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(54) **Framework unit for modular building structure**

Rahmeneinheit für modulare Gebäude

Cadre pour bâtiment modulaire

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Description

Field of art

[0001] The invention relates to framework units for modular construction of load-bearing frameworks of buildings and to a system of such framework units.

Prior art

[0002] Various types of modular building structures are known, such as building structures made of prefabricated concrete panels, structures made of steel and sheathed with metal sheets or with sandwich panels, structures made of customized complete wall panels consisting of sheathed wooden frame with a lath grate and insulation etc. The disadvantages of these structures are mainly in that they are not sufficiently variable and at the same time simple and quick to assemble, and further in the fact that due to their weight a crane is necessary while unloading the panels and other construction parts off the transport vehicle at the construction site and possibly it is also needed while moving it around the site, which makes the construction more expensive and it reduces the possibility of do-it-yourself house raising; i.e. without any building companies and heavy machinery. Framework units for a modular building structures are disclosed in DE2159703, WO8404770, US17333169, WO0146531 and LU40627. DE 2 159 703 discloses a framework unit according to the preamble of claim 1.

Summary of the invention

[0003] The above listed disadvantages are removed to a large extent by a framework unit for a modular building construction of load-bearing structures of buildings specified in claim 1. The unit comprises a system of basic metal profiles which are welded together end to end forming an outer frame of a right rectangular prism whose edges are defined by the basic metal profiles. The basic metal profiles are L profiles. Considering the static load capacity the framework unit further comprises metal reinforcing elements mounted inside the framework unit in parallel to at least one of the sides of the framework unit. The reinforcing elements are reinforcing rods, each of them being welded to the inner side of two adjacent parallel metal profiles and extending diagonally along at least a part of a side of the framework unit. Preferably there are further reinforcing elements being reinforcing profiles welded to form a rectangular reinforcing frame, which is mounted inside the framework unit in parallel to the smallest side of the framework unit.

[0004] Preferably at least some basic metal profiles are provided with pre-drilled holes for bolts for connecting the framework units with each other and / or for fastening the framework units to the ground.

[0005] Considering the use of the framework units it is advantageous to make the framework module having a 312 mm or 625 mm, or an integer multiple of 625 mm and the depth of the framework unit 100 to 250 mm and the height of the framework unit 2650 mm, in order to make the construction of a building as simple as possible.

[0006] Preferably, the basic metal profiles are steel profiles and the framework unit is galvanized.

[0007] The disadvantages of the prior art are also solved by a system of the above mentioned framework units, wherein for a construction of a load-bearing structure of a building some of the framework units are anchored to the ground to form a load-bearing walls of the building, adjacent framework units are mutually connected by means of connecting bolts and nuts and washers, and other framework units are fastened on the anchored framework units to form window and door lintels and ceilings of the building.

Brief description of the drawings

[0008] The invention will be further described in more detail with respect to an exemplifying embodiment illustrated in the drawings, wherein Fig. 1 is a schematic plan view of an exemplary embodiment of the framework unit according to the invention, Fig. 2 schematically shows a side view of the framework unit shown in Fig. 1, Fig. 3 is a schematic a plan view of the framework unit shown in Fig. 1 and Fig. 4 is a section view of the framework unit of Fig. 1 cut along A - A.

Detailed description of the exemplifying embodiment

[0009] The framework unit **1** shown in Figs. 1 to 4 is made of twelve metal L profiles **10**, for example L profiles having 45mm sides and a thickness of 3mm, the profiles **10** being welded together end to end to form the outer frame of a cuboid. The height, the width and the depth of the framework unit **1** are set by the length of the L-shaped profiles **10,** or it results from the purpose of use of the framework unit **1.**

[0010] According to the purpose and size of a particular module **1,** each module **1** can be supplemented with further reinforcing elements, such as reinforcing frames **11,** which are made by welding four L-shaped profiles together and which are then welded or screwed or using other fastening means attached inside the framework unit parallel with the two smallest sides of the cuboid, i.e. of the framework unit **1.** The plan view of the reinforcing frame **11** is obvious from a cross section A-A illustrated in Fig. 4. The framework unit **1** may be for example equipped with four reinforcing frames **11** which are arranged evenly spaced apart and parallel with each other. The reinforcement elements are the reinforcement bars **12** which are welded by their ends to the inner sides of two L-shaped profiles **10** so that they extend diagonally along a part of an imaginary wall of the framework unit **1.** According to a particularly advantageous embodiment, each area of the framework unit **1** defined by two adjacent reinforcing

frames **11** or defined by a reinforcing frame **11** and by a parallel imaginary side wall of the framework unit **1** is provided with four reinforcing bars **12,** so that a reinforcing bar **12** is arranged one along each wall section of the defined area, the axis of the reinforcing bars **12** extending along two parallel sides of the framework unit **1** in the defined area and skew to each other, while the axis of the reinforcing bars **12** extending in the defined area along two adjacent sides of the framework unit **1** may cross at the edge formed by these adjoining sides or close to it.

[0011] For instance, framework units **1** having the height of 2650 mm, the width of 625 mm and the depth of 240 mm may be used for building walls of a house. These framework units **1** shall be erected and anchored to the groundwork and they shall be connected with each other by means of bolts and nuts with washers by using pre-drilled holes **7**. A suitable bolt size is for example M10. To increase the variability of use of the framework units **1,** i.e. especially to increase the variability of floor plans of buildings, the framework units **1** are made in several other widths, such as the half width of 312 mm, double width of 1250 mm and so on. In areas where windows are supposed to be, framework units **1** having reduced height are used, another framework units **1** with reduced height are used for window lintels, or for door lintels. Alternatively, the window can be formed by leaving free space at full height and the window lintel is then formed by the ceiling framework units **1,** which are preferably in the size of 1680 mm x 580 mm x 350 mm; when installed the height of the framework unit **1,** which forms the ceiling of a building is 350 mm. Other suitable dimensions of a framework unit **1** suitable for a construction of a ceiling of a building are 5000 mm x 625 mm x 350 mm. It is obvious that such a large framework units **1** have to be provided with reinforcement elements, e.g. with seven reinforcing frames **11** and sixteen shorter reinforcing bars **12** and sixteen longer reinforcing bars **12** which are arranged as described above. While framework units **1** for building of walls of a building are made of L-shaped profiles preferably, framework units for building ceilings or at least their end faces - i.e. the smallest sides - of the framework unit **1** are made of U profiles. A framework unit **1** having a square base and a width and depth equal to the depth of the framework units **1,** which form the adjacent walls of the building, are preferably used in places where two inner or outer walls of the building meet at right angle. For example, the dimensions of a corner framework unit **1** may be 2650 mm x 240 mm x 240 mm. It is also possible to attach further framework units **1** to the ceiling framework units **1** in order to create an attic.

[0012] Preferably, the framework units **1** are provided with pre-drilled holes **7** for connecting bolts. Alternatively, it is possible to drill these holes **7** during construction as necessary.

[0013] As mentioned above, preferably, the framework units **1** have the width of 625 mm or multiples of 625 mm, which corresponds to the width of standard plasterboards or OSB boards and similar tiling panels. Thus, when tiling the constructions made of the framework units **1** there is no need to adjust the width of the plasterboards, which saves time and material. The depth of the framework units **1** is advantageously 100 mm for interior walls and 250 mm for outer walls of a building. It is of course possible to make framework units **1** having different dimensions as necessary; the dimensions, individual metal profiles and reinforcing elements may be replaced by other dimensions, cross sections and reinforcing elements, depending on the load of the system components and on the chosen material.

[0014] A building made of the framework units **1** according to the invention can be built on any suitable flat surface, such as a leveled soil surface, a gravel embankment with supporting footings or on poured concrete slab foundation. There are anchoring elements placed and fastened to such a foundation, and the framework units are placed into them according to the required layout of the building. Then, the ceiling framework units **1** are fastened on the walls made of the framework units **1** over the entire layout of the building and wooden battens and roofing can be later placed thereon. The outer siding of the building is made of OSB panels or of any wood-fiber or cement-fiber panels, cement bonded particle boards or outdoor plaster boards, which are fastened to the framework units **1,** for example by screws. From the outer side of the building polystyrene insulation board can be attached to the OSB panels, which can be then coated with a glue and silicone facade. The insides of the framework units **1** are preferably filled with thermal insulation and advantageously these insides of the framework units **1** are used to put in installation elements such as water and sewage pipes, electrical wiring etc. This is possible due to the fact that the framework unit **1** forms an outer skeleton of a prism and each side of the framework unit **1** is covered by parts of the profiles **10** in an extent lower than one half, preferably lower than one third of the overall area of the respective side of the framework unit **1,** whereas the rest of the wall is free. At the interior side of the building the framework units **1** are coated with vapor barrier film and are covered with fire resistant plasterboards. Framework units **1** forming the interior walls are coated with vapor barrier film on both sides and then they are covered with fire resistant plasterboards, which are fastened by means of screws. A construction of a floor is similar to that of other buildings and it includes for example mineral wool or polystyrene, OSB panels, on which the required type of floor covering can be placed (carpet, parquet, PVC, floating floor, tiles, etc.). A ceiling or roof construction forming the framework units **1** are covered on the inner side of the building, that is the area of the ceiling, also with a vapor barrier film and with fire resistant plasterboards.

[0015] Constructing buildings using the framework units **1** is time-efficient and inexpensive, there is a wide variability of layout arrangement, no assistance of specialized professions is required, and also unlike other

modular structures no crane is required for getting the materials at site and during the construction of the building as such, because each framework unit **1,** as well as cladding board or panel can be easily manipulated by the builder alone or in a pair with a helper. The builder can design the building according to his own requirements and needs, and he can build it alone, while the professional workers will be needed only to do the electrical wiring, and plumbing. It is also possible to expand the building additionally, to modify the layout, or to move the interior walls as necessary.

Claims

1. A framework unit (1) for a modular building construction of load-bearing structures of buildings, **wherein** it comprises a system of basic metal profiles (10) which are L profiles and which are welded together end to end forming an outer frame of a right rectangular prism whose edges are defined by the basic metal profiles (10), wherein it further comprises metal reinforcing elements mounted inside the framework unit (1) in parallel to at least one of the sides of the framework unit, **characterised in that** the reinforcing elements are reinforcing rods (12), each of them being welded to the inner side of two adjacent parallel metal profiles (10) and extending diagonally along at least a part of a side of the framework unit (1).

2. The framework unit according to claim 1, **characterized in that** it further comprises further metal reinforcing elements mounted inside the framework unit (1) in parallel to at least one of the sides of the framework unit, wherein the further reinforcing elements are reinforcing profiles welded to form a rectangular reinforcing frame (11), which is mounted inside the framework unit (1) in parallel to the smallest side of the framework unit (1).

3. The framework unit according to any of the previous claims, **characterized in that** at least some basic metal profiles (10) are provided with pre-drilled holes (7) for bolts for connecting the framework units (1) with each other and / or for fastening the framework units (1) to the ground.

4. The framework unit according to any of the previous claims, **characterized in that** the width of the framework unit (1) is 312 mm or 625 mm, or it is an integer multiple of 625 mm.

5. The framework unit according to any of the previous claims, **characterized in that** the depth of the framework unit (1) is 100 to 250 mm and the height of the framework unit (1) is 2650 mm.

6. The framework unit according to any of the previous claims, **characterized in that** the basic metal profiles (10) are steel profiles and the framework unit (1) is galvanized.

7. A system of framework units according to any one of the claims 1 to 6, **characterized in that** for construction of a load-bearing structure of a building some of the framework units (1) are anchored to the ground to form a load-bearing walls of the building, adjacent framework units (1) are mutually connected by means of connecting bolts and nuts and washers, and other framework units (1) are fastened on the anchored framework units (1) to form window and door lintels and ceilings of the building.

Patentansprüche

1. Rahmenmodul (1) für baukastenartig aufgebaute Tragwerke von Gebäuden, wobei das Modul einerseits einen Satz von aus Metall gefertigten Grundprofilelementen (10) umfasst, die eine L-förmige Ausgestaltung aufweisen und in ihren Endbereichen derart gegenseitig verschweißt sind, dass sie das äußere Gerüst eines rechteckigen vierseitigen Prismas bilden, dessen Kanten von den aus Metall gefertigten Grundprofilelementen (10) abgegrenzt sind, wobei das Modul ferner Versteifungselemente umfasst, die ebenfalls aus Metall gefertigt sind und die innerhalb des Rahmenmoduls (1) derart angebracht sind, dass sie parallel zu mindestens einer dessen Seiten verlaufen, **dadurch gekennzeichnet, dass** die Versteifungselemente von Versteifungsstäben (12) gebildet sind, wobei jeder der Versteifungsstäbe in seinen Endbereichen mit der inneren Seite der benachbarten, gegenseitig parallel verlaufenden, aus Metall gefertigten Grundprofilelementen (10) verschweißt ist und sich in einer schrägen Richtung entlang zumindest eines Abschnittes einer Seite des Rahmenmoduls (1) erstreckt.

2. Rahmenmodul nach Anspruch 1, **dadurch gekennzeichnet, dass** es zusätzliche Versteifungselemente umfasst, die innerhalb des Rahmenmoduls (1) angebracht sind und parallel zu mindestens einer dessen Seiten verlaufen, wobei diese zusätzlichen Versteifungselemente als Versteifungsprofilelemente ausgebildet sind, die gegenseitig derart verschweißt sind, dass sie einen rechteckigen Versteifungsrahmen (11) bilden, der innerhalb des Rahmenmoduls (1) derart angebracht ist, dass er parallel zu dessen kleinsten Seite verläuft.

3. Rahmenmodul nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** zumindest einige der aus Metall gefertigten Grundprofilelementen (10) mit vorgebohrten Öffnungen (7) ver-

sehen sind, die für Schrauben zum gegenseitigen Verbinden von Rahmenmodulen (1) und/oder zum Anbringen von Rahmenmodulen (1) an einen Untergrund vorgesehen sind.

4. Rahmenmodul nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Weite des Rahmenmoduls (1) gleich 312 mm oder 625 mm oder einem ganzen Vielfachen von 625 mm ist.

5. Rahmenmodul nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Tiefe des Rahmenmoduls (1) 100 bis 250 mm beträgt und die Höhe des Rahmenmoduls (1) 2650 mm beträgt.

6. Rahmenmodul nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die aus Metall gefertigten Grundprofilelemente (10) als Stahlprofilelement ausgebildet sind und das Rahmenmodul (1) verzinkt ist.

7. System von Rahmenmodulen nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** zwecks des Aufbaus eines Tragwerks für ein Gebäude einige der Rahmenmodule (1) in einem für den Aufbau der Tragwerke für die Wände des Gebäudes vorgesehenen Untergrund verankert sind, wobei die gegenseitig benachbarten Rahmenmodule (1) miteinander mittels Verbindungsschrauben mit Muttern und Unterlegscheiben verbunden sind und an den derart verankerten Rahmenmodulen (1) weitere Rahmenmodule (1) angebracht sind, die zur Ausbildung von Tür- und Fenstersturzträgern sowie von Decken des Gebäudes vorgesehen sind.

Revendications

1. Module (1) de cadre pour une construction modulaire de squelettes de support de bâtiments, qui comprend une pluralité des profils (10) métalliques de base qui sont profilés en L et qui sont à leurs extrémités soudés ensemble pour former une enveloppe extérieure d'un prisme quadrilatère rectangulaire, dont les arêtes sont définies par les profils (10) métalliques de base, pendant que le module comprend en outre des éléments de renforcement métalliques fixés à l'intérieur du module (1) de cadre parallèle à au moins un côté de celui-ci, **caractérisé en ce que** les éléments de renforcement sont des barreaux (12) de renforcement dont chacun est avec ses extrémités soudé à la face interne des profils (10) métalliques adjacents, mutuellement parallèles, et passe obliquement le long d'au moins une partie d'un côté du module (1) de cadre.

2. Le module de cadre selon la revendication 1, **caractérisé en ce qu'**il comporte d'autres éléments de renforcement fixés à l'intérieur du module (1) de cadre parallèlement au moins à un de ses côtés, lesdits autres éléments de renforcement étant des profils de renforcement soudés à la forme d'un cadre (11) de renforcement rectangulaire qui est fixé à l'intérieur du module (1) de cadre parallèlement à son plus petit côté.

3. Le module de cadre selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**au moins certains des profils (10) métalliques de base sont munis des trous (7) pré-percés pour les boulons pour l'assemblage des modules (1) de cadre et / ou pour la fixation des modules (1) de cadre sur le fond.

4. Le module de cadre selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la largeur du module (1) de cadre est égale à 312 mm ou 625 mm ou au multiple entier de 625 mm.

5. Le module de cadre selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la profondeur du module (1) de cadre est de 100 à 250 mm et la hauteur du module (1) de cadre est de 2650 mm.

6. Le module de cadre selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les profils (10) métalliques de base sont des profils en acier et le module (1) de cadre est zingué.

7. Le système de modules de cadre selon l'une quelconque des revendications 1 à 6, **caractérisé en ce que,** pour la constitution de la construction de support du bâtiment, certains des modules (1) de cadre sont ancrés sur le fond pour former les structures de support des murs du bâtiment, les modules (1) de cadre adjacents sont liés les uns aux autres par des boulons de connexion avec des écrous et des rondelles, et d'autres modules (1) de cadre sont fixés sur les modules (1) de cadre ancrés pour former des linteaux de fenêtre et de porte et des plafonds du bâtiment.

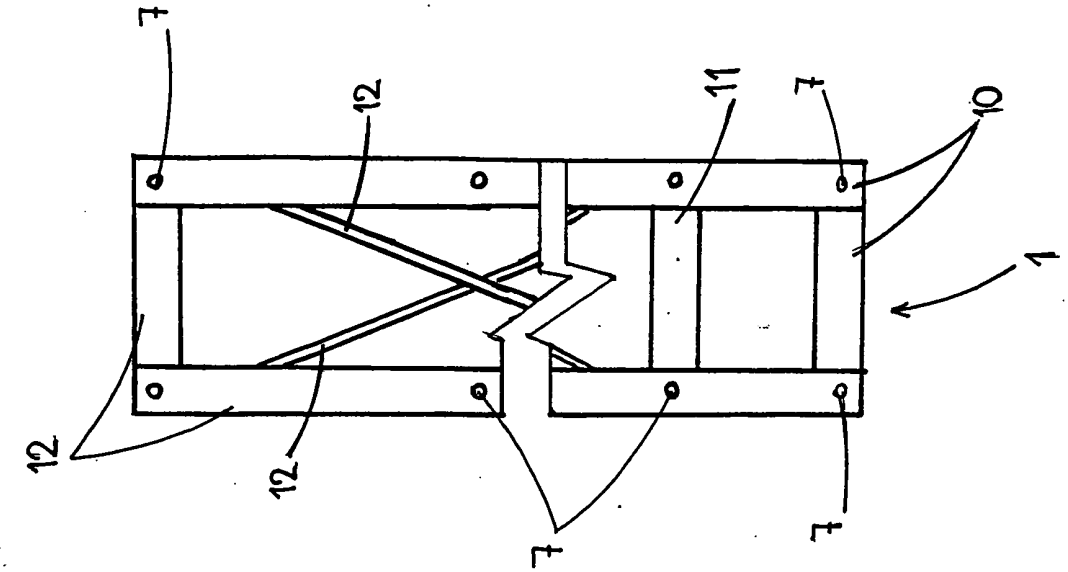


Fig. 2

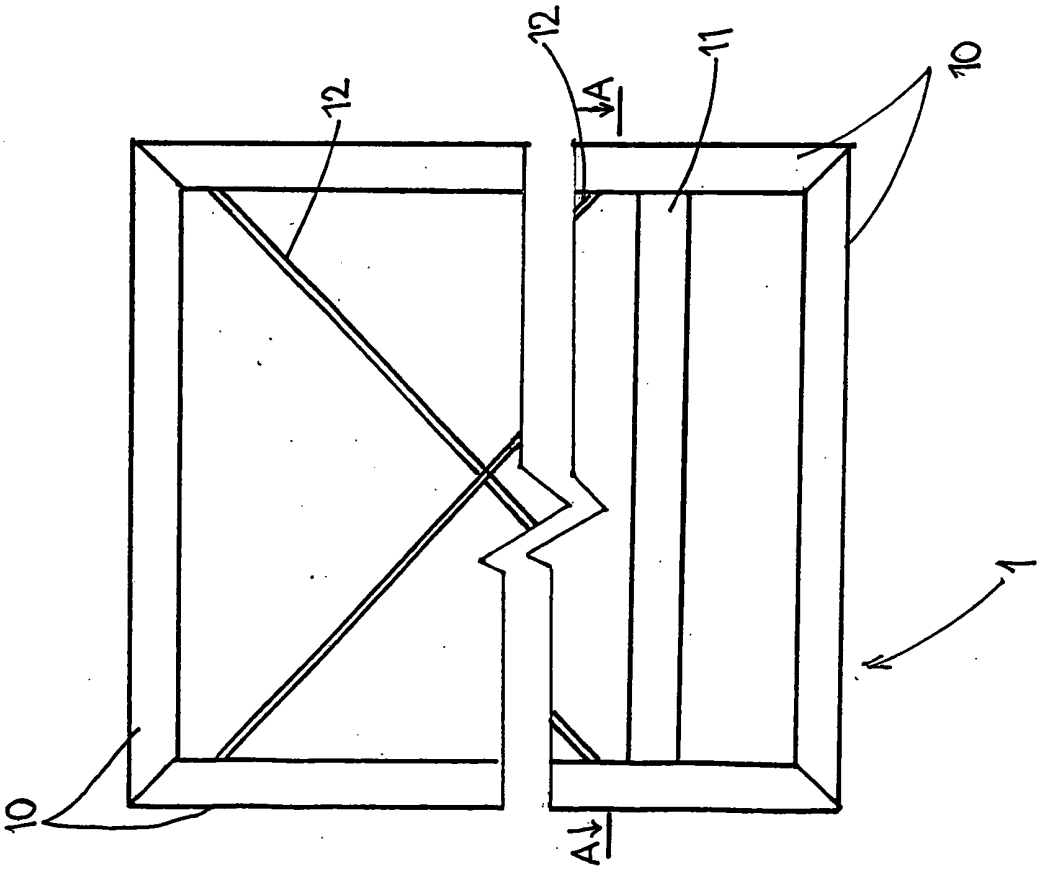


Fig. 1

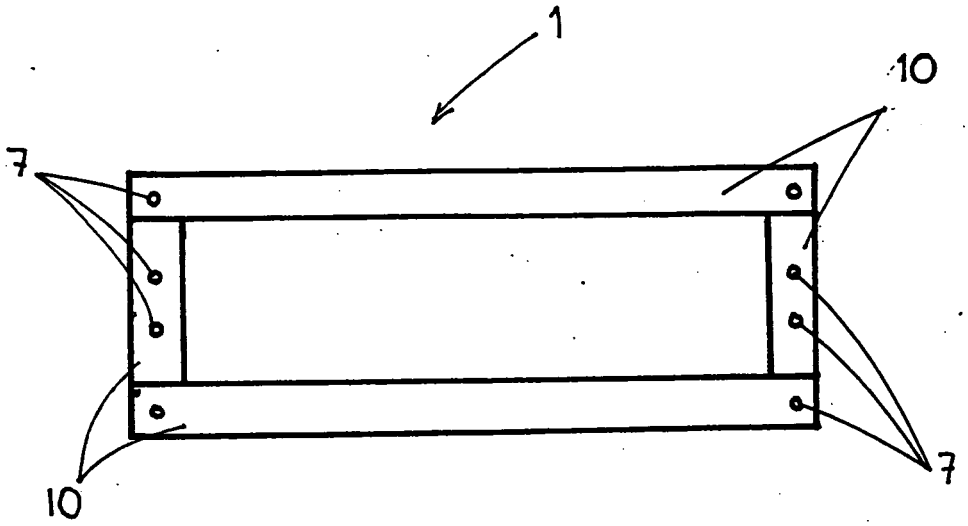


Fig. 3

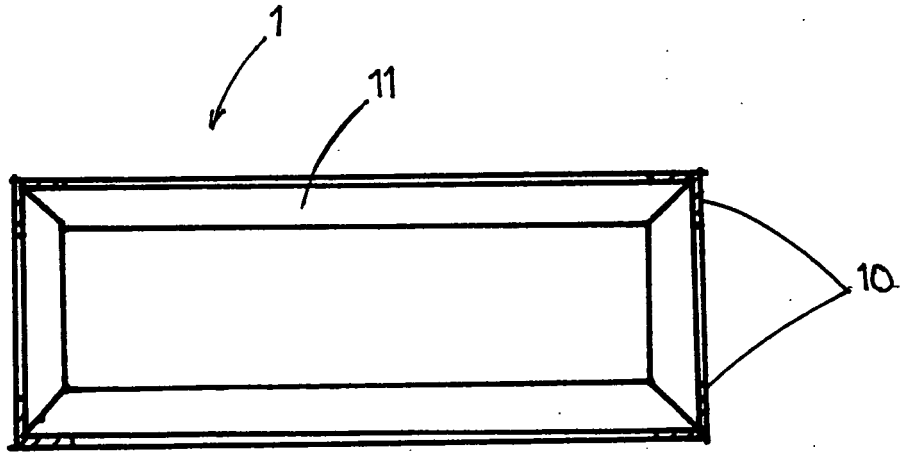


Fig. 4

REFERENCES CITED IN THE DESCRIPTION

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- WO 8404770 A **[0002]**
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- WO 0146531 A **[0002]**
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