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(54) Machine for straightening, bending and cutting of iron concrete rods

(57) Machine for straightening, bending and cutting of iron concrete rods, comprising a four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end, said mechanism consisting of a rotating plate (1) which has four openings for the entrance of the four bending pins (5). The bending pins (5) are adjusted by twos on the two half rings (3) which are adjusted externally of the plate (1).

Internally of the rotating plate (1) is adjusted the base (2) of the knives (20) and in its internal is adjusted the axle (4) with the formation pins (6) and the openings for the steady point of cutting-holding of the iron rod.

The base of knives (2) and the axle (4), depending on the function, move and slide up and down. The mechanism is placed in a metallic casing (16) and on its two sides are adjusted seating mountings (17) for the backward & forward motion of the mechanism.

It runs by use of pairs of gears (11&12) and pistons.

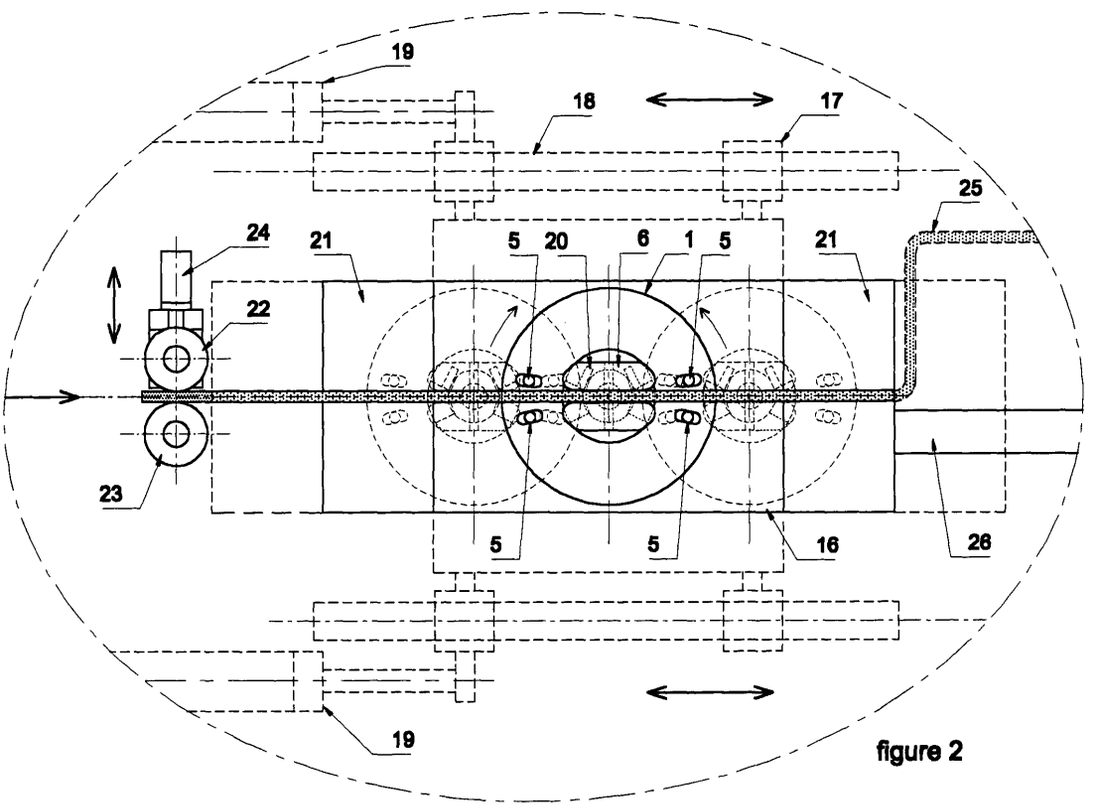

figure 2

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Description

[0001] The invention refers to a **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end**.

[0002] It is installed in special machines known as robotic machines for cutting and forming building steel (straightened rods or from coil) or in any other machine which executes the above-mentioned tasks and processes iron rods with various geometrical shapes.

[0003] For many years, the productive procedure regarding cutting and forming of the iron concrete rod for the production of concrete reinforcement or any other type of iron rod, has been industrialized. Various "smart" machinery and mechanisms have replaced the -until then- manual labour and increased in a significant degree the productive abilities.

[0004] Some of these machines are known as "cutting carriages for iron concrete rods" or "machinery for straightening, bending and cutting of iron concrete rods".

[0005] These machines are also known as "robotic machines", manufactured with various abilities by various manufacturers and, in the past, the applicant has been awarded with patents for relative machinery inventions.

[0006] The above-mentioned machinery consist of a set of separate mechanisms each one of which carries out the corresponding task and, as a whole, the final product is produced.

[0007] Significant mechanisms by themselves, or as a part of a set of mechanisms, are the iron rod bending and cutting points.

[0008] The already known machines have the ability, apart from cutting and bending the one side of the iron rod, to also cut and form the second side of the iron rod, something similar to the present invention.

[0009] However, factors such as the great number of the independent mechanisms that execute each task phase have as a result the restriction of the cutting and forming speed as well as the wearing due to the many attachments participating in the procedure.

[0010] The bending speed is lower in relation to the invention, for the reason that although for the first end of the rod is followed the same procedure, that is, propulsion, bending and propulsion, for the bending of the rear end, the bending plate -which has a formation pin- rotates by 180°, the iron rod is moved -via additional propulsive rolls that these machines are provided with- firstly forwards as far as the length of the side to be bended, the cutting is accomplished and then, the rod returns to the bending point or to the bending points for the realization of bending.

[0011] This leads to the increase of the processing time and to the use of an additional roll system.

[0012] The cutting of the bars is done with reciprocation, always on the same point without the ability of the rear end cutting, unless some additional specific movements of the iron rod are made.

[0013] The bending and cutting system consists of two different mechanisms, which are of a higher manufacture cost and they demand more space coverage for the machine.

[0014] Other manufacturers use various independent mechanims in order to achieve this result.

[0015] The **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end** is characterized by the fact that the processes of cutting and bending are executed by an integrated mechanism that performs a series of movements according to the commands given by the program of the machine.

[0016] This integrated structure increases the formation speed and decreases considerably the manufacture and damage cost.

[0017] During the bending phase of the front or the rear side of the iron rod, the cutting preceding the bending is realized via rotation of the cutting tool (immovable-movable point) while the whole mechanism can move and remain at any point of the rod that is about to be formed. The rod can be held in the formation canal via the cutting tool and the immovable formation point, so that during its movement or the movement of the formed shape, no any additional holding mechanism will be needed.

[0018] For the bending of the rear part of the iron rod the entire mechanism for bending and cutting moves so far as the length of the bended part without any demand for an additional roll propulsion system. Moreover, since the bending plate has the ability to bend in four directions via the four formation pins (two at the front and two at the back), the procedure of rotating the formation plate by 180° is not needed.

[0019] Each formation pin can also be used as an extractor, for the unblocking of the already formed shape out of the mechanism.

[0020] This has as result the increased speed of the bending procedure, the decrease of the cost, since the manufacture of undependable mechanisms is avoided, and the damage reduction concerning spare parts used to wear out in particular.

[0021] The invention can be well comprehended by right of the following figures:

Sheet 1 shows the **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end** in the section and phase (lower point) that can form the front or rear end of the iron concrete rod.

Sheet 2 shows in top view the **mechanism** with the moving abilities that it can perform (forwards-backwards), the optional assisting rolls and the canal for the holding of the formed rods, which is used for shapes of great length.

Sheet 3 shows the mechanism in the section and phase (upper point) where the cutting of the front or the rear end and the holding of the iron rod can be realized.

Sheet 4 shows in top view the **mechanism** (figure 4) in the phase of the iron rod cutting, the front side cutting in enlargement (figure 5) and the rear side cutting in enlargement (figure 6).

Sheet 5 shows the bending of the rear end (figure 7) in a right angle and the bending of the rear end (figure 8) in a left angle as well as the position of the bending pin (A=up and K=down).

Sheet 6 shows in top view the **mechanism** (figure 9) in the phase of holding and moving the formed shape, the holding of the rod from the rear side in enlargement (figure 10) and the holding of the rod from the front side in enlargement (figure 11).

Sheet 7 shows the **mechanism** during the phase of using the formation pin as an extractor in order to remove the formed shape (figure 12 &13).

Sheet 8 shows the phases executed in order a square shape to be formed by the procedure of propelling the iron rod to the front and forming it.

Sheet 9 shows the phases executed in order to be formed a square shape by the procedure of having propelled the entire length of the iron rod to be bended and the forming procedure executed backwards.

Sheet 10 shows the **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end** placed on a straightening-cutting and bending machine of iron concrete rods (robotic machine), having adjusted the optional rolls, the canal for the holding of the formed shape and the collector which gathers the final product (formed shapes).

Sheet 11 shows the **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end** placed on a straightening-cutting and bending machine of iron concrete rods (robotic machine) having adjusted the canal for the holding of the formed shape and the collector which gathers the final product (formed shapes).

Sheet 12 indicatively shows various "closed type" shapes that the **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end** can form.

Sheet 13 indicatively shows various shapes (of open and closed type as well as many complicated shapes) that the **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end** can form.

Sheet 14 indicatively shows various shapes in spiral figure that the **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end** can form.

Sheet 15 indicatively shows various shapes with "core" (single, double, triple, etc) that the **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end** can form.

Detailed description:

[0022] The **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end**, according to the above-mentioned shapes, consists of a rotating plate (1), which has four openings for the entrance of the four bending pins (5). The bending pins (5) are adjusted firmly by twos on the two half rings (3). The rings are adjusted externally of the plate (1) and glide up and down, with the aid of pistons (7) and transfer-springs (8) depending on the phase that the mechanism performs. The rotation of the plate (1) is accomplished via a pair of gears (11) and (12), and the motion is given by motor (10).

[0023] The rings (3) externally have circumferential grooves (paths) so that during their rotation (e.g. bending phase) they can function as guides of the transfer-springs (8), which, in this way, can move circumferentially of the rings.

[0024] The whole system of the rotating plate is based on ball bearings and corresponding housings.

[0025] Internally of the rotating plate (1) is adjusted the pierced base (2) of knives (20) and in its internal is adjusted the axle (4) for the assembling of the formation pins (6) and for the use of its openings as a steady point so as to achieve cutting-holding.

[0026] The base for the knives (2) and the axle (4) move and slide up and down by use of a piston (9). The upward motion (figures 3, 4, 5 & 6) is necessary in order to fulfill the front or rear cutting of the iron rod and the use of the knives (20) and of the axle housings (4) (figures 3, 9, 10, 11) as a clamp for the transference of the rod or of the formed shape, and the backward motion is necessary for the front or rear bending (figures 1 & 7).

[0027] The base (2) is seated on ball bearings and corresponding housings. Its rotation regarding the cutting of the rod is executed by use of a piston (13) and a corresponding ringed base (15) which allows the upward and downward movement of the base (2).

[0028] For the holding and moving the iron rod, the base (2) is rotated via an assisting pneumatic piston (14) and stabilizes the rod between the knives (20) and the opening of the base (4) with such a pressure that it's

sufficient for the transference of the rod without scratching its surface.

[0029] The **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end** is placed on a metal casing (16). On its two sides are adjusted seating mountings (17) for the sliding of the entire mechanism on the axles-guides for transference (18).

[0030] The backward & forward motion of the mechanism is accomplished by use of pistons (19) or other mechanism.

[0031] The **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end** is adjustable to machines for straightening, bending and cutting of iron concrete rods or to corresponding machines which form iron rods.

[0032] On sheets 10 & 11 two cases of such machinery are presented.

[0033] At the point where the mechanism is placed, is constructed an opening as big as the way we select the machine to follow. During the phase of forward and backward motion of the mechanism (figure 2) the spaces created at the opening due to the motion of the mechanism, are covered by laminations (21) which -at the same time- are also used as surfaces for the iron rod being formatted.

[0034] The mechanism can optionally cooperate with a holding-driving canal for the formed shape (26) which has the length of our choice.

[0035] It functions with pistons (27) and has the ability to hold the shapes -in case they are of great length- by operating as a clamp with the help of the pistons and to place them in the collection place that is located on the lower part of the canals after the completion of the formation of the shapes (25).

[0036] Also, in cases that the propulsive roll line is not enough for the machines, a pair of propulsive roll guides (22 & 23) is optionally placed near to the mechanism.

[0037] The pair of rolls consists of the immovable roll (23), the mobile roll (22) that is adjusted by piston (24) according to the diameter size or the cross section of the iron rod.

[0038] The rotation of the roll (23) is carried out by a motor.

[0039] As already mentioned, the **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end** is placed in machines for straightening, bending and cutting of iron concrete rod, or in corresponding machines, which processes iron rods, also known as robotic machines.

[0040] This kind of machines can form straightened iron concrete rods or other iron rods and can also elaborate iron rod from coil.

[0041] They function by use of computer, like all the relevant patents, the applicant was awarded with, do.

1st Application example

[0042] The **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end**, is placed in a machine for straightening, bending and cutting of iron concrete rod, (electronic robotic machine), figure 14, sheet 10.

[0043] The machine collaborates with canal-holding guide of the formed shape (26) and collector of the formed shapes (25), which is located in the lower part of the machine and of the canal, as well as with assisting propulsive roll-guides (22 & 23) in case the machine does not provide them near the mechanism. The iron concrete rod is inserted into the propulsive and straightening rolls - usually the rod comes from an iron coil (steel works) - or is straight and passes through the assisting propulsive and straightening roll-guides (22 & 23).

[0044] The mechanism is located on the left side of the opening, the bending pins (5) and the cutting knives (20) are located on the lower part.

[0045] The formation pins (6) are at the phase of formation (lower point).

[0046] After programming the computer regarding the shape to be formed (indicative figures on sheets 12, 13, 14 &15) the square shape is chosen.

[0047] Its formation phases are shown on sheet 8, which concerns the bending of the iron rod when it is being advanced and bent forwards.

[0048] Propulsion and straightening of the iron rod will be as much as the length of the side of the first bended part.

[0049] Realization of the bending (P1) by use of one pair of formation pins coming out and rotating with the aid of the rotating plate (1) as much as the programmed angle and direction.

[0050] Descent of the bending pins pair (5), return of the rotating plate (1) at the initial point and propulsion of the iron rod that much as the length of the bended side (P2).

[0051] After this phase, the shape can insert into the canal-holding guide (26) if its length is correspondent.

[0052] Bend and repetition of the procedure up to (P8) where the axle (4) with the formation pins (6) and the base (2) with the knives (20) are advanced to the upper part so as to accomplish the cutting with the rotation of the knives (20) and the opening of the immovable point (4). Return of the formation pins and of the knives at the lower point, the shape is held at the canal-guide with the aid of the pistons (27) and forward movement of the entire mechanism as much as the length of the last bended part, as it is presented on (P9). Ascent of the bending pins, rotation of the bending plate and bending of the last part.

[0053] The formation is completed. The pins are at the lower point and the rotating plate (1) rotates till the point where one bending pin shall be under the cross section of the iron rod of the formed shape so as to function as an extractor. At this phase, the one pair of bending pins

is ascending (figure 12 & 13, sheet 7) and at the same time with the opening of the canal - if the shape due to its size is inside the canal - the formed shape (25) is detached from the mechanism and collected by the collectors for formed schemes which are located at the lower part of the machine and the canal.

2nd Application example

[0054] The **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end**, is placed in a machine for straightening, bending and cutting of iron concrete rod, (electronic robotic machine), figure 14, sheet 10.

[0055] The machine collaborates with a canal-holding guide of the formed shape (26) and with a collector of the formed shapes (25) which is located on the lower part of the machine and of the canal as well as with assisting propulsive roll guides (22 & 23) in case the machine does not provided them near the mechanism.

[0056] The iron concrete rod inserts into the propulsive rolls and passes through the assisting propulsive roll-guides.

[0057] The mechanism is located on the left side of the opening, the bending pins (5) and the cutting knives (20) are located on the lower part.

[0058] The formation pins (6) are at the formation phase (lower point).

[0059] After programming the computer regarding the shape to be formed (indicative figures on sheets 12, 13, 14 &15) the square shape is chosen.

[0060] Its formation phases are shown on sheet 9, which concerns the bending of the iron rod when its total length is being advanced forwards and the bending procedure is executed backwards.

[0061] Propulsion and straightening of the iron rod will be as much as the total length of the sides of the bended parts.

[0062] The straightened rod is inserted to the canal (26) and is held still. The mechanism moves forward as much as the length of the first bended part and, according to those analyzed at the first application example, rear bending is realized (P1).

[0063] At figures 7 & 8 of sheet 5 is shown the way of achieving the rear bending and the position of the bending pins corresponding to each case.

[0064] With 5 (A) the position of the pin is in the upper position and with 5 (K) the position of the pin is in the lower position.

[0065] Return of the rotating plate (1) at the initial point and forward movement of the mechanism as much as the length of the bended part (P2).

[0066] Realization of bending (P3) and return of the plate (1) as its initial point, the formation pins on the lower position, the base (2) with the knives (20) and the axle (4) with the formation pins (6) are advanced to the upper point so as to be realized the clamp of the rod (figures 9, 10, 11, sheet 6) by the rotation of the knives (20) and the immovable point of the axle (4) and with the aid of the piston (14). Release of the rod from the canal (26), movement of the mechanism with the formed shape backwards as much as the bended side, stabilization of the rod in the canal (26), return of the base (2) and the axle (4) on the lower point and forward advance of the mechanism as much as the length of the bended part (P4), realization of bending (P5) and return of the rotation plate (1) on its initial point.

[0067] Similar procedure is followed for the (P6), (P7) and (P8) while in (P9) we have forward bending and completion of the formation procedure.

3rd Application example

[0068] The **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end**, is placed in a machine for straightening, bending and cutting of iron concrete rod, (electronic robotic machine), figure 15, sheet 11.

[0069] The machine collaborates with a canal-holding guide of the formed shape (26) and with a collector of the formed shapes (25) which is located at the lower part of the machine and of the canal.

[0070] The iron concrete rod is inserted into the propulsive and straightening rolls - the rod is usually straightened or comes from an iron coil (steel works) - and passes through the assisting propulsive roll-guides (22 & 23) which these machines are provided with.

[0071] The mechanism is located on the left side of the opening, the bending pins (5) and the cutting knives (20) are located at the lower part.

[0072] The formation pins (6) are at the phase of formation (lower point).

[0073] After programming the computer regarding the shape to be formed, one or more of the indicative figures are chosen as shown at sheets 12, 13, 14 &15.

[0074] For the formation the procedures mentioned in the two previous application examples are followed.

[0075] **The four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end,** has the ability of plenty applications regarding formation of iron concrete rods or other iron rods and mainly its use is important when it concerns formations of open-type shapes of great length as shown at figures 14 & 15 and at sheet 13.

Claims

1. The **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end**, consists of a rotating plate (1) that has four openings for the entrance of the four bending pins (5). The bending pins (5) are firmly adjusted by twos on the two half rings (3). The rings are adjusted externally of the plate (1) and slide up and down. Externally they have circumferential grooves

(paths) so that during their rotation according to operation phase of the mechanism, to function as guides of their transfer-springs (8).

Internally of the rotating plate (1) is adjusted the pierced base (2) of knives (20) and in its internal are adjusted the axle (4) with the formation pins (6) and the openings for the immovable point of cutting-holding.

The base of knives (2) and the axle (4) move and slide up and down. The mechanism is placed upon a metallic casing (16) and on its two sides are adjusted seating mountings (17) for the backward & forward motion of the whole mechanism on the axles-moving guides (18).

The mechanism is placed in machines for straightening, bending and cutting of iron concrete rods or to corresponding machines which form iron rods and at its installation point is constructed an opening as big as the way selected the machine to follow.

During the phase of back and forth movement of the mechanism, the spaces created at the opening due to the movement of the mechanism, are covered by laminations (21).

The mechanism runs by use of pairs of gears and pistons.

2. The **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end,** according to claim 1 is **characterized by** the fact that it has two pairs of bending pins (5), which, by ascending in pairs above the rotating plate (1) and in combination with the formation pins (6), they execute the front or rear bending of the iron concrete rod at any direction and angle chosen.

3. The **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end**, according to claims 1 & 2 is **characterized by** the fact that it has two pairs of bending pins (5) which, by ascending in pairs above the rotating plate (1) and under the cross section point of the formed shape, they function as extractors of the formed shape.

4. The **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end,** according to claim 1 is **characterized by** the fact that internally of the rotating plate (1) it has the pierced base (2) with the cutting knives (20) and at its internal is adjusted the axle (4) with the openings for the steady point of cutting-holding.

As the base (2) ascends to the upper part and rotates rightwards or leftwards via the piston (13) it realizes the front or rear cutting of the iron rod.

5. The **four-direction mechanism for iron concrete rod bending with cutting ability of the front and rear end**, according to claims 1 & 4 is **characterized by** the fact that internally of the rotating plate (1) it has the pierced base (2) with the cutting knives (20) and at its internal is adjusted the axle (4) with the openings for the steady point of cutting-holding.

As the base (2) ascends to the upper part and rotates rightwards or leftwards via the piston (14) it realizes the front or rear holding of the iron rod or of the formed shape.

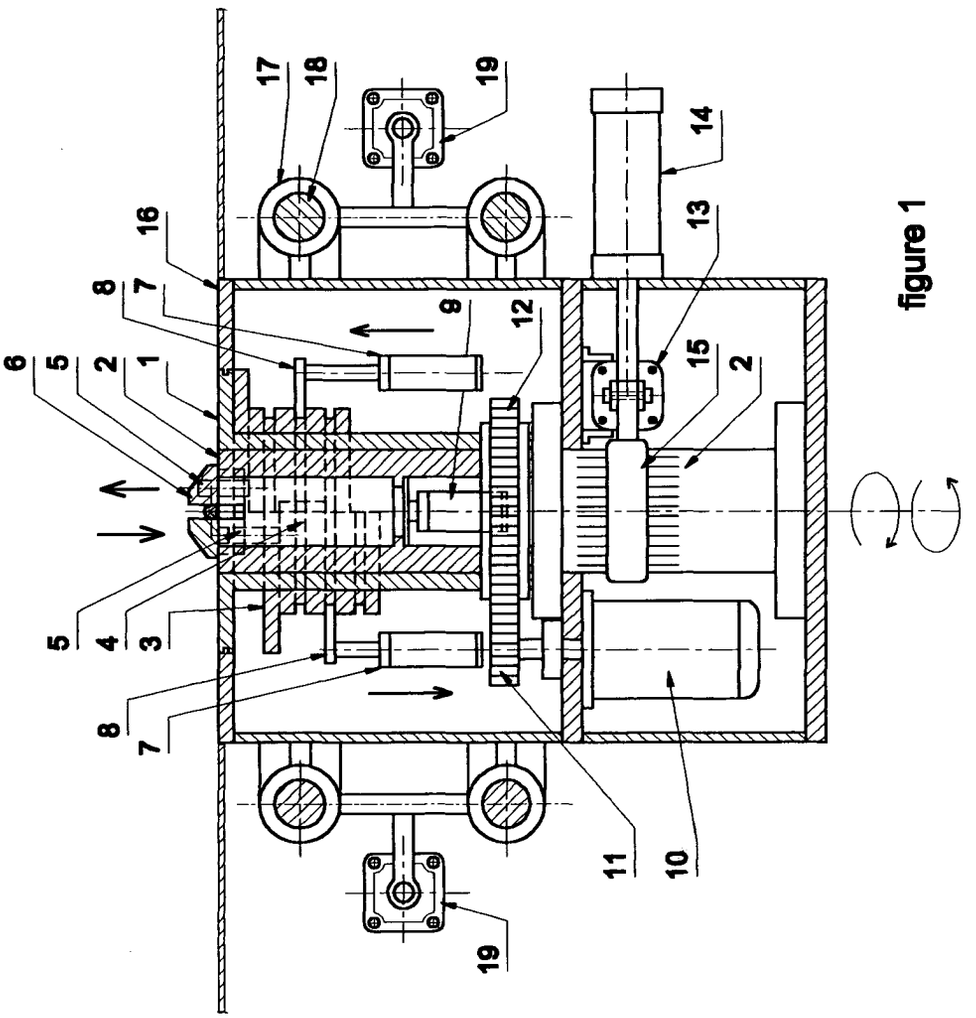
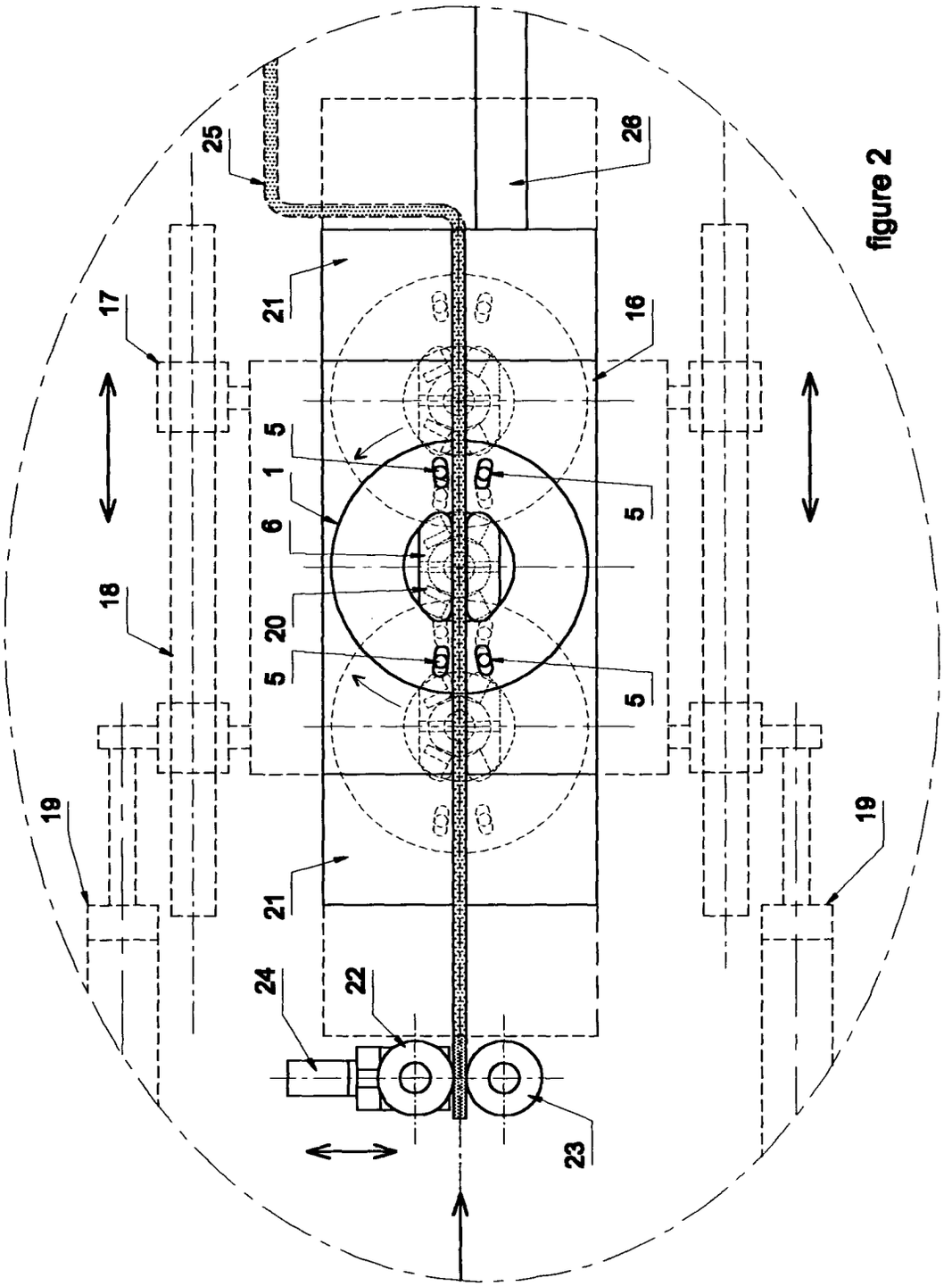


figure 1



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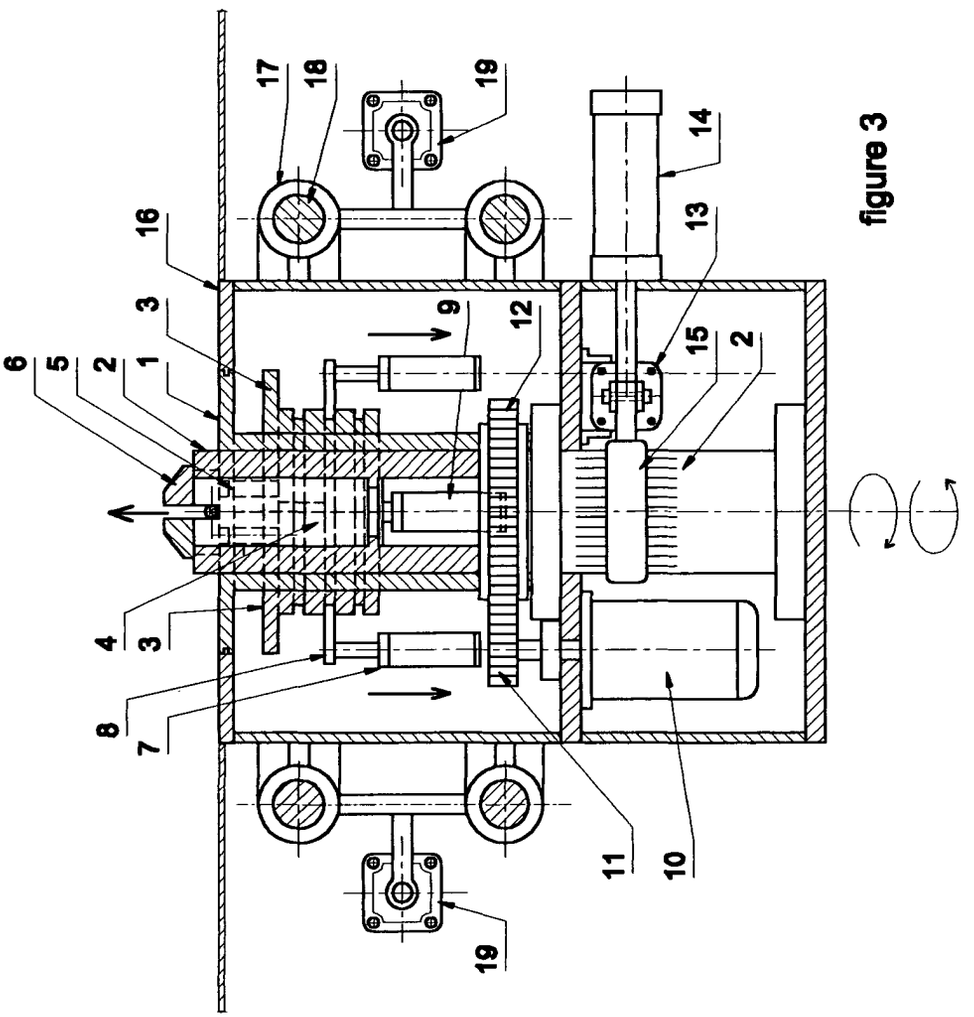


figure 3

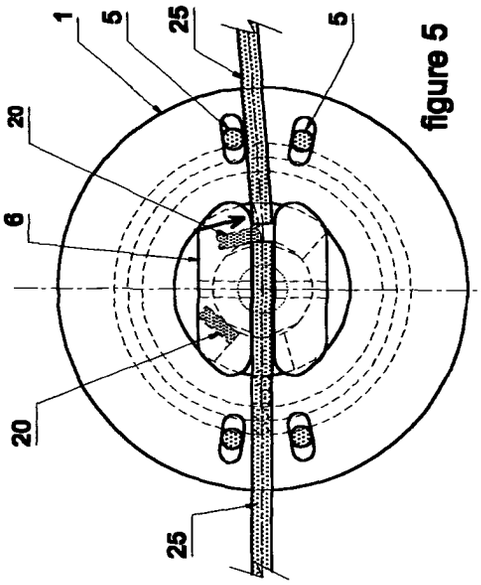


figure 5

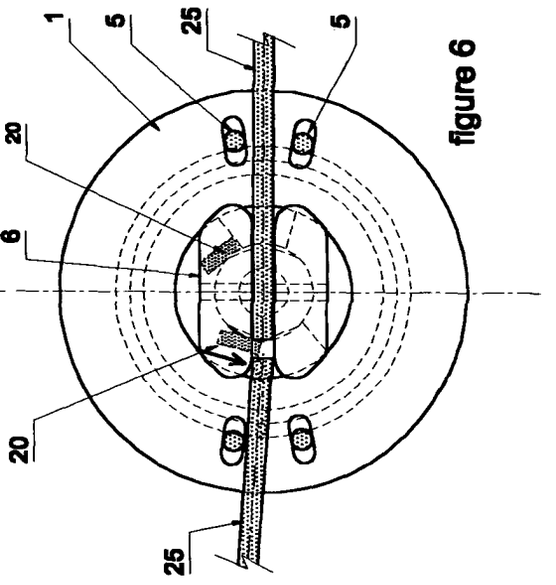


figure 6

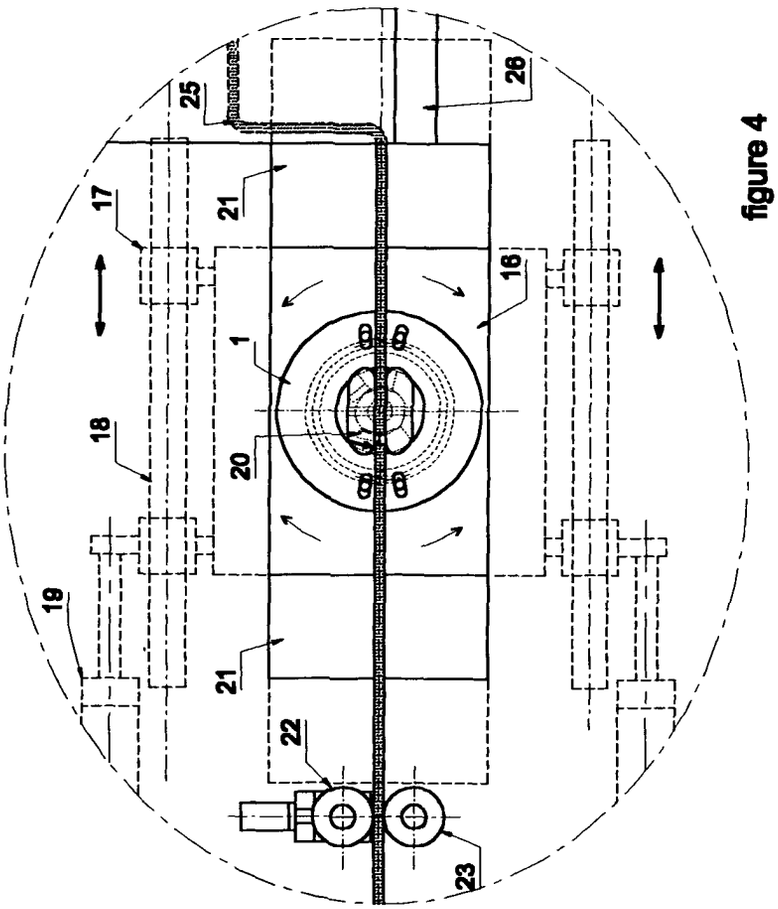


figure 4

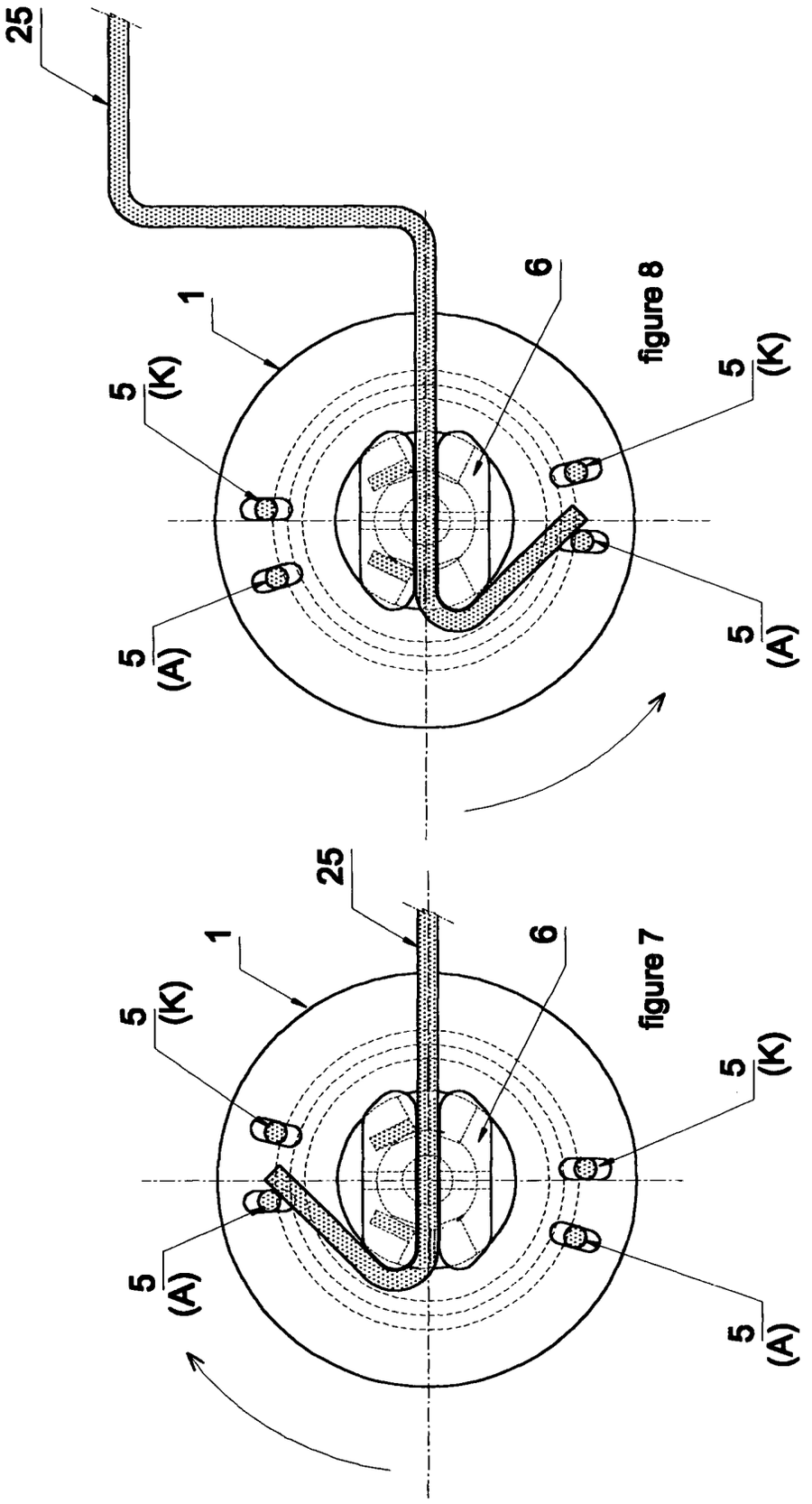
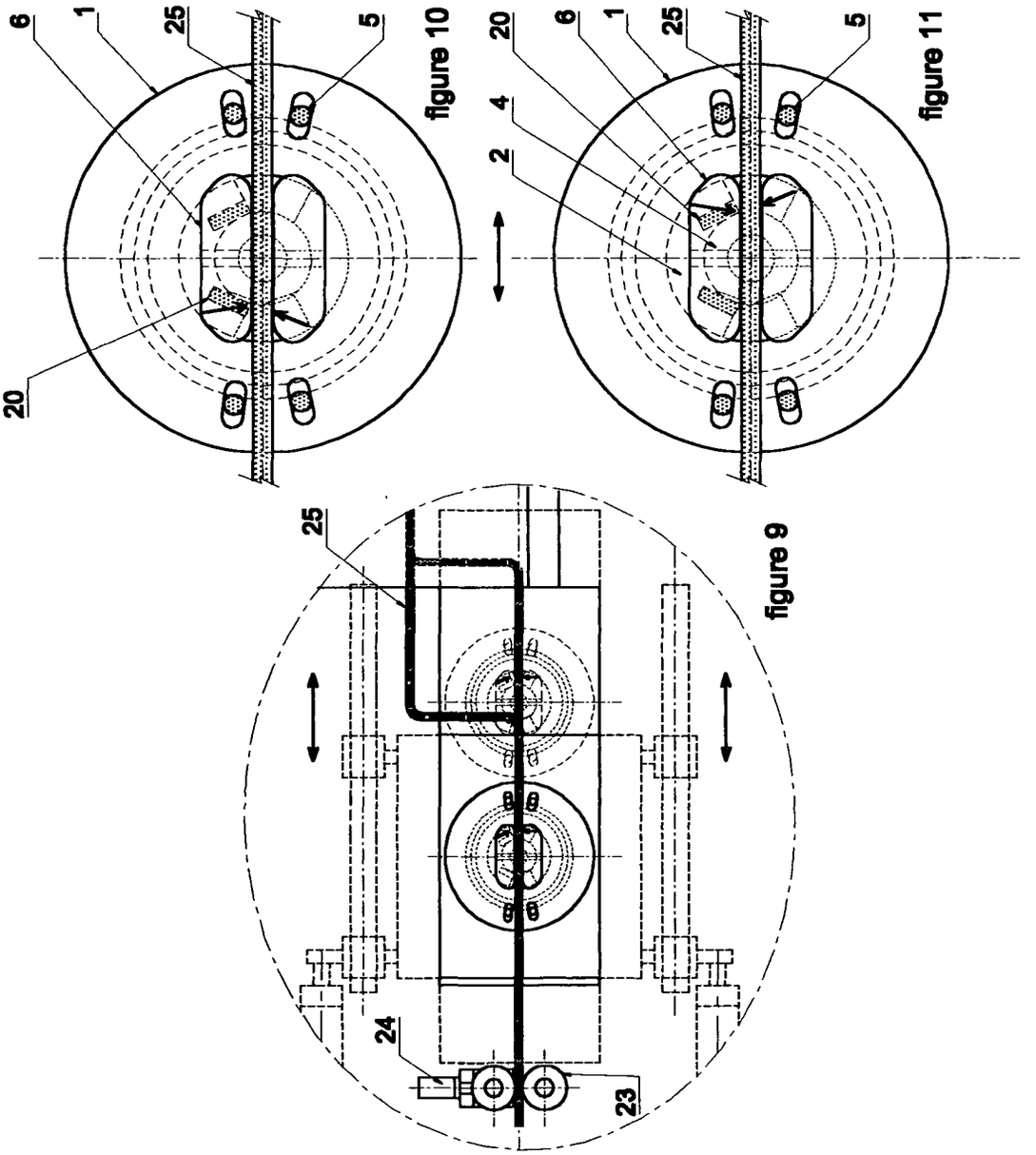


figure 8

figure 7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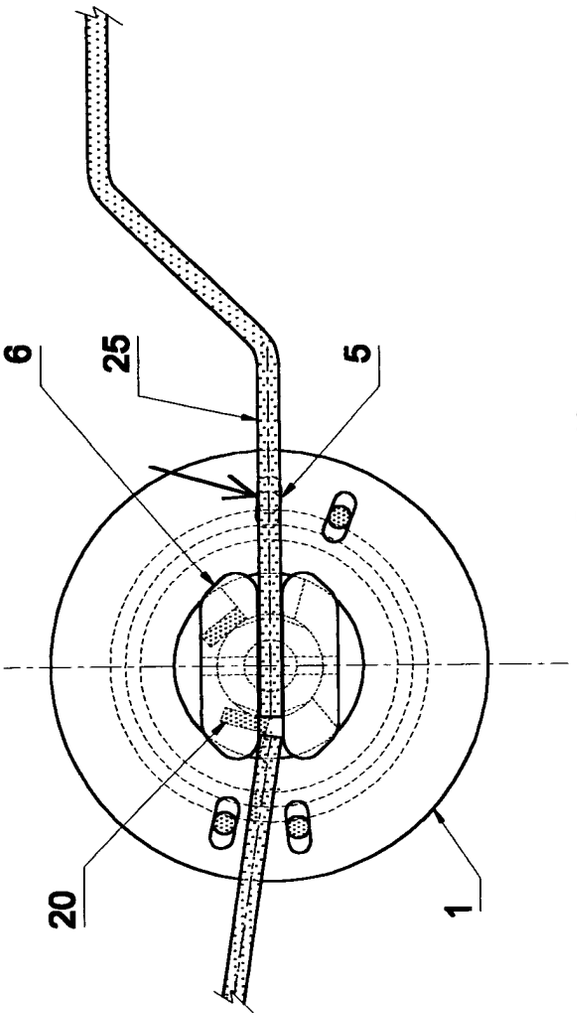


figure 13

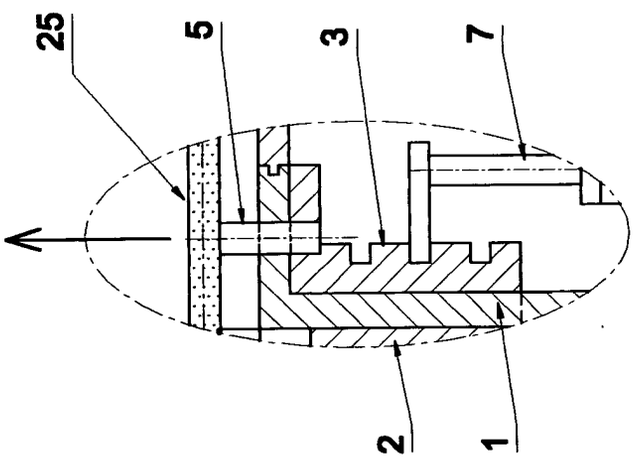
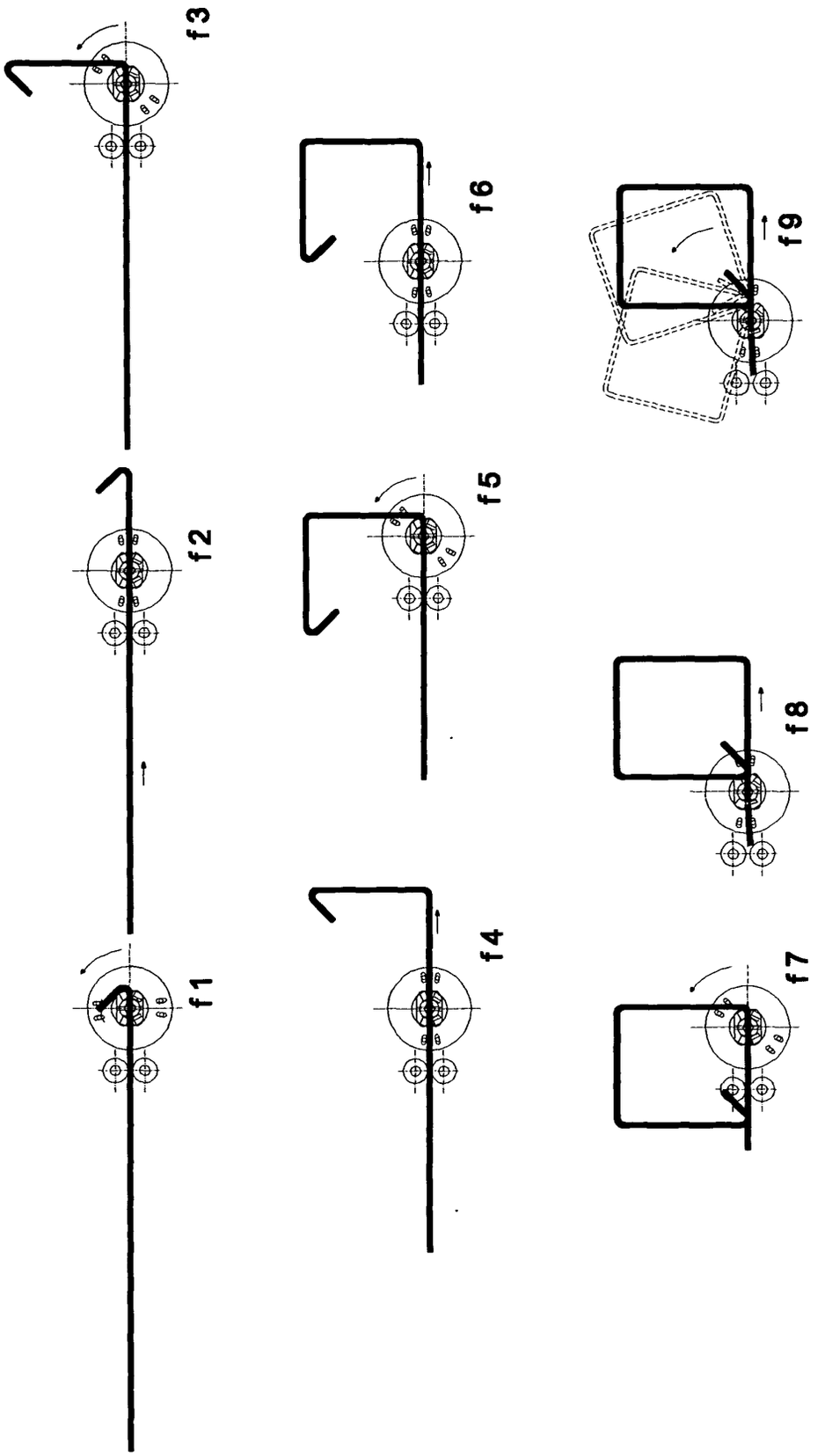


figure 12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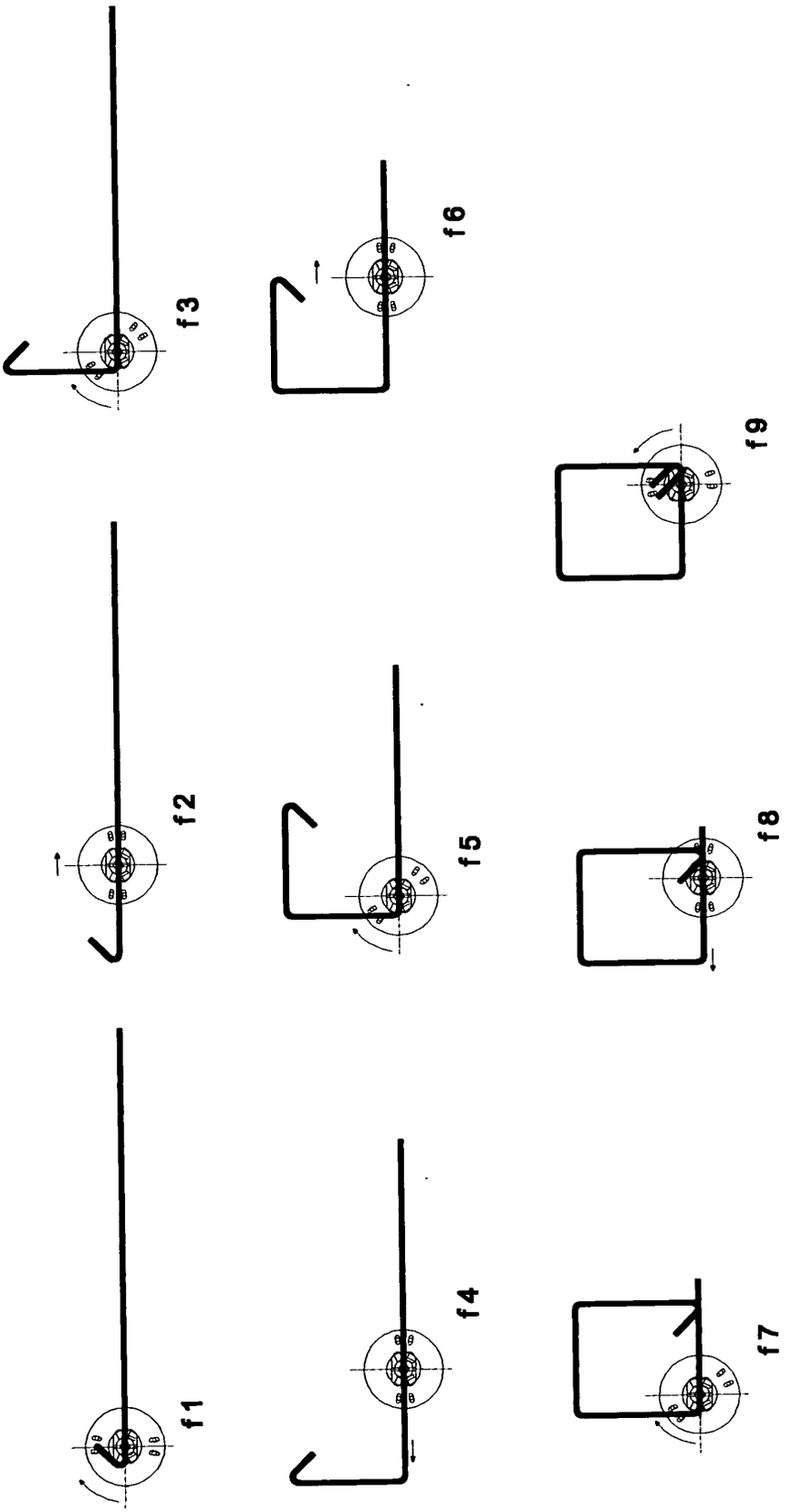
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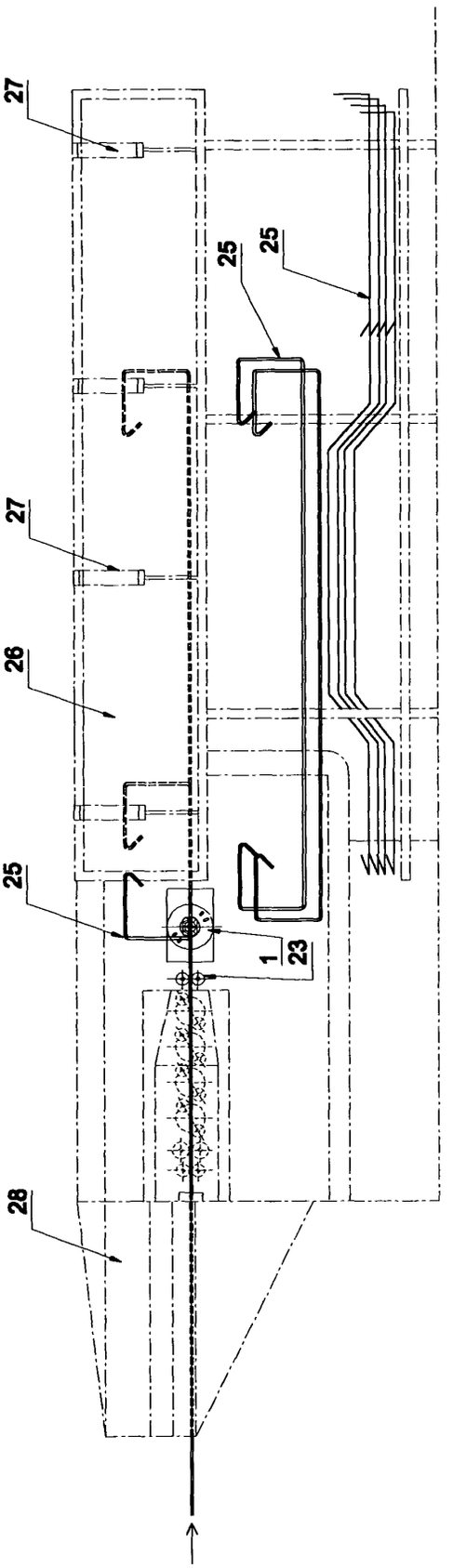


figure 14

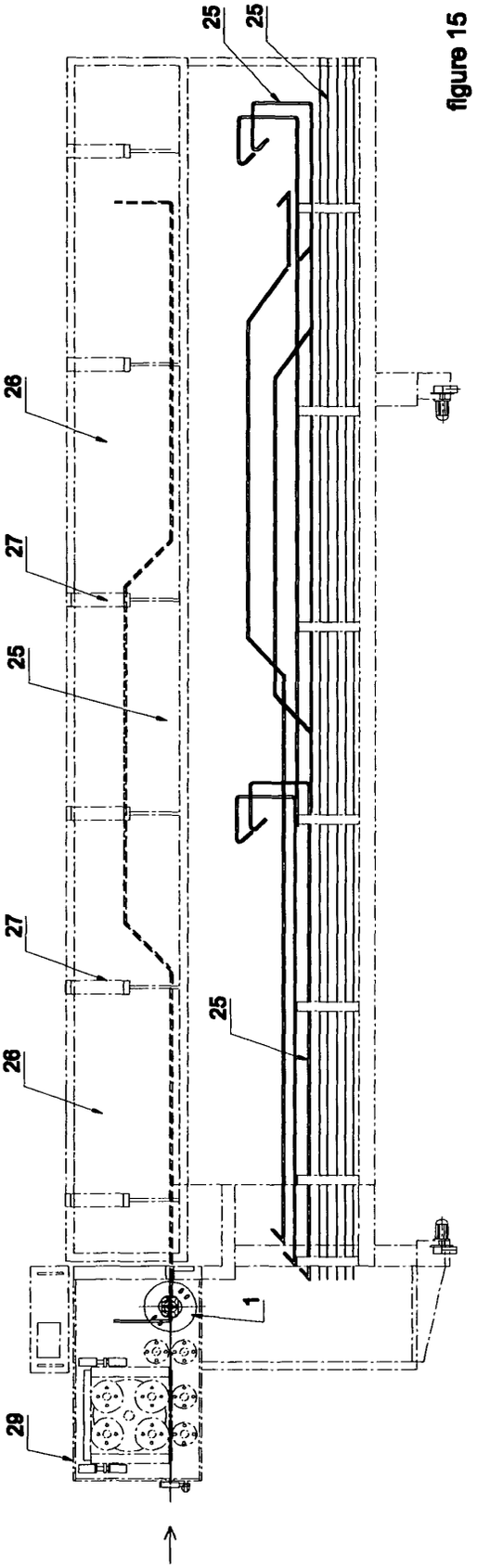
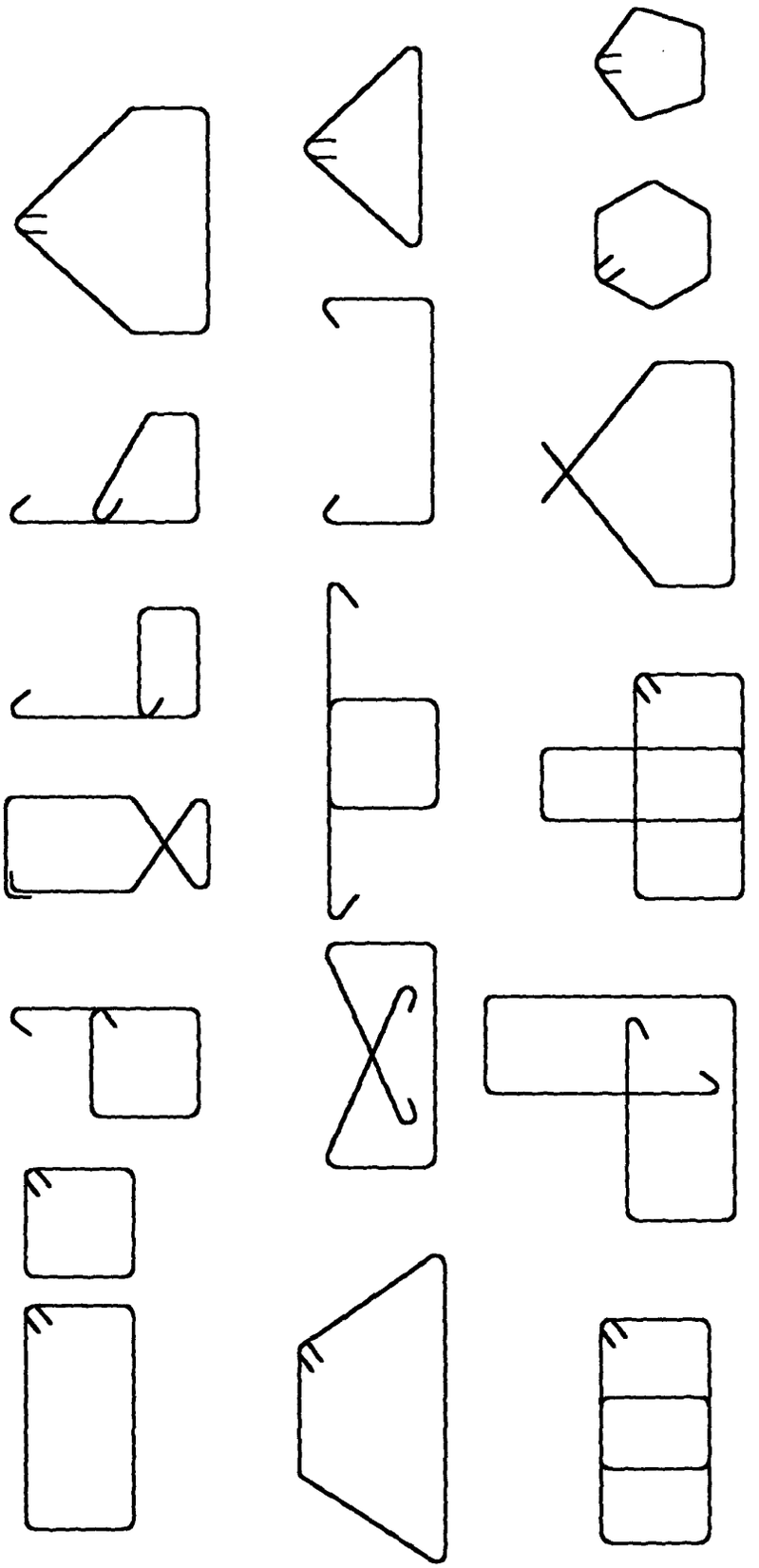
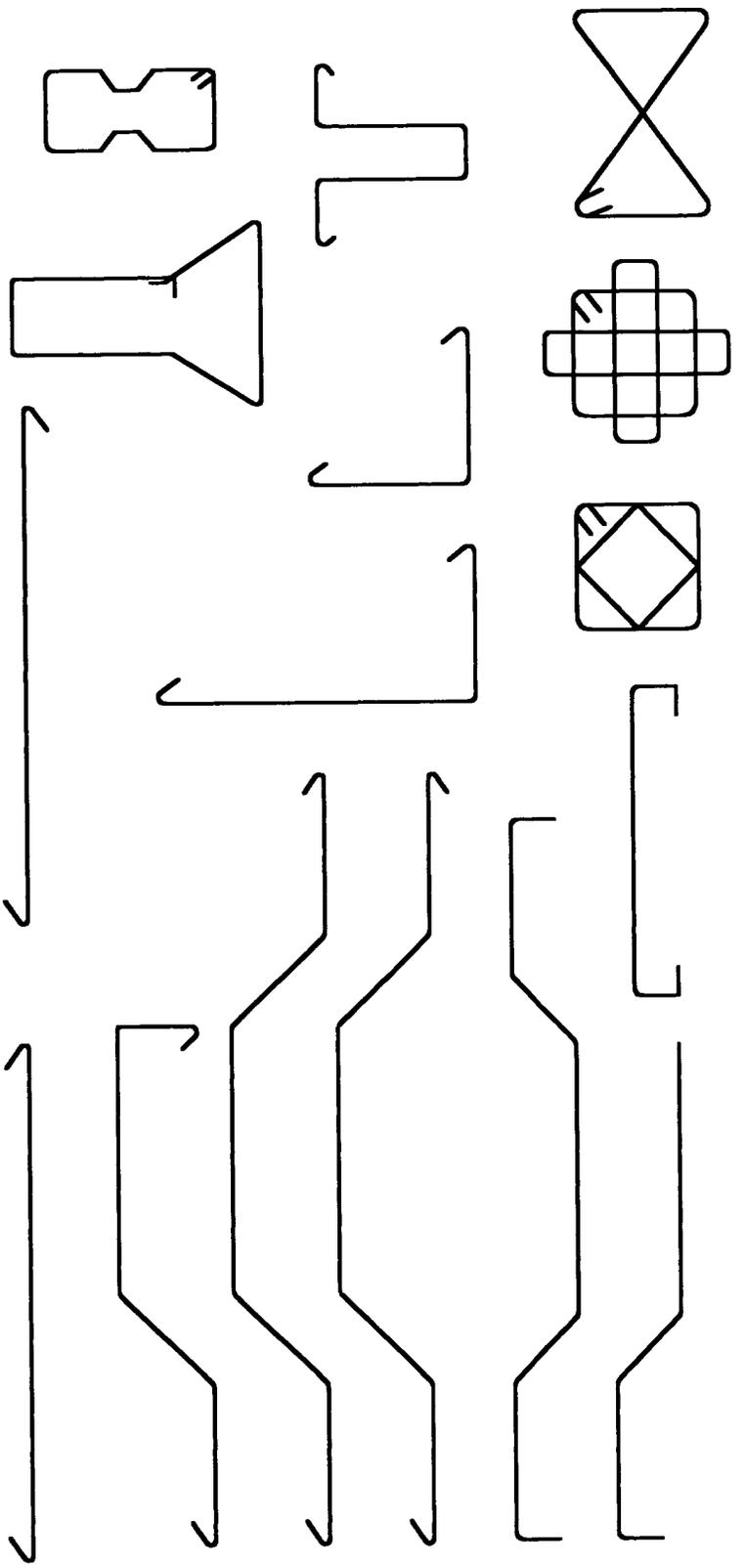
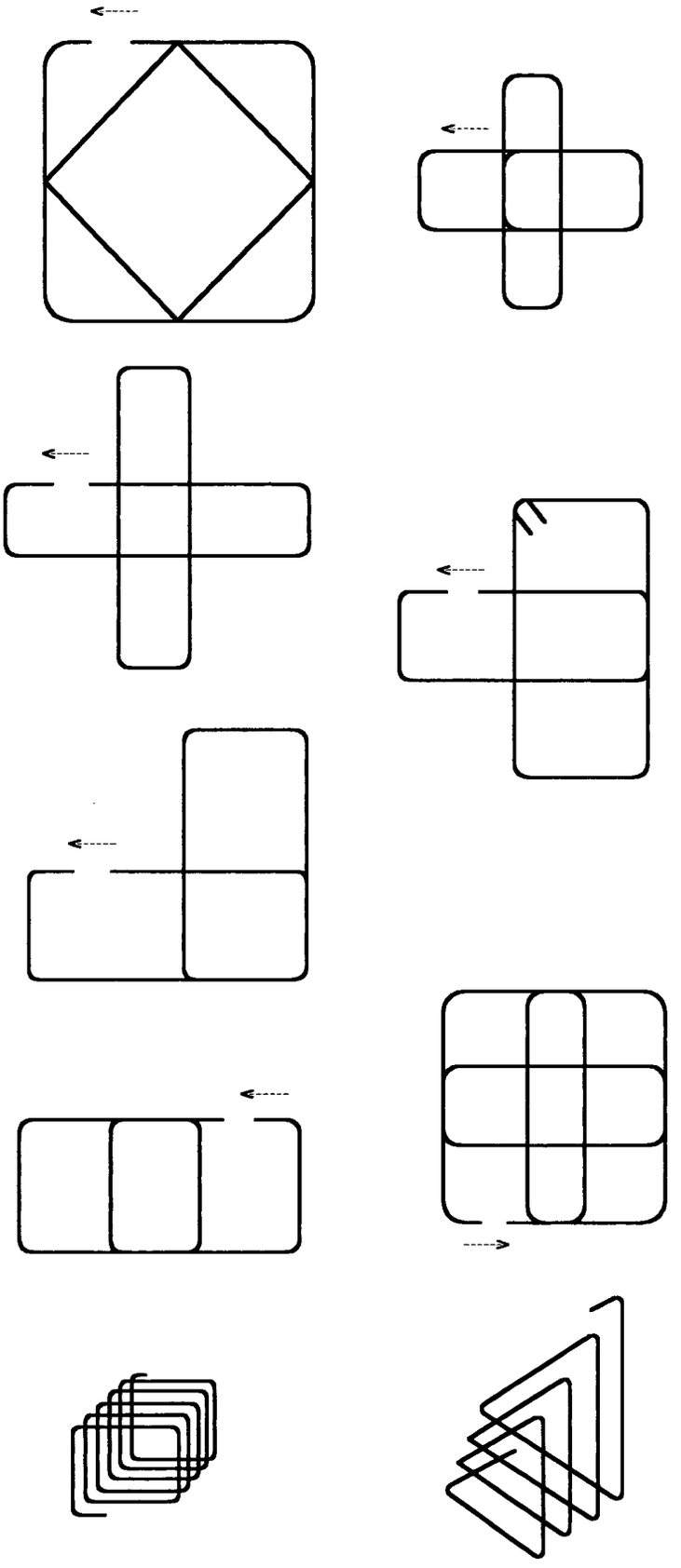
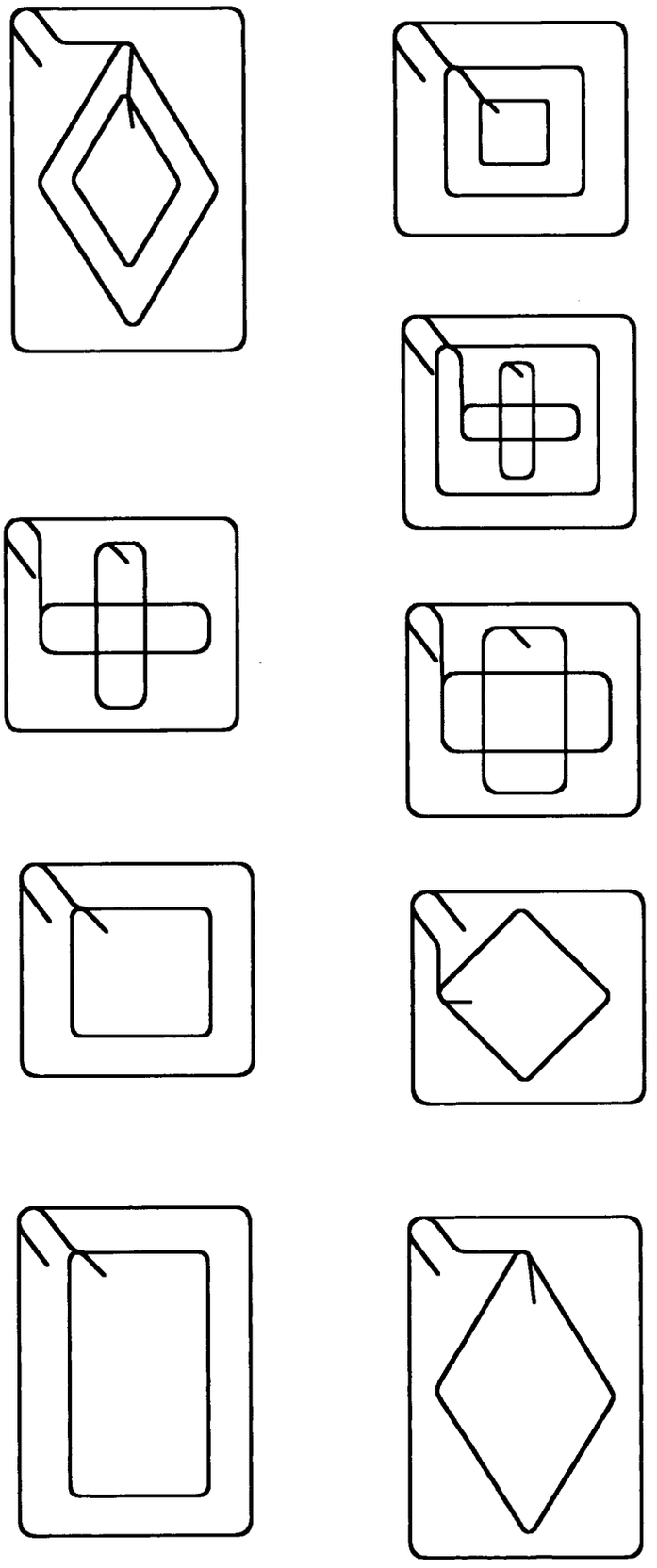


figure 15









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EUROPEAN SEARCH REPORT

Application Number
EP 04 38 6028

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.7)
A	EP 0 123 231 A (BUCHER, FRANZ) 31 October 1984 (1984-10-31) * the whole document *	1-5	B21D11/12
A	DE 27 23 846 A1 (RISTA-DRAHTWERK HUFNAGL & CO GMBH; RISTA-DRAHTWERK HUFNAGL & CO GMBH,) 15 December 1977 (1977-12-15) * page 8, paragraph 1 - page 10, paragraph 2; figures 2-4 *	1	
A	WO 03/082492 A (ANAGNOSTOPOULOS, ANTONIOS) 9 October 2003 (2003-10-09) * figures 3-5 *	1	
A	EP 0 437 714 A (M.E.P. MACCHINE ELETTRONICHE PIEGATRICI S.P.A) 24 July 1991 (1991-07-24) * figures 1-5 *	1	
A	EP 0 506 575 A (CARRERE, NOEL) 30 September 1992 (1992-09-30) * column 3, line 7 - line 33; figure 1 *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.7) B21D B21F
A	DE 35 46 449 A1 (ALPHA MASCHINENBAU AG; ALPHA MASCHINENBAU AG, ZUERICH, CH) 25 September 1986 (1986-09-25) * the whole document *	1	
A	CH 534 551 A (DEL FABRO,REMIGIO) 15 March 1973 (1973-03-15) * figures 1,2 *	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	23 February 2005	Ritter, F

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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23-02-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0123231 A	31-10-1984	AT 378700 A	10-09-1985
		AT 137483 A	15-02-1985
		DE 3462753 D1	30-04-1987
		EP 0123231 A1	31-10-1984
DE 2723846 A1	15-12-1977	AT 368724 B	10-11-1982
		AT 391276 A	15-11-1977
		CH 620379 A5	28-11-1980
WO 03082492 A	09-10-2003	GR 1004238 B1	14-05-2003
		AU 2003214481 A1	13-10-2003
		EP 1494825 A1	12-01-2005
		WO 03082492 A1	09-10-2003
EP 0437714 A	24-07-1991	IT 1236462 B	09-03-1993
		CA 2031737 A1	30-06-1991
		EP 0437714 A1	24-07-1991
		JP 4055021 A	21-02-1992
		US 5099669 A	31-03-1992
EP 0506575 A	30-09-1992	FR 2674558 A1	02-10-1992
		EP 0506575 A1	30-09-1992
DE 3546449 A1	25-09-1986	DE 3508809 A1	25-09-1986
		DE 3546448 A1	25-09-1986
		ES 8706051 A1	16-08-1987
		FR 2578764 A1	19-09-1986
		GB 2172229 A ,B	17-09-1986
		IT 1188435 B	14-01-1988
		JP 61209726 A	18-09-1986
		US 4718265 A	12-01-1988
CH 534551 A	15-03-1973	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82