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54 **A CASTING BED.**

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Description

The present invention relates to a casting bed for casting concrete slab-like building elements.

When casting slab-like concrete elements, such as wall elements or flooring elements for building structures, the most common technique applied today is one in which the elements are cast in moulds or forms which, in principle, are located on the factory floor. This technique is highly space consuming. Furthermore, the work of vibrating the concrete, which work must be effected with the aid of a manual workforce, is highly time consuming.

It is also known to cast concrete in movable moulds which are transported between different stations and the concrete vibrated at one of said stations. In DE 24 26 457 such an arrangement is shown.

These moulds, however, are large and made of steel, and hence the mass to be vibrated, additional to the concrete present in the mould, is heavy.

The present invention relates to a casting bed which will enable concrete to be cast, including the vibration of said concrete, in a rational and simple fashion in comparison with known techniques.

The present invention thus relates to a casting bed intended for casting slab-like building elements and comprising a vibrating table and a mould which is vibrated by the vibrating table, which vibrating table includes a first frame structure effective in supporting a mould, and is characterized in, that a mould carrier is provided, which carrier is effective in supporting the mould which mould comprises a flat plate provided with bulkheads; in that the vibrating table includes a second frame structure which can be displaced vertically in relation to the first frame structure and which is intended to raise the mould to a position in which the mould is free from the mould carrier; and in that the second frame structure is provided with one or more vibrators.

The invention will now be described in more detail with reference to exemplifying embodiments thereof illustrated in the accompanying drawings, in which

Figure 1 is a sectional view of the inventive casting bed, taken on the line A-A in Figure 2;

Figure 2 is a side view of the inventive casting bed;

Figure 3 is a plan view of the casting bed;

Figure 4 is a plan view of a mould carrier with a mould constructed in accordance with the invention;

Figure 5 is a sectional view taken on the line B-B in Figure 4;

Figure 6 is a sectional view taken on the line C-C in Figure 4; and

Figure 7 is a detailed view of the area within the circle D in Figure 5.

Figure 1 is a cross-sectional view of the casting bed illustrated in Figure 2 and is taken on the line A-A

in said Figure.

The casting bed includes a vibrating table which incorporates the arrangement shown in full lines. Above this arrangement is a further arrangement which is shown in broken lines, the lower part of this further arrangement consisting of a mould carrier 2 and the upper part thereof consisting of a mould 3.

The upstanding elements 4 represent reinforcing rods which protrude from the mould 3.

In accordance with the invention, the vibrating table 1 includes a first frame structure, generally referenced 10, which is effective in supporting the mould carrier 2. The mould carrier 2 is intended to support the mould 3. The vibrating table 1 also includes a second frame structure, generally referenced 20, which can be displaced vertically in relation to the first frame structure 10, so as to lift the mould 3 to a position in which it is free from the mould carrier 2. This is effected by lifting a number of beams 38, which form part of the second frame structure 20, into abutment with the undersurface 5 of the mould 3, with the aid of piston-cylinder devices 30, 31, such as to raise the mould.

The second frame structure 20 is provided with one or more vibrators 11, 12, 13, 14. When the mould is raised to a position in which it is free from the mould carrier 2, solely the mould, which is relatively light in weight, and the concrete and reinforcements therein will be vibrated by means of the second frame structure.

The structure configuration of the first and the second frame structures will now be described with reference to Figures 1, 2 and 3.

The first frame structure 10 includes upper side pieces 21, 22 which are attached to a plurality of mutually parallel square-section beams 23. The first frame structure may be supported on a stand (not shown) which rests on a foundation surface 6.

According to a preferred embodiment, however, the first frame structure 10 is arranged so that it can be raised and lowered vertically by means of lifting devices operative between the foundation surface 6 and said first frame structure 10. The lifting devices may be of any suitable kind whatsoever, although they will preferably have the form of scissor-type devices 40, 41, 50, 51 which are activated by means of a hydraulic piston-cylinder device 43 in the direction of arrows 44, through the agency of a pull rod 42. The scissors 40, 41 are rigid but pivotally mounted to the attachments 45, 46, such that linear displacement of the pull rod 42 by the piston-cylinder device 43 will result in displacement of displacement members or pushers 47, 48 in the direction of the arrows 49. The scissor-like devices are solely shown schematically in Figure 3, and then in chain lines.

The second frame structure 20 is suspended from the beams 23 of the first frame structure, or specifically from the beams 23' and 23'', through the inter-

mediary of hydraulic piston-cylinder devices 30-33.

The second frame structure 20 also includes a first elongated rectangular frame 34 which is attached to the piston-cylinder devices 30-33. When retracting the piston rods 37 of respective devices 30-33, the frame 34 will be lifted upwards in Figure 1, as indicated by the arrow 60.

Resting on the first frame 34 is a further, second elongated rectangular frame 35. Extending upwardly from the frame 34 are vertical posts or pillars 36, which are joined pairwise at their upper ends with mutually parallel, horizontal beams 38, preferably I-beams.

The longitudinal sides of the second rectangular frame 35 are extended beyond the actual rectangle, such as to provide outwardly projecting parts 39. Mounted on these outwardly projecting parts 39 are further vertical posts or pillars 36', which are connected pairwise with horizontal, mutually parallel beams 61.

Attached to the upper ends of the aforesaid vertical pillars 36', and thus also to the second frame structure 20, are suction cups 62. The suction cups 62 are intended to lie against the undersurface 5 of the mould 3 when the mould is positioned out of contact with the mould carrier.

Arranged between the first rectangular frame 34 and the second rectangular frame 35 are rubber air pads 63, which may conveniently comprise rubber bellows filled with air, see Figures 1 and 2.

These air pads 63 are effective in providing a vibration-damping connection between the first and the second rectangular frames. It will be understood that other, corresponding spring devices may be used instead.

The upper surfaces of the side pieces 21, 22 of the first frame structure 10 have mounted thereon a plurality of wheels 64 or rollers on which flanges 65, 66 projecting from the upper long sides of the mould carrier 2 are intended to rest.

The mould carrier 2 includes an elongated rectangular frame 70. Extending between the long sides of the frame are a number of mutually parallel beams 71 which are intended to support the mould 3.

The mould has longitudinally extending, beam-like sides 72, 73, of which two are provided with said flanges 65, 66 at their respective upper surfaces.

The actual mould itself comprises a flat plate 74 which has bulkheads or stop ends 75, 76, 77, 78 located adjacent thereto. The plate will have a suitable thickness, e.g. a thickness of 8 mm in the case of a mould which measures, for instance, 3 x 7 meters.

The flanges 65, 66, or some other part, will suitably extend such as to form a means for positioning or holding the mould in relation to the mould carrier.

Figure 7 illustrates an alternative embodiment in which the undersurface of the mould plate 74 has mounted thereon claws 79, 80, which can be placed,

for instance, in four locations on the plate 74, as indicated in broken lines in Figure 4. These claws extend around one flange 81 of the aforesaid beam 71 without being in actual contact with the flange. Instead, the configuration of the claws 79, 80 is such as to enable the mould 3 to be raised to a position in which said mould is free from the mould carrier, without the claws coming into contact with said carrier.

The claws 79, 80 thus function as positioning members for retaining the mould in connection with the mould carrier, even in those eventualities during manufacture, in which the mould carrier and the mould are turned upside down, so that the mould will face downwards, or in which the mould and the mould carrier are inclined to the horizontal.

As beforementioned, the second frame structure includes a number of mutually parallel beams 38. According to the invention these beams are placed and arranged so that they can be raised through the spaces between respective mutually parallel beams 71 of the mould carrier 2 and therewith lift a mould resting on said carrier. Subsequent to lifting the mould 3 a short distance from the beams 71, the weight of the mould will be carried by the beams 38, which rest on the air cushions 63 via the vertical pillars or posts 36 and the rectangular frame 35. The air cushions, in turn, rest on the first frame 34.

Because the vibrators 11-14, which may be of any known kind, are mounted on the second rectangular frame 34, only this frame, and its associated pillars 36, 36' and beams 38, together with the mould 3 and the concrete therein, will be vibrated, these components constituting only a part of the casting bed as a whole, with associated mould carrier and mould.

Consequently, the advantages are afforded whereby a smaller mass is vibrated and whereby the vibrations will not be transmitted to the foundation surface 6 or corresponding surface, owing to the presence of the air cushions.

The first mentioned advantage means that the concrete will be agitated more vigorously by a given vibrator, whereas the second advantage results in a lower noise level.

It was mentioned in the foregoing that the suction cups 62 are intended to abut the undersurface 5 of the mould 3, when the mould is located free from the mould carrier. This arrangement will ensure that the mould is held in position while being vibrated.

The fact that the mould 3 solely comprises a plate provided with bulkheads, or stop ends, means that the bulkheads need not be given a certain clearance angle or arranged so that they can be readily dismantled in order to enable a cured concrete slab to be removed from the mould, in addition to the aforesaid fact that the weight or mass vibrated is lighter or smaller than would be the case if the mould was integral with the mould carrier.

When a cured, or hardened, concrete slab is to be

lifted from the mould, the mould plate is held firmly by suction at its corners, from beneath, by means of suitable suction cups, while the cast and cured concrete slab is lifted from the mould plate with the aid of a traverse crane. When the mould plate has a thickness of 8 mm and a plate size of 3 x 7 meters. the sides of the plate will bend downwards sufficiently to enable the slab to leave the mould.

It will be understood that a mould of the aforesaid kind is best used in a manufacturing line, where vibration of the mould and its contents constitutes one manufacturing stage in said line and where the mould carriers and respective moulds circulate between various stations, e.g. individual stations which include a reinforcement packing station, a concrete charging station, a vibrating station and a concrete curing station, and a station in which the mould and mould-carrier components are dismantled and cleaned.

Transportation of a mould carrier with associated mould, to and from the casting bed, and transportation of a mould filled with cured concrete from said casting bed is effected with the aid of transporters, such as roller pads, not shown.

In accordance with one embodiment, at least one side piece 21 of the casting bed iso to this end, capable of being raised and lowered between a vertical and a horizontal position about a pivot arm or hinge 81, with the aid of a hydraulic piston-cylinder device 82, as illustrated by the arrows 83. According to one embodiment, the mould carrier, with associated mould, is rolled into the casting bed in the direction of the arrow 84, on a roller path (not shown), with the side piece 21 lowered to its horizontal position.

The mould carrier is suitably rolled on its bottom edge surfaces 85. In this respect, the mould carrier flanges 65, 66 are located at a higher level than the uppermost surface of the wheels 64 of the side pieces in Figure 1, by lowering the first frame structure 10 slightly in comparison with the position shown in Figure 1, with the aid of the lifting devices 40, 41, 50, 51.

Subsequent to placing the mould carrier over the casting bed, the side piece 21 is raised to the position illustrated in Figure 1 and the first frame structure 10 is then lifted by the lifting devices 40, 41, 50, 51, so that the mould carrier will rest on the wheels 64. The mould carrier is lifted herewith to a position in which it is free from the roller path used to transport the mould carrier to a position above the casting bed.

Subsequent to vibrating the concrete, the mould carrier is rolled away on wheels 64 in a direction into the plane of the paper in Figure 1, and as illustrated by the arrow 86 in Figure 3, wherewith the mould carrier is moved in over a roller path (not shown) for transportation away from the bed.

The lifting devices 40, 41, 50, 51 can also be used, to advantage, in the manufacture of concrete elements which comprise two, mutually parallel concrete slabs with intermediate reinforcement. When

the second concrete slab of said element is to be cast, a mould carrier carrying a mould which contains fresh concrete is placed on the casting bed, as illustrated in Figure 1. the first concrete slab of said element, with associated reinforcements protruding therefrom, is then moved to a position in which said slab is located above the mould containing fresh concrete, with the aid of an overhead traverse or some like device. The previously cured concrete slab, with reinforcements protruding therefrom, thus hangs over the casting bed with the reinforcements projecting down towards the fresh concrete.

The first frame structure is then lifted with the aid of the lifting devices 40, 41, 50, 51, until the reinforcement projecting from the cured concrete slab extends to a pre-determined distance in the fresh concrete, whereafter the mould is lifted by means of the second frame structure 20 to a position in which said mould is free from the mould carrier, whereafter the fresh concrete is vibrated.

The lifting devices 40, 41, 50, 51 will thus enable a structural element which has already cured to be placed above the casting bed in a fixed position on a frame or like structure, whereafter the position of the mould relative to the cured concrete element and the reinforcement projecting therefrom can be adjusted with the aid of the lifting devices 40, 41, 50, 51. This is much more advantageous than adjusting the heights of the cured concrete slab, since such adjustment would need the provision of a traverse crane or like device.

Claims

1. A casting bed intended for casting slab-like building elements and comprising a vibrating table and a mould which is vibrated by the vibrating table, which vibrating table includes a first frame structure effective in supporting a mould, **characterized in**, that a mould carrier (2) is provided, which carrier is effective in supporting the mould (3), which mould (3) comprises a flat plate (74) provided with bulkheads (75-78); in that the vibrating table includes a second frame structure (20) which can be displaced vertically in relation to the first frame structure (10) and which is intended to raise the mould (3) to a position in which the mould is free from the mould carrier (2); and in that the second frame structure (20) is provided with one or more vibrators (11-14).

2. A casting bed according to claim 1, **characterized in**, that the second frame structure (20) is carried by the first frame structure (10) via air-filled rubber cylinders (63) or corresponding spring devices.

3. A casting bed according to claim 1 or 2, **characterized in**, that the first frame structure (10) can be raised and lowered vertically by means of lifting devices (40,41,50,51), preferably scissor-like lift-

ing devices, operative between a foundation surface (6) and the first frame structure (10).

4. A casting bed according to claim 1, 2 or 3, **characterized in**, that the mould carrier (2) includes a frame structure (70) having mutually parallel beams (71) for supporting the mould (3).

5. A casting bed according to claim 4, **characterized in**, that the mould (3) comprises a flat plate (74) having bulkheads or stop ends (75-78) mounted thereon.

6. A casting bed according to Claim 4 or 5, characterized in that the second frame structure (20) includes a plurality of parallel beams (38) which can be raised vertically between the parallel beams (71) of the mould carrier (2), such as to lift a mould (3) resting on the mould carrier (2).

7. A casting bed according to Claim 1, 2, 3, 4, 5 or 6, characterized in that said second frame structure (20) has mounted thereon suction cups (62) which are intended to lie against the mould (3) when said mould occupies its free position relative to the mould carrier (2).

8. A casting bed according to Claim 1, 2, 3, 4, 5, 6 or 7, characterized in that said first frame structure (10) includes two upper vertical side pieces (21, 22) intended for supporting said mould carrier (2).

9. A casting bed according to Claim 8, characterized in that the side pieces are provided at their upper edge surfaces with wheels (64) against which the mould carrier (2) is intended to rest.

10. A casting bed according to Claim 8 or 9, characterized in that at least one of the side pieces (21) can be raised and lowered between a vertical and a horizontal position, such as to enable horizontal movement of a mould carrier (2) in over the casting bed when said side piece is in its horizontal position.

Patentansprüche

1. Giessbett zum Giessen von Plattenbalken mit einem Rütteltisch und einer Giessform die durch den Rütteltisch vibriert ist und der Rütteltisch einen ersten Rahmen als Träger für die Giessform umfasst dadurch gekennzeichnet, dass ein Träger (2) für die Giessform (3) vorhanden ist, welche Giessform (3) eine flache Platte (74) mit Querwänden (75-78) umfasst, dass der Rütteltisch einen zweiten Rahmen (20) umfasst der bezüglich des ersten Rahmens (10) vertikal verschiebbar ist, um die Giessform (3) bis zu einer Stelle anzuheben, bei der die Giessform (3) frei über dem Formträger (2) ist, und dass der zweite Rahmen (20) mit wenigstens einem Vibrator (11-14) versehen ist.

2. Giessbett nach Patentanspruch 1, dadurch gekennzeichnet, dass der zweite Rahmen (20) vom ersten Rahmen (10) mittels luftgefüllter Gummizylinder (63) oder mittels dementsprechender Federmit-

teln getragen ist.

3. Giessbett nach Patentanspruch 1 oder 2, dadurch gekennzeichnet, dass der erste Rahmen (10) mittels Hebemitteln (40, 41, 50, 51) vertikal anhebbar oder absenkbar ist, vorzugsweise mit scheffelförmigen Hebemitteln, die zwischen einer Fundamentoberfläche (6) und dem ersten Rahmen (10) zur Wirkung gelangt.

4. Giessbett nach einem der Ansprüche 1,2 oder 3, dadurch gekennzeichnet, dass der Formträger (2) einen Rahmen (70) mit zueinander parallelen Tragelementen (70) zum Unterstützen der Giessform (3) umfasst.

5. Giessbett nach Patentanspruch 4, dadurch gekennzeichnet, dass die Giessform (3) eine flache Platte (74) mit Querwänden oder Anschlägen (75-78) darauf versehen ist.

6. Giessbett nach Patentanspruch 4 oder 5, dadurch gekennzeichnet, dass der zweite Rahmen (20) eine Anzahl paralleler Tragelemente (38) umfasst, die vertikal zwischen den parallelen Trägern (71) des Formträgers (2) anhebbar sind, um die Giessform (3) anzuheben, die auf dem Formträger (2) aufliegt.

7. Giessbett nach einem der Patentansprüche 1,2,3,4,5 oder 6, dadurch gekennzeichnet, dass auf dem zweiten Rahmen (20) Saugnäpfe (62) montiert sind, zum Zweck, dass sie an der Giessform (3) anliegen, wenn die Giessform (3) ihre freie Lage über dem Formträger (2) innehat.

8. Giessbett nach einem der Patentansprüche 1,2,3,4,5,6 oder 7, dadurch gekennzeichnet, dass der erste Rahmen (10) zwei obere vertikale Seitenstücke (21,22) zur Stützung des Formträgers (2) aufweist.

9. Giessbett nach Patentanspruch 8, dadurch gekennzeichnet, dass die Seitenstücke an ihrer oberen Kantenpartie mit Rädern (64) versehen ist, auf denen der Formträger (2) ruht.

10. Giessbett nach Patentanspruch 8 oder 9, dadurch gekennzeichnet, dass wenigstens eines der Seitenstücke (21) zwischen einer vertikalen Lage und einer horizontalen Lage anhebbar und absenkbar ist, derart, dass der Formträger (2) über dem Giessbett horizontal verschiebbar ist, wenn der erwähnte Seitenstück in horizontaler Lage ist.

Revendications

1. Couche de coulée destinée à couler des éléments de construction en forme de dalles et comprenant une table vibrante ainsi qu'un moule qu'on fait vibrer au moyen de la table vibrante, cette table vibrante comprenant une première structure de châssis servant à supporter un moule, couche de coulée caractérisée en ce qu'on utilise un porte-moule (2) servant à supporter le moule (3), ce moule (3) comprenant une plaque plate (74) munie de cloisons

(75 à 78) ; en ce que la table vibrante comprend une seconde structure de châssis (20) qu'on peut déplacer verticalement par rapport à la première structure de châssis (10) et qui est destinée à soulever le moule (3) jusqu'à une position dans laquelle ce moule est dégagé du porte-moule (2) ; et en ce que la seconde structure de châssis (20) est munie d'un ou plusieurs vibreurs (11 à 14).

2. Couche de coulée selon la revendication 1, caractérisée en ce que la seconde structure de châssis (20) est portée par la première structure de châssis (10) par l'intermédiaire de cylindres de caoutchouc gonflés d'air (63) ou autres dispositifs élastiques correspondants.

3. Couche de coulée selon l'une quelconque des revendications 1 et 2, caractérisée en ce qu'on peut faire monter et descendre verticalement la première structure de châssis (10) au moyen de dispositifs de levage (40, 41, 50, 51) constitués de préférence par des dispositifs de levage en forme de ciseaux, ces dispositifs de levage fonctionnant entre une surface de fondation (6) et la première structure de châssis (10).

4. Couche de coulée selon l'une quelconque des revendications 1 à 3, caractérisée en ce que le porte-moule (2) comprend une structure de châssis (70) munie de poutres mutuellement parallèles (71) pour supporter le moule (3).

5. Couche de coulée selon la revendication 4, caractérisée en ce que le moule (3) comprend une plaque plate (74) munie de cloisons ou butées d'extrémités (75 à 78) montées sur celle-ci.

6. Couche de coulée selon l'une quelconque des revendications 4 et 5, caractérisée en ce que la seconde structure de châssis (20) comprend un certain nombre de poutres parallèles (38) qu'on peut soulever verticalement entre les poutres parallèles (71) du porte-moule (2) de manière à soulever un moule (3) reposant sur le porte-moule (2).

7. Couche de coulée selon l'une quelconque des revendications 1 à 6, caractérisée en ce que la seconde structure de châssis (20) comporte des coupelles d'aspiration (62) montées sur celle-ci et destinées à venir s'appuyer contre le moule (3), lorsque ce moule se trouve dans sa position dégagée du porte-moule (2).

8. Couche de coulée selon l'une quelconque des revendications 1 à 7, caractérisée en ce que la première structure de châssis (10) comprend deux pièces latérales verticales supérieures (21, 22) destinées à supporter le porte-moule (2).

9. Couche de coulée selon la revendication 8, caractérisée en ce que les pièces latérales sont munies, à leurs surfaces de bords supérieurs, de roues (64) sur lesquelles le porte-moule (2) doit venir s'appuyer.

10. Couche de coulée selon l'une quelconque des revendications 8 et 9, caractérisée en ce qu'on

peut faire monter et descendre au moins l'une des pièces latérales (21) entre une position verticale et une position horizontale, de manière à permettre le mouvement horizontal d'un porte-moule (2) pour qu'il vienne se placer au-dessus de la couche de coulée lorsque cette pièce latérale se trouve dans sa position horizontale.

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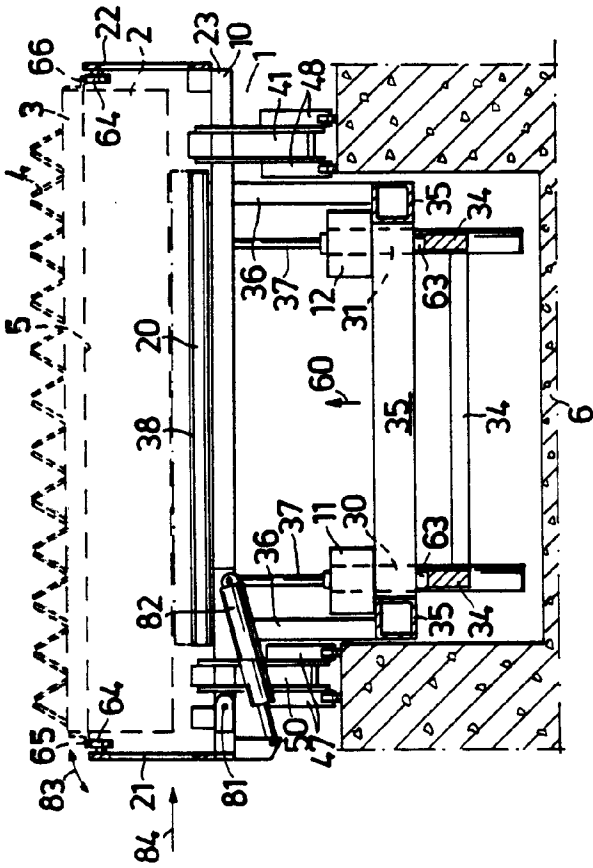


Fig. 1

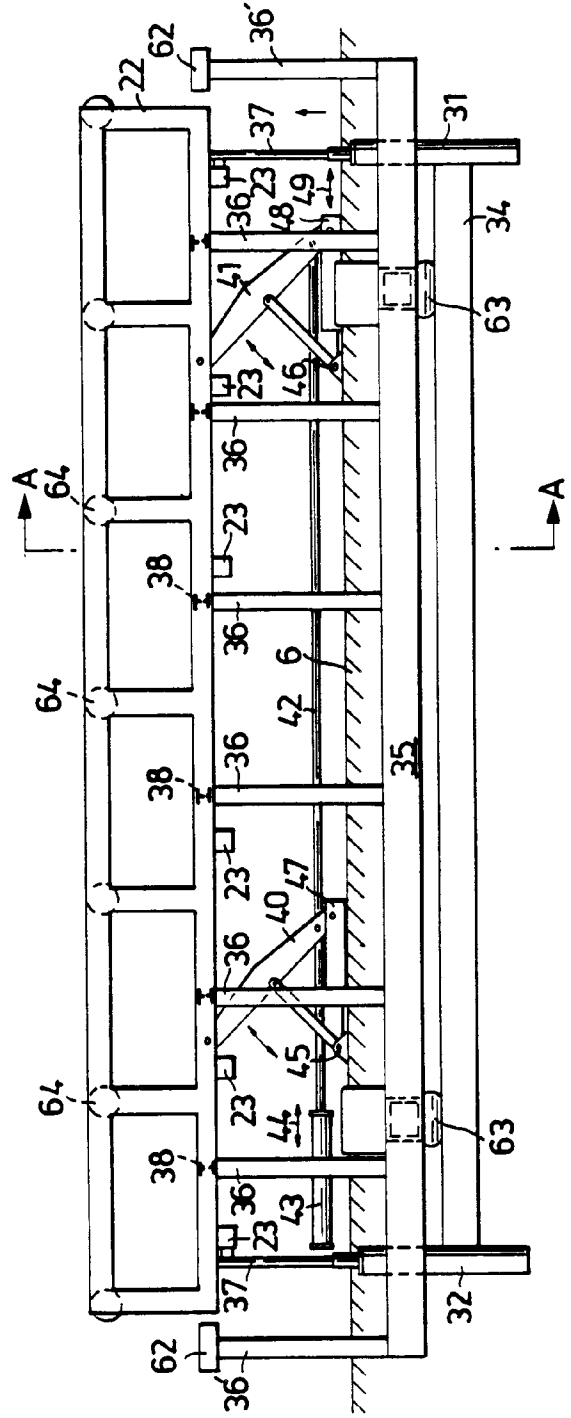


Fig. 2

Fig. 3

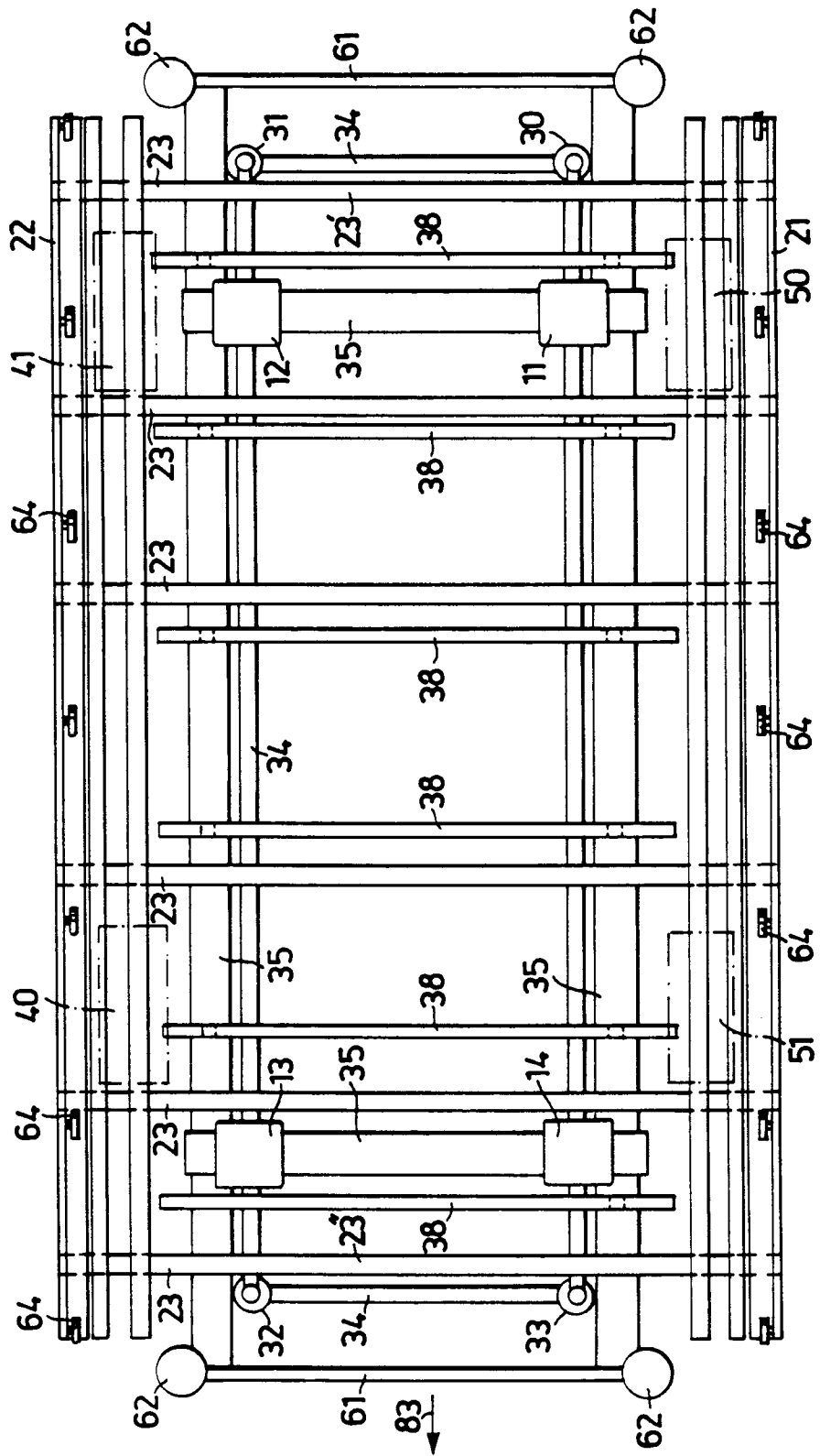


Fig. 4

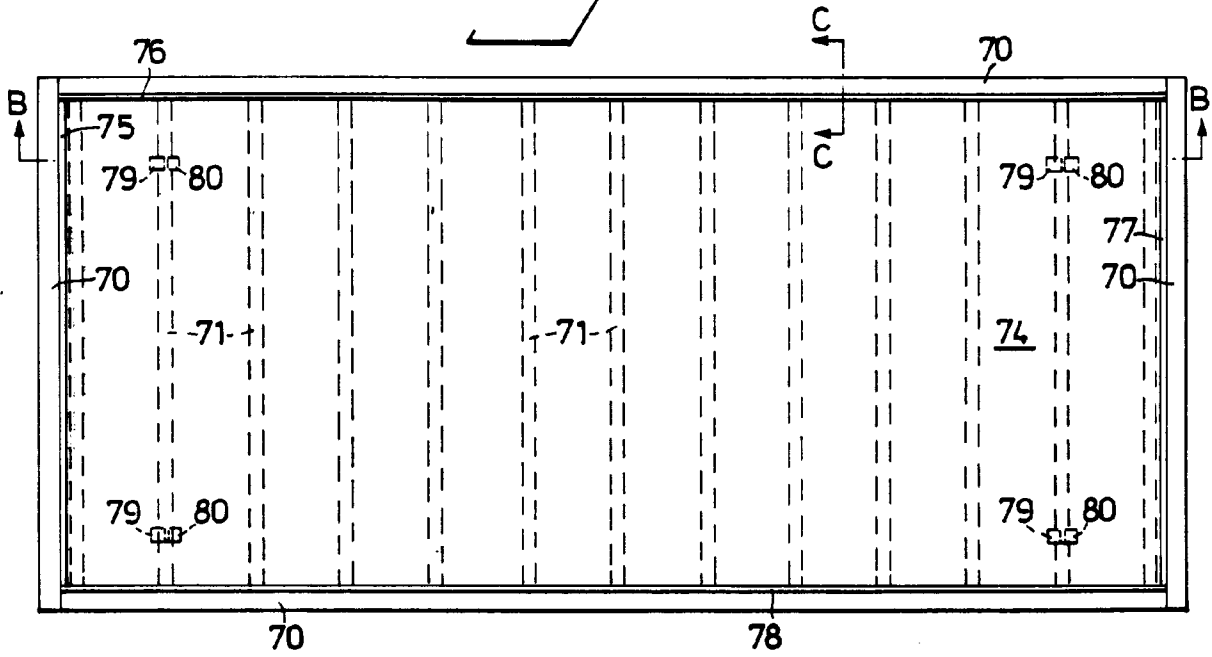


Fig. 5

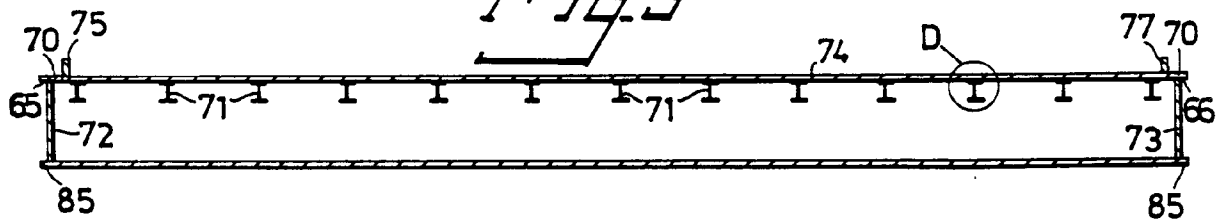


Fig. 6

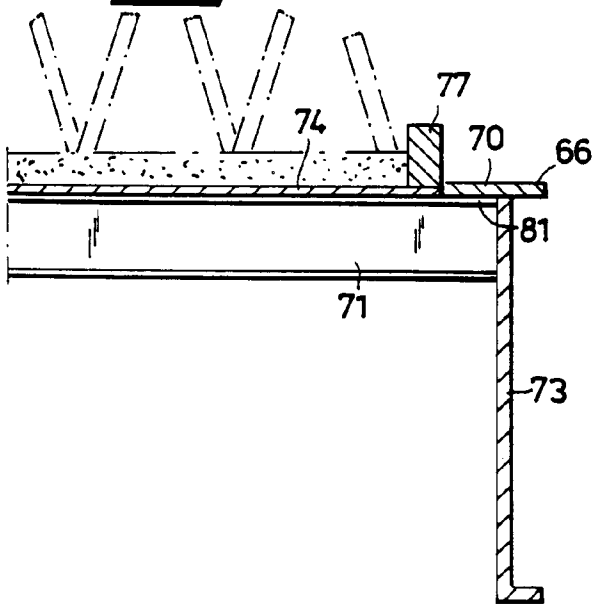


Fig. 7

