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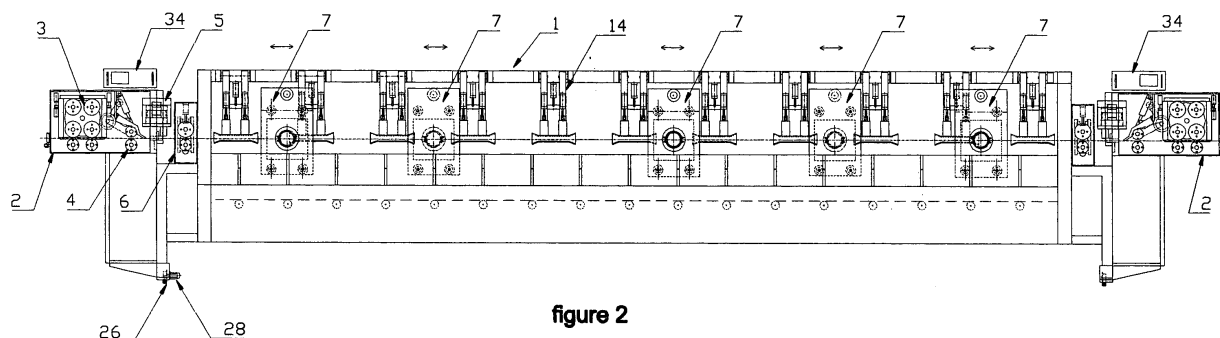
(54) **Machine for cutting and bending of iron rods by use of mobile heads and displaceable per section holding guides of straight rod.**

(57) The machine for cutting bending of iron rods by use of mobile heads and displaceable per section holding guides of straight rod consists of a metallic framework (1). It bears one or two heads (2) for advance and cutting of the rod and bending heads (9) which are three or more, installed lengthwise the framework (1) and the number of which depends on whether the machine bears one or two heads (2).

Lengthwise the framework (1), mobile holding

guides of the straight iron rod (14) are placed which, with forward-backward movements, disengage space for the movement of the bending head (9).

At the front part, two corridors provided with sliding rolls (24) and a third, open one (25) are placed. The machine runs on a trail, on four wheels (26). Its feeding is achieved by use of iron-coil (29) straightened via rolls system (31) or by straight rods (32). The function commands are given by an in-built control panel (34).



Description

[0001] The invention refers to a machine for **cutting and bending of iron rods by use of mobile heads and displaceable per section holding guides of straight rod**, which cuts and bends straight iron rods, thus forming concrete reinforcement in various shapes and sizes.

It accepts a plurality of regulations and motions so as the programmed-in-computer shape of armature to be automatically formed.

[0002] The enhancement of building constructions by means of "reinforced concrete" is an essential requirement for safe constructions against earthquakes and it is provided by the regulations related to building constructions.

Within the sphere of the above goal, for many years, the productive procedure regarding concrete reinforcement, has been industrialized. Various "smart" machineries have replaced the -until then- manual labour and increased, in a significant degree, the productive abilities. One of these machineries is the known as "mobile machinery-group for cutting of iron concrete rods" which moves onto constant trail and in a confined site, usually indoor. In the past, the applicant has been awarded with patents for relative machinery inventions, that is **Hellenic Industrial Property Organization Patent No: 862302/9-9-1986**, titled: **"Mobile machinery-group for cutting of iron concrete rod"** and **Hellenic Industrial Property Organization Patent No: 1004632/14-2-2003**, titled: **"System for propulsion and cutting of iron concrete rod"** which consists an independent mechanism, capable to be installed in the above-mentioned cutting machines. The "mobile machinery-groups for cutting" cut straight iron concrete rods, of various diameters or cross-sections, into straight pieces of various lengths, with the aid of the mechanisms that they carry for this purpose and, thereafter, - in case they are not used as straight parts - they are advanced to the iron concrete bending and cutting machineries, known as "robotic machines" which are manufactured with various abilities by various manufacturers and the applicant has been awarded in the past with patents for relative machinery inventions, bearing **Hellenic Industrial Property Organization Patent No: 1003131/16-4-1998**, titled **"Machine for straightening bending and cutting of iron concrete with rotating and mobile head (automatic electronic stirrup-bender)"** **Hellenic Industrial Property Organization Patent No: 1003500/6-4-1999**, titled **"Reclining machine for straightening bending and cutting of iron concrete rods (automatic stirrup-bender)"**.

They consist of a set of separate mechanisms each one of which carries out the corresponding task, having as result the formation of a variety of schemes used for the construction of concrete reinforcement.

Significant mechanism at the above machines is the point for bending and cutting of iron concrete rod, like the one of the applicant bearing **Hellenic Industrial Property Organization Patent No: 1004760/26-11-2003**, and

European Patent No: 1535675/21-10-2004, titled **"Four direction mechanism for iron concrete rod bending with cutting ability of the front and rear end"**.

Moreover, the system for iron straightening, used for the feeding of machines from iron-coil, is inbuilt in the machines; while in other cases it may be independent as well, like the one of the applicant with **Hellenic Industrial Property Organization Patent Application No: 20050100201/20-4-2005**, and **European patent Application No: 06386006.8/18-4-2006** titled **"Feeder of concrete armature assembling machine"**.

Machines relative to the present invention exist in the market. They carry head for propulsion and cutting of straight iron rod as well as movable formation heads. The movable heads are one or two and, due to the lack of a movable holding guide of straight iron rod, a greater number of steps is needed for the completion of an armature shape, thus, the time needed for a bending cycle increases. Moreover, due to the unique intake of the iron rod as well as the one or two bending heads that each machine carries, there is no capability for simultaneous formation of various shapes -given that the size of the shape affords this simultaneous formation- which would also mean double productive ability.

[0003] The machine for **cutting and bending of iron rods by use of mobile heads and displaceable per section holding guides of straight rods** is characterized by the fact that it constitutes a combination of cutting machinery and bending machinery of iron concrete.

Each section used in the productive procedure is driven via commands, which are given by the control-panel, having as a result the accurate adaptation to the specifications of the shape to-be-formed.

It bears a head for cutting the straight iron rod and advancing it towards the bending heads. The heads for cutting and advance may also be two, placed on the right and left side of the framework of the machine. Lengthwise the framework, three or more bending heads, which reciprocate right-left depending on the bending phase, are installed while the unoccupied part of the straight iron rod is within the movable holding guide, which moves forward-backwards accordingly, in order to disengage space for the movement of the bending heads. This way, the procedure for the formation of the armature shapes is simplified, the production time is reduced, while by use of two heads for advance and cutting and a corresponding number of bending heads, the productive ability of a machine is even more increased.

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

Sheet 1 (figure, 1) shows the machine **for cutting bending of iron rods by use of mobile heads and displaceable per section holding guides of straight rod** in front view, with one head for advance and cutting of iron rod and three bending heads.

Sheet 2 (figure 2) shows the machine **for cutting bending of iron rods by use of mobile' heads and displaceable per section holding guides of straight rod** in front view, with two heads for advance and cutting of iron rod and five bending heads.

5

Sheet 3 (figure 3) shows the machine in side section at the point of the bending head.

Sheet 4 (figure 4) shows the machine in side section at the point of the movable holding guide.

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Sheet 5 (figure 5) shows the machine in side section at the point of the bending head and the movement of the holding guide.

15

Sheet 6 (figure 6) shows the machine in side section at the point of the movable guide and the opening of the upper jaw of the holding guide of the straight iron rod.

20

Sheet 7 (figure 7) shows the machine in side section at the point of the movable guide and the opening of the upper and lower jaw of the holding guide of the straight iron rod.

25

Sheet 8 (figure 8) shows the machine with the head for advance and cutting of iron rod in side view.

Sheet 9 (figure 9) shows the machine **for cutting bending of iron rods by use of mobile heads and displaceable per section holding guides of straight rod** collaborating with iron-coil and straightening system.

30

Sheet 10 (figure 10) shows the machine **for cutting bending of iron rods by use of mobile heads and displaceable per section holding guides of straight rod** collaborating with bench for straight iron rods.

35

Sheet 11 (figure 11) shows the machine **for cutting bending of iron rods by use of mobile heads and displaceable per section holding guides of straight rod** collaborating with bench for straight iron rods, coil-holder with iron-coil and straightening system.

40

Sheet 12 (figure 12) shows the machine in production phase collaborating with iron-coil and straightening system.

45

Sheet 13 (figures 13, 14, 15, 16, 17, 18, 19, 20 and 21) shows the bending head while bending; the head is driven from the right to the left.

50

Sheet 14 (figures 22, 23, 24, 25, 26, 27, 28, 29 and 30) shows the bending head while bending; the head

is driven from the left to the right.

Sheet 15 (figures 31, 32, 33, 34, 35, 36 and 37) shows the phases for the completion of a shape by use of three bending heads. The two external heads can move simultaneously or independently, bending the iron rod, while the intermediate head holds the intermediate straight part.

Sheet 16 (figures 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54 and 55) shows various shapes that the machine **for cutting bending of iron rods by use of mobile heads and displaceable per section holding guides of straight rod** can produce.

Sheet 17 (figures 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70 and 71) shows various indicative shapes that the machine can produce.

Sheet 18 (figures 72, 73, 74, 75, 76, 77, 78, 79 and 80) shows various indicative shapes that the machine can produce.

Sheet 19 (figures 81, 82, 83, 84, 85, 86, 87, 88 and 89) shows various indicative shapes of spiral type that the machine can produce.

Detailed description:

[0004] The machine **for cutting bending of iron rods by use of mobile heads and displaceable per section holding guides of straight rod**, consists of the metallic framework (1) which is also the base for the assembly of the mechanisms and components of machine.

At the one side of the framework (1), e.g. left (sheet 1-figure 1) a head (2) for the advance and cutting of the iron concrete rod is placed, which is a patent of the applicant and bears **Hellenic Industrial Property Organization Patent No: 1004632/14-2-2003, titled: System for propulsion and cutting of iron concrete rod**. The System is provided with a rotating head of rolls (3) which consists of two pairs of plastic rolls, highly adhesive to the iron concrete rods of all cross-sections that they can advance; following to the head, a pair of rolls (4) is placed which function as counters of length of straight iron and as guides of iron rod towards the cutting head (5) and towards the pair of advance rolls (6) which advance the iron rod towards the bending heads. The regulation of the rolls is proportional to the size of the iron's cross-section for the best adhesion of the rolls at the iron concrete rod.

The rolls at the **System for propulsion and cutting of iron concrete rod** have the ability, apart from the forward movement (advance), to carry out also backward movement.

For the regulations, the rotation of the rolls and the cutting, a hydraulic unit (8) is installed, which feeds the cor-

responding hydraulic motors and mechanisms of the head (2).

For greater productive abilities, a second head for advance and cutting (2) can be installed, according to sheet 2-figure 2.

At each machine, the bending heads can be from three and more, they are placed lengthwise the framework (1) -which is destined for the bending procedure- and their number depends on whether they will bear one or two heads for advance and cutting (2).

Each bending head (sheet 3-figure 3) consists of a plate (7) at the center of which is installed a bending head (9) which is a patent of the applicant and bears **Hellenic Industrial Property Organization Patent No: 1004760/26-11-2003**, and **European Patent No: 1535675/21-10-2004** titled: **Four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end**.

On the bending head, only the part of the mechanism which concerns the bending (9) is installed, since the cutting is carried out by a component of the head for advance and cutting (2). The bending head can rotate on the right or the left, depending on the bending demands, with the aid of motor and drive unit which is placed on the bending head.

The plate (7) moves -after programmed command- right-left by use of motor (10) and toothed ruler-gear (11) with the aid of four sliding rolls (12) and guides (13).

Lengthwise the entire framework (1) destined for the bending procedure, mobile holding guides of the straight iron rod (sheet 4 - figure 4) are placed- per sections- which consist of the articulated brace (14), which moves forward-backwards with the aid of piston (15), and the articulation (17). This movement is necessary so that space is disengaged during the displacement of the bending plate (sheet 5 - figure 5). At its lower part, the articulated brace (14) bears jaw for the holding of the straight iron rod. This jaw (sheet 6 -figure 6), on its upper part, has the ability to open and close with the aid of piston (19) and guide (20), so that, during the backward movement of the articulated brace (14), the straight part of the rod to be disengaged; while, at its lower part (21), the jaw opens and closes with the aid of piston (22) and articulation (23), thus, it fully disengages the straight iron rod pieces that it holds (sheet 7 figure 7).

At the front part of the machine (side view figures), corridors are placed for the collection of the formed shapes, which are placed, depending on their size and shape, in one of the three corridors.

The first two corridors bear sliding rolls (24) for the easy removal of the formed shapes which usually are straight, open-type parts bended at the ends.

The third corridor (25) is open, it accepts more complicated schemes -as those of closed type (squares, polygons)- of various sizes, which are deposited on the ground or onto a special collection carriage, that is at the lower part of the corridor (25), and consists an optional structure.

The machine for cutting **bending of iron rods by use of mobile heads and displaceable per section holding guides of straight rod**, at its base, bears four wheels (26) which run on a constant trail (27) by aid of motor (28).

5 The feeding of the machine is achieved directly by straight iron rods, by iron-coil or by using both occasions simultaneously, when regards a machine that bears two heads for advance and cutting (2).

10 In case the feeding is by iron-coil (29) (sheet 9 - figure 9), the iron-coil is placed on a coil-holder (30) and then it passes through an independent straightening rolls system (31) as the one of the applicant bearing **Hellenic Industrial Property Organization Patent Application No: 20050100201/20-4-2005**, and **European Patent Application No: 06386006.8/18-4-2006**, titled **"Feeder of concrete armature assembling machine"** which includes iron rod straightening rolls system or other system having the specific ability.

20 In case the feeding is directly by straight iron rods (32) (sheet 10-figure 10), the rods are placed onto a bench (33), they are advanced to the intake of the head for advance and cutting of straight iron rod (2) and the bending procedure follows.

25 The commands for the function of the machine are given by an in-built control-panel (34).

Application example

30 **[0005]** The machine for cutting bending of iron rods by use of mobile heads and displaceable per section holding guides of straight rod, is placed on rails and, preferably, in an indoor site.

35 First, it is selected whether the machine will be fed by straight iron rod or by iron-coil and, then, the shape and the size to be bended are programmed at the control panel.

40 **[0006]** In case of choosing the feeding by use of iron-coil (29), the iron-coil is placed on the coil-holder (30) and, via the straightening rolls (31), the finally straight iron rod is introduced in the head for advance and cutting of the rod (2).

45 In case of choosing the feeding by use of straight rod, the straight rods are placed upon the bench (33). The end point of the rod is introduced in the head for advance and cutting of the iron rod (2) and the rod is advanced via the rolls head (3), the rolls for counting the rod's length (4) and the rolls (6) towards the bending head (9). According to sheet 15, the straight iron rod is advanced as much as the length of the shape's span. Through the counting rolls (4) the length is measured and the rod is cut by use of the cutting head (5). In the case of the figures indicated on sheet 15, there is use of three bending heads and as many of the movable guides for holding the straight rod (14) as needed.

55 The intermediate bending head (9) receives the rod by making a slight rotation of the bending jaws and it carries it as much as needed, so as the heads to be able to realize the bending programmed, while the two heads at

the ends move simultaneously towards the corresponding programmed points (figure 31). The right and left heads carry out the first bending (figure 32) and the jaws return to their initial position, while the intermediate head and the movable guides for holding the straight rod (14) retain the straight part. The two bending heads (9) move inwards (figure 33) for as much as the length of each side that is to be bended, while the mobile holding guides (14) hold the iron rod and the intermediate head retains the rod's position. During this shifting phase, some of the holding guides (14) are displaced backwards, so as to disengage space for the movable bending heads (9), sheet 5, figure 5. The bending (figure 34) follows and the procedure is repeated until the shape is completed (fig. 35, fig.36, fig.37). With the completion of the shape, the intermediate head (9), which was holding the intermediate part, rotates reversely so as the jaws to disengage the iron rod, while, at the same time, the jaws of the straight holding guides for the straight rod (14), which retained the rest straight part, open (sheet 6-figure 6) and, thus, the ready shape (sheet 7-figure 7) is deposited at the corridor allocated.

The machine can accomplish a variety of movements and bending phases, depending on the operator's consideration.

The above-mentioned application example can be also applied to a machine for **cutting and bending of iron rods by use of mobile heads and displaceable per section holding guides of straight rods** with two heads for advance and cutting (2) and more than three bending heads (9) installed, for simultaneous formation of shapes and, thus, achievement of double production capacity. For the pre-mentioned, it is predicated that the sizes of the shapes allow this simultaneous production procedure.

Claims

1. The machine **for cutting bending of iron rods by use of mobile heads and displaceable per section holding guides of straight rod** consists of a metallic framework (1) on which one or even two heads for advance and cutting of the iron-concrete rod (2) are installed, which advance(s) the rod towards the bending heads; the bending heads can be three or more, they are placed lengthwise the framework (1) and their number depends on whether the machine bears one or two heads for advance and cutting (2); each bending head consists of a plate (7), at the center of which there is a bending head (9), the mechanism can rotate to the right or left, according to the bending demands; each plate (7), following to a programmed command, moves right-left, by use of motor (10) and toothed ruler-gear (11) with the aid of sliding rolls (12) and guides (13); at the entire extent of the framework (1), mobile holding guides of the straight iron rod (14) are assembled

per section; at the front part of the machine corridors are placed, the first two of which bear sliding rolls (24) and the third (25) is open; at its base, the machine bears four wheels (26) which run onto a constant trail (27) with the aid of motor (28); the feeding of the machine is achieved by iron-coil (29) which is placed on a coil-holder (30) and passes through a straightening rolls system (31), or by straight iron rods (32) which are placed on a bench (33) and are advanced to the intake of the head for advance and cutting (2); the commands for the function of the machine are given by an in-built control-panel (34).

2. The machine **for cutting bending of iron rods by use of mobile heads and displaceable per section holding guides of straight rod**, according to claim 1, is **characterized by** the fact that lengthwise the framework (1) that is destined for the bending procedure, mobile holding guides of the straight iron rod are assembled per section, which consist of the articulated brace (14) that moves forward-backwards with the aid of piston (15) and articulation (17), thus, saving space for the movement of the bending plate (7).
3. The machine **for cutting bending of iron rods by use of mobile heads and displaceable per section holding guides of straight rod**, according to claims 1 & 2 is **characterized by** the fact that each articulated brace (14), at its lower part, bears a jaw for the holding of the straight iron rod. The upper part of the jaw (18) opens and closes with the aid of piston (19) and guide (20) while its lower part (21) opens and closes with the aid of piston (22) and articulation (23).

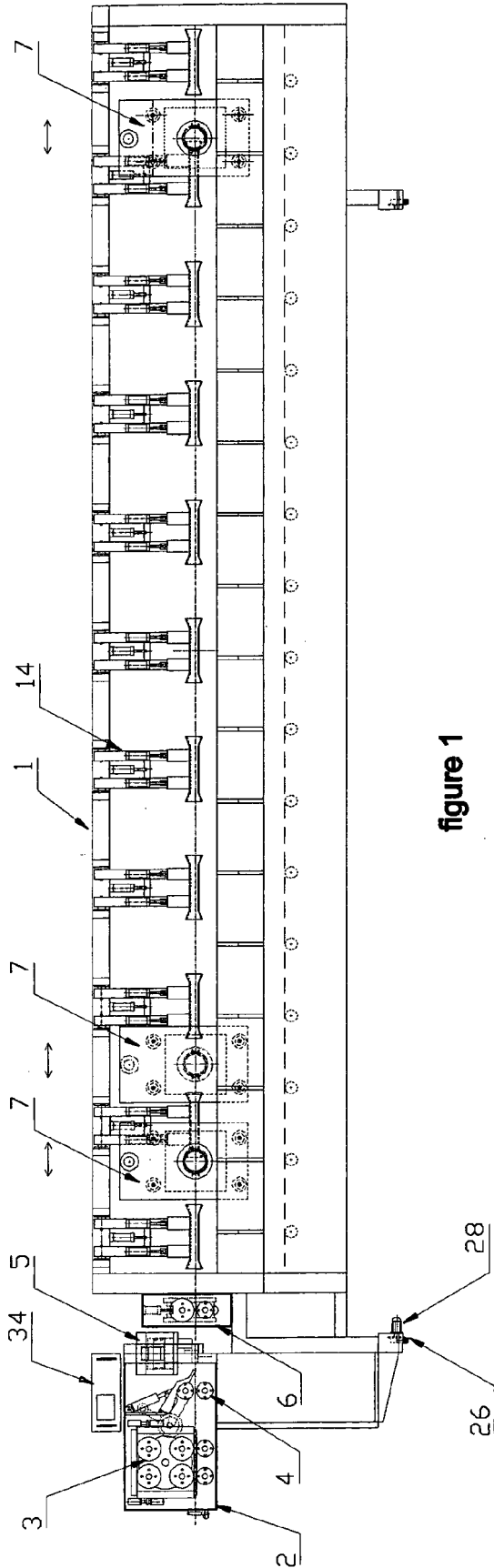


figure 1

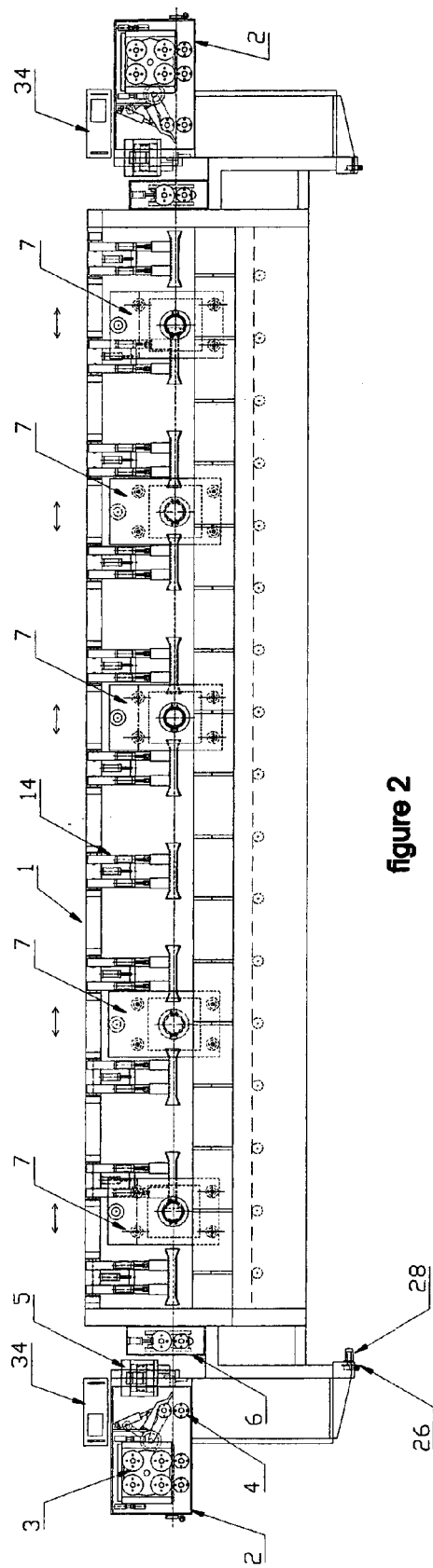
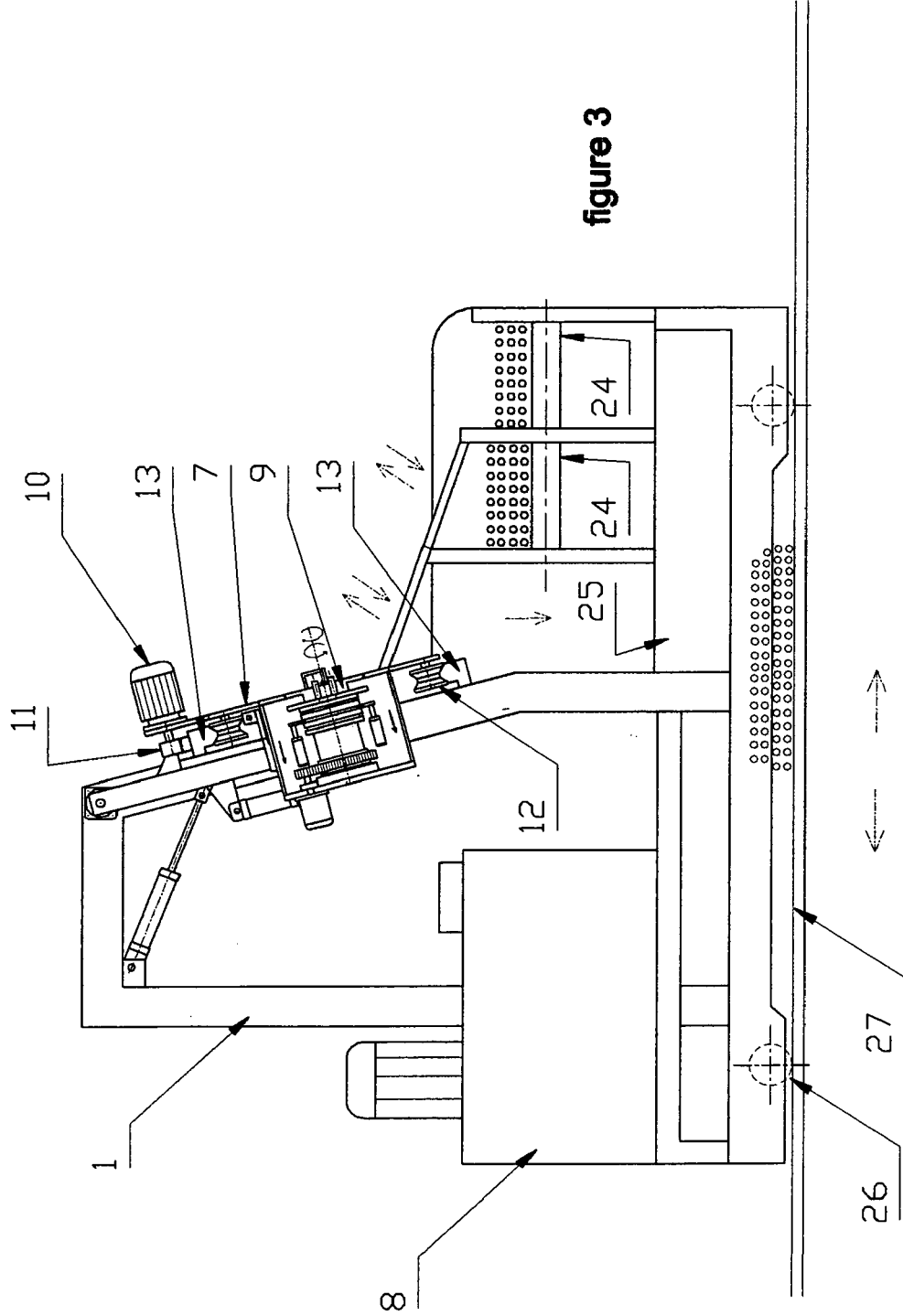
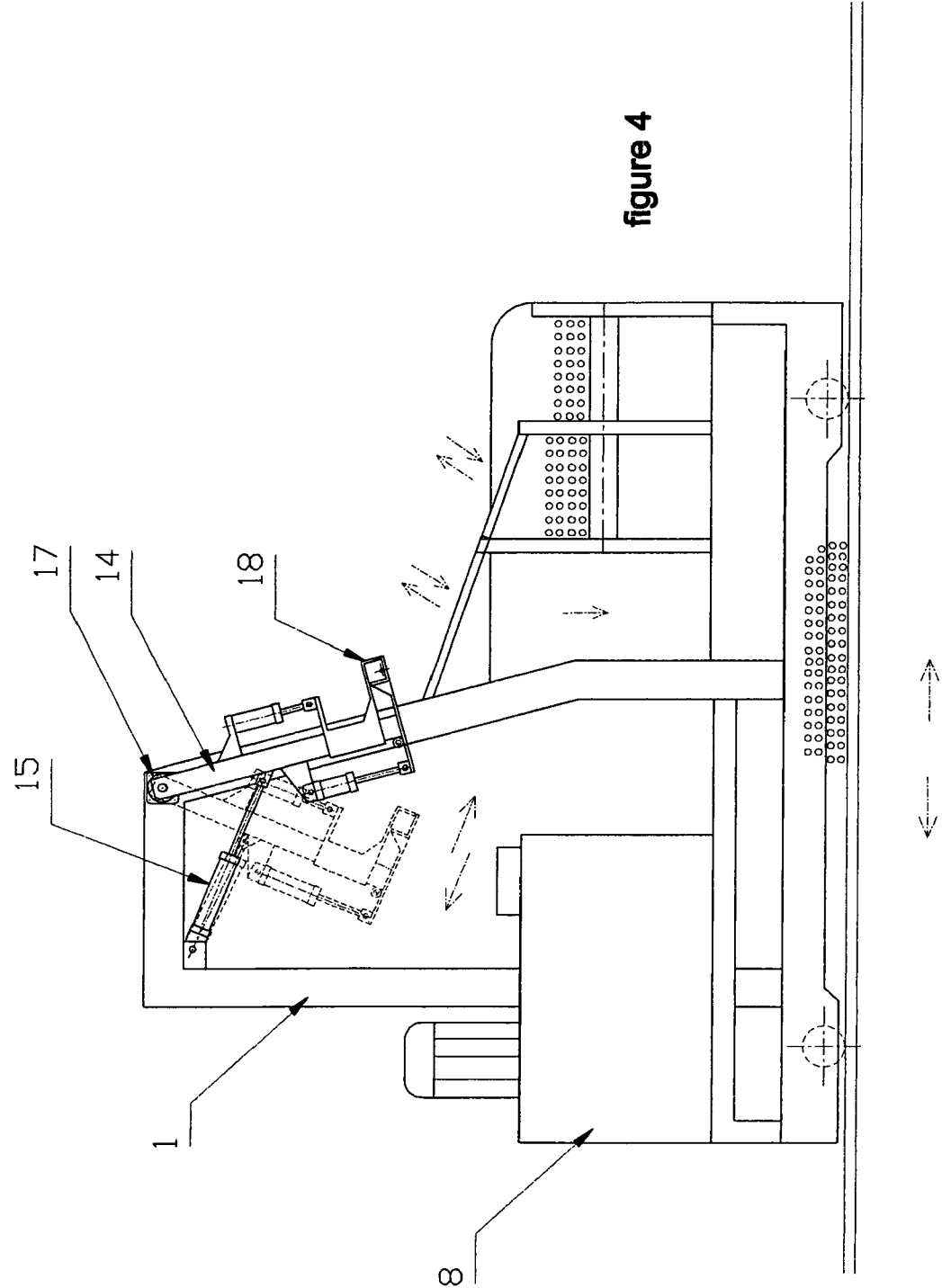


figure 2





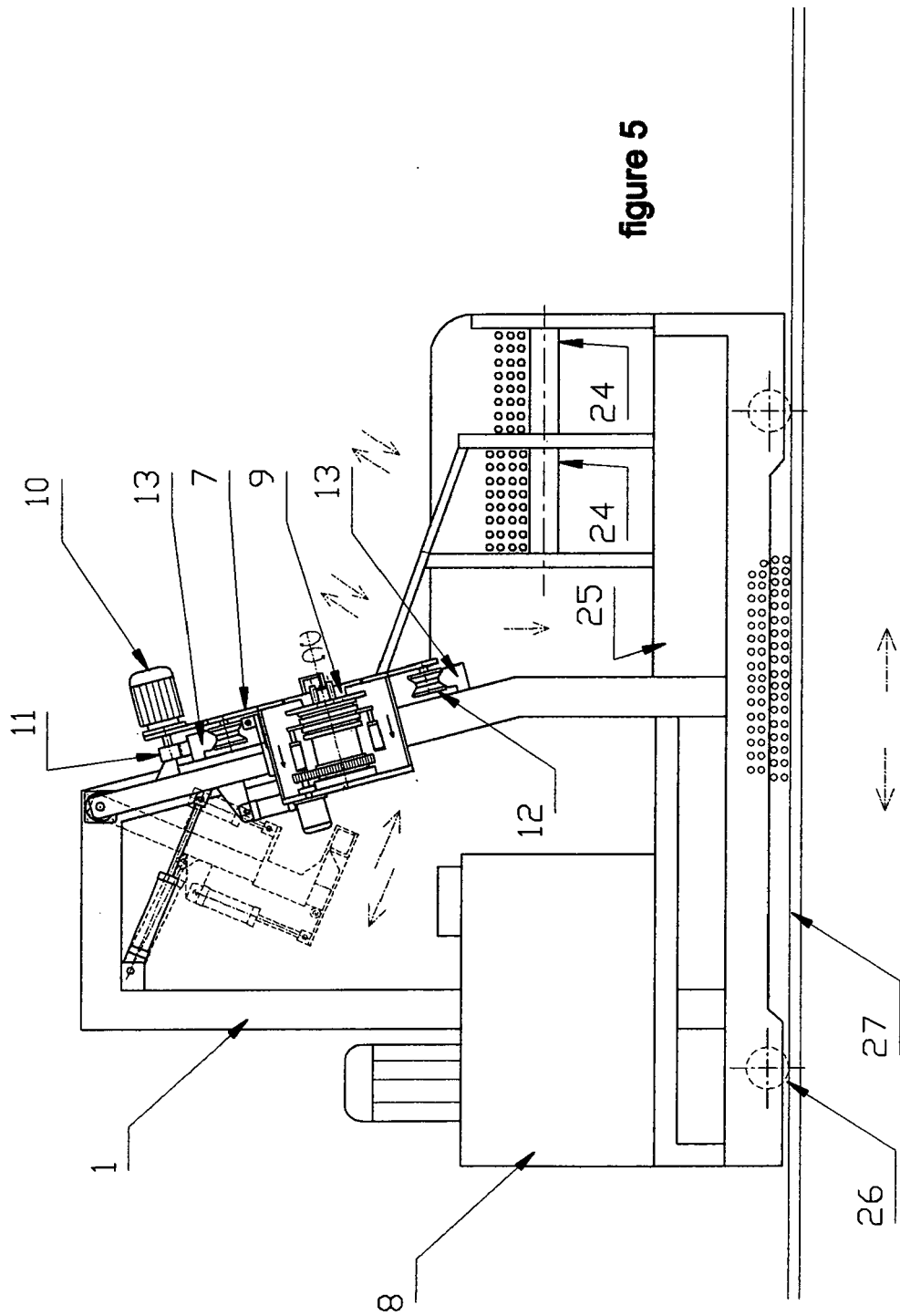


figure 5

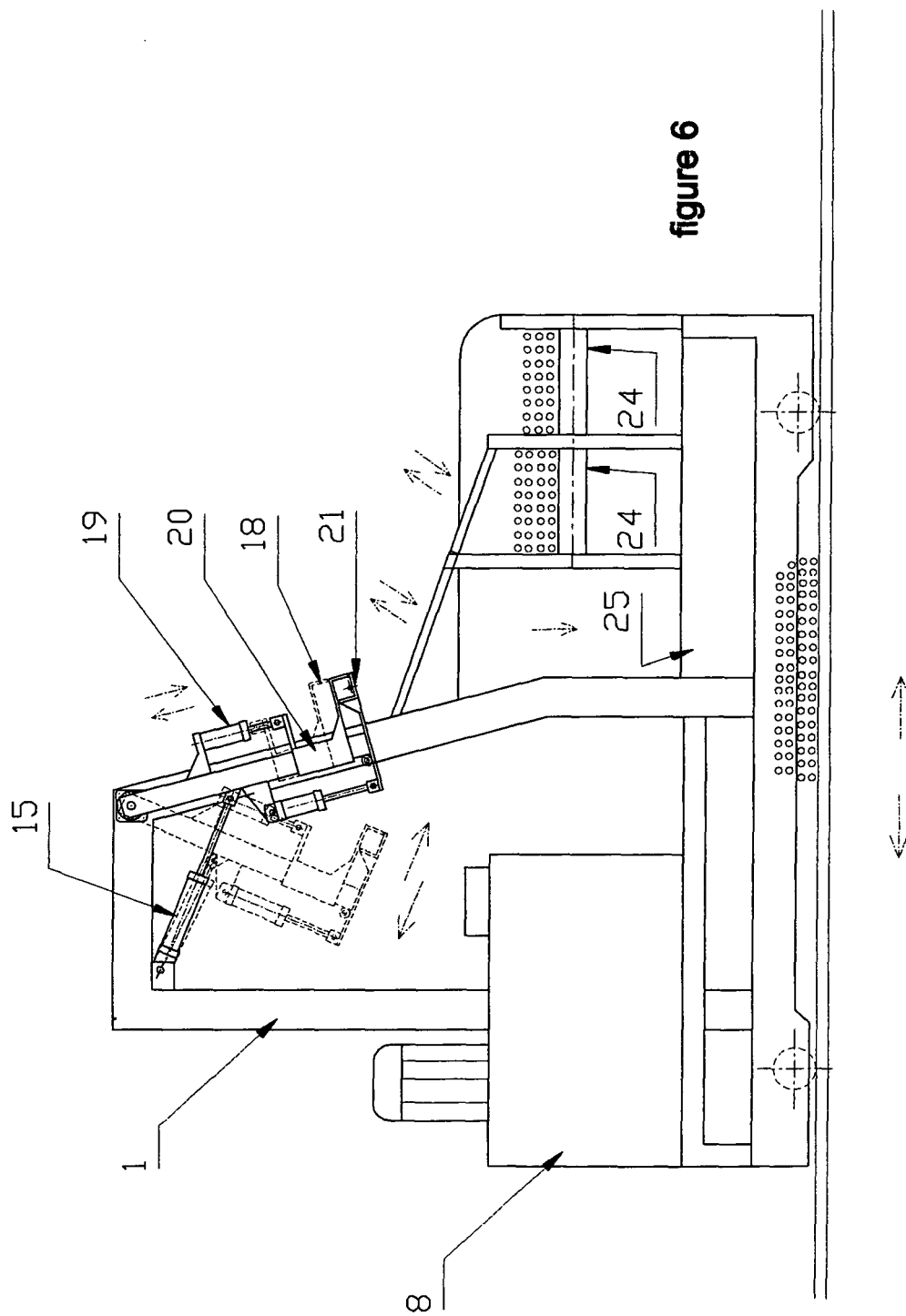
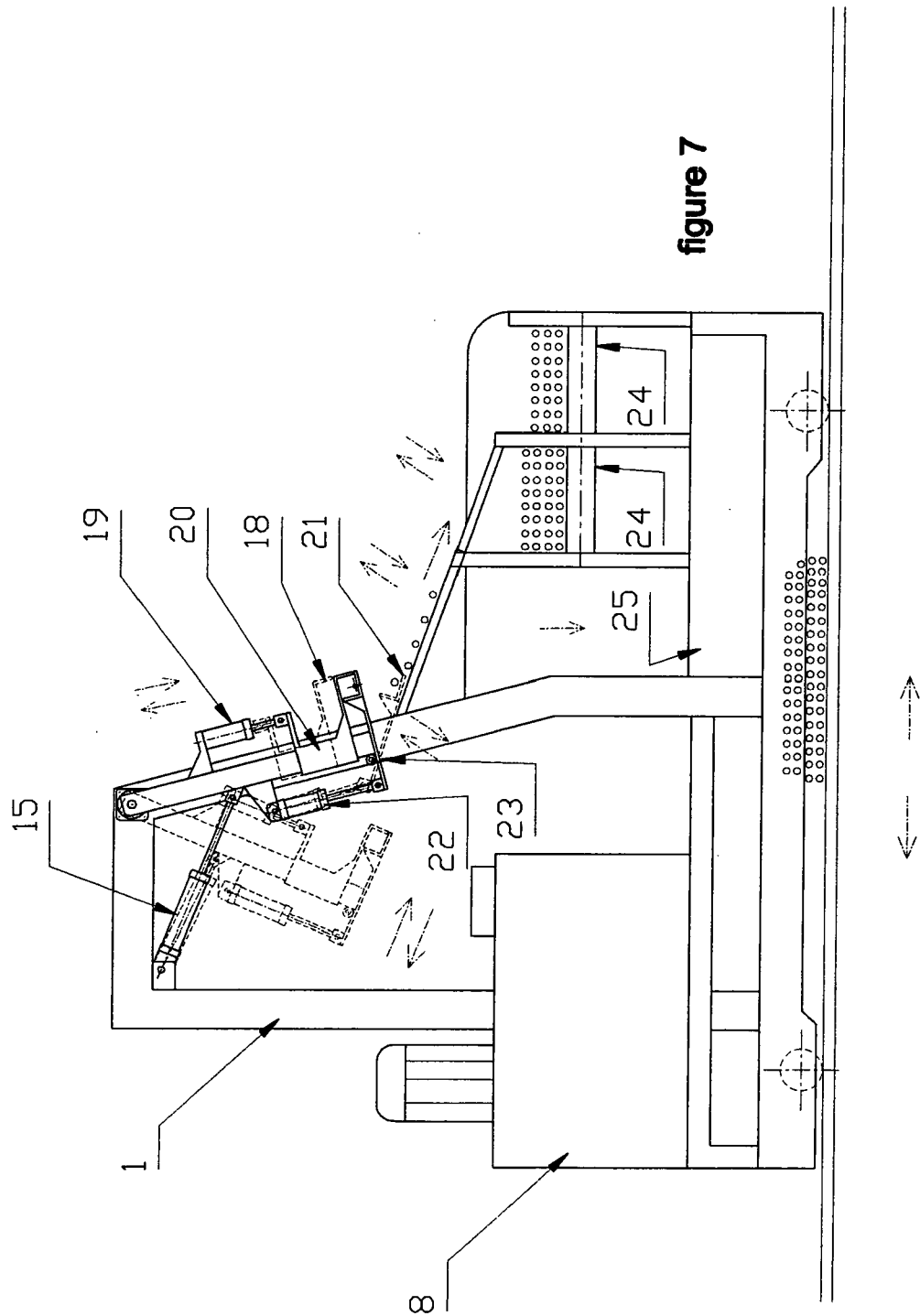
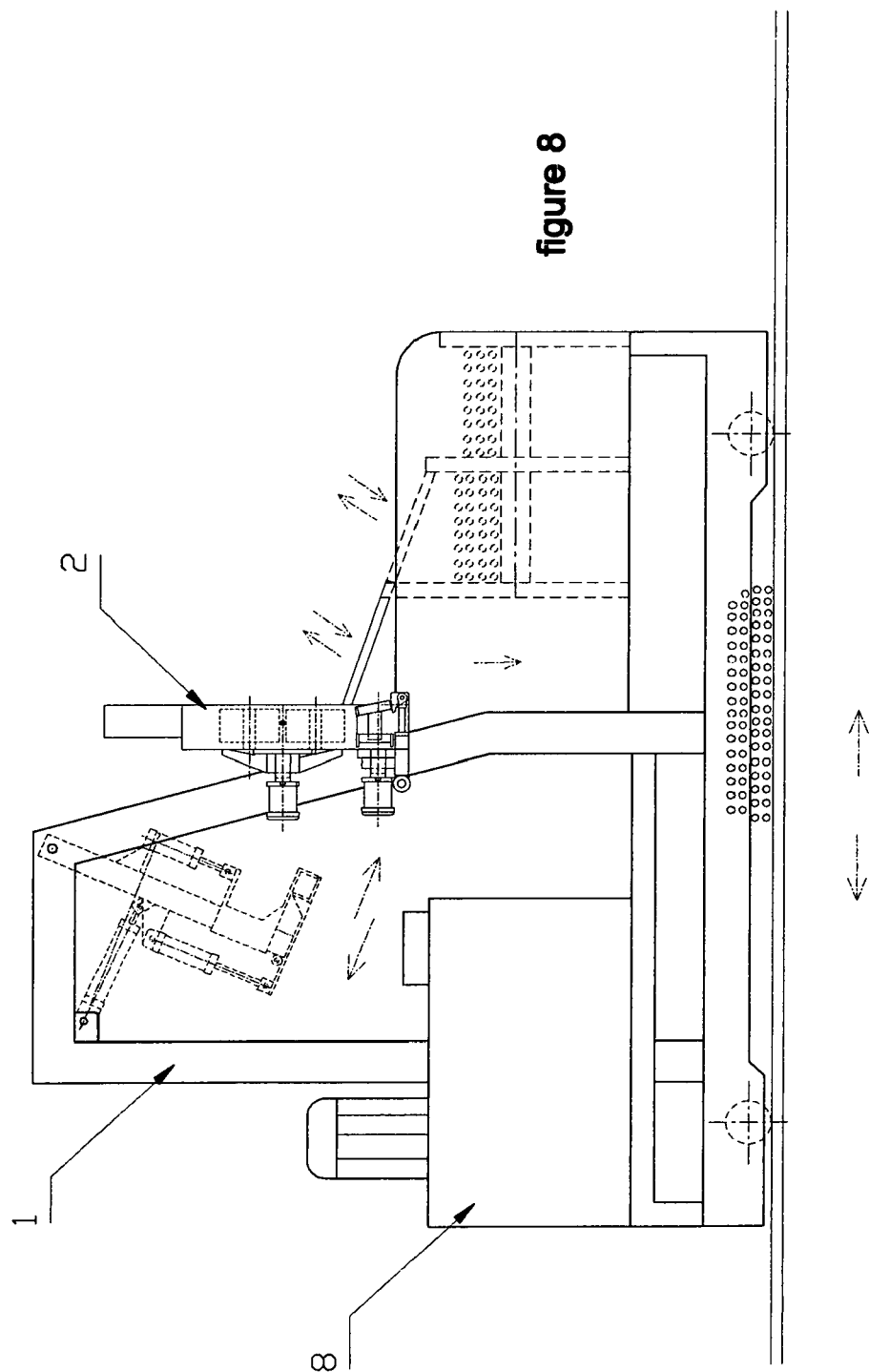


figure 6





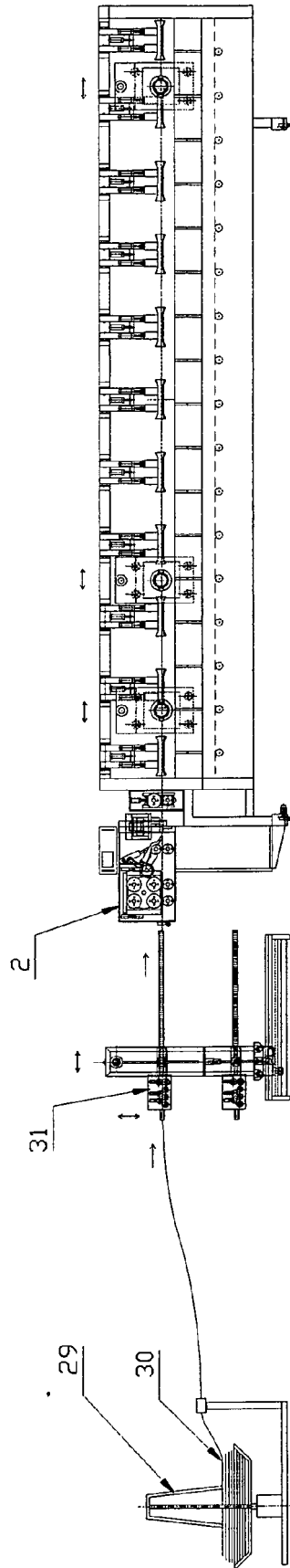


figure 9

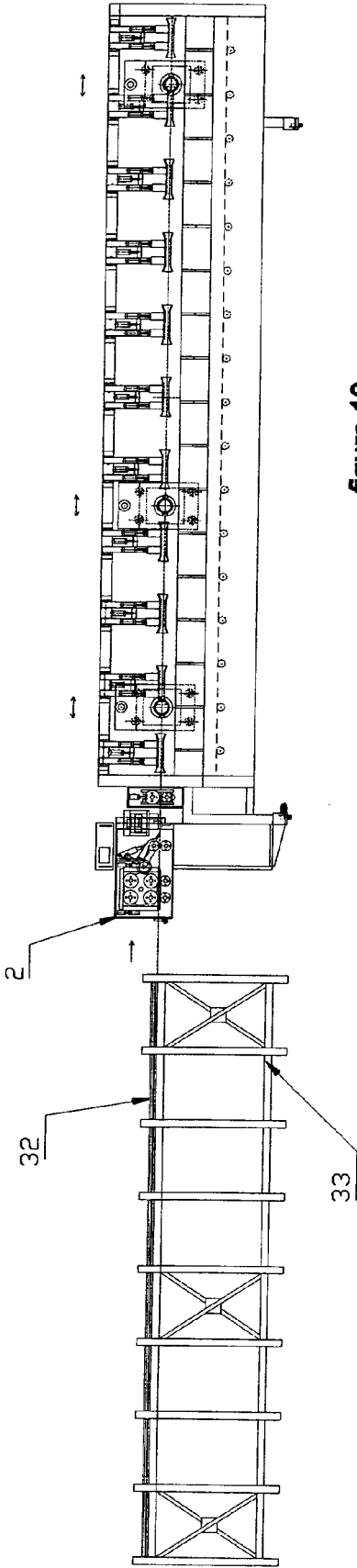


figure 10

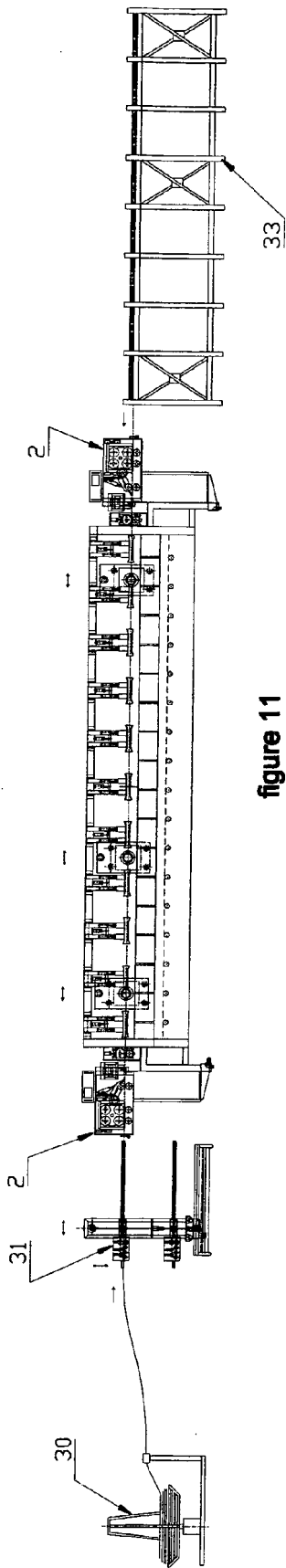


figure 11

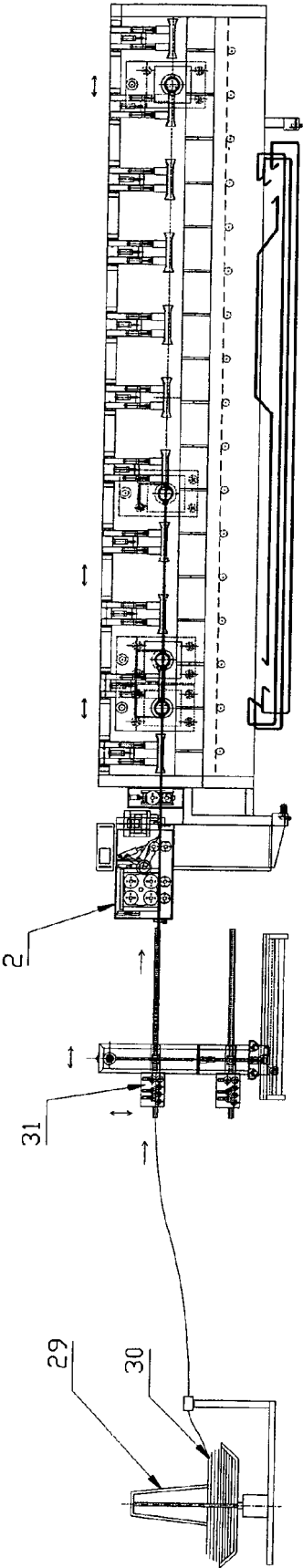
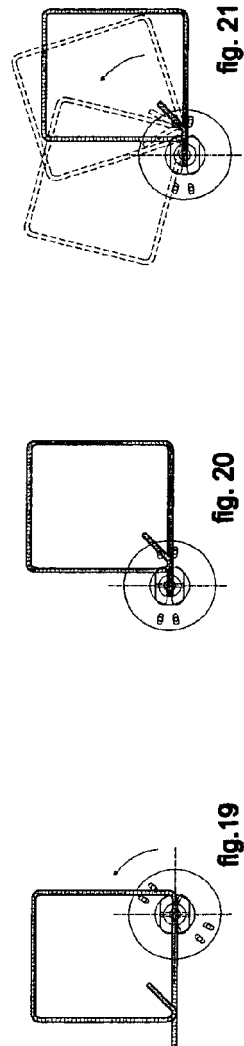
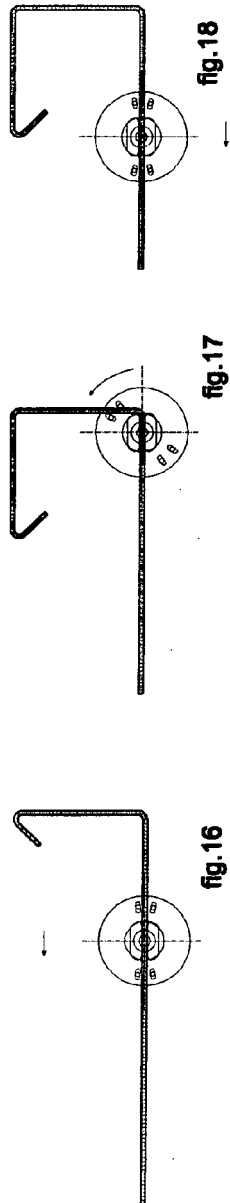
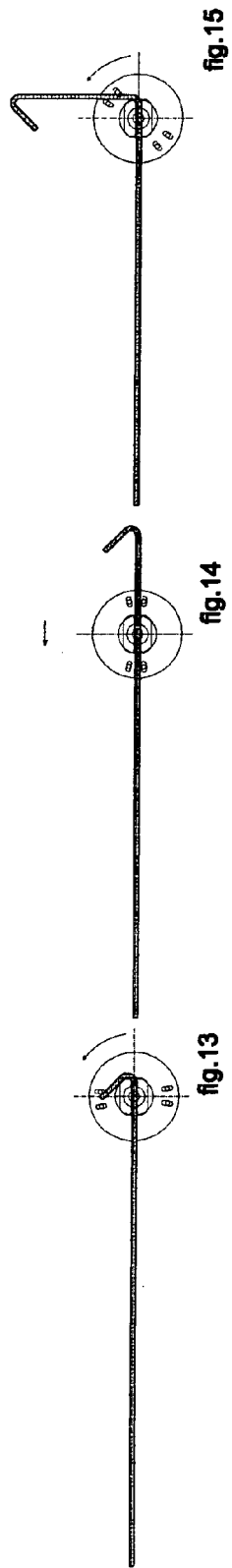


figure 12



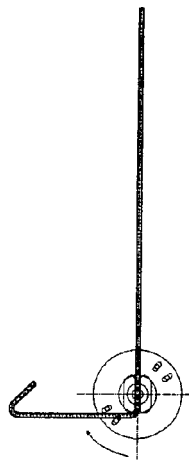


fig. 24

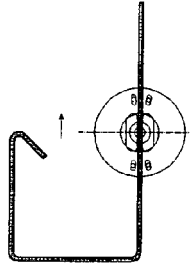


fig. 27



fig. 23

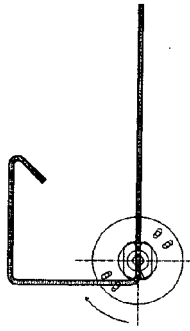


fig. 26

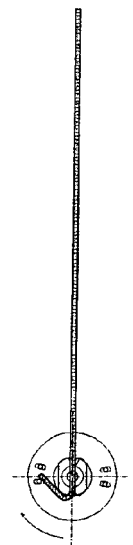


fig. 22

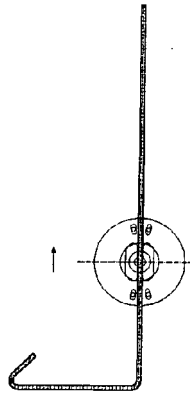


fig. 25

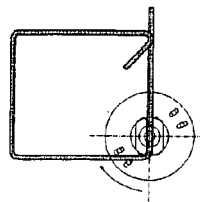


fig. 28

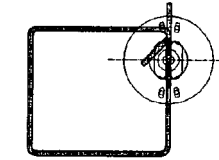


fig. 29

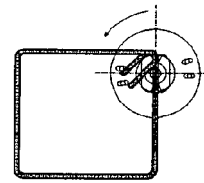


fig. 30



fig. 31



fig. 32



fig. 33

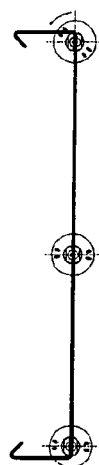


fig. 34

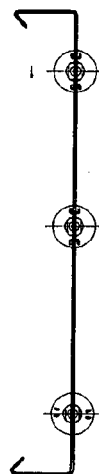


fig. 35

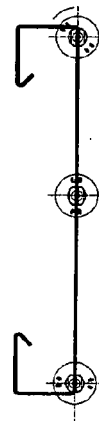


fig. 36

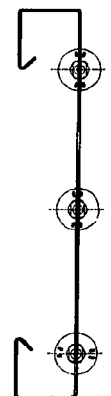
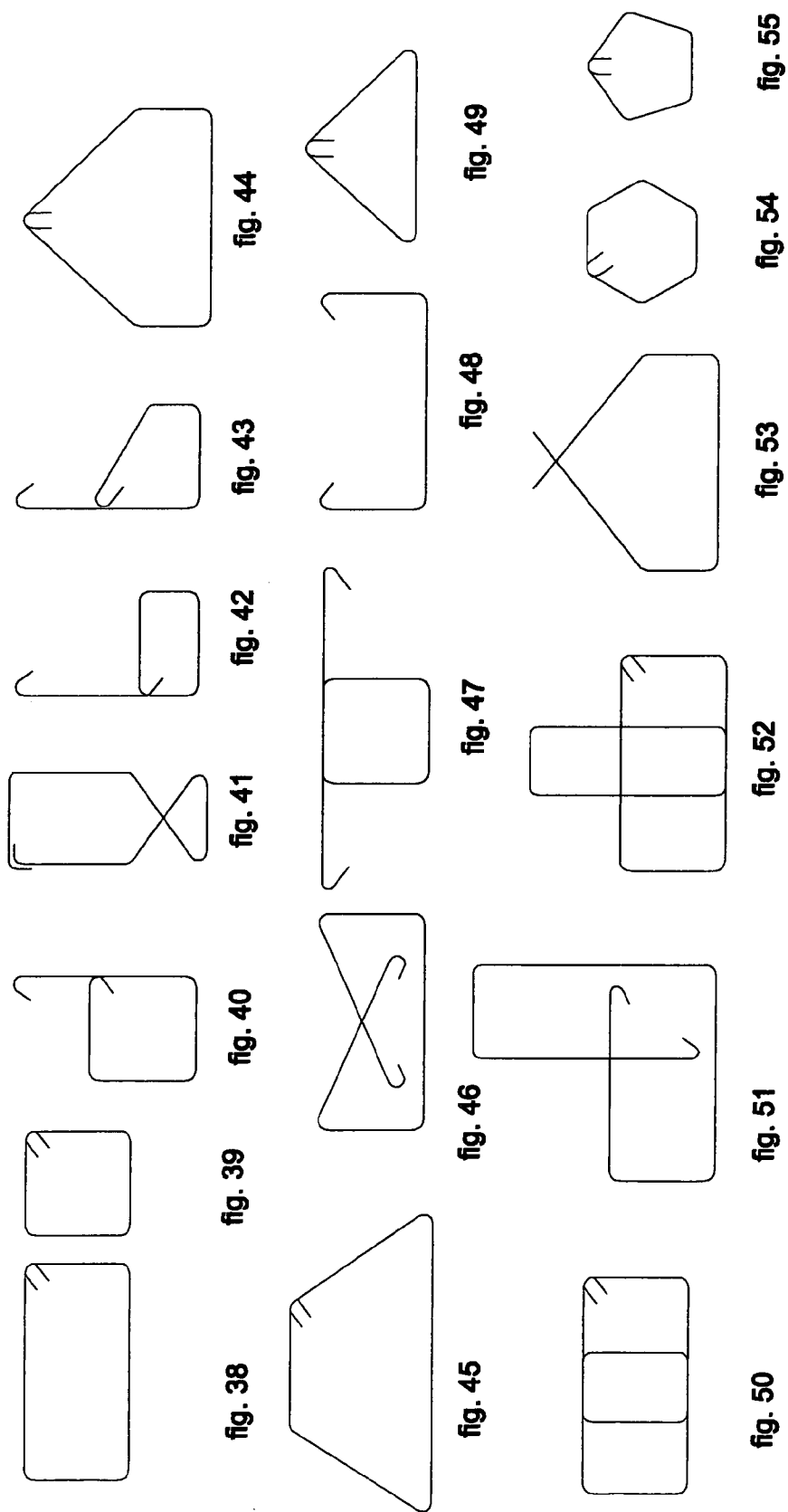
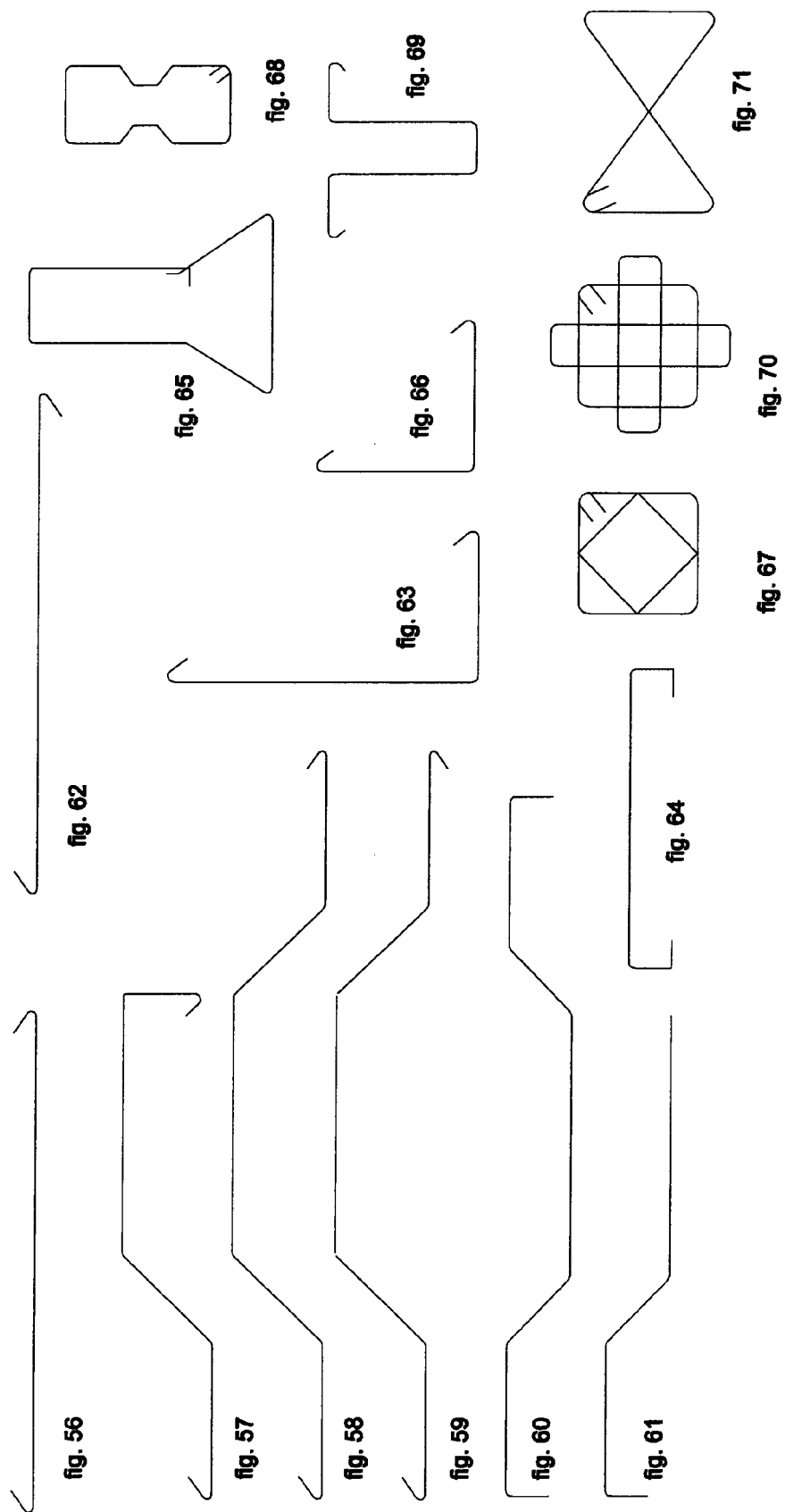


fig. 37





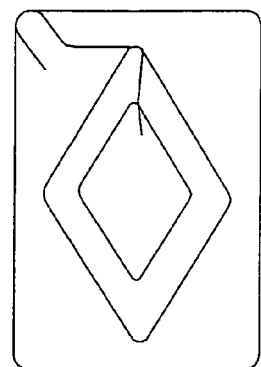


fig. 75

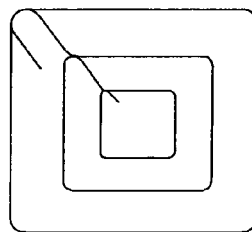


fig. 80

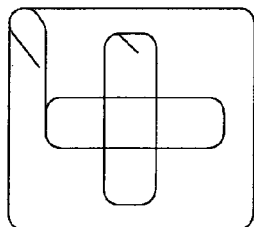


fig. 74

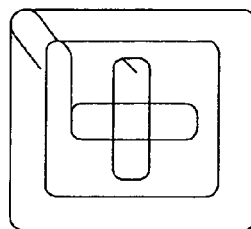


fig. 79

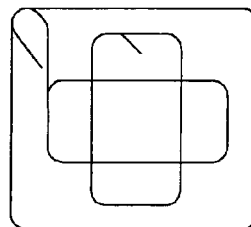


fig. 78

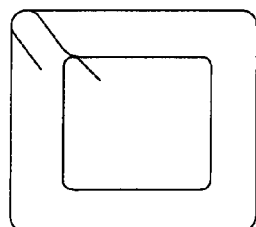


fig. 73

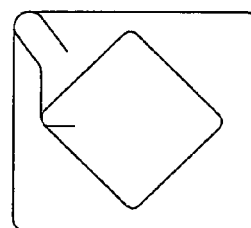


fig. 77

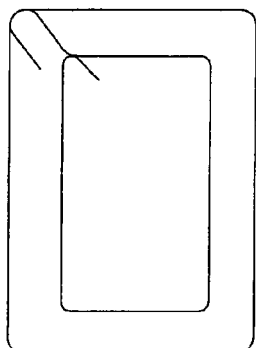


fig. 72

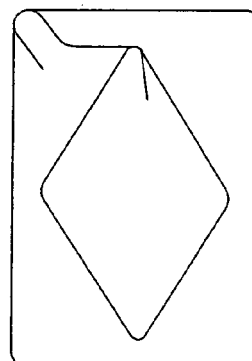


fig. 76

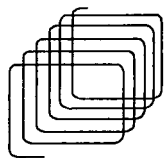


fig. 81

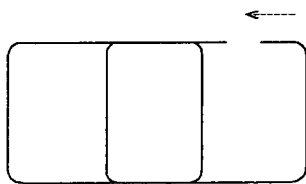


fig. 83

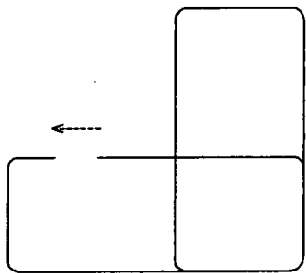


fig. 84

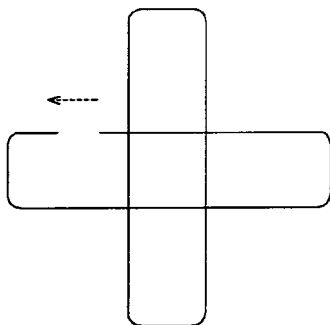


fig. 85

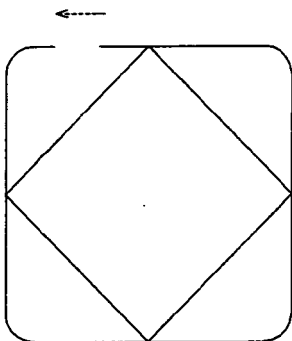


fig. 86

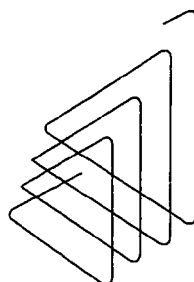


fig. 82

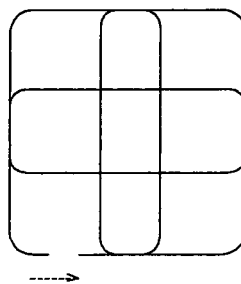


fig. 87

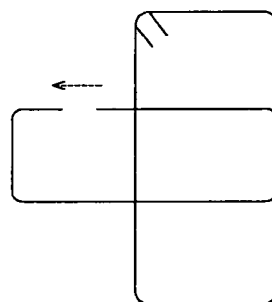


fig. 88

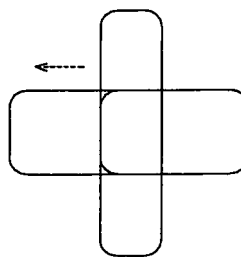


fig. 89



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 08 38 6003

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A	* the whole document *	2,3	
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			B21F B21D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 29 May 2008	Examiner Ritter, Florian
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