



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
23.07.2008 Bulletin 2008/30

(51) Int Cl.:
E04C 3/07 (2006.01) E04G 11/50 (2006.01)

(21) Application number: **07380009.6**

(22) Date of filing: **17.01.2007**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK RS

(72) Inventor: **Barba Castro, Julio Angel**
47002 Valladolid (ES)

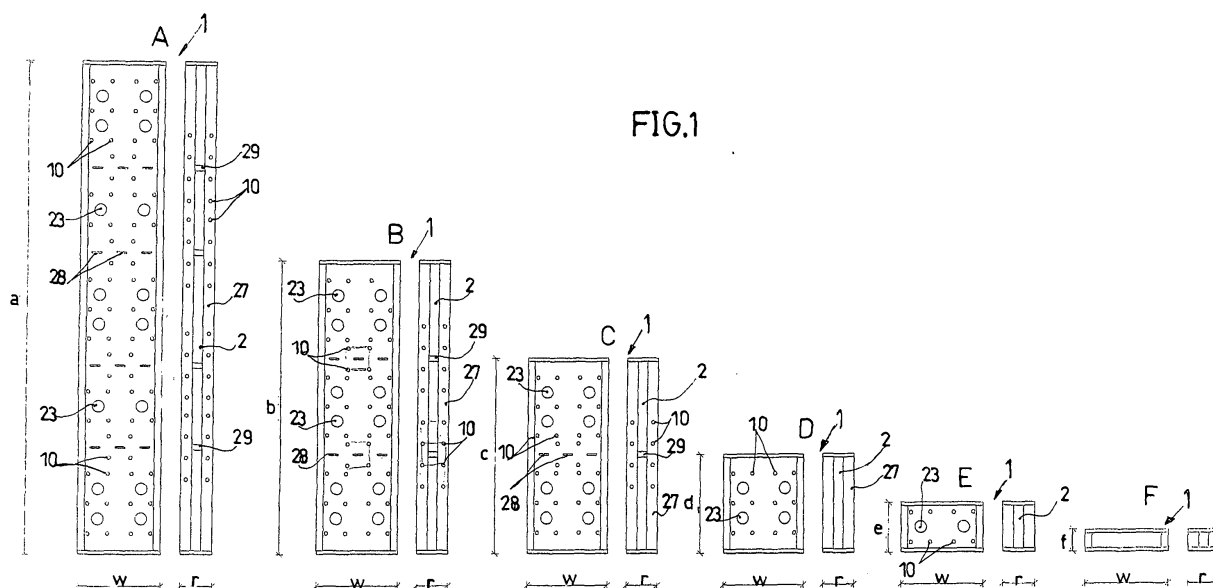
(74) Representative: **Manzano Cantos, Gregorio**
Cabinet Manzano
Embajadores, 55
28012 Madrid (ES)

(71) Applicant: **Barba Castro, Julio Angel**
47002 Valladolid (ES)

(54) **System of truss structures for intermediate and heavy loads for forming, shoring, scaffolding or the like**

(57) The invention relates to a system of truss structures for intermediate and heavy loads for forming, shoring, scaffolding or the like of the double T type made up of opposing metal C-shaped profiles with bent flanges and parallel purlins separated by equidistantly spaced reinforcing cross-members, consisting of two metal beams having different spans, each having a different section and each of them having different lengths respec-

tively; they are made of sheet metal having a thickness that is proportional to their dimensions, having through lightening holes with a large diameter between the purlins and on their ends which are closed at the head by means of corresponding plates having an equal width and different section, also provided with lightening holes having a large diameter and separated by reinforcing cross-members which can be joined to one another and at the head by means of fixing holes having a smaller diameter.



Description

[0001] The system is substantially based on or supported by a set of metal double T beams, which will be referred to as lightweight and heavyweight, of the type made up of the joining of a double C-section profile having bent flanges joined to or overlapped by their respective webs, which are parallel, opposing and spaced from one another by bolts or reinforcing cross-members which are transversely welded equidistantly spaced from one another.

[0002] These beams are combined with a series of accessories carrying out different functions of building, trussing, shoring, scaffolding, and for other purposes in any type of construction or building processes, whether public or private, providing simple solutions for very diverse and complicated building cases, consisting of metal beams made of galvanized sheet or sheet treated against oxidation due to their broadest outdoor function, which beams preferably must be highly stress resistant in any working direction and they must also be resistant to the loads they are to withstand, which in this case are average and heavy loads, and preferably, the lighter and more lightweight the more recommendable they are.

[0003] The aforementioned beams are doubly lightened in the web of each side and at the head in transverse coincidence with the separations between webs. In summary, it is the same profile inverted, opposing at their webs and joined by welded reinforcing cross-members, with a special profile and arranged with proportional equidistance to the length of the beam. There is an arrangement of holes with a large diameter for reducing the weight of the beam and for some specific applications combined with a set of holes with a small diameter which are used for less weight reduction, for the bracing, joining, anchoring and fastening to one another and of their elements which are complementary to the different functions of the beam.

[0004] According to the invention, the calculation of the dimensions, of the section of the sheets, of the arrangement and diameter of the lightening holes and of the assembly holes, will depend on a series of advantages with respect to weight, use of material and use of the beam constituting a novelty in the structural systems of this type which have been used or known until now as the most current and relevant systems.

BACKGROUND OF THE INVENTION:

[0005] In relation to the state of the art, at least two systems can be pointed out in relation to this type of beams for forming truss structures, one corresponding to the British company SGB FORMWORK, known as Mk II Soldier System, and another one corresponding to the company RMD IBERICA, S.A., known as Super Slim or Slimshor.

[0006] In relation to the first, D1 of the SGB GROUP Brochure, The SGB Guide Formwork and Shoring, pub-

lished October 2003, mentioned in the search report and examination relating to EP 04380040/8, must be mentioned.

[0007] Both of them are made up of double T beams formed by two C-shaped profiles with bent flanges, joined at their respective webs by means of reinforcing cross-members.

[0008] The first ones have diamond-shaped openworkings with rounded vertexes in their webs with a very small equidistance and broad span having intercalated blade-shaped ribs parallel to the sides of each openworking and having in the center thereof one or two boreholes, depending on the section, in this case aligned according to the vertical axis.

[0009] The second ones have aligned, circular-shaped openworkings, with somewhat less of a span in relation to the section which is about 40% and having circumscribed boreholes arranged in an orthogonal formation with respect to the central openworking. The web has reinforcements in the area including the openworking and the boreholes. This arrangement of boreholes is made on two first end openworkings and alternating every three openworkings in the rest.

[0010] The section of the beams in both cases is unchanged.

[0011] In both cases connectors are used which at most consist of eight connections, making it unfeasible to bend the horizontal shaft of the truss of the structure, which logically has certain resistance conditions.

[0012] Essentially, however, the invention is based on Spanish patent ES 2244253 A1, belonging to the same applicant as the present and of the inventor Mr. Julio Barba Castro, relating to a: SYSTEM OF LIGHTWEIGHT TRUSS STRUCTURES FOR FORMING, SHORING, SCAFFOLDING OR THE LIKE, dated 19/06/2002, anticipating the mentioned document D1 and in which the lightweight beam of the set of beams of the current invention is substantially the same as this one with advantageous changes in the positioning, location and measurements of the different elements forming this structure and in the development of a related beam, which is a heavy beam or is a beam for withstanding heavy loads, which is itself reinforced with other identical beams joined to one another, having the same basic structure and especially the equivalent means for the joints or connections in the trussing of the structures to one another and with others in different combinations for the purposes laid out in the title of these patents.

FIELD OF THE INVENTION

[0013] The invention attempts to rationalize and make use of the working moments of said beams so as to adjust them such that, when combined to one another, it is not necessary to use excessively large beams in relation to the average, high and very high stress and loads they must withstand in this case; for that purpose two beams having different sections and spans but which are directly

complementary to one another have been provided so that they can be combined or connected using virtually ambivalent parts and means; which beams are very specific and lightened such that according to the calculation performed they effectively carry out the working task they must carry out.

DESCRIPTION OF THE INVENTION

[0014] The new development offered by the beams of the invention in both their versions are defined by a series of lightening holes arranged with the same strategy as in the aforementioned earlier patent of the same inventor for the coupling of a group of additional complements making it a single known beam which, with smaller dimensions and thicknesses in relation to existing beams, better defines their resistant capabilities as the lightening holes are understood as being merely functional and not primarily esthetic or commercial.

[0015] As the beams are prefabricated metal beams, the object of the invention is to allow their use in any sector requiring structural solutions of the type comprised in the title of the invention, no matter how complex they may be, not necessarily having to manufacture said structures for exclusive use in this job. As is known, they are especially intended for trussing formwork boards, for forming scaffolding structures, for shoring frameworks or others such as timbering, stiffeners and the like in which, reinforcing means such as simple braces are additionally provided for spacing between beams having little span or combined with jacks having tensioning members for reinforcement between beams with a spacing having a large span.

[0016] The lightweight and heavyweight beams according to the invention share the same lightening holes with the same size (60 mm) in the webs of each of them, there being one centered lightening hole in the first case and axially aligned lightening holes in the second case, preferably three in number in relation to the width of the beam. As previously mentioned and in relation to thicknesses, the difference is minimal according to very different stress load functions and in a complementary order they act as a very versatile and resistant purlin which, since they share the same distances between axes in the head end plates at the beginning and end of the beam as those distances between the webs and flanges or side soles for either beam, can be combined together perfectly and accessories can be interchanged which in this case would become common to the two beams.

[0017] Therefore, with the two versions of the beams of the invention, a direct relationship between the structure and the installer has been considered, so the heavyweight beam or beam with the larger section and the lightweight beam or beam with the smaller section and the entire assembly of additional elements can be assembled manually with maximum safety features, even creating a series of auxiliary elements ensuring the installer's safety in any structure to be built based on the

assembly processes.

[0018] The invention consists of developing two hollow double T beams having purlins made up of 5 and 6 mm thick C-shaped profiles respectively, with bent flanges acting as soles and planar webs separated by corresponding equidistantly spaced reinforcing cross-members and having two versions of different widths, the smallest one being 47.62% smaller, which will be referred to as the lightweight beam and, the larger beam will be referred to as the heavyweight beam. Both beams are of the same height, i.e. they have the same measurement between the flanges or soles, such that the additional beginning and end head end plates have different sizes and formats but the same distribution and complementary sizes in the lightening holes and anchoring or fixing holes, making their connection or joining possible among one another even though they have the same or different span.

[0019] Both the lightweight and heavyweight beams also have the same developments and equivalent distribution and size in relation to their means of lightening their complementary and anchoring means, and they are completely identical in relation to the fixing holes, even in relation to the orthogonal arrangement around the nodes of the reinforcing cross-members. In other words, the lightening holes are equal circular vertical openworkings of 60 mm in diameter in the webs of the beams, but they vary in number, and the fixing or anchoring holes are also equal to 18 mm in diameter and the lightening and anchoring holes of the end plates are also equal in both beams, 50 mm in diameter, and the fixing holes are 20 mm for the heavyweight beam and 18 mm for the lightweight beam, the distribution of the first holes being formed by pairs which are equidistant between centers at the same distance of 110 mm, and intercalating sets of pairs which may vary in number depending on the length of the beam, bearing a set of four circumscribed fixing holes distributed in orthogonal position in relation to the lightening holes in both beams, to the nodes of the cross-members and of the lightening holes of the head end plates which also have an equal equidistant spacing between centers, as previously mentioned, of 110 mm in both cases, and they define a regular square perimeter around the lightening hole.

[0020] The aforementioned head end plates of the beams according to the invention are rectangular and adapted to the section of the heavyweight and lightweight beams respectively. Each one has its respective portions but they have an equal section in both cases, and the plate of the heavyweight beam is 18 mm thick and the plate of the lightweight beam is 15 mm thick, the distribution of the lightening holes and fixing boreholes being the same, the one with the largest diameter being located in the center and the other four with the smaller diameter orthogonally circumscribing the center one, there being an equal distance between centers (110 mm), with the particularity that the plate of the heavyweight beam has three axially and horizontally aligned lightening holes and

the plate of the lightweight beam has one in the center.

[0021] Said heavyweight and lightweight beams are arranged according to the invention in five lengths, four of them being comprised between 2500 mm and 500 mm, decreasing by 500 mm; a fifth one being half the length of the latter (250 mm) and final sixth one being 44% of the previous one, being a part for compensating measurements when double connectors are alternated with single connectors in the same structure since they have the same length as the separation between axes of the fixing holes (110 mm).

[0022] The aforementioned known connectors are essential elements for carrying out any structure; they are defined by plates in a hexahedral arrangement in a simple case, with just as many connections for the beams and for the plates in the parallelepiped arrangement of double connectors, for a larger number of connections for the beams forming two joined bodies equivalent to two single connectors in which the head end plates have the same lightening holes with a larger diameter and the fixing with a smaller diameter in the same equidistant arrangement as in the case discussed in the background of the patent belonging to the applicant of this invention.

[0023] According to the known version and the invention, for better rationalization of the assembly operations and to ensure greater resistance, the connectors internally incorporate on the lightening holes having the smaller diameter respective fixing nuts for fixing the different joining members of the corresponding beams. These nuts allow the direct threading of the joining members by turning them in either direction, according to their position, to secure the screwing.

[0024] The known version and the invention also have adjustable jacks with a typical function of shoring of the beam structure, made up of the corresponding screw assembled in a support formed by a threaded cylinder resting on a rectangular plate with fixing boreholes and triangular reinforcing stiffeners for the cylinder and an end with an anchor for bracing the beams. Such anchor is assembled in the lightening holes with the larger diameter of the beams by means of a corresponding pin, threading and complementary side means. Therefore screw with a left-hand threading in one end and a right-hand threading on the other end allows installing the beam by opening or closing the diagonal by simply turning said beam. Another complementary means is also used with a typical function of bracing the beam structure for fixing a rod to the beam which is adjusted against the inner diameter of two parallel lightening holes with a larger diameter, and it is fastened by means of respective nuts above and below the wedge.

[0025] In the known version and the invention as it has been explained above, the jack is completed with a diagonal reinforcement for the rod and a diagonal reinforcement for the jack. The former is a semi-cylindrical half-round part with a perpendicular borehole and milled sides in its perimeter and the other one is a disc-shaped part with a central concentric deep-drawing and a circular

borehole also concentric to the deep-drawing. The former is arranged between parallel lightening holes with a larger diameter with the milling locked against its edges and being fastened by means of nuts, one above the wedge and another below it. The second one is assembled in said lightening holes on either side, used as a fastener for the pin and nuts passing through the anchor of the jack.

[0026] A broader idea of the features of the invention shall be provided below in reference to the drawings attached to this specification in which the preferred details of the invention have been shown schematically and by way of example.

[0027] In the drawings:

Figure 1 is a side elevational plan view of the heavyweight beam in its length versions A- to -F, all inclusive.

Figure 1A is a foreshortened longitudinal profile perspective view of the beam of Figure 1.

Figure 1B is a foreshortened longitudinal plan perspective view of the beam of the Figure 1.

Figure 2 shows views equal to those of the previous figure of the lightweight beam also in its length versions A -to- F, all inclusive.

Figure 2A is a foreshortened longitudinal profile perspective view of the beam of the Figure 2.

Figure 2B is a foreshortened longitudinal plan perspective view of the beam of the Figure 2.

Figure 3 is a plan view of the head end plate of the heavyweight beam of Figure 1.

Figure 4 is a cross-section view of the heavyweight beam of Figure 1 closed at the head by an end plate.

Figure 5 shows a similar view to the previous one of the heavyweight beam of Figure 1, without a head end plate, and reinforcing cross-member.

Figure 6 is a plan view of the web of a purlin of the heavyweight beam of Figure 1.

Figure 7 is a plan view of detail A' of Figure 6.

Figure 8 is a plan view of the reinforcing cross-member of either of the two beams.

Figure 9 is a plan view of the head end plate of the lightweight beam of Figure 2.

Figure 10 is a cross-section view of the lightweight beam of Figure 2 with the end plate.

Figure 11 is a similar view to the previous view of the lightweight beam of Figure 2, without the head end plate, and with the reinforcing cross-member.

Preferred Embodiment of the Invention

[0028] A preferred embodiment of the invention is interpreted according to the drawings and with the alphabetical references therein provided.

[0029] Generally, the heavyweight beam is indicated with (1) and the lightweight beam with (1a), which beams have through lightening holes in their respective webs with a large diameter of 60 mm (23 - 23'), being located

in two rows, paired and vertically opposing in the heavyweight beam (1), and in a single row and centered (34 - 34'), also vertically opposing and 60 mm in the lightweight beam (1a). Each one is surrounded by smaller holes (10) of 18 mm of diameter in both beams, preferably in an orthogonal arrangement, equidistant and on both coordinate axes, at a distance (x) (Figure 7) of preferably 110 mm between axes, while the welding nodes of the reinforcing cross-members (29) are aligned with the longitudinal axes in the same orthogonal arrangement and housed in the spaces (20) and (30) of each beam and set in the in the slots (28) (Figures 7 and 8) of the web of both beams, and they also have fixing holes (10) at a distance (x) between axes, also of 110 mm, the thicknesses of the sheet of beams (1) being 6 mm and the sheet of beams (1a) being 5 mm.

[0030] It must also be pointed out that the distance between axes of the fixing holes (10) in either beam is (x) in all cases and that the distance in the end of the beams (1) and (1a) and the axis of the lightening holes (23 - 23'), (34-34') is proportionally variable in all cases but equal in both beams (1), (1a), the following being the respective dimensions for A - F:

A = length (a) 2500.0 mm
 B = length (b) 1500.0 mm
 C = length (c) 1000.0 mm
 D = length (d) 500.0 mm
 E = length (e) 250.0 mm
 F = length (f) 110.0 mm; which is the distance (x) between axes of the fixing holes.
 A to F = width (w) 420.0 mm
 A to F = thickness (r) 162.0 mm

[0031] The aforementioned heavyweight (1) and lightweight (1a) beams with webs secured by parallel separations (2) and (3) respectively, define a space (20) for the former and (30) for the latter with an equal opening at 50 mm, which are formed by respective C-shaped profiles (21-22) and (32-33), opposing at their webs and with bent flanges (27) which are bent inwardly. Such flanges (27) are also provided with corresponding fixing holes (10), with the same diameter of 18 mm and at the same distance (x) at 110 mm between axes.

[0032] The reinforcing cross-members (29) are assembled in the openings or separations (20-30) of the beams (1) and (1a), being fastened in three slots (28) cut into each of the webs with 49 mm in length, with spaces of 77 mm, by means of 48 mm long embossments (28'), spaced transversely at distances of 78 mm, in which the embossments (28') are fixed by means of welding, forming nodes around which there are sets of fixing holes (10) in an equal orthogonal arrangement and separation (x) as the previous ones at 110 mm between axes and which, according to the length of the beams (1- 1a), are distributed as follows (shown in Figure 1a):

Length (a) = Divided by four transverse reinforce-

ments (29) with equidistant spaces (h) between them; space (g) between these and the ends and a central space (i).

Length (b) = Divided by two transverse reinforcements (29), with equidistant spaces between these and the ends (k) and a central space (1).

Length (c) = Divided by a transverse reinforcement (29) leaving equidistant spaces (m) on either side of the former.

[0033] The spaces according to the lengths of each beam correspond with the following measurements:

g) = 540.5 mm
 h) = 423.0 mm
 i) = 573.0 mm
 k) = 502.0 mm
 l) = 496.0 mm
 m) = 500.0 mm

[0034] Beams (1) and (1a) are closed at their ends by means of the corresponding head plates (24) and (31) respectively, Figures 3 and 4 and Figures 9 and 10 also respectively. Said plates (24) have axially aligned central lightening holes (26) and plate (31) has a central lightening hole (35) equal to the previous ones, all having a large diameter of 50 mm and in the contour of these fixing holes there are other holes with a smaller diameter (25-36), respectively, in the same orthogonal distribution as in the webs of profiles (21-22) and (32-33) of the beams (1) and (1a) such that the distance (x) between the centers of the holes (25-36) is the same in the two plates (24) and (31) and that the diameter of the holes (25) in plate (24) is 20 mm and the diameter of the holes (36) in plates (31) is 18 mm.

[0035] The vertical section is equal in both plates (24 and 31) and equivalent to the thickness (r) of the beams (1) and width of the beams (1a). Therefore, the horizontal section of said beams (1) and (1a) varies, such that the latter is (y) 47.62% (200 mm) of the first one, i.e. the first beam (1) is twice as long + 20 mm (w) (420 mm). The thickness of the longer plate (24) is 18 mm and the thickness of the shorter plate (31) is 15 mm.

[0036] Having sufficiently described the nature of the invention it is hereby stated for all intents and purposes that the invention is not limited to the exact details of this description, but in contrast, any modifications considered appropriate shall be introduced provided that they do not alter the essential features thereof claimed below.

Claims

1. A system of truss structures for intermediate and heavy loads for forming, shoring, scaffolding or the like of the type formed in double T, made up of opposing C-shaped metal profiles with bent flanges and parallel webs separated by reinforcing cross-mem-

- bers, equidistantly spaced comprising two beams formed by two different spans, **characterized in that** they consist of two metal beams, a heavyweight beam (1) and another lightweight beam (1a), which compensate and are complementary to one another but have different sections, the larger one having a section of 420 mm, being twice that of the smaller one + 20 mm or the smaller one of 200 mm 47.2% of the larger one and having the same number of beams with the same different lengths (A to F), respectively; such beams being made of metal sheet with a thickness that is proportional to its dimensions of 6 mm (1) and 5 mm (1a) respectively; having through lightening holes (23) and (23') with a large diameter of 60 mm between the webs (21-22) of beam (1), and through lightening holes (34), (34') between the webs (32-33) of beam (1a), which beams (1-1a) are closed by means of corresponding head plates (24) and (31) respectively, also having equal width (r) and different section (w) and (e) also provided with lightening holes (26-35) having a large diameter of 50 mm coinciding with the opening of the webs (2) and (3) produced by parallel separations (20-30), the head joining between them being possible by means of fixing holes (10, 25 and 36)
2. A system of truss structures for intermediate and heavy loads for forming, shoring, scaffolding or the like according to claim 1, the lightening holes having a larger diameter (23-23') and (34-34') provided in the webs (21-22; 32-33) of beams (1-1a) are **characterized in that** the lightening holes having a larger diameter (23-23') or (34-34') are arranged vertically opposite and horizontally paired in both cases, in two rows in the heavyweight beam (1) and in one row in the lightweight beam (1a), and around each of said lightening holes in an orthogonal arrangement the fixing holes having a smaller diameter (10) are arranged with an equidistance (x) between them equivalent to 110 mm occurring both vertically and horizontally and with the same arrangement, both in the webs (21-22; 32-33) of the beams (1-1a) and in the head end plates (24) and (31), and in the flanges or side soles (27) of each beam (1) and (1a).
 3. A system of truss structures for intermediate and heavy loads for forming, shoring, scaffolding or the like according to claim 1, the different lengths (A to F) of the beams (1) and (1a) are **characterized in that** they are equal in both cases and have the same separation equidistance between the reinforcing cross-members (20-30) in both beams (1) and (1a), being divided according to their lengths into (A) x four reinforcing cross-members; (B) x two reinforcing cross-members and (C) one reinforcing cross-member and, no reinforcing cross-member for the remaining three (D, E and F).
 4. A system of truss structures for intermediate and heavy loads for forming, shoring, scaffolding or the like according to claims 1 and 3, the lengths (A to F) of the beams (1) and (1a) are **characterized in that** they are constituted in both cases by the same measurements of 2500 mm to 500 mm, decreasing by 500 mm between (A and D), (E) being 250 mm and (F) being 110.00 mm which corresponds exactly with the distance (x) between axes of the fixing holes (10, 25 and 36).
 5. A system of truss structures for intermediate and heavy loads for forming, shoring, scaffolding or the like according to claims 1 and 2, the end plates (24-31) are **characterized in that** the end plate (24) of the heavyweight beam (1) and the end plate (31) of the lightweight beam (1a) are rectangular plates with different dimensions coinciding with the proportionality measurements corresponding to the sections of said beams and also having lightening holes (26-35) having a large diameter of 50 mm which is the measurement of the separation (20-30) between the webs of the beams (1-1a).
 6. A system of truss structures for intermediate and heavy loads for forming, shoring, scaffolding or the like according to claims 1 and 5, the head end plates (24) and (31) are **characterized in that** they are planar sheet bodies which are 18 mm thick for the heavyweight beam (1) and 15 mm thick for the lightweight beam (1a), comprising three lightening holes (26) with 50 mm in diameter axially aligned in the first one and a lightening hole (35) of 50 mm in diameter located in the center of the second one, each of which is surrounded by the orthogonal arrangement of four head fixing holes (25) and (36) respectively and with the aforementioned separation (x) between axes of 110 mm, both vertically and horizontally.
 7. A system of truss structures for intermediate and heavy loads for forming, shoring, scaffolding or the like according to claim 6, the fixing holes (25), (36) of the end plates (24) and (31) are **characterized in that** they have a diameter of 20 mm for the larger end plate (24) and a diameter of 18 mm for the smaller end plate (31).
 8. A system of truss structures for intermediate and heavy loads for forming, shoring, scaffolding or the like according to claims 1 and 3, the reinforcing cross-members (20 - 30) are **characterized in that** they are sheet metal flats (29) which are 6 mm thick and have embossments (28') on the edges for fitting in the corresponding slots (28) provided in the webs (21-22) and (32-33), respectively, of the beams (1) and (1a) also respectively, in the arrangement of three transversely aligned slots (28) in the first case

and of one transverse slot (28) in the second case, to which they are fixed by means of the corresponding welding nodes.

9. A system of truss structures for intermediate and heavy loads for forming, shoring, scaffolding or the like according to claim 8, the aforementioned slots (28) are **characterized in that** they are 49 mm long and equidistantly spaced from one another at 77 mm when there is more than one slot (28).
10. A system of truss structures for intermediate and heavy loads for forming, shoring, scaffolding or the like according to claim 8, the corresponding welding nodes are **characterized in that** they are surrounded by an orthogonal arrangement of the corresponding sets of fixing holes (10) at their respective distance (x) between axes at 110 mm.

5

10

15

20

25

30

35

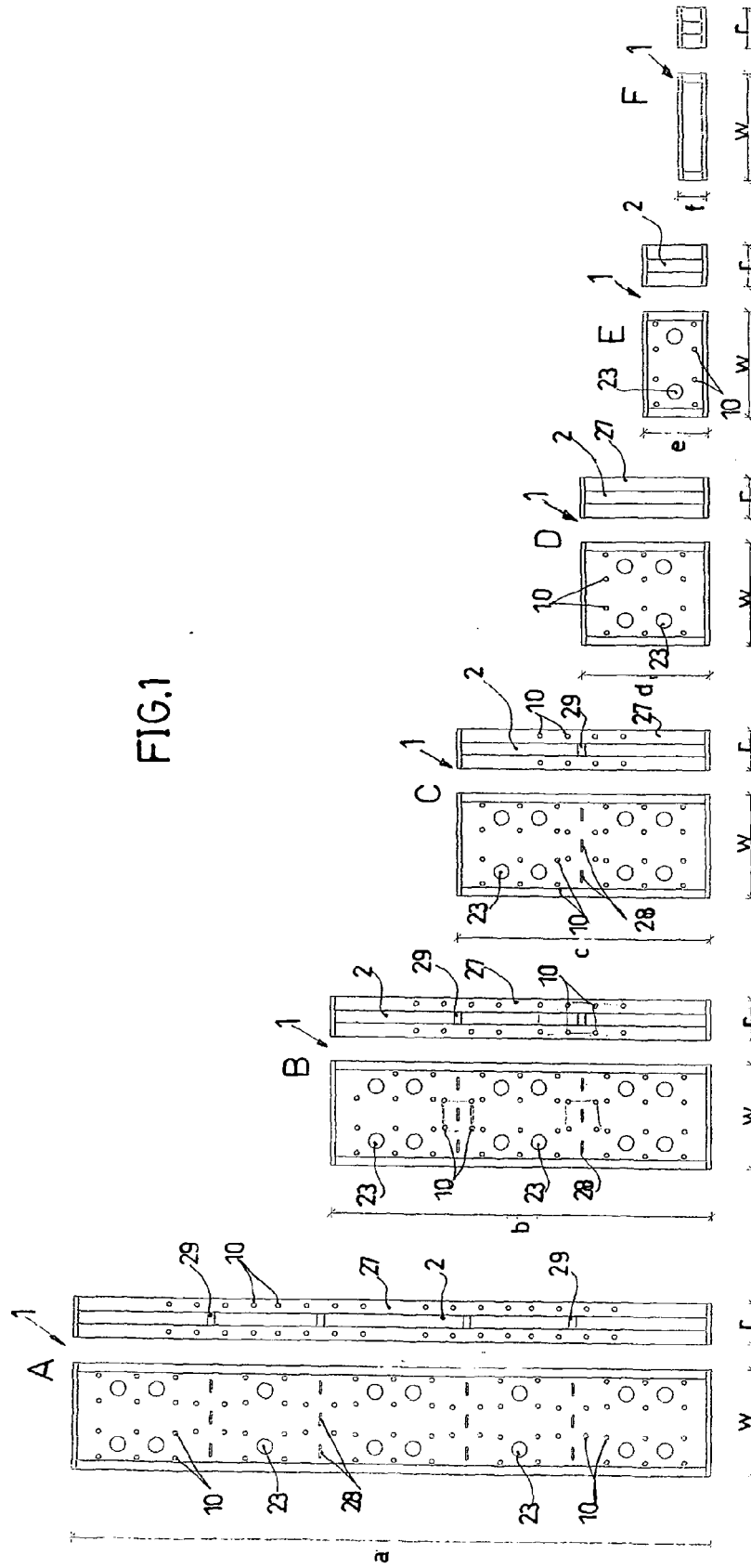
40

45

50

55

FIG. 1



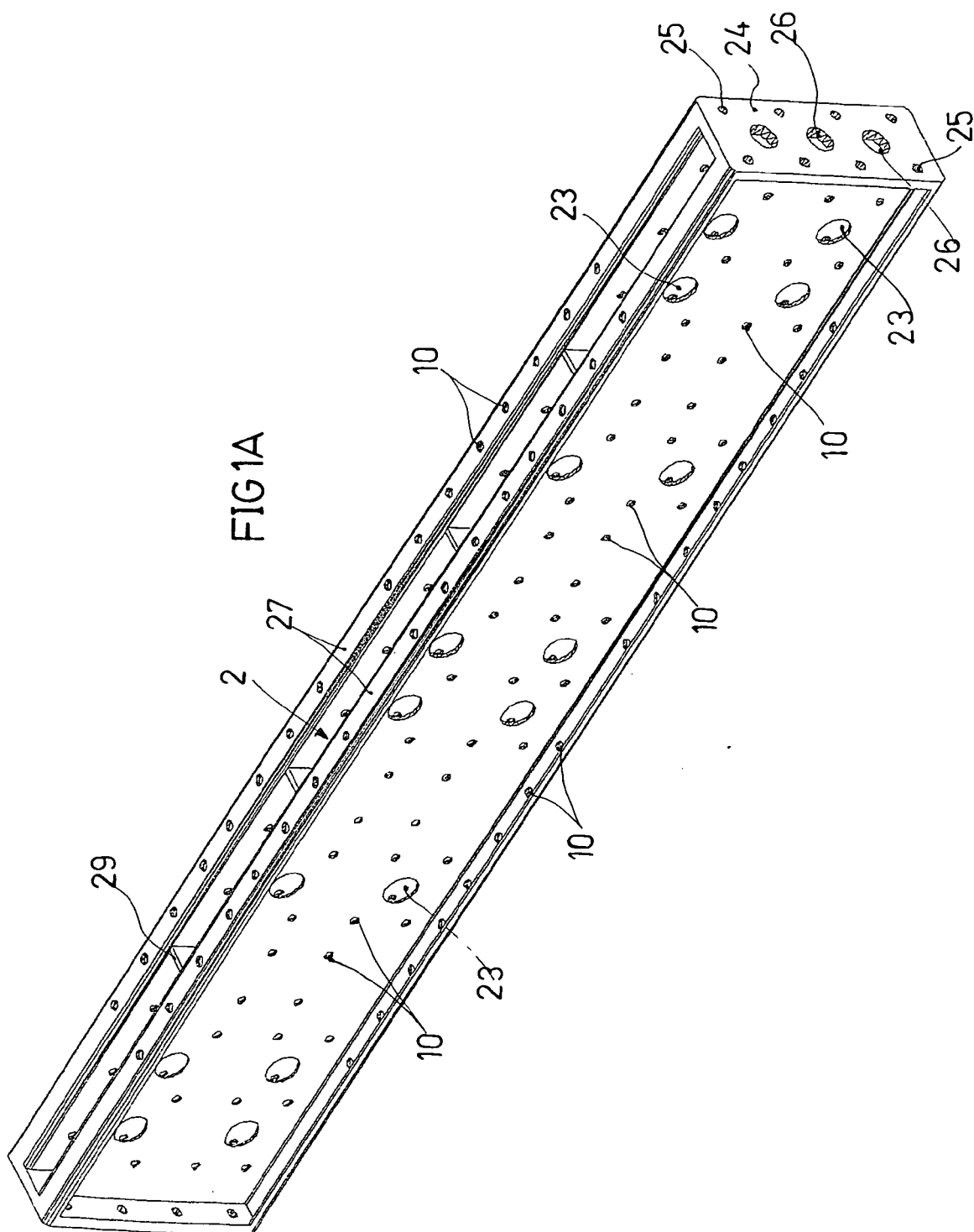


FIG1B

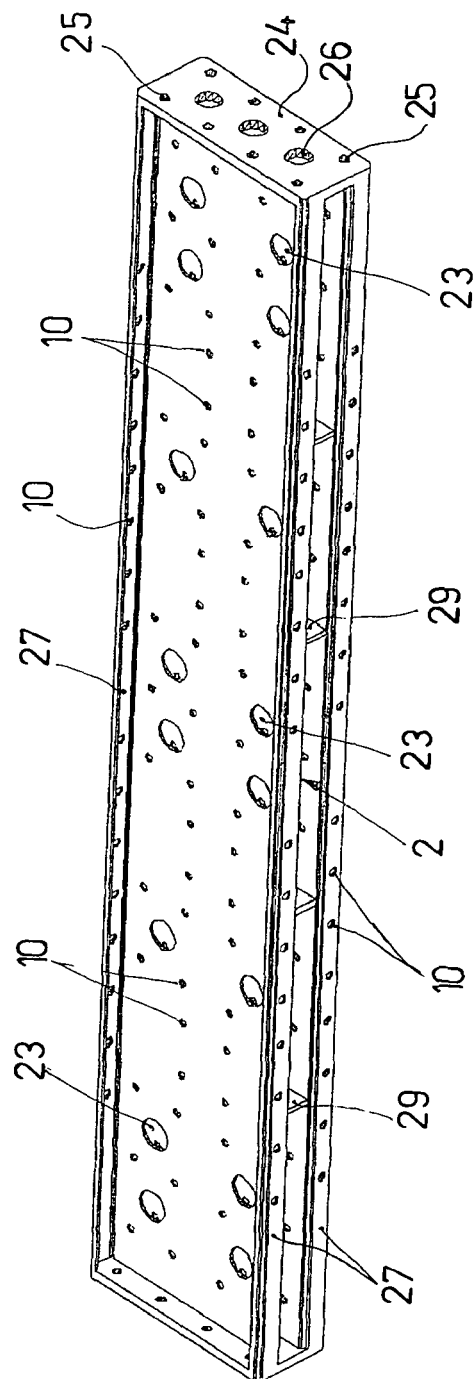
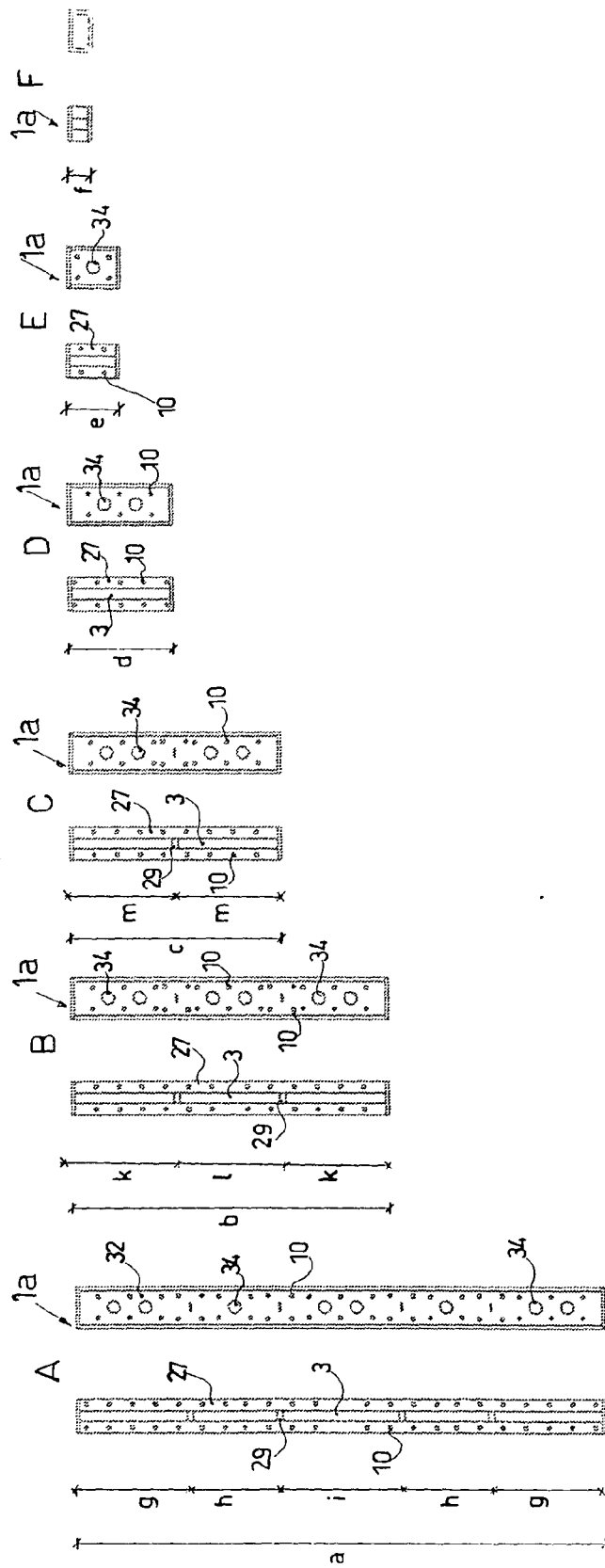


FIG.2



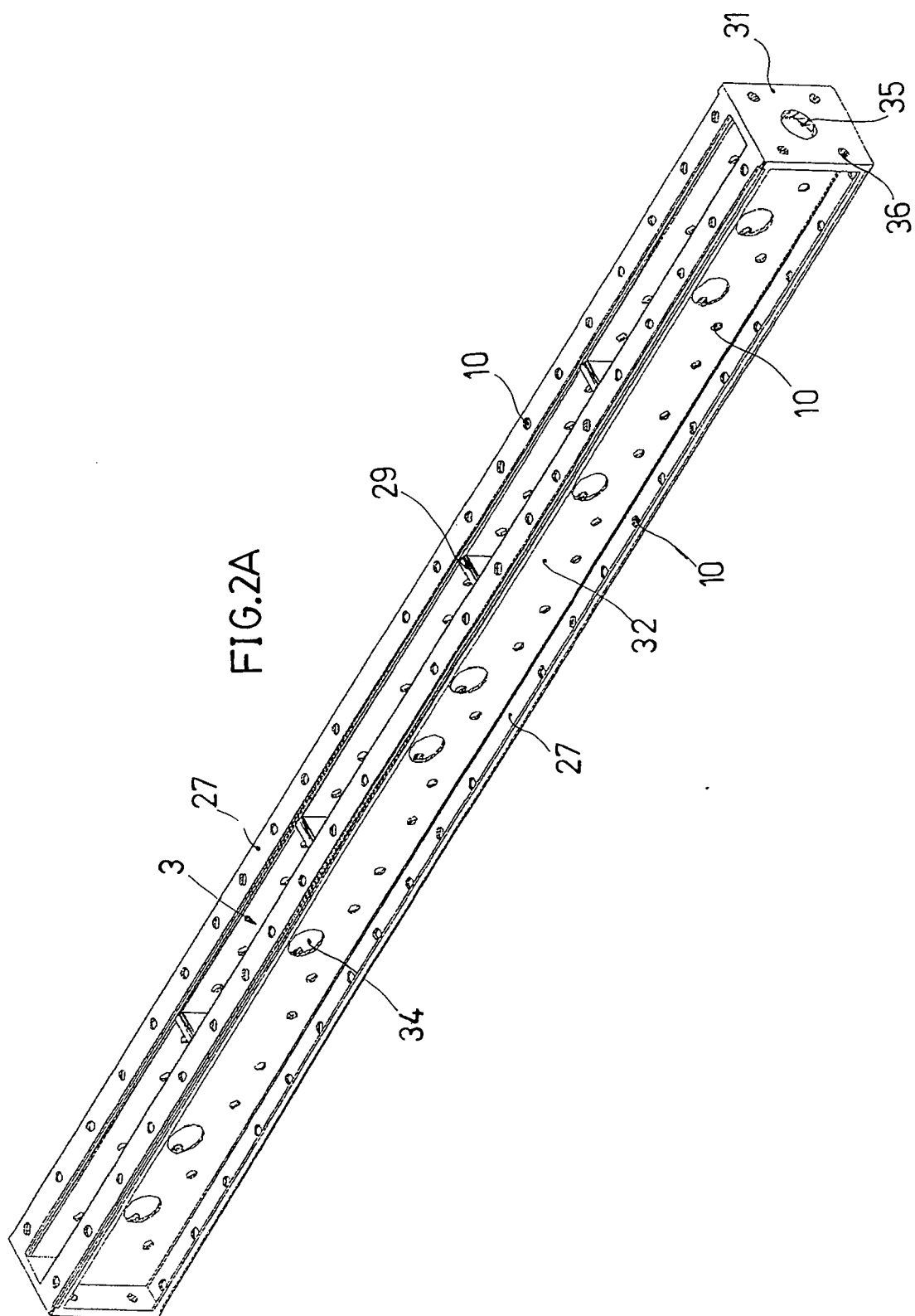


FIG 2B

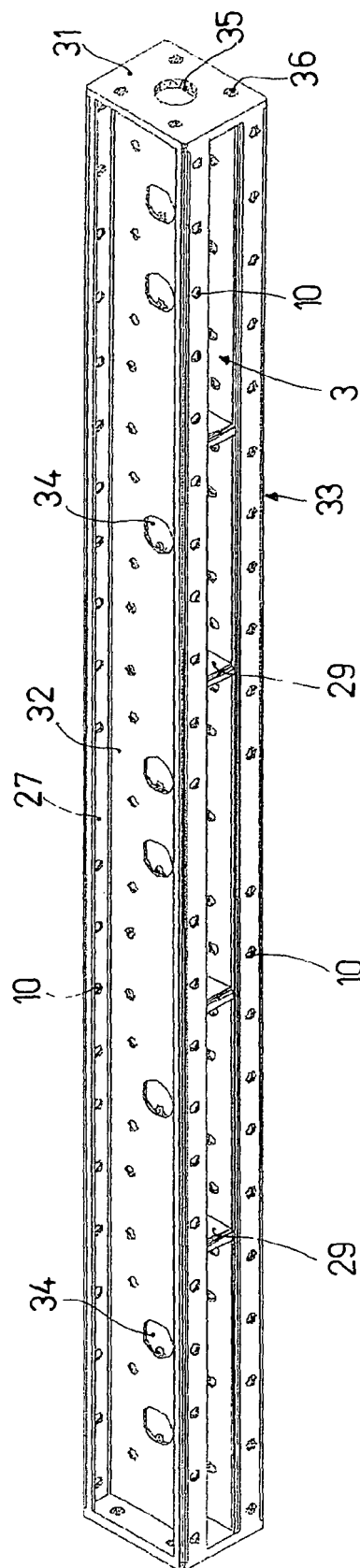


FIG.3

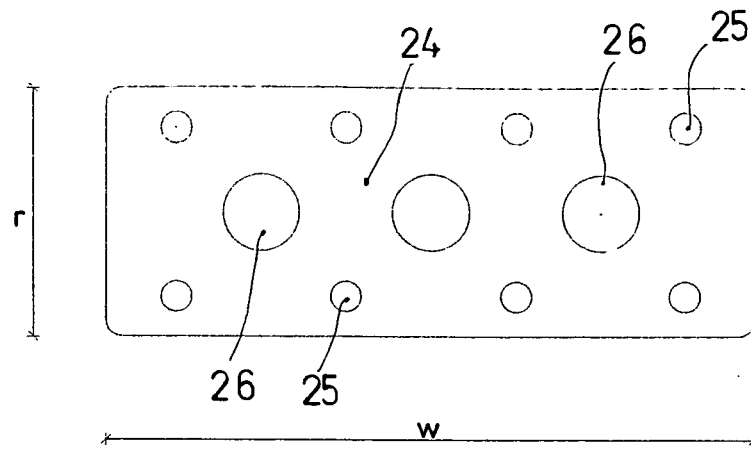


FIG.4

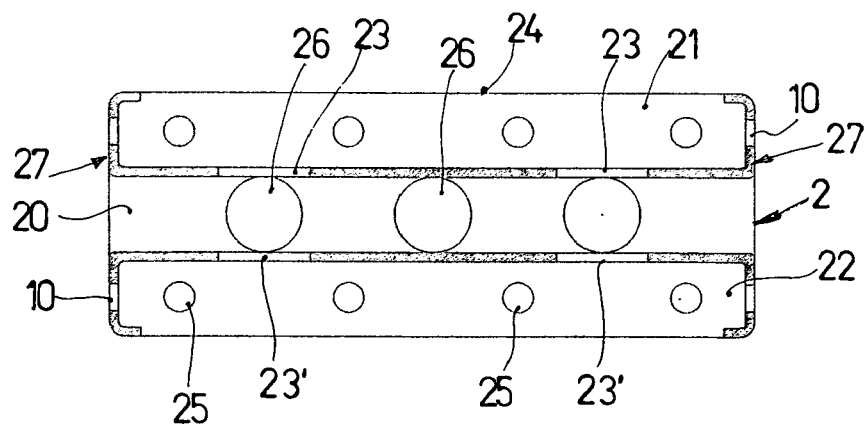


FIG.5

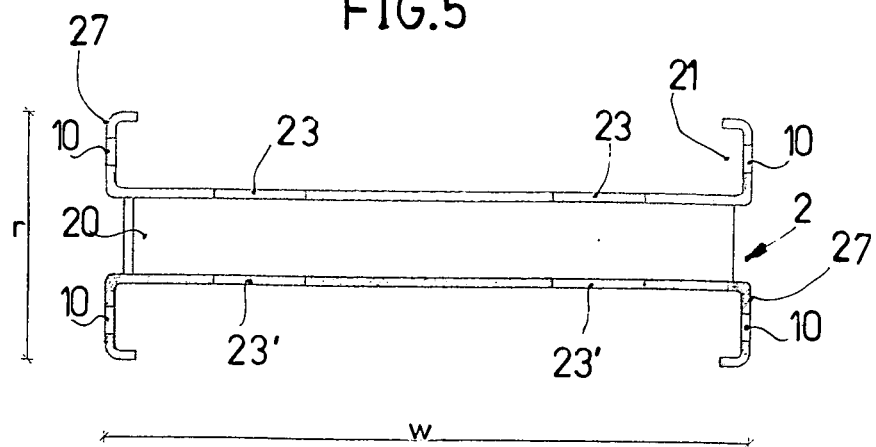


FIG.6

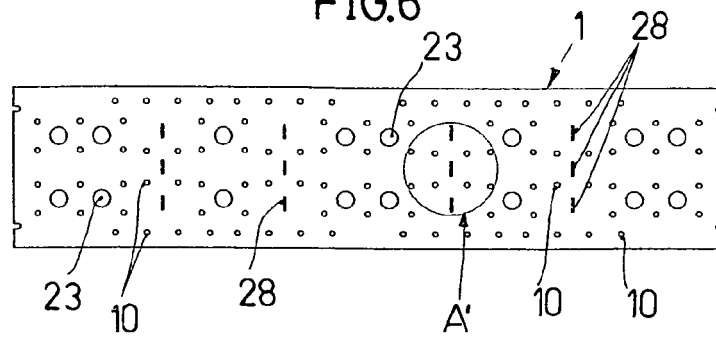


FIG.7

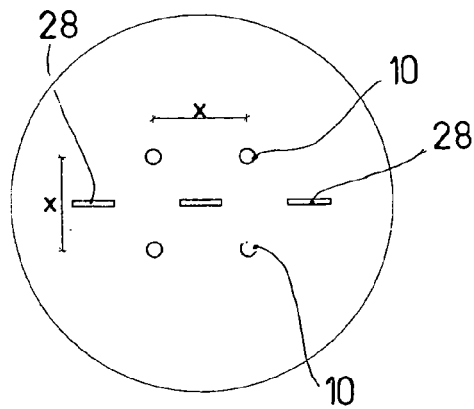


FIG.8

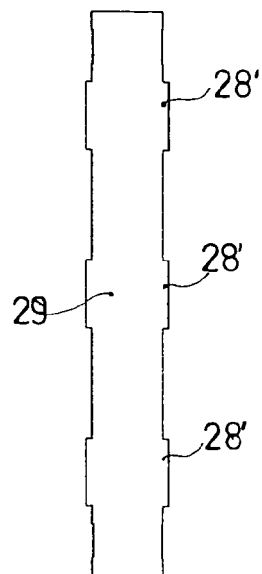


FIG.9

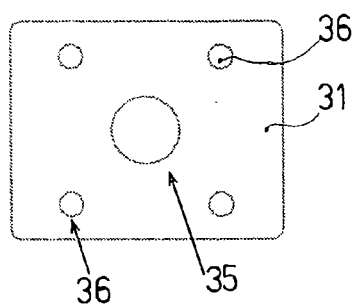


FIG.11

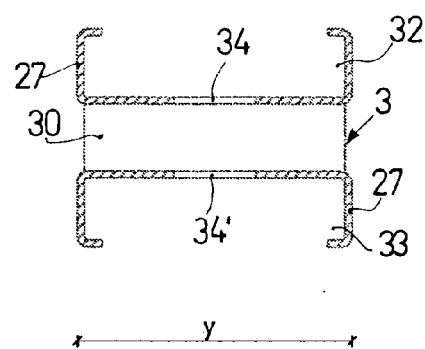
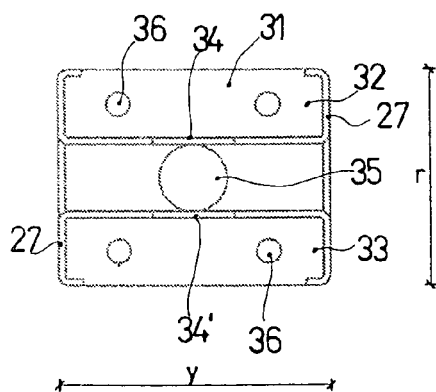


FIG.10





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 38 0009

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
D,X A	EP 1 566 504 A (BARBA CASTRO) 24 August 2005 (2005-08-24) * column 2, paragraph 13 - column 3, paragraph 18; claim 1; figures * -----	1 2-10	INV. E04C3/07 E04G11/50
			TECHNICAL FIELDS SEARCHED (IPC)
			E04C E04G
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 29 June 2007	Examiner Righetti, Roberto
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			

3
EPO FORM 1503 03.82 (F04C01)

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

EP 07 38 0009

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.

29-06-2007

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1566504	A	24-08-2005	NONE

EPO FORM P0459

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

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

- EP 043800408 A [0006]
- ES 2244253 A1 [0012]