



EUROPEAN PATENT APPLICATION

(43) Date of publication:
21.09.2022 Bulletin 2022/38

(51) International Patent Classification (IPC):
A47B 13/06 (2006.01)

(21) Application number: **21425010.2**

(52) Cooperative Patent Classification (CPC):
A47B 13/06

(22) Date of filing: **19.03.2021**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicants:

- **Universita' Degli Studi Di Camerino
62032 Camerino (MC) (IT)**
- **Università degli Studi dell'Aquila
67100 L'Aquila (AQ) (IT)**
- **Vastarredo Industrie Srl
66054 Vasto (CH) (IT)**
- **Camillo Sirianni di Sirianni Angelo Francesco
SAS
88049 Soveria Mannelli (CZ) (IT)**

(72) Inventors:

- **Pietroni, Lucia
00184 Roma (RM) (IT)**
- **Dall'Asta, Andrea
60131 Ancona (AN) (IT)**
- **Leoni, Graziano
60035 Jesi (AN) (IT)**

- **Zona, Alessandro
65123 Pescara (PE) (IT)**
- **Mascitti, Jacopo
63100 Ascoli Piceno (AP) (IT)**
- **Di Stefano, Alessandro
97019 Vittoria (RG) (IT)**
- **Galloppo, Daniele
64010 Colonnella (TE) (IT)**
- **Paciotti, Davide
62019 Recanati (MC) (IT)**
- **Gioiella, Laura
60121 Ancona (AN) (IT)**
- **Scozzese, Fabrizio
65121 Pescara (PE) (IT)**
- **Morici, Michele
60041 Sassoferrato (AN) (IT)**
- **Micozzi, Fabio
62100 Macerata (MC) (IT)**
- **Fragiacomo, Massimo
34122 Trieste (IT)**
- **Tamagnone, Gabriele
10023 Chieri (TO) (IT)**
- **Sciomenta, Martina
67100 L'Aquila (AQ) (IT)**
- **Sirianni, Angelo Francesco
88049 Soveria Mannelli (CZ) (IT)**
- **Salvatorelli, Emidio
66054 Vasto (CH) (IT)**

(54) **COMBINED DUAL FRAME SYSTEM FOR LIFE-SAVING DESKS AGAINST SEISMIC-INDUCED COLLAPSES**

(57) The claimed anti-seismic protective desk comprises an worktop made of a sheet metal (3) and a multilayer wood tier (4), a first structure, deformable, aiming at absorbing shocks of objects falling on the desk and a second structure, non-deformable, aiming at keeping a volume safe from deformation to protect a person inside this volume.

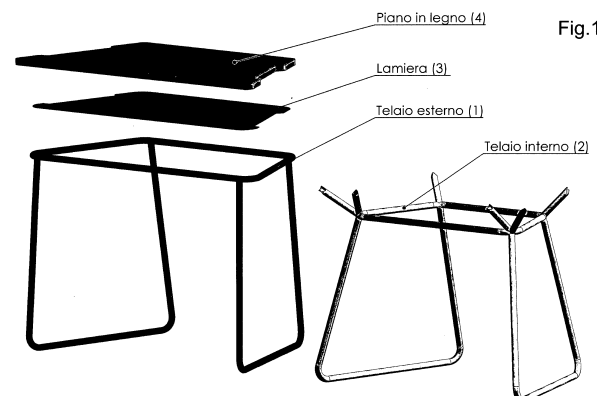


Fig.1

Description

[0001] The present invention refers to an innovative school desk designed to guarantee individual protection in case of seismic events.

[0002] In the event of an earthquake, the structures of public and private buildings are subjected to abnormal dynamic stresses.

[0003] This event might produce minimal or catastrophic damages, it depends on the quality of the construction, the criteria of the building and the materials used.

[0004] Even more so when the issue is related to public buildings, such as schools. In this regards, occupant's safety becomes a major problem. Consequently, public buildings, in particular schools, need a specific furniture that, regardless of the level of security, is able to guarantee the protection of the individuals against the harmful effects generated by an earthquake.

[0005] There are already many inventions related to the development of an earthquake-proof school desks, which are able to provide shelter for students and teachers. In fact, the consequences of a seismic event can be devastating in terms of human lives, especially in closed places with a high population density.

[0006] The marketplace already offers solutions in terms of anti-seismic desks, compliant or not with safety criteria and standard models. However, the present invention is totally innovative and substantially different from the previous ones.

[0007] US 8,887,48 B2 this patent refers to a steel frame, which is the load-bearing structure of the school desk. In the transverse centreline axis there is a hinge that allows the table top to tilt in case of impact with objects resulting from structural failure of the building (thanks to collapsible elements that maintain the level horizontally), thus allowing the discharge of the object laterally to the bench. Therefore, the desk's structure gives a shelter and protection to an individual thanks to the metal cage of the structure.

[0008] CN109124060: this patent is composed by sheet metal elements, boxed sheet metal and metal profiles. It is a sort of closed metal cabinet, with sliding elements (bulkheads), which allow the access to an internal shelter compartment. Moreover, the desk's level is particularly resistant to impacts thanks to its elastic elements that guarantee the absorption of the energy generated by structural failure. ITCH20100010A1: this patent has a steel desk frame made with "L" section elements welded together. The structure is twice the area of a traditional school desk, with a hinged table top that, if necessary, can be reversed to a close shelter compartment where the individual can find protection from the fall of bodies, and from a hypothetical ground failure, with the consequently collapsing to the lower floor of the building.

[0009] It might be possible to go on reporting many other peculiar patents with bizarre solutions. The patents mentioned above might be valid tools to protect the life

of individuals, however there are also many inconsistencies that is necessary to highlight. Indeed, there are some fundamental issues related to: the complexity of construction, the overall weight of the product, the high prices of production and consequently the inability to commercialize it within the school sector.

[0010] The difference between the current invention and the above mentioned patents of the school desk's sector, is represented by its innovative concept. Firstly, the invention has the purpose to transform a school desk into a protective body overcoming the critical issues mentioned earlier, and, secondly, it preserves the standard shape.

[0011] Another benefit of the present invention is represented by the maintenance of traditional construction techniques for school desk, therefore, it is easier for the producers to proceed with construction, due to the fact that they do not have to modify the existing production system. This represents a huge advantage in terms of the practical realization of the invention.

[0012] Moreover, the present invention is a variety of metals profiles (i.e. tubular) welded together. The geometrical shape of the structure gives a significant mechanical resistance to the dynamic stresses produced by an earthquake and it withstands the impacts of falling structural bodies of the building.

[0013] Indeed, the present invention is designed to safeguard the individual thanks to a protective cage with no mechanical system.

[0014] The structure is not particularly complex and it is light considering the mechanical performances it is pursuing.

[0015] As can be seen from the previous analysis, the patents mentioned above are considerable heavy. This implicates some deficiencies, for example: higher construction costs, lack of logistical organization caused by the difficulty of handling, and, also, a limited use due to the excessive weight. The heaviness of the desks is harmful to the floors of existing buildings, because it could over-load the structure. Moreover, the declared area occupied by the desks is far larger than the norm.

[0016] The school desk covered by this invention ensures a significant mechanical strength, it also maintains a balanced weight thanks to its construction feature.

[0017] The invention is a monolithic union of two defined structures (Fig.1 and Fig.2) "External frame" (1) and "Inner frame" (2), these structures take on different functions, depending on the strength and the resistance to the fall of a severe mass.

[0018] In particular, the external frame has the function to protect individuals from falling bodies, being able to absorb the impact energy thanks to the permanent deformation of its metals, while the internal frame has the function to protect individuals by creating a safety capsule and/or survival cavity, so the invention turns out to be almost non-deformable, thanks to the external structure's protection.

[0019] The structure of the school desk is a reticular

frame of metal elements. This particular frame is designed to optimize the ratio between weight and strength. Another innovative feature is represented by the structural redundancy of the desk frame; the main characteristic of the structural redundancy is the ability to keep exceptional stress conditions.

[0020] In addition, the peculiarity of the structure allows the full potential of the materials and the optimization of manufacturing processes.

[0021] The present invention is a school desk and one of the main characteristic is its anti-seismic hierarchical frame. The external frame is able to withstand the stresses caused by impacts of falling structural bodies of the building (i.e. floors).

[0022] The internal frame has the function to protect individuals by creating a safety capsule and/or survival cavity.

[0023] In this respect, it is necessary to analyse in details the innovations described above. The present description has an illustrative and non-limiting purpose, please refers to the figures attached:

Figure 1: it is an overall schematic perspective view and an exploded view of each desk's components, according to standard models.

Figure 2: is a schematic representation of the desk in front, side, and upper view.

[0024] With reference to Fig. 1 and Fig. 2, the upper section of the frame (1) jointly houses a sheet metal (3) of small thickness, which has the function of creating an anti-intrusion barrier. In the event of a collision, it is able to absorb the energy of the impact thanks to the deformability of the sheet metal itself preventing falling bodies from penetrating into the survival space.

[0025] Above the sheet metal is placed a multilayer wood tier (4). It has a consistent thickness. This particular level ensures a greater comfort, and it works together with the underlying sheet metal. This particular kind of interconnection contributes to the dissipation of impact energy and at the same time it protects from the breakthrough of falling bodies into the survival space, and it has, also, an anti-intrusion function.

[0026] In particular, the invention is a School desk wherein the two tubular steel frames are welded together. The frames have an appropriate thickness and size which ensure resistance to dynamic stresses.

[0027] The two frames (external and internal) are welded together into a monolithic structure. Its geometrical configuration allows the structure to respond differentially to stresses, and it also guarantees the features of individual frames.

[0028] The size of the present invention is far comparable to other traditional school desks. It makes it easier to integrate and replace the furniture of existing contexts. For instance, Fig. 3 is the representation of the individual using the desk's protection inside the shelter.

[0029] Given the fact that the structural concept de-

scribed above can be declined in different shapes and sizes, the present invention extends its applicability to the whole category of school desks, such as teachers' desks, and also to other types of use such as: office, meeting rooms and home desks. Thus, larger tables become a shelter for multiple individuals.

[0030] The present invention guarantees the safety of individuals in a simple way, indeed, there are no folding planes or sliding partition bulkheads, contrary to the other solutions previously examined, which use these tools to create a shelter space just in case.

[0031] Finally, the present invention was tested through static and dynamic stresses, managing to overcome them brilliantly and without falling back to heavy structural oversizing.

[0032] Overall, it is clear that the described system has achieved its innovation's goals and objectives.

[0033] This invention has been described especially with reference to its preferred structures of implementation, in this respect, it is clear that the cutting-edge tool has achieved its innovation's purposes.

[0034] The content of the present innovation can be changed and modified, all these adjustments are included within the innovative concept expressed in the attached claims.

[0035] All details may be replaced by other technically equivalent elements, and the materials may be different according to requirements, without failing to fulfil the scope of protection of this invention. The invention has been described with particular reference to the attached figures, however the reference numbers are used to improve the intelligence of the invention and do not constitute any limitation to the claimed scope of protection.

Claims

1. The present school desk (Fig. 1 and 2) has a hierarchical structure with variable shape and dimensions. It has two or more metal frames, which has the following properties: at least one deformable external frame, for the purpose of absorbing the impact energy; and at least one internal frame with a non-deformable structure, for the purpose of protecting individual's life. All frames are welded together into a monolithic form; they work together to fulfil their specific structural functions; in addition, the frames have the function to protect individuals by creating a safety capsule against external events caused by an earthquake. All the above mentioned features can safeguard the health of individuals who finds refuge in it.
2. The present school desk (Fig. 1 and 2), according to the above mentioned claim, is **characterized by** the fact that the upper part of the frame (1) jointly holds a sheet metal (3) of small thickness above which is placed a multilayer wood tier (4) firmly con-

nected with the sheet metal (3). The internal frame prevents from the breakthrough of falling bodies into the survival space (2).

3. The present school desk, according to one or more of the above mentioned claims, has a sheet metal (3) with appropriate thickness. It is rigidly attached with the top of the frame (1); it has a fixed or removable connection; it has the function of creating an anti-intrusion barrier.

4. The present school desk, according to one or more of the above mentioned claims, has at the top of the sheet metal (3) a multilayer wood tier (4) with appropriate thickness. This particular level ensures a more suitable user-friendliness, and it works together with the sheet metal (3), it has, also, an anti-intrusion function, and it protects the cage from external bodies.

20

25

30

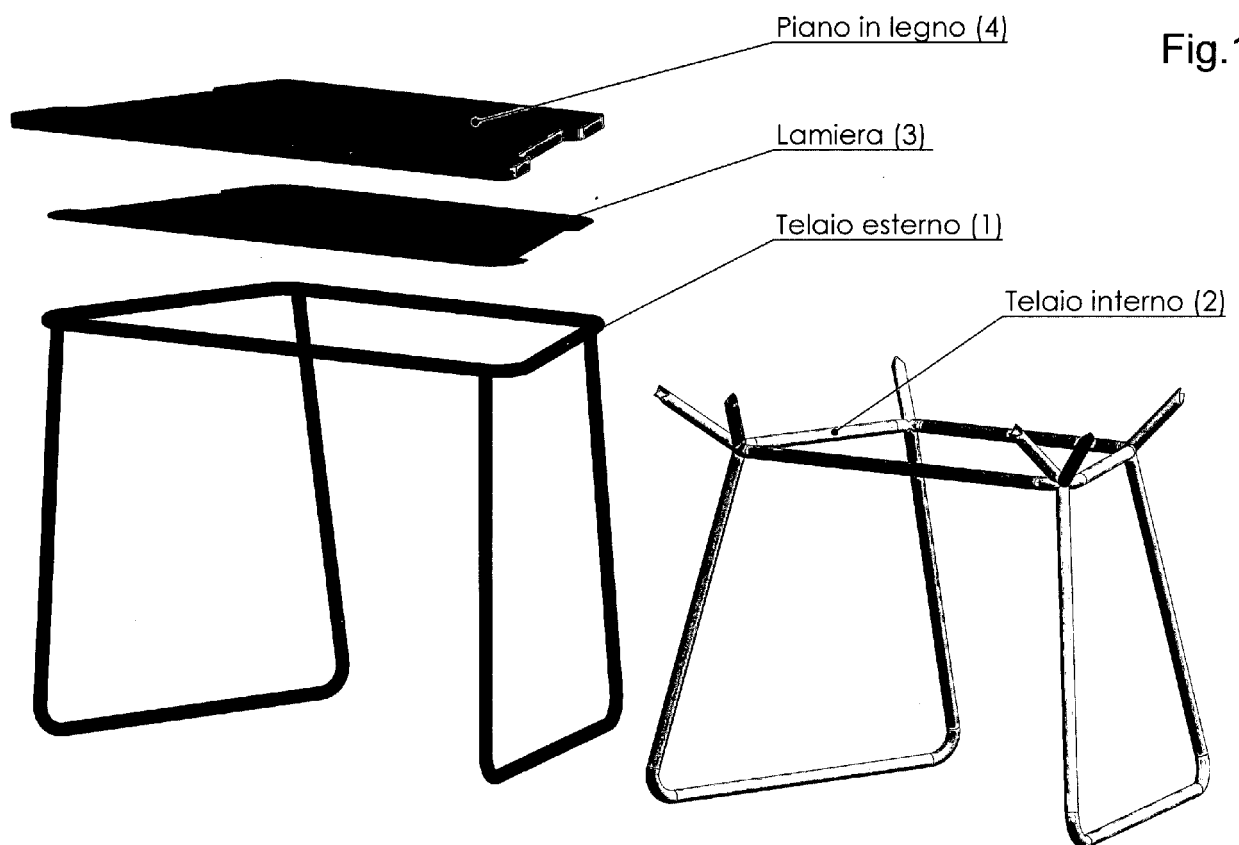
35

40

45

50

55



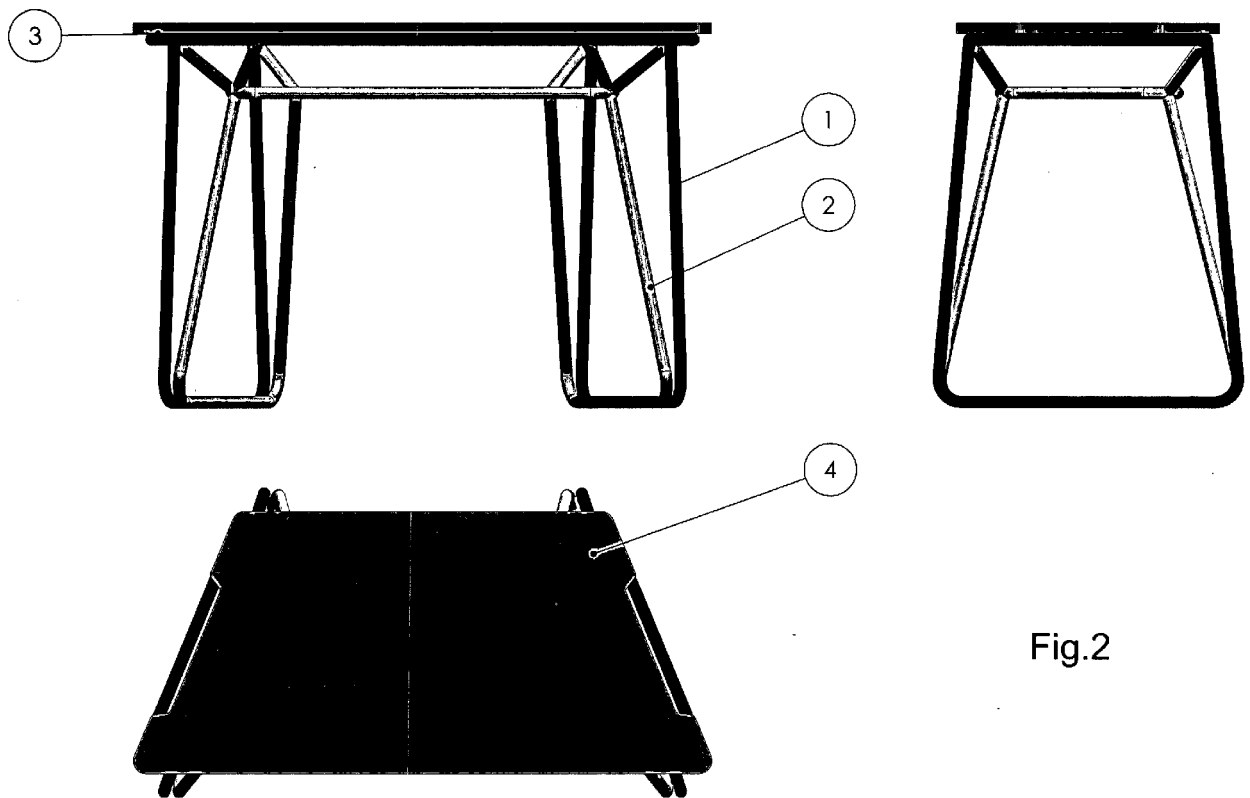


Fig.2



Fig.3



EUROPEAN SEARCH REPORT

Application Number

EP 21 42 5010

5

10

15

20

25

30

35

40

45

50

55

EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 2 582 266 B1 (A D MERAZ IND LTD [IL]) 14 October 2015 (2015-10-14)	1-4	INV. A47B13/06
Y	* paragraph [0035] * * paragraphs [0040] - [0043], [0048] * * paragraph [0064] * * figures 5-7 *	2	
Y	DE 41 00 043 A1 (BAER GERHARD [DE]; BAER BEATA [DE]) 9 July 1992 (1992-07-09) * column 4, lines 39-51 *	2	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47B
1 The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 1 September 2021	Examiner de Cornulier, P
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 21 42 5010

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

01-09-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2582266	B1	14-10-2015	CN 103140150 A
			05-06-2013
			EP 2582266 A1
			24-04-2013
			ES 2556452 T3
			18-01-2016
			IL 223771 A
			30-11-2015
			JP 6023704 B2
			09-11-2016
			JP 2013529730 A
			22-07-2013
			KR 20130116861 A
			24-10-2013
			US 2013092059 A1
			18-04-2013
			WO 2011161677 A1
			29-12-2011
DE 4100043	A1	09-07-1992	NONE

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 888748 B2 [0007]
- CN 109124060 [0008]