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(54) **RESILIENT TOY CONSTRUCTION BLOCKS**

(57) The invention provides a toy building brick made of a soft material and joinable to at least one other building brick. Additionally, disclosed is a solid building brick system of a soft elastic material, which enables the detach-

ably joining of said bricks with each other, allowing the assembly of structures whose dimensions exceed the state of the art and, maintaining the firmness in said structures.

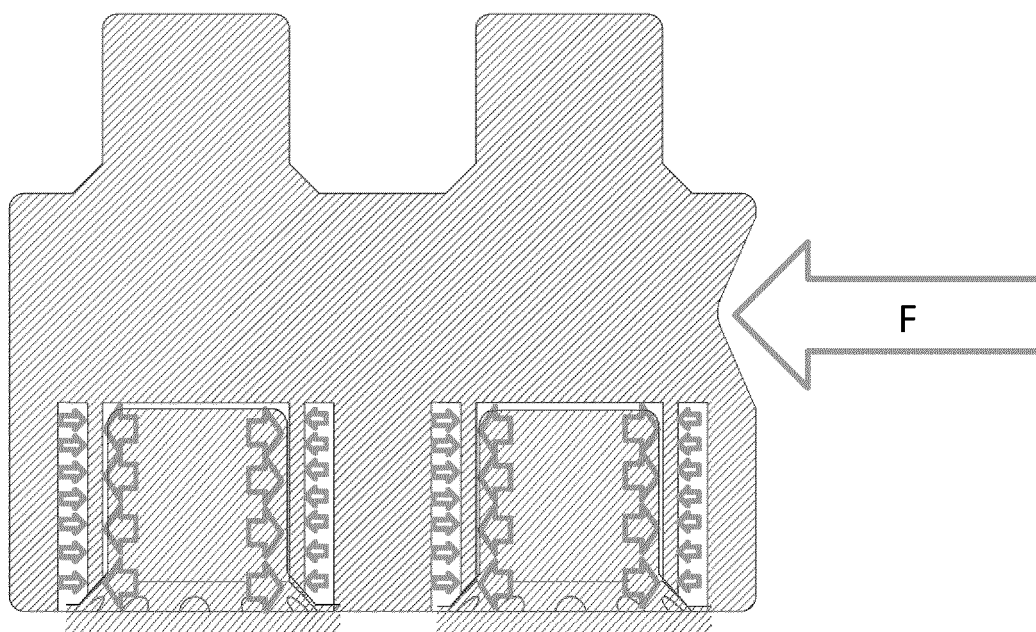


FIG. 6

Description

FIELD OF THE INVENTION

[0001] The present invention relates to the field of building bricks in children's building sets. Particularly to giant-sized bricks with different configurations and simple manufacturing, wherein the joining is made based on a male-female relationship, including bricks made of compressive elastic materials which further allow assembling firm structures.

BACKGROUND OF THE INVENTION

[0002] Children's building sets are well known in the art. They are usually made up of a plurality of bricks with a certain configuration which allows each brick to be detachably joined to at least one other brick to build and create larger size figures, as claimed in patent US 3,005,282 which describes a brick having hollows of several configurations for example, square, rectangular or other shapes, made of rigid plastic and provided with several cylindrical projections that fit into the hollow of one other brick or the hollows of two or more adjacent bricks.

[0003] In this regard, it is customary in the art that to allow the concatenated and continuous assembly of bricks, the separation distance between said cylindrical projections is a multiple of the distance corresponding to the width and/or length of said brick. In this regard, patent IL 121303 claims a toy building brick made of a semi-rigid plastic material and joinable to at least one other building brick, wherein the use of non-rigid materials is started to be considered for the manufacture of toy building bricks, however, the bricks disclosed in said invention include a plurality of irregular shapes and special cuts, the manufacture of which requires complex processes or specialized machinery.

[0004] It is common in the art for each brick to have at least one male element and at least one female element, so that the male element or elements of each brick is/are inserted into the female element of at least one other brick and so on. Usually, in the art, the male-female relationship is based on circular elements mainly on the male element having a cylindrical shape, and the female element having a tube shape or other configurations. In this regard, since there is a male-female relationship based on circular elements, it is possible to rotate on the axis of the circle of each male-female element to increase the range of building configurations. Thus, it is possible to build straight and angled structures.

[0005] It is important to note that the dimensions of the building bricks in the art are designed so that a child can handle them with its fingers, that is, wherein the size of each brick is not larger than the size of an average child's fist. In this regard, the use of these materials with these dimensions only allows creating relatively small structures or figures, due to the number of parts required, com-

plexity, and to the fact that the structure loses stability as the building bricks reach certain height. However, it is not possible simply to scale up the size of the bricks found in the art, since a child would not have enough force to join or detach the bricks. In this regard, it has been identified that children want to build figures exceeding the dimensions found in the art, that is, figures or structures exceeding their height such as castles, walls, or houses, but also providing stability in the structure to be built, safety and ease of use for the child.

[0006] At the same time, it is customary in the art to use rigid or semi-rigid materials such as acrylonitrile butadiene styrene (ABS) plastic or an equivalent, wherein due to the properties of these materials, the male-female relationship must be perfect, often making the already joined bricks to be very difficult to detach by the force of a child or, in contrast, the joining to be weak causing the structures to fall easily. Additionally, the use of rigid materials may pose a risk to children, because the bricks include blunt edges or corners that can easily injure a human being and wherein the type of injury due to impact or blow varies according to the toy building brick size.

[0007] Thus, it is desirable to obtain a set of building bricks, the design of which is oriented to the use of soft materials that can receive impacts or be struck by a user such as a child, without injuring said user, which further allows building firm structures exceeding the average dimensions used in the art. Likewise, it is equally desirable the creation of a set of building bricks that allows a child assembling and disassembling structures exceeding the average dimensions found in the art without the help of an adult, that is, wherein the force required to join or detach is compatible with the force of an average child.

[0008] Thus, allowing said bricks or molds for the manufacturing of said bricks to involve simple designs without arbitrary shapes or curves or which are difficult to design and/or manufacture.

SUMMARY OF THE INVENTION

[0009] The present invention is related to the toy building bricks, wherein the bricks include one or more shapes, thereby defining sets of bricks, wherein all the shapes are compatible with each other so that the sets of bricks can be joined with each other, that is, wherein a brick can fit to be detachably joined to at least one other brick thus allowing the modular construction of three-dimensional structures, maintaining a single brick final shape without arbitrary components, the manufacture of which is more complex. The bricks being independent parts which can be detachably joined to form structures or figures of different configurations. The invention may include methods, systems, devices and/or apparatuses.

[0010] In one embodiment of the invention, each brick consists of a rectangular parallelepiped which includes at one face or upper face at least one protrusion composed of a projection which projects outwardly in a distributed form from the center of said face thereby defining

a male element, and at its bottom or opposite face a recess or hollow thereby defining a female element whose shape, location and dimensions have a direct relationship with the shape, location and dimensions of the protrusion so that the at least one protrusion of a brick may fit into a hollow of one other brick, thereby defining a male-female detachable joining relationship. In this regard, the design of the bricks disclosed in the present invention allows adjusting the required force to perform the joining and/or detachment. In one embodiment of the invention, the protrusion is hollow allowing the protrusion to have a greater elastic deformation due to compression. In one embodiment of the invention the protrusion is solid. In one embodiment of the invention, the protrusion is cylindrical. In one embodiment of the invention the height of the protrusion is approximately equal to or greater than half the height of the brick, so that a larger amount of the protrusion surface of a brick is in contact with the inner walls of the hollow of one other brick where it has been detachably joined, allowing the successive joining of bricks to maintain firmness.

[0011] In one embodiment of the invention, each rectangular parallelepiped is more than 10 cm wide, more than 20 cm long, and more than 15 cm high. In a particular embodiment, the rectangular parallelepiped has a length of 25 cm.

[0012] In one embodiment of the invention, each set of bricks is made with at least one soft material with elastic properties, which absorb the impacts reducing the risk of injury to the user by some direct blow. In this regard, the material requiring between 0 to 12 psi to compress 25% of said material and which returns to its original shape in a period of time after the pressure stops being applied is considered soft. In a preferred embodiment, a material having a pressure is used to compress 25% of said material from 3 psi to 5 psi. Thus, the risk of injury is reduced, and support is maintained in the structure formed when building several bricks vertically, including the density of the material which provides stability to said assembly equally.

[0013] In one embodiment of the invention, the material used to manufacture the set of bricks is selected from the list of ethylene-vinyl acetate (foamy), light polyurethane or polyurethane foam, polyethylene or polyethylene foam, and/or polystyrene or polystyrene foam, wherein said materials are considered soft. In one embodiment of the invention, foamy and polyurethane foam are used.

[0014] In one embodiment of the invention, a set of bricks is made of one material, another set of bricks is made of another material, and so on.

[0015] In one embodiment of the invention, a building brick system is disclosed, wherein the building bricks are divided into different material building brick groups, wherein each brick of the building brick groups has the same shape.

[0016] In one embodiment of the invention, a building brick system is disclosed, wherein the building bricks are

divided into different material building brick groups, wherein each building brick group has a different shape.

[0017] In one embodiment of the invention, a building brick system is provided, wherein the joining between bricks is performed through a male-female elements relationship, wherein said relationship is not perfect. In one embodiment of the invention, the male element is a smaller percentage regarding the female element, thereby defining a free space for easy assembly. In another embodiment of the invention, the male element is a larger percentage regarding the female element, thereby defining a controlled and relative compression to said percentage when inserting the male into said female. In one embodiment of the invention, a plurality of bores defined by a pattern is included around the female (hollow), wherein said bores, upon insertion of the male element, relieve the pressure exerted around said male element by the female element, thereby defining relief bores. The shape, depth, number and location of the relief bores may vary and will depend on the type of material, on its coefficient of friction, of the male-female relationship and of the force required to join or detach bricks.

[0018] In one embodiment of the invention, the surface of each brick includes a material which modifies the coefficient of friction and thus modifies the joining and/or detachment force of the bricks, either with a perfect female-male relationship or not.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

Figure 1 shows an embodiment of the present invention in three different views corresponding to the isometric view, front view and bottom view.

Figure 2 shows an AA sectional view of the brick of figure 1.

Figure 3 shows an embodiment of the present invention, wherein all dimensions of the brick are made in relation to multiples of a length L.

Figure 4, shows an embodiment of the present invention in front view and sectional view, wherein a support chamfer is included around the base of each protrusion or pivot.

Figure 5 shows an embodiment of the present invention in front view and sectional view, wherein a support chamfer is included around the base of each protrusion or pivot and/or relief bores are included around each female element.

Figure 6 shows the brick of Figure 5, wherein some of the stresses undergone during use by said brick are seen.

Figure 7 shows an isometric bottom view of an embodiment of the present invention, wherein the relief bores have a non-circular shape.

Figure 8 shows an illustrative example of the assembly of three bricks.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] The following description is presented to enable any person skilled in the art to make and use the embodiments and is provided in the context of a particular application and its requirements.

[0021] Several modifications to the disclosed embodiments will be readily apparent to those skilled in the art and the general principles defined herein may be applied to other embodiments and applications without departing from the spirit and scope of the present disclosure. Thus, the present invention is not limited to the embodiments shown, on the contrary it must concur with the broader scope consistent with the principles and features disclosed herein.

[0022] The present invention relates to a toy building brick made of a soft elastic material joinable to at least one other building brick with the same properties, characterized in that it comprises: a plurality of projections extending from at least one surface of said brick, and undercut recesses disposed on the surface opposite to said at least one surface, at least some of said recesses being in substantial alignment with said projections, said projections having a hollow cylindrical shape or not, constituting male joining means, said undercut recesses constituting female joining means, being at least partial counterparts of said projections.

[0023] The examples shown in this document use bricks with two male elements and two female elements. However, one skilled in the art will appreciate that the number of male elements and female elements per brick may vary without affecting the subject matter of the present invention, wherein the dimensions of the brick are proportionally adjusted to accommodate said number of male and female elements. Additionally, the examples shown are made from rectangular parallelepipeds, however, one skilled in the art will appreciate that said configuration may vary without affecting the subject matter of the present invention.

[0024] Figure 1, shows an embodiment of the present invention in several views (isometric, frontal and bottom), wherein a brick 10 is shown with two protrusions which we will call male elements 11 distributed centrally and uniformly on one face of said brick 10; and two tubular holes corresponding to the female elements 12, distributed centrally and uniformly at one opposite face of said brick 10. One skilled in the art will appreciate that the number of male elements and female elements may vary without affecting the subject matter of the present invention, so they could be bricks of at least one male element 11 and at least one female element 12. Thus, a brick with a length L, width M, height H is shown. In one embodiment of the invention, the width M and the height H correspond to a multiple of said length L. In a particular embodiment, the width M correspond to L/2.

[0025] Figure 2 shows the AA sectional view in Figure 1. Thus, male elements with a height A and a diameter

D are shown. In this regard, the female elements with a depth P and a diameter Q are shown. In one embodiment of the invention, the diameter D is equal to the diameter Q.

[0026] In another embodiment of the invention, the diameter D is different to the diameter Q. In a particular embodiment, the diameter D is greater than the diameter Q. In this regard, the height A is, either equal to or less than the depth P. In one embodiment of the invention, the height A and the depth P are equal to or greater than half the height H. In one embodiment of the invention, the diameter D is a multiple of the length L. In another embodiment of the invention, the diameter Q is a multiple of the length L.

[0027] In this context, making use of the properties of the materials used, that is, soft materials, and to ensure that the structures formed from the detachably joining of bricks 10 are firm, an offset between the diameter Q and diameter D is included, thus defining a non-perfect relationship or pressure relationship between said elements, wherein an elastic deformation in at least one of the male and/or female elements generates a joining force in said male-female relationship. In this regard, said offset is greater than 1 mm. In a particular embodiment, the offset is 2 mm.

[0028] The separation distance X between each center of the male elements 11 corresponds to the separation distance between female elements 12. Additionally, in one embodiment of the invention said distance X is a multiple of the length L. In a particular embodiment, the distance X is equal to L/2.

[0029] Figure 3 shows an embodiment of the present invention, wherein a brick whose configuration and dimensions are relative to a length L.

[0030] In one embodiment of the invention, the length L, either corresponding to the embodiment of Figure 1 or the embodiment of Figure 3, is greater than 20 cm. In a particular embodiment, the length L is equal to 25 cm. Thus, a relationship between said length and the mechanical properties of the selected material corresponding to a soft and elastic material requiring about 3 psi to 5 psi of pressure to compress 25% thereof and return to its original shape after said pressure, defines a set of bricks that can be assembled forming firm structures, and representing a minimum risk to the user or users.

[0031] Figure 4, shows an embodiment of the invention, wherein the brick 10 includes a chamfer 20. Once a multi-brick structure of the present invention has been formed, the male elements 11 undergo a bending due to the same structure and to external forces, the base of each male element 11 being particularly a critical point. Thus, to increase the useful life of each brick, in said embodiment of the invention, a chamfer around the base of each male element 11 is included. Figure 4 shows a chamfer with straight and 45° shape, however, one skilled in the art will appreciate that the shape, angle and depth of the chamfer may vary without affecting the subject matter of the present invention.

[0032] Additionally, one skilled in the art will appreciate

that the chamfer shape may be curved or irregular, without affecting the subject matter of the present invention.

[0033] Figure 5 shows an embodiment of the present invention in sectional view and bottom view, wherein one or a plurality of relief bores 5 around the female elements 12 are included, which, depending on their size, number, shape and location, provide a controlled elastic deformation or controlled pressure on the male and/or female element when inserted with one another into a non-perfect male-female relationship. In this regard, the use of relief bores enables each male element to be inserted and detached from the female element when the male-female relationship includes a male width greater than the female width. Thus, when the male element is attempted to be inserted into the female element, a pressure is generated which is increasing as it continues to be inserted due to several factors including friction. In this regard, it has been identified that some children do not have enough force to either join or detach bricks when the male-female relationship is not perfect. Thus, the relief bores 5 enable the detachably joining of bricks by allowing firm structures of several joined bricks to be assembled.

[0034] In one embodiment of the invention, the relief bores, in a sectional view, have a conic shape. Thus, the relief pressure generated by said bores varies according to the depth with which each male element is inserted.

[0035] One skilled in the art will appreciate that the number, configuration, depth, shape and/or size of the relief bores may vary without affecting the subject matter of the present invention.

[0036] In one embodiment of the invention, a friction-reducing layer of slip material is used on the surface of either each male element and/or each female element to enable the joining and detachment of bricks with each other.

[0037] Figure 6 shows a brick of an embodiment of the invention in sectional view, wherein the stresses to which each brick is subjected during use are depicted. Thus, a force F applied cross-sectionally at one point of the brick is absorbed elastically deforming said brick without affecting the other points. The deformation of each brick will depend on the applied force F and on the material with which said brick is made. In this regard, an impact defined by a force F applied in a short period of time is likewise absorbed by the material of the brick.

[0038] Additionally, Figure 6 shows the stresses to which the male elements and the female elements are subjected particularly when there is a non-perfect detachably joining relationship and wherein there is an elastic deformation in at least one of said elements. In this regard, it is shown how the relief bores allow part of the material around the female element to be freely compressed and/or bent generating a joining stress between the male element and the female element controlled and dependent on the shape, number and size of the relief bore or bores. Thus, reflecting on a friendly force to join or detach the bricks by the user. In this regard, the use

of soft materials in a non-perfect female-male relationship allows compressions and/or bends in different parts of the bricks to be relieved from elastic deformations, so that these are detachably joined.

[0039] Figure 7 shows an embodiment of the present invention wherein the relief bores have a shape other than circular.

[0040] Figure 8 shows an example of assembly of bricks 10 of an embodiment of the present invention, wherein pressure is applied on said bricks to be joined so as to maintain a mutual joining.

[0041] The foregoing descriptions of several embodiments have been presented for purposes of illustration and description only. They are not intended to be exhaustive or to limit the present invention to the disclosed shapes. Accordingly, many modifications and variations will be apparent to those skilled in the art. Further, the foregoing disclosure is not intended to limit the present invention.

Claims

1. A building brick, wherein the brick includes a rectangular parallelepiped shape having a length, a width and a height, and wherein the brick is capable of being detachably joined to at least one other brick from a male-female joining relationship, the brick includes:

at least one male joining element whose location at one face of the brick varies according to the magnitude of the length of the brick;

at least one female joining element whose location at one opposite face of the brick depends on the location of the male element;

characterized in that the brick is made of a soft elastic material, wherein the male-female relationship is not perfect.

2. The brick according to claim 1, wherein the width of the female element is smaller than the diameter of the male element.
3. The brick according to the preceding claim, wherein the width of the female element is at least one 1 mm smaller than the width of the male element.
4. The brick according to claim 1, wherein the brick further includes at least one relief bore around the female element.
5. The brick according to claim 1, wherein the length of the brick is greater than 20 cm.
6. The brick according to claim 1, wherein the material is selected from the list of: ethylene-vinyl acetate, polyurethane foam, polyethylene foam and polysty-

rene foam.

7. The brick according to claim 1, wherein each male element includes a chamfer around its base. 5
8. The brick according to the preceding claim, wherein the chamfer has a curved shape.
9. The brick according to claim 1, wherein the brick further includes at least one relief bore around the female element. 10
10. A set of modular building bricks, comprising a plurality of building bricks made of a soft material, wherein each brick is detachably joined to at least one other brick by means of a non-perfect male-female element relationship, wherein the force of said joining and detachment depends on the elastic deformation of the material. 15
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11. The set of bricks according to claim 10, wherein the non-perfect male-female relationship is defined because the female element is smaller than the male element. 25
12. The set of bricks according to the preceding claim, wherein the female element is at least one 1 mm smaller than the male element.
13. The set of bricks according to claim 10, wherein each brick of the set of bricks further includes at least one relief bore around the female element. 30
14. The set of bricks according to claim 10, wherein the soft material is selected from the list of: ethylene-vinyl acetate, polyurethane foam, polyethylene foam and polystyrene foam. 35

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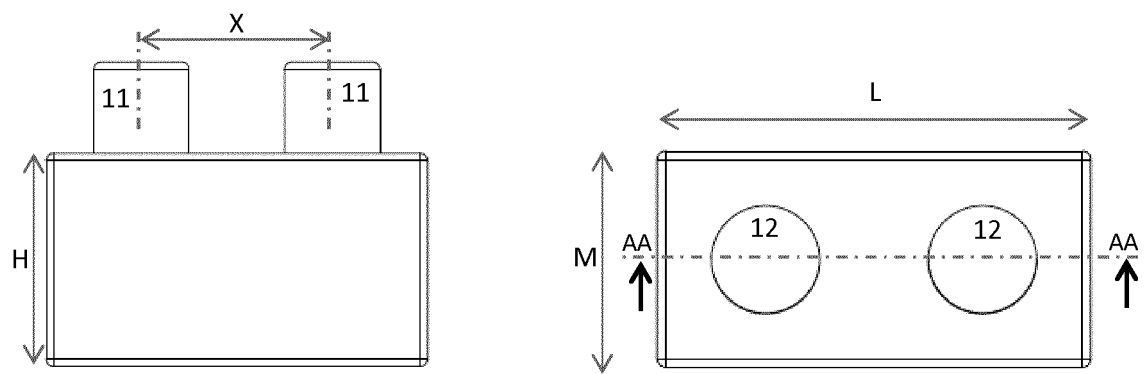
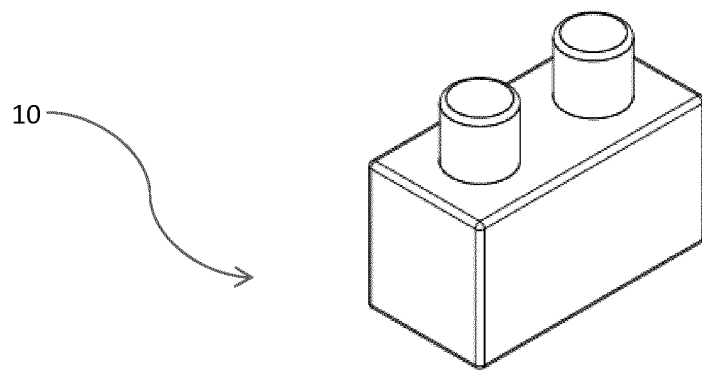


FIG. 1

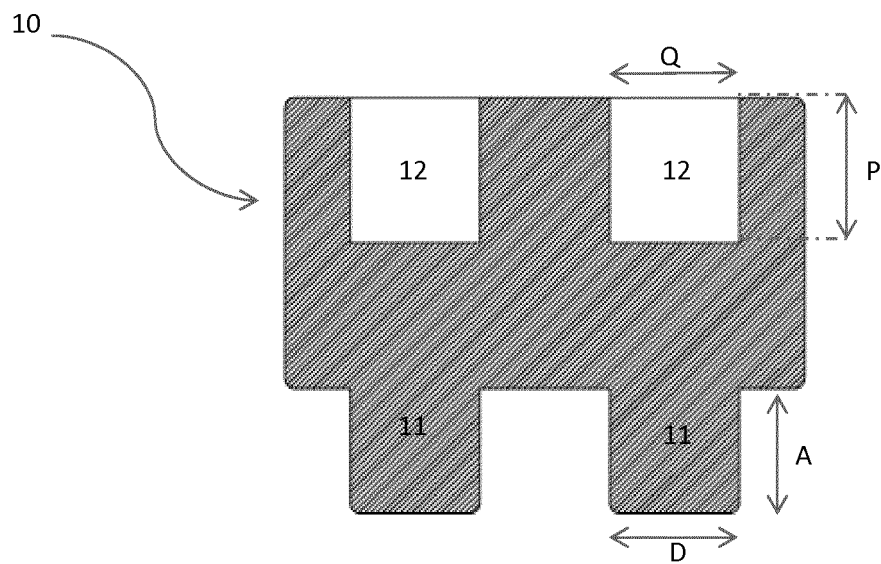


FIG. 2

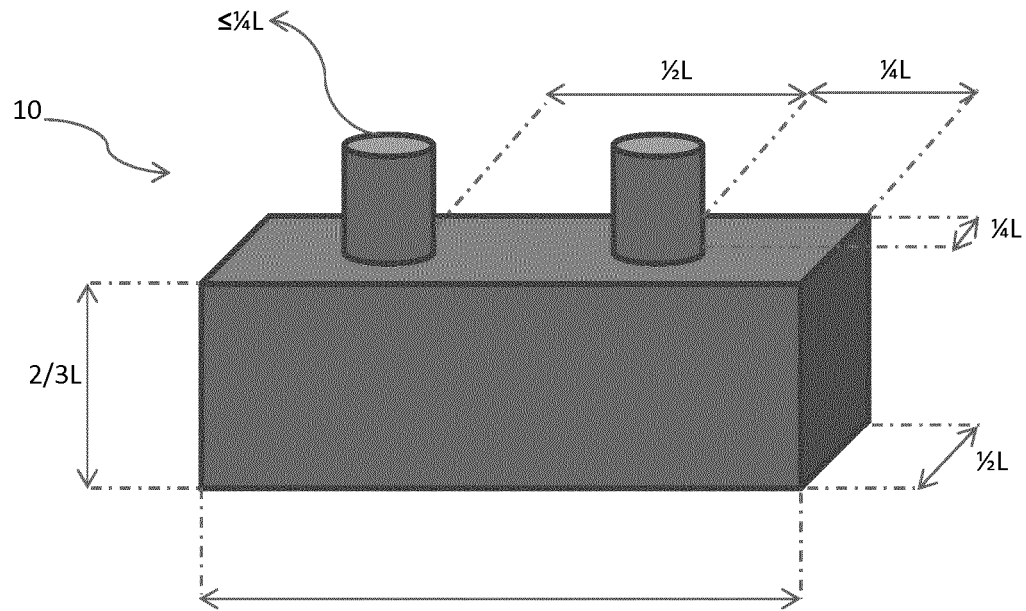


FIG. 3

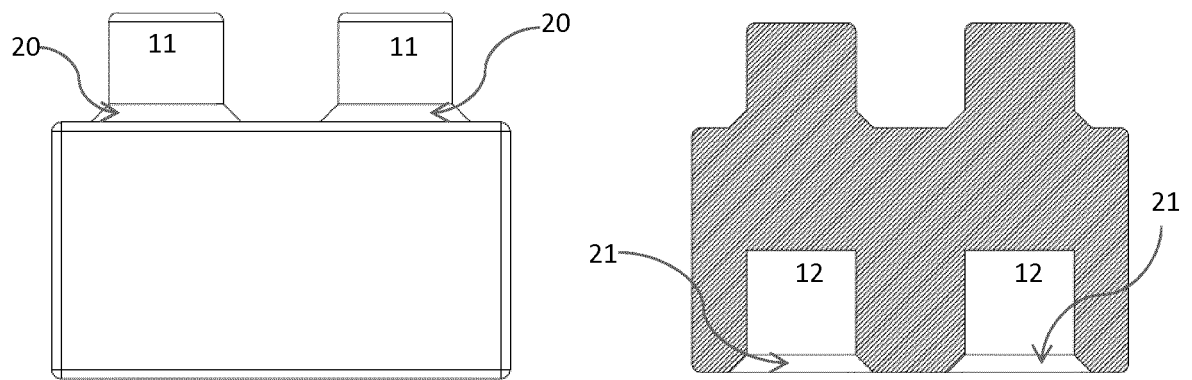


FIG. 4

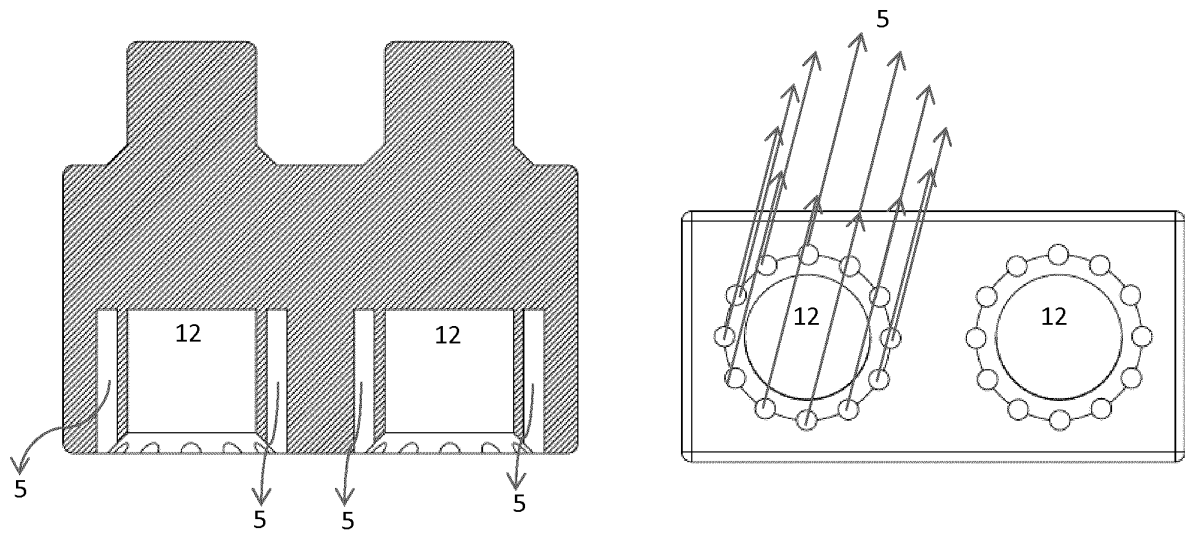


FIG. 5

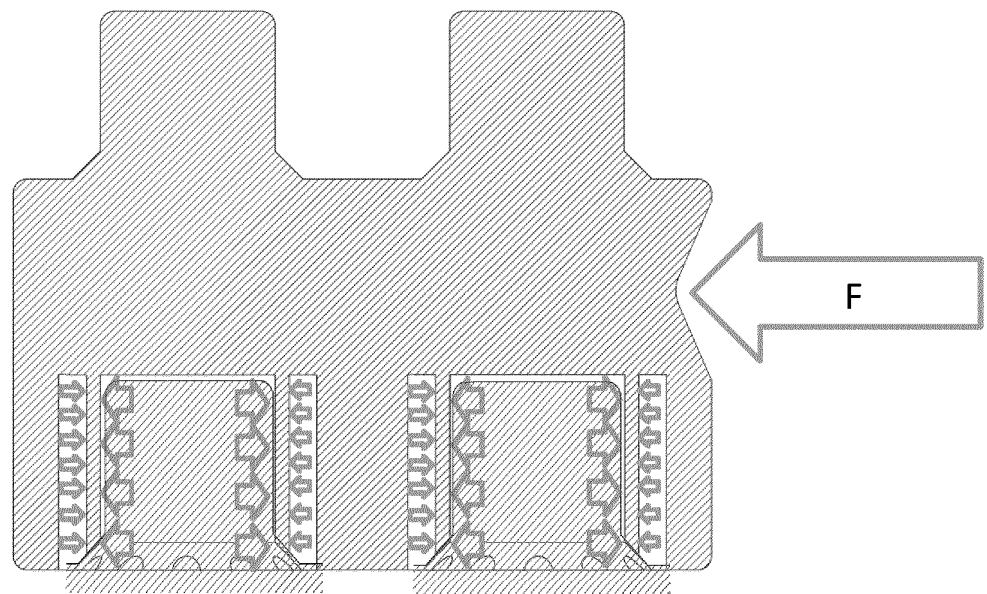


FIG. 6

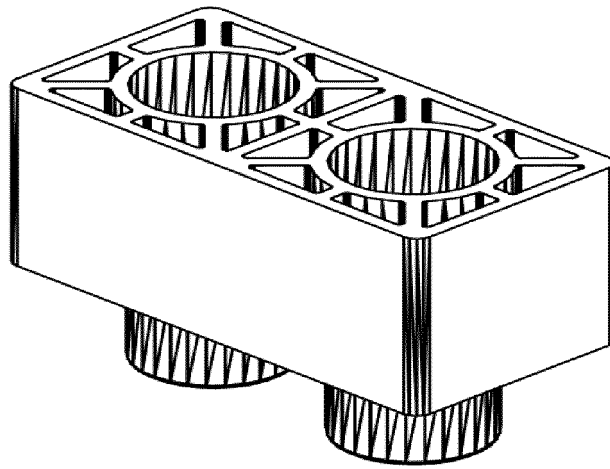


FIG. 7

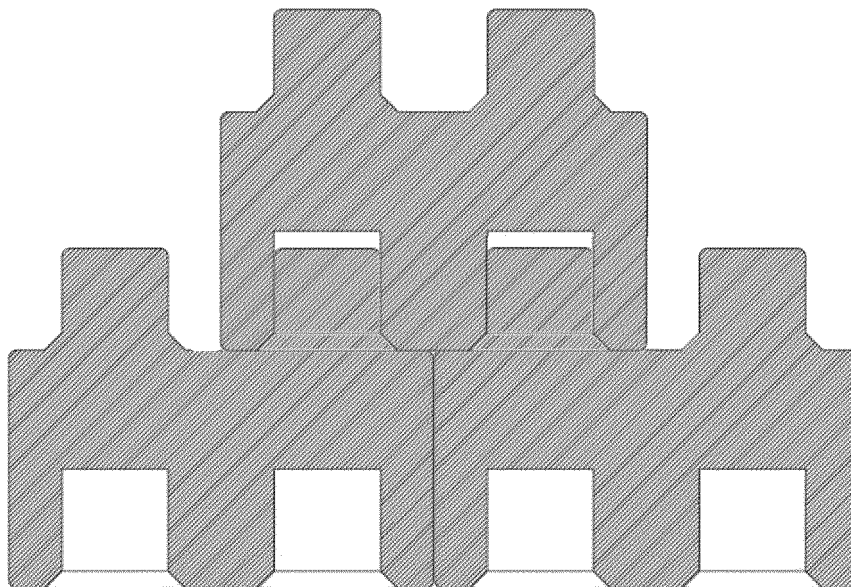


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/MX2017/050014

A. CLASSIFICATION OF SUBJECT MATTER		
(CIP) A63H33/04, 33/00, 33/08 (2017.01)		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
(CIP) A63H33/04, 33/00, 33/08 (CPC) A63H33/086		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
INAPI, ESP@ACENET, EPOQUE, THOMSON, GOOGLE PATENTS		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US20150367245(A1) (BUBBLE BLOCK CO. LTD.) 24-12-2015 Descripción and Figures 1-3	1-6, 9-14 7, 8
X Y	US20110045733(A1) (TAKERU, Saigo et al) 24-02-2011 , Abstract and Figures 7-8	1, 10 7, 8
Y	"Early Leaming", (LEGO EDUCATION), Catálogo [en línea], 2011. [Recovered 11-12-2017]. Recovered from <ftp://ftp.robotec.co.il/Robotec_Resources/catalog/LEGO_education_early_2011.pdf> Page 12.	7, 8
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Date of the actual completion of the international search 12/12/2017 12/december/2017		Date of mailing of the international search report 06/03/2018 06/march/2018
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EP 3 517 191 A1

INTERNATIONAL SEARCH REPORT Information on patent family members

International application No.

PCT/MX2017/050014

US20150367245(A1)	24-12-2015	CN104968401(A)	07-10-2015
		KR101279847(B1)	28-06-2013
		WO2014098379(A1)	26-06-2014
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		JP2010172568(A)	12-08-2010
		WO2010087037(A1)	05-08-2010

REFERENCES CITED IN THE DESCRIPTION

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- IL 121303 [0003]