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DESCRIPTION

Field of the Invention

[0001] The present invention relates to the field of building materials, and in particular it concerns stackable and self-supporting blocks or bricks for the construction of changeable modular assemblies, specifically for interior walls and partitions, floors and furniture

Background of the invention

[0002] Interior design and construction has been experiencing an increasing demand for materials that are easy to handle, versatile and reusable, perfectly suited to the emerging "do it yourself" trend. A modular construction system that enables structures to be quickly and easily erected, with adequate strength and durability, is in high demand. Several modular systems for building walls or furniture have thus been created, none of the existing techniques nevertheless allowing for an easy-to-lock changeable modular assembly combined with an interlocking system which guarantees the stability of the modular structure.

[0003] The patent US4473985 refers to a building block which has an inner and an outer wall defining a cavity there between. The walls at the top each have a longitudinal projection extending along an inner portion which in a building locates the blocks by being positioned in the lower horizontal channel. The block has two end portions which are either both a female recess or a male protrusion so that the block can be reversed if necessary. A building is formed by using a plurality of double-male and double-female blocks and interlocking them together. Though male-female connections may be established, adjacent blocks cannot be simultaneously interlocked both vertically and horizontally, like the building blocks of the invention.

[0004] The patent US2007094989 describes an improved system of interlocking modular construction blocks, the system comprising a standard interlocking modular block comprising an elongated rectangular block body having a top elongated protrusion along a top center of the length of the rectangular block, the ridge having a trapezoidal cross-section tapering to a top edge and the rectangular block body having a bottom longitudinal trapezoidal slot along the length of the rectangular block in a center of a bottom edge, the trapezoidal slot wider along the bottom edge so that it can mate with a top elongated protrusion of another standard interlocking modular block to interlock the standard interlocking modular blocks with one on top of the other, the top elongated protrusion being shorter than the depth of the bottom trapezoidal slot so that a space between a top of the elongated protrusion and a top inner surface of the trapezoidal slot forms a passageway for conduits and wiring. The system also comprises a series of interlocking modular blocks, both T-shaped or L-shaped, for mating with at least one of the standard interlocking modular blocks, each of the interlocking modular blocks of the series comprising a rectangular block body having-the same overall dimensions as the standard interlocking modular block and a similar size trapezoidal slot along at least a portion of a center of a bottom edge for mating with at least a portion of a top elongated protrusion of a standard interlocking modular block to interlock therewith. Though male-female connections may be established, and T-shaped and L-shaped pieces allow different spatial configurations, adjacent blocks cannot be simultaneously interlocked both vertically and horizontally, like the building blocks of the invention whose different male blocks allow interlocking female blocks along four different perpendicular directions, both vertically and horizontally. Therefore, the cohesion and steadiness of the built structures cannot be guaranteed in all axes, unlike the building system of the invention. at least one of the standard interlocking modular blocks, each of the interlocking modular blocks of the series comprising a rectangular block body having-the same overall dimensions as the standard interlocking modular block and a similar size trapezoidal slot along at least a portion of a center of a bottom edge for mating with at least a portion of a top elongated protrusion of a standard interlocking modular block to interlock therewith. Though male-female connections may be established, and T-shaped and L-shaped pieces allow different spatial configurations, adjacent blocks cannot be simultaneously interlocked both vertically and horizontally, like the building blocks of the invention whose different male blocks allow interlocking female blocks along four different perpendicular directions, both vertically and horizontally. Therefore, the cohesion and steadiness of the built structures cannot be guaranteed in all axes, unlike the building system of the invention.

[0005] The patent WO9708402 refers to a set of structural elements meant for obtaining a self-supported module for constructions of varied sizes and configurations, in a modulated system. The set is composed of a modulated element under the form of a regulated polyhedron, for example a cube, serving with the forming of the corner and field poles; a multifunctional male-female element derived from the said cubic element and having the role of bricks and a lintel with plugs for fixing in the brickwork of the window and door frames. All the three mentioned building parts, presenting guiding, joining, pushing and adherence means according to a labyrinth route of plane surfaces. Even though the building blocks can be interconnected, they are not self supported and cannot be interlocked on their own like the system of the present invention. The stability and reinforcement of the built structures require fixing means (vertical and horizontal bars piercing the building blocks), which are not compatible with the reuse of the building blocks made of a lightweight and easy-to-handle material, like cork-based material, and also turns the building of the structure more difficult and time consuming.

[0006] The patent US2003029119 refers to a modular construction block system for use in e.g. landscaping wall, with raised ribs located adjacent to top wall to surround the outer cylinders of block, and aperture formed on the top wall of the block. The end and sidewalls of the interconnecting and stackable blocks are connected to a top wall to define a blind bore to receive the inner cylinders. The outer cylinders set adjacent to the top wall, mate with the inner cylinders if the blocks are coupled. Apertures are formed to the top wall, and raised ribs are located adjacent on the top wall to surround the outer cylinders. The system improves stability of an erected structure since raised ribs of one block are in contact with other blocks when connecting. It enables simple and quick construction of a wall structure, with enhanced wall strength characteristics, using light weight components. But even though this system ensures some vertical resistance, because it relies on fitting of inner and outer cylinders whose volume is considerably smaller than the volume of the stacked blocks, it does not prevent the tendency to lose verticality with increased height.

[0007] The patent WO2008132667 refers to a reversible self-supporting module for constructing lighting walls which has a rectangular rectangular-shaped unitary block body with two opposite faces that delimit an internal cavity. The self-supporting module is used for constructing lighting walls, and can also be used to perform finishing of upper portion of wall such as counter walls, tank walls, dividing walls. It reduces required construction time since reference projections ensure easy and accurate positioning and also ensure resistance against horizontal stress. But even though this system ensures resistance against horizontal stress and some vertical resistance due to the interconnectability of the modules, because it relies on fitting of protrusions whose volume is considerably smaller than the volume of the stacked blocks does not prevent the tendency to lose verticality with increased height.

[0008] The patent WO9609870 refers to an easy separation stackable block toy system, which has spacers underside to space stacked blocks apart and provide peripheral gripping edge. Each stacking block has a body part with coupling knobs on its upper side. The knobs are spaced at a mutual uniform modular distance. The bottom of each stacking block body has complementary coupling elements to be coupled with the knobs of another block. The bottom area of each stacking block has one or more spacers. The spacers are configured so that when two stacking blocks are stacked one on top of the other, the block body parts will be spaced apart along their entire periphery. Blocks in this modular toy system can be simply separated, in particular by children under 2 or 3 years of age. Though this system is light weight and quite easy to use, it does also not guarantee vertical stability with increased height.

[0009] The patent WO2012153328 refers to building blocks for mortar-free construction. The invention discloses devices and methods for using building blocks for construction that does not require mortar, internal columns or additional internal or external finishing. A building block includes joining elements for attaching blocks from top to bottom as well as from side to side. Additionally, blocks have internal and external finishes that are complete. Thus, after construction of a structure, there is no additional need to paint, hang wallpaper or otherwise treat the outer and inner walls of the final structure. However, the locking system doesn't also guarantee vertical stability with increased height.

[0010] The patent DE3106676 refers to a roof or facade insulation panel which has interlocking shaped pieces facilitating the adaption to varying spacings. The insulating panel, of any thickness, made of insulating material, allows insulation in roofs and external wall facings. Two or preferably three shaped pieces are formed for inserting into each other, or for toothed interlocking. The panel can have a structured sheet metal piece on the underside, serving also for its attachment. This permits ready adaptation to different spacings, between rafters or structural parts of facade supports, and eliminates

associated difficult and dusty overhead work. Even though this modular panel has interlocking shaped pieces, it is not vertically stable on its own, and the provided pieces are not meant to be re-used in a changeable modular assembly. And even if the shaped pieces would be provided in a thickness allowing for vertical stability on their own, the limited number of connecting pieces and their conformation only allows building planar structures like insulating panels, with short widths, compatible with insulating appliances and not with whole walls and partitions or modular furniture like the blocks in the present invention. Moreover, even though the provided toothed interlocking, female pieces receive the teeth of only one male piece, so there is no interlocking between adjacent female pieces, like in the present invention. ES2063599 refers to a modular building system with a high resistance to seismic shocks. The system is based on the interconnection of a series of modules of a rectangular prismatic overall shape, in which one of their faces bears projections and the other has complementary depressions for interlocking and immobilizing the different modules together, the assembly thus being based on superposed rows with the modules out of phase with one another to achieve this mutual interconnection; there are corner modules with projections and similar depressions; there are also plates forming the floor structure separating two floors, and modules for forming the upper part or lintel of openings for doors and windows. The mutual interconnection of the various modules, which is made by superposing them in an unsynchronized arrangement, does not require joining components or elements, enabling rapid assembly and disassembly of the building, thus being possible for the modules to be used for another structure. Even though this modular system has interlocking shaped pieces, the provided pieces are not meant to be re-used in a changeable modular assembly, but for building construction instead of the ordinary building bricks which require applying a fixing agent to increase cohesion and blocking the structure. Moreover, the building blocks of ES2063599 are blocked only in the horizontal direction, unlike the present invention whose different male blocks allow interlocking along four different perpendicular directions. Furthermore, according to the present invention, steadiness of the modular assembly relies on the fact that each basic female block is locked by two different male blocks, which strengthens the interlocking of bricks, while in ES2063599 only in some of the complementary blocks there's this same double locking connection. Finally, the elongated form of the basic bricks in ES2063599 requires a strong material to make it resistant, not compatible with lightweight materials that would easily break on the middle, unlike the female basic blocks in the present invention.

[0011] DE-A-2409848 discloses I-shaped toy building block, all dimensions of which are an integer multiple of a basic dimension (m), preferably made of synthetic material.

[0012] EP0653323 discloses a block toy comprising blocks selected from a first group of blocks comprising six different types of blocks, namely a first to a sixth block each of which is symmetrical with respect to a line, each of which is formed by connecting at least one desired unit block selected from a 11th through a 15th unit block to essential unit blocks corresponding to a second, fourth, seventh, eighth, ninth, 17th, 18th, 19th, 22nd and 24th unit block..

[0013] None of the prior art documents discloses an interlocking building block in which the female block (1) is a semi-hollow cubical block with a flat bottom face and four side walls having one rectangular indentations (7) in each, said indentations (7) having a depth equal to half the height of the cube and width equal to one third of the width of the cube and the male blocks (2-5) are symmetrically built along at least one of their axis and having at least two rectangular projections (8) linked by a web (9), and said rectangular projections (8) and said web (9) have twice the height of the indentations (7) of the female block (1), half the height of the rectangular projections (8) and half the height of the web (9) of said male block (2-5).

PATENTKRAV

TIL UDSKIFTLIGE MODULÆRE MONTERINGER

1. Sammenkoblende byggeklodser, der let kan monteres og afmonteres uden behov for skruer, søm, værktøj eller lim til udskiftelige modulære enheder omfattende en hunblok (1) og et sæt hanblokke (2-5), hvor hunblokken (1) har rektangulære indsnit (7) og hanblokke (2-5), der passer ind i de rektangulære indsnit (7) i hunblokkene (1), således at en hunblok (1) samtidig kan passe ind i de rektangulære indsnit (7) i hanblokke (2-5), og en hanblok (2-5) samtidig kan passe ind i mindst to hunblokke (1), hvor hver hanblok (2-5) samtidig udfylder mindst halvdelen af de rektangulære indsnit (7) i mindst to hunblokke (1) og således fast forbinder de mindst to hunblokke (1), **kendetegnet ved**, at hunblokken (1) er en halvhul terning med en flad bundflade og fire sidevægge, der har en af de rektangulære fordybninger (7) på deres øverste halvdel og en rektangulær fordybning (7) i midten af den øverste flade, fordybninger(7) med en dybde lig med halvdelen af terningen og bredde lig med en tredjedel af bredden af terningen og hanblokkene (2-5), som er symmetrisk bygget langs mindst en af deres akser, hver hanblok, der har mindst to rektangulære fremspring (8) forbundet med en krydsindsats (9), og de rektangulære fremspring (8) og nævnte krydsindsats (9), der har to gange højden af indsnittet (7) af en hunblok (1), således at når en hanblok (2-5) passer inden i mindst to hunblokke (1), halveres højden af de rektangulære fremspring (8) og halvdelen af højden af krydsindsatsen (9) af hanblokken (2-5) er inde i mindst to hunblokke (1), og en symmetrisk del strækker sig uden for overfladen af hunblokkene (2), således at den symmetriske del, der strækker sig uden for overfladen af hunblokkene (1), kan passe ind i mindst to ekstra hunblokke (1).

2. 2. Sammenkoblende byggeklodser til udskiftelige modulære samlinger ifølge krav 1, **kendetegnet ved** sættet af hanblokke (2-5) omfattende hanblokke med forskellige konfigurationer, idet disse forskellige konfigurationer tillader forbindelse af mindst to hunblokke, hver hanblok (2-5) med mindst to rektangulære

fremspring (8), der passer ind i de rektangulære indsnit (7) af mindst to hunblokke (1), hvilke fremspring har to firkantede modstående overflader og to rektangulære modstående overflader, hvis bredde er halvdelen af et indsnit (7) af en hunblok (1), så når hver montering inde i en hunblok (1) udfylder hvert rektangulært fremspring (8) halvdelen af det hule rum af det rektangulære indsnit (7) i midten af hunblokken (1) og halvdelen af det hule rum af de rektangulære indsnit (7) i to modsatte sidevægge af hunblokken (1).

3. 3. Sammenkoblende byggeklodser, der let kan monteres og afmonteres uden behov for skruer, søm, værktøj eller lim til udskiftelige modulære enheder ifølge krav 2, **kendetegnet ved at** have et sæt hanblokke (2-5) med fire forskellige typer hanblokke, hver hanblok (2-5) omfattende to, tre eller fire rektangulære fremspring (8), som samtidig kan passe ind i to, tre, fire eller fem hunblokke.

4. 4. Sammenkoblende byggeklodser, der let kan monteres og afmonteres uden behov for skruer, søm, værktøj eller lim til udskiftelige modulære enheder ifølge krav 3, en hanblok (2) bestående af to modsatte rektangulære fremspring (8) forbundet med en krydsindsats (9) i en I-bjælke-konfiguration, idet krydsindsatsen (9) er en lineær forbindelsesdel, hvis bredde er lig med to tredjedele af hunblokkens (1) bredde, hvor I-bjælken hanblok (2) samtidigt passer ind i to hunblokke (1) således at hver halvdel af I-bjælken hanblok (2), hvad angår dens symmetri linje, samtidig udfylder halvdelen af det hule rum af to lineært anbragte hunblokke (1).

5. 4. Sammenkoblende byggeklodser, der let kan monteres og afmonteres uden behov for skruer, søm, værktøj eller lim til udskiftelige modulære enheder ifølge krav 3, hvor den krydsformede hanblok (5) bestående af fire rektangulære fremspring (8) i rette vinkler med hinanden og bundet af en krydsindsats (9), hvilken krydsindsats er krydsformet og forbundet til et rektangulært fremspring (8) på hver af dens

arme, idet de rektangulære fremspring (8) således er modsatte og parallelle to for to, hvor nævnte krydsformetde hanblok (5), der samtidig kan passe ind i fem hunblokke (1), således at når fire hunblokke (1) sidder sammen på en anden sidevæg af en centralt anbragt femte hunblok (1) i en krydsformet konfiguration, dermed udfylder de rektangulære fremspring (8) og krydsindsatsen (9) samtidigt halvdelen af det hule rum af nævnte fire hunblokke (1) og hele det hule rum af den centralt anbragte hunblok (1).

6. 4. Sammenkoblende byggeklodser, der let kan monteres og afmonteres uden behov for skruer, søm, værktøj eller lim til udskiftelige modulære enheder ifølge krav 3, hvor en T-bjælke hanblok (4) bestående af tre rektangulære fremspring (8) forbundet med en krydsindsatsen (9), hvor krydsindsats er krydsformet og er forbundet med en rektangulært fremspring (8) i tre af dens fire ender, hvor to af de rektangulære fremspring er opstillet i en I-bjælke-konfiguration og et 90 grader til I-bjælken, T-bjælke hanblok (4), der samtidig kan passe ind i fire hunblokke (1), så når tre hunblokke (1) sidder sammen på en anden sidevæg af en centralt anbragt fjerde hunblok (1) i en T-formet konfiguration, udfylder de rektangulære fremspring (8) og nævnte krydsindsats (9) samtidigt halvdelen af det hule rum af nævnte tre hunblokke (1) og hele det hule rum i den centralt anbragte fjerde hunblok (1).

7. 4. Sammenkoblende byggeklodser, der let kan monteres og afmonteres uden behov for skruer, søm, værktøj eller lim til udskiftelige modulære enheder ifølge krav 3, hvor en L-bjælke hanblok (3) bestående af to vinkelrette rektangulære fremspring (8) i rette vinkler med hinanden og bundet af en krydsindsats (9), hvor krydsindsatsen er krydsformet, hvor L-bjælke hanbloken (3) er i stand til samtidig at passe ind i tre hunblokke (1), således at når to hunblokke (1) forbundet til to vinkelrette sidevægge af en tredje centralt anbragt hunblok (1) i en L-formet konfiguration, udfylder de rektangulære fremspring (8) og nævnte krydsindsats (9) samtidigt det halve hulrum af de to hunblokke (1) og hele hulrummet af nævnte centralt placerede hunblok (1).

8. 5. Sammenkoblende byggeklodser, der let kan monteres og afmonteres uden behov for skruer, søm, værktøj eller lim til udskiftelige modulære enheder ifølge krav 4, hvor I-bjælke hanbloken (2) har en krydsindsats (9), der er vinkelret på rektangulære fremspring (8), hvilken krydsindsats har samme højde som de rektangulære fremspring (8), der strækker sig mellem rektangulære fremspring (8) langs en længde, der er to tredjedele af bredden af den hunlige sidevæg og har en bredde, der er en tredjedel af bredden af den hunlige sidevæg.

9. 9. Sammenkoblende byggeklodser, der let kan monteres og afmonteres uden behov for skruer, søm, værktøj eller lim til udskiftelige modulære enheder ifølge krav 1 til 8, hvor sættet af hun- og hanblokke yderligere omfatter en terminalblok (6), bestående af et rektangulært fremspring (8) forbundet til en vinkelret terminaldel (10), det kombinerede bredde af nævnte terminaldel (10) og den rektangulære fremspring (8) svarende til halvdelen af bredden af en hunbloks sidevæg og højde hvor enten den rektangulære fremspring (8) eller terminaldelen (10) er det samme som højden af en hunblok (1) sidevæg, således at hver terminalblok (6) kan udfylde halvdelen af hule rum af en hunblok (1) og en symmetrisk del, der strækker sig uden for overfladen af hunblokken (1), kan udfylde halvdelen af det hule rum i en anden hunblok (1).

10. 10. Sammenkoblende byggeklodser, der let kan monteres og afmonteres uden behov for skruer, søm, værktøj eller lim til udskiftelige modulære enheder ifølge krav 1 til 90, **kendetegnet ved** sæt af hun- og hanblokke, der endvidere omfatter en påfyldningsblok (11) til at udvide det modulære systemet i højde, bredde eller længde, hver udfyldningsblok (11) er et spejlbillede af den kvindelige blok (1) langs dens nedre flade, og derfor har rektangulære fordybninger (7) på toppen og i bunden af stykket, og højden af to hunblokke, så de rektangulære fremspring (8) af hanblokke (2-5) kan passe ind i de rektangulære fordybninger (7) på begge sider af fyldeblokkene (11) og en hanblok (2-5) dermed samtidig kan passe ind i mindst

to udfyldningsblokke (11), idet hver hanblok (2-5) udfylder halvdelen af de rektangulære fordybninger (7) på mindst to udfyldningsblokke (11) og således fast forbinder mindst to udfyldningsblokke (1).

11. 11. Sammenkoblende byggeklodser, der let kan monteres og afmonteres uden behov for skruer, søm, værktøj eller lim til udskiftelige modulære enheder ifølge krav 1 til 10, **kendetegnet ved**, at blokkene er lavet af et letvægtsmateriale med god modstandskraft mod mekaniske belastninger, hvilket gør at blokkene, der kan stables og er vertical stabile, men også lette at håndtere og adskille, idet materialet er kork- eller korkbaserede materialer.

12. Sammenkoblende byggeklodser, der let kan monteres og afmonteres uden behov for skruer, søm, værktøj eller lim til udskiftelige modulære enheder ifølge krav 11, **kendetegnet ved**, at blokke er fremstillet af presset kork, fortrinsvis presset kork, hvilket resulterer i blokke med en vægt på mellem 100 kg / m³ til 200 kg / m³.

13. Sammenkoblende byggeklodser, der let kan monteres og afmonteres uden behov for skruer, søm, værktøj eller lim til udskiftelige modulære enheder ifølge krav 1 til 12, **kendetegnet ved**, at blokkene er dimensioneret efter de kubiske hunblokke (1), der måler mellem 80 mm og 700 mm på alle sider.

14. 13. Sammenkoblende byggeklodser, der let kan monteres og afmonteres uden behov for skruer, søm, værktøj eller lim til udskiftelige modulære enheder ifølge krav 1 til 12, **kendetegnet ved**, at blokkene er dimensioneret med de kubiske hunblokke (1), der måler mellem 190 mm og 700 mm i alle dens sider.

15. 15. Sammenkoblende byggeklodser, der let kan monteres og afmonteres uden behov for skruer, søm, værktøj eller lim til udskiftelige modulære enheder ifølge krav 1 til 14, **kendetegnet ved**, at blokkene yderligere har hjul således at modulære samlinger let kan flyttes.

16. 16. Anvendelse af sammenkoblede byggeklodser ifølge krav 1 til 15 til udskiftelige modulære enheder, såsom indvendige vægge, gulve, møbler, udvendige vægge, udemøbler eller udendørs konstruktioner.

17. 16. Fremgangsmåde til bygning af udskiftelige modulære enheder med indbyrdes låsende byggeklodser som defineret i krav 1 til 15, hvor:

- a) mindst en hunblok (1) anvendes som basiskonstruktionsenhed,
- b) mindst en hanblok (2-5) bruges til at sammenkoble hunblokke i et lineært, L-formet, T-formet eller krydsformet arrangement,
- c) mindst en fyldeblok (11) bruges mellem hanblokke til at øge modulær panelbredde, længde eller højde,
- d) hunblokke, hanblokke og udfyldningsblokke er forbundet med hinanden, indtil en ønsket længde, bredde og højde af den modulopbyggede samling er opnået,
- e) mindst en terminalblok (6) bruges til at passe ind i mindst en hunblok (1) og udfylde det tomme rum i ekstremiteterne på enheden for at danne en lige kant.
- f) ved at kombinere hunblokken (1), hanblokkene (1-5), fyldningsblokken (11) og terminalblokken forskelligt (6) kan en hvilken som helst type tredimensionel modulopbygning opnås.

FIGURE 1

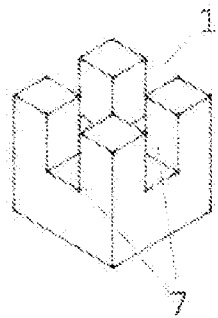


FIGURE 2A

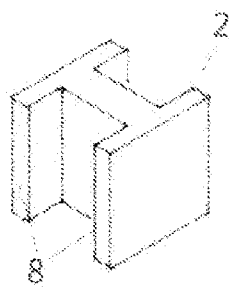


FIGURE 2B

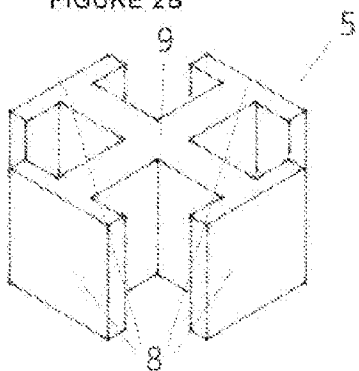


FIGURE 2C

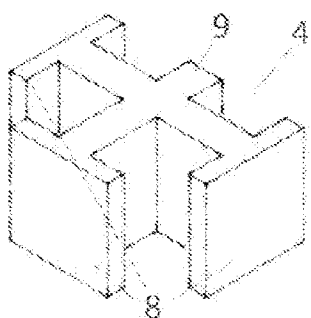


FIGURE 2D

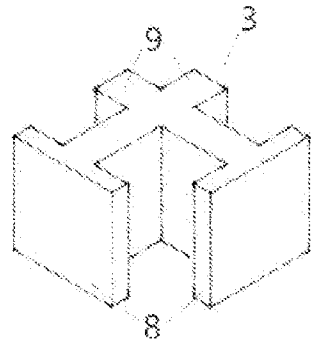


FIGURE 3

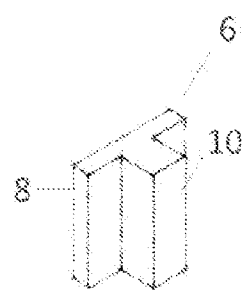
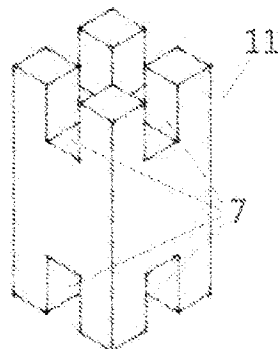


FIGURE 4



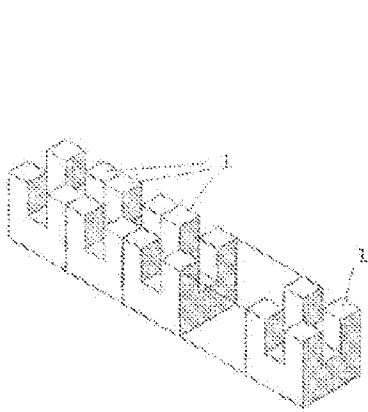


FIGURE 5A

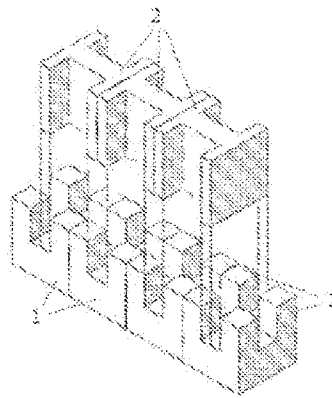


FIGURE 5B

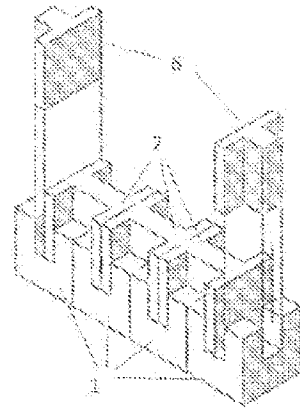


FIGURE 5C

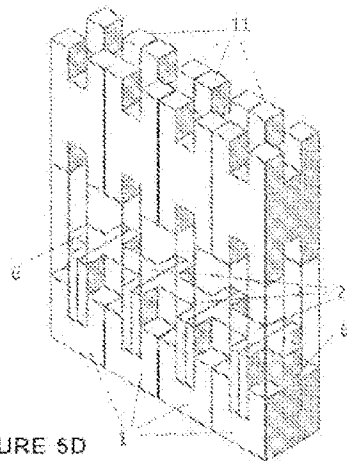


FIGURE 5D

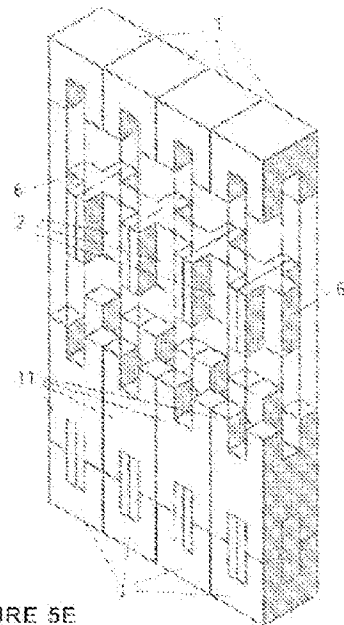


FIGURE 5E

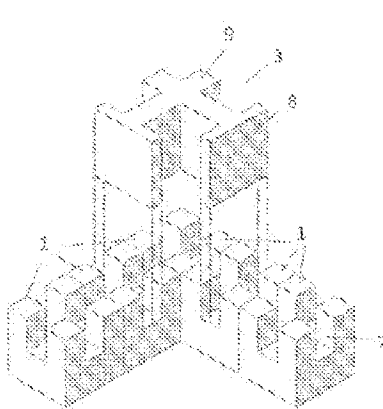


FIGURE 6A

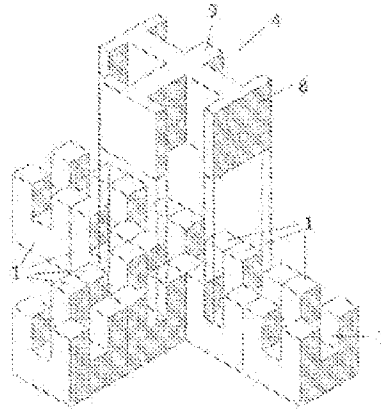


FIGURE 6B

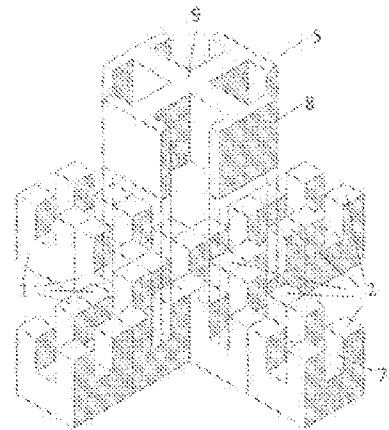


FIGURE 6C

FIGURE 7A

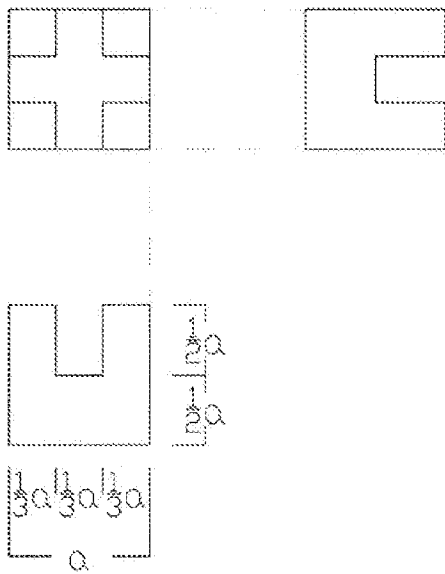


FIGURE 7B

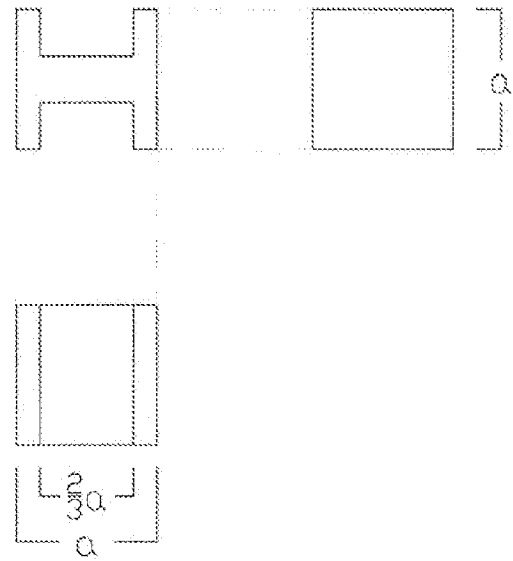


FIGURE 7C

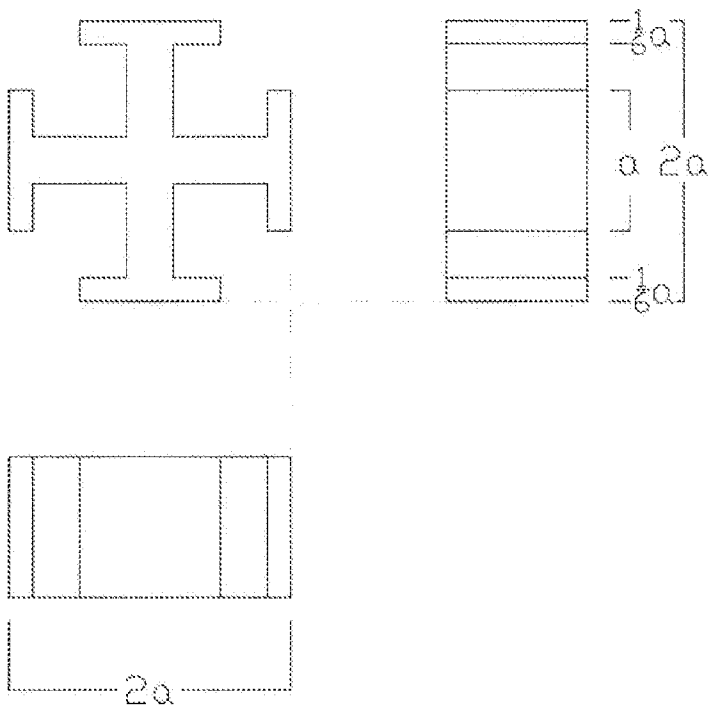


FIGURE 7D

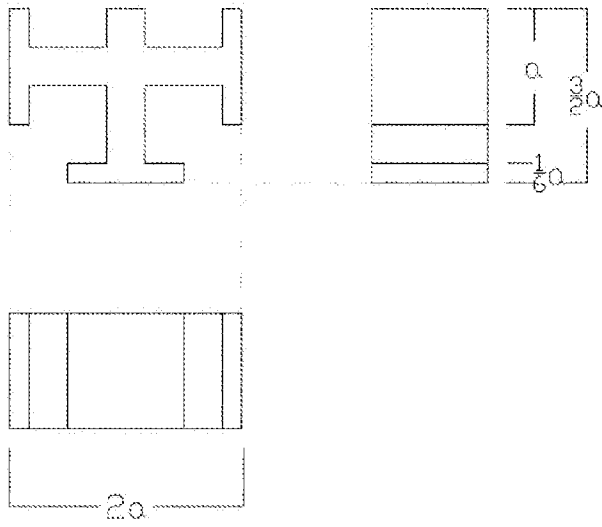


FIGURE 7E

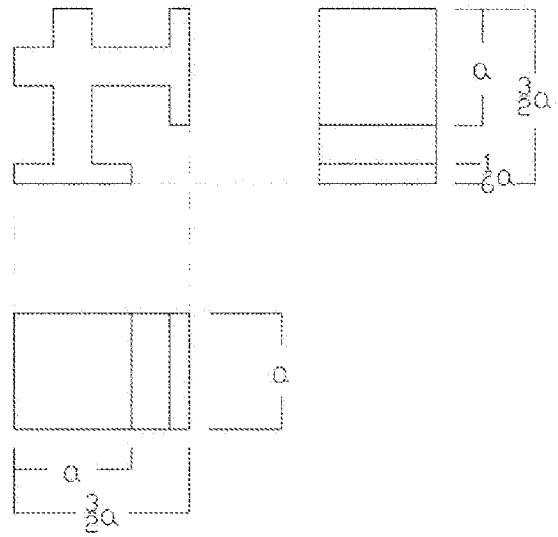


FIGURE 7F

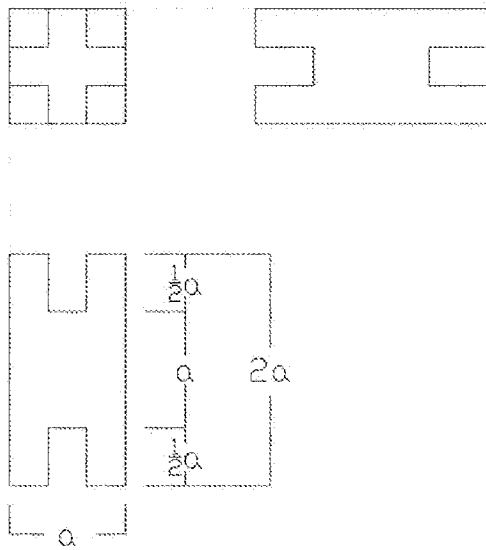
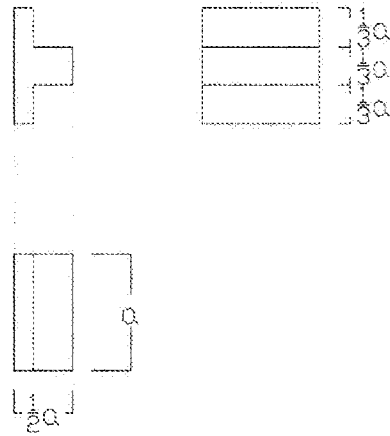


FIGURE 7G



REFERENCER CITERET I BESKRIVELSE

Denne liste over referencer, der er citeret af ansøgeren, er kun til læsernes bekvemmelighed. Det udgør ikke en del af det europæiske patentdokument. Selvom der er taget stor omhu ved at udarbejde referencerne, kan fejl eller mangler ikke udelukkes, og EPO fraskriver sig ethvert ansvar i denne henseende.

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