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(54) **Shuttering for the fabrication of two-slab panels.**

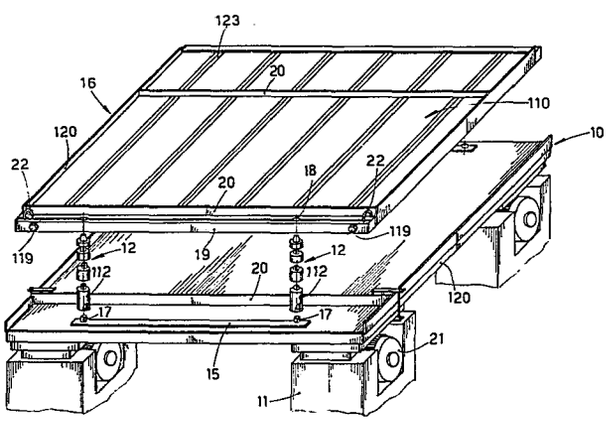
(57) Shuttering for the fabrication of two-slab panels, whereby the double slabs consist of two layer of vibrated, cemented conglomerate material incorporating cores of electrically welded metallic mesh and coupled together and spaced by advantageously flat trelliswork so as to constitute slab there can be insulating and/or non-conducting means, said shuttering comprising in coordinated cooperation with a surface to mould single slabs:

– shuttering means (16) for forming the second surface (110), said shuttering means being provided with longitudinal slits (23), and at least one removable end plate means (19) terminally and transversally anchored to said shuttering means (16),

– and composite spacer means (12) located between said shuttering means (16) and said surface (10) moulding single slabs,

– whereby removable support elements (15) carrying said composite spacer means (12) are included, said support elements being fixed on said surface moulding the single slab, and

– whereby there are advantageously present independent means (25) for carrying out withdrawal of the mould.



EP 0 053 587 A1

Classe Int n. rif. stp 3-3045

Description of the invention entitled:
"SHUTTERING FOR THE FABRICATION OF TWO-SLAB PANELS"
in the name of IMPIANTI INDUSTRIALI SPA
submitted on under No.

This invention concerns shuttering for the fabrication of two-slab panels.

To be more specific, the invention deals with shuttering which is employed in a coordinated manner to make composite building structures which consist substantially of electrically welded mesh incorporated in castings of cemented comglomerate and which are anchored together with suitable trelliswork so as to form structures with plane-parallel slabs separated by hollow spaces that can be filled advantageously for given purposes with thermally insulating and/or sound absorbing materials.

This invention refers in particular to shuttering characterised by new structural and practical solutions.

Double slabs are known as also are diverse devices and means to make them. In the know art there is, for instance, an application for a patent IT 19741 A/77 in the name of SARTORIO which describes a device and procedures for fabricating and applying constructional building elements. Said building elements are made substantially with an automatic device working with a continuous cycle and comprising a

Gilberto Petraz

movable surface, equipped with lateral forming rings, on which said building elements are formed.

This automatic device involves many drawbacks. One of them lies in the fact that the movement itself hinders the performance of the operations to be carried out in making the building elements.

A futher drawback is that the manufacture of several elements on one single working surface can lead to interference in the various operations or tasks to be done on said surface. Moreover, said patent does not indicate all the functional elements required.

In patent application IT 23223 A/77, also in the name of SARTORIO, some improvements to the preceding patent are described.

The purpose of said improvements is to make the double slabs by immersing both a mesh suitable for embodying the core of the slab and also spacer elements in a mass of cemented material already deposited on the movable working surface but not yet solidified.

This device too, desides being substantially utopian, requires a very fluid cemented mass to enable the mesh and spacer elements to be immersed therein and reveals many drawbacks and shortcomings which make it difficult to apply.

Patent application IT 25325 A/77, once again in the name of SARTORIO, has been put forward, wherein a system is substantially envisaged for bonding together neighbouring two-slab panels; a special panel is also visualised which resumes substantially an old patent IT 713072 in the name of SARTORIO.

There is also patent application IT 27620 A/78 in the name of SARTORIO wherein the manufacture of slabs is envisaged with a system of crosswise supports cooperating with sound absorbing elements. This procedure is utopian in that

Gilberto Petraz

it foresees the use of elements cooperating with the spacer trelliswork and providing special formations which do not permit easy applications on building sites; moreover, said patent envisages solutions which are substantially unreal in the light of normal working methods.

Another type of shuttering is disclosed in DE-OS 2611843 which consists of a bottom plate for casting one concrete slab in which is encased the metal mesh and trelliswork projecting therefrom and a top frame provided with support legs which is placed on top of, and separated from the bottom plate.

According to DE-OS 2611843, for casting the top slab, the top frame is provided with a removable bottom consisting of a plurality of boards arranged longitudinally between the trelliswork which project therefrom in the spaces provided between the boards.

Said boards are kept in place by a number of traverse bars terminally suspended from the edge of the top frame.

After casting the bottom slab and arranging the metal reinforcement, the top frame is placed on top thereon and the removable bottom is constructed from the the longitudinal boards and the travese bars. The top frame is then ready for casting the top concrete slab.

For removing the finished two-slab panel, one has to dismantle the top shuttering by first removing the bottom thereof piece by piece, then lifting the top frame and finally pulling the two-slab panle out of the lower plate.

It is obvious that the shuttering proposed in DE-OS 2611843 requires a laborious and lengthy assembling and dismantling operations which are simply incompatible with today's urge to increase productivity.

There is also patent application IT 83345 A.78 in the name of the present author, which describes a device for the embodiment of double slabs made by vertical removal of the

upper shuttering suitable for forming the second slab.

This device is especially restrictive if it is used in working surroundings of small dimensions.

There is also another patent application which was submitted in the name of the present author under No. IT 83443 A/80 and refers to a procedure and the relative device for making double slabs.

This invention envisages an embodying solution which is simple and at the same time very effective.

It requires, however, the employment of supporting structures which need careful controls, and also requires specific structures which are hard to adapt to existing structures.

The purpose of the present invention is to embody a device for fabricating two-slab panels which is simple and effective which requires no lengthy and laborious setting-up and dismantling operations.

Furthermore, said device must be able to be embodied by using existing structures already employed in the fabrication of simple slabs.

A further purpose of the invention is to embody a device which does not require excessive controls or maintenance work but which ensures excellent performance at the same time.

Lastly, a purpose of this invention is to embody a device which ensure the parallelism of, or a possible preset angle of inclination between, the flatslabs constituing the panel moulded, and also the ability to repeat the operations within very narrow limits of tolerances.

Yet another purpose is to embody a simple and effective device for removing the shuttering.

The invention is embodied, therefore, in shuttering for the fabrication of two-slab panels, whereby the double slabs consist of two layers of vibrated, cemented conglomerated

material incorporating electrically welded metallic mesh cores and linked together with flat trelliswork so as to form panels for building work, whereby there can be insulating or non-conducting means in the double slab, said shuttering being characterised by comprising in coordinated cooperation with a surface for moulding single slabs:

- shuttering means for moulding the second surface, said shuttering means being provided with longitudinal slits; and at least one removable end plate means terminally and trasversally anchored to said shuttering means, and
- composite spacer means located between said shuttering means and said surface moulding the single slabs;
- whereby there are included support elements to carry said composite spacer means, said support element being arranged on said surface moulding the single slab;
- and whereby there are independent means to remove the formwork.

Hereinafter we shall give, as a non-restrictive example, a description of a preferential embodiment of the invention, at the same time referring to the tables, wherein:

Fig. 1 gives a diagrammatic exploded view in which are shown the shuttering and the composite spacer means;

Fig. 2 shows diagrammatically the shuttering installed according to the phase of formation of the second slab;

Fig. 3 gives a diagram of a spacer means component in orthographic projection;

Fig. 4 shows a formulation of the shuttering means;

Fig. 5 shows a table for the removal of the formwork, in a plan view.

In the figures the same parts or parts performing the same functions bear the same reference numbers.

Fig. 1 shows a surface for forming flat slabs 10, to which is fitted a surface 110 consisting of shuttering means 16:

such, according to the invention, as to make the whole suitable for forming the double slabs, said surface 110 forming the bottom surface of shutting means 16 which is provided with a plurality of longitudinal slits 23 and at least one removable end plate means 19. The shuttering 16 and end plate means 19 are generally preassembled in advance.

The surface for forming flat slabs 10 is a normal surface known in itself and already available with manufacturers of simple slabs.

In particular, the forming surface 10 is installed rigidly on a supporting structure 11 cooperating with vibrating means 21 or other means suitable for the purpose.

The forming surface 10 has fixed 120 and movable 20 side panels able to be positioned as desired for delimiting and conforming the perimeter of a single slab.

The single, or first, of the two slabs comprising a double slab is made on said forming surface 10 in a known manner, care being taken to pre-arrange and position the necessary flat trellises.

According to the invention removable support elements 15 are put on the edges of said forming surface 10.

Said support elements 15 can cooperate with suitable means of the right size for quick or automatic positioning, or else can be already fixed, or at least caused to be fixed temporally, to the surface 10.

The support elements 15 comprise two pins 17 which are advantageously threaded and to which it is possible to fit one or more components of composite spacer means 12 (illustrated in Fig. 3) so as to obtain the required height of the empty space between the two slabs.

One of the advantages of the use of removable support elements 15 is that the distance between the centrelines of the various composite spacer means 12 provided on each

support element 15 is registered and carefully determined in advance in a workshop so as to offer precise centering of the spacer means 12 and between the corresponding threaded holes in the upper shuttering.

A second advantage is the fact that it offers a simple operation for removing the composite spacer means (2) when necessary.

Each component 112 of said composite spacer means 12 can include knurled areas to facilitate handling, and also possible holes 24 (or like means) where the required motive force can be applied that is necessary for the proper engagement of said means 12.

The component of composite spacer means 12 have various heights so that, in combination with each other, they can be adapted to various requirements; they also comprise male 14 and female 13 coupling means,preferably threaded.

The male coupling means 14 of the spacer means components 112 are located at the top thereof and serve in our example to position the shuttering means 16.

More specifically each composite spacer means 12 consists of a plurality of components 112 of substantially different heights, arrangeable in columns, each component 112 being provided with a threaded hole 13 on one side and a thread stem 14 on the opposite side, whereby the threaded stem 14 of one component engages the threaded hole 13 of the next component in the column and the threaded hole 13 of the bottom component 112 of a column being engaged by the threaded stem 17 provided on the removable support means 15 while the threaded stem 14 of the top component 112 of a column engaging the threaded hole 18 provided in the shuttering means 16.

The shuttering means 16 consists of a plurality of tubular or C-shaped elements of which the upper side constitutes

the moulding surface for the second slab.

The shuttering means 16 form with end plate means 19 a rectangular mould having a bottom 110 provided as previously mentioned with longitudinal slits 23.

Said slits 23 serve for the passage of the flat, trelliswork, intermediate, distancing uprights of the double slab.

Each slit 23 is closed temporally by elastic means 123, so that said elastic means, in the example rubber strips, do not allow the cemented conglomerate to pass through said spaces 23.

The shuttering means 16 can also be equipped for the passage and distribution of steam; in this case holes 216 are envisaged for proper distribution of steam so as to improve the action of drying and curing the product.

The end plate means 19 is terminally and trasversally connected to shuttering means 16.

Said plate means 19 can be connected mutually with bolts pins 119 or other removable means, which facilitate the rapid removal of said end plate means 19.

In practice the top shuttering 16 has only one removable end plate means 19 at one end thereof, the rest forming one solid unit.

The fixed and movable side panels 20-120 lie on the shuttering surface 110.

When the lower layer of the double slab has been moulded on the forming surface 10, the shuttering surface 110 is installed, the mesh (Fig. 2) is put on said shuttering surface 110, care being taken to anchor it to the flat trelliswork means, and the concrete is then cast.

The casting is levelled and is perhaps vibrated.

When the desired degree of compaction of the casting has been obtained, the shuttering 16 and, therewith, the double slab

made are lifted, suitable crane lifting means being used for the purpose and being able to be hooked to the rings 22 of the shuttering means 16.

Next, steps are taken to put said double slab on a table 25 that withdraws it from its mould, and in the meanwhile the forming surface 10 can be used again.

On said withdrawal table 25 are supporting surfaces 27 and fixture pins 26.

The fixture pins 26 cooperate with the holes 18 of the end plate 19 which, for this reason, is now disconnected from the shuttering means 16.

A winch 29 is then connected to the free end of shuttering 16.

When the winch 29 is made to operate, the shuttering 16 without end plate 19 is withdrawn from the double slab, which is held by the supporting surfaces 27.

The shuttering runs on upholding means 30, which may consists of a bed of rullers.

The table 25 that withdraws the mould can be manifold according to the invention.

We have described here a preferential embodiment of the invention together with some variants, but other variants are possible; thus it is possible to change shapes and sizes, and each threaded stem 17 can have a separate support conformed differently; it is also possible to visualize that the support elements 15 and, in substance, the composite spacer means 12 are arranged lengthwise on the side edges of the fixed mould 10 and, therefore, that the seatings 18 of the shuttering 16 are machined laterally so as to cooperate with said composite spacer means 12.

These and other variants are possible for a technician in this field without departing thereby from the scope of the idea of the solution.

CLAIMS

1 - Shuttering for the fabrication of two-slab panels, whereby the double slabs consist of two layers of vibrated, cemented conglomerate materials incorporating cores of electrically welded metallic mesh and coupled together and spaced apart by advantageously flat trelliswork so as to constitute panels for building purposes, whereby in the double slab there can be insulating and/or non-conducting means, said shuttering being characterized by comprising in coordinated cooperation with a surface to form slabs:

- shuttering means (16) to form the second surface (110), said shuttering means being provided with longitudinal slits (23), and at least one removable end plate means (19) terminally and trasversally anchored to said shuttering means (16), and
- composite spacer means (12) located between said shuttering means (16) and said surface (10) to form single slabs
- whereby support elements (15) carrying said composite spacer means (12) are arranged on said surface moulding the single slab;
- and whereby there are advantageously present independent means (25) for withdrawing the mould.

2 - Shuttering for the fabrication of two-slab panels, as in Claim 1, characterized by the fact that the shuttering means (16) has elastic means (123) arranged to cover slits (23) and withhold conglomerate and to provide a passage for advantageously flat trelliswork.

3 - Shuttering for the fabrication of two-slab panels, as in Claims 1 and 2, characterised by the fact that the end plate means (19) of shuttering means (16) is provided with hole means (18) for positioning purposes and ring means (22) for lifting purpose.

4 - Shuttering for the fabrication of two-slab panels, as in

Gilberto Cerruti

claim 1 and in one or the other of the claims thereafter, characterized by the fact that the shuttering means (16) are positioned on composite spacer means (12) provided with removable support means (15) removably fixed to the surface moulding the single slab.

5 - Shuttering for the fabrication of two-slab panels as in Claim 1 andin one or the other of the claims thereafter characterized by the fact that said composite spacer means (12) consists of a plurality of components (112) of substantially different heights, arrangeable in columns, each component (112) being provided with a threaded hole (13), on one side and a threaded stem (14) on the opposite side, whereby the threaded stem (14) of one component engages the threaded hole (13) of the next component in the column, the threaded hole of the bottom component (112) of a column being engaged by a threaded stem (17) provided with the removable support means (15), while the threaded stem (14) of the top component 112 of the same column engaging a threaded hole (18) provided in the shuttering means (16).

6 - Shuttering for the fabrication of two-slab panels, as in Claim 1 and in one or another of the claims thereafter, characterized by the fact that the double slabs thus made are withdrawn form their mould on a withdrawal table (25) which comprises in mutual cooperation and coordination:

- pin means (26) to withhold end plate (19);
- support means (27) to support and hold the double slab;
- sliding and sustaining means (28-30) to sustain shuttering means (16), disconneted from the end plate means (19), and
- winch means (29) for the lengthwise withdrawal of shuttering means (16)

7 - Shuttering for the fabrication of two-slab panels, as in Claim 1 and in one or another of the claims thereafter, as described and shown and for the purposes allowed.

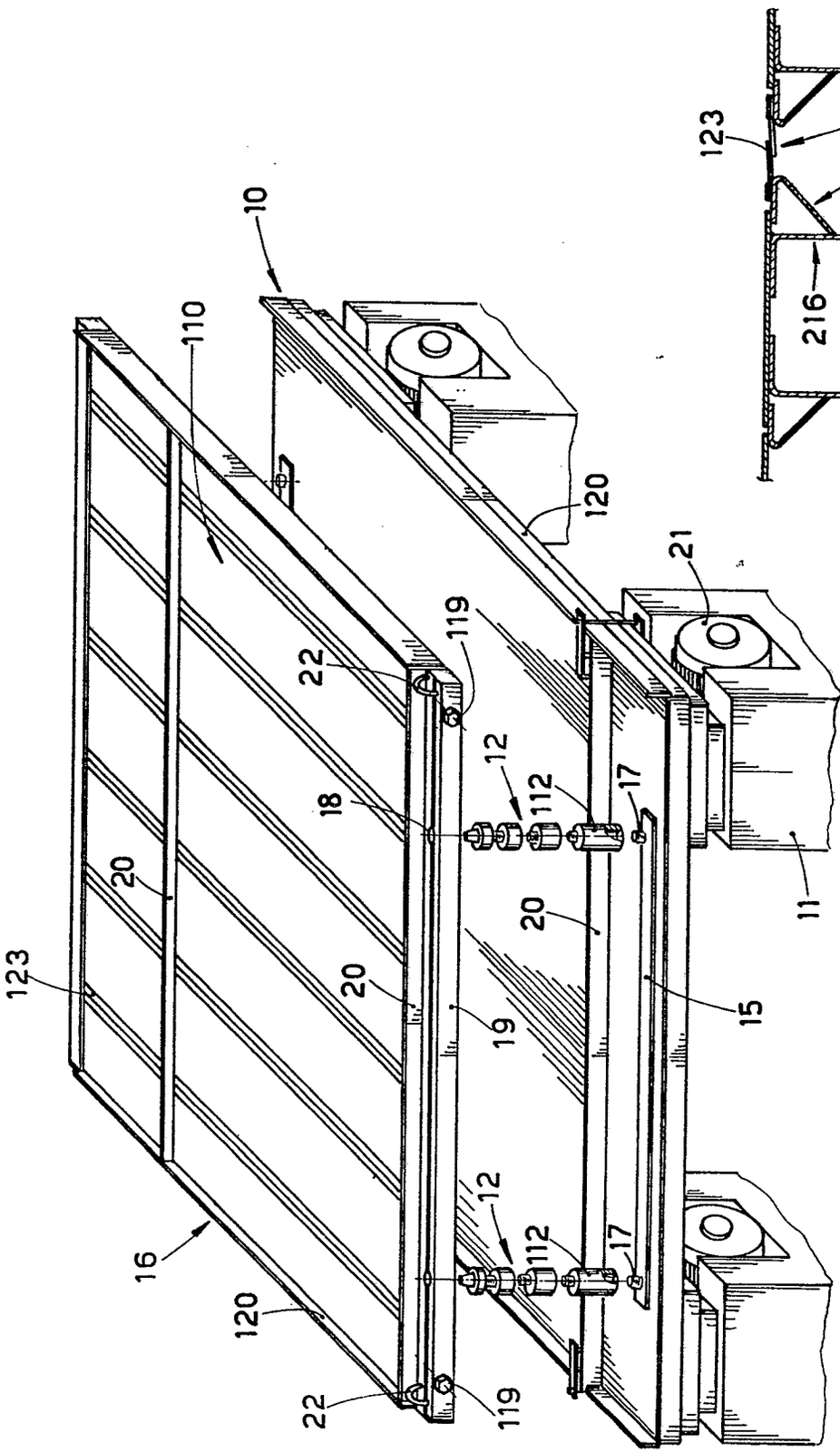


fig.1

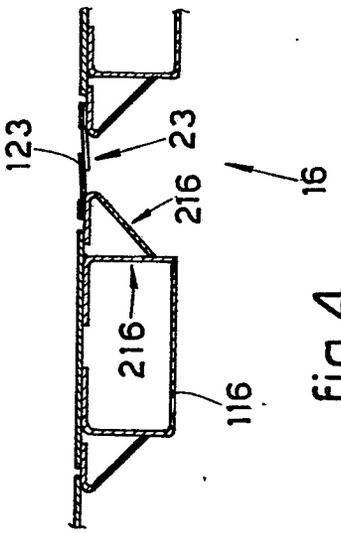


fig.4

Gilberto Petraz

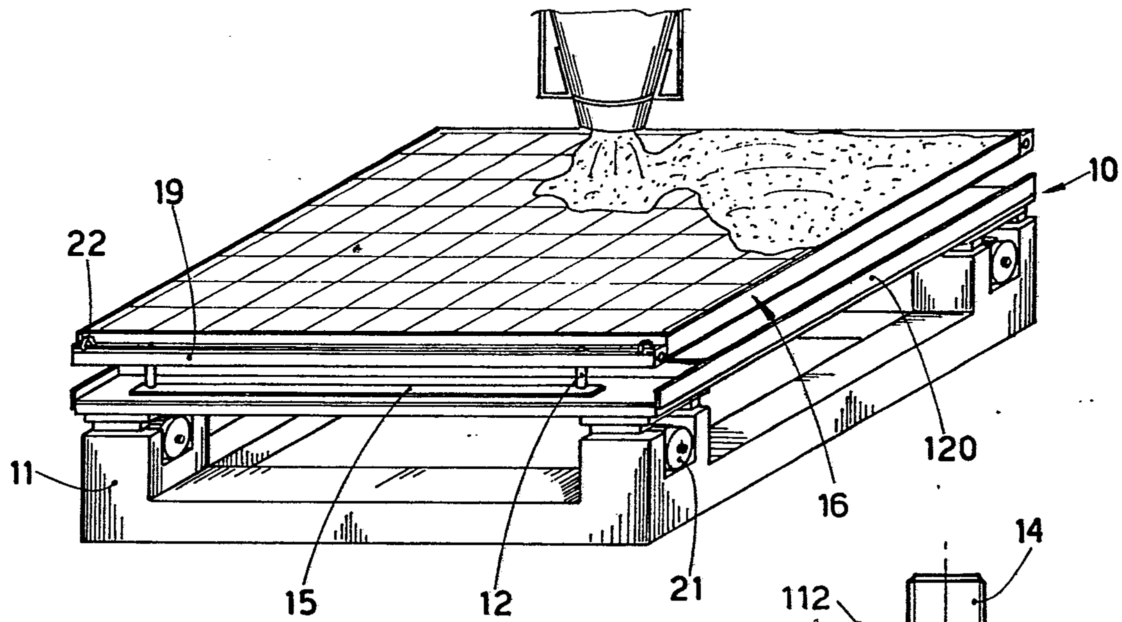


fig. 2

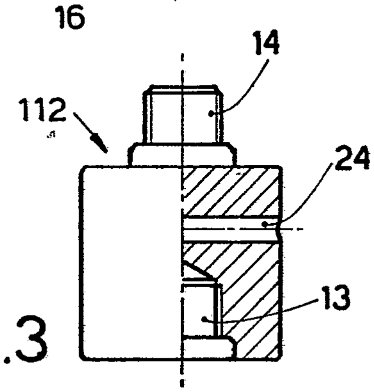


fig.3

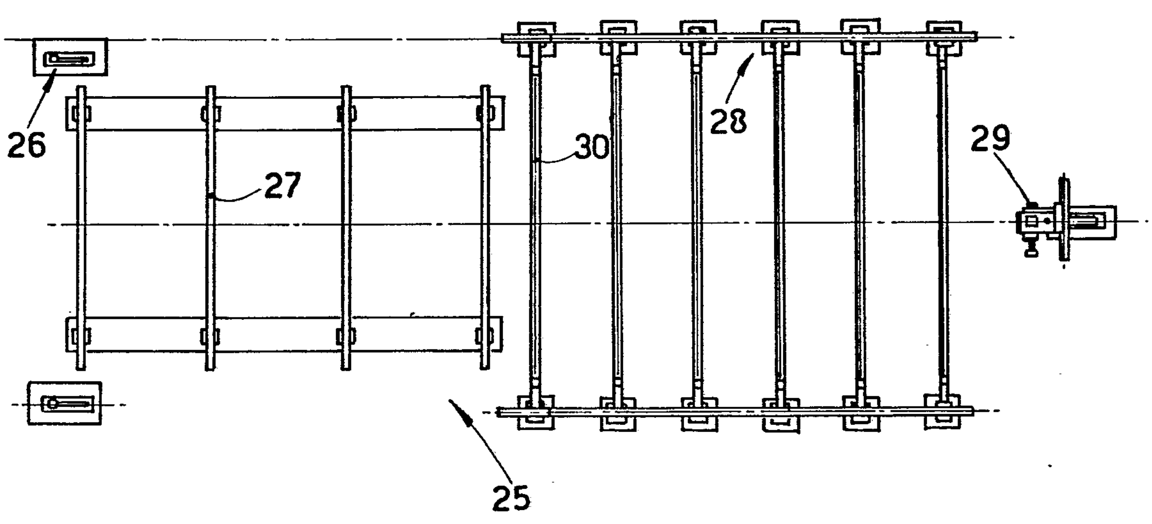


fig. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application number
EP 81 83 0233

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A,D	DE - A - 2 611 843 (WAGNER) * page 5, paragraphs 3 to 4; page 6, paragraphs 1 to 5 *	1	B 28 B 23/02
			TECHNICAL FIELDS SEARCHED (Int.Cl. 3)
			B 28 B

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
Y: particularly relevant if combined with another document of the same category
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: earlier patent document, but published on, or after the filing date
D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	01-03-1982	NOESEN

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