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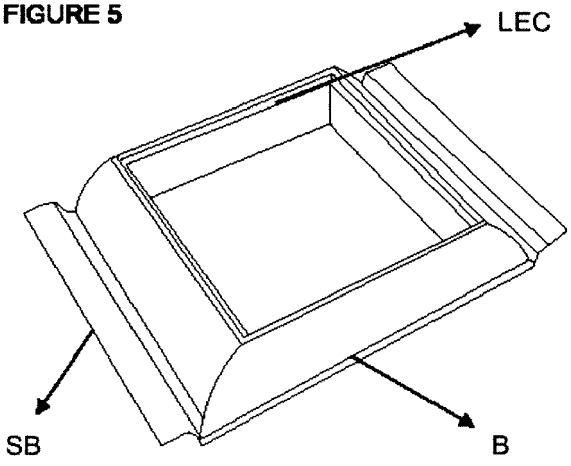
(54) **BOX USED IN CIVIL CONSTRUCTION FOR FORMING A SOLAR ROOF FRAME**

(57) Boxes used in civil construction for forming a solar roof frame; this invention is particularly related to concave or pyramidal-shaped open-end box (B) and smaller dimensioned end box on top (BS) having a basin-like shape manufactured with synthetic, metallic material, rigid polyethylene, cement, polystyrene, clay or any other suitable material in a variety of sizes and used to obtain a solar roof structure able to offer user an environmentally friendly tool, savings in electric energy consumption, obtaining a clear safe inner ambience, lighter roof structure, beautiful look and natural light.

Concave or pyramidal boxes (B/BS) may be manufactured in a variation of sizes as king, large, medium, small size or other suitable dimensions; the invention also contemplates an extender (EX) that may be used together with concave or pyramidal open-end boxes (B) or smaller dimensioned end box on top (BS) in order to augment height of such boxes and fit a solar roof structure height that is higher than pyramidal boxes height. Pyramidal boxes replace solid or hollow bricks in solar roof structure to allow natural light into commercial or residential interiors.

Yet, pyramidal open-end boxes (B) are used with premanufactured iron and concrete stems and may remain aggregated into the roof structure if so desired by a constructor; smaller dimensioned end box on top (BS) are used with roof formed by a sheet of fresh concrete laid upon wooden or metallic supporting posts. Said boxes additionally are contemplated with a glass block or similar translucent material (GB) as aforesaid already attached to the top or upper end and therefore forming a whole single piece.

FIGURE 5



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Description

AREA OF THE INVENTION

[0001] This invention refers to concave or pyramidal-shaped open-end box specially designed for civil work construction and for receiving translucent polycarbonate blocks, plates, similar blocks or glass blocks on open-top of said concave or pyramidal box aimed at forming a solar roof frame. Said box is an environmentally friendly tool since it helps in saving electric energy consumption and aids in obtaining a clear safe inner ambience with beautiful look and natural light.

BACKGROUND OF THE INVENTION

[0002] Roof frames in civil constructions are usually made of solid pieces that are molded by means of plastic or wooden molds or yet by means of pre-molded pieces that require filling complementary pieces and lattice structures as in the form of meshed iron rods individually tied to each other by wires, welding or the like. Solid bricks or hollow bricks are laid down on said lattice frames and concrete and other materials are then laid upon in order to form a roof in residential and commercial buildings and thus finishing the upper portion of the building or adding grounds for additional floors.

[0003] Yet, solar roofs or roof pavements may not be made of pre-manufactured solid pieces like iron-concreted stems that are arranged to form a roof or pavement; instead, said solar roof or pavement is made with an entire whole sheet of fresh concrete that is laid upon a supporting frame generally made of wooden stems or metal tube stems.

It is not too early that modern civil construction engineering seeks for means of providing a clearer inner ambience which can afford sharing the benefits of natural light, elegance and being, at the same time, environmentally friendly so as to save electric energy consumption.

PRIOR ART

[0004] A search in patent national and international database did not disclose any particular document which taught an object as now claimed by the inventor.

BRIEF DESCRIPTION OF THE INVENTION

[0005] Having in mind an idea to provide the civil construction industry with a novel non-structural piece to be fully integrated with the building roof structure, to add lighter materials to said roof structure, to offer several decorative shapes like squared-shaped, triangular-shaped, rectangular-shaped, oval-shaped and round-shaped and yet to conform to local material resistance regulations and specification and to provide for natural light inside the room the applicant designed this now claimed invention.

[0006] Concave or pyramidal-shaped open-end boxes (B) are manufactured with long-lasting or convenient light raw materials, as for instance rigid polypropylene, cement, plaster, clay, polystyrene, metal or any suitable similar material, and have varied size dimensions so that they may fit between ready-made concrete and iron stems or roof entire whole sheet of fresh concrete supported by wooden or metal posts of a standard space-apart distance; concave or pyramidal-shaped open-end boxes (B) are used in roof structures placed instead of solid or hollow bricks at some particular intervals in accordance with a constructor convenience.

[0007] Translucent polycarbonate blocks, blocks of similar materials, glass blocks or translucent plates (GB) are attached to the top-end of such concave or pyramidal-shaped open-end boxes (B) after said boxes are placed into the roof frame formed by concrete and iron stems or at some particular spot along said sheet of fresh concrete that form the roof.

[0008] Another useful application for concave or pyramidal-shaped box (B) is horizontally attached into walls so that they are used as wall tiles to allow natural light into a room; application mode is the same as for vertically attached to roof frames.

[0009] When a building is made up of more than one roof, additional roofs may have concave or pyramidal-shaped open-end boxes (B) attached to every additional floor structure so that natural light is allowed to pass from one upper floor into a lower floor.

[0010] After having laid down ready-made concrete and iron stems, solid or hollow bricks and concave or pyramidal open-end boxes (B) at particular intervals on the roof structure then transparent plates, polycarbonate plates translucent blocks, acrylic plates, glass blocks or similar pieces (GB) are then attached into a specific oval, round, rectangular, triangular or square-shaped central fitting lower entrance configuration (LEC) on the top-end of said concave or pyramidal boxes (B) and remain in place after receiving an application of sealing agent (not disclosed) around the glass block (GB) so as to avoid concrete or water penetration. This sealing agent application is made individually at every roof site whereon concave or pyramidal boxes (B) replace roof solid or hollow bricks to provide for internal natural light.

[0011] Thereafter, a last step for forming said roof is provided by laying down a sheet of concrete across the roof structure for finishing the construction.

[0012] Said pyramidal open-end boxes (B) meet any civil construction particular height requirements of the roof structure since each of such boxes is provided with a respective extender (EX) to increase its own individual height and many extenders (EX) may be safely used until a desired height of the roof structure is achieved.

[0013] This invention also contemplates a concave or pyramidal-shaped open-end box (BS) having a smaller dimensioned upper open end to accommodate transparent plates, polycarbonate translucent blocks, acrylic plates or glass blocks (GB); this embodiment of the in-

vention with smaller dimensioned end on top (BS) is somewhat basin-like-shaped and is particularly contemplated for solar roofs which are made by a sheet of fresh concrete laid upon roof and supported by supporting posts.

[0014] Smaller dimensioned end box on top (BS) is particularly used for solar roofs made of a concrete sheet in contrast to open-end boxes (B) which have side supporting brims (SB) and are particularly designed for solar roofs made of pre-manufactured iron and concrete stems used with hollow or solid bricks which are laid on a roof structure.

[0015] Smaller dimensioned end box on top (BS) not provided with supporting brims (SB) usually is removed from the solar roof structure after a sheet of concrete is laid upon said roof structures since it (BS) is used to form a place where a block or plate (GB) as aforesaid shall be located; open-end boxes (B) having supporting brims, however, usually remain aggregated to the solar roof structure after its completion depending on a constructor's convenience.

[0016] It is to be noted that open-end boxes (B) are provided with supporting brims (SB) to lay said open-end boxes (B) on pre-manufactured iron and concrete stems at both sides while smaller dimensioned end box on top (BS) is not provided with said supporting brims (SB) as depicted on figure 18 as they are always rested upon wooden or metal supporting posts.

[0017] In another embodiment of the invention open-end concave or pyramidal boxes (B) with side supporting brims (SB) or smaller dimensioned end box on top (BS) not having supporting brims are contemplated as manufactured with translucent, transparent, polycarbonate or glass materials to allow natural light to pass through their own body and additionally are contemplated with a glass block or similar translucent material (GB) as aforesaid attached to the top or upper end of such boxes (B/BS). In this case they are manufactured as a whole single piece and their upper end are closed by having a glass block (GB) or similar material attached on top as depicted in figure 19.

DESCRIPTION OF THE DRAWINGS

[0018] In order to provide a better understanding of the features in this invention a full set of drawings is illustrated and practical embodiments of the invention are demonstrated in an exemplified manner, however, not intending to put any limits to the invention.

Figure 1 illustrates a perspective view of the functionality of a particular roof forming piece which requires some adjustment with a type of tier so as to make flexible the securing of the piece into place;

Figure 2 represents a perspective view of the functionality of a pyramidal open-end box (B) with side supporting brims (SB) manufactured with synthetic, metallic material, rigid polyethylene, cement, polystyrene, clay or any other suitable material;

Figures 3 and 4 illustrate another perspective view of functionality of a pyramidal open-end box (B) having side supporting brims (SB);

Figures 5 and 6 illustrate a perspective view of an open-end concave or pyramidal open-end box (B) having side supporting brims (SB) which may be manufactured with aforesaid materials;

Figure 7 and 8 illustrate a perspective view of solar roof with a box (B) provided with side supporting brims (SB) being laid and wherein a pyramidal open-end box (B) is laid over a pre-manufactured frame.

Figure 9 illustrates a front view of said extender (EX).

Figure 10 and 11 illustrate a top and a lower view of an extender (EX) used with small-sized, medium-sized, large-sized and king-sized pyramidal open-end boxes (B) having or having not side supporting brims (SB) to extend height of said pyramidal boxes

Figure 12 illustrates a perspective view of a pyramidal open-end box (B) having side supporting brims (SB) with a respective extender (EX) being laid at LEC on said box;

Figure 13 illustrates a top view of said large-sized pyramidal open-end box (B) having side supporting brims (SB);

Figure 14 illustrates a perspective view of a medium-sized pyramidal open-end box (B) having side supporting brims (SB);

Figure 15 illustrates a top view of said small-sized pyramidal open-end box (B) having side supporting brims (SB) ;

Figure 16 illustrates a perspective view of a concave or pyramidal open-end box (B) having side supporting brims (SB) and with an extender (EX) secured on top;

Figure 17 illustrates an upper view of a smaller dimensioned end box on top (BS) not having side supporting brims (SB) and basin-like-shaped;

Figure 18 illustrates a perspective view of a smaller dimensioned end box on top (BS) having side supporting brims (SB) and basin-like-shaped;

Figure 19 illustrates a perspective view of a concave or pyramidal box (B) having a closed upper end with side supporting brims (SB), said box (B) made of transparent or translucent material and manufactured with a translucent or transparent block already aggregated into its top so as to be a whole single piece.

DETAILED DESCRIPTION OF THE INVENTION

[0019] Referring now to the set of drawings figures 5, 7 and 8 teach a rectangular-shaped pyramidal open-end box (B) provided with a central square-shaped open end on top having a smaller dimensioned lower square-shaped entrance (LEC), wherein a glass block (GB) or translucent block or plate is attached, and an open opposite distal end having elevated supporting brims (SB)

on both opposite longitudinal sidewalls. Said opposite elevated supporting brims (SB) at each side are used to lay down said pyramidal open-end box (B) on concrete and iron stems (CS) that form the roof structure of a building.

[0020] Yet, figures 6 teaches a concave or pyramidal-shaped open-end box (B) with open end provided with a central square-shaped open end on top having a smaller dimensioned lower square-shaped entrance (LEC), wherein a glass block or translucent block (GB) or plate is attached and a distal opposite end having supporting brims on both sidewalls.

[0021] Figures 9, 10 and 11 teach an extender (EX) used with all sizes of said concave or pyramidal open-end boxes (B) which functions to add height to said boxes. The extender (EX) is provided with two fully open ends. A base opposite end (BOE) of such extender is provided with an oval, round, rectangular, triangular or square shape having the same dimension as that of all pyramidal boxes entrance end (BEE) on top of the box so that the extender base opposite end (BOE) may rest upon top of said pyramidal open-end boxes (B) of small, medium, large and king sizes to augment height of the boxes (B) and conveniently fit the height of a solar roof structure that is higher than the aforesaid dimension. It is to be noted that said base opposite end (BOE) of said extender (EX) is fully open but at the same time may be provided or not be provided with thin polypropylene strips in the form of a cross (PS) incorporated by molding together with said extender (EX) and secured individually to all four sides of each lateral wall of said extender (EX). Said strips (PS) are used to reinforce said extender (EX) walls thus preventing walls from retracting. The opposite distal open end (ODE) of said extender (EX) has the same dimension as that of smaller-sized squared-shaped entrance end on top of said pyramidal open-end boxes (B) in order to attach the glass or translucent block (GB) as aforesaid for all concave or pyramidal open-end boxes (B) either small, medium, large-sized or king-sized.

[0022] The fitting and attaching procedures for additional extenders (EX) used to adequately meet higher heights of solar roof structures are the same as specified above for a first extender (EX) and as many extenders (EX) as required may be used one attached to the other.

[0023] Pyramidal open-end boxes (B/BS) are available in variable sizes for civil construction works to provide natural light to inner ambience, beautiful look, savings in electrical energy, light weight to solar roof structures which are usually heavy, savings in structural materials and long-lasting durability.

[0024] Extenders (EX) for concave or pyramidal open-end boxes (B) have always the same and constant dimensions at base opposite end (BOE) which is larger than opposite distal open end (ODE) in accordance with a particular model. On its turn opposite distal open end (ODE) has smaller dimension. The height of extender (EX) from an end to another distal end is a constant height. The base opposite end (BOE) is so called since it is used to attach translucent, similar piece or glass blocks (GB) of all sorts as aforesaid in cases when extender (EX) is used to augment the height of pyramidal open-end boxes (B) to adequately fit the height of a solar roof structures when a projected height of said solar roof structure is higher than the height of the pyramidal box. In cases when no extender is used the open-end of pyramidal box (B) serves as a base to accommodate the glass block (GB) or similar piece.

[0025] Concave or pyramidal-shaped open-end box (B/BS) may be manufactured with synthetic, metallic material, rigid polyethylene, cement, polystyrene, clay or any other suitable material and have open ends on top and bottom sides.

[0026] Boxes manufactured with open-end (B) are designed for solar roof made with pre-manufactured iron and concrete stems and have supporting brims (SB) to lay said boxes on said stems.

[0027] On the other hand, smaller dimensioned end box on top (BS) having basin-like shape are designed for solar roof made of a fresh entire sheet of concrete slurry which is laid above and is supported by wooden or metallic supporting posts aimed at forming a pavement on top of a construction building after said fresh entire sheet of concrete is cured on sun or whatever means.

[0028] In another embodiment of the invention said boxes (B/BS), either concave or pyramidal-shaped open-end boxes (B) or smaller dimensioned end box on top (BS) may also be provided with a translucent plate, glass block or the aforesaid plate materials blocks (GB) at the top end; said boxes are manufactured with said translucent material already aggregated to the box for a matter of ease for a constructor and may also be made of said shapes on top as described herein.

[0029] Yet, for purposes of decorative design in solar roof structures seen from an internal perspective of the ambience either in some commercial or residential building or house said (B/BS) boxes of small, medium, large and king sizes are also contemplated with an oval, square, rectangular, triangular or round shape on top; as a result, extenders (EX) are also contemplated with the same oval, square, rectangular, triangular or round shapes accordingly.

[0030] It is certain that when this present invention is put into practice modifications may be introduced in certain details of construction, measures, shapes and form without departing from the fundamental principles that are clearly based on the set of claims, thus it is to be understood that the terminology employed herein has no intention to put any limits.

Claims

1. Box used in civil construction for forming a solar roof frame **characterized in that** said box (B) has a concave or pyramidal shape and is manufactured with

open opposite upper and lower ends and has supporting brims (SB) projecting from distal opposite sidewalls to be used with pre-fabricated iron and concrete stems for solar roof.

2. Box used in civil construction for forming a solar roof frame in accordance with claim 1, **characterized in that** said concave or pyramidal-shaped box (B) is manufactured in the form of smaller dimensioned end box on top (BS) having a basin-like shape with no supporting brims (SB) to be used with sheet of fresh concrete supported by wooden or metallic posts.

3. Box used in civil construction for forming a solar roof frame in accordance with claim 1 - 2, **characterized in that** said boxes (B/BS) are provided with an oval, round, rectangular, triangular or square-shaped lower entrance configuration (LEC) on upper end to receive transparent plates, translucent polycarbonate blocks or glass blocks (GB) for ambient natural light.

4. Box used in civil construction for forming a solar roof frame in accordance with claims 1 - 3, **characterized in that** said lower entrance configuration (LEC) on upper end is in the form of upper supporting inner brims with smaller dimension than that of side and front walls in such box.

5. Box used in civil construction for forming a solar roof frame in accordance with claims 1 - 4, **characterized in that** said upper supporting inner brims (LEC) project from box (B) sidewalls and are used to rest transparent plates, translucent polycarbonate blocks or glass blocks (GB).

6. Box used in civil construction for forming a solar roof frame in accordance with claims 1 - 5, **characterized in that** such box is provided with an extender device (EX) to augment box height and said extender laid upon upper end of such box on upper supporting inner brims (LEC).

7. Box used in civil construction for forming a solar roof frame in accordance with claims 1 - 6, **characterized in that** such extender device (EX) has either an oval, rectangular, triangular, round or square-shaped configuration on top end and opposite distal ends in which lower end is a base-end (BOE) to rest upon said entrance configuration (LEC) on upper end of pyramidal box in order to augment pyramidal box height.

8. Box used in civil construction for forming a solar roof frame in accordance with claims 1 - 7, **characterized in that** such extender (EX) also has either an oval, rectangular, triangular, round or square-shaped configuration on upper distal end also formed with either an oval, rectangular, triangular, round or square-shaped entrance configuration having larger measures than lower-end base end (BOE) in order to rest transparent plates, translucent polycarbonate blocks or glass blocks (GB) when extender (EX) is used to augment pyramidal box height.

9. Box used in civil construction for forming a solar roof frame in accordance with claims 1 - 8, **characterized in that** such extender (EX) is provided with reinforcing strips (PS) at lower end-base (BOE) projecting from and to each four sidewalls of said extender device (EX) in the form of a cross in order to avoid sidewall from retracting.

10. Box used in civil construction for forming a solar roof frame in accordance with claims 1 - 9, **characterized in that** such concave or pyramidal boxes (B/BS) and such extender device (EX) may be manufactured with hard rigid polypropylene, polystyrene, cement, plaster, clay or any suitable similar material.

11. Box used in civil construction for forming a solar roof frame in accordance with claims 1 - 10, **characterized in that** lower entrance configuration (LEC) on upper end of concave or pyramidal open-end boxes (B/BS) of small, medium, large and king-sizes can either be squared-shaped, rectangular-shaped, oval-shaped triangular-shaped and round-shaped in order to have transparent plates, translucent polycarbonate blocks or glass blocks (GB) rested into said entrance configuration (LEC) to allow natural light into an ambience.

12. Box used in civil construction for forming a solar roof frame in accordance with claims 1 - 11, **characterized in that** extender (EX) configuration can either be squared-shaped, rectangular-shaped, oval-shaped, triangular-shaped and round-shaped in order to have transparent plates, translucent polycarbonate blocks or glass blocks (GB) rested into said particular configuration (LEC) to allow natural light into an ambience.

13. Box used in civil construction for forming a solar roof frame in accordance with claims 1 - 12, **characterized in that** said boxes (B/BS) are used to substitute solid and hollow bricks when forming a solar roof structure to provide natural light into an inner ambience.

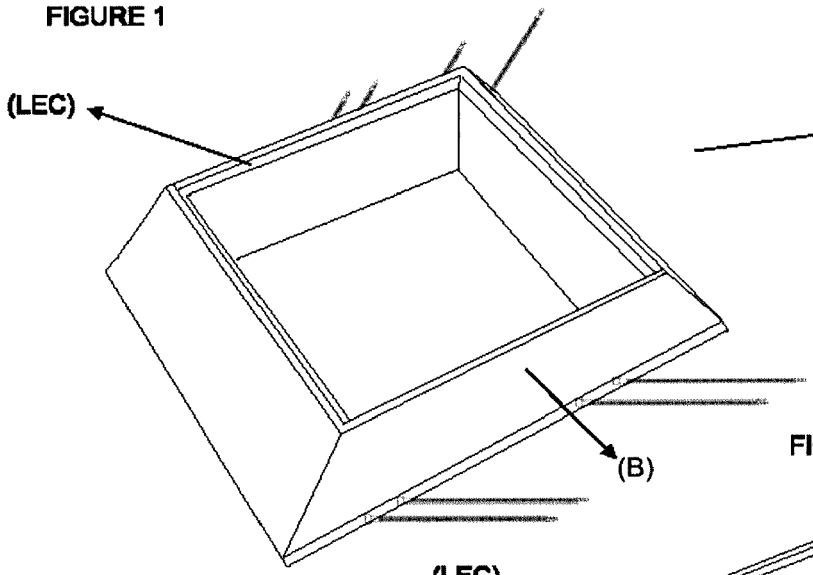
14. Box used in civil construction for forming a solar roof frame in accordance with claims 1 - 13, **characterized in that** said box (B) may further be used as a wall tile or intermediary floor piece to allow natural light into an inner ambience.

15. Box used in civil construction for forming a solar roof

frame in accordance with claims 1 - 14, **characterized in that** said boxes (B/BS) may be provided with more than one oval, round, rectangular, triangular or square-shaped lower entrance configuration (LEC) on upper end to receive transparent plates, translucent polycarbonate blocks or glass blocks (GB) for ambient natural light.

16. Box used in civil construction for forming a solar roof frame in accordance with claims 1 - 15, **characterized in that** said boxes (B/BS) may be contemplated with a glass block or similar translucent material (GB) as aforesaid already attached to the top and manufactured as a whole single piece.

FIGURE 1



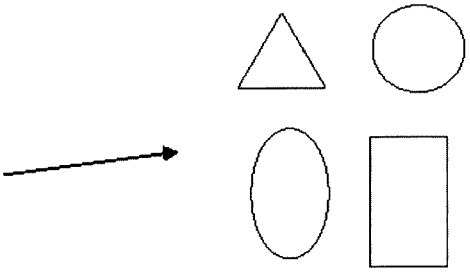


FIGURE 2

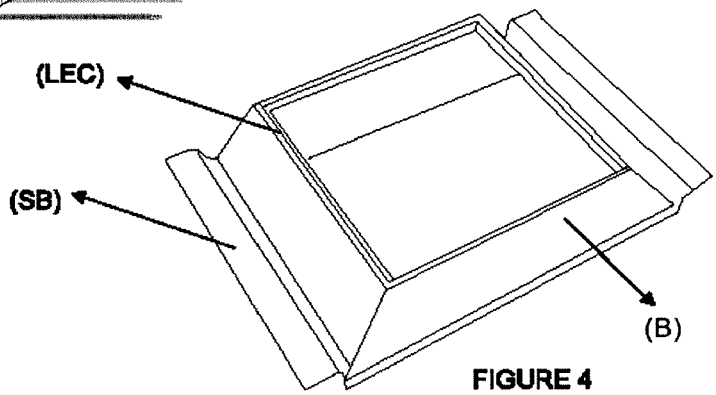


FIGURE 3

FIGURE 4

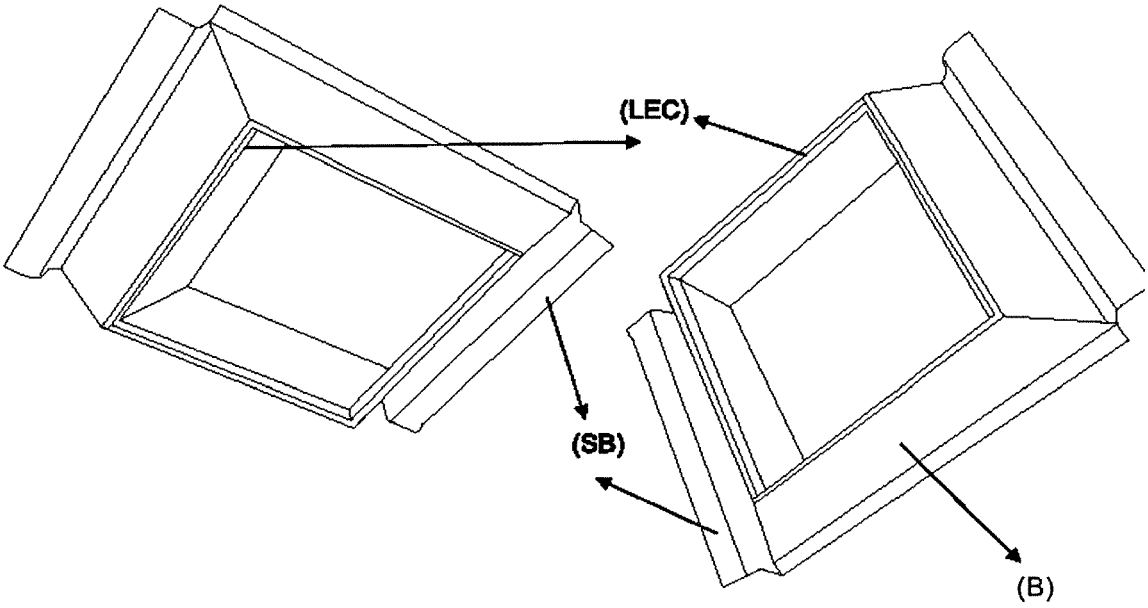


FIGURE 5

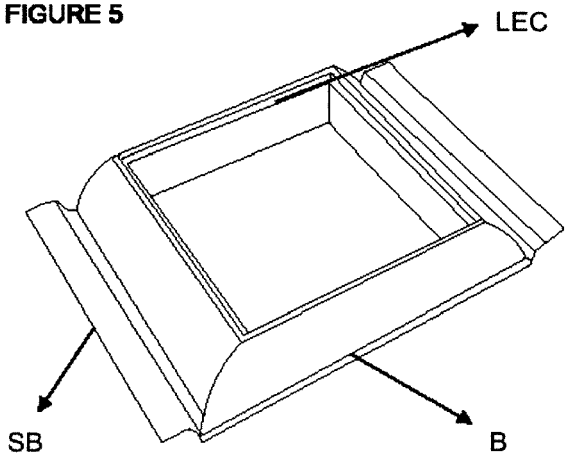


FIGURE 6

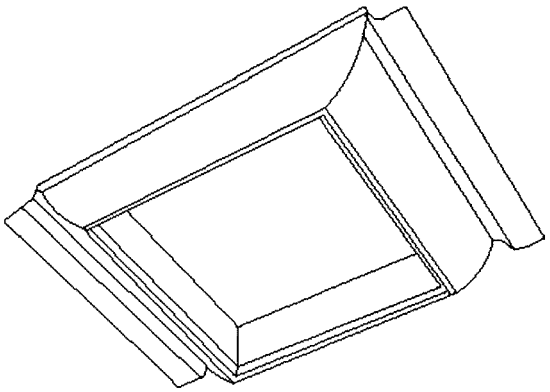


FIGURE 7

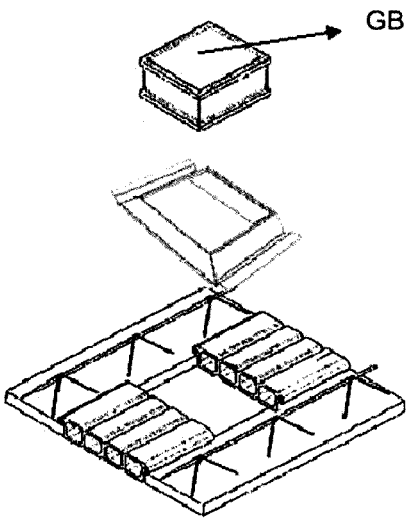


FIGURE 8

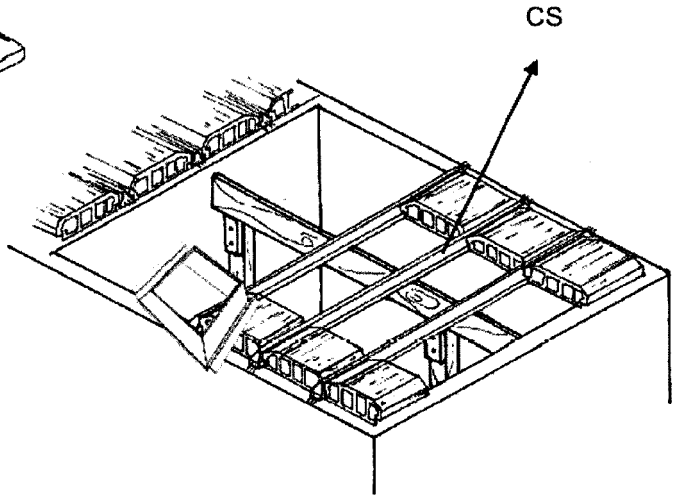
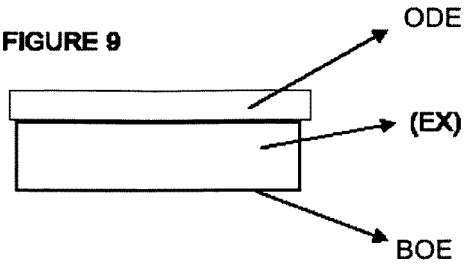


FIGURE 9



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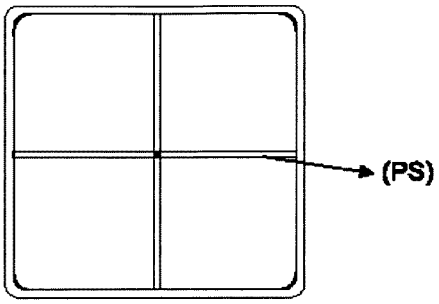


FIGURE 11

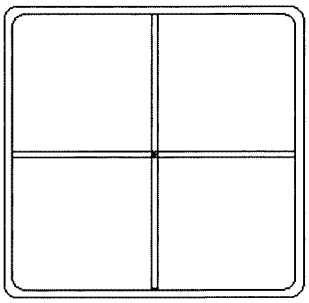


FIGURE 12

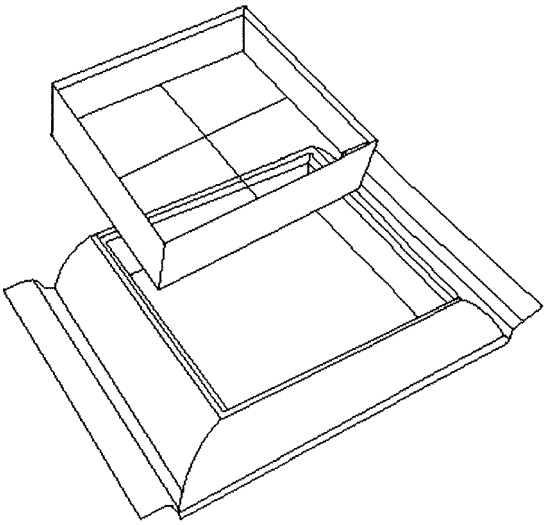


FIGURE 13

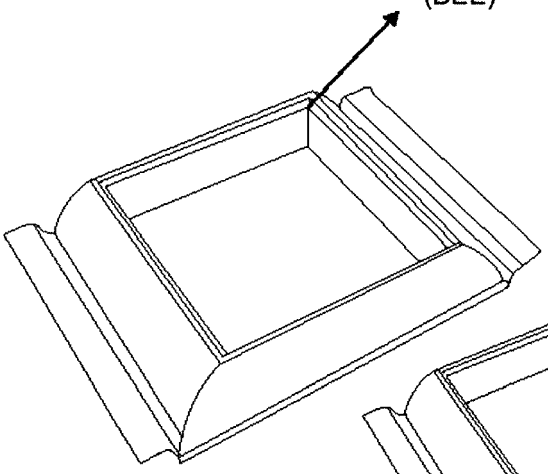


FIGURE 14

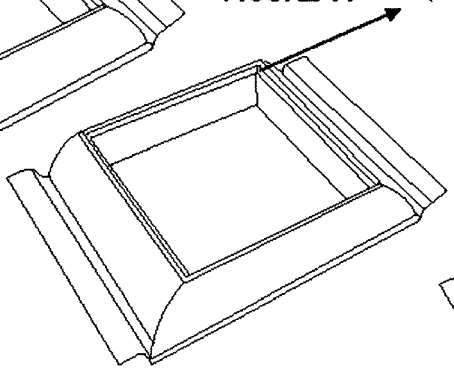
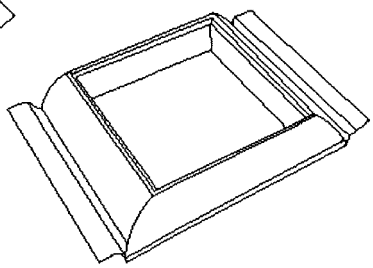


FIGURE 15



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EUROPEAN SEARCH REPORT

Application Number
EP 17 00 1039

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	US 5 297 371 A (BORGHETTO ODDO [IT]) 29 March 1994 (1994-03-29) * figures *	1-16	INV. E04D13/03
X	GB 703 206 A (T & W IDE LTD; FREDERICK GORDON IDE; DEREK GARWOOD IDE) 27 January 1954 (1954-01-27) * figures *	1,13,14, 16	
X	US 6 044 592 A (STRIETER JOEL W [US]) 4 April 2000 (2000-04-04) * figures *	1,13,14, 16	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 October 2017	Tran, Kim Lien

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 17 00 1039

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