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(54) Installation for carrying out metallic reinforcements.

(57) An installation for carrying out metallic reinforcements for construction and public works, in which trestle bents (A-frames) are arranged on moving wagons or carts that slide along rails. The workers remain stationary while the reinforcements move to their work stations so that each of their sections can be bound together. There is one area for loading (13, 14), another for unloading (19) and a third for the binding (15, 16) itself, preferably arranged in a closed circuit.

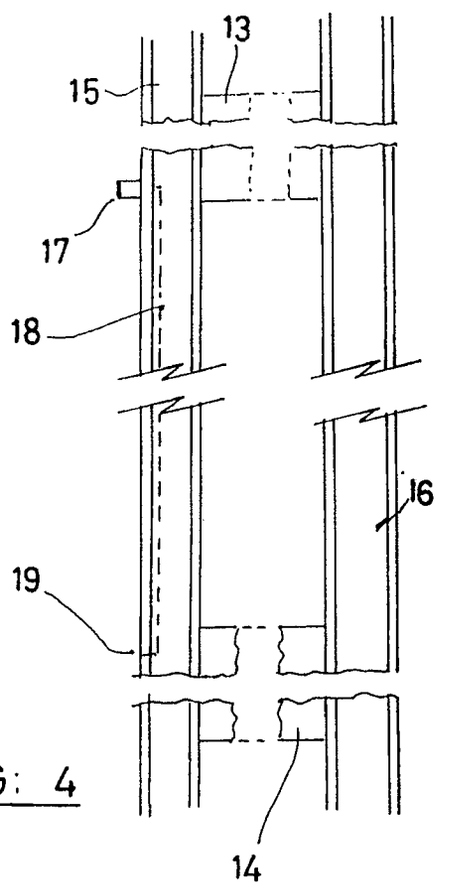

FIG: 4

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The patent deals with reinforcements used in construction , such as in pillars, beams, supports, girders, etc. The manufacture of reinforcements of this kind is carried out either on site, where the construction is taking place, or in a factory, in which case the prepared reinforcements are transported to the construction site to be arranged in the place in question, that is, for assembly.

A method of carrying out these reinforcements either on site or in a factory, by which a first cutting and shaping operation is carried out on the different pieces of iron needed for the said reinforcement. These pieces of iron are then placed on tables or trestle bents, where a pre-assembly of the reinforcement to be made is carried out. Next, the workers proceed to bind together the meeting points of the preassembled reinforcement in the places in question, with the reinforcement being static on the trestle bents and the worker or workers moving along its length until all the necessary points have been bound together, thus giving shape to the reinforcement.

For binding together the meeting points, the traditional way is known, based on manually placing a wire at each point and later braiding it by means of a tool, for instance a pair of pliers or pincers.

This traditional system needs specially skilled workers, called steel erectors or steelworkers, who usually develop a high level of production, in the region of 45 to 50 Kg. of iron per hour and even up to 60 Kg. of iron per hour per person. The problem with this traditional method of assembly lies in the high production costs, due especially to the high cost of skilled labour and its scarcity as workers of this kind are needed by all constructors.

More recently, pre-shaped clips are being used which are fitted where the reinforcement members cross. These clips are provided with projections which are picked up by a tool which automatically braids the said projections until a perfect closure of the clip is obtained.

The advantage of using clips and automatic braiding tools is that highly skilled labour is not needed but that semi-skilled workers and even apprentices can be used. In this case, the production is similar to with the previous system, although with the inherent advantage of employment and the possibility of finding suitable personnel.

The system of welding the pre-assembled reinforcement at the meeting points by using skilled labour is also known. Apart from the kind of welding to be used, with or without flux, the production in Kilograms per hour per person will remain at a maximum of 60 and the welded reinforcement will be more rigid, which is not advisable.

With slight differences, the workers move along the structure in all these methods of carrying out the work, whereas the structure remains static until it is completely bound together and ready for its assembly or transport. Therefore, in all the systems known up to now, these two constants are present: the reinforcements remain static while the workers move. Also in general terms, the production turns out to be limited, as has already been stated, with the maximum amount being some 60 Kg. per hour per person.

More recently, known by means of the French patent 84.14888 LAFON, is a type of installation based on a fle xible machine which has an area for the longitudinal irons of the structure to be arranged and another adjacent area for the transverse irons, which are stacked up. In this installation, traction on the longitudinal irons is carried out among the stacked transverse irons, taking one transverse iron each time, which is bound in the traditional way until the structure is completed.

This installation is complex in itself and in the way of proceeding to make up the structure, meaning that its use in practice is not viable given that it is neither cheaper than traditional processes nor increases production.

One aim of the patent is to attain a method of production which provides a greater output of reinforcements of the order of at least 30 per cent and usually 50 per cent more in equality of conditions, with which the cost of the finished reinforcement can be quite considerably cheapened, even taking into account the amortization or repayment for the installations and the tools.

Another aim of the patent is to obtain an automatic or semi-automatic installation which moves the reinforcements for their pre-assembly and assembly, and in which the workers remain static while the reinforcements are moved in front of their work stations.

To put the patent into operation, pre-shaped clips and braiding tools are used, after the clips have first been positioned by the worker or operator. Each worker is provided with an automatic braider and a sufficient amount of clips to be arranged at the binding points of each reinforcement. The operations of cutting and shaping the pieces of iron are carried out in the same way as with the traditional methods, with the special features of the patent coming in after the shaping of the components.

The existence is claimed of a set of wagons or carts on which are situated the trestle bents or A-frames that receive the already shaped pieces of iron, in that these wagons are fitted with suitable means of rolling along rails 50 that they can move in at least one direction. When the different pieces of iron have been suitably cut and shaped, the pre-assembly of the reinforcement is carried out on the trestle bents on the said wagons.

In this situation, each wagon is moved along the rails of this pre-assembly area to another rail in which means are fitted to move the wagons at a variable speed and in that these means go together with other ones in the lower part of each wagon. Normally in this binding line, a variator motor is provided, with a connection on its shaft outlet for an endless chain of a similar length to that of the rail; this endless chain will engage with the projections on the wagons and move them along the assembly track.

On this assembly track, the reinforcement on the wagons circulates at a certain speed while the workers remain stationary, binding together the meeting points of the reinforcement with the clips and the braiding machine as each section of the reinforcement passes in front of their work stations.

The number of workers is logically variable, given that it is obvious to point out that, in general terms, a greater work rate can be achieved with a higher number of operators.

The traverse speed of the wagons which carry the reinforcement is variable as was stated previously, and it should be considered that with an equal number of operators or workers, the speed of the wagon will be slower when the reinforcement is more complex and has a greater number of binding points in each section.

At the end of the work track, any specific reinforcement will be completely finished and ready to be moved into stock, loaded onto a lorry, etc. It must be considered here that the pieces of iron, for assembly of the reinforcement on site are placed on the wagon at the beginning of the process, so that when the reinforcement is finished, these pieces of iron can be fastened to it so that they are controlled until the time of assembly on site.

When the reinforcement has been taken off the wagon, this moves to another area with rails, adjacent to the work area, where the wagons can be loaded again before moving to another or to the first assembly line.

The possible combinations of work tracks and pre-assembly areas, as well as unloading areas are infinite and will depend, as is logical, on variables, such as the space available, the capacity that the installation is to be provided with, etc., as will be pointed out later in relation with the sheets of drawings.

In the pre-assembly areas, the wagons can be provided, if desired, with a gentle traverse movement towards the work track, and the worker or workers could perfectly carry out the pre-assembly of the reinforcement during this movement.

For purposes of clarification, and as an example, the accompanying sheets of drawings show an example of an installation in which the procedure laid down in this specification could be applied.

Figure 1 shows, partially, a simple reinforcement.

Figure 2 shows a piece of iron, a stirrup or hoop in this case, pre-shaped for fitting into the reinforcement.

Figure 3 shows a wagon on which the reinforcements can be placed.

Figure 4 is a layout diagram of a possible installation.

Figure 5 shows a detail of Figure 4.

Figure 6 deals with the wagon mounted on the rails of the binding track.

Figure 7 shows, partially, a reinforcement with the pieces of iron for assembly.

Figure 8 represents a section of a more complicated reinforcement.

As can be observed in Figures 1 and 2, a pre-assembled reinforcement 1 is based on longitudinal pieces of iron 2 and transverse iron stirrups or hoops 3, which must be joined together with wire at the meeting points, for instance at 4, 5, and 6 etc. with the help of already pre-shaped clips which are placed at these points and with tools that braid together the ends of these clips.

Figure 3 shows a wagon or cart 7 on which a structure based on trestle bents or A-frames 8 - 9 has been mounted to procure a support base for the reinforcements, The wagon moves along rails 11 and 12 using its own means of rolling, which are not shown but could be, for instance, wheels, bearing, etc.

With reference to Figure 4, we can see the arrangement of a model installation as an example, according to which there is a pre-assembly area 13 in which the wagons with the reinforcements receive the pieces of iron and travel to an adjoining area 15 where the wagons are engaged by a chain 18 driven by a variator motor 17. In this area, the workers or operators remain stationary and while the reinforcement moves in front of them can carry out the binding together of the points in each section. At the end of its travel, for example in position 19, the reinforcement is now completely finished and ready to be stored or loaded onto a lorry for site delivery.

The wagons which are left free move to are 14, which might be another pre-assembly area, for example, from which the wagons move to area 16, where these reinforcements are bound together by another group of workers. This order or succession might be altered, making area 16 a return area only for the empty wagons from the first pre-assembly area 13. This situation would respond, for example, to the fact of only one group of workers being available.

In Figure 8 we can see an enlargement of the preassembly area 13 and the position of one of the

wagons 7 with the trestle bents. A indicates the direction in which the pieces of iron enter onto the trestle bents, which enter from direction C. The wagons 7, once loaded with the pre-assembled reinforcements, are transferred in direction B towards the binding line.

Figure 6 shows a wagon 7, illustrated here without either trestle bents or reinforcements, on the rails 11 of the binding areal The aim of D and E is to indicate the work stations of the operators, in this case on both sides of the wagon, when it is moved by the action of the chain or rack rail 18 on the stops 23 and 22 of the wagon itself.

In Figure 7 we can observe the final position of the assembly irons 20, which are placed on the reinforcement and bound to it, specifically to the stirrups 21, once that the other meeting points have been consolidated.

Figure 8, finally, shows a reinforcement with a greater number of binding points 24 in each section, than the one shown in Figure 1. This and other types of reinforcements which are more complex or for special applications can be dealt with by the procedure which is proposed in this specification.

On the other hand, it is pointed out that for reinforcements of the kind described, and in normal conditions, a wagon of approximately 11 metres in length has proved to be the most advisable size for practical reasons.

The installation described up to present is situated on rails arranged on the floor of a certain bay. For the purposes in question, it is pointed out that the same arrangement can be carried out aerially, so that the trestle bents (A-frames) rest on hooks or similar at a certain distance from the ground.

Claims

1.- INSTALLATION FOR CARRYING OUT METALLIC REINFORCEMENTS, of the type applicable in the preparation of pillars, beams, supports, etc., starting from pieces of iron, when cut, bent to the sizes required, pre-assembled on trestle bents or similar, marked and bound together at the necessary points, in that the reinforcements preassembled on trestle bents remain static while the worker(s), by moving along the reinforcement, attach wires or clips at the said points, with these wires or clips then being braided by a special braiding tool, which is essentially characterised for the following reasons:

- the trestle bents (A-frames) are arranged on mobile wagons which roll along rails.
- the mobile wagons move, at least during the binding operation on the reinforcement.
- the worker(s) or operator(s) who perform the binding operation remain stationary while the wagons move along the rails to come level with their work stations.
- the speed of the wagons during the time they are in the binding area at least, is variable depending on the type of reinforcement in question and on the number of workers.
- the number of workers who bind together the reinforcement is variable in terms of its greater of lesser complexity and the speed at which the wagon travels.
- the workers will preferably be positioned on both sides of the wagons when these are moving so that the reinforcement can be bound together.

in that there is an area for loading, pre-assemling and marking the pieces of iron on the trestle bents mounted on the wagons which travel along the rails, a binding area where the wagons travel along rails so that the workers can perform the binding operation and which follows on from the loading area, and a later unloading area, in which the wagons on their rails allow the finished reinforcements to be unloaded and another area which the empty wagons pass through on their return towards the starting point.

2.- INSTALLATION FOR CARRYING OUT METALLIC REINFORCEMENTS, in accordance with Claim 1, characterised because during the pre-assembly and marking of the reinforcement on the trestle bents mounted on the wagons, the wagons remain stationary and are moved along to the binding line once that the said two operations have finished so that the binding can begin.

3.- INSTALLATION FOR CARRYING OUT METALLIC REINFORCEMENTS, in accordance with Claim 1, characterised because during the pre-assembly and marking operations of the reinforcements on the trestle bents mounted on the wagons, the wagons move very slowly towards the binding line.

4.- INSTALLATION FOR CARRYING OUT METALLIC REINFORCEMENTS, in accordance with Claim 1, characterised because when a reinforcement has already been bound together on the mobile wagon, the wagon travels to an area where the reinforcement is loaded, in that the wagon is mobile, in that once the wagon is unloaded, it rolls towards another area for loading, pre-assembly and marking of a new reinforcement.

5.- INSTALLATION FOR CARRYING OUT METALLIC REINFORCEMENTS, in accordance with Claim 4, characterised because the reinforcement loading and unloading areas are one, same area.

6.- INSTALLATION FOR CARRYING OUT METALLIC REINFORCEMENTS, in accordance with Claim 1, characterised because in the loading area, the pieces of assembly iron for site assembly, with these then being bound on the inside of the reinforcement, once that it has been bound together

and before it is unloaded.

7.- INSTALLATION FOR CARRYING OUT METALLIC REINFORCEMENTS, in accordance with Claims 1 and 5, characterized because the wagons are provided with forward and backward movement while in the binding area and during binding.

8.- INSTALLATION FOR CARRYING OUT METALLIC REINFORCEMENTS, characterised because there are rails which receive wagons with trestle bents on board, the wagons moving on these rails in a reinforcement pre-assembly and marking area, in that these rails communicate with other adjoining rails between which a means of traction operated by a variator motor is situated, in that the bottom of the wagons have means of interconnection with the previously mentioned means of traction so as to move the wagons along the rail, in that at the end of the rail there are other areas where the reinforcements are unloaded.

9.- INSTALLATION FOR CARRYING OUT METALLIC REINFORCEMENTS, in accordance with Claim 8, characterised because the means of traction for the wagons is a chain, into which projections on the bottoms of the wagons engage.

10.- INSTALLATION FOR CARRYING OUT METALLIC REINFORCEMENTS, in accordance with Claim 8, characterised because another wagon travel line is established between the initial and final rails, which takes the empty wagons to the initial loading area, thus forming a closed circuit.

11.- INSTALLATION FOR CARRYING OUT METALLIC REINFORCEMENTS, in accordance with Claim 8, characterised because the length of the wagons with trestle bents in variable, preferably of approximately 11 metres.

12.- INSTALLATION FOR CARRYING OUT METALLIC REINFORCEMENTS, in accordance with Claims 8 and 10, characterised because the motors which drive the means of traction for the wagons can vary their speed depending on the reinforcement in question and the number of workers.

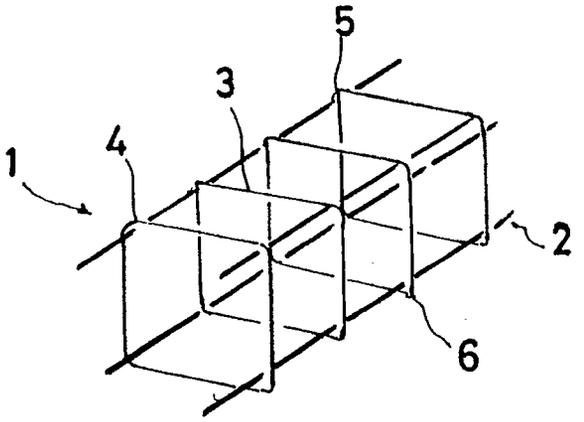

FIG: 1

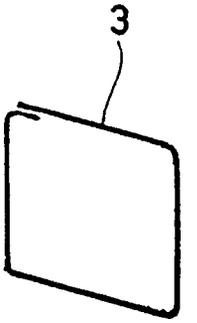

FIG: 2

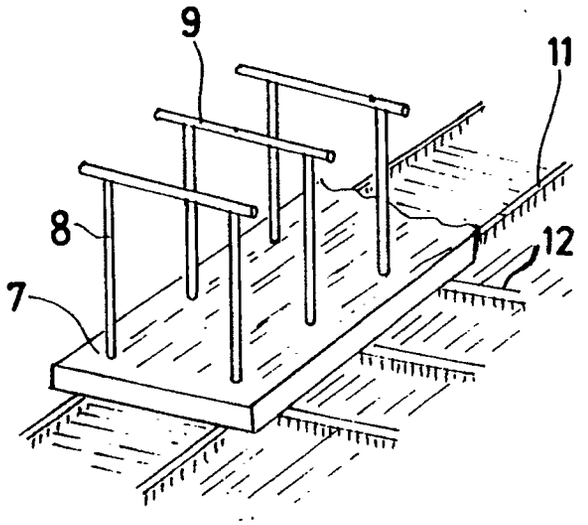

FIG: 3

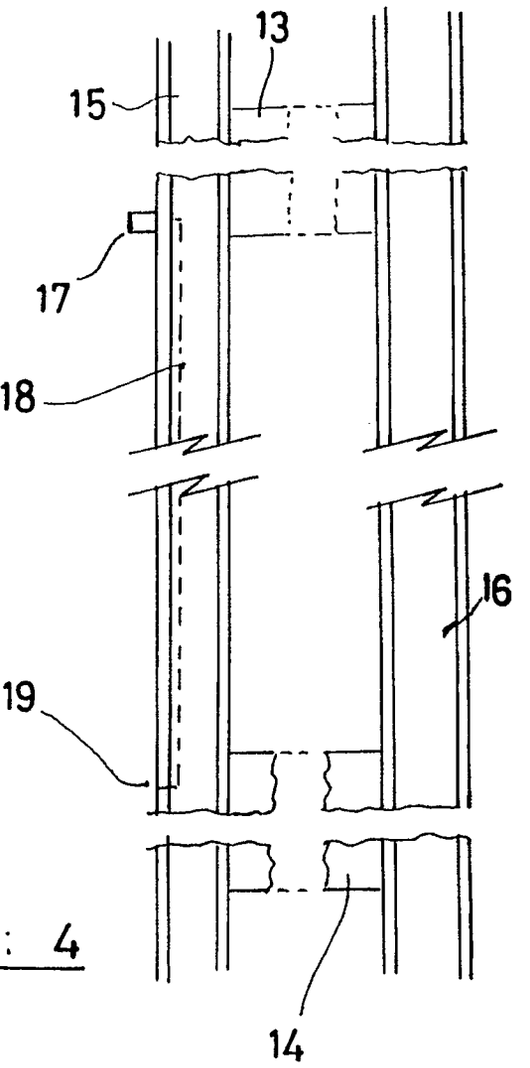

FIG: 4

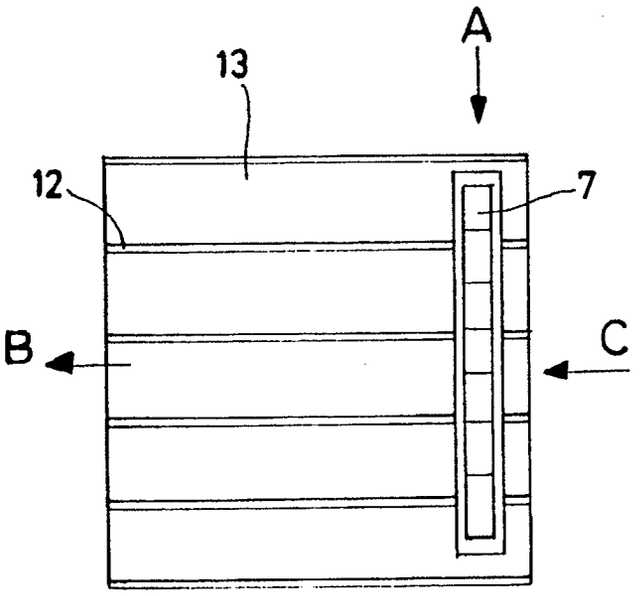

FIG: 5

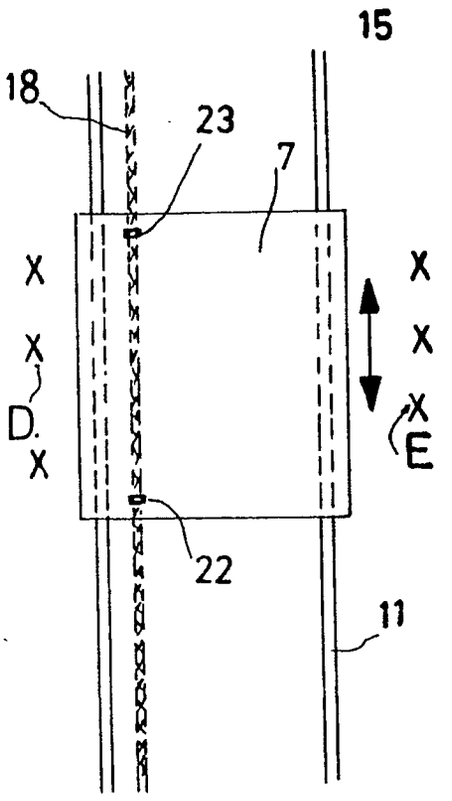

FIG: 6

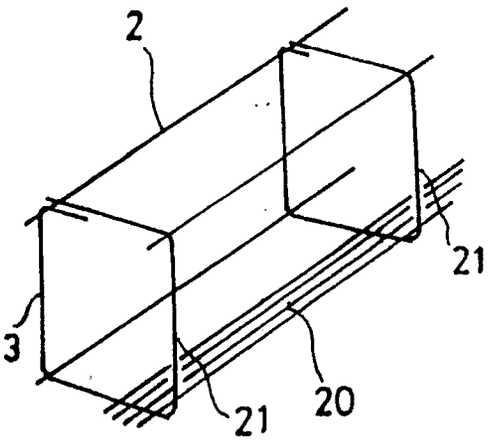

FIG: 7

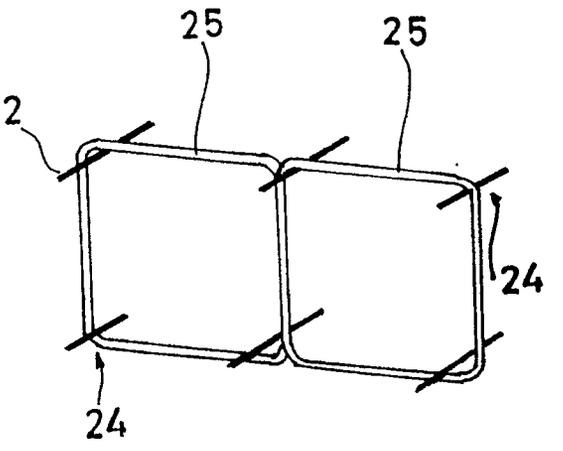

FIG: 8

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EUROPEAN SEARCH REPORT

Application Number

EP 90 50 0075

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
D,X	FR-A-2 570 625 (LAFON) * Page 4, line 33 - page 5, line 26; page 6, line 36 - page 7, line 7; page 8, lines 1-15; page 8, line 38 - page 9, line 20; figures 1-5,12-21,28 *	1-4,6,8,9	B 21 F 27/20
A	US-A-3 874 062 (MUTO) * Abstract; figures *	1,6	
A	FR-A-2 623 548 (BAUMANN) * Abstract; figure 1 *	1,6	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
B 21 F

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	08 November 90	THE K.H.

CATEGORY OF CITED DOCUMENTS

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