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

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Chassis renforcé pour coffrage, éttayage, échafaudage etc...

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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.

[0010] A brochure, also from the SGB Group, entitled "The SGB Guide to Formwork and Shoring" and published in october 2003, discloses a similar light reinforced frame system to the one mentioned above. This system comprises all of the features of the preamble of claim 1.

INVENTIVE STEP

[0011] 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.

[0012] This aim is achieved by the combination of features described in claim 1.

DESCRIPTION OF THE INVENTION

[0013] 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.

[0014] 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.

[0015] According to the invention, the beam having a smaller section shares the same lightening holes of equal size (for example 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 cover 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.

[0016] 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.

[0017] The invention consists of the development of light, hollow "I"-beams made up of two "C"-shaped profiles for example 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 for example 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.

[0018] 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 for example circular transverse openworks equal in both beams, for example 60 mm in diameter, and the anchoring through holes are also equal in both beams, for example 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, for example 150 mm, intercalating between each pair a single lightening hole in the two beams of largest size having a longer length, for example 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.

[0019] 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 (for example 110 mm) in both cases and different but proportional thicknesses of for example 8 mm for the main beam plate and for example 6 mm for the purlin plate.

[0020] According to the invention, the main beam and the purlin, are arranged in said beams in five lengths comprised for example between 2500 mm and 500 mm, with differences of multiples of 500 mm between them. Furthermore, these beams may 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.

[0021] According to the invention, said connectors, a necessary element for carrying out any frame, may be 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.

[0022] According to the invention, the connectors , for better rationalization of the assembly operations and for ensuring greater resistance, may internally incorporate on the smaller diameter lightening holes respective locknuts 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.

[0023] The invention is also provided with an adjustable jack which may be 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.

[0024] According to the invention and as previously specified, this jack may be 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 semicylindrical, 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.

[0025] 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

[0026]

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 shows 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.

PREFERRED EMBODIMENT OF THE INVENTION

[0027] One preferred embodiment of the invention is interpreted according to the representations in said drawings and with the alphanumerical references provided therein.

[0028] Thus, the main beam is generally indicated with (1) and the purlin beam with (1a), which are provided 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.

[0029] 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.

[0030] 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).

[0031] The beams (1) and (1a) are covered at their ends by means of the corresponding cover plates (8) and (9), see figures 3 and 4, and figures 5 and 6. Said cover 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 cm for plate (8) and 6 cm for plate (9), varies.

[0032] 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.

[0033] For that purpose, said smaller diameter lightening holes (7) of the single connectors (10) and double connectors (11) are internally provided with nuts (7b) at-

tached 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.

[0034] 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).

[0035] 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).

[0036] 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.

[0037] Figure 20 shows 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. The reinforcement corresponding to the jack (13) is assembled in a through screw fastened by the reinforcements , one on each side, going through an anchoring hole of the end of a spindle .

[0038] 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 lie within the scope of the claims attached below .

Claims

1. A light reinforced frame system for forming, shoring, scaffolding or the like, comprising two types of light metal beams in "I"-shape and made up of facing "C"-shaped metal profiles having bent flanges and a hollow web (2) separated by spaced anchor pins, both types of beam having the same shape and section, and thus compensating for and complementing each other, but having a different size and width, the first type being a main beam (1) and the second type being an accessory beam or purlin (1a), each type being present in five different dimensions (A to E), with a further proportional complementary element (F) being added to each type, the two types having through lightening holes going through the webs, some having a larger diameter (5, 6) and some a smaller diameter (7, 7a), the beams being covered at their ends by means of corresponding cover plates (8, 9), said plates being coupled to one another by means of connectors (10, 11), the beams being further complemented with an adjustable jack (13), a diagonal reinforcement (20) for the strut or rod (27) and a diagonal reinforcement (23) for the adjustable jack, smaller diameter lightening holes (7a) being aligned with the longitudinal axis of the beam on all of the purlin beams (1a),
characterised in that
said cover plates (8, 9) have equal widths and different lengths,
in that said connectors are present as single connectors (10) and double connectors (11),
in that said larger diameter lightening holes (5) are arranged in pairs, and in the case of the two largest sizes of each type of beam between each pair there being a further independent larger diameter lightening hole (6), several smaller diameter lightening holes (7) being arranged in a group around each larger diameter lightening hole (5, 6) in an orthogonal formation on all of the main beams (1),
in that the distance (c) between centers of the larger diameter lightening holes (5) within each pair is equal among all of them and equal for all beams of both types, and the distance (c) between centers of the smaller diameter lightening holes (7, 7a) is equal among all of them and equal for all beams of both types, **in that** the distance between the end of each beam (1, 1 a) and the center of the larger diameter lightening hole (5) nearest to said end is equal for all beams,
and **in that** the distance between the end of each beam (1, 1 a) and the center of the smaller diameter lightening hole or holes (7, 7a) nearest to said end is equal for all beams.

2. A light reinforced frame system according to claim 1, further **characterised 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), both plates having the same width (b) equal to the width of each beam (1, 1a) and different lengths (a, b), each cover plate (8, 9) comprising a central larger diameter lightening hole (5) to coincide with the hollow web (2) of the beam (1, 1a) and smaller lightening holes (7) to coincide with the profiles (2a) and (2b) of the beam (1, 1a), the centers of said smaller lightening holes (7) being spaced by the same distance (n) in the two plates (8) and (9).

3. A light reinforced frame system according to claim 1, further **characterised in that** the single connector of the beams is a hollow hexahedral (10) body having on all its faces smaller diameter lightening holes (7) arranged in an orthogonal position and a distance (n) between their centers equal to that of the smaller diameter lightening holes (7) in the cover plates (8) and (9) and, therefore, being provided with six connection ways for main (1) or purlin (1a) beams.

4. A light reinforced frame system according to claim

3, further **characterised in that** the double connectors of the beams are hollow parallelepipedic bodies (11) made up of two single connectors with an empty spacing (12) between their elevations and have an orthogonal arrangement of smaller diameter lightening holes (7) with distances (n) between centers equal to that of the smaller diameter lightening holes (7) in the cover plates (8), larger diameter lightening holes (5) concentric to the smaller diameter lightening holes (7), and one further larger diameter lightening hole (5) coinciding with the empty spacing on both a base and on an upper surface of said double connector, the connector thus being provided with ten connection ways for main (1) or purlin (1a) beams.

5. A light reinforced frame system according to claim 4, further **characterised in that** in the single connectors (10) and the double connectors (12) the smaller diameter lightening holes (7) internally have fixed respective nuts (7b) allowing the direct screwing in of coupling elements.

6. A light reinforced frame system according to claim 1, further **characterised in that** the adjustable jack (13) is made up of a spindle (14) with an anchoring hole (15) on the end and is screwed into a 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 equal to that of the smaller diameter lightening holes (7) in the cover plates (8), said jack being able to be bound to the beams (1,1 a) in different diagonal positions by means of reinforcements (23) on a transverse screw assembled between two such reinforcements (23), one on each side of the beam.

7. A light reinforced frame system according to claim 1, further **characterised in that** the diagonal reinforcement for the strut or rod (27) is made up of a semicircular wedge-shaped part (20) having milled sides (21) between the body and sides, which milled sides (21) adapt to the edges of the larger diameter lightening holes (5), said diagonal reinforcement (20) being provided with a vertical axial borehole (22) through which the strut or rod (27) passes, fastened by means of nuts (28), one above and the other one below the wedge-shaped part (20).

8. A light reinforced frame system according to claim 1, further **characterised in that** the diagonal reinforcement (23) of the jack is a disk-shaped part having little thickness, provided with a concentric recess (24) causing a projection (25) at the base equivalent to its thickness, and being provided with a central concentric hole (26).

Patentansprüche

1. Leichtes verstärktes Rahmensystem zum Formen, Stützen, Einrüsten oder Ähnliches, das zwei Arten von leichten Metallbalken in "I"-Form umfasst, und aus "C"-förmigen zugewandten Metallprofilen besteht, die gebogene Flansche und einen Hohlsteg haben, der durch beabstandete Ankerbolzen getrennt ist, wobei beide Arten von Balken dieselbe Form und Querschnitt haben, und somit sich gegenseitig ausgleichen und ergänzen, aber eine unterschiedliche Größe und Breite haben, wobei die erste Art ein Hauptbalken (1) ist und die zweite Art ein Zusatzbalken oder Pfette (1a) ist, wobei jede Art in fünf unterschiedlichen Ausmaßen (A bis E) vorliegt, mit einem weiteren verhältnismäßigen Gegenstück (F), das jeder Art zugefügt wird, wobei die beiden Arten durch den Steg durchgehende Erleichterungslöcher haben, wobei einige einen größeren Durchmesser (5, 6), und einige einen kleineren Durchmesser (7, 7a) haben, wobei die Balken an ihren Enden mittels entsprechenden Deckplatten (8, 9) bedeckt sind, wobei die genannten Platten untereinander mittels Steckverbindern (10, 11) gekoppelt sind, wobei die Balken desweiteren durch einen einstellbaren Hebebock (13) ergänzt werden, einer diagonalen Verstärkung (20) für die Strebe oder Stange (27) und einer diagonalen Verstärkung (23) für den einstellbaren Hebebock (13), wobei die Erleichterungslöcher (7a) kleineren Durchmessers mit der Längsachse des Balkens auf allen Pfetten (1a) fluchtend angeordnet sind,
dadurch gekennzeichnet, dass
die genannten Deckplatten (8, 9) gleiche Breiten und unterschiedliche Längen haben,
dass die genannten Steckverbinder als einzelne Steckverbinder (10) und Doppelsteckverbinder (11) vorliegen,
dass die genannten Erleichterungslöcher (5) größeren Durchmessers in Paaren angeordnet sind, und im Falle der zwei größten Größen jeder Balkenart zwischen jedem Paar ein weiteres getrenntes Erleichterungsloch (6) größeren Durchmessers vorliegt, wobei mehrere Erleichterungslöcher (7) kleineren Durchmessers in einer Gruppe um jedes Erleichterungsloch (5, 6) größeren Durchmessers herum in einer orthogonalen Formierung auf allen Hauptbalken (1) angeordnet sind, dass der Abstand (c) zwischen den Mittelpunkten der Erleichterungslöcher (5) größeren Durchmessers in jedem Paar unter allen gleich ist und für alle Balken beider Arten gleich ist, und der Abstand (c) zwischen den Mittelpunkten der Erleichterungslöcher (7, 7a) kleineren Durchmessers unter allen gleich ist und für alle Balken beider Arten gleich ist,
dass der Abstand zwischen dem Ende jedes Balkens (1, 1a) und dem Mittelpunkt des Erleichterungslochs (5) größeren Durchmessers, das dem genannten

Ende am nächsten gelegen ist, für alle Balken gleich ist,
und dass der Abstand zwischen dem Ende jedes Balkens (1, 1a) und dem Mittelpunkt des (oder der) Erleichterungsloch/-löcher (7, 7a) kleineren Durchmessers, das (die) dem genannten Ende am nächsten gelegen ist (sind), für alle Balken gleich ist.

2. Leichtes verstärktes Rahmensystem nach Anspruch 1, desweiteren **dadurch gekennzeichnet, dass** die Deckplatte des Hauptbalkens (1) eine rechteckige Platte (8) ist, und die Deckplatte des Pfettenbalkens (1a) eine quadratische Platte (9) ist, wobei beide Platten dieselbe Breite (b), die der Breite jedes Balkens (1, 1a) entspricht, und unterschiedliche Längen (a, b) haben, wobei jede Deckplatte (8, 9) ein zentrales Erleichterungsloch (5) größeren Durchmessers umfasst, um mit dem Hohlsteg (2) des Balkens (1, 1a) überein zu stimmen, und kleinere Erleichterungslöcher (7), um mit den Profilen (2a) und (2b) des Balkens (1, 1a) überein zu stimmen, wobei die Mittelpunkte der genannten kleineren Erleichterungslöcher (7) durch denselben Abstand (n) in den beiden Platten (8) und (9) getrennt sind.

3. Leichtes verstärktes Rahmensystem nach Anspruch 1, desweiteren **dadurch gekennzeichnet, dass** der einzelne Steckverbinder der Balken ein hohler sechsflächiger Körper (10) ist, der an all seinen Seiten Erleichterungslöcher (7) kleineren Durchmessers hat, die in einer orthogonalen Position und mit einem Abstand (n) zwischen ihren Mittelpunkten angeordnet sind, der dem der Erleichterungslöcher (7) kleineren Durchmessers in den Deckplatten (8) und (9) entspricht, und daher mit sechs Verbindungswegen für die Haupt- (1) und Pfettenbalken (1a) versehen ist.

4. Leichtes verstärktes Rahmensystem nach Anspruch 3, desweiteren **dadurch gekennzeichnet, dass** die Doppelsteckverbinder der Balken hohle parallelepipedische Körper (11) sind, die aus zwei einzelnen Steckverbindern mit einer Freilücke (12) zwischen ihren Erhebungen aufgebaut sind, und eine orthogonale Anordnung von Erleichterungslöchern (7) kleineren Durchmessers mit Abständen (n) zwischen Mittelpunkten haben, die dem der Erleichterugnslöcher (7) kleineren Durchmessers in den Deckplatten (8) entsprechen, Erleichterungslöcher (5) größeren Durchmessers, die zu den Erleichterungslöchern (7) kleineren Durchmessers konzentrisch sind, und ein weiteres Erleichterungsloch (5) größeren Durchmessers, das mit der Freilücke sowohl auf einer Grundfläche, als auch auf einer oberen Fläche des genannten Doppelsteckverbinders, wobei der Steckverbinder somit mit zehn Verbindungswegen für die Haupt- (1) oder Pfettenbalken (1a) versehen ist.

5. Leichtes verstärktes Rahmensystem nach Anspruch 4, desweiteren **dadurch gekennzeichnet, dass** bei den einzelnen Steckverbindern (10) und den Doppelsteckverbindern (12) im Innern der Erleichterungslöcher (7) kleineren Durchmessers jeweilige Muttern (7) befestigt sind, die ein direktes Einschrauben der Kopplungselemente erlauben.

6. Leichtes verstärktes Rahmensystem nach Anspruch 1, desweiteren **dadurch gekennzeichnet, dass** der einstellbare Hebebock (13) aus einer Spindel (14) mit einem Verankerungsloch (15) am Ende aufgebaut ist, und in einen entsprechenden Zylinder (17) eingeschraubt ist, der mit einer Grundplatte (18) verbunden ist, die mit Stützpfeilern (19) verstärkt ist und mit Erleichterungslöchern (7) kleineren Durchmessers versehen ist, die gleichermaßen mit einer Lücke (n) zwischen Mittelpunkten angeordnet sind, die der der Erleichterungslöcher (7) kleineren Durchmesser in den Deckplatten (8) entspricht, wobei der genannte Hebebock mit den Balken (1, 1a) in unterschiedlichen diagonalen Positionen mittels Verstärkungen (23) auf einer Querschraube verbunden werden kann, die zwischen zwei solcher Verstärkungen (23) zusammengesetzt ist, einer auf jeder Seite des Balkens.

7. Leichtes verstärktes Rahmensystem nach Anspruch 1, desweiteren **dadurch gekennzeichnet, dass** die diagonale Verstärkung für die Strebe oder Stange (27) aus einem halbkreisförmigen, keilförmigen Teil (20) aufgebaut ist, das gefräste Seiten (21) zwischen dem Körper und den Seiten hat, wobei sich die gefrästen Seiten (21) den Kanten der Erleichterungslöcher (5) größeren Durchmessers anpassen, wobei die genannte diagonale Verstärkung (20) mit einem vertikalen axialen Bohrloch (22) versehen ist, durch welches die Strebe oder Stange (27) hindurchgeht, das durch Muttern (28) befestigt ist, das eine oberhalb und das andere unterhalb des keilförmigen Teils (20).

8. Leichtes verstärktes Rahmensystem nach Anspruch 1, desweiteren **dadurch gekennzeichnet, dass** die diagonale Verstärkung (23) des Hebebocks ein scheibenförmiges Teil ist, das geringe Dicke hat, das mit einem konzentrischen Aussparung (24) versehen ist, die einen Überstand (25) an der Grundfläche verursacht, der ihrer Dicke entspricht, und das mit einem zentralen konzentrischen Loch (26) versehen ist.

Revendications

1. Système de cadre léger renforcé pour formation, étaiement, échafaudage ou similaire comprenant deux types de poutrelles métalliques légères, sous

forme de "I" et constitué de profilés métalliques sous forme de C opposés ayant des rebords cintrés et une âme creuse (2) séparée par des boulons d'ancrage espacés, les deux types de poutrelle ayant la même forme et la même section qui ainsi se compensent et complémentent mais ayant une dimension et une largeur différentes, le premier type étant une poutrelle principale (1) et le second type étant une autre poutrelle accessoire ou panne (1a), chaque type étant présent dans cinq dimensions différentes (A à E), avec un autre élément complémentaire proportionnel (F) qui est ajouté à chaque type, les deux types ayant des trous d'allègement traversants à travers les âmes, quelques-uns ayant un plus grand diamètre (5, 6) et d'autres un diamètre plus petit (7, 7a), les poutrelles étant couvertes à leurs extrémités au moyen des plaques de recouvrement (8, 9) correspondantes, lesdites plaques étant couplées l'une à l'autre au moyen de connecteurs (10, 11), les poutrelles étant en outre complétées par un vérin ajustable (13), un renforcement diagonal (20) pour l'entretoise ou tringle (27) et un renforcement diagonal (23) pour le vérin ajustable, des trous d'allègement (7a) de diamètre plus petit étant alignés avec l'axe longitudinal de la poutrelle sur toutes les pannes (1a),

caractérisé en ce que

lesdites plaques de recouvrement (8, 9) ont des largeurs identiques et les longueurs différentes,

en ce que lesdits connecteurs se présentent comme des connecteurs simples (10) e des connecteurs doubles (11),

en ce que lesdits trous d'allègement (5) de plus grand diamètre sont disposés par paires, et ayant dans le cas des deux dimensions plus grandes de chaque type de poutrelle entre chaque paire un autre trou d'allègement (6) de diamètre plus grand indépendant, plusieurs trous d'allègement (7) de diamètre plus petit étant disposés dans un groupe autour de chaque trou d'allègement (5,6) de diamètre plus grand dans une formation orthogonale sur toutes les poutrelles principales (1).

en ce que la distance (c) entre les centres des trous d'allègement (5) de plus grand diamètre de chaque paire est égale entre tous ceux-ci et égale pour toutes les poutrelles des deux types, et la distance (c) entre les centres des trous d'allègement (7, 7a) de diamètre plus petit est égale entre tous ceux-ci et égale pour toutes les poutrelles des deux types,

en ce que la distance entre l'extrémité de chaque poutrelle (1, 1a) et le centre du trou d'allègement (5) de plus grand diamètre le plus près de ladite extrémité est égale pour toutes les poutrelles,

et **en ce que** la distance entre l'extrémité de chaque poutrelle (1, 1a) et le centre du trou ou des trous d'allègement (7, 7a) de plus petit diamètre les plus près de ladite extrémité est égale pour toutes les poutrelles

2. Système de cadre léger renforcé selon la revendication 1, **caractérisé en outre en ce que** la plaque de recouvrement de la poutrelle principale (1) est une plaque rectangulaire (8), et la plaque de recouvrement de la panne (1a) est une plaque carrée (9), les deux plaques ayant la même largeur (b) identique à la largeur de chaque poutrelle (1, 1a) et des longueurs (a, b) différentes, chaque plaque de recouvrement (8, 9) comprenant un trou d'allègement (5) de diamètre plus grand pour coïncider avec l'âme creuse (2) de la poutrelle (1, 1a) et des trous d'allègement (7) plus petits pour coïncider avec les profilés (2a) et (2b) de la poutrelle (1, 1a), les centres desdits trous d'allègement (7) plus petits étant séparés par la même distance (n) dans les deux plaques (8) et (9).

3. Système de cadre léger renforcé selon la revendication 1, **caractérisé en outre en ce que** le connecteur simple des poutrelles est un corps creux hexaédrique (10) ayant sur toutes ses faces des trous d'allègement (7) de diamètre plus petit disposés dans une position orthogonale et une distance (n) entre ses centres identique à celle des trous d'allègement (7) de diamètre plus petit dans les plaques de recouvrement (8) et (9), et étant par conséquent pourvu de six modes de connexion pour la poutrelle principale (1) ou la panne (1a).

4. Système de cadre léger renforcé selon la revendication 3, **caractérisé en outre en ce que** les connecteurs doubles des poutrelles sont des corps creux parallélépipèdes (11) constitués par deux connecteurs simples avec un espacement vide (12) entre leurs élévations et qui ont une disposition orthogonale de trous d'allègement (7) de diamètre plus petit avec des distances (n) entre les centres identique à celle des trous d'allègement (7) de diamètre plus petit dans les plaques de recouvrement (8), des trous d'allégement (5) de diamètre plus grand concentriques aux trous d'allègement (7) de diamètre plus petit, et un autre trou d'allègement (5) de diamètre plus grand qui coïncide avec l'espacement vide aussi bien sur une base que sur une surface supérieure dudit connecteur double, le connecteur étant par conséquent pourvu de dix modes de connexion pour la poutrelle principale (1) ou la panne (1a).

5. Système de cadre léger renforcé selon la revendication 4 **caractérisé en outre en ce que** dans les connecteurs simples (10) et les connecteurs doubles (12), les trous d'allègements (7) de diamètre plus petit ont intérieurement des écrous fixés (7b) respectifs permettant le vissage direct des éléments de couplement.

6. Système de cadre léger renforcé selon la revendi-

cation 1, **caractérisé en ce que** le vérin ajustable (13) est constitué par un arbre (14) avec un trou d'ancrage (15) à l'extrémité et il est vissé à l'intérieur du cylindre correspondant (17) fixé à une embase (18) renforcée par des arc-boutants (19) et pourvu de trous d'allègement (7) de diamètre plus petit disposés équidistants avec un espacement (n) entre les centres identique à celui des trous d'allègement (7) de diamètre plus petit dans les plaques de recouvrement (8), ledit vérin pouvant être unie aux poutrelles (1, 1a) dans différentes positions diagonales au moyen de renforcements (23) sur une vis transversale (29) montée entre deux renforcements (23) de ce type, un de chaque côté de la poutrelle.

7. Système de cadre léger renforcé selon la revendication 1, **caractérisé en outre en ce que** le renforcement diagonal de l'arc-boutant ou tringle (27) est constitué d'une partie sous forme de coin semi-circulaire (20) ayant des côtés cannelés (21) entre le corps et les côtés, lesdits côtés cannelés (21) s'adaptent aux bords des trous d'allègement (5) de diamètre plus grand, ledit renforcement diagonal (20) étant pourvu d'une perforation axiale verticale (22) à travers laquelle passe l'arc-boutant ou tringle (27), fixé au moyen des écrous (28), l'un sur la partie sous forme de coin (20) et l'autre sous celle-ci.

8. Système de cadre léger renforcé selon la revendication 1, **caractérisé en outre en ce que** le renforcement diagonal (23) du vérin est une partie sous forme de disque qui a une petite épaisseur, pourvue d'un évidemment concentrique (24) qui génère une projection (25) sur la base équivalent à son épaisseur, et étant pourvu d'un trou concentrique central (26).

FIG.1

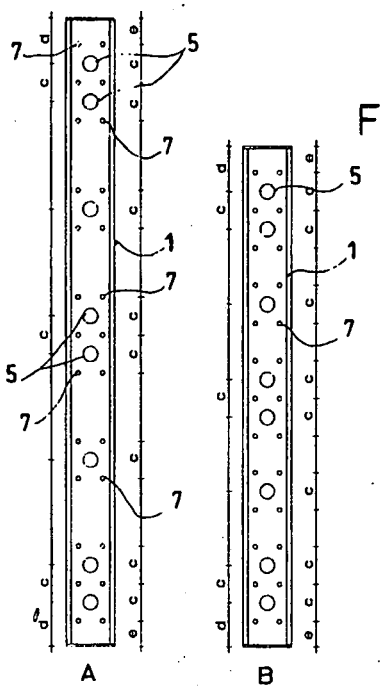

FIG.3

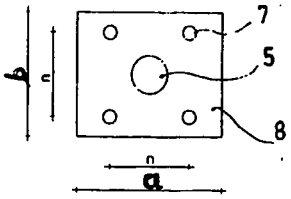

FIG.4

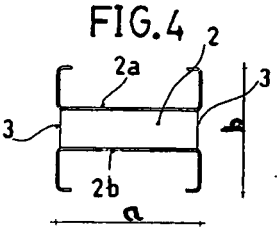

FIG.2

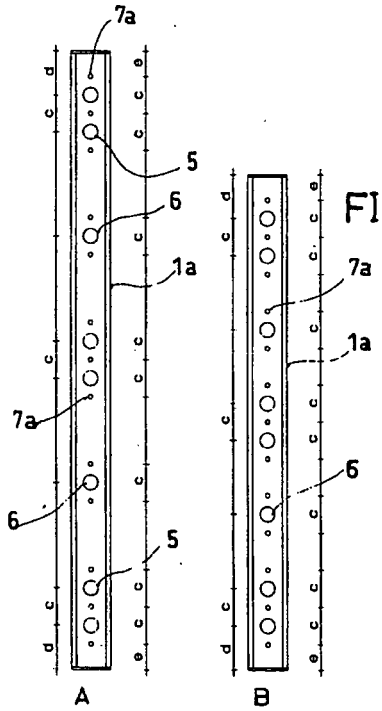

FIG.5

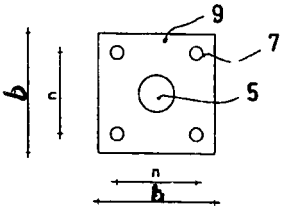

FIG.6

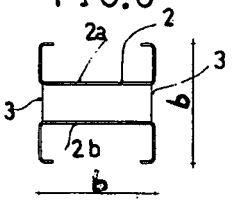

FIG.7

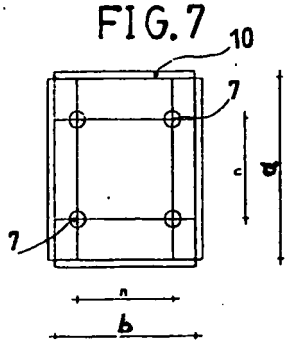

FIG.8

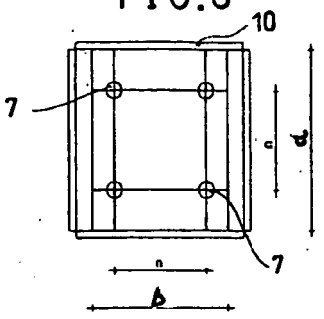

FIG.9

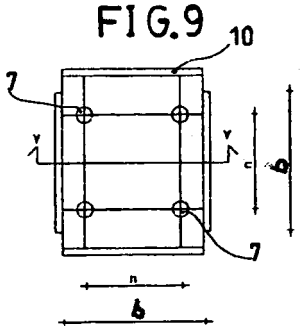

FIG9B

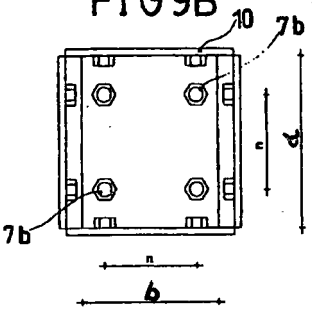

FIG.10

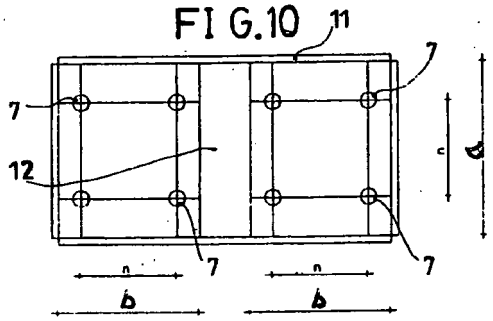

FIG.11

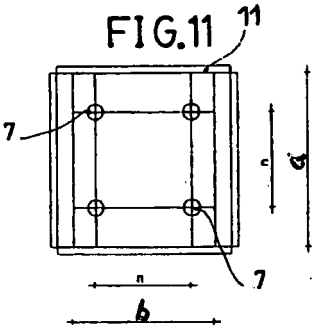

FIG.12

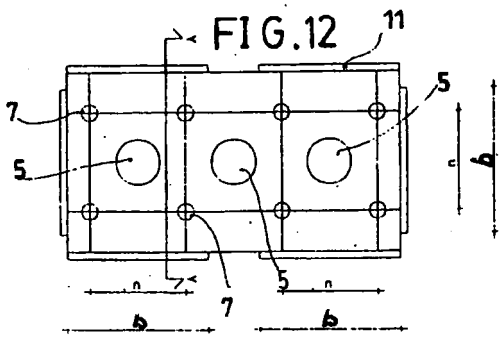

FIG.12B

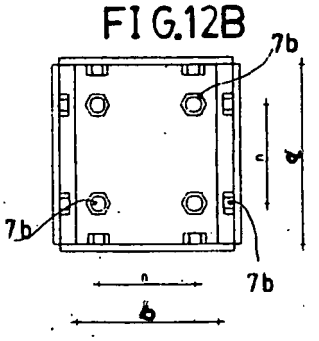

FIG 7A

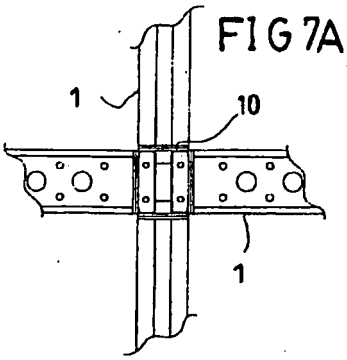

FIG.8A

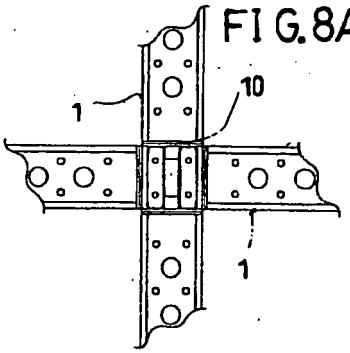

FIG.9A

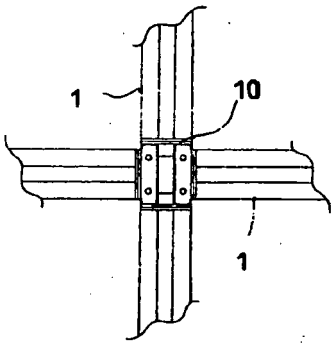

FIG 10A

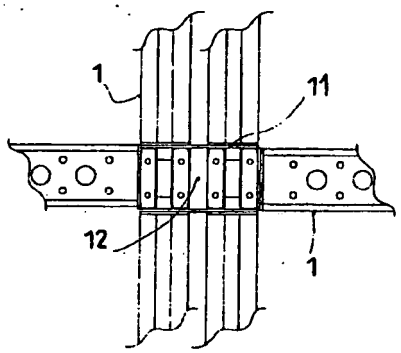

FIG 11A

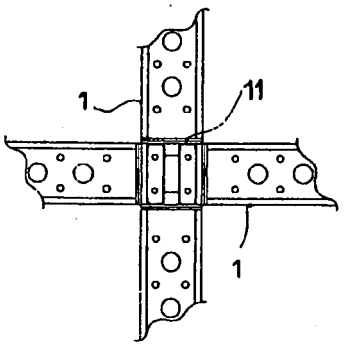

FIG 12A

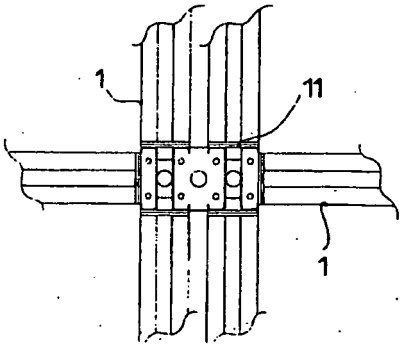

FIG.13

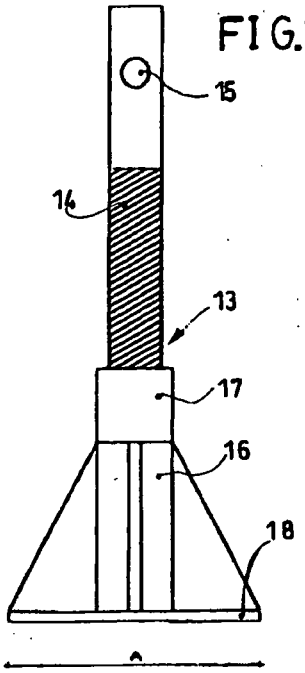

FIG.14

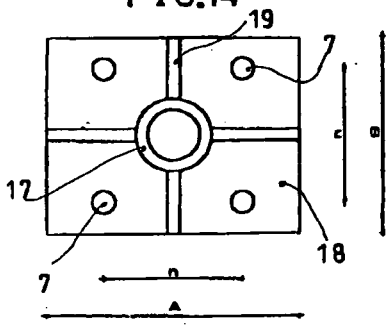

FIG.15

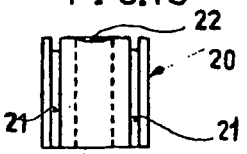

FIG.16

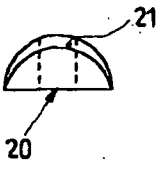

FIG.17

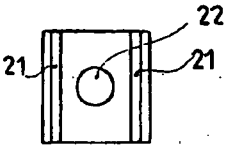

FIG.18

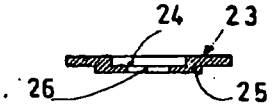

FIG.19

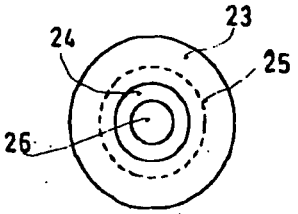

FIG.20