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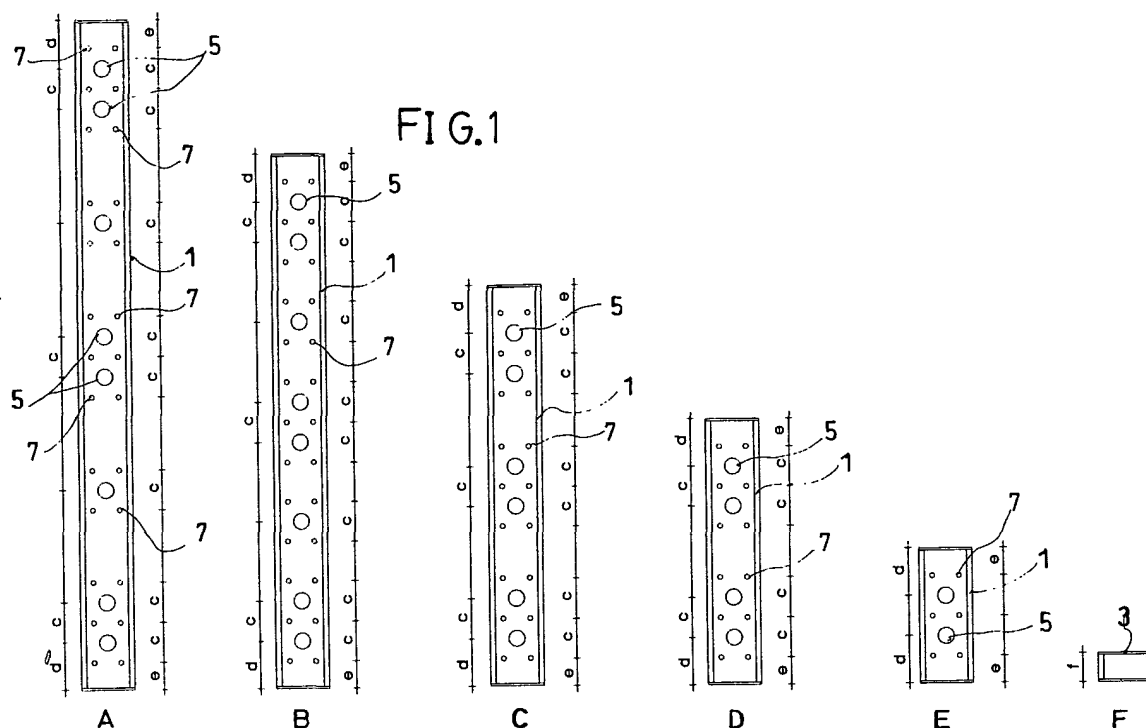
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(54) **Light reinforced frames for forming, shoring, scaffolding or the like**

(57) A light reinforced frame system for forming, shoring, scaffolding or the like, constituted of an assembly of complementary metal beams having a hollow web of different lengths in each one of the versions, made up of two C-shaped profiles having bent flanges, overlapped and coupled by spaced separators, and especially lightened by means of through boreholes of different

ent diameters, some having a larger diameter and other ones having a smaller diameter, in an arrangement and equally distant between centers maintained in any of the beams and in all their versions in order to be coupled to one another by means of plates and by means of single and double connectors in six and ten ways, respectively.



## Description

**[0001]** The system is significantly based on or supported by a metal "I"-beam of those integrated by the connection of a double "C"-shaped section profile having bent flanges connected or overlapped by their respective webs, facing one another and separated by spaced and equidistant transverse welded anchor pins.

**[0002]** Beams, in combination with a series of accessories, complying with several structuring, reinforcing, shoring, scaffolding functions, and for other purposes in any type of public or private work or construction processes, consisting of a metal beam manufactured in a sheet galvanized or treated against oxidation due to its broadest use being exposed to the elements, beams which must preferably have great resistance to stresses in any working sense and to the loads they must support, and which, preferably, are more recommendable the lighter and less heavy they are.

**[0003]** Said beams are doubly lightened in the web of each side and in absolute transverse coincidence of their housings. In short, it is the same reverse profile facing at their webs and connected by welded transverse brackets. An arrangement of holes having a large diameter for lightening the weight of the beam and for some specific applications, combined with a set of holes having a small diameter used for minor lightening, for bracing, connecting, anchoring and fastening the elements complementary to the different functions of the beam.

**[0004]** According to the invention, a series of advantages, such as weight, material expense and use of the beam, are going to depend on the calculation of the dimensions, on the section of the plate, on the arrangement and diameter of the lightening holes and of the assembly holes, constituting a novelty in structural systems of this type which, up until now, are used or known as the most common and relevant.

## BACKGROUND OF THE INVENTION

**[0005]** In reference to the State of the Art, at least two systems related to this type of beams for reinforced frame forming can be mentioned, one system corresponding to the British company SGB FORMWORK, known as "MkII Soldier System", and the other system is of the company RMD IBERICA, S.A., known as "Super Slim" or "Slim Shore".

**[0006]** Both systems are constituted of "I"-beams formed by two "C"-shaped profiles having bent flanges, connected at their respective webs by means of transverse anchor pins.

**[0007]** The first beams have diamond-shaped openworks having rounded edges in their webs with a very short equidistance and broad span, having intercalated ribs in the form of a cross, which are ribs parallel to the sides of each openwork, and which in the center of these are provided with one or two boreholes, depending on

the section, in this case aligned according to the vertical axis.

**[0008]** The second ones have circular-shaped aligned openworks, having a somewhat smaller span with regard to the section, which is approximately 40%, and provided with circumscribed boreholes arranged in orthogonal formation with regard to the central openwork. The web is provided with reinforcements in the area affected by the openwork and by the boreholes. This borehole arrangement is made on the first two end openworks and on every third openwork on the rest of the beam.

**[0009]** The section of the beams is invariable in the first and second case. In both cases, connectors are used which are provided with a maximum of eight connection ways, a circumstance making it unfeasible to bend the reinforced horizontal axis of the frame which, logically, has certain resistance conditions.

## INVENTIVE STEP

**[0010]** The invention tries to rationalize and use the working moments of said beams in order to adapt them such that, combined with one another, it is not necessary to use beams having an excess dimension in relation to the stresses they must carry out or the loads they must support; therefore, two beams have been provided having different sections but which are directly complementary for being able to be combined or joined together using practically ambivalent means and parts; very simple and lightened beams which, according to the calculation carried out, effectively comply with the working task they must carry out.

## DESCRIPTION OF THE INVENTION

**[0011]** The new development provided by the beam of the invention, in its two versions, is defined by a series of strategically arranged lightening holes for coupling a group of additional complements, converting it into the only beam known which, with dimensions and thicknesses smaller than those existing, much better defines its resistant capabilities since the lightening holes are understood as exclusively functional and not mainly aesthetic or commercial.

**[0012]** The object of the invention, since it is a prefabricated metal beam, allows being used in any sector needing structural solutions of any type, no matter how complex they are, not necessarily having to manufacture said frames for exclusive use on that job.

**[0013]** According to the invention, the beam having a smaller section shares the same lightening holes of equal size (60 mm) as the beam having the larger section, even though it has a smaller section as mentioned, and with regard to thicknesses, its second order application being a very versatile and resistant purlin which, since it shares the same distances between axes on beam beginning and end plates as those which the

beam having a larger section has, can be perfectly combined with one another and accessories can be exchanged which, in this case, become common to the two beams.

**[0014]** A direct relationship between the frame and installer has been observed with the two beam versions of the invention, therefore the beam having a larger section and the beam having a smaller section and the entire assembly of additional elements can be assembled by hand with maximum safety, even creating, from the assembly processes, a series of auxiliary elements ensuring safety of the installer in any frame to be carried out.

**[0015]** The invention consists of the development of light, hollow "I"-beams made up of two "C"-shaped profiles 3 mm thick, having bent flanges, separated by corresponding spaced transverse anchor pins, having flat webs and in two versions having a different section, the smallest one, which is called purlin, being 19% smaller, and the bases of the beam having the larger section, which is called main beam, are equal to those of the beam having the smaller section, or purlin, and to the measurements of the base of the latter, such that the additional beginning and end cover plates of the beams have a different set up but equal distribution of the lightening holes and anchoring or fixing holes.

**[0016]** Both beams, the main beam and the purlin, also have the same developments and equivalent distribution and sizes in the lightening hole means and in the complementary anchoring and fixing means. In other words, the lightening holes are circular transverse openworks equal in both beams, 60 mm in diameter, and the anchoring through holes are also equal in both beams, 18 mm in diameter, considering that the distribution of lightening and anchoring and fixing holes is formed by pairs equally spaced between centers at an equal distance, 150 mm, intercalating between each pair a single lightening hole in the beams having a longer length, 2000 mm upwards, having a set of four circumscribed holes distributed in an orthogonal position on the beam having a larger section for each openwork, and a set of two holes aligned with the longitudinal axis of each openwork on the beam of a smaller section or purlin.

**[0017]** According to the invention, said cover plates have a rectangular shape adapted to the section of the main beam, and they have a square shape for the purlin, but the width of these plates is equal and coincides with the section of the bases of each one, and the distribution of the lightening holes and fixing boreholes is the same, one being equally centered having a larger diameter and four others orthogonally circumscribing the former, with an equal distance between centers (110 mm) in both cases and different but proportional thicknesses of 8 mm for the main beam plate and 6 mm for the purlin plate.

**[0018]** According to the invention, the main beam and the purlin, are arranged in said beams in five lengths comprised between 2500 mm and 500 mm, with differ-

ences of multiples of 500 mm between them. Furthermore, these beams contemplate a beam equivalent to 22% of the latter, which is a part for compensating sizes when double connectors are alternated with single connectors in the same frame.

**[0019]** According to the invention, said connectors, a necessary element for carrying out any frame, are defined by six plates in a hexahedral arrangement in the case of single connectors with six connection ways, and in the case of double connectors, they are defined by six plates in a parallelepipedic arrangement with ten connection ways for the beams, forming two equivalent bodies connected to two single connectors in which the base plates contain larger diameter lightening holes and smaller diameter lightening holes equally spaced and in an equal arrangement as those of the cover plates and those of the beams themselves, and smaller diameter lightening holes in the elevations with an arrangement equal to the previous ones.

**[0020]** According to the invention, connectors which, for better rationalization of the assembly operations and for ensuring greater resistance, internally incorporate on the smaller diameter lightening holes respective lock-nuts for locking the different coupling elements of the corresponding beams. Nuts allowing the direct screwing in of the coupling elements by turning them in one direction or another, according to their position, to ensure tightening.

**[0021]** The invention is also provided with an adjustable jack made up of a corresponding spindle assembled in a support formed by a threaded cylinder resting on a rectangular plate with fixing boreholes and triangular reinforcement buttresses for reinforcing the cylinder, and one end with an anchoring hole for bracing it to the beams. An anchoring which, by means of a corresponding pin, threading and complementary side means, is assembled in the larger diameter lightening holes of the beams. Thus, a spindle threaded to the left on one end and to the right on the other end allows installing the beam, opening or closing the diagonal by simply turning said beam. Another complementary means is also used for fixing a rod to the beam which is adjusted against the internal diameter of two parallel, larger diameter lighting holes, and is fastened by means of respective nuts above and below the wedge.

**[0022]** According to the invention and as previously specified, this jack is completed with a diagonal reinforcement for the rod and a diagonal reinforcement for the jack. The first one is a part in the form of a semi-cylindrical, semi-ball joint with a perpendicular openwork and milled sides on its perimeters, and the other one is a disk-shaped part with a central concentric recess and a circular borehole equally concentric to the recess. The first one is arranged between two parallel larger diameter lightening holes with the milled sides locked against their edges and fastened by means of nuts, one above and one below the wedge. The second one is arranged in said lightening holes, one on each

side, serving to fasten the pin and nuts going through the jack anchoring hole.

**[0023]** A broader idea of the features of the invention will be carried out below in reference to the sheets of drawings attached to this specification, in which the preferred details of the invention are shown in a schematic manner and only as an example.

#### IN THE DRAWINGS

##### **[0024]**

Figure 1 shows a side elevation view of the main beam in its versions A-F, both inclusive.

Figure 2 shows a view equal to the previous view of the complementary beam or purlin, also in its versions A-F, both inclusive.

Figure 3 shows a plan view of the cover plate of the main beam of figure 1.

Figure 4 shows a sectional view of the main beam of figure 1.

Figure 5 shows a plan view of the cover plate of the purlin beam of figure 2.

Figure 6 shows a sectional view of the purlin beam of figure 2.

Figures 7, 8 and 9 show elevation, side and plan views of the single connector.

Figures 7A, 8A and 9A show elevation, side and plan views of the single connector, showing the six connection ways.

Figure 9B shows a vertical, symmetrical sectional view along the Y-Y line of figure 9.

Figures 10, 11 and 12 show elevation, side and plan views of the double connector.

Figures 10A, 11A and 12A show elevation, side and plan views of the double connector, showing the ten connection ways.

Figure 12B shows a vertical, symmetrical sectional view along the Y-Y line of figure 12.

Figures 13 and 14 show elevation and plan views of the adjustable jack.

Figures 15, 16 and 17 show elevation, side and plan views of the diagonal reinforcement of the rod.

Figures 18 and 19 show sectional and plan views of the diagonal reinforcement of the jack.

Figure 20 shows a side view of the arrangement of a rod in its corresponding wedge.

Figure 21 shows a side view of the arrangement of a jack in its corresponding reinforcement.

#### PREFERRED EMBODIMENT OF THE INVENTION

**[0025]** One preferred embodiment of the invention is interpreted according to the representations in said drawings and with the alphanumerical references provided therein.

**[0026]** Thus, the main beam is generally indicated with (1) and the purlin beam with (1a), which are provided

ed in their respective webs with larger diameter through lightening holes which are paired (5) and intercalated (6), of which holes, each one is surrounded by smaller lightening holes (7) in a preferred orthogonal arrangement, since the section of said main beam allows this, and smaller lightening holes (7a) aligned with the longitudinal axis of the lightening holes (5), since the section of the beam (1a) is smaller.

**[0027]** It is also suitable to point out that the distance between axes of the lightening holes (5) is (c) in all cases, that the distance between the axes of the smaller lightening holes (7) or (7a) is also (c) in all cases; that the distance between the end of the beam (1) and (1a) and the axis of the lightening hole (5) is (d) in all cases, and that the distance between the axis of the lightening holes (7) and (7a) is (e) in all cases.

**[0028]** Said main (1) and purlin (1a) beams having a hollow web (2) are formed by respective profiles (2a) and (2b) having bent flanges and separated by spaced anchor pins (3).

**[0029]** The beams (1) and (1a) are covered at their ends by means of the corresponding plates (8) and (9), see figures 3 and 4, and figures 5 and 6. Said plates are provided with equally centered larger diameter lightening holes (5) and with smaller diameter lightening holes (7) in the contour in the same orthogonal distribution as in the beam (1), such that the distance (n) between centers of the lightening holes (7) is the same in the two plates (8 and 9); such that the section (b) is equal in both plates (8 and 9) and equal to the section of the base of the two beams (1) and (1a), which are equal to one another. Therefore, the section (a) of said beams corresponding to the height thereof, and the thickness of the latter, which is 8 mm for plate (8) and 6 mm for plate (9), varies.

**[0030]** The connectors in figures 7 to 9 are single connectors integrated by hexahedral volumes (10) which, on all their faces, are provided with smaller lightening holes (7) in an orthogonal distribution with the same distance (n) between axes, just like the plates (8 and 9), and the double connectors in figures 10 to 12 are parallelepipedic volumes (11) comprising two hexahedral volumes (10) and an empty spacing (12) between the elevations. The faces of the elevations and sides have smaller lightening holes (7) in an orthogonal distribution and the same distance (n) between axes. And in addition to the smaller lightening holes (7), they are also provided with larger lightening holes (5) on the faces of the surfaces in a distribution equal to that of the plates (8 and 9), such that a larger lightening hole (5) coinciding with the empty spacings (12) has the same equidistance with regard to the other two.

**[0031]** For that purpose, said smaller diameter lightening holes (7) of the single connectors (10) and double connectors (11) are internally provided with nuts (7b) attached thereto and fixed by welding or pressing, such that the coupling elements can be fixed directly to said connectors (10) and (11) by simply turning them in the

suitable direction.

**[0032]** The adjustable jack (13) of figures 13 and 14 is provided with a spindle (14) finished in an anchoring hole (15); it is screwed into a cylinder (17) arranged in a base plate (18) reinforced by buttresses (19) and provided with smaller lightening holes (7) with the same distance (n) between centers as that of the plates (8 and 9) and connectors (10 and 11).

**[0033]** The diagonal reinforcement (20) of the rod of figures 15 to 17 is a semi-circular wedge-shaped part having milled sides (21) defining a central body and the sides, having a central vertical anchoring borehole (22).

**[0034]** The diagonal reinforcement (23) of the jack of figures 18 and 19 is a circular part with a central recess (24), a concentric relief (25) and a central openwork (26) with very little thickness.

**[0035]** Figures 20 and 21 show the arrangement of said diagonal reinforcements, thus the one corresponding to the rod (27) is assembled in the wedge (20), being fastened or tightened by one nut (28), which can be seen in the part under the wedge, and by another nut which cannot be seen, which is above the wedge. Thus, the reinforcement corresponding to the jack (13) can be seen assembled in a through screw (29) fastened by the reinforcements (23), one on each side, going through the anchoring hole (15) of the end of the spindle (14).

**[0036]** Having suitably described the nature of the invention, it is stated for suitable purposes that the invention is not limited to the exact details of this description, but rather on the contrary, those modifications deemed suitable, as long as they do not alter the essential features thereof, which are claimed below, will be introduced to it.

## Claims

1. A light reinforced frame system for forming, shoring, scaffolding or the like, in "I"-shape of the type made up of facing "C"-shaped metal profiles having bent flanges and a hollow web separated by spaced anchor pins, and **characterized in that** it is provided with two light metal beams, compensated and complementary to one another but having a different section, a main beam (1) and another accessory beam or purlin (1a) in five different dimensions (A to E), and a complement (F) proportional to them, having through lightening holes going through the webs, having a larger diameter (5) and (6) and a smaller diameter (7) or (7a), which are covered at their ends by means of the corresponding plates (8) and (9) respectively, having an equal width and different section, or they are coupled to one another by means of single connectors (10) or double connectors (11) complemented by means of an adjustable jack (13), a diagonal reinforcement (20) of the rod and a diagonal reinforcement (23) of the jack.
2. A light reinforced frame system for forming, shoring, scaffolding or the like according to claim 1, larger diameter lightening holes (5) and smaller diameter lightening holes (7) or (7a), which are **characterized in that** the larger diameter lightening holes (5) are arranged in pairs, and between each pair there is an independent one, and the smaller diameter lightening holes (7) are arranged around the former in an orthogonal formation on the main beam (1), and the holes (7a) are aligned with the longitudinal axis on the purlin beam (1a).
3. A light reinforced frame system for forming, shoring, scaffolding or the like according to claim 2, the larger diameter lightening holes (5) and smaller diameter lightening holes (7) or (7a) are **characterized in that** the spacing of the centers of the larger diameter lightening holes (5) among one another is (n), equal among them all, the distance between centers of the smaller diameter lightening holes (7) or (7a) among one another is (n), equal among them all, the distance between the ends of the beams (1) and (1a) being equal (d) to the center of the larger diameter lightening hole (5) and equal (e) to the center of the smaller diameter lightening hole (7) or (7a).
4. A light reinforced frame system for forming, shoring, scaffolding or the like according to claim 1, the cover plates are **characterized in that** the cover plate of the main beam (1) is a rectangular plate (8), and the cover plate of the purlin beam (1a) is a square plate (9) having the same base (B) equal to the bases of each beam (1) and (1a) and different section, with a central larger diameter lightening hole (5) coinciding with the hollow web (2) and smaller lightening holes (7) coinciding with the profiles (2a) and (2b), and with distances (n) between the centers of both in the two plates (8) and (9).
5. A light reinforced frame system for forming, shoring, scaffolding or the like according to claim 1, the single connector is **characterized in that** it is a hollow hexahedral body (10) having on all its faces smaller diameter lightening holes (7) arranged in an orthogonal position and a distance (n) between its centers equal to that in the cover plates (8) and (9) and is provided with six connection ways for main (1) or purlin (1a) beams.
6. A light reinforced frame system for forming, shoring, scaffolding or the like according to claims 1 and 5, the double connectors are **characterized in that** they are hollow parallelepipedic bodies (11) made up of two simple connectors with an empty spacing (12) between the elevations and having an orthogonal arrangement of smaller diameter lightening holes (7) with distances (n) between centers and

larger diameter lightening holes (5) concentric to the former, and another one (5) coinciding with the empty spacing on the base and on the surface, with ten connection ways for main (1) or purlin (1a) beams.

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7. A light reinforced frame system for forming, shoring, scaffolding or the like according to claim 6, the single connectors (10) and the double connectors (12) are **characterized in that** the smaller diameter lightening holes (7) are internally provided with respective nuts (7b) fixed on them allowing the direct screwing in of the coupling elements by simply turning them in the suitable direction.
8. A light reinforced frame system for forming, shoring, scaffolding or the like according to claim 1, the adjustable jack (13) is **characterized by** being made up of a spindle (14) with an anchoring hole (15) on the end and screwed into the corresponding cylinder (17) attached to a base plate (18) reinforced with buttresses (19) and provided with smaller diameter lightening holes (7) equally arranged with a spacing (n) between centers, which is bound to the beams (1) (1a) by means of reinforcements (23) in different diagonal positions on a transverse screw (29) assembled between two reinforcements, one on each side of the beam.
9. A light reinforced frame system for forming, shoring, scaffolding or the like according to claim 1, the diagonal reinforcement (20) of the rod (27) is **characterized in that** it is made up of a semicircular wedge-shaped part having milled sides (21) between the body and sides, which adapt to the edges of the lightening holes (5), and it is provided with a vertical axial borehole (22) through which the rod (27) passes, fastened by means of nuts (28), on above and the other one below the wedge (20).
10. A light reinforced frame system for forming, shoring, scaffolding or the like according to claim 1, the diagonal reinforcement (23) of the jack is **characterized in that** it is a disk-shaped part having little thickness, provided with a concentric recess (24) causing an equivalent projection (25) at the base, and is provided with a central concentric hole (26).

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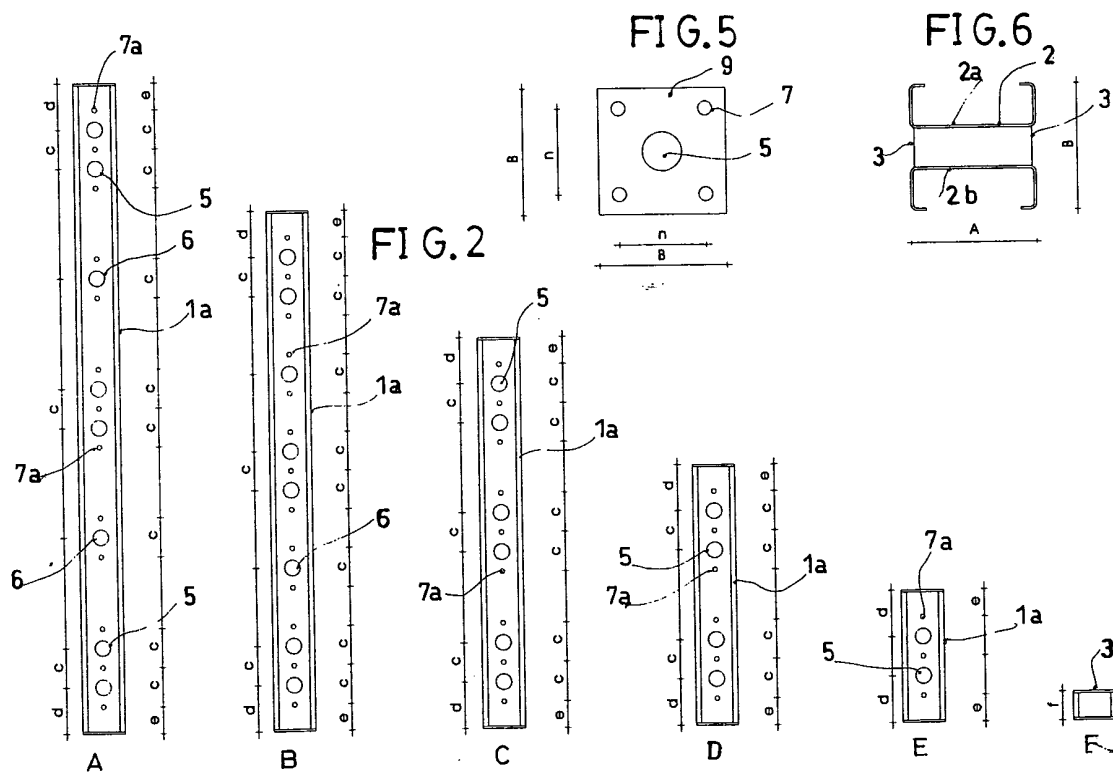
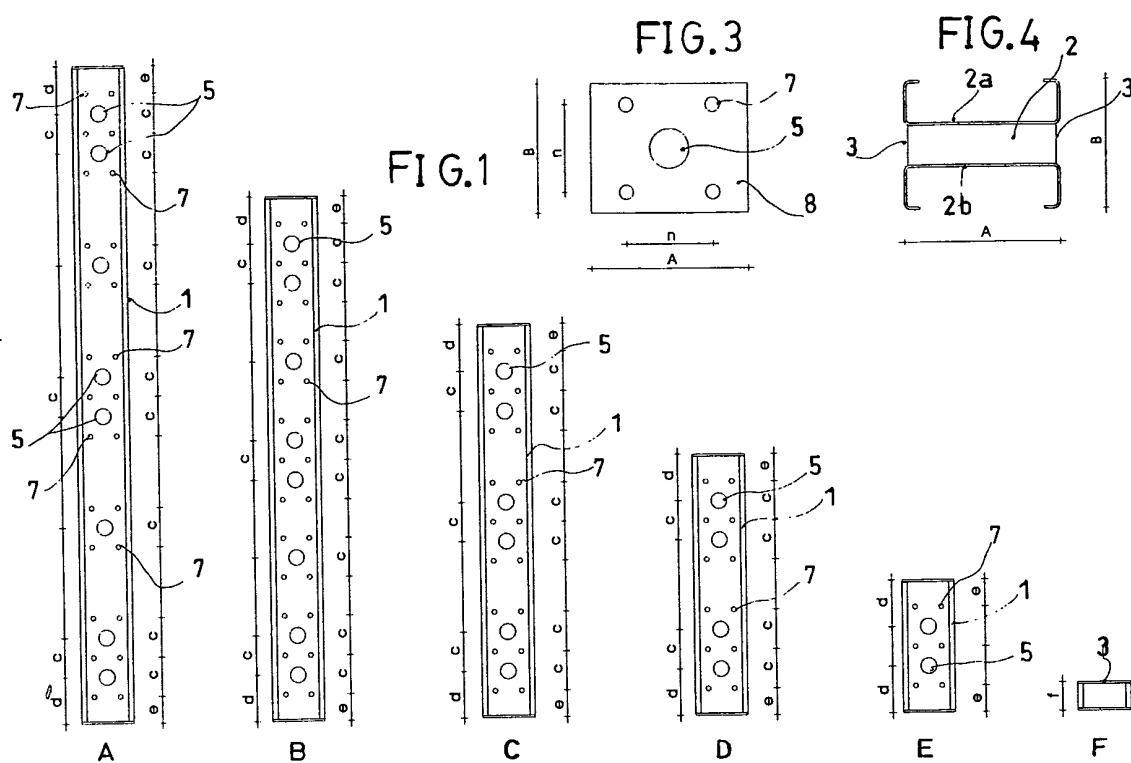
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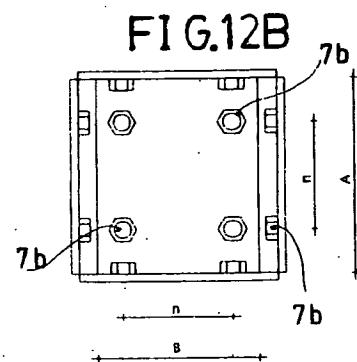
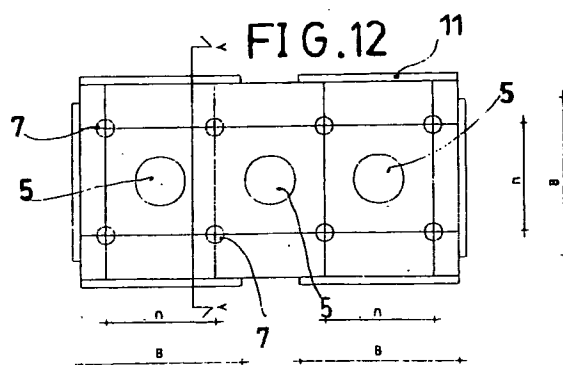
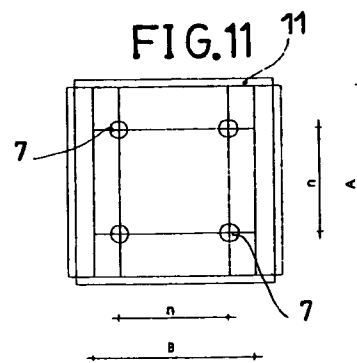
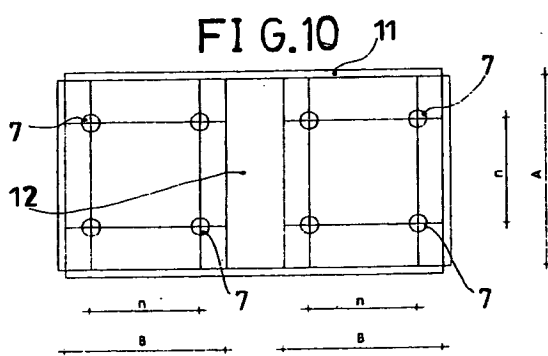
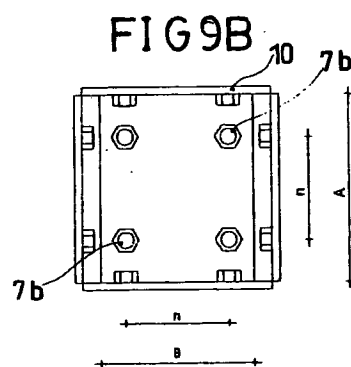
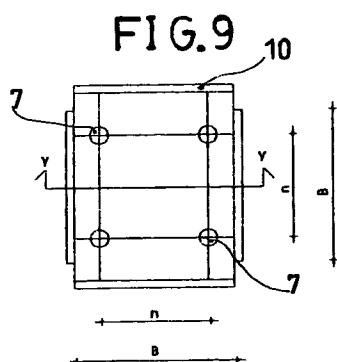
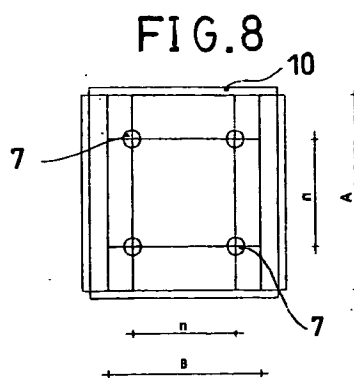
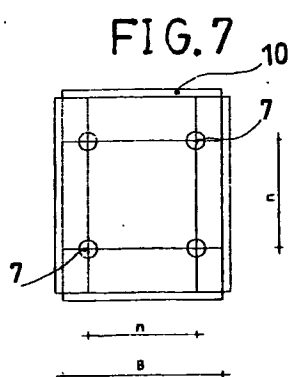
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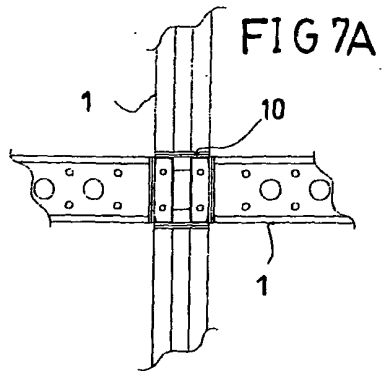


FIG 7A

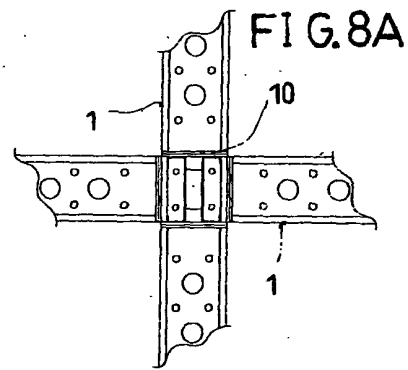


FIG 8A

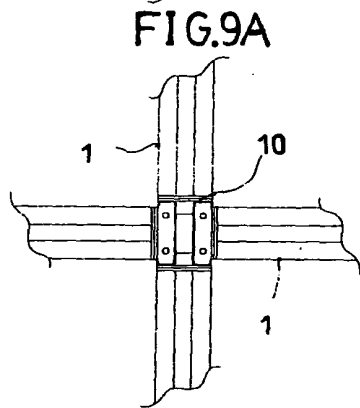


FIG 9A

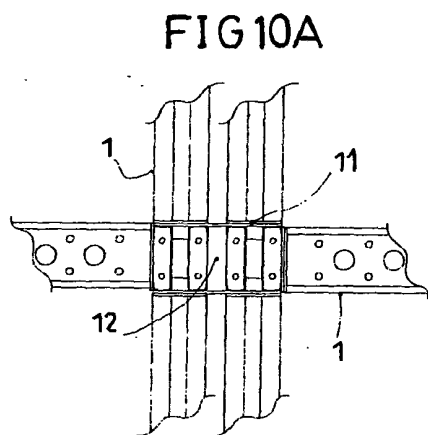


FIG 10A

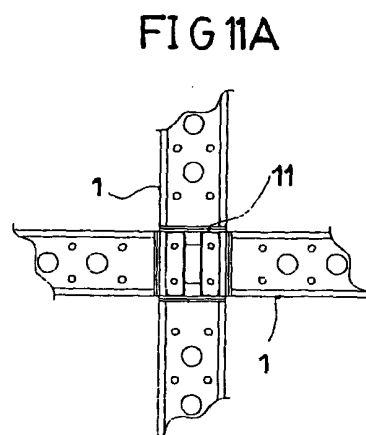


FIG 11A

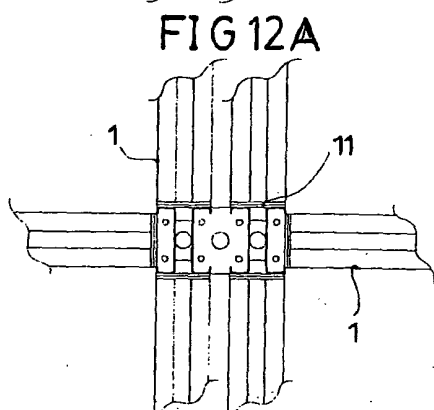


FIG 12A

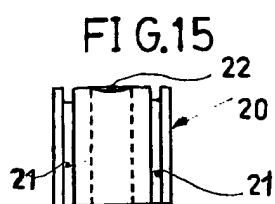
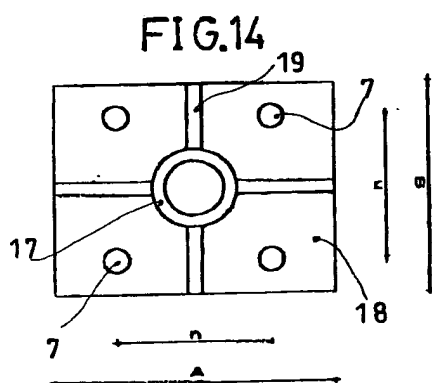
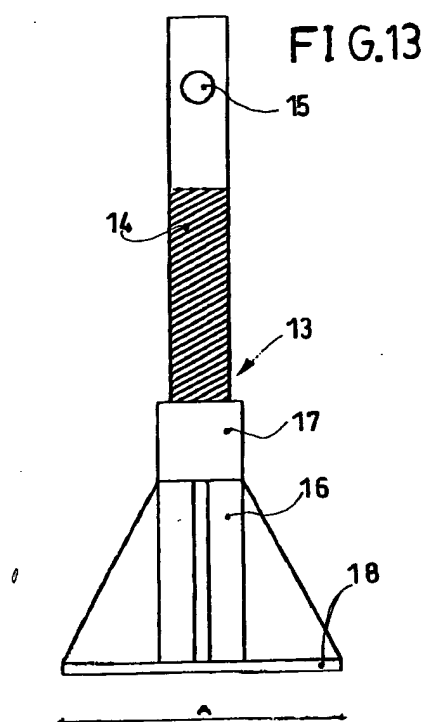


FIG.16

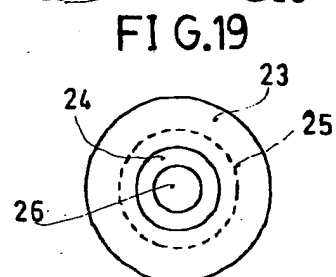
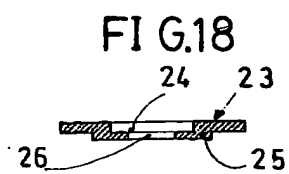
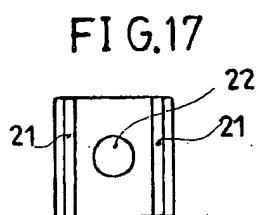
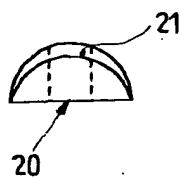
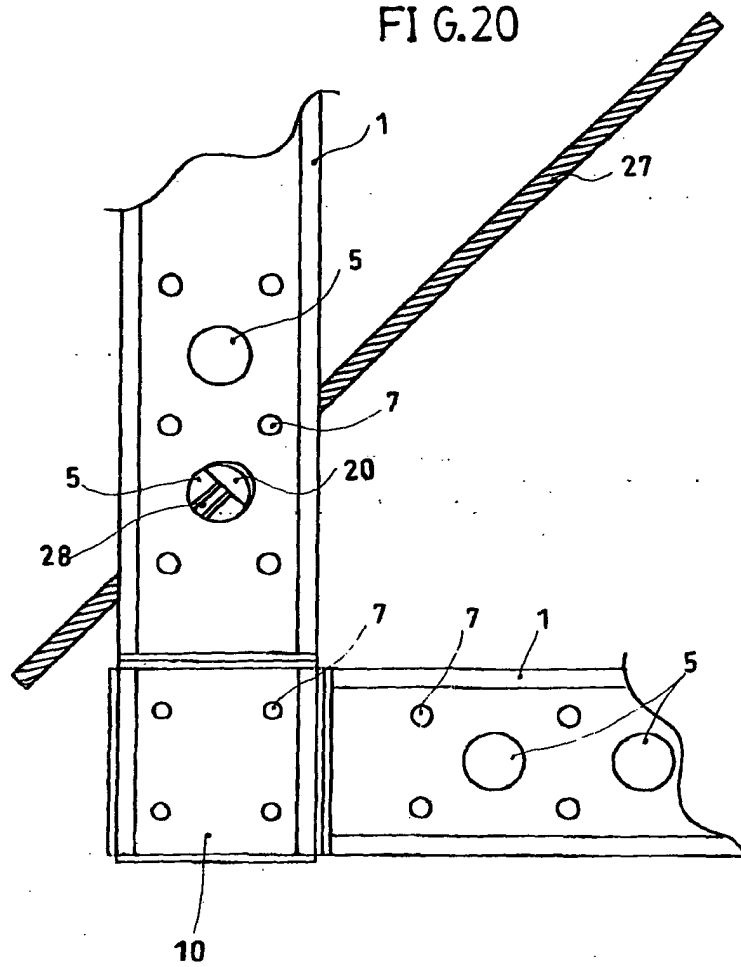


FIG. 20





European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 04 38 0040

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
D,X	RMD KWIKFORM: "Brochure No. 2033 (European) - Shoring" November 2003 (2003-11), , XP002289349 * page 11 - page 12 *	1	E04G1/12 E04G11/12 E04G17/14 E04B1/24
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 21 July 2004	Examiner Fordham, A
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EPO FORM 1503 03.82 (P04C01)



European Patent  
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# EUROPEAN SEARCH REPORT

Application Number  
EP 04 38 0040

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<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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 &amp; : member of the same patent family, corresponding document</p>			

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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