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(54) Concrete reinforcement assembling machinery

(57) The invention refers to a **Concrete Reinforcement Assembling Machinery**.

It is a machine which automatically or semi-automatically assembles by use of welding method the formed shapes from iron rods (stirrups) with straightened ones, thus constructing the concrete reinforcement.

It consists of an immovable metal frame (1) upon which all mechanisms and components are installed.

On the frame (1) the rotating feeder (2) is adjusted for the -either automatic or manual- feeding of the assembling point with formed shapes (stirrups) (6) and with straightened iron rods (24).

The assembling phase is accomplished by means of two mobile and independently moving assembling columns (15 and 21), in combination with the system for holding-welding and propulsion of the concrete reinforcement that is placed at the upper and lower part of each mobile column (15 and 21).

The assembled concrete reinforcement (main or auxiliary) is based on a corresponding bench (32) the size of which is adjusted according to the sizes of the concrete reinforcements being assembled.

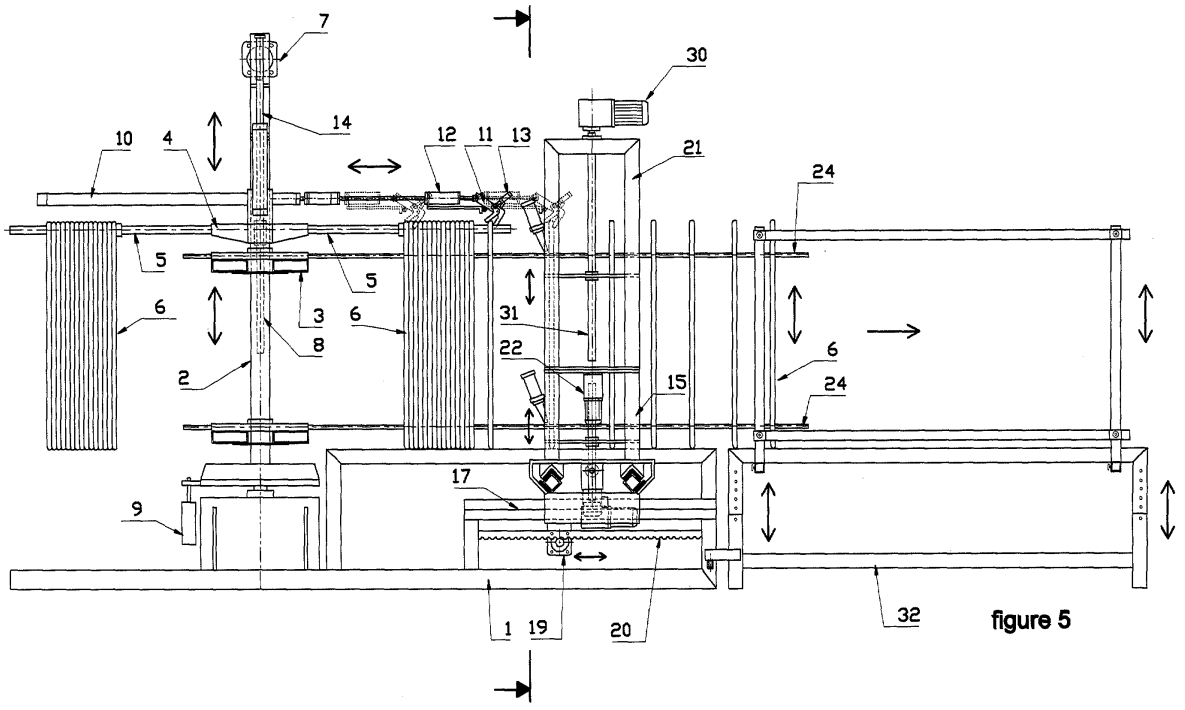

figure 5

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Description

[0001] The invention refers to a machine that assembles automatically or semi-automatically by method of welding the formed shapes from iron rod (stirrups) with straightened ones, thus creating the concrete reinforcement, which is essential for the construction of buildings. It has the ability to assemble different types of concrete reinforcement of various shapes and sizes which may be either of closed or opened type, such as straightened iron rods with square, rectangular, polygon, multi-sectional etc shapes, known as stirrups.

[0002] Until today, the common technique for the assembling of concrete reinforcement was that of forming the iron rods into various shapes (stirrups), their setting in definite -between them- distances and then tying them by use of wire or by manual welding at the points where they intersect with the straightened iron rods, creating the concrete reinforcement.

This way of assembling and constructing concrete reinforcement leads to the requirement of considerable time and to small production.

Another way of concrete reinforcement assembly concerns an invention of our conception, Patent No: 980100509, regarding Automatic Assembling Machine of Shaped Iron Concrete Rods with Straightened ones. It concerns a machine that functions entirely automatically via computer, yet with a different structure and design than those described at the present invention.

[0003] The **Concrete Reinforcement Assembling Machinery** consists of an immovable metal frame upon which all those mechanisms and components that compose it are installed.

On the frame is adjusted the rotating feeder of the machine with formed shapes (stirrups) and bears with the adjustable guides for the straightened iron rod and the movable base with the adjustable guides for the installation of the formed shapes. The movable base has the ability of ascent-descent of the entire system as well as of its adjustment according to the size of the concrete reinforcement to be assembled. In addition, the movable base -in case of automatic function- bears with a mechanism for the automatic propulsion of the shape (stirrup) at the assembling point. A corresponding variety of adjustment exists at the guides for the straightened iron rod.

The concrete reinforcement assembly is achieved via the two mobile columns adjusted on to glide-guides having the ability of a free opening-closing as well as of a forward-backward movement; in addition, the upper part of every column can move independently (opening-closing).

On the upper and lower part of every column, the system of holding-welding and propulsion of the concrete reinforcement, which has the ability to ascend-descend and to adjust depending on the size and the kind of the concrete reinforcement, is adjusted.

During assembling phase and upon then, the assembled concrete reinforcement is based on a corresponding bench.

[0004] The advantage of this invention is that for the assembling of the concrete reinforcement (main or auxiliary) either the automatic or the semi-automatic procedure is followed by use of minimum mechanisms and components that achieve the result.

[0005] It has the ability to accept all the gathered -to-be-assembled- formed shapes of closed or opened type (square, circular, polygon, multi-sectional etc of different sizes) in a rotating feeder and in a -self-contained from the assembling- space, which one by one are propelled for either automatic or manual assembly.

The rotating feeder bears two or more positions for the installation of the formed shapes, decreasing significantly the time intermediating from the completion of an assembly and the re-start process of a new one.

Via the guides for the iron rod, the straightened rods are propelled simultaneously with the propulsion of the assembled concrete reinforcement.

The system of holding-welding and propulsion of the concrete reinforcement assembles the concrete reinforcement thus fulfilling the assembling procedure (welding) in less time compared to the previous technique, with high quality productive results and small concrete reinforcement construction cost, while the method contributes considerably to the standardization by way of the similar concrete reinforcement construction.

The invention can be well comprehended by right of the following figures:

On sheet 1 (figure 1) is shown the sector coming from sheet 5 and 6 of the **Concrete Reinforcement Assembling Machinery**, at a phase that a simple rectangular shape is assembled with straightened iron rods for the construction of auxiliary concrete reinforcement.

On sheet 2 (figure 2) is shown the sector coming from sheet 5 and 6 at the phase where a complex shape is assembled for the construction of auxiliary concrete reinforcement, which demands a dissimilar opening of the upper part of the assembling columns.

On sheet 3 (figure 3) is shown the sector coming from sheet 5 and 6 at the phase where a rectangular shape as well as a corresponding continuous inner shape (core) is assembled with straightened iron rods for the construction of auxiliary concrete reinforcement.

On sheet 4 (figure 4) is shown the sector coming from sheet 5 and 6 at the phase where an open broken shape is assembled with straightened iron rods for the construction of main concrete reinforcement.

On sheet 5 (figure 5) is shown the side view of the invention at the phase of an automatic assembly.

On sheet 6 (figure 6) is shown the side view of the invention at the phase of a semi-automatic assembly (manual propulsion of the formed shape).

On sheet 7 (figure 7) is shown in top view the **Concrete Reinforcement Assembling Machinery** with the feeder being at a rotation phase for the new feeding of the machine with formed shapes.

On sheet 8 (figure 8) is indicatively shown in side view and in enlargement a system of holding-welding and propulsion of the concrete reinforcement at an assembling phase.

On sheet 8 (figure 9) is shown in top view and in enlargement the system of holding-welding and propulsion of the concrete reinforcement at an assembling phase.

On sheet 8 (figure 10) is shown in top view and in enlargement the system of holding-welding and propulsion of the concrete reinforcement during the completion of the assembling and the transfer of the whole system backwards, so as the next phase of assembling to follow.

On sheet 9 is shown a series of indicative shapes that the Concrete **Reinforcement Assembling Machinery** can assemble and regard the auxiliary concrete reinforcement.

On sheet 10 is shown a series of indicative shapes that the Concrete **Reinforcement Assembling Machinery** can assemble and regard the main concrete reinforcement.

On sheets 11, 12 and 13 are indicatively shown 3 types of assembled concrete reinforcement in a three-dimensional view.

DETAILED DESCRIPTION

[0006] The **Concrete Reinforcement Assembling Machinery** consists of an immovable metal frame (1) upon which all those mechanisms and components that compose it are installed.

[0007] On the frame (1) is adjusted the rotating feeder of the machine with the formed shapes (stirrups) (2) which bears the adjustable guides of the straightened iron rod (3) and the movable base (4) with the adjustable guides (5) for the installation of the formed shapes (6).
The guides can regulate either manually or mechanically as well, while the movable base (4) moves at an upper-lower position via electro-motor or other kind of motor (7) as well as via bolt-system (8).
The feeder (2) rotates manually or mechanically and fastens at the position desired for the feeding of the machine by way of the mechanism (9).
In case the feeding is done in automatic mode (sheet 5, figure 5) at the upper part of the column of the feeder, the mechanism for the automatic propulsion of the formed shape (6) is adjusted, which consists of the propulsive piston (10) and the hook for the holding of shape (11) that functions via pistons (12) and (13).
While the machine carries out the feeding phase, which demands the rotation of the feeder, the mechanism for propulsion of the formed shape ascends to the upper point of the column by way of piston (14). The upper part is undependable of the column and does not rotate together with the rest part. After the feeder completes its rotation, the propulsion mechanism comes back to the initial position for the automatic process.
As regards the semi-automatic function (figure 6, sheet 6) the above-mentioned mechanism does not exist and the feeding of the machine with formed shapes is executed manually.

[0008] The assembling phase is performed by two mobile assembling columns (15 and 21) which are adjusted on to glide-guides (16) and the whole system of both two columns slides forwards-backwards on to the glide-guides (17).
The sliding (opening-closing) of the two columns (15) is done by use of two motors (18) that give the ability to the columns to move independently one of the other.
The front-rear movement of the assembling columns is done via motor (19) and via rack system or other system (20).
At each column (15), its upper part (21) opens and closes freely, by sliding on prisms with the aid of a motor with bolt (22).
At the lower and upper part of every column (15 and 21) the holding-welding and propulsion systems of concrete reinforcement are adjusted.
The holding-welding and propulsion of concrete reinforcement system (sheet 8, figures 8-9 and 10) consists of the hook (23) for the holding of the straightened iron rod (24), which executes an opening-closing movement via piston (25) and the clamp (26) which carries out the holding or non-holding of the formed shape (6) via the piston (27). The welding is realized at the selected time by the electro-welding head (28) that is adjusted to the system.
The entire system moves forwards-backwards via piston (29) by shutting in or by releasing the already formed concrete reinforcement and it has the ability to ascend-descend via motor (30) and bolt (31).
These movements enable the **Concrete Reinforcement Assembling Machinery** to accomplish a great number of actions having as aim the adjustment of its mechanisms at the size and welding positions of the concrete reinforcement to be assembled. All actions, commands and programming are executed by use of a control panel, placed in such a position that is accessible to the operator.
The -ready for placement- concrete reinforcement (main or auxiliary) is based on a corresponding bench (32) the

size of which is adjusted, according to the corresponding regulations, at the sizes of the concrete reinforcements being assembled.

DESCRIPTION OF AUTOMATIC OPERATION

[0009] The automatic function of the **Concrete Reinforcement Assembling Machinery** (sheet 5, figure 5) is simple, since it does not consist of complicated and inaccessible mechanisms and it is provided with a handy and legible control panel.

After the selection of the formed shape (6) (size, shape, and cross-section) is done, the selected quantity is put on the adjustable guides (5) which are at the rotating feeder (2). Following, the length and the size of the cross-section of the straightened iron rods (24) is selected and they are passed through the corresponding guides (3) by optioning the position accordingly, whether it regards the main concrete reinforcement assembly (angular position) or auxiliary concrete reinforcement (at a straightened part of the shape) and the bench (32) is regulated at the size of the concrete reinforcement assembled.

All mobile parts of the machinery are regulated by the control panel, for their adjustment at the size of the concrete reinforcement to be assembled, as well as the forward-backward movement of the columns that will be of such a distance as the one there is between the assembled shapes (step) of concrete reinforcement.

Also, the periods of time and the commands for propulsion and for assembly are programmed.

The start command is given and the first shape (6) is propelled at the assembling point via the propulsion mechanism (10), (11), (12) and (13) and then, the holding of the straightened rod (24) by means of the hook (23) as well as the holding of the shape (6) by means of the clamp (26) follow. At this phase, the electro-welding heads (28) are activated, which weld the shape with the straightened rods, while, at the same time, via the welding procedure, the columns (15 and 21) move forwards, carrying away the assembled concrete reinforcement as far as the selected distance there is between the shapes (step), thus decreasing the time demanded for each assembling phase.

With the completion of this motion, the hook (23) and the clamp (26) release the concrete reinforcement, the holding-welding and propulsion systems of the concrete reinforcement move backwards and the columns (15 and 21) return to the initial position.

From the propulsion mechanism (10), (11), (12) and (13), the next shape is propelled to the assembling position, so that the commands for forward movement of the holding-welding and propulsion systems, the stabilization of the shape to be assembled, the activation of the electro-welding heads and the repetition procedure to follow.

The same operation steps are followed, whether we produce main concrete reinforcement or auxiliary.

During the entire assembling process, the operator places the shapes to be assembled at the rear part of the feeder (2), so as, with the fulfillment of the concrete reinforcement assembling phases and without any waste of time, the feeder to rotate (sheet 7, figure 7) and via the mechanism (9) to fasten at the position desired for the beginning of the subsequent assembly.

The -ready for placement- concrete reinforcement is removed from the machine either manually or by use of an elevating vehicle, depending on its size and weight.

[0010] For the semi-automatic operation of the **Concrete Reinforcement Assembling Machinery**, all the above-mentioned procedures are followed; the only difference regards the feeding of the machine with the shapes (6) which is done manually (sheet 6, figure 6).

Claims

1. The **Concrete Reinforcement Assembling Machinery** is a machine that automatically or semi-automatically assembles by use of the welding method the formed shapes of iron rods (stirrups) with straightened ones and creates the main or auxiliary concrete reinforcement, which is essential for the construction of buildings.
   It consists of an immovable metal frame (1) upon which all those mechanisms and components that compose it are installed.
   At the frame (1) the rotating feeder of the machine (2) for the formed shapes (stirrups) (6) and the straightened iron rods (24) is adjusted.
   The assembling phase is realized by the two mobile assembling columns (15 and 21) which are adjusted on to glide-guides (16) and the whole system of both two columns slides forwards-backwards on to the glide-guides (17).
   On the upper and lower part of each mobile column (15 and 21) the system for holding-welding and propulsion of the concrete reinforcement is adjusted.
   The assembled concrete reinforcement (main or auxiliary) is based on a corresponding bench (32) the size of which is adjusted, according to the corresponding regulations, at the sizes of the concrete reinforcements being assembled.

2. The **Concrete Reinforcement Assembling Machinery**, according to Claim 1, is **characterized by** the fact that the rotating feeder of the machine (2) for the formed shapes (stirrups) (6) as well as for the straightened iron rods (24) bears the adjustable guides for the straightened iron rod (3) and the movable base (4) with the adjustable guides (5) for the placement of the formed shapes (6).
   The guides regulate manually or mechanically, while the mobile base (4) moves at an upper-lower position via electro-motor or other kind of motor (7) as well as via bolt-system (8).
   The feeder (2) rotates manually or mechanically and fastens at the position desired for the feeding of the

machine by way of the mechanism (9).

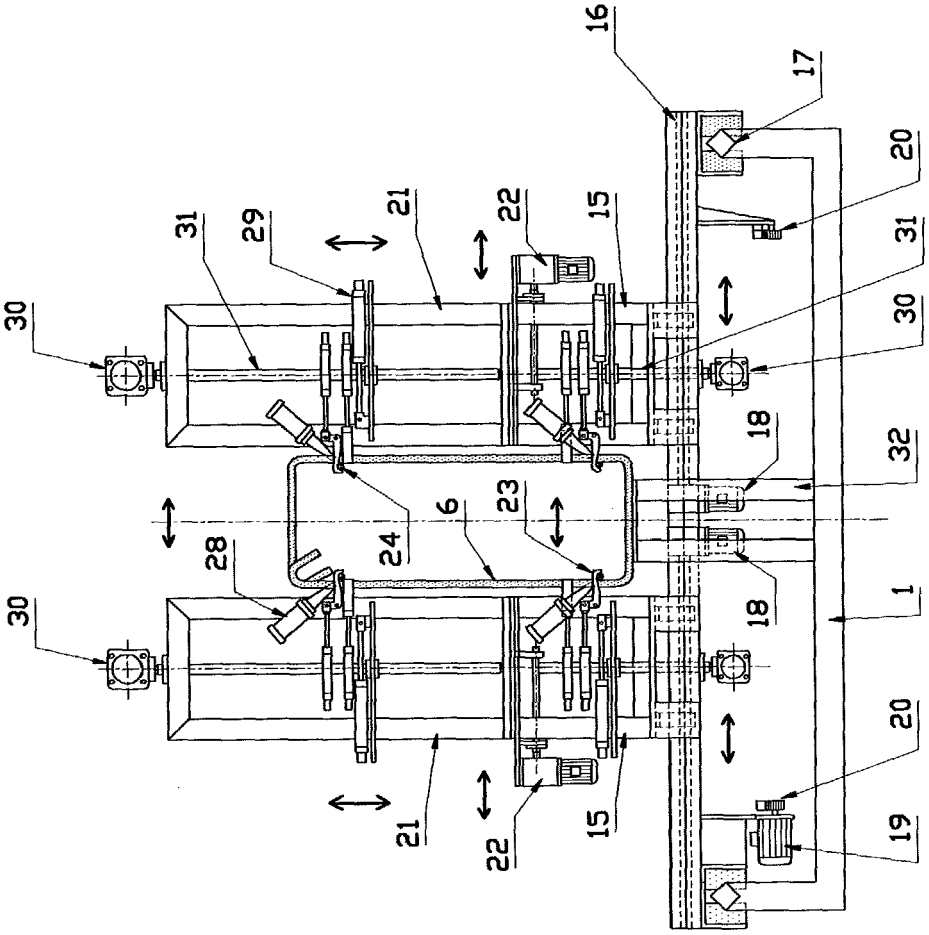
3. The **Concrete Reinforcement Assembling Machinery**, according to Claims 1 and 2, is **characterized by** the fact that the rotating feeder for the automatic feeding of the machine (2), at the upper part of its column, the mechanism for automatic propulsion of the formed shape (6) is adjusted, which consists of the propulsive piston (10) and the hook for the holding of shape (11) that functions via pistons (12) and (13).
During the phase of a new feeding of the machine, which demands the rotation of the feeder, the mechanism for propulsion of the formed shape ascends to the upper point of the column by way of piston (14). The upper part does not rotate together with the rest part. After completion of the rotation of the feeder, the propulsion mechanism comes back to the initial position for the automatic process.

4. The **Concrete Reinforcement Assembling Machinery**, according to Claim 1 is **characterized by** the fact that the upper and lower part of each assembling column (15 and 21) has the ability to move by opening and closing independently.

5. The **Concrete Reinforcement Assembling Machinery**, according to Claims 1 and 4 is **characterized by** the fact that at the upper and lower part of each assembling column (15 and 21) the system for holding-welding and propulsion of the concrete reinforcement is adjusted. It consists of the hook (23) for the holding of the straightened iron rod (24) which executes an opening-closing movement, as well as of the clamp (26) that carries out the holding or non-holding of the formed shape (6). The welding is realized by means of the electro-welding head (28) that is adjusted at the system.
The entire system moves forward-backward by shutting in or by releasing the already formed concrete reinforcement and upwards downwards for its adjustment depending on the size and shape of the concrete reinforcement to be assembled.

sheet 1

figure 1



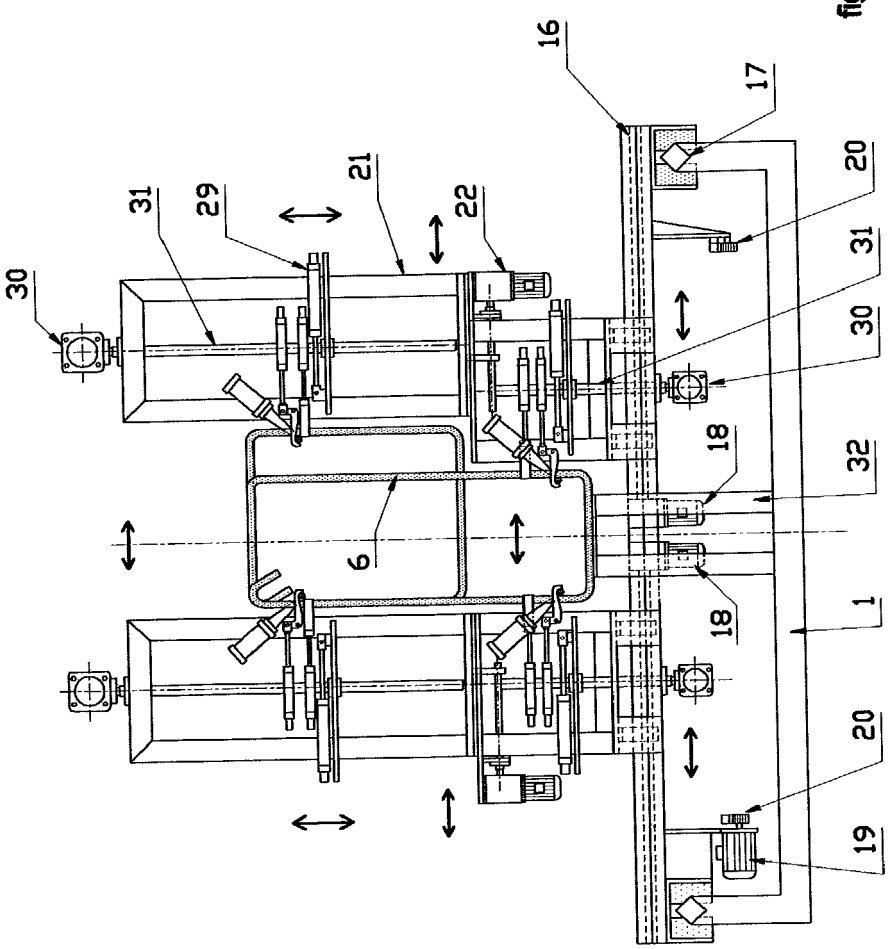


figure 2

sheet 2

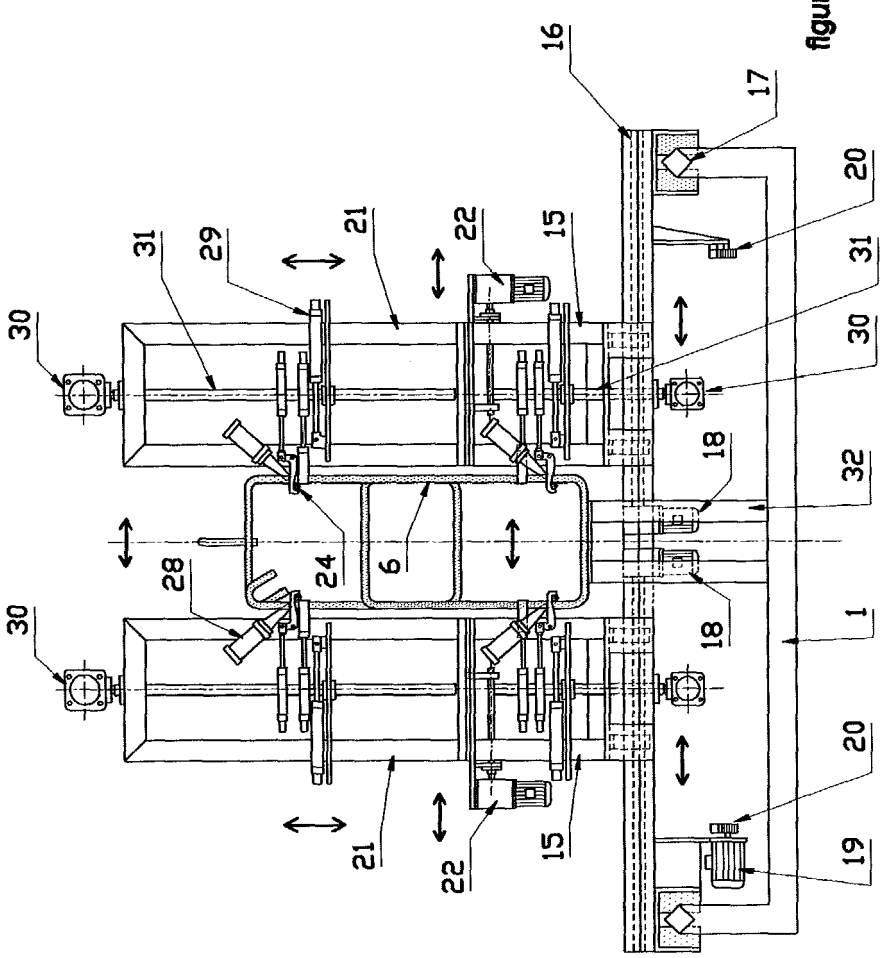
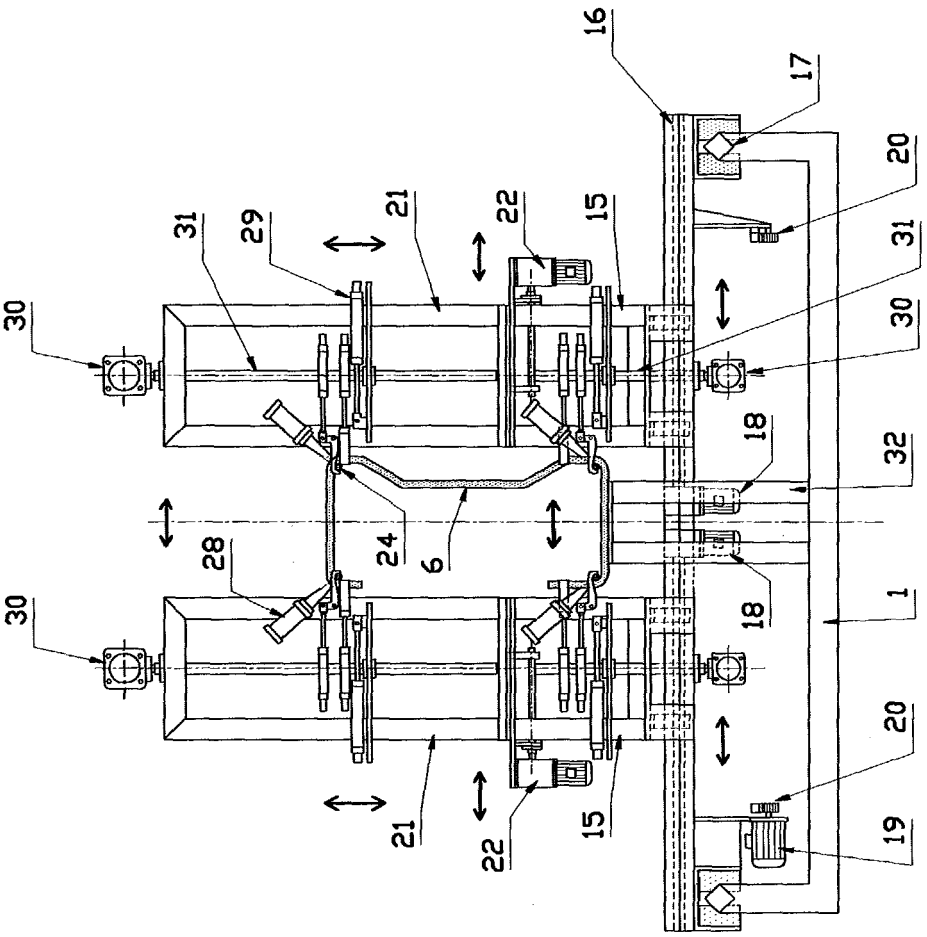


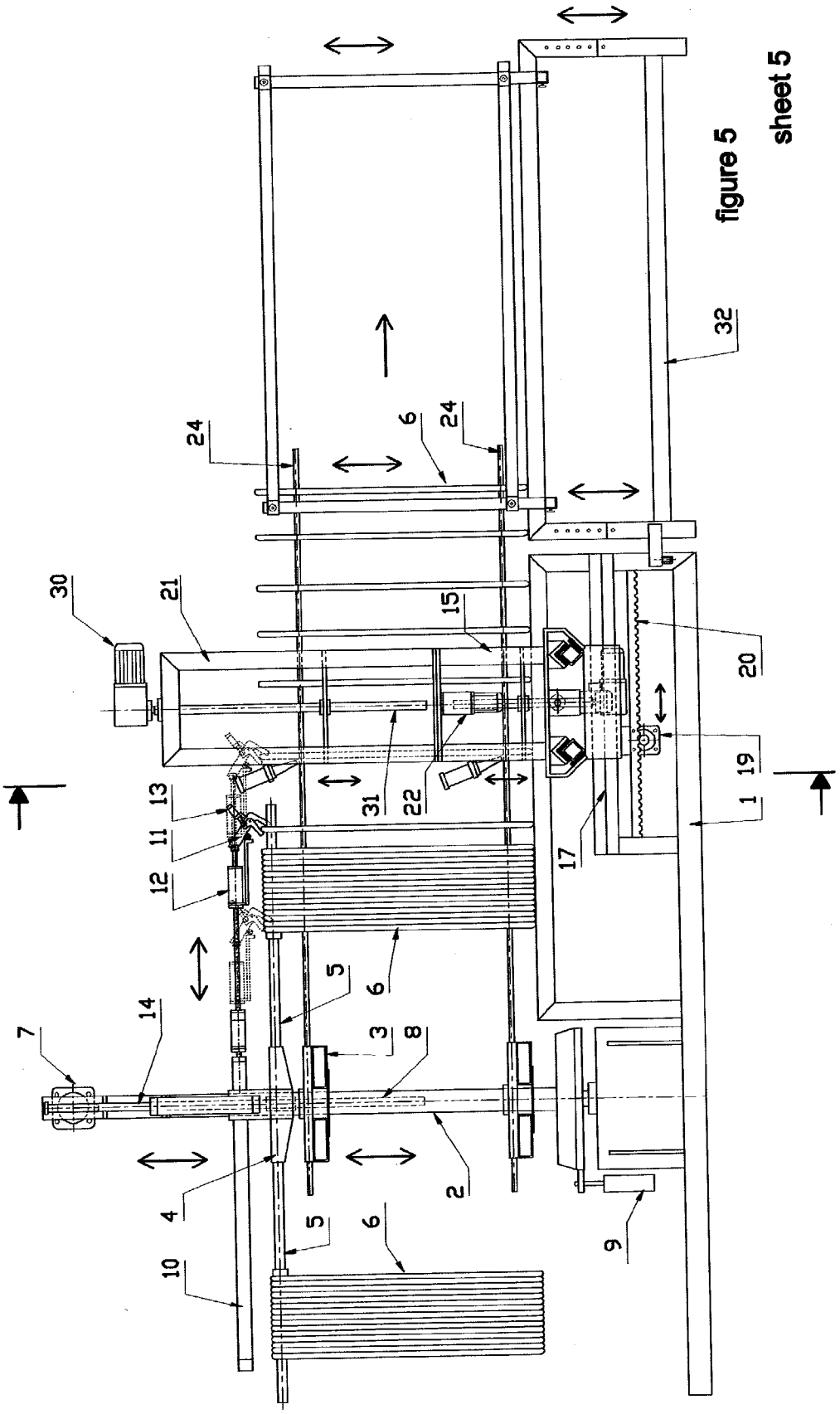
figure 3

sheet 3

sheet 4

figure 4




sheet 5
figure 5
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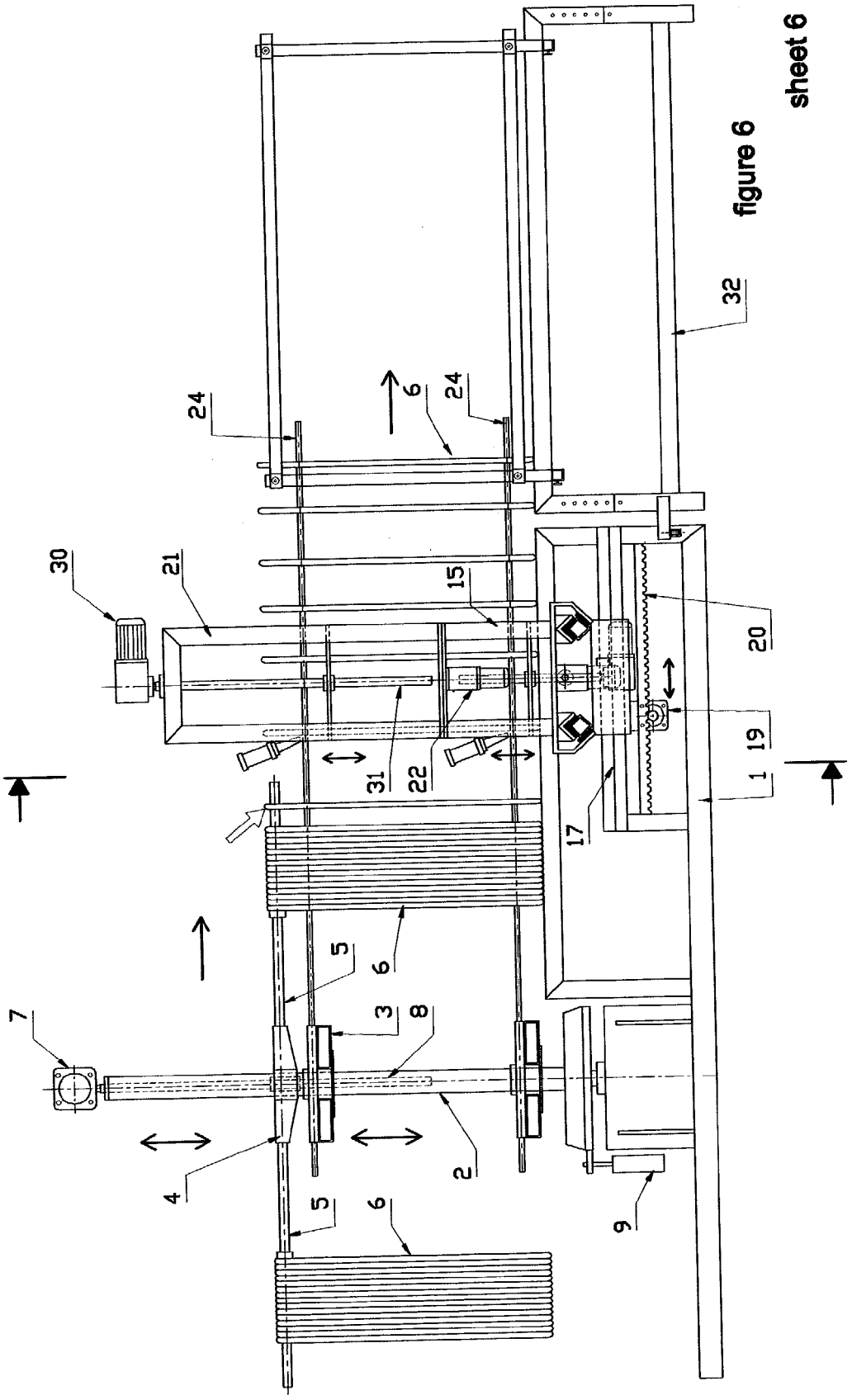
sheet 6
figure 6
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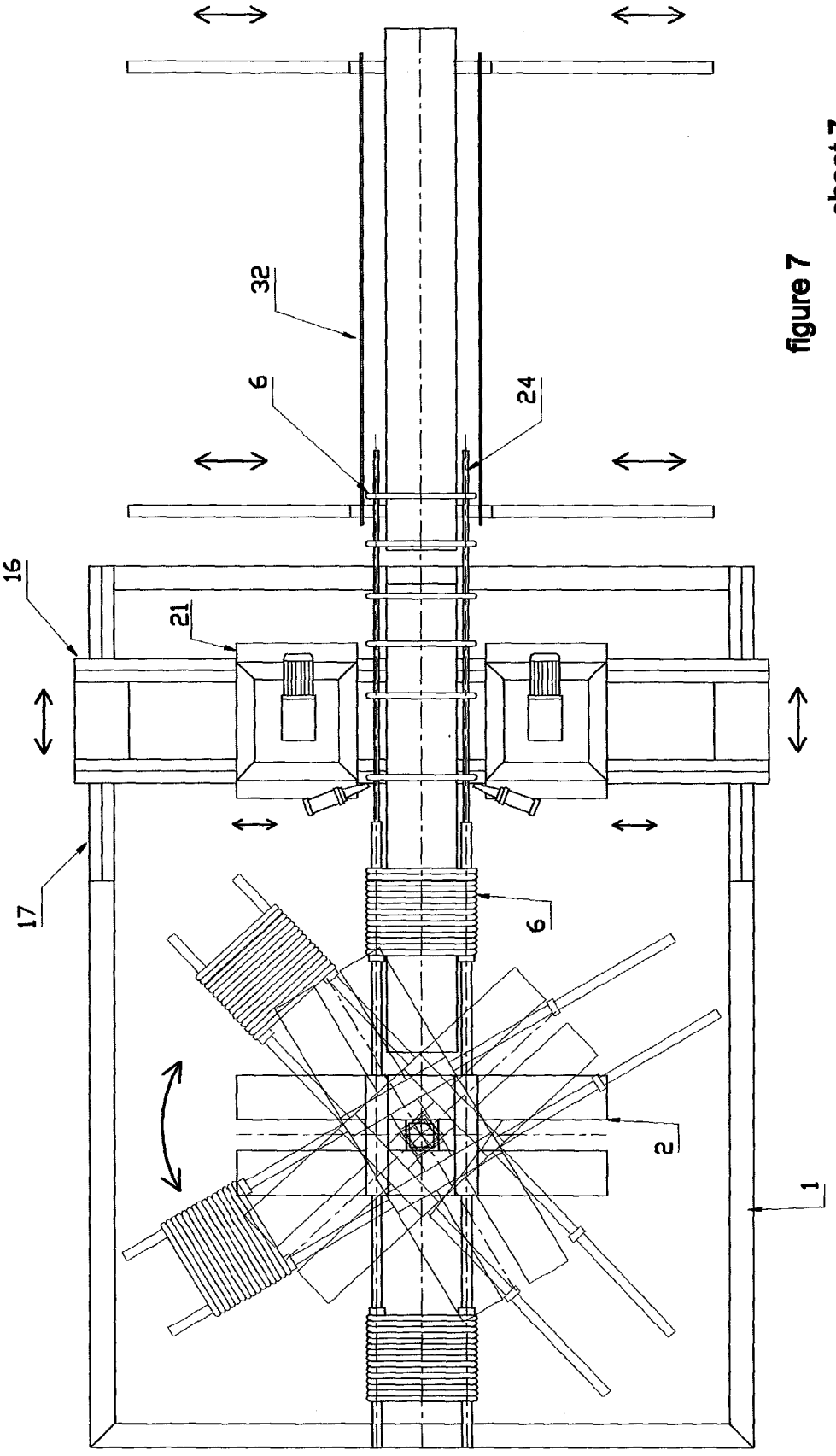


figure 7

sheet 7

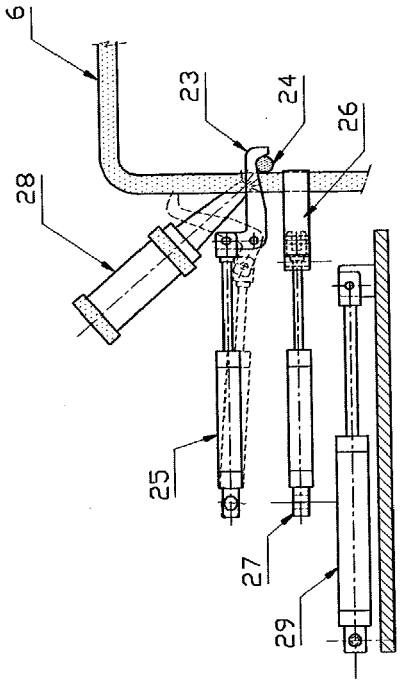


figure 9

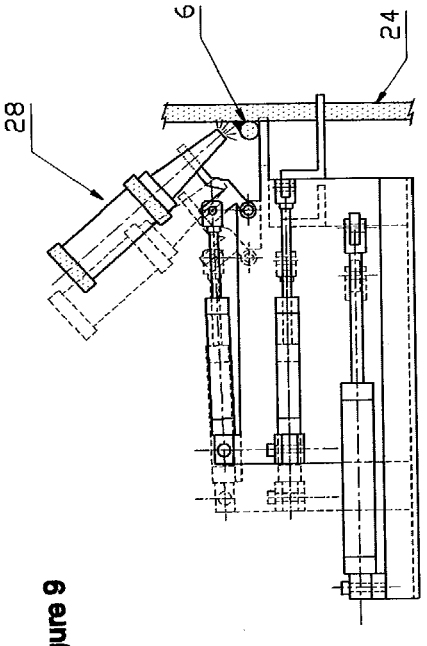


figure 10

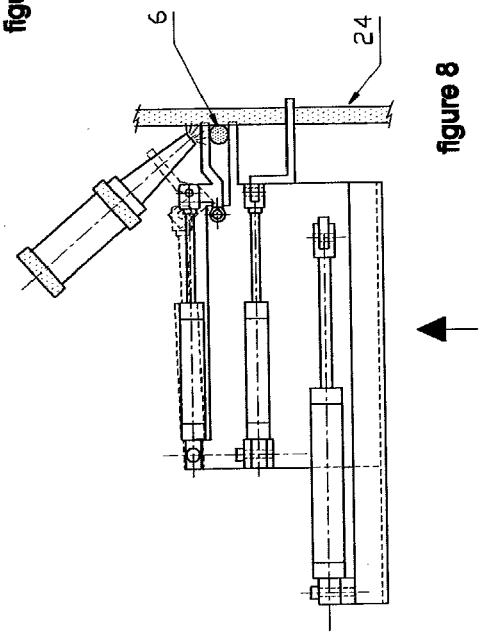
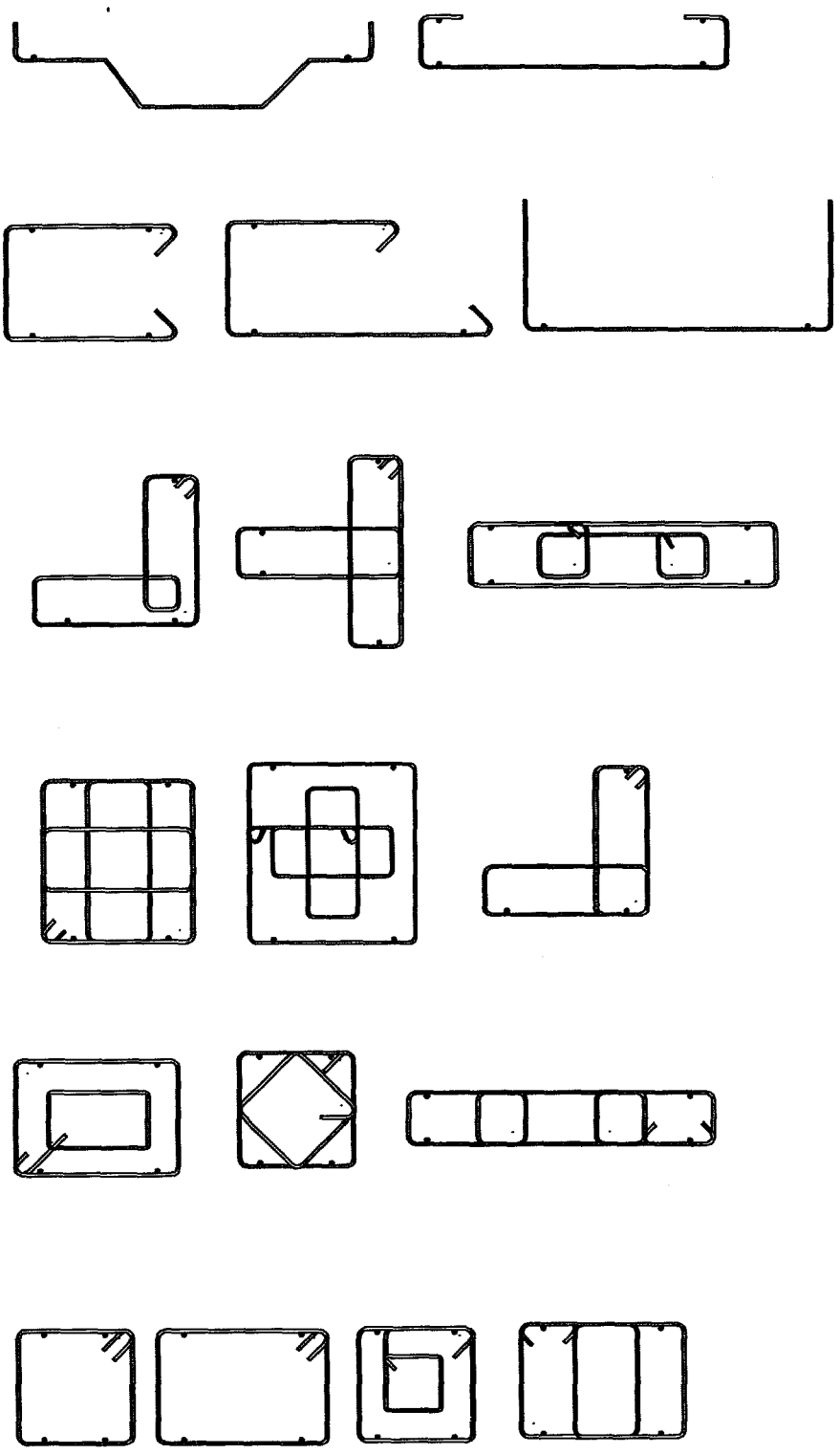
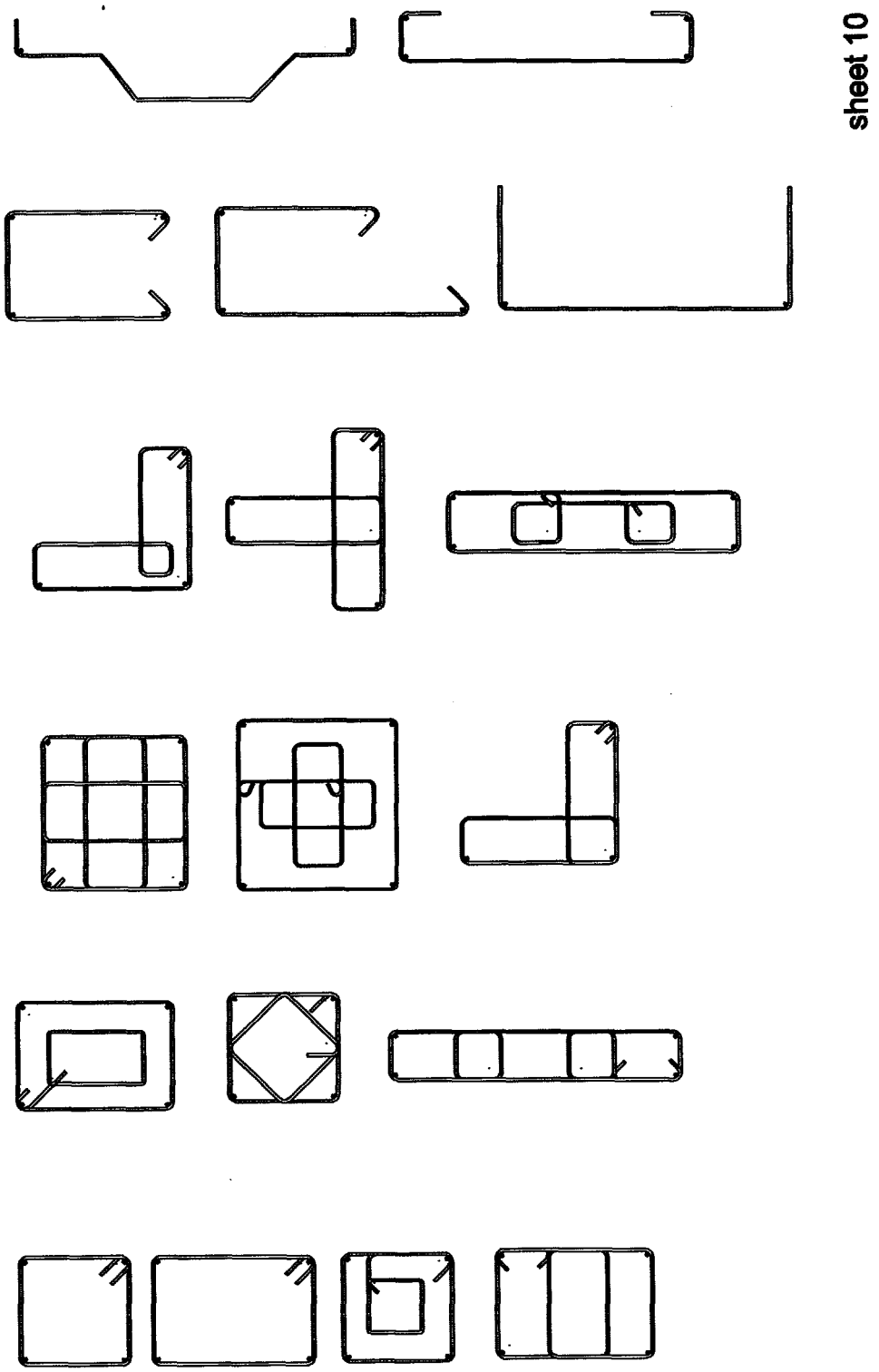


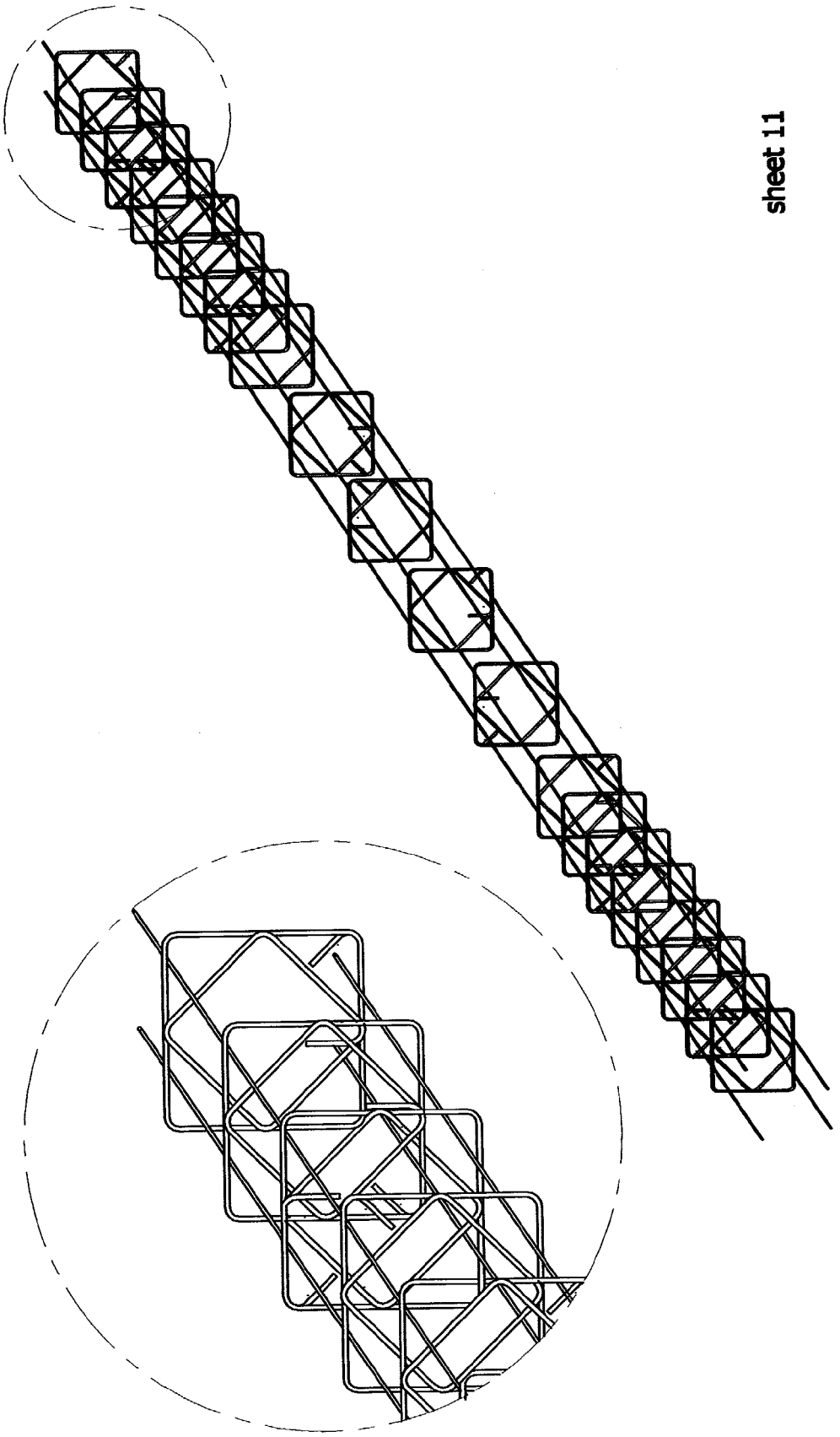
figure 8

sheet 8

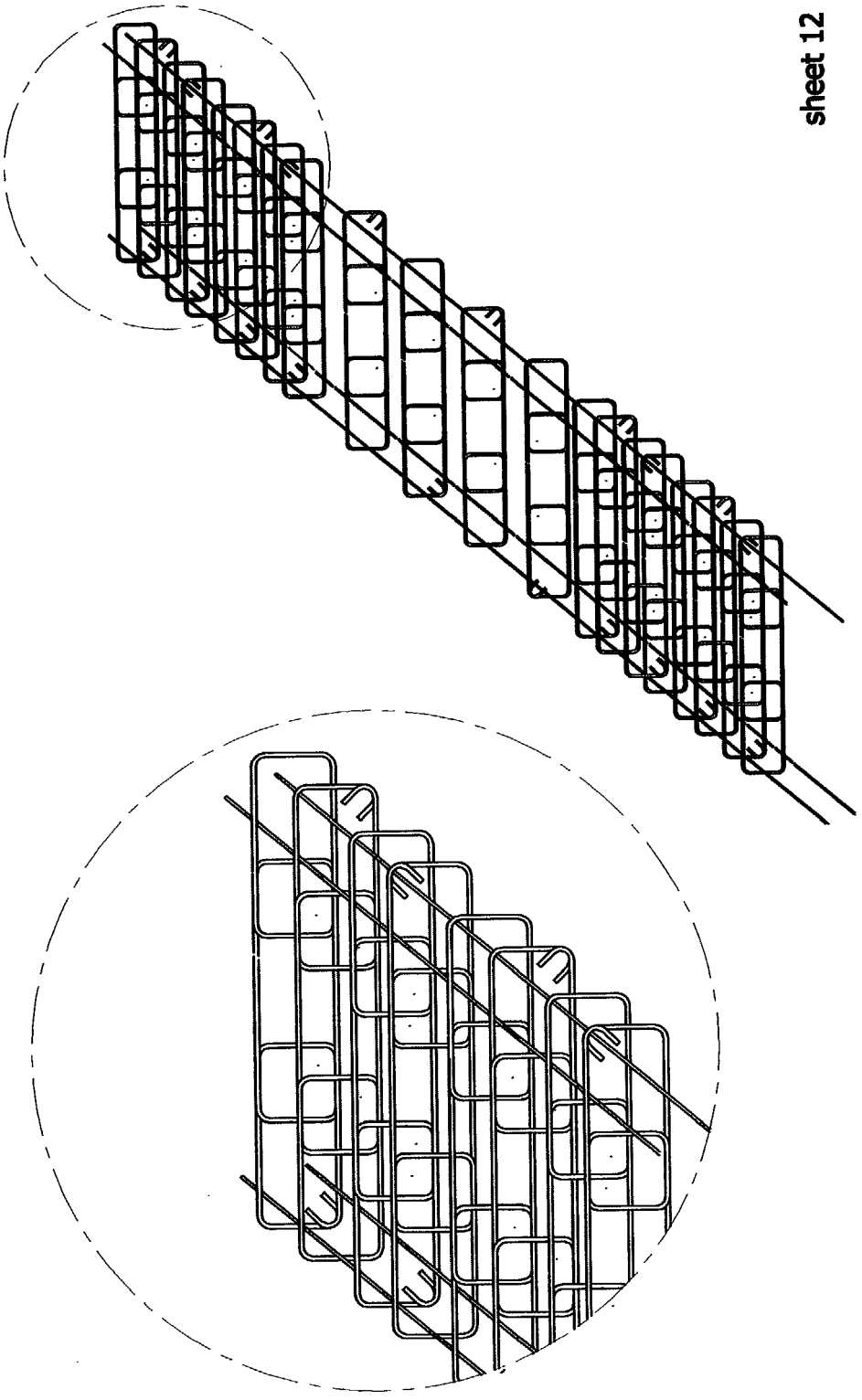
sheet 9



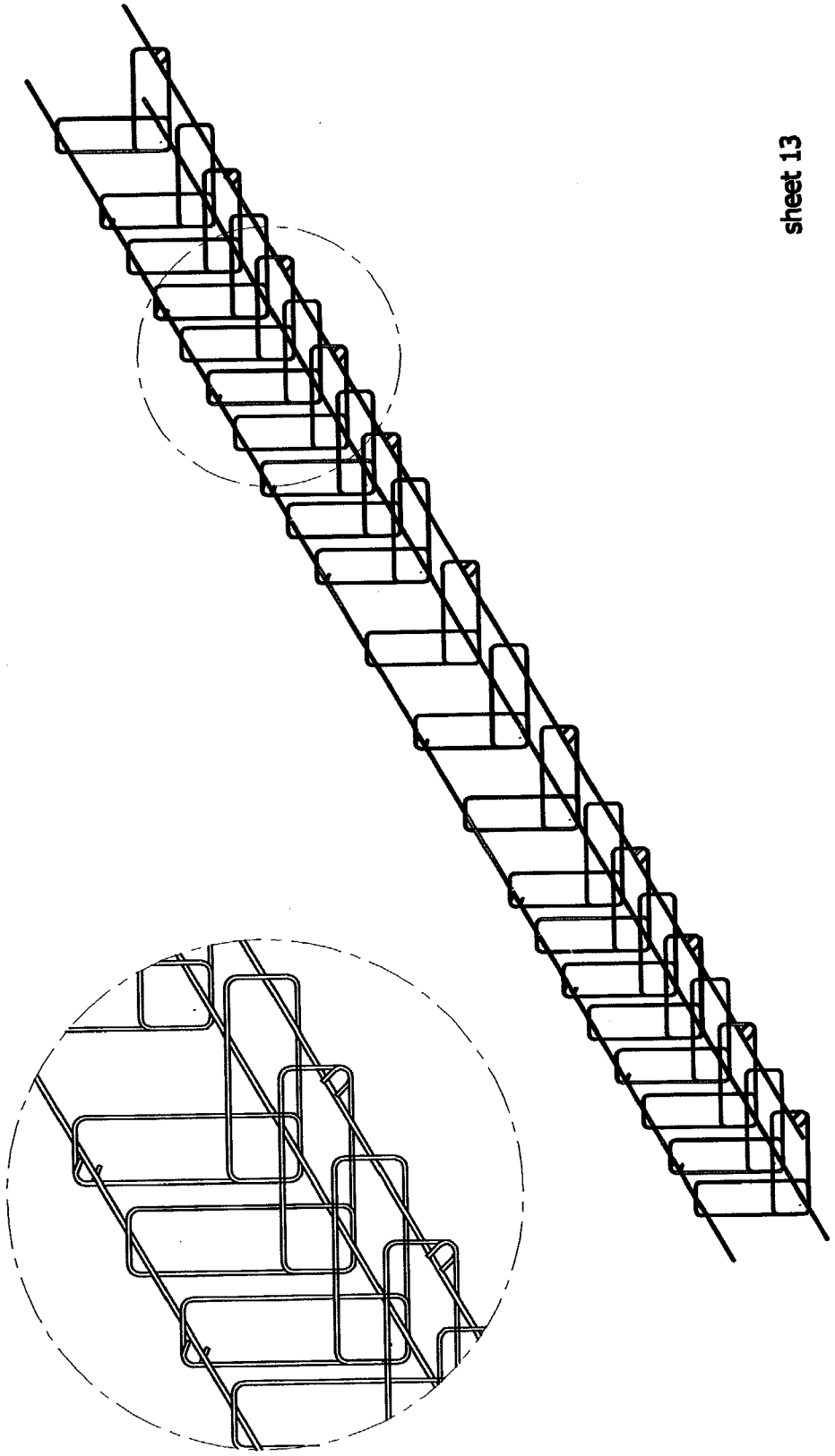




sheet 11



sheet 12



sheet 13

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 38 6004

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 December 2005	Ritter, F

CATEGORY OF CITED DOCUMENTS

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