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(54) **System comprising a beam, a corrugated sheet and a connector**

System mit einem Träger, einem Wellblech und einem Verbinder

Système avec une poutre, une tôle ondulée et un connecteur

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EP-A2- 1 361 396 DE-A1- 2 023 635
DE-A1- 3 820 476 JP-U- 62 154 042

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Description

[0001] The present finding regards a system comprising a beam, a corrugated trapezoidal sheet and a connector on said corrugated trapezoidal sheet.

[0002] A typical case of use of this kind of system is the one supporting a concrete slab. The connector mainly exercises a resistance against the horizontal movement between the underlying beam and the slab. Furthermore, the connector is shaped in such a manner to resist against vertical detachment forces between the beam and the slab.

[0003] As known in the building industry there often arises the problem regarding proper connection of steel beams with a concrete slab. The steel beams are referred to as primary or secondary depending on their importance from a static point of view in the building industry. The structure of the transverse section of these beams can be extremely varied and, strictly for exemplification purpose, only IPE or HE beams are mentioned hereinafter. On the upper part, the beams are covered with a layer of concrete and thus there is the possibility of providing for reciprocal fastening between the beam and the concrete itself.

[0004] As a matter of fact, in cases where the performance of these kind of connections are not provided for, the beams would require to be made with much greater dimensions, hence implying higher costs for manufacturing structures comprising the beams themselves. In practice, it is possible to ensure the connection between the steel and concrete material and considerably reduce the amount of steel used at the same time, consequently leading to advantages in terms of reducing both the manufacturing costs and the overall dimensions of the structure.

[0005] At times, provided on the upper part of the beams, are metal sheets, of the so called trapezoidal corrugated type, given that they have alternating furrows and reliefs; in particular, it is provided for that the concrete be applied over the sheets, which thus end up interposed between the concrete and the beams. Thus, when using trapezoidal corrugated sheets, reciprocal fastening between the underlying steel beam and the concrete slab through the trapezoidal corrugated sheet is required.

[0006] In order to allow these connections many types of connectors have been invented and among which the one described in the EP-A-0504500 document, of the same applicant, which regards a connector-pin provided with a fastening plate and studs or any other fastening material.

[0007] EP-A-0 504 500 discloses a system according to the preamble of claim 1.

[0008] Other connectors of the State of the art are described in EP 1 582 644 A1; DE 38 20 476 A1; JP 62 154042 U and DE 20 23 635 A1.

[0009] The objective of the present invention is to provide a system comprising a connector of the type described above, easier to mount and also more resistant

once mounted, with respect to similar connectors of the known type.

[0010] According to the invention, this is attained by providing a system according to claim 1.

[0011] The connector in said system is capable of adapting both to the presence of straight or U-shaped bars, for reinforcing the connection with the concrete, which will be arranged in proximity to the upper ends of said side edges, and also to the presence of possible ribs (usually referred to as bosses) at the bottom of the trapezoidal corrugated sheets.

[0012] These and other characteristics of the finding shall be described in details hereinafter, with reference to some of its particular embodiments, provided for exemplification purposes, with the aid of the attached drawings wherein:

- Figures 1-5 (tab. I) represent some views of the connector;
- Figures 6-10 (tab. II) represent the same views of the connector, provided with accessories and fastening means;
- Figures 11-14 (tab. III) represent alternative modes of the fastening means provided for in the connector;
- Figures 15-16 (tab IV) represent a system, in a cross-sectional view and side view respectively, applied on a filled slab; This system does not form part of the invention.
- Fig. 17 (tab. V) represents a cross-sectional view of the the system of the invention comprising a trapezoidal corrugated sheet;
- Figures 18, 19 and 20 (tab. VI) represent side views of the system of the invention comprising various types of trapezoidal corrugated sheets;
- Represented in fig. 21 (tab. VII) is the system of the invention comprising a plurality of connectors, applied in various ways onto beams also provided with a trapezoidal corrugated sheet.

[0013] In figures 1-5 it can be observed that the connector, generally indicated by 100, has a substantially rectangular-shaped base 1, which is fastenable against a beam (possibly through an interposed sheet), through one or more studs 2 or other equivalent fixed connection elements. Rising from said base are two substantially flat-shaped side edges 3 arranged slanting with respect to the abovementioned base, in such a manner to widen moving from the base upwards. Advantageously provided at the upper face of the side edges 3 are some grooves 4 provided with a widened end 4', to allow the insertion of a metal rod 5 (see figures 6-10) inside the same, which will serve as a reinforcement element for the concrete;

the insertion is conceived in a manner such that the rod cannot dislodge neither during the execution step, nor during the operation step when the connector exercises its resistance against the horizontal movement between the slab and the beam.

[0014] As observable in fig. 19, the connector subject of the finding shall be directly fastened against a trapezoidal corrugated sheet 7. The trapezoidal corrugated sheet 7 is provided with a boss 8 at the bottom of its furrows and, to allow the fastening of the connector against the sheet, it is provided that the bottom 1 of the base be advantageously wavy 9, purposely for adapting to the corresponding boss of the trapezoidal corrugated sheet; additionally, advantageously provided at the inner surface of the connector is a reinforcement rib 10.

[0015] On the other hand, figures 11-14 show that the fastening of the base 1 to the trapezoidal corrugated sheet shall require at least one fastening point, through studs 2 or other connection means, though the best results shall be obtained by means of a pair of studs, as illustrated in fig. 11.

[0016] As observable in figures 15 and 16 the device subject of the present invention shall be advantageously used for direct connection between the concrete 11 and the beam 6; this system does not form part of the claimed invention. Provided within the concrete are reinforcement ribs 5.

[0017] Fig. 17 shows that the connector is used in a system, wherein a trapezoidal corrugated sheet 7 is provided and in this system the connector shall be fastened against the beam 6 passing through the trapezoidal corrugated sheet.

[0018] Figures 18-20 show that the connector is adapted to be applied to various shapes of a trapezoidal corrugated sheet 7; obviously the structure of the base 1 of the connector shall vary depending on the boss 8 if provided on said trapezoidal corrugated sheet.

Claims

1. A system comprising a steel beam (6), a corrugated trapezoidal sheet (7) on top of said beam (6) and a connector (100) on top of said corrugated trapezoidal sheet, wherein the connector (100) is intended for the connection between said steel beam (6) and a concrete floor slab (11), which can be formed on top of said corrugated trapezoidal sheet (7), **characterised in that** the connector (100) has a rectangular shaped base (1) and two flat-shaped side wings (3), which are arranged inclined with respect to the base, in such a manner to widen moving from the base upwards, wherein the base of the connector (100) is fastened to the beam through a plurality of fastening elements (2) going through the corrugated trapezoidal sheet (7), and wherein the base of the connector (100) has a wavy relief (9), which is installed over a corresponding boss (8) provided at the bottom of a

furrow of the corrugated trapezoidal sheet (7).

2. A system according to claim 1, wherein said connector (100) has a groove (4) on the upper face of the side wings (3), ending with a widened end (4'), within which a rod (5) is intended to be accommodated for the reinforcement of the concrete floor slab (11), the insertion of the rod into the groove can be performed in such a manner that the rod cannot dislodge neither during the execution, nor during the operation step.
3. A system according to one or more of the preceding claims, **characterised in that** it has a reinforcement rib (10) at the lower portion of the connector (100) itself.
4. A system according to one or more of the preceding claims **characterised in that** said plurality of fixed fastening elements (2) are studs.

Patentansprüche

1. System, umfassend einen Stahlträger (6), ein Trapezblech (7) auf diesem Stahlträger (6) und einen Verbinder (100) auf diesem Trapezblech, wobei der Verbinder (100) für die Verbindung zwischen dem Stahlträger (6) und einer Betonbodenplatte (11) vorgesehen ist, die auf dem Trapezblech (7) ausgebildet sein kann, **dadurch gekennzeichnet, dass** der Verbinder (100) eine rechteckige Basis (1) und zwei flächige seitliche Flügel (3) aufweist, die derart zur Basis geneigt angeordnet sind, dass sie sich von der Basis her nach oben hin aufweiten, wobei die Basis des Verbinders (100) durch eine Vielzahl von Befestigungselementen (2) am Träger befestigt ist, die durch das Trapezblech (7) hindurchgehen, und wobei die Basis des Verbinders (100) eine wellenförmige Erhöhung (9) aufweist, die über einer entsprechenden Wölbung (8) installiert ist, die auf dem Boden einer Sicke des Trapezblechs (7) vorgesehen ist.
2. System nach Anspruch 1, bei dem der Verbinder (100) eine Nut (4) auf der oberen Fläche der seitlichen Flügel (3) aufweist, die mit einem aufgeweiteten Ende (4') endet, in dem die Unterbringung eines Stabs (5) für die Verstärkung der Betonbodenplatte (11) vorgesehen ist, wobei das Einsetzen des Stabs in die Nut so ausgeführt werden kann, dass der Stab weder während der Ausführung, noch während der Betriebsphase austreten kann.
3. System nach einem oder mehreren der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** es im unteren Bereich des Verbinders (100) eine Verstärkungsrippe (10) aufweist.

4. System nach einem oder mehreren der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** es sich bei der Vielzahl von festen Befestigungselementen (2) um Bolzen handelt.

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Revendications

1. Système comprenant une poutre d'acier (6), une tôle ondulée trapézoïdale (7) au-dessus de ladite poutre (6) et un connecteur (100) au-dessus de ladite tôle ondulée trapézoïdale, où le connecteur (100) est destiné à la connexion entre ladite poutre d'acier (6) et une dalle de plancher en béton (11), qui peut être formée au-dessus de ladite tôle ondulée trapézoïdale (7), **caractérisé en ce que** le connecteur (100) a une base de forme rectangulaire (1) et deux ailes latérales de forme plate (3), qui sont disposées inclinées par rapport à la base, de telle manière à s'élargir en se déplaçant de la base vers le haut, où la base du connecteur (100) est fixée à la poutre par le biais d'une pluralité d'éléments de fixation (2) traversant la tôle ondulée trapézoïdale (7), et où la base du connecteur (100) a un relief ondulé (9), qui est installé sur un bossage correspondant (8) prévu au fond d'un sillon de la tôle ondulée trapézoïdale (7).

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2. Système selon la revendication 1, où ledit connecteur (100) a une rainure (4) sur la face supérieure des ailes latérales (3), se terminant avec une extrémité élargie (4'), à l'intérieur de laquelle il est prévu de loger une tige (5) pour le renforcement de la dalle de plancher en béton (11), l'insertion de la tige dans la rainure pouvant s'effectuer de telle manière à ce que la tige ne puisse se déloger ni pendant l'exécution, ni pendant l'étape opérationnelle.

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3. Système selon une ou plusieurs des revendications précédentes, **caractérisé en ce qu'il** a une arête de renforcement (10) en correspondance de la partie inférieure du connecteur (100) lui-même.

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4. Système selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** ladite pluralité d'éléments de fixation fixes sont des goujons.

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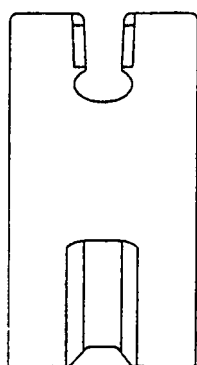


FIG. 3

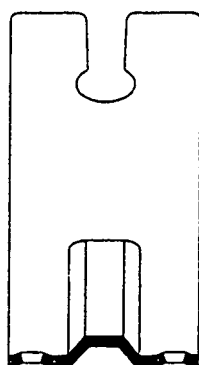


FIG. 4

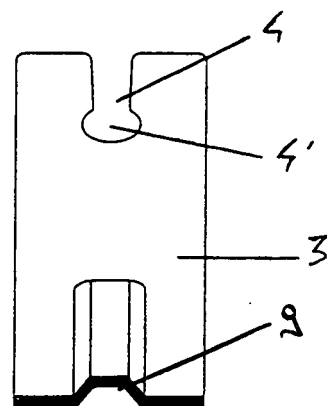


FIG. 5

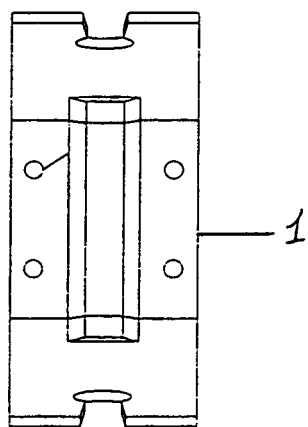


FIG. 1

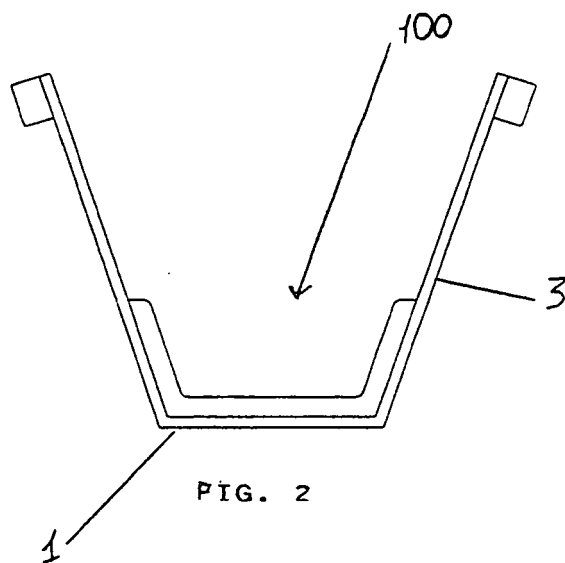
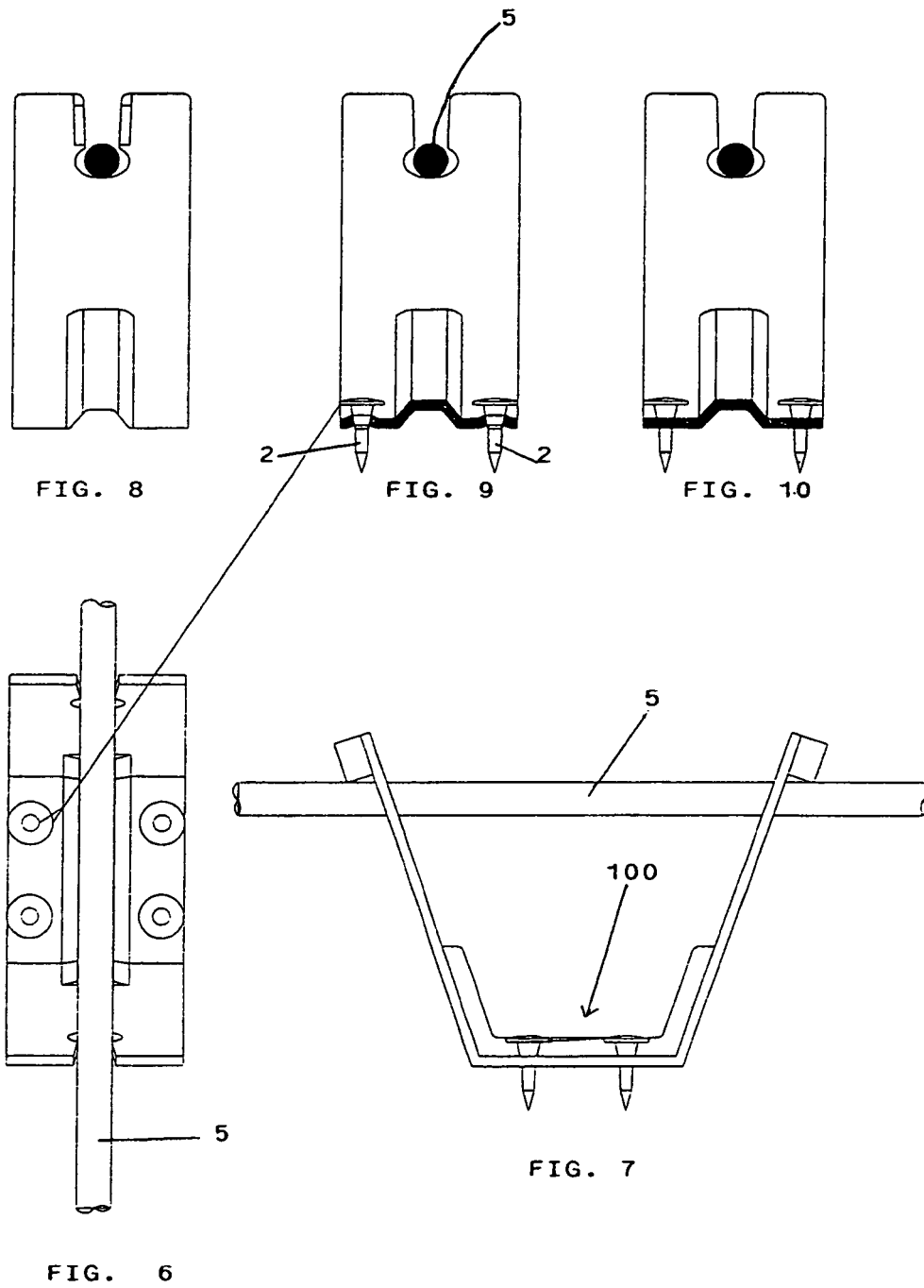


FIG. 2



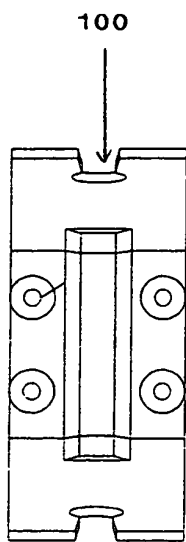


FIG. 11

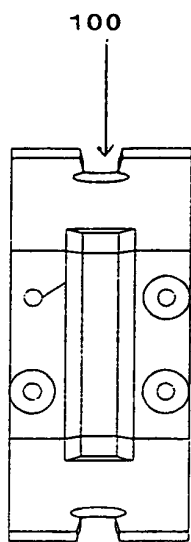


FIG. 12

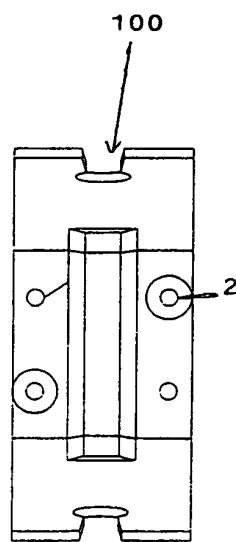


FIG. 13

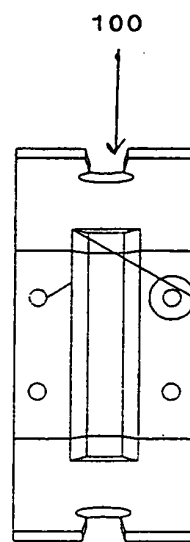


FIG. 14

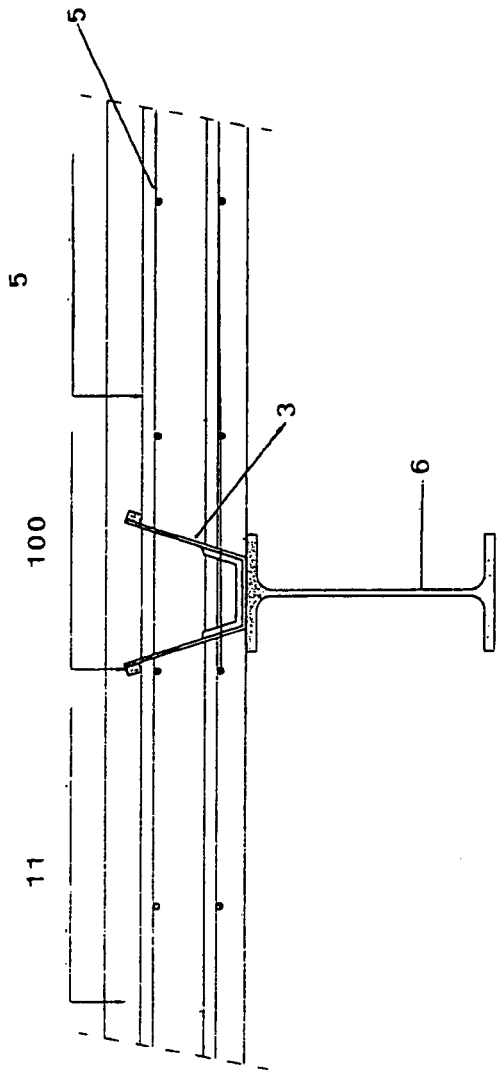


FIG. 15

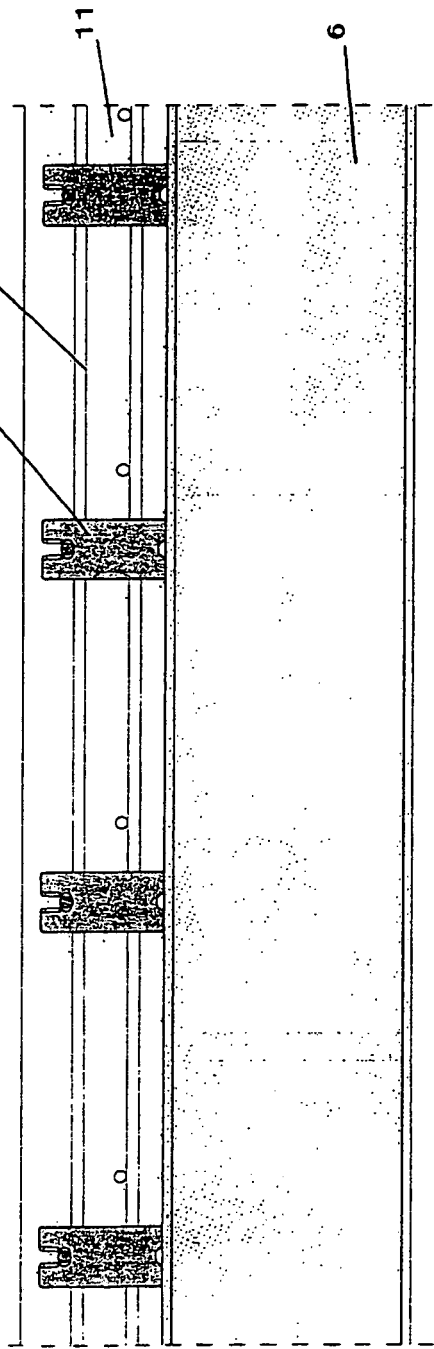


FIG. 16

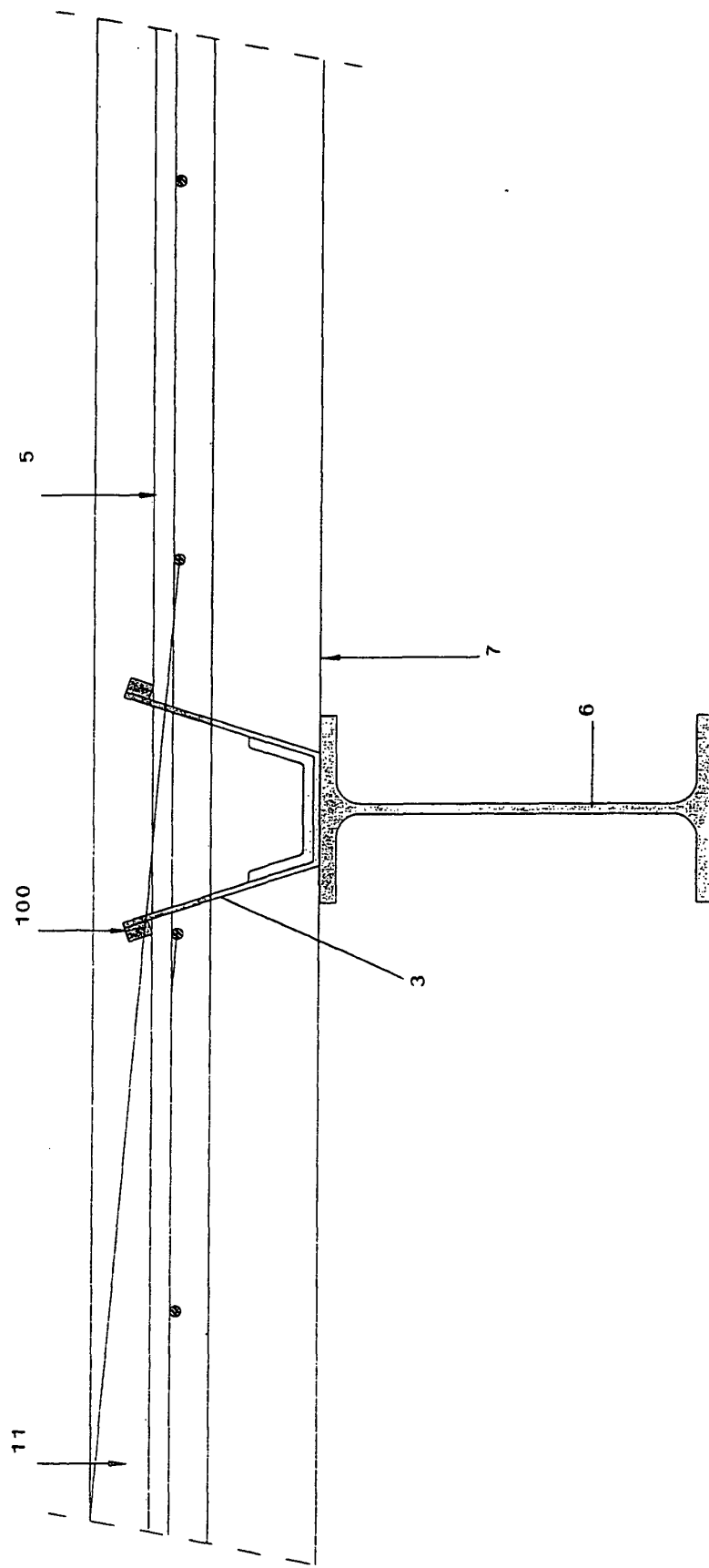
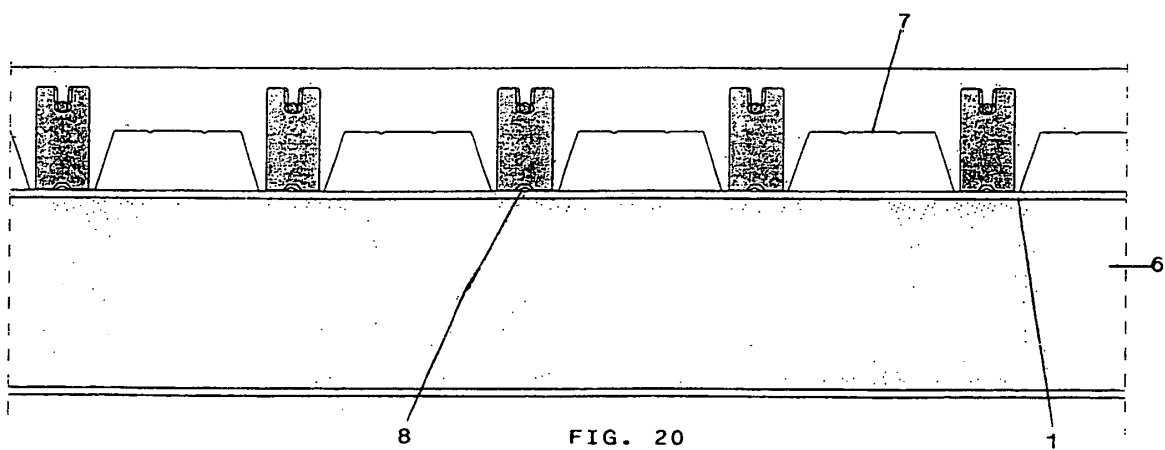
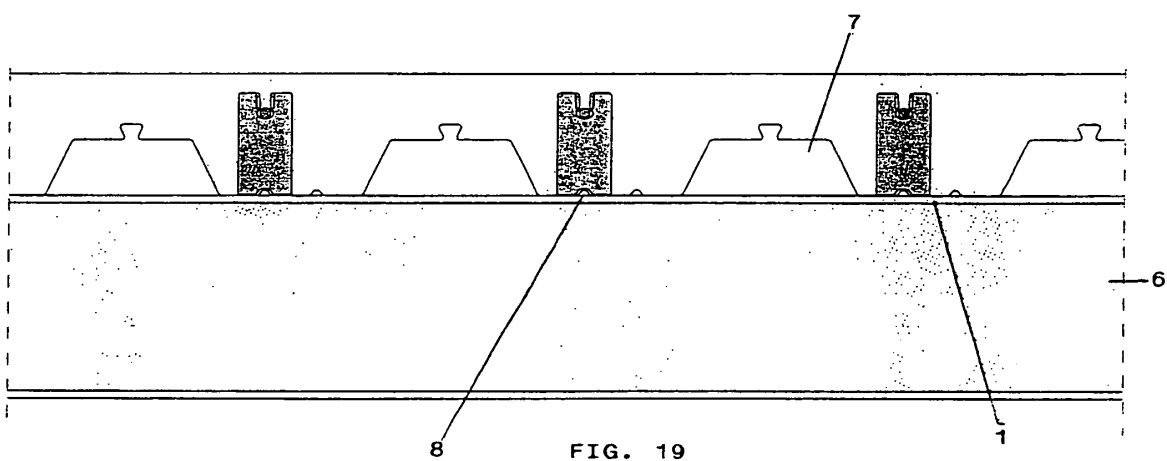
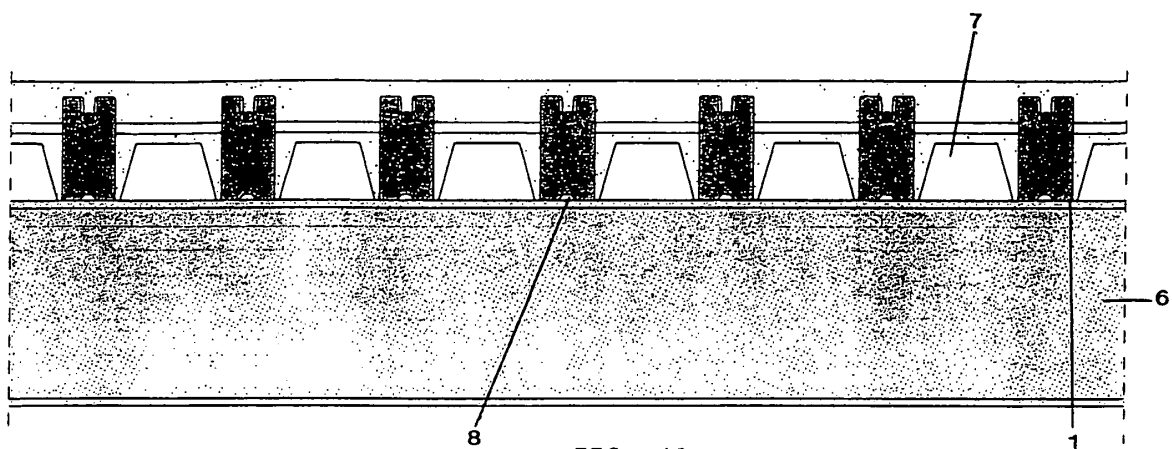


FIG. 17



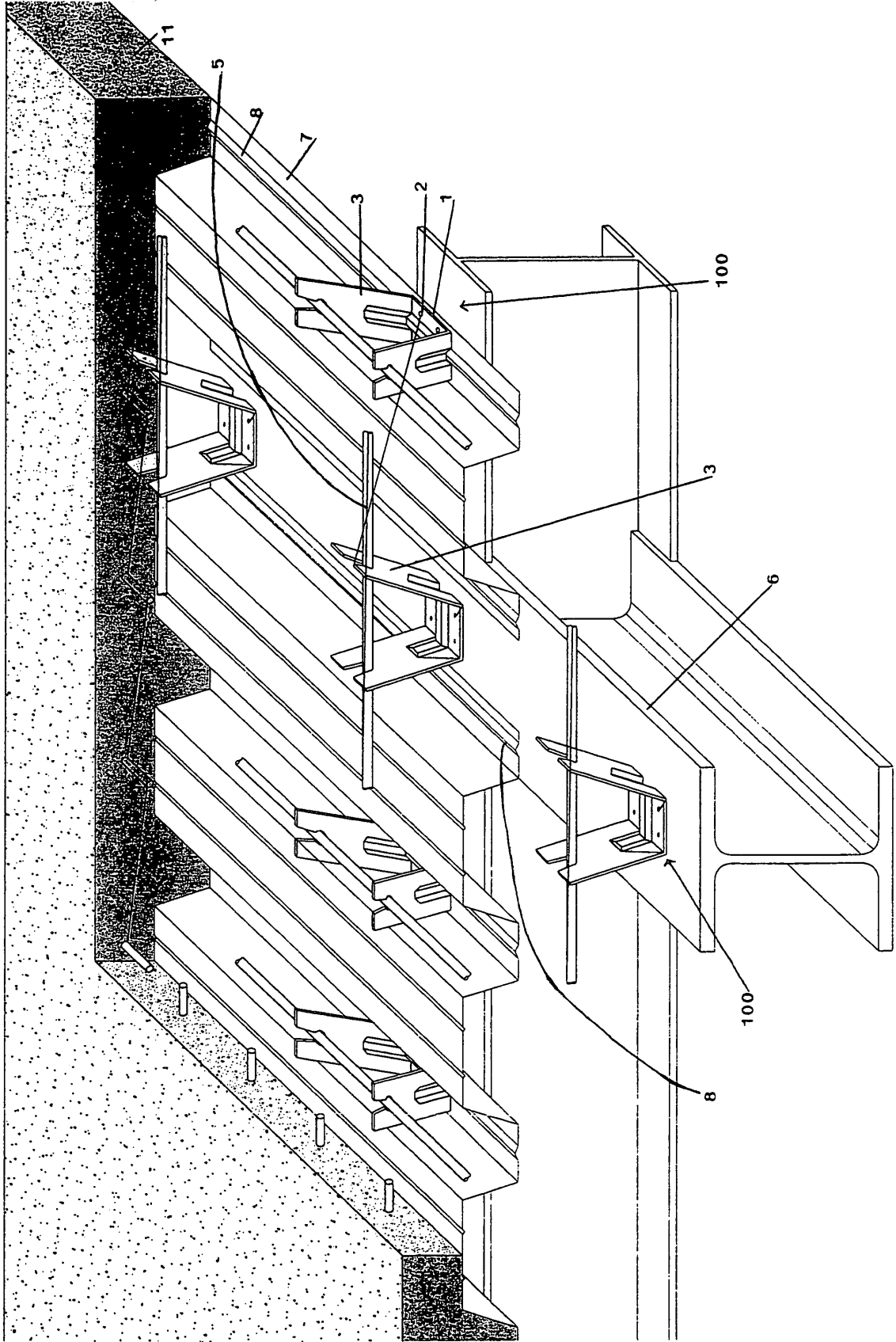


FIG. 21

REFERENCES CITED IN THE DESCRIPTION

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