

12 **EUROPEAN PATENT APPLICATION**

21 Application number: **90102953.8**

51 Int. Cl.⁵: **E04B 1/21**

22 Date of filing: **15.02.90**

30 Priority: **24.02.89 IT 1243189**

43 Date of publication of application:
29.08.90 Bulletin 90/35

64 Designated Contracting States:
AT BE CH DE ES FR GB GR LI LU NL SE

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DELLA RICERCA SCIENTIFICA E
TECNOLOGICA**

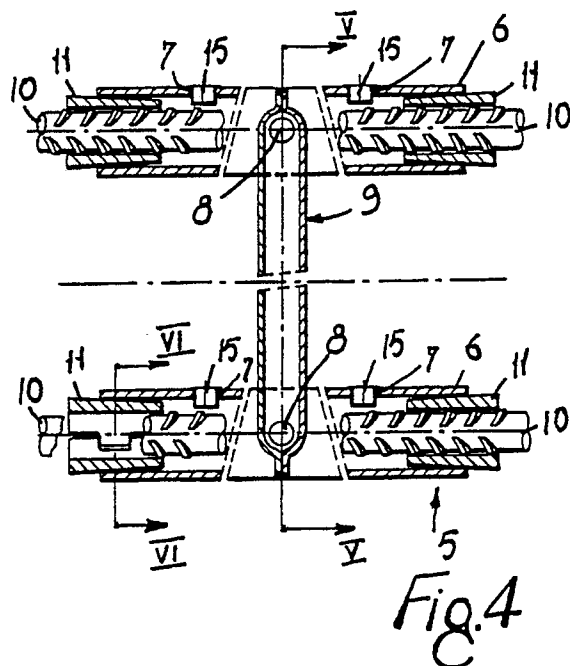
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54 **Device for interconnecting the pillars to the beams in prefabricated multistore buildings.**

57 At intermediate knots (4) of a pre-fabricated pillar (1) there are incorporated one or more bundles of metal pipes (6) which protrude from at least two opposite faces of said pillar and which are connected both mechanically and circuitally by an intermediate metallic box-type body (9), also incorporated in the pillar. Inserted through said pipes (6) are either the main or complementary reinforcement rods (10) of the flooring beams or panels abutting the pillar, so that said reinforcement rods (10) may have a structural continuity similarly to the reinforcement rods in said pillar at said knots. The reinforcement rods (10) are fixed and centered axially within said pipes (6) by means of conical and composite plugs (11) pressure-fitted in the ends of said pipes. The protruding portions of said pipes (6) are provided with vent holes (7) wherethrough expanding mortar may be injected into said pipes and, upon setting, it firmly secured the reinforcing rods (10) to the device of the invention.



The invention relates to a pillar-beam connecting device for multi-storey buildings using pre-fabricated pillars and is concerned with the pillars therefor using said device. The object of the invention is to provide pre-fabricated pillars made of reinforced and vibrated concrete, for multi-storey buildings, which at the zones where they are connected to the flooring beams or panels afford an internal reinforcement having structural continuity so as to permit a structural continuity also for either the main or the complementary reinforcements of said flooring beams or panels and to permit as well an effective mutual solidarization of said reinforcements.

These and other objects have been achieved by incorporating in the reinforcements of the pillar, at each knot for connection to the intermediate flooring structures, devices provided with at least one group of parallel pipes, interconnected by an intermediate box-type body communicating with said pipes through holes. The pipes protrude from the opposite faces of the pre-fabricated pillar body with portions of equal length and provided at the top thereof with a respective vent hole which is normally closed by a plug. In said pipes there are inserted rods of either the main or the complementary reinforcements of the floor beams or panels, whereafter said pipes are closed at the ends thereof by conical and composite plugs which also effect an initial fastening between the reinforcement and the pipes and which make said portions become aligned axially. By removing the plugs from the vent holes, expanding mortar may be injected, through one of said holes in the lower pipes, into the assembly of said pipes and into the associated interconnecting box-type body, whereafter said holes are plugged again. Upon setting, the expanding mortar firmly secures the reinforcing rods to said pipes. The pre-fabricated pillar using said device is, preferably, formed with a rectangular cross-section whose shorter sides are parallel to the pipes of said device, whereby the main or complementary reinforcements of the flooring structures abutting said shorter sides of the pillar section, may also be positioned in place with structural continuity characteristics, intersecting the protruding portions of said pipes with the possibility of being mechanically fastened to them and to the respective internal reinforcements.

The portions of the pipes of the device that are protruding from the pillar have hung therefrom small recoverable shelves serving as supports for the ends of the flooring beams or panels.

Further characteristics of the invention and the advantages resulting therefrom will be more apparent from the following description of a preferred embodiment thereof, shown merely as a non-limiting example in the Figures of the accompanying

two sheets of drawings, wherein:

Figures 1 and 2 are elevational views of two consecutive sides, respectively, of a pillar using connecting devices according to the invention;

Figure 3 is a cross-sectional view of a pillar at an intermediate knot, as indicated by the line III-III of Figure 1;

Figure 4 shows one of the connecting devices, as seen from the section line IV-IV of Figure 3;

Figures 5 and 6 show further structural details of the device of Figure 4, as seen from the section lines V-V and VI-VI, respectively;

Figure 7 is a front elevational view of the device, with an associated hopper for injection of expanding mortar;

Figure 8 is a top plan view showing the small shelves applied to the pre-fabricated pillars at the areas to be connected to the intermediate flooring structures;

Figures 9 and 10 show as many details of the shelves of Figure 8, as seen from the section lines IX-IX and X-X, respectively.

The pre-fabricated pillar 1 shown in the Figures 1 and 2 is suitable for the erection of a three-storey building, is provided at the bottom with annular recesses 2 for incorporation in the sill-casting, is provided at the top with protruding rods 3 for linking with the reinforcement rods of the roofing structure of the multi-storey building, and at the knots for connection to the intermediate-storey floorings it is provided with small annular recesses 4, for example, 25 cm high and 0.8 cm deep. From Figures 1 and 2 it can be appreciated that, for the reasons to be explained below, said pillar is of rectangular cross section. For merely illustrative purposes, it is noted that the pillar has a height $H = 9.65$ m and intermediate heights $H_1 = 3.65$ m and $H_2 = H_3 = 2.75$ m. The base dimensions are $L_1 = 60$ cm and $L_2 = 20$ cm, respectively.

The subject pillar is characterized in that it comprises an internal reinforcement with structural continuity at the intermediate knots 4 and, therefore, in that it has a high mechanical strength at said zones connected to the flooring structures. At each recess 4, said pillar has incorporated therein a pair of devices 5 of the type which is shown in Figures 4 and 5. Each device 5 comprises four metallic pipes 6 having the same suitable length, such as 50 cm, with an outer diameter of about 42-43 mm and a thickness of 4 mm. The pipes 6 are arranged parallel to each other and at the apexes of an imaginary rectangle having its longer sides disposed vertically. The center-to-center spacing of the pipes 6 is, for example, 93 mm and 115 mm, respectively, referred to the shorter side and the longer side of said imaginary rectangle. At a distance of about 50 mm from each end, each pipe 6

is provided at its top side with a hole 7 of suitable diameter, such as 12 mm, and said hole is normally closed by a removable plug 15, for example, made of plastics material. Said pipes 6 are provided, at the inner side thereof and at an intermediate position, with a hole 8 which is equal to the holes 7, and all holes 8 open into the interior of a flat box 9 made of metallic plates and secured to said pipes transversely and by means of weldings.

It is noted in Figure 4 that at each intermediate knot 4 of the pillar there are arranged two devices 5 as from Figures 4 and 5 in a side-by-side symmetrical arrangement, the pipes 6 being oriented perpendicularly to the wider faces of the pillar so as to protrude therefrom with portions of the same length (of the order of 15 cm).

The pipes 6 of the devices arranged at the intermediate knots of the pillar receive therethrough the rods 10 constituting either the main or the complementary reinforcement of the beams or the floor panels abutting the wider faces of the pillar, said reinforcements having, therefore, as structural continuity and interseting effectively the reinforcement of the pillar. After positioning the rods 10, these are centered axially in the pipes 6 while closing simultaneously the ends of the latter, by means of conical plugs 11 which are formed by two portions assembled with each other at diametrical positions (Figure 6) and provided at the contacting areas with ridges 12 and recesses 13 designed to engage with each other. After the plugs 11 have been applied, a hopper 14 terminating in a tapered duct 114 so sized as to enter the hole 7 of the underlying pipe 6, is fastened to one of the protruding portions of the upper pipes 6, so that by placing expanding mortar into the hopper, said mortar flows by the action of gravity into the lower pipes 6 and then, through the box 9, it reaches also the upper pipes 6 until it flows out through the respective vent holes 7. As soon as the mortar flows out of a hole 7, said hole is closed by means of plug 15. It is apparent how in the injection step of the expanding mortar, the holes 7 permit the air to be vented out of the parts 6-9 and, therefore, permit said mortar to fill said parts completely. Upon setting, said expanding mortar firmly secures the rods 10 to the device 6-9 and, therefore, to the internal reinforcement of the pillar 1.

The rods of either the main or the complementary reinforcement of the flooring elements abutting the shorter sides of the intermediate knots 4 of the pillar, are passed through the upper pairs of the protruding portions of the pipes 6 of said devices 5 and will be fixed thereto by means of the final casting of the floors. However, it is to be understood that affixing may be effected previously by means of clamps, brackets, or other suitable devices, all in a manner which can be easily con-

ceived and effected by those skilled in the art.

With reference to Figures 8, 9 and 10, it will be noted that the portions of pipes 6 protruding from the pillar have hung therefrom, through brackets 16-116, co-planar shelves 17-117 circumscribing the pillar along its entire perimeter and secured to each other at the shorter sides of said pillar. Said shelves are disposed immediately below each recessed zone 4 of the pillar knots and are used as supports for the ends of the flooring beams or panels for their correct operative positioning. Said shelves may be recovered, with the exception of the brackets 16 which will be embedded in the floor casting wherefrom they will protrude with their threaded end portions, which will be ground off.

It is to be understood that the description is referred to a preferred embodiment of the invention, and that many changes and modifications, especially of constructional nature, may be made thereto and may be related, for example, to the number of pipes 6 comprised in each device; that said device may be different from the one which is shown in the drawings; and that the number of devices at each intermediate knot of the pillar may be also different. It is not to be excluded, moreover, that one and the same device may be provided with pipes disposed perpendicularly to each other so as to protrude from all the faces of a pillar. These and all those modifications that anyway can be apparent to those skilled in the art, do not depart from the scope of the invention, as disclosed above, as shown and as claimed below. In the following claims, the references in parentheses are only intended to facilitate the understanding of said claims and, therefore, shall not be interpreted at all as limiting the scope of protection of said claims.

Claims

1. A pillar-beam connecting device for multi-storey buildings using pre-fabricated pillars, characterized in that it comprises at least one group of preferably metallic pipes (6) arranged parallelly to each other and secured to an intermediate box-type member (9) which through holes (8) enables the mutual communication between the pipes, one or more of said devices, suitably arranged side by side, being embedded at each intermediate knot (4) of the pre-fabricated pillar (1) so that said pipes (6) protrude from the opposite faces of said pillar with portions of suitable and, preferably, equal length, provided at the top with a respective vent hole (7) to be closed by a removable plug (15), said pipes (6) being of such dimensions as to receive therethrough a respective rod of either the main or complementary reinforcement (10) of the

flooring beams or panels, whereby also this reinforcement, like the one of the pillar, may be characterized by a structural continuity at the pillar-floor connecting knots, the invention providing that after positioning the reinforcement rods within said pipes, the ends of said pipes will be closed by conical and composite plugs (11) effecting a previous mechanical fastening between the rod and the pipe and positioning said two members coaxially to each other, the invention providing successively that through one of the vent holes (7) of one of the lower pipes, expanding mortar may be injected into said pipes by the action either of gravity or of pressure, while the air outflows from the space being occupied by the mortar through the remaining vent holes which are opened temporarily, the arrangement being such that when said mortar will set, it will firmly fasten the reinforcement rods to the pipes (6) embedded in the pre-fabricated pillar.

2. A device according to claim 1, characterized in that it comprises four pipes (6) having the same length and welded, at their intermediate portions having a respective hole (8), to suitably rounded corner portions of a box-type body (9) serving both as a mechanical connecting means and as a circual connecting manifold of said pipes.

3. A device according to claim 1, wherein a plurality of equal devices are arranged simmetricaly side by side at each intermediate knot (4) of the pre-fabricated pillar.

4. A device according to claim 1, characterized in that the pipes (6) thereof protrude from the opposite wider faces of the pillar (1) embedding them, the arrangement being such that the main or the complementary reinforcements of either the flooring beams or panels abutting the shorter sides of a pillar may intersect the protruding portions of said pipes and will be either firmly secured thereto by the final casting of the floor or they will be previously fastened thereto by suitable means.

5. A device according to claim 1, characterized in that said conical plugs (11) for closing the pipes (6) of said device are divided into two pieces along a plane containing the axis of the plug, and said two pieces are provided at the contacting zones with ridges (12) and recesses (13) which will mate together so as to unite said pieces to each other.

6. A device according to claim 1, characterized in that according to a conistructional modification there are provided two groups of pipes (6) arranged perpendicularly to each other and secured to at least one box-type interconnecting body (9), the arrangement being such that said pipes will protrude with portions of suitable length from all the four faces of the intermediate knots (4) of the pre-fabricated pillar incorporating the device of the invention, whereby said pipes may have affixed

thereto by means of the technics disclosed above, either the main of the complementary reinforcements of the various flooring beams or panels abutting at said knots of the pillar.

7. A device according to claim 1, characterized in that it comprises small co-planar shelves (17-117) circumscribing each intermediate knot (4) of the pillar and secured to each other at the ends thereof so as to be removable when desired, said small shelves being fastened by means of disposable brackets (16-116) to the opposite protruding ends of the pipes (6) of the same device of the invention.

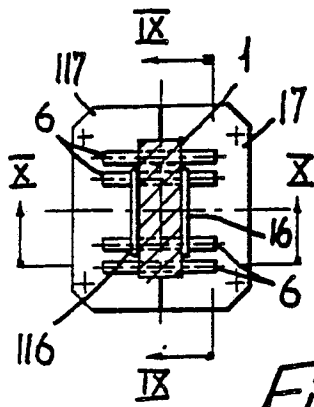


Fig. 8

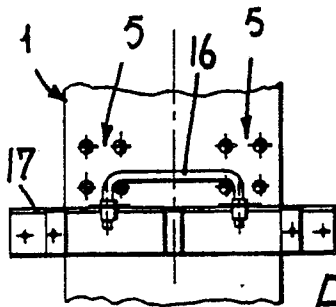


Fig. 9

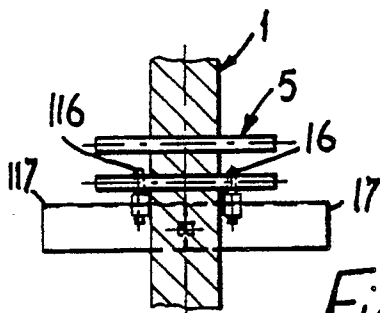


Fig. 10

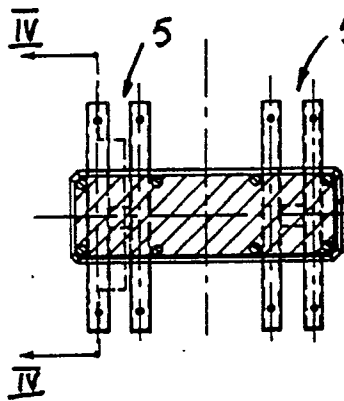


Fig. 3

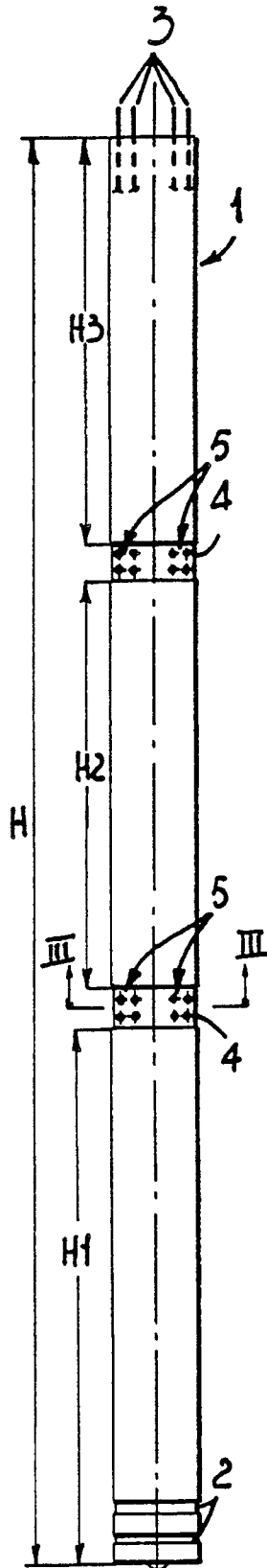


Fig. 1

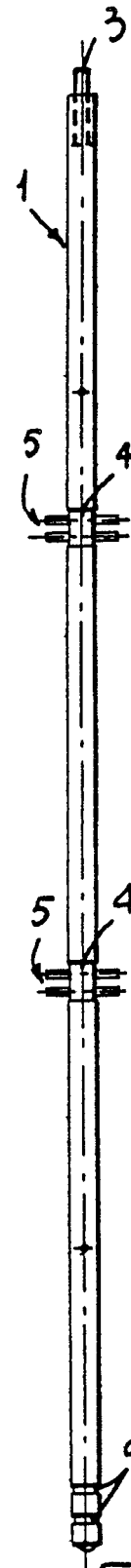


Fig. 2

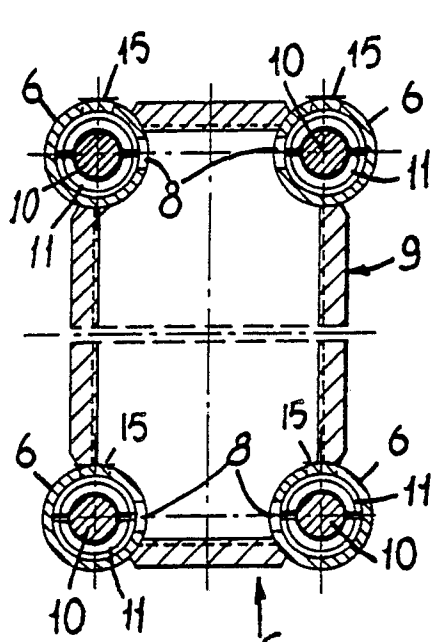


Fig. 5

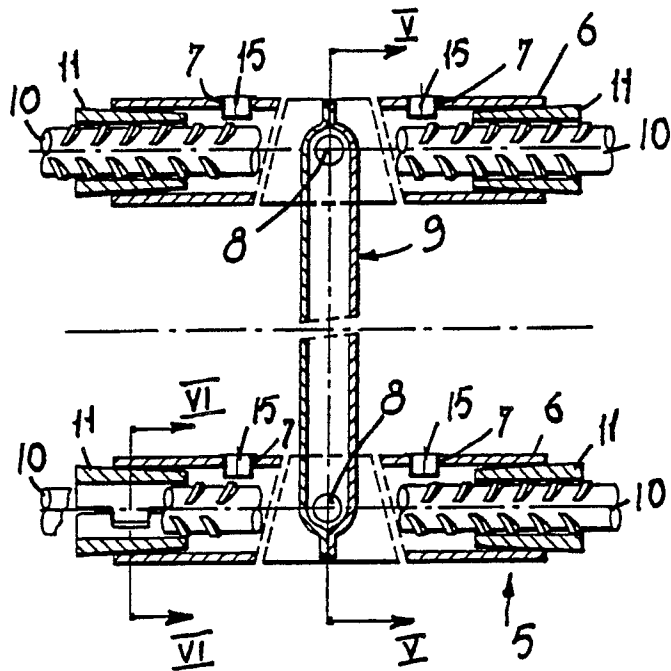


Fig. 4

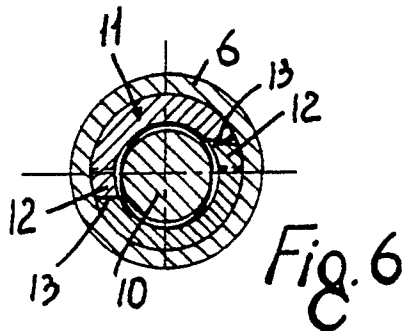


Fig. 6

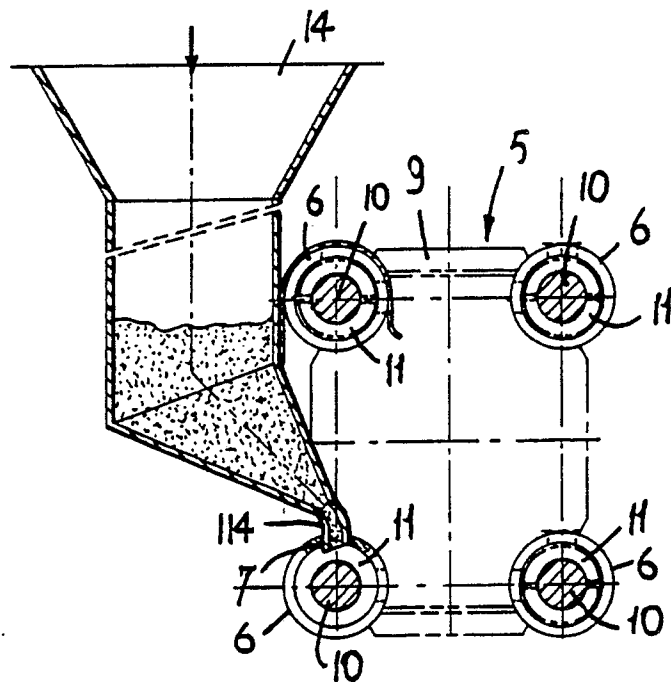


Fig. 7



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RAPPORT DE RECHERCHE EUROPEENNE

Numero de la demande

EP 90 10 2953

DOCUMENTS CONSIDERES COMME PERTINENTS			
Catégorie	Citation du document avec indication, en cas de besoin, des parties pertinentes	Revendication concernée	CLASSEMENT DE LA DEMANDE (Int. Cl.5)
A	US-A-2 616 284 (LEONTOVICH) * Colonne 3, ligne 75 - colonne 4, ligne 66; colonne 5, lignes 19-55; figures 9-11 *	1	E 04 B 1/21
A	GB-A-1 400 595 (DOWSETT ENGINEERING (AUSTRALIA)) * Page 2, lignes 22-82; figures 1-3 *	1	
			DOMAINES TECHNIQUES RECHERCHES (Int. Cl.5)
			E 04 B
Le présent rapport a été établi pour toutes les revendications			
Lien de la recherche LA HAYE		Date d'achèvement de la recherche 10-05-1990	Examineur PORWOLL H. P.
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