



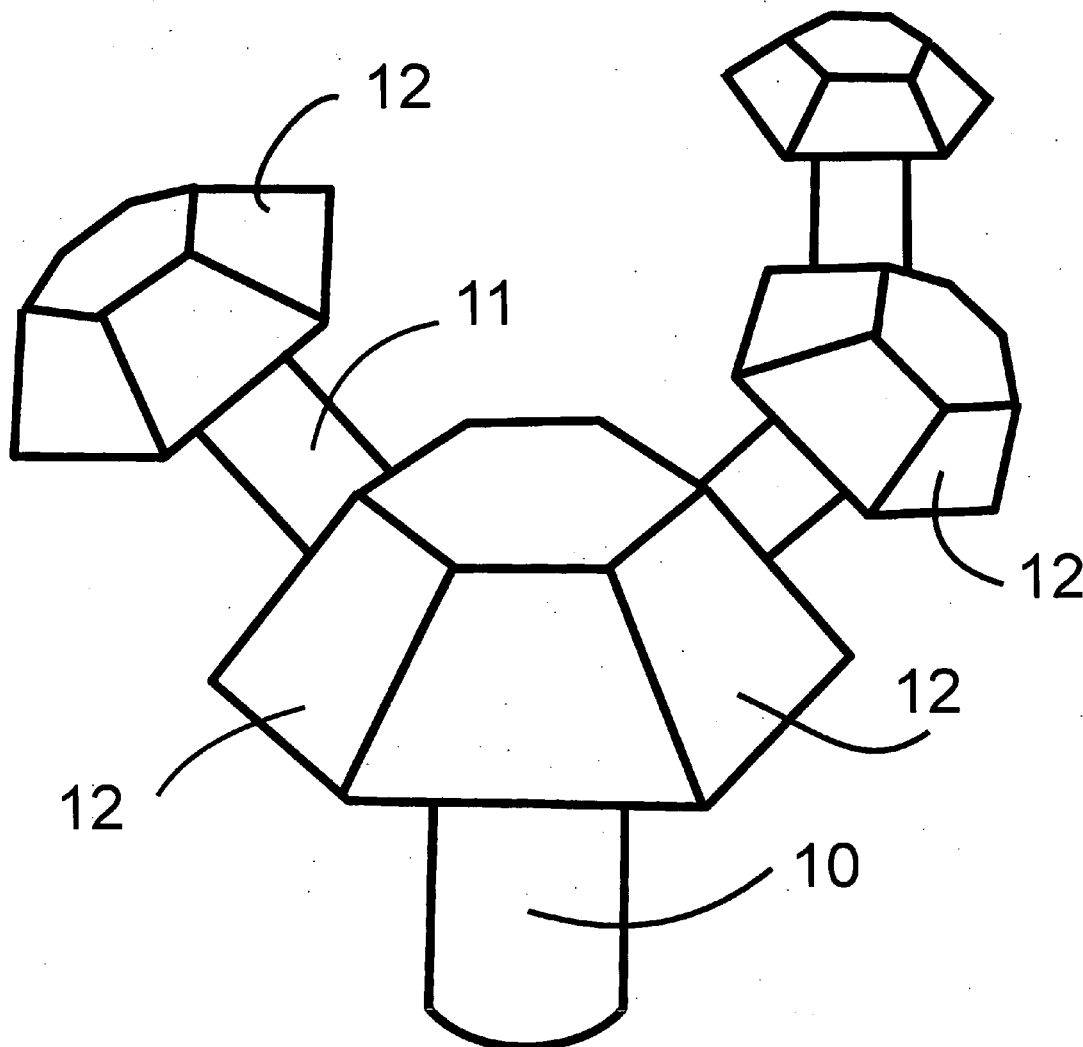
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(19) **United States**(12) **Patent Application Publication**
Jabr(10) **Pub. No.: US 2017/0157523 A1**(43) **Pub. Date: Jun. 8, 2017**(54) **MATING BLOCKS FOR CONSTRUCTING
NATURAL SHAPES**(52) **U.S. Cl.**CPC *A63H 33/06* (2013.01); *A63H 33/046*
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(57)

ABSTRACT

A construction set consisting of a sequence of subsets of mating blocks each subset having blocks of a smaller size than the preceding subset, all blocks being of the same general shape and enabling the construction of naturally occurring shapes such as fractal shapes. Each block has an attachment site to the next larger size blocks and at least two attachment sites to blocks of the next smaller size. The blocks can attach to each other by a variety of means including pin and hole pairs or magnets.



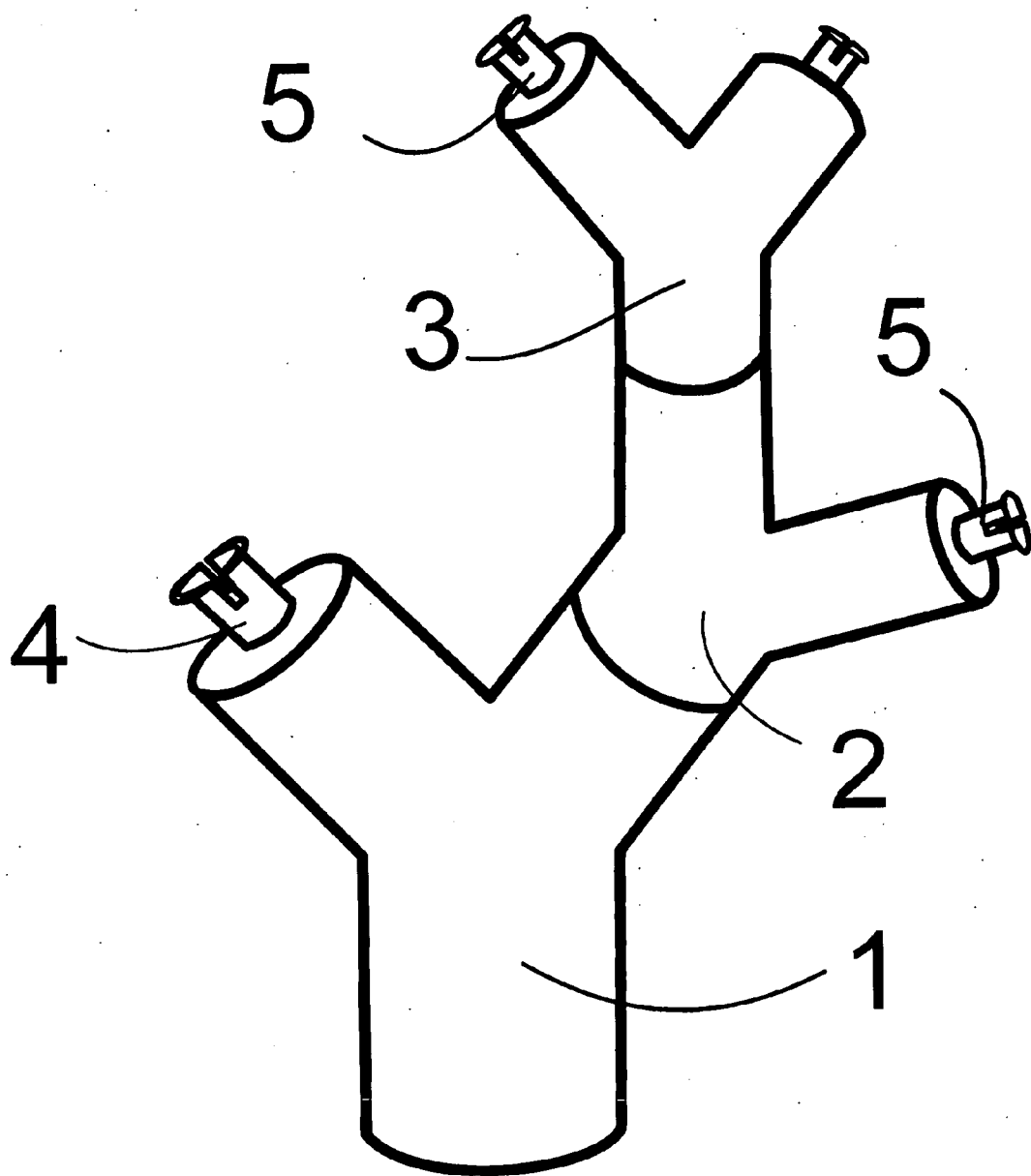


Fig. 1

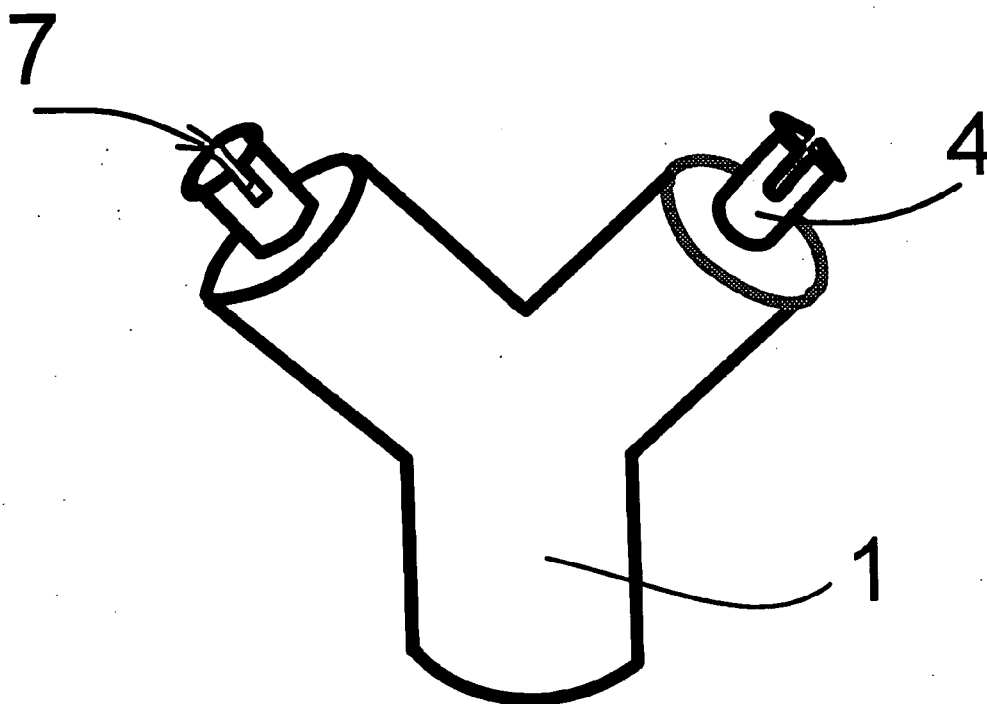


Fig 2A

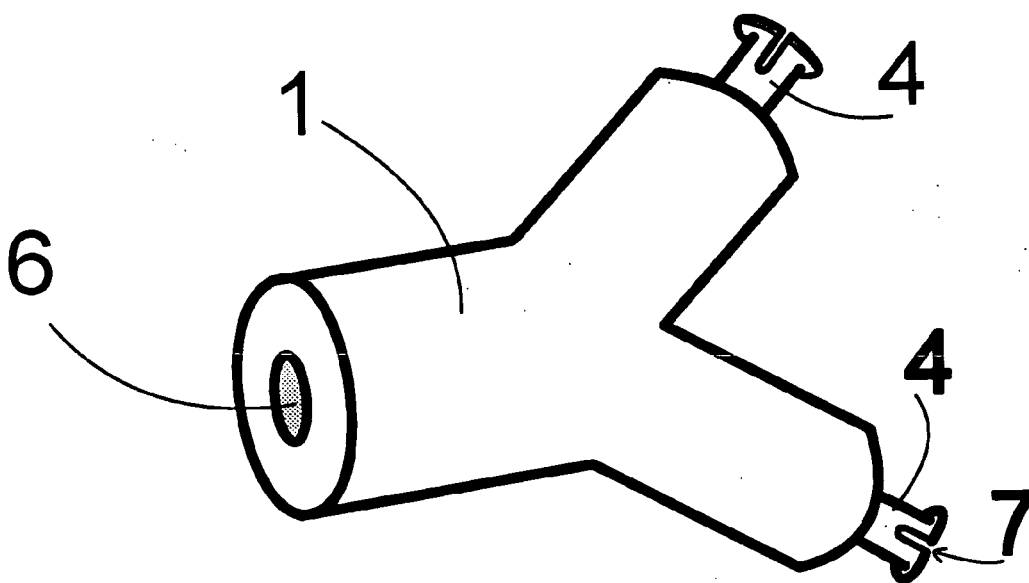


Fig. 2B

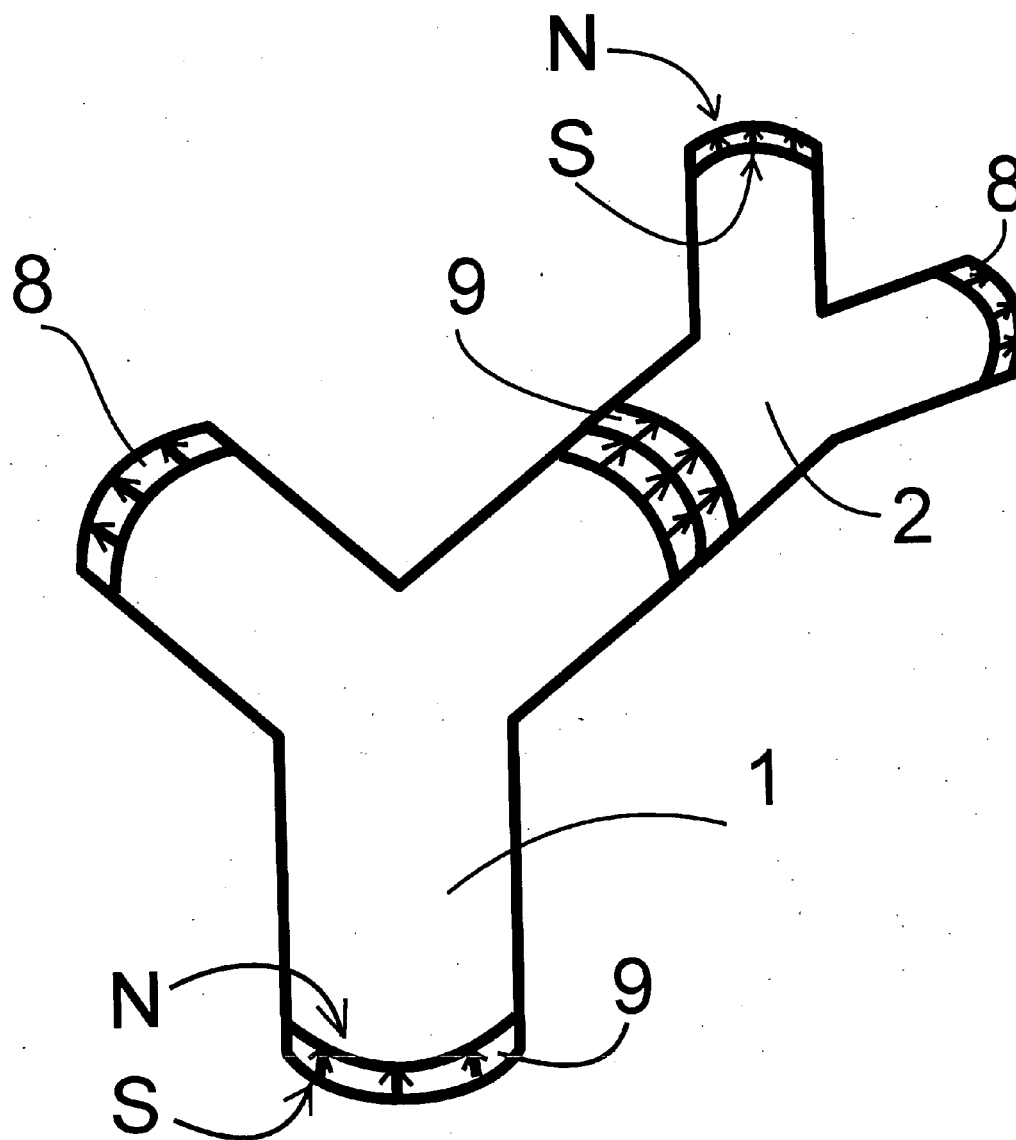


Fig. 3

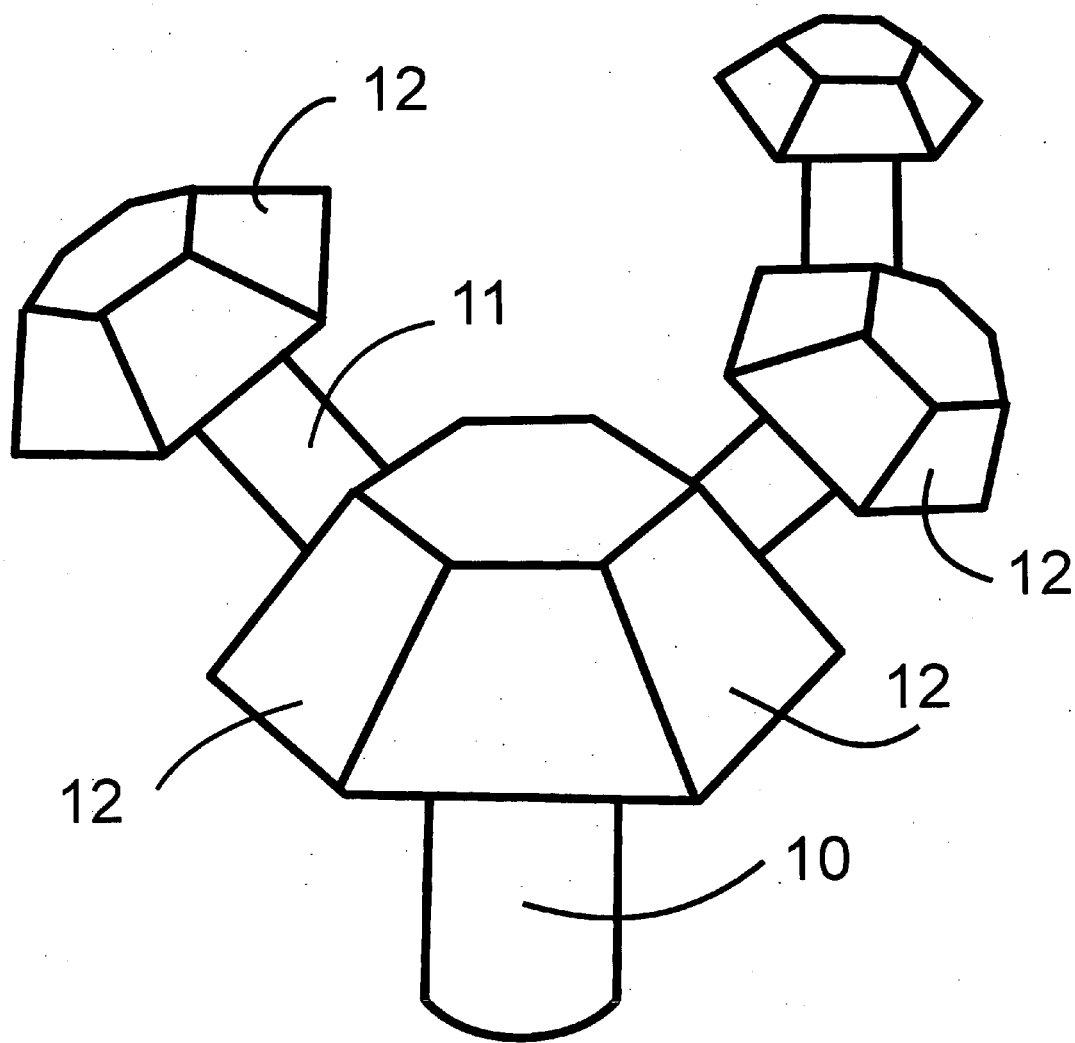


Fig. 4

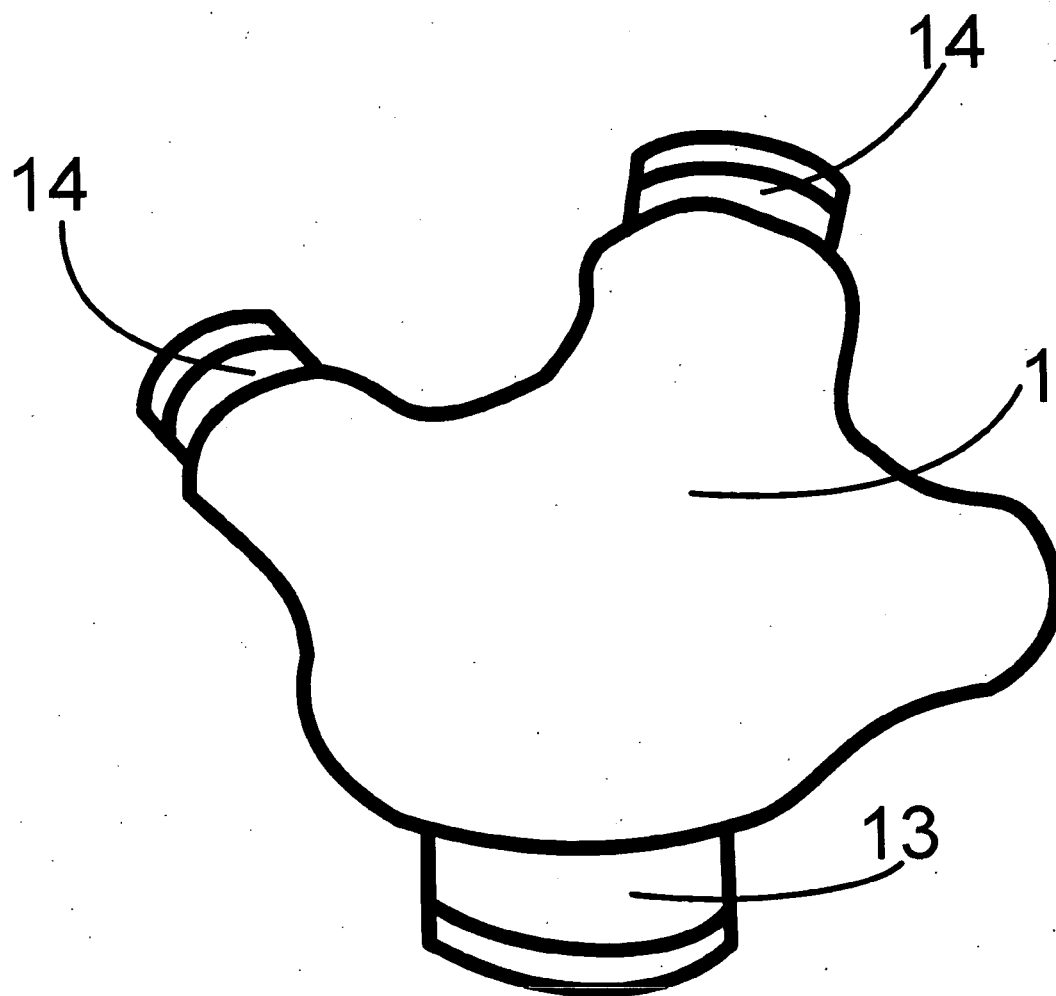


Fig. 5

MATING BLOCKS FOR CONSTRUCTING NATURAL SHAPES

BACKGROUND FIELD OF THE INVENTION

[0001] The present invention relates to novel construction elements that may be connected together to construct art pieces or models of engineered or natural objects.

DESCRIPTION OF THE PRIOR ART

[0002] Construction sets have long been of great utility to artists designers and engineers. In particular toy construction sets for enabling the creation of simulated animate and inanimate objects have been a source of amusement for decades, particularly the types of toy construction sets with various types and configurations of interlocking components that enable formation of various shapes.

[0003] One such early construction set is shown and described in U.S. Pat. No. 311,793, issued Feb. 3, 1895 to Stranders for a "Building Toy", such patent showing a set including connectable dowel rods and partitions capable of being assembled into a structure depicting a building. Stranders' set therefore is limited to the construction of models representing buildings.

[0004] U.S. Pat. No. 3,566,531, entitled "Mating Blocks Having Beaded Studs and Resilient Sidewalls", issued to Hasel et al on Mar. 2, 1971, such patent disclosing hollow box-like toy blocks open on the lower side and having studs on the upper side to mate with the open side, the lower sidewalls being resilient and the studs may have beads. AH blocks in the Hasel patent are of the same size and mate to other blocks of the same size, thus they do not enable construction of natural shaped objects wherein subcomponents are of varying sizes.

[0005] Another such set is shown and described in U.S. Pat. No. 3,777,393, issued to Baer, on Dec. 11, 1973, such patent being entitled "Construction Toy", the toy including a plurality of unitary construction members, each having two wing-shaped elements joined by a hinge at the longitudinal axis of the member and two hinges in each end of the member. Each member is provided with an array of holes and an array of pins for enabling interconnection into three-dimensional geometric configurations, with varying angles between members. Baer therefore teaches a construction set enabling varying angles but does not teach varying the size of members to enable construction of naturally occurring shapes.

[0006] U.S. Pat. No. 8,388,401 Issued to Lanahan, teaches a plurality of structural members configured to be coupled together to form an array, each structural member comprising a top portion having a plurality of top extending members spaced apart from one another; and a bottom portion having a plurality of bottom extending members spaced apart from one another.

[0007] However in Lanahan, the structural members have three top extending members and three bottom extending members, and the three top extending members are formed with the same height so that coupling of the plurality of structural members to one another results in a plurality of layers having a uniform height. Lanahan is therefore aimed at constructing dense interconnected arrays.

[0008] Generally, construction elements in the known prior art have geometrical shapes that do not permit the construction of naturally occurring shapes such as trees, or

other shapes from the myriad biological organisms, or natural mountain ranges or general Fractal shapes, wherein the size of individual building blocks varies between sub components of the whole.

SUMMARY OF THE INVENTION

[0009] It is an objective of the present invention to provide sets of construction elements designed in such manner as to allow their assembly into what is generally known as fractal objects. Fractal objects are defined by the essential property that any part of such objects is a reduced size copy of the whole object. Many naturally occurring shapes such as trees, mountain ranges, corals, ferns, have a fractal geometry. The present invention enables such assemblies by providing special construction elements of similar shape and varying size that interconnect with each other to form fractal objects. Each element has at least one connection site to larger size elements and at least two connection sites to smaller size elements.

[0010] It is a further objective of the present invention to allow anyone to experiment with creating new fractal shapes by providing construction sets of elements that allow variations in the size and shape of the elements as well as variations in the relative orientation of the interconnection sites therein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 shows an assembly made of three construction elements 1,2,3, of different sizes, element 1 having connection pins 4 of a first size and element 2 having connection pins 5 of a different size.

[0012] FIG. 2A shows a construction element 1 together with connection pins 4, having a slot 7.

[0013] In FIG. 2B a different view of element 1 is shown with a connection hole 6.

[0014] FIG. 3 shows a pair of elements 1,2 with magnets 8 at the large branch and magnets 9 at the small branches.

[0015] FIG. 4 shows a construction elements 10,11 having a plurality of connection sites 12 allowing a variable number of connections to the next smaller size element.

[0016] FIG. 5 shows a construction element 1 of very general shape having a connection site 13 to larger size elements and two connection sites 14 to smaller size elements.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0017] Referring to FIG. 1. there is shown a fractal object constructed from three construction elements 1,2 and 3. The particular shape of said elements in this invention is not limited to any particular shape even though elements 1,2,3 are shown having a Y shape for illustrative purposes. Construction element 1 is the largest and a pin 4 is shown on the end of one of its branches. A similar pin, not visible, plugs into element 2 of the next smaller size. Element 2 has the same shape as element 1 and dimensions substantially $\frac{1}{2}$ the dimensions of element 1. Element 2 also has two pins 5, one of which is visible, designed to fit into the holes of the next smaller size element 3. Element 3 has the same shape as elements 1 and 2 and has dimensions substantially $\frac{1}{2}$ the size of element 2 dimensions.

[0018] FIG. 2 shows a single construction element 1 wherein pins 4 are provided at the two ends of the Y shaped

element and a hole 6 is provided at the stem end. The pins 4 have a cylindrical shape and may have a longitudinal slot 7, in order to provide a better fit into the hole of the next smaller element.

[0019] In order to enable the construction of fractal shaped objects it is advantageous to have construction elements having the same shape that connect in one site to a similar element of larger size and in at least one other site to at least one other element of smaller size. Such construction elements enable an iterative construction system. Such iterative processes are the backbone of Fractals as described in "Fractals For the Classroom", by Peitgen, Jurgens et. al., Springer-Verlag, Ch1, (1992).

[0020] In practice, the user would first attach an element of a given size to a second element of the next larger size. One or more of the resulting composite objects would then be attached to a third element of yet larger size and so forth. The present invention therefore has four objectives.

[0021] The first objective is to provide a connection between an element and a larger element in one site on the element and another connection between said element and a smaller element in at least a second site. The present invention achieves this first objective by providing two different sizes of paired pins 4 and 5, and holes 6, on different sites in the elements.

[0022] Another method of achieving the first objective is to provide magnetic stiction surfaces at the joints between construction elements. FIG. 3 shows construction elements 1,2 with such magnets 8,9. Said magnets 8,9 could have one pole, say the south pole indicated by the letter S, facing outward at a site that connects to a larger element 1, and an opposing North pole, indicated by the letter N, facing outward at a site that connects to a smaller element 2. This arrangement assures that different size elements will connect together in the proper order to form a larger object from sequentially smaller elements.

[0023] A second objective of this invention is to enable variations in the number of branches between elements of different size. FIG. 4 shows a particular embodiment wherein the elements 10, 11, have a multiplicity of connection sites 12. In practice the user can choose to populate part or all of said connection sites thus varying the number of branches as well as the angle between branches.

[0024] A third objective is to provide element shapes that avoid leading to overall constructions wherein the different parts interfere with each other. The present invention achieves this third objective by avoiding small angles between the directions normal to the connection surfaces between elements. Said angles are preferably chosen between 30 and 180 degrees of arc.

[0025] A fourth objective is to allow the assembly of generally smooth and natural looking constructions. The present invention achieves this by providing elementary shapes having specific size ratios between one set of elements and the next set of larger or smaller size. Said size ratios are preferably chosen to be substantially in the range 1.3 to 3.

[0026] The particular shape of any element 1 is not germane to the present invention, provided that each element includes attachment sites to larger as well as smaller elements as described herein.

[0027] FIG. 5 shows a construction element of very general shape having a connection site 13 to larger elements and two connection sites 14 to smaller elements.

SUMMARY, RAMIFICATIONS AND SCOPE

[0028] Accordingly the construction elements described in this invention enable the construction of a variety of naturally occurring shapes easily and conveniently. Although the description above contains many specificities, these should not be construed as limiting the scope of the invention but as merely providing illustrations of some of the presently preferred embodiments of this invention. For example the construction elements can have other shapes such as pyramids, cubes, icosahedrons etc. insofar as they have attachment sites to other elements of larger and smaller sizes. The elements may be solid or hollow and may be made from a variety of materials including but not limited to plastic, metal or wood. The elements may have hinges or flexible sections allowing parts thereof to move relative to other parts.

[0029] Furthermore the means of attaching one element to another need not be limited to pin and hole pairs or magnets. Said attachment means could be selected from a large variety of means including glues or adhesive tapes such as Velcro tapes.

[0030] While the above embodiments aim to illustrate specific cases of the present invention, the inventive scope thereof is not limited to such illustrative cases and is further specified by the following claims.

1-17. (canceled)

18. A method comprising:

providing a first construction element and a second construction element, wherein the first construction element is larger than the second construction element, wherein the first construction element and the second construction element have a substantially same shape, wherein the first construction element has a first set of dimensions, wherein the second construction element has a second set of dimensions, wherein each dimension in the first set of dimensions is of a substantially similar ratio to each dimension in the second set of dimensions, wherein the first construction element comprises:

a first connector portion that extends along a first axis; a second connector portion that extends along a second axis, wherein the second connector portion has smaller dimensions than the first connector portion, and wherein the second axis is different from the first axis; and a third connector portion that extends along a third axis, wherein the third connector portion has dimensions smaller than the first connector portion, wherein the third connector portion has dimensions substantially similar to the second connector portion, wherein the third axis is different from the first axis, and wherein the third axis is different from the second axis; and wherein the second construction element comprises:

a fourth connector portion that is attachable to the second connector portion of the first construction element along the second axis, wherein the fourth connector portion has dimensions substantially similar to the second connector portion of the first construction element; a fifth connector portion, wherein the fifth connector portion has smaller dimensions than the fourth connector portion; and a sixth connector portion, wherein the sixth connector portion has smaller dimensions than the fourth connector portion.

tor portion, and wherein the sixth connector portion has substantially similar dimensions as the fifth connector portion.

19. The method of claim **18**, wherein the first construction element and the second construction element are Y-shaped.

20. The method of claim **18**, further comprising: providing a third construction element having a seventh connector portion, an eighth connector portion, and a ninth connector portion, wherein the third construction element has a third set of dimensions that is substantially similar to the second set of dimensions of the second construction element, and wherein the seventh connector portion is attachable to the third connector portion of the first construction element along the third axis.

21. The method of claim **20**, wherein the eighth connector portion and the ninth connector portion have substantially similar dimensions, and wherein the eighth connector portion has smaller dimensions than the seventh connector portion.

22. The method of claim **20**, further comprising: instructing a user to attach the fourth connector portion of the second construction element to the second connector portion of the first construction element, wherein the second construction element is attached to the first construction element; and

instructing the user to attach the seventh connector portion of the third construction element to the third connector portion of the first construction element, wherein the third construction element is attached to the first construction element, and wherein the first construction element, the second construction element, and the third construction element form a fractal object.

23. The method of claim **20**, wherein the first construction element and the second construction element are solid objects or hollow objects.

24. The method of claim **20**, wherein the first construction element and the second construction element are formed from a material taken from the group consisting of: plastic, metal, and wood.

25. The method of claim **20**, wherein the fourth connector portion of the second construction element has a slot, wherein the second connector portion of the first construction element has a pin, and wherein the pin of the second connector portion is adapted to plug into the slot of the fourth connector portion.

26. The method of claim **20**, wherein the fourth connector portion of the second construction element is attachable to the second connector portion of the first construction element via attachment mechanisms taken from the group consisting of: magnets, glues, adhesive tapes, and Velcro tapes.

27. The method of claim **20**, wherein the substantially similar ratio is between 1.3 and 3.0, wherein each dimension in the first set of dimensions is between 1.3 times and 3.0 times each dimension in the second set of dimensions.

28. The method of claim **20**, wherein a first intersection of the first axis and the second axis forms an angle between thirty degrees and one-hundred and eighty degrees, wherein a second intersection of the first axis and the third axis forms an angle between thirty degrees and one-hundred and eighty degrees, and wherein a third intersection of the second axis and the third axis forms an angle between thirty degrees and one-hundred and eighty degrees.

29. A construction set comprising:

a first construction element having a first connector, a second connector, and a third connector, wherein the first construction element is of a first shape, and wherein directions normal to any two of the first, second, and third connectors form an arc between thirty degrees and one-hundred and eighty degrees; and

a second construction element having a first connector, a second connector, and a third connector, wherein the second construction element is of a second shape, wherein the second shape is substantially equivalent to the second shape, wherein dimensions of the first construction element are between 1.3 and 3.0 times dimensions of the second construction element, wherein directions normal to any two of the first, second, and third connectors of the second construction element form an arc between thirty degrees and one-hundred and eighty degrees, and wherein the first connector of the second construction element is connectable to the second connector of the first construction element; and

a third construction element having a first connector, a second connector, and a third connector, wherein the third construction element is of a third shape, wherein the third shape is substantially equivalent to the second shape, wherein dimensions of the second construction element are between 1.3 and 3.0 times dimensions of the third construction element, wherein directions normal to any two of the first, second, and third connectors of the third construction element form an arc between thirty degrees and one-hundred and eighty degrees, and wherein the first connector of the third construction element is connectable to the second connector of the second construction element.

30. The construction set of claim **29**, further comprising: an amount of instructions instructing a user to assemble a fractal object by attaching the second construction element to the first construction element and attaching the third construction element to the second construction element.

31. The construction set of claim **29**, wherein the first connector of the second construction element is connectable to the second connector of the first construction element via an attachment mechanism taken from the group consisting of: pin and hole pairs, magnets, glues, adhesive tape, and Velcro tape.

32. The construction set of claim **29**, wherein the first construction element has a shape taken from the group consisting of: a pyramid shape, a cube shape, a polyhedron shape, a Y-shape, and a tree shape.

33. The construction set of claim **29**, wherein the first construction element, the second construction element, and the third construction element are formed from a material taken from the group consisting of: plastic, metal, and wood.

34. The construction set of claim **29**, wherein the first construction element, the second construction element, and the third construction element are solid objects or hollow objects.

35. A construction element, wherein the construction element is part of a toy construction set having at least one other construction element, wherein the construction element comprises:

a body portion having a plurality of connector portions, wherein the body portion is of a first shape, wherein

directions normal to any two of the plurality of connector portions form an arc between thirty degrees and one-hundred and eighty degrees, wherein the construction element is 1.3 to 3.0 times a size of the at least one other construction element, and wherein the construction element has a shape equivalent to a shape of the at least one other construction element; and means for attaching one of the plurality of connector portions to a connector portion of the at least one other construction element.

36. The construction element of claim **36**, wherein the means is an attachment mechanism taken from the group consisting of: a connection pin, a connection slot, a magnet, glue, an adhesive tape, and a Velcro tape.

37. The construction element of claim **36**, wherein the shape of the construction element is taken from the group consisting of: a pyramid shape, a cube shape, a polyhedron shape, a Y-shape, and a tree shape.

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