimension them with $a = b\sqrt{2}$. Hereby complete proportionality will be provided between the different sizes of elements, in that both wall thickness and the dimensions of primary and secondary studs and the main dimensions of the elements will have the following proportions: 1:2:4:6 etc.

The invention will be explained here with reference to the drawing, in which:

FIG. 1 shows two assembled building elements according to the invention, viewed in perspective, and

FIG. 2 the same elements viewed from above and in larger measure.

The building elements 1 and 2 shown in FIG. 1 are coupled together by means of the studs 3 on the surface of the element 1 — hereinafter called primary studs — which cooperate with one or more secondary studs disposed within the hollow space of the element 2 and in FIG. 2 designated 4. It will be seen directly from this figure that the module of the element 1 corresponds to twice the basic module indicated with respect to the element 2.

In FIG. 2 the two elements 1 and 2 are viewed from above, and it will be seen that the element 1 has upwardly facing primary studs 3 and downwardly facing secondary studs 6. Correspondingly, the element 2 has upwardly facing primary studs 5 and downwardly facing secondary studs 4 of approximately the same external diameter as the internal diameter of the tubular primary studs 3.

In order that a small element may also be coupled to the underside of the large element 1, the side and end walls 1a and 1b are provided with recesses 1c for receiving the primary studs 5.

The geometrical conditions for obtaining the desired coupling possibilities between the elements 1 and 2 may be derived from FIG. 2:

If "a" designates the radius of the primary stud 5, "b" the wall thickness of the element 2, "c" the outer radius of the secondary stud 4, "A" the outer radius of the primary stud 3, "B" the effective wall thickness of the element 1, "C" the outer radius of the secondary stud 6, "A₁" the inner radius of the primary stud 3, and "B₁" the reduced wall thickness of the element 1, the following ratios between wall thickness and stud dimensions will be obtained:

$$B = c - (a+b) \sqrt{2} - a(\sqrt{2}-1) + b\sqrt{2}, \text{ og}$$

$$A = 2(a+b) - c, \text{ eller } A = a + (a+b)(2-\sqrt{2})$$

In an embodiment where $A=2a$ the figures will be:

$$A = 2a = a + (a+b)(2-\sqrt{2}); a = b\sqrt{2}$$

It will also be seen from the drawing that the free ends of the secondary studs 6 are provided with recesses 7 for receiving primary studs 5 of a small element 2 disposed under the large element 1.

What I claim is:

1. A toy building set of the type comprising downwardly open, rectangular, box-shaped building elements, each of which on the outer surface opposite the open side is provided with an even number, not less than four, of primary coupling studs serving to couple the element to a corresponding element by engagement between the sidewalls of the latter element said primary coupling studs being arranged with their axes in the corner of squares, said toy building set comprising at least two types of elements, smaller-type elements and larger-type elements, the smaller-type elements having a given basic module with respect to external dimensions and positioning of coupling studs, having a secondary stud arranged within the hollow space of the element centrally in relation to each square formed by the axes of the primary studs and so

dimensioned as to engage four primary studs of another element of the same basic module, the larger-type elements having a module which is an integral multiple of the said basic module, its primary coupling studs being tubular, the external diameter of the secondary studs of the smaller-type elements being equal to the internal diameter of said primary studs of the larger-type elements and to the space between adjacent primary studs on such larger-type elements whereby adjacent secondary studs of a smaller-type element are capable of being gripped alternately within and between adjacent primary coupling studs of a larger-type element.

2. A toy building set according to claim 1, characterized in that the ratio of the outer radius "A" of the said tubular primary studs to the radius "a" of the primary studs of the base element and its wall thickness "b" is substantially as follows: $A = a + (a+b)(2-\sqrt{2})$.

3. A toy building set according to claim 1, characterized in that in the inner face of the sidewalls of the large elements there are recesses for receiving the primary studs of small elements.

4. A toy building set according to claim 1, characterized in that $a = b\sqrt{2}$.

5. A toy building set of the type comprising downwardly open, box-shaped building elements, each of which on the outer surface opposite the open side is provided with primary coupling studs serving to couple the element to a corresponding element by engagement between the sidewalls of the latter element said primary coupling studs being arranged with their axes in the corner of squares, said toy building set comprising at least two elements, a smaller one of which is considered as a base element of a given basic module with respect to external dimensions and positioning of coupling studs, said base element having at least three secondary studs within the hollow space of the element so dimensioned as to engage centrally four primary studs of another element of the same basic module, a larger second element having a module which is an integral multiple of the said basic module, its primary coupling studs being tubular, the external diameter of the secondary

studs of the base element being equal to the internal diameter of said primary studs of the second element and to the space between adjacent primary studs on said secondary element whereby adjacent secondary studs are capable of being gripped alternately within and between adjacent primary coupling studs of said larger element.

6. A building set comprising at least two box-shaped building elements, a smaller one and a large one which has a module which is an integral multiple of that of the small one, each having sidewalls, a top wall, the large one having at least two studs on the upper surface of said top walls and the small one having at least three projections on the under surface of its top wall, the studs of said larger block being hollow and having an inside diameter equal to that of the under surface projections of the smaller block and being so spaced that the shortest path between the external surface of adjacent studs is substantially equal to the outside diameter of the projections of the smaller block.

7. A toy building set of the type comprising downwardly open, box-shaped building elements, each of which on the outer surface opposite the open side is provided with primary coupling studs serving to couple the element to a corresponding element by engagement between the sidewalls of the latter element, said primary coupling studs being arranged with their axes in the corner of squares, each element having secondary studs within the hollow space of the element for engagement with four primary studs of a block of identical proportions, said toy building set comprising at least two elements, a smaller one of which is considered as a base element of a given basic module with respect to external dimensions and positioning of coupling studs, a larger second element having a module, its primary coupling studs being tubular, the external diameter of the secondary studs of the base element being equal to the internal diameter of said primary studs of the second element and to the space between adjacent primary studs of said second element, the secondary studs of the larger element having cavities adapted to accommodate primary studs of the smaller element.

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