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(54) **TABLE CONVERTIBLE INTO AN ANTI-SEISMIC SHELTER**

(57) A table convertible in a temporary earthquake shelter capable of protecting at least a user and easing her/his rescue in case of earthquakes associated to collapses of building materials. According to an aspect of the invention, the table is made of high-resilience polyethylene.

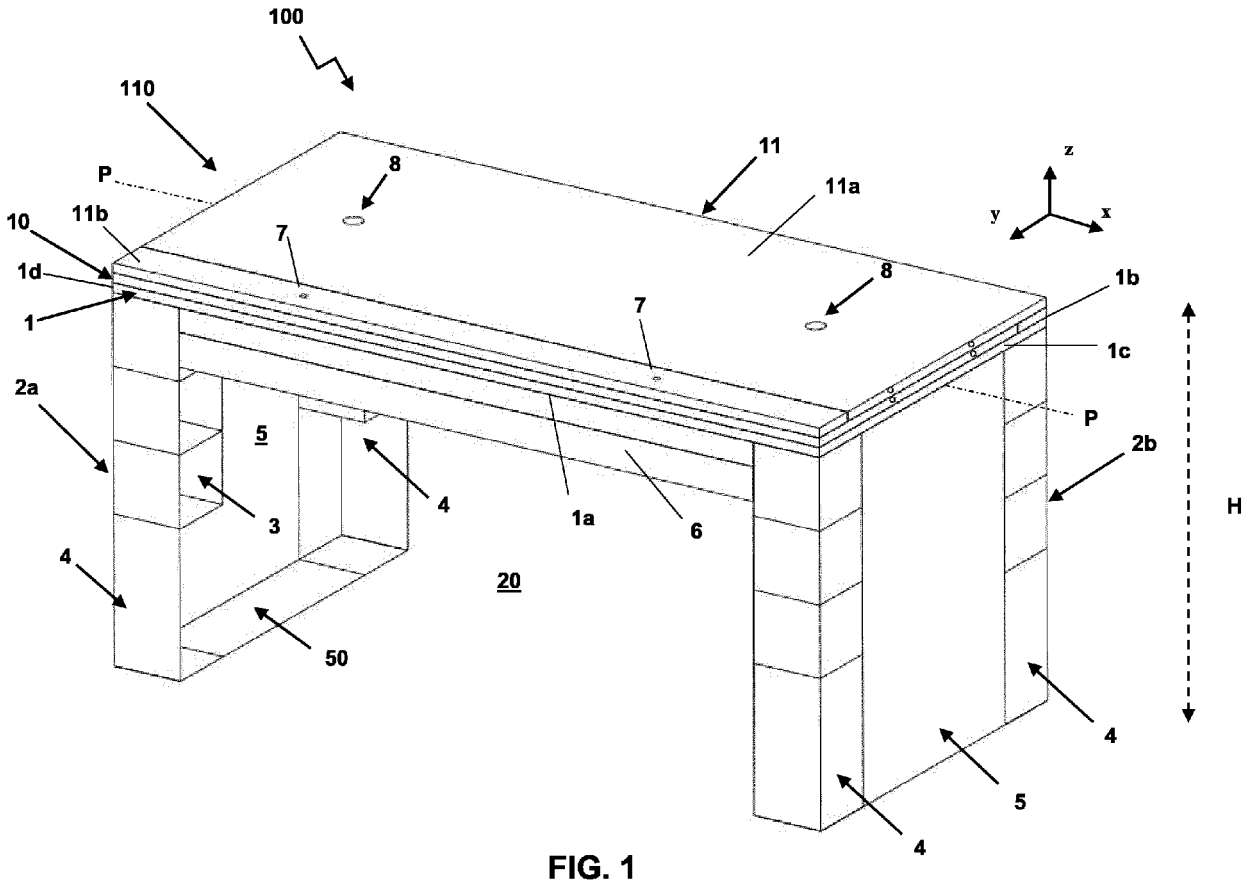

FIG. 1

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Description

Technical field of the invention

[0001] The present invention relates to an anti-seismic temporary shelter structure capable of protecting a user and easing her/his rescue in case of earthquakes associated to collapses of building materials.

Background

[0002] According to what reported by the National Institute of Geophysics and Volcanology, in 2022 over the world about 2493 earthquakes with magnitude higher than 2 were recorded. This piece of data is indicative of a significant increase in high intensity seismic events on a global scale.

[0003] The recommendations issued by the Civil Protection Department in the event of an earthquake generally provide seeking shelter under a table or in the doorway inserted into a load-bearing wall or under a beam, so as to find protection from possible collapses of building material. Such solutions, however, remain very dangerous, since often not sufficient to avoid deaths due to the burial of individuals under the rubble caused by the collapse, and consequent poor capability to communicate with outside. According to the indications of the Civil Protection Department, at the end of an earthquake shock it is advisable to leave the house and reach the nearest collection centres in order to protect from any subsequent shocks. In most cases these indications, however, are not adequately respected, often due to lack of preparation in managing such emergencies, as well as discomfort and difficulties related to hastily leaving the house when the seismic event occurs. The decision to find shelter inside the house can often be wrong, since, in case of shocks repeated at intervals even of minutes or hours, it is probable that these result to be more intense and destructive, with consequent risks for the individuals' safety.

[0004] In order to mitigate risks and damages caused by earthquake shocks on people inside a living space, over the last few years various solutions of anti-seismic shelter have been proposed, which can be integrated within a domestic environment. For example anti-seismic personal protection units are known in the art, shaped like capsules, tables or beds, sometimes to act as temporary shelter environment in case of earthquakes or other natural disasters.

[0005] However, the several preventive solutions proposed to date in the art have different drawbacks of technical and economic nature which make the use thereof in domestic field very complex, if not impossible, by hindering its commercial success. The above is widely demonstrated by the data found in the latest devastating earthquake occurred in Turkey and Syria in the first days of February 2023, which caused more than 45,000 deaths. In fact, in the thousands of destroyed buildings no anti-seismic shelter resulted to be present.

[0006] Firstly, the individual protection solutions designed to date generally provide the construction and installation of complex, heavy and bulky structures, then often which cannot be integrated easily in living spaces, in particular in old houses and/or small-sized houses. Even when such structures are designed so as to result that they can be placed inside a house, often they have a configuration that overturns its habitability. For example, it is known that some among the solutions aimed at providing protection against structural collapses caused by an earthquake, provide the construction of cages or suitable structures made of metal around a bed or at the walls of a passage, by drastically reducing the living comfort.

[0007] Secondly, such anti-seismic structures are often made of expensive materials, such as steel, carbon fibres, Kevlar or other synthetic fibres, with a consequent expense commitment difficult to face.

[0008] In such context, then the need for having effective shelter solutions appears to be very urgent, to avoid or limit the damages deriving from earthquakes, which could conjugate, in particular, an optimum robustness at a reduced cost and greater ease of installation within a living space.

Summary of the invention

[0009] The technical problem underlying the present invention is then to provide a temporary anti-seismic shelter system allowing to meet the needs mentioned above with reference to the known art. Such problem is solved by a convertible table according to claim 1.

[0010] Preferred features of the present invention are set forth by the depending claims.

[0011] The invention in particular provides a table which can be converted easily in a box-like structure of temporary shelter, by allowing to protect a user and to ease her/his rescue in case of earthquakes associated to collapses of building materials.

[0012] In particular, the structure is made of wood and/or high resilience polyethylene and, in case of seismic emergency, it can assume said box-like shape by converting, in few seconds, in anti-seismic shelter.

[0013] In one of its preferred meanings, the convertible table, the present invention relates to, comprises a work platform arranged, in use as a table, substantially horizontal and at least one pair of uprights acting as bilateral legs of the table and configured to support the work platform at a predefined height with respect to the ground. In this way, between the work platform and the ground a shelter environment results to be defined, capable of housing at least a user in case of needs, delimited above by a lower wall of the work platform, below by the ground and laterally by the uprights.

[0014] Advantageously, the work platform of the table according to the present invention is formed by a structure with three panels, wherein a first lower support panel

is directly supported by the uprights of the table and a second and third closure panel are movable between an operating position of normal use wherein they are stacked one on top of the other one and on the first lower panel, and an anti-seismic closed position, wherein they are placed so as to allow at least a portion of the same to assume a substantially vertical orientation, by closing frontally and posteriorly the shelter environment.

[0015] Inside the uprights of the table preferably one or more compartments are obtained, intended to house survival kits, accessible to a user from inside the shelter environment itself.

[0016] According to a preferred embodiment, the table according to the present invention can be made of polyethylene, in particular high resiliency polyethylene. The elastic deformability of this material and then its capability of adapting readily to a sudden change such as that caused by the collapse of a heavy object, allows to dampen and absorb potential destructive impacts which can happen during a high intensity seismic event. Apart from having high resiliency, polyethylene is light, in fact is has a weight almost nine times less than that of steel, and it further results to be easy to be manufactured and cheap.

[0017] Therefore, the table the invention relates to allows, in its various embodiments, to conjugate an optimum resiliency and robustness at a reduced cost, by providing an effective solution to save lives in the event of unexpected seismic or other activities that may cause heavy objects to fall.

[0018] Differently from the solutions of anti-seismic shelter known in the art, the table the present invention relates to can be easily integrated within a living space, as well as it is simple to be used and cheap to be produced on a large scale. In fact, the table takes up little space and does not require to implement complex or expensive installation work, thus resulting to be easily placeable/usable in any house. Since it can be placed in different environments of a house, the table the present application relates to represents an easy solution to guarantee protection to people surprised by an earthquake while carrying out daily activities, as well as valuable objects that one wishes to protect from possible collapses and structural damages.

[0019] Other advantages, features and use modes of the present invention will result evident from the following detailed description of some embodiments, shown by way of example and not for limiting purposes.

Brief description of figures

[0020] The figures of the enclosed drawings will be referred to, wherein:

- Figure 1 shows schematically a perspective view of a first embodiment of a table according to the present invention in an operating configuration of normal use;
- Figure 2 shows schematically a front view of the table of Figure 1, wherein a support element of the table is positioned on the ground;
- Figure 3 shows schematically a perspective view of the table of Figure 2;
- Figure 4 shows schematically a partially exploded perspective view of the table of Figure 2;
- Figure 5 shows schematically a perspective view of the table of Figure 2, during the passage from an operating configuration of normal use to an anti-seismic closed configuration;
- Figure 6 shows schematically a perspective view of the table of Figure 1 in an anti-seismic closed configuration;
- Figure 7 shows schematically an enlarged perspective view of the support element of the table of Figure 2.

[0021] In the above-mentioned figures, the sizes are to be meant as exemplifying and not necessarily with components shown in proportion.

Detailed description of preferred embodiments

[0022] Different embodiments and variants of the invention and parts thereof will be described hereinafter, based on different aspects thereof usable separately or in combination.

[0023] In the following detailed description, additional embodiments and variants with respect to embodiments and variants already treated in the same description will be illustrated limitedly to the differences with what already shown.

[0024] Moreover, as said the different embodiments and variants described hereinafter are likely to be used in combination.

[0025] With reference to Figures 1 to 6, a convertible table according to a preferred embodiment of the invention is designated as a whole with 100.

[0026] The table 100 is configured to be convertible in a temporary shelter for at least a user in case of earthquakes, in particular high magnitude earthquakes, thereto collapses of heavy objects and building material are often associated. Therefore, the table 100 is particularly suitable to be placed inside houses for domestic use.

[0027] To this purpose, the convertible table 100 comprises a work platform 110 arranged, in use as a table, substantially horizontal, and at least one pair of uprights 2a, 2b arranged as bilateral legs of the table and configured to support the work platform at a predefined height H with respect to the ground. The arrangement is so that between the work platform 110 and the ground, a shelter environment 20 is defined, delimited above by a lower

wall of the work platform 110, below by the ground and laterally by the pair of the uprights.

[0028] In particular, in the present embodiment the work platform 110 of the table 100 is formed by a structure articulated with three panels. More specifically, a first lower panel 1, which is called support panel, is directly supported by the above-mentioned uprights and a second and third panel 10 and 11, which are called closure panels, are movable. In particular, in the present embodiment the panels 10 and 11 are movable between an operating position of normal use, wherein they are stacked one on top of the other one and on said first lower panel and constrained thereto, and an anti-seismic closed position, wherein they are placed so as to close frontally and posteriorly the shelter environment 20, in particular so that at least one portion of the aforesaid panels assumes a substantially vertical orientation, by closing frontally and posteriorly the shelter environment 20.

[0029] When the second and third closure panel 10 and 11 are placed in the operating position of normal use, then all with horizontal orientation or substantially as such, the table 100 can be used for domestic purposes, for example such as dining or work table.

[0030] When the second and the third closure panel 10 and 11 are placed so as to allow at least a portion of both above-mentioned panels to assume a vertical orientation, by closing frontally and posteriorly the shelter environment, the table 100, in turn, assumes a closure configuration, that is a substantially box-like configuration suitable to act as temporary anti-seismic shelter for at least a user.

[0031] In particular, the table 100 is configured so that, in the anti-seismic closed configuration, the second and third closure panel 10 and 11 and the pair of the uprights 2a and 2b define, between the support panel 1 and the ground, the above-mentioned shelter environment 20 suitable to house at least a user. In other terms, in the anti-seismic closed configuration, the second and third closure panel 10, 11, the pair of the uprights 2a, 2b, and the support panel 1 result to be connected to each other so as to form substantially a box-like casing, delimited inferiorly by the ground. Such shelter environment is substantially closed, or at least shielded, on the four sides.

[0032] According to a preferred embodiment of the present invention, the second and third closure panel 10, 11 comprises, each one, a first panel portion 10a, 11a, and a second panel portion 10b, 11b connected to the first panel portion through at least a coupling of revolving type, preferably by means of at least a pair of hidden hinges.

[0033] In particular, each first panel portion 10a, 11a, is revolvingly movable between a coplanar position with respect to the corresponding second portion of panel 10b, 11b, and a position in which it is rotated to assume a substantially orthogonal position with respect to the corresponding second panel portion 10b, 11b.

[0034] According to an additional preferred aspect, the second panel portion 10b, 11b of each closure panel 10, 11, is configured so as to be able to be associated removably to the support panel 1, respectively at a first and a second opposite perimeter edges 1a, 1b of the same, in particular a front edge and a rear edge.

[0035] To this purpose, the second panel portion 10b, 11b of each closure panel comprises locking means 7 to constrain or fix each second panel portion 10b, 11b to the surface of the support panel 1, respectively at a first and second opposite peripheral edges 1a, 1b of the same.

[0036] By pure way of example, each second panel portion 10b, 11b of the closure panels comprises at least a pair of holes or recesses as locking means 7, configured to constrain each one of the above-mentioned portions at least at a pair of corresponding holes or recesses obtained in the surface of the support panel 1, preferably through elastic pins for quick locking/unlocking, in particular with spring made of harmonic steel and internal safety pin.

[0037] The use of elastic pins with spring made of harmonic steel allows to fix to the support panel the second portion of each closure panel in a particularly quick and easy way. The possibility of fixing each second portion 10b, 11b of the closure panel to the surface of the support panel 1 of the table allows to keep firmly the second and third panel 10, 11 in closed position.

[0038] As illustrated schematically in Figure 5, in case of earthquake, one or more users can move manually the closure panels 10, 11 of the table 100 and fix manually the second portion 10b, 11b of each closure panel at a first and a second perimeter edges of the support panel 1, before accessing the internal shelter environment. Once such portions have been fixed to the resting plane, the first panel portion 10a, 11a of each closure panel can be rotated with respect to the corresponding second panel portion 10b, 11b so as to assume an orthogonal position with respect thereto, and then to be placed downwards to close frontally and posteriorly, respectively, the shelter environment. The described configuration then allows to arrange each first panel portion 10a, 11a of the two closure panels in perpendicular position with respect to the plane P, below the same, so as to implement, together with the pair of the uprights, a substantially box-like casing.

[0039] The support panel 1 and the closure panels 10, 11 of the table convertible 100 can have variable length and width along the longitudinal direction *x* or transversal direction *y* (schematically identified in Figure 1 by a cartesian reference *xyz* wherein the directions *xy* define the above-mentioned plane P). In particular, based upon the needs, and even depending upon the space available in the house in which its placing is expected, the height, the length and the width of the table 100 can vary so as to assume the wished sizes as long as these allow to position at least a user in fetal, supine, seated or squatting position in the shelter environment 20.

[0040] According to a preferred aspect of the invention, the convertible table 100 has height, width and length so

as to define a shelter environment 20 suitable to house only one user, for example an adult of a robust or very robust build, even tall. However, according to other embodiments, the table 100 has height, width and length so as to define a shelter environment 20 capable of housing at least two users, in particular positioned in an overlapped way, for example two adults of normal build, even tall, two adults of robust build, an even robust adult and a boy, an even robust adult and a child, two boys/girls or an adult and one or more domestic animals.

[0041] According to an embodiment of the invention, the convertible table 100 has a substantially parallelepiped geometry.

[0042] Preferably, the convertible table 100 according to the present invention has a height comprised between 0.75 metres and 0.84 metres, preferably equal to 0.80 metres.

[0043] According to a preferred aspect of the invention, the support panel 1 has a length along the direction x comprised between 1 metre up to 2 metres, still more preferably between 1.2 and 1.8 metres, and has a width along the direction y comprised between 0.70 metres and 1.30 metres.

[0044] According to a preferred aspect of the invention, the second and third closure panel 10, 11 have an equal length along the direction x with respect to the length of the support panel 1, even to compensate the transversal extension of the uprights. Having an equal length along the direction x with respect to the length of the support panel 1, the second and third closure panel 10 and 11 provide the table according to such embodiment variant a significantly better resistance to impacts, especially in the event of overturning. This is due in particular to the fact that, in anti-seismic closed configuration, the closure panels 10 and 11 result to be in contact with the uprights of the table for a significant portion of their surface.

[0045] According to a preferred embodiment, the second and third closure panel 10, 11, comprise, each one, a first panel portion 10a, 11a, having a width along the transversal direction y substantially equal to the height of the table 100.

[0046] According to an embodiment of the invention, the support panel 1, the second and third closure panel 10, 11 have thicknesses (in direction z) equal or different therebetween. In a preferred embodiment, the support panel 1 has thickness ranging from 2 to 3 cm, preferably 2 cm, whereas the second and third closure panel 10, 11 have thickness ranging from 1 to 2 cm, preferably equal to 2 cm.

[0047] The support panel 1, the second and third closure panel 10, 11 and the pair of the uprights 2a, 2b of a table 100 can be made of any material suitable for the construction of anti-seismic structures, in particular of wood and/or polyethylene.

[0048] According to a particularly preferred embodiment, the support panel 1, the second and third closure panel 10, 11 and the pair of the uprights 2a, 2b are made of polyethylene, in particular high resilience polyethylene.

[0049] Some considerations related to possible implementations of the table of the above-described embodiments will be made hereinafter by pure way of example and not for limitative purposes.

[0050] Under the term "resilience", in the context of the present description, the mechanical property of the material is meant, defined as the capability of resisting to dynamic forces, that is impacts, until rupture, by absorbing energy with elastic and plastic deformations. This definition of resilience coincides with the one that in English technical literature is defined *impact toughness* or *impact strength.*

[0051] In the context of the present description, the term "polyethylene" relates to the thermoplastic polymer belonging to the family of polyolefins obtainable from ethylene polymerization. Examples of polyethylene having an optimum resilience which can be used for manufacturing the components of a convertible table according to any one of the embodiments of the present invention comprise low-density polyethylene (also herein abbreviated as LDPE, from English *low-density polyethylene*), linear low-density polyethylene (also herein abbreviated as LLDPE, from English *linear low-density polyethylene*), or a combination thereof.

[0052] In the context of the present description, under LLDPE in particular a polymer based on substantially linear polyethylene is meant, with a significant number of *short branching.* It is commonly obtained from the copolymerization of ethene with longer chain alkenes. The linear low-density polyethylenes are structurally different from the low-density polyethylenes due to the absence of *long chain branching.* The greater linearity of LLDPE derives from the production processes, which are different from those of LDPE. Generally, LLDPE is synthetized at lower temperatures and pressures through copolymerization of ethene and α-alkenes such as butene, hexene and octene. The copolymerization process produces a copolymer of LLDPE having a narrower distribution of molecular weight than the conventional LDPE and different rheological properties for the structure linearity.

[0053] According to an aspect, the polyethylene used for implementing the panels, the uprights, or the whole table is LDPE and is characterized by a density range comprised between 0.910 and 0.940 g/cm^3. LDPE is preferably synthetized by high pressure radicalic polymerization, in particular between 1000 and 3000 bar, with reaction temperatures comprised between 80°C and 300°C, in particular with oxygen and peroxide catalysts.

[0054] According to a preferred aspect of the invention, LDPE suitable to be used to implement one or more of the components or all components of a table 100 according to the present invention has a density comprised between 0.918 and 0.920 g/cm^3. Still more preferably, said LDPE has a density comprised between 0.918 and 0.920 g/cm^3 and a high average molecular weight. Such combination of features provides to the polymer LDPE a high resilience, particularly optimum to implement the con-

vertible table according to any one of the herein described embodiments.

[0055] By pure way of example, the average molecular weight of a polymer such as LDPE or LLDPE can be estimated by rheological measurement of the *Melt Flow Index* (MFI). As a person skilled in the art knows, such index can be determined by loading the polymer melt at a determined temperature into a heated cylinder thereto a standard small cylinder (for example diameter 2.095 mm and length 8 mm) is fixed, which exerts a constant force and makes the polymer to flow through a capillary; the mass (expressed in grams) of polymer leaked in 10 minutes corresponds to the *Melt Flow Index* value. Preferably, MFI index is determined by standard methods as described in the standards ISO 133 and ASTM D1238.

[0056] In particular, the herein expressed values of MFI index can be determined by measuring, by any standard techniques known in the field such as those previously exemplified, how many grams of the considered polymer flow through an orifice or said standard capillary under a constant load of 2.1 kg. The greater the leaked material mass is, the greater the MFI is and the lesser the polymer viscosity is. The lower the value of MFI is, the higher the average molecular weight of the polymer is.

[0057] According to a preferred aspect, LDPE suitable to be used for implementing one or more of the components of a table 100 according to the present invention has a density comprised between 0.918 and 0.920 g/cm^3 and/or an MFI value ranging from 0.2 to 1, which MFI in particular is determined by using any one of the standard techniques known to a person skilled in the art by applying a constant load of 2.1 kg. Preferably, said LDPE has a density comprised between 0.918 and 0.920 g/cm^3 and an MFI value ranging from 0.2 to 1, which MFI in particular is determined by using any one of the standard techniques known to a person skilled in the art by applying a constant load of 2.1 Kg.

[0058] The values of density and of MFI of the LDPE polymer shown in the present application can be obtained by acting, during the polymer synthesis process, contemporarily, and especially gradually, on the amount of the used catalysts oxygen and peroxides (in particular by decreasing progressively the amount thereof), as well as on the reactor pressure (in particular by increasing it progressively), on the temperature of the heating and cooling water of ethylene in the used reactor (in particular by decreasing it progressively) and the temperatures of reaction ethylene (which can slightly decrease during the synthesis process, but they cannot increase).

[0059] According to an additional aspect, the polyethylene used for implementing the panels, the uprights, or the whole table 100 according to the invention is LLDPE and it is characterized by a density range comprised between 0.915 and 0.935 g/cm^3, preferably equal to 0.920 g/cm^3.

[0060] Preferably, LLDPE suitable to be used for implementing one or more of the components or all components of table 100 according to the present invention has a density value ranging from 0.915 to 0.930 g/cm^3 and/or an MFI value ranging from 0.2 to 0.8, which MFI in particular is determined by using any one of the standard techniques known to a person skilled in the art by applying a constant load of 2.1 Kg. Still more preferably, said LLDPE has a density value ranging from 0.915 to 0.930 g/cm^3 and an MFI value ranging from 0.2 to 0.8, which MFI in particular is determined by using any one of the standard techniques known to a person skilled in the art by applying a constant load of 2.1 Kg. Such combination of features gives high resilience to LLDPE, particularly optimum for implementing a table according to any one of the herein described embodiments.

[0061] Still more preferably, said LLDPE has an impact resistance value (or notched Izod resistance) equal to 1.06 kJ/m, determined by notched Izod impact test. Within the ASTM rules, the notched impact resistance of the plastic materials is usually measured by using the test Izod according to ASTM D256. The bending impact stress is applied laterally on a notched sample locked on one side. The result is shown as an energy absorption linked to the sample thickness. The Izod impact tests are described even in the standards ISO 180 and ASTM D4508.

[0062] The use of LLDPE for implementing a table according to the present invention is particularly advantageous since the plants generally used for the production of this polymer allow to produce a mixture of polyethylene having an overall optimum quality, in particular in terms of resilience, with lower production costs.

[0063] According to an additional preferred aspect, the polyethylene used for implementing the panels, the uprights, or the whole table according to the invention is a combination of LDPE and LLDPE according to any one of the herein described variants.

[0064] Preferably, the uprights 2a, 2b of the pair of the uprights of the convertible table 100 according to any one of the herein described variants have a transversal extension along the transversal direction y suitable for laterally closing off the shelter environment 20.

[0065] According to an additional preferred aspect of the invention, each upright of the pair of the uprights 2a, 2b of the table 100 is integrally connected to the support panel 1 respectively at a third and a fourth opposite lateral perimeter edge 1c, 1d of the same. In particular, the uprights 2a, 2b preferably extend along the whole width of the third and fourth opposite perimeter edge of the support panel 1 along the direction y, so as to result to be stable with respect to the ground and to support adequately the support panel 1.

[0066] According to an embodiment, at least an upright of the pair of the uprights 2a, 2b comprises one or more compartments 3 accessible to a user which is in shelter environment 20. Preferably, the compartments 3 of the table 100 are placed in a region of the upright(s) proximal to the support panel 1, still more preferably at a distance from the ground at least equal to 0.50 cm.

[0067] Such one or more compartments are mainly in-

tended to house survival kits, useful to face the user permanence inside the shelter environment during the seismic event, wating for the shock interruption and/or waiting for rescuers' arrival.

[0068] Preferably, each upright of the pair of the uprights 2a, 2b according to any one of the herein described embodiments comprises two vertical legs 4, which have square or triangular section, preferably triangular section, and a side wall 5 interposed between the above-mentioned legs and integrally connected to them so as to shield laterally the shelter environment. Preferably, each side wall 5 has a thickness ranging from 1 to 3 cm, still more preferably equal to 2 cm.

[0069] As shown by way of example in Figure 1, the vertical legs 4 of the table 100 are preferably placed at the angles of the support panel 1 and integrally connected to one lower wall thereof facing the ground.

[0070] According to a preferred embodiment of the invention, the compartments 3 of the table 100 according to any one of the herein described variants are obtained inside one or more legs 4, and comprise one or more shelves or ledges.

[0071] According to an additional embodiment of the invention, the closure panels 10, 11 according to any one of the herein described variants comprise engagement means 8, preferably in form of one or more holes or recesses, obtained on the surface of the second and third closure panel 10, 11, and able to constrain the closure panels 10, 11 to the support panel 1 when the above-mentioned panels are placed in the operating position of normal use, that is when they are stacked one on top of the other one.

[0072] To this purpose, the support panel 1 could comprise corresponding constraint means 80, preferably in form of one or more projections made of rubber, suitable to allow to constrain the closure panels 10, 11 to the support panel 1 when the above-mentioned panels are placed in the operating position of normal use.

[0073] As shown by way of example in Figure 4, the engagement means 8 is preferably in form of holes obtained in the surface of each second panel portion of the closure panels 10 and 11. Preferably, the above-mentioned engagement means 8 is obtained in the surface of each first portion 10a and 11a of the closure panels. In such configuration, the engagement means 8 can be used even as gripping means and they can allow a user to move manually the above-mentioned panels. As it will also illustrated more in detail hereinafter, the engagement means 8 can also be used as gripping means by a user present inside the shelter to keep the first portion of each closure panel 10 and 11 adhered to the uprights of the table, once the above-mentioned portions are placed in substantially vertical position to close frontally and posteriorly the shelter environment, so as to allow the fastening thereof to the uprights themselves.

[0074] In order to ease the manual motion of the closure panels 10 and 11, one or more holes or additional recesses could be present, in the side edges of the same.

[0075] As previously mentioned, in case of earthquake, one or more users can move manually the closure panels 10, 11 of the table 100, by releasing them from the support panel 1, and then rotate the second portion 10b, 11b of each closure panel to assume an orthogonal position with respect to the first portion of each panel. The second portion of panel in this way can be fixed at a perimeter edge of the support panel, before accessing the internal shelter environment.

[0076] Once the user is inside the shelter environment, each first panel portion 10a, 11a of the closure panels, suitably placed so as to close frontally and posteriorly the shelter environment, can be suitably fixed from the inside, so as to guarantee adequate protection from possible external collapses.

[0077] In a preferred embodiment, each first panel portion 10a, 11a of the closure panels can be provided at least with a pair of holes configured to constrain each one of the above-mentioned portions at a pair of holes obtained near the perimeter edge of the uprights 2a and 2b of the table, through the insertion of pins for the quick locking/unlocking, such as pins known in the art as "ball lock pins". To this purpose, the above-mentioned holes have all a suitable diameter to allow to insert ball lock pins.

[0078] The insertion of lock pins in the holes can be favoured manually in real time by a user present inside the shelter environment 20, should he/she wish to prevent a closure panel from opening, by pressing a suitable spring button. As previously mentioned, the insertion of the lock pins in the above-mentioned holes can be eased by keeping each first portion 10a and 11a of the closure panels in position adhered to the uprights of the table through the engagement means 8.

[0079] Such configuration allows a user inside the shelter environment to lock the closure panels and prevent the opening during the seismic event in particularly quick and easy way. In the same way and still from inside the shelter it is possible, when one wishes, to proceed with extracting the pins to escape from the shelter.

[0080] In order to strengthen the box-like structure which is created when the table 100 assumes the anti-seismic closed configuration, as well to ease a prolonged permanence of a user inside the shelter environment 20, the table 100 according to any one of the herein described variants can further include a support element 6 associated in a removable manner to a lower wall of the support panel 1 facing the ground.

[0081] The possibility of associating the support element 6 to the lower wall of the support panel 1 of the table makes that the support element is not an impediment when, in everyday life, the table is used also to have lunch.

[0082] According to a preferred aspect of the invention, the support element 6 is associated to a lower wall of the support panel 1 so as to be able to be detached or unhooked if necessary and placed onto the ground, inside the shelter environment itself, so as to delimit or seal inferiorly the shelter environment and to support a user

in supine lying, fetal or squatted position. A support element 6 suitable to be integrated in a table 100 according to any one of the variants of the invention is preferably made of a material capable of supporting a user within said environment in supine lying, fetal or squatted position.

[0083] According to a preferred embodiment, the support element 6 comprises foam rubber. According to an additional embodiment, the support element 6 comprises one or more inflatable or self-inflating cushions.

[0084] Preferably, as shown by pure way of example in Figure 7, the support element 6 according to any one of the herein described embodiments is shaped so as to delimit or seal inferiorly the shelter environment 20, when in use.

[0085] As shown by way of example in Figure 1, in the configuration of normal use of the table 100, the support element 6 can be fixed to the lower wall of the support panel 1, for example by means of quick locking/unlocking pins, such as spring lock pins. To this purpose, the support element 6 and the support panel 1 can include at least two pairs of holes corresponding to each other, respectively obtained in the long internal edges of the support element 6 and in the lower walls of the long sides of the support panel 1, configured to allow the insertion of the spring lock pins. In case of earthquake, one or more users can release the support element 6 from the lower wall of the support panel 1, by removing the locking pins easily and quickly, so as to be able to place the support element 6 at the level of the ground and to delimit and seal inferiorly the shelter environment 20.

[0086] Once the support element 6 is placed on the ground, inside the shelter environment, this can be suitably fixed to the portions 10a and 11a of the closure panels. Such fixing of the support element 6 can be performed from inside itself of the shelter by using pins for the quick locking/unlocking, for example spring lock pins.

[0087] Said fixing is important to strengthen completely and definitely the anti-seismic structure in case of earthquake. In particular it is important so that the table could resist to possible impacts, as well as protect and support the weight of the users, even in case of displacements or overturning.

[0088] In an embodiment, the support element 6 according to any one of the variants described in the present application, has a thickness ranging from 1 to 3 cm, still more preferably equal to 2 cm.

[0089] The support element 6 according to any one of the variants described in the present application could also comprise a supporting plane, preferably having thickness ranging from 1 to 3 cm, still more preferably equal to 2 cm, intended to rest onto the ground when the support element 6 is placed on the ground, and a foam rubber layer, preferably having thickness equal to about 5 cm, fixed to the supporting plane. According to an additional preferred aspect of the invention, the table 100 comprises one or more props or supporting rods, preferably of expansion Piher type (or of "push and pull" type), which can be removably connected to a lower wall of said support panel 1 facing the ground, preferably by engaging at least one hole made in said wall and corresponding holes or recesses 9 obtained in the support element 6. To this purpose, the holes or recesses 9 obtained in the support element 6 can have sizes so as to allow the insertion of any device known in the art suitable to act as support for props of Piher type.

[0090] In the configuration of normal use of the table 100, the support props can be placed in vertical position below the platform 110, preferably they can be embedded or incorporated in the side wall 5 of the uprights of the table.

[0091] The connection of the support props on the lower wall of the support panel 1 can be favoured by a user inside the shelter environment 20 and it allows to give the table 100 a greater resistance to the squeezing force (500 Kg per prop) as well as a greater resistance to a possible internal widening force.

[0092] In order to allow the connection of the support props, the table 100 comprises preferably a pair of plates, associated to the lower wall of the support panel 1, or housed between the lower wall of the support panel 1 and a support element 6 according to any one of the variants described in the present application.

[0093] According to an additional aspect, the table 100 comprises a pair of sheets 50, preferably made of steel, wherein each sheet is underneath a corresponding upright 2a, 2b, that is interposed between an upright of the table and the ground, and firmly associable or associated thereto.

[0094] In particular, each sheet 50 can be fastened to the lower surface of a corresponding upright, that is to the surface of the upright resting on the ground. Preferably, as shown by way of example in Figure 1 each sheet 50 can be fixed to the lower surface of the vertical legs 4 and of the side wall 5 of a corresponding upright of the table, so as to join therebetween the vertical legs 4 of the upright.

[0095] For example, each sheet can be fixed to the lower surface of the vertical legs 4 and of the side wall 5 of a corresponding upright by hidden bolts incorporated in the lower surface of each upright. Preferably, each sheet has a thickness equal to about 5 mm. In such configuration, the support element 6, once placed on the ground so as to limit and seal inferiorly the shelter environment, can advantageously be fixed at each one of the sheets made of steel.

[0096] In case of collapses, in order to ease the detection thereof by rescuers, the table according to any one of the herein described embodiments can include even alarm means, automatic or operable from the shelter environment, and/or a localization system configured to signal accurately the position of the same and to ease the recovery of the people sheltered in the shelter environment by the rescuers. According to an additional preferred aspect, the table comprises lights for illuminating the shelter environment.

[0097] According to an additional preferred aspect, the table according to any one of the described embodiments comprises helmets and/or safety belts wearable by a user within the shelter environment.

[0098] According to an additional preferred aspect, the table comprises cloth and/or rope nets associated to the lower wall of the support panel 1 facing the shelter environment, intended to house kits or objects useful for survival.

[0099] According to a preferred aspect of the invention, a table according to any one of the herein described variants further comprises survival kits arranged within said plurality of compartments 3 of the uprights.

[0100] In particular, the survival kits can include one or more of the objects selected from: drugs, bottle water, food supply, disinfectant products, LED lamps, batteries, whistles, paper handkerchiefs, dust masks, means to detect the position of said anti-seismic structure, in particular a GPS detector and/or a transmitter/receiver, first aid material, scissors.

[0101] The accessories present in the kit allow to make the user's stay inside the shelter as comfortable as possible, waiting for the interruption of the seismic event or for rescuers' arrival.

[0102] Once inside the shelter environment 20 of a table 100 according to any one of the herein described embodiments, a user could use the several objects or protection means available in the internal compartment(s).

[0103] It is further preferable that at least one of the closure panels and/or at least one of the uprights according to any one of the variants described in the present application, have a preferably closable aeration window, for example a sliding window, suitable to allow the air passage from inside towards outside of the shelter environment and vice versa. By pure way of example, the table, as well as the herein described single components of the same, can be produced by means of a hot injection moulding process comprising the fact of performing at least a step of melting tablets made of polyethylene according to any one of the herein described variants and subsequent introduction of the melt material inside a mould having wished sizes and shape, for example a mould made of metal or aluminium. Once it has become sufficiently malleable, the polyethylene can be underpressure injected in the cavity of the selected mould, until it is completely filled, and left to solidify inside thereof.

[0104] Alternatively, the table, as well as the single components of the same as herein described, can be produced by a hot compression moulding process comprising the compression of a measured amount of polyethylene (also defined as "charge") in the pre-established shape, by using at least two heated moulds, for example moulds made of metal or aluminium.

[0105] The shape, sizes, details and thicknesses of the moulds usable in any one of the manufacturing processes described in the present application can be accurately designed or calculated by a person skilled in the art with the purpose of giving the resulting table the resistance suitable to resist to possible collapses of heavy material which can be caused by an earthquake. According to an aspect of the invention, the moulds can be suitably implemented by 3D printing starting from a three-dimensional prototype of the wished table 100, manufactured for example by *cad-cam* technology and stereolithography.

[0106] 3D printing of the pieces of the mould(s) to be assembled can be performed, for example, by using a 3D Mammoth printer. The produced moulds could be used at industrial level for reproducing the table by injection and/or compression moulding. The selection of the moulding system most suitable for manufacturing the table 100 depends upon several factors. According to some aspects, it is preferable that the implementation of the different components of the table is performed by using both moulding systems illustrated in the present description (that is injection and compression moulding), for example for cost saving reasons or for greater precision of the details in some moulds. This is possible thanks to the fact that the different components made of polyethylene of the table, implementable through the above-mentioned processes, can be hot assembled easily, by making the whole manufacturing process very simple and unexpensive.

[0107] At this point it will be better appreciated that the invention allows to convert in very few seconds a table usable in domestic field into a safe anti-seismic shelter.

[0108] The present invention has been sofar described with reference to preferred embodiments. It is to be meant that other embodiments belonging to the same inventive core may exist, as defined by the protective scope of the hereinafter reported claims.

[0109] It will be understood that additional specific constructive implementations and variants can be added to the above-described embodiment forms and variants. These can relate, for example, to the connection between the above-mentioned uprights, the panels and the support element and/or specific selections of absolute and relative thicknesses, this with the purpose, for example, of improving ergonomicity, mechanical resistance and interaction of the parts of the system.

Claims

1. A table (100) convertible in a temporary earthquake shelter, which convertible table comprises:

   - a work platform (110) arranged, in use as a table, substantially horizontal;
   - at least one pair of uprights (2a, 2b) arranged as bilateral legs of the table and configured to support said work platform at a predefined height (H) with respect to the ground, so that between said work platform and the ground a shelter environment (20) is defined delimited

above by a lower wall of said work platform, below by the ground and laterally by said pair of uprights,

wherein said work platform (110) is formed by a structure with three panels, wherein a first lower support panel (1) is directly supported by said uprights and a second (10) and third (11) closure panels are movable between an operating position of normal use, in which they are stacked one on top of the other one and on said first lower panel and constrained thereto, and an anti-seismic closed position, in which they are placed in such a way that at least one portion of the aforesaid panels assumes a substantially vertical orientation, closing said shelter environment frontally and posteriorly.

2. The convertible table (100) according to claim 1, wherein each upright (2a, 2b) of said pair has a transversal extension suitable for laterally closing off said shelter environment.

3. The convertible table (100) according to claim 1 or 2, which has a substantially parallelepiped geometry.

4. The convertible table (100) according to any one of the preceding claims, wherein said panels and said pair of uprights (2a, 2b) are made of wood and/or polyethylene.

5. The convertible table (100) according to the preceding claim, wherein said polyethylene is selected from a group comprising:

- low-density polyethylene (LDPE) having a density ranging from 0.918 to 0.920 g/cm^3 and/or a melt flow index value (MFI) ranging from 0.2 and 1;
- linear low-density polyethylene (LLDPE) having a density ranging from 0.915 to 0.935 g/cm^3, preferably equal to 0.920 g/cm^3, and/or an MFI value ranging from 0.2 to 0.8; and
- a combination thereof.

6. The convertible table (100) according to any one of the preceding claims, wherein said closure panels (10, 11) comprises, each one, a first panel portion (10a, 11a) and a second panel portion (10b, 11b) connected to said first panel portion through at least a rotatable coupling, in particular a pair of hinges; and wherein each second panel portion (10b, 11b) of said closure panels (10, 11) is configured to be associated in a removable manner with said support panel (1), respectively at a first and a second opposite perimeter edges (1a, 1b) of said support panel (1).

7. The convertible table (100) according to any one of the preceding claims, wherein said closure panels (10, 11) comprise engagement means (8) able to constrain said closure panels (10, 11) to said support panel (1) when the above-mentioned closure panels are placed in the operating position of normal use.

8. The convertible table (100) according to any one of claims 1 to 7, wherein each upright of said pair of uprights (2a, 2b) is integrally connected to said support panel (1) respectively at a third and a fourth opposite lateral perimeter edges (1c, 1d) of the same.

9. The convertible table (100) according to any one of claims 1 to 8, wherein at least an upright of said pair of uprights (2a, 2b) comprises one or more compartments (3) accessible to a user from inside the shelter environment (20) and intended to house survival kits or items, for example medicines and/or one or more helmets.

10. The convertible table (100) according to any one of claims 1 to 9, wherein each upright of said pair of uprights (2a, 2b) comprises two vertical legs (4), and a side wall (5) interposed between said legs and integrally connected to them.

11. The convertible table (100) according to any one of the preceding claims, wherein at least one of said closure panels and/or at least one of said uprights has a preferably closable aeration window.

12. The convertible table (100) according to any one of claims 1 to 11, further comprising a support element (6) associated in a removable manner to a lower wall of said support panel (1) facing the ground, said support element (6) being shaped to inferiorly delimit or seal said shelter environment (20), when in use, and to support a user within said shelter environment in a seated, fetal, supine or squatting position.

13. The table (100) according to any one of claims 1 to 12, comprising one or more support props which can be removably connected to a lower wall of said support panel (1) facing the ground, preferably by engaging at least one hole made in said wall.

14. The table (100) according to any one of claims 1 to 13, comprising safety belts and/or helmets wearable by a user within said shelter environment.

15. The table (100) according to any one of claims 1 to 14, comprising lights for illuminating said shelter environment and/or alarm means, automatic or operable from said shelter environment.

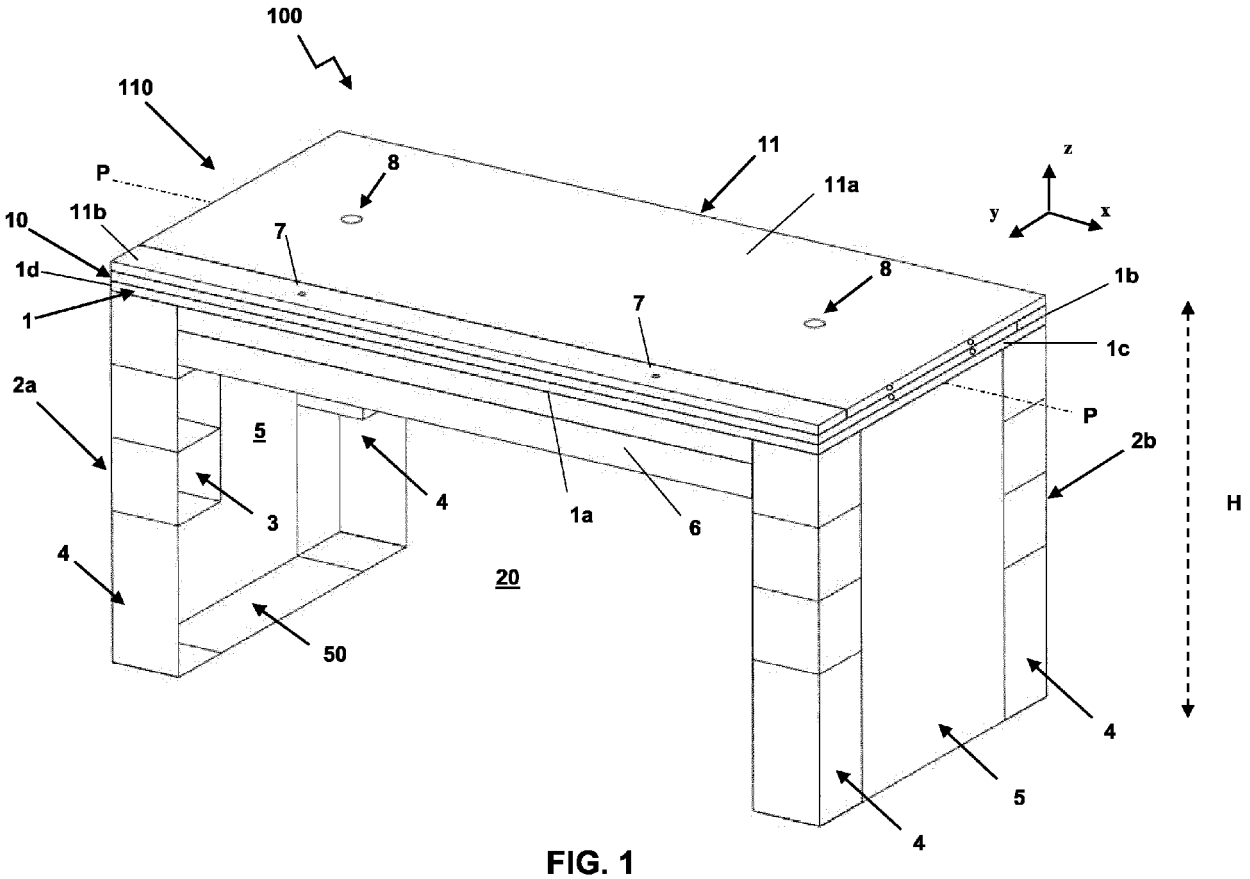
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FIG. 1

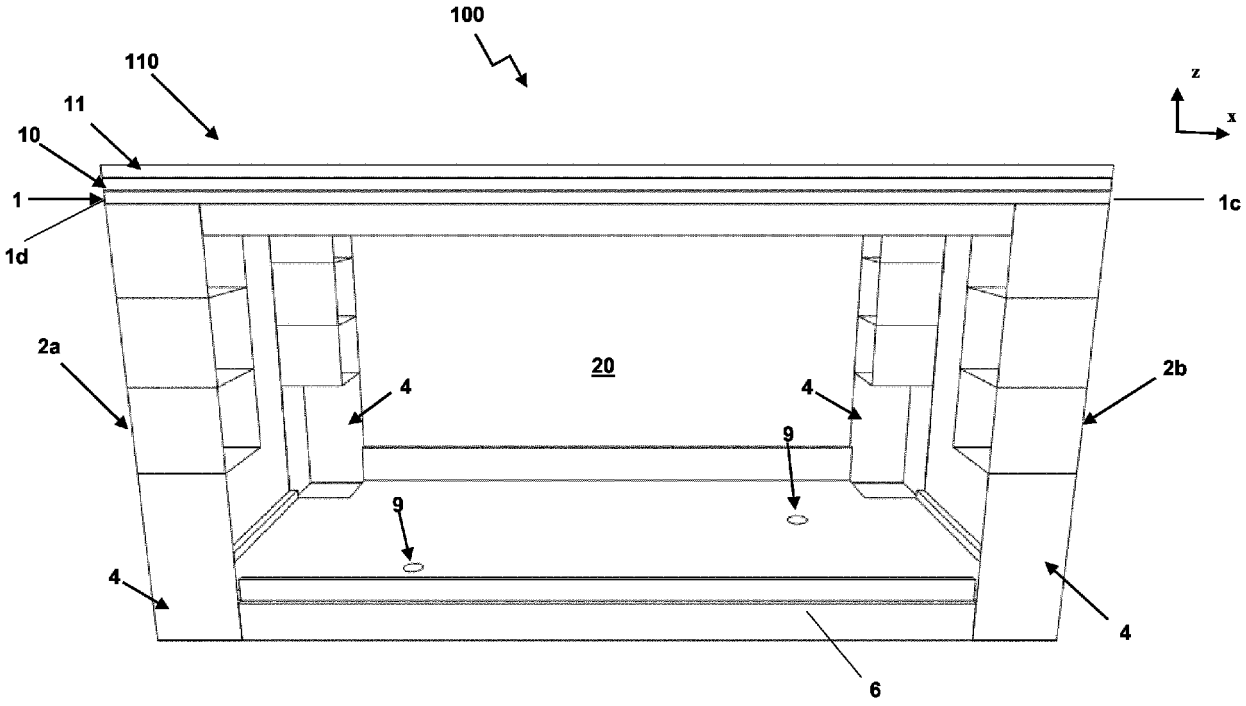

FIG. 2

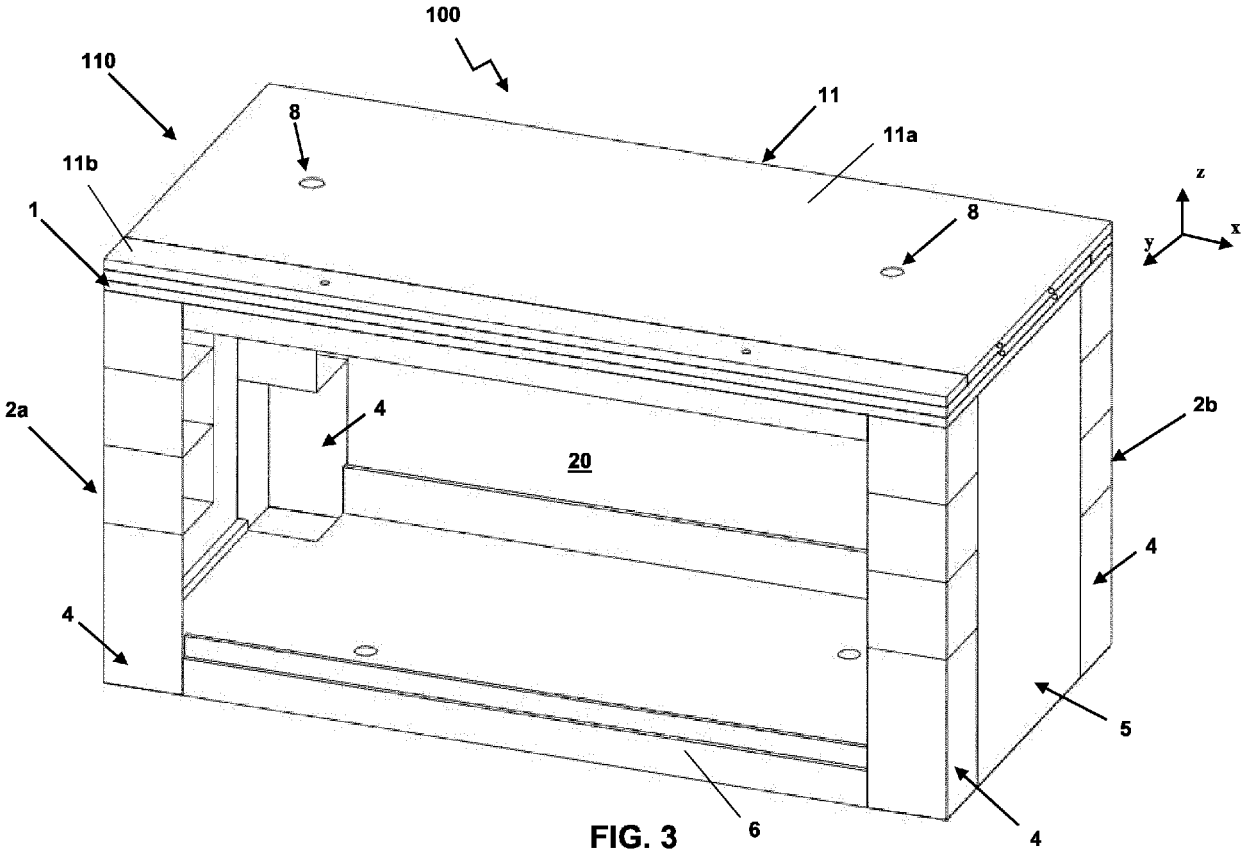

FIG. 3

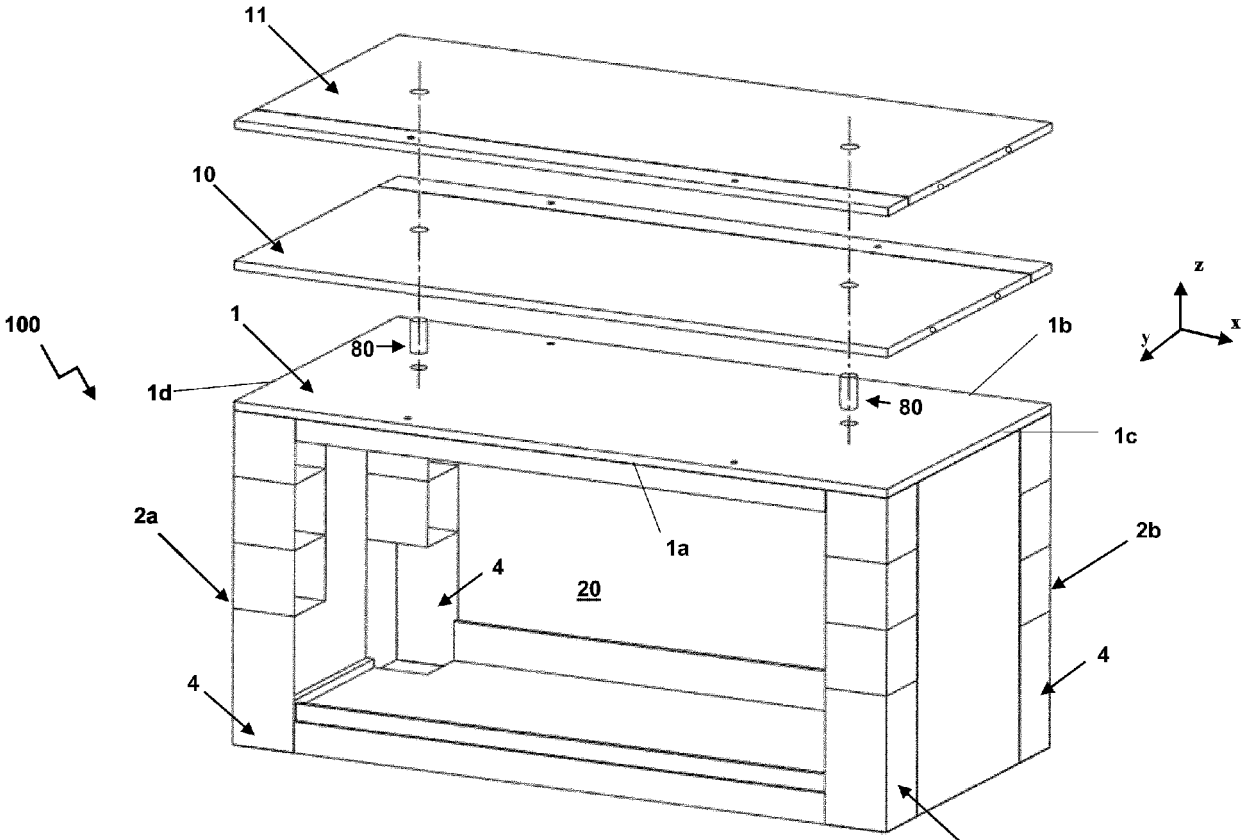

FIG. 4

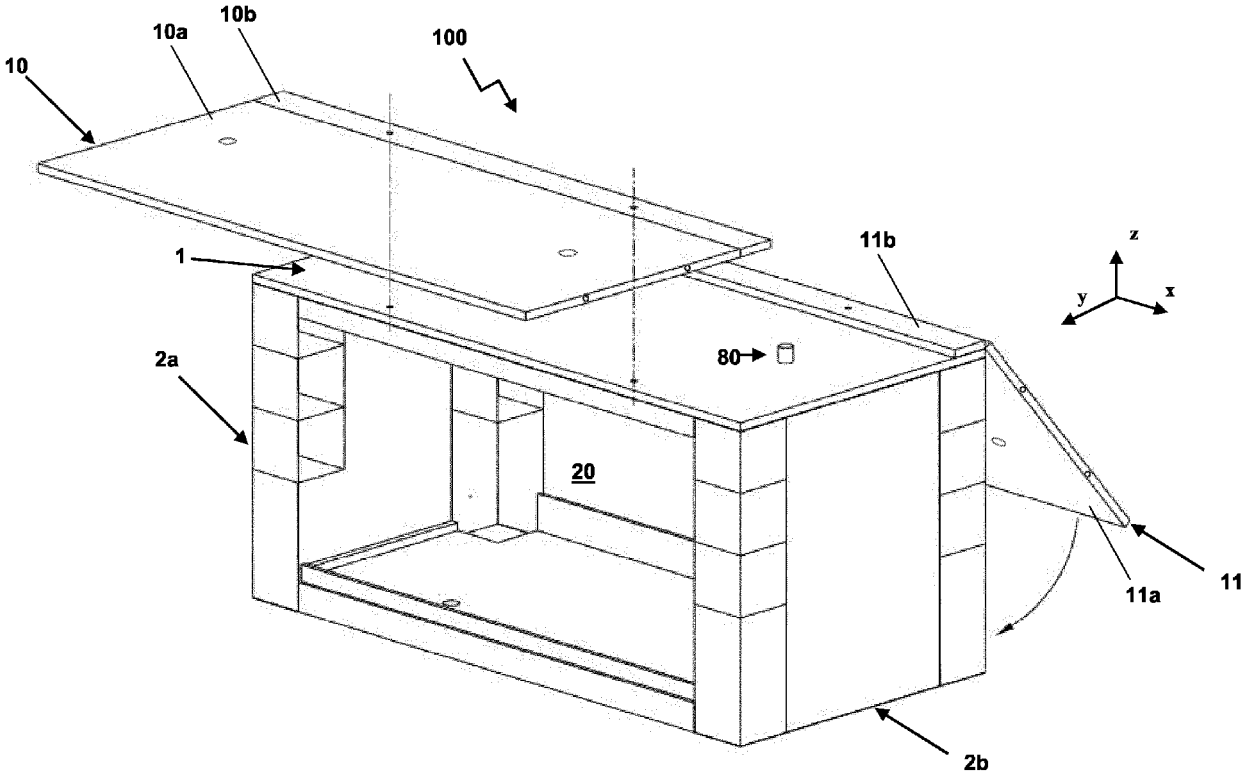

FIG. 5

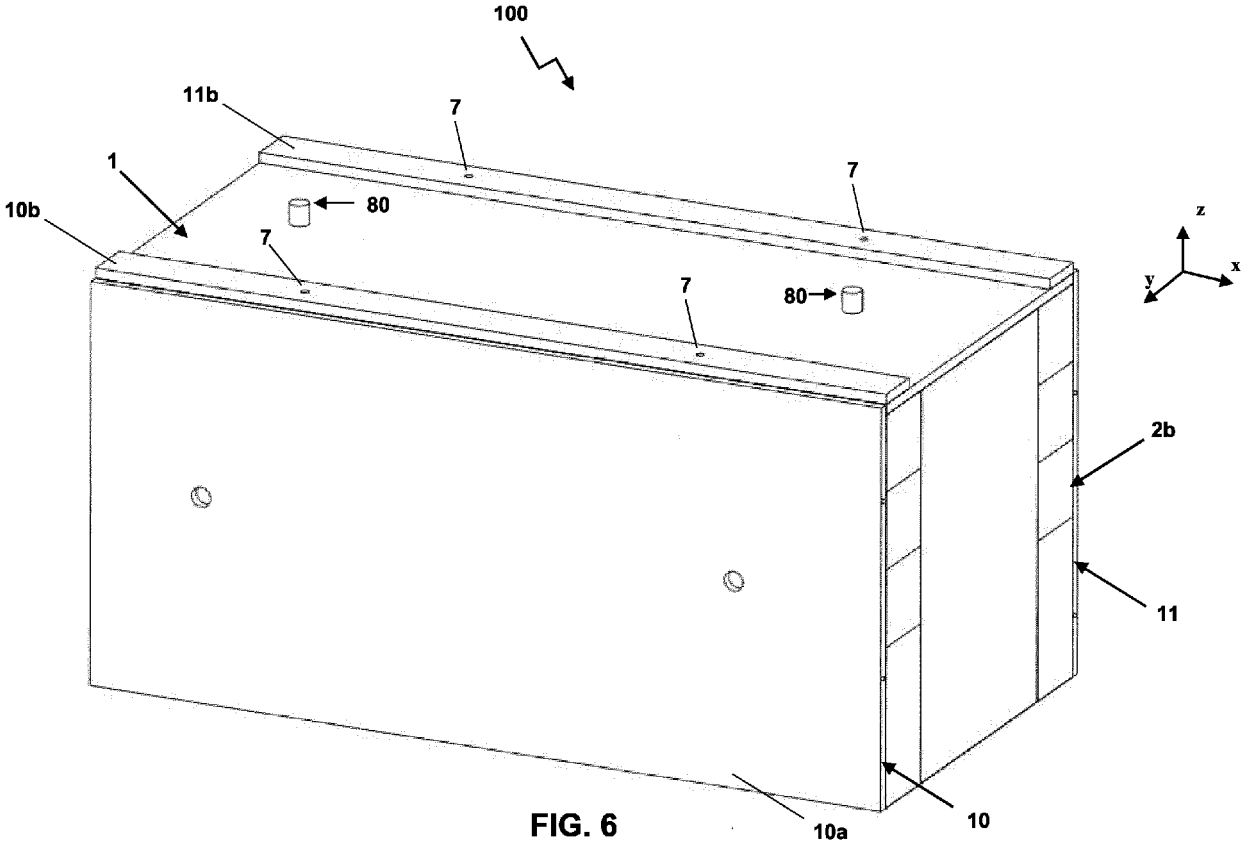

FIG. 6

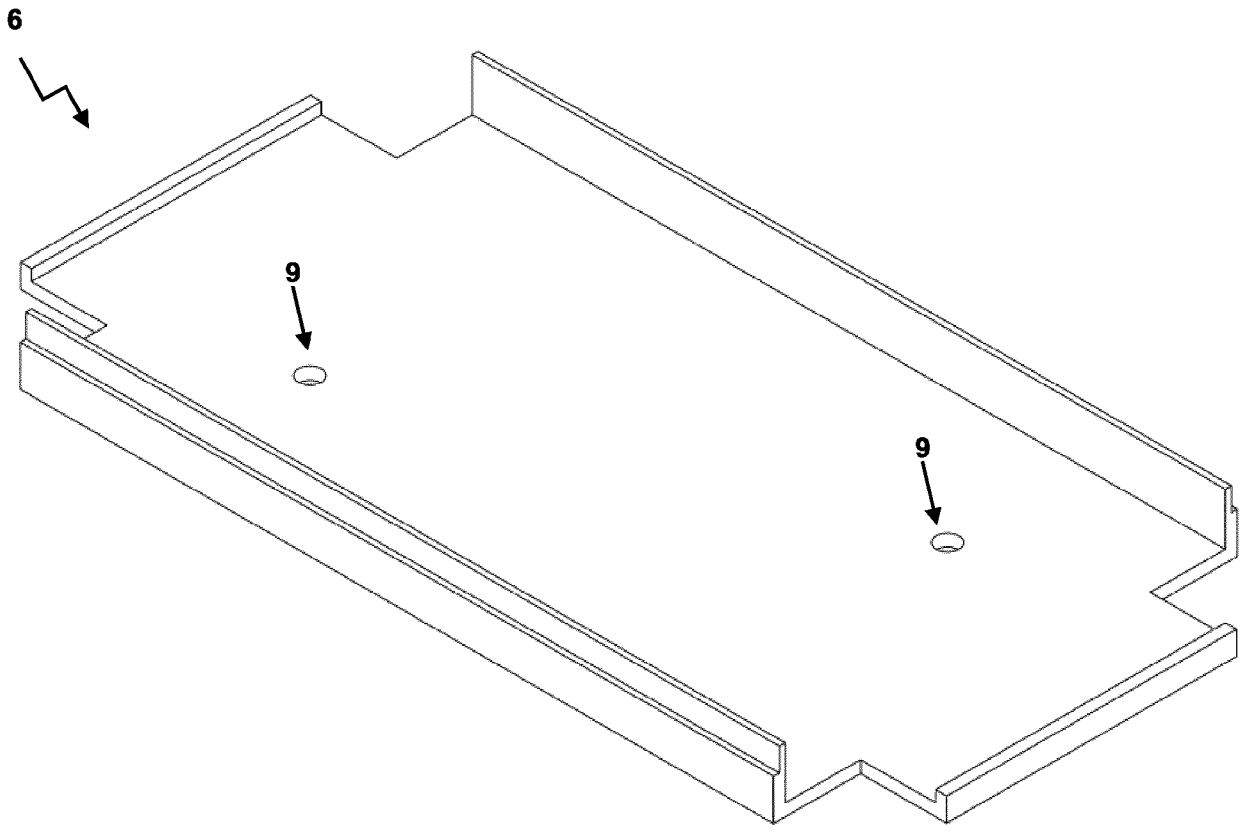

FIG. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 24 17 6824

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2008/066400 A1 (MANOLESCU MIRCEA [RO]) 5 June 2008 (2008-06-05) * figures 1, 2 * * page 1, paragraph first *	1-15	INV. E04H9/02 A47B13/00 A62B99/00
A	CN 201 319 972 Y (WEIBIN JIN) 7 October 2009 (2009-10-07) * figures 1, 2 *	1-15	
A	JP 2007 125282 A (COMSYS TOHOKU TECHNO KK) 24 May 2007 (2007-05-24) * figure 1 *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04H A47B A62B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 October 2024	Valenta, Ivar

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21-10-2024

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82