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(54) Method to bind packages of metallic mesh and apparatus which employs the method.

(57) Method to bind packages of metallic mesh, the binding being carried out by the insertion of binding elements normally into lateral links of the meshes and being completed by the reciprocal twisting of the ends of the binding elements, the packages of metallic mesh arriving from plants which produce and stack the metallic meshes or from any system that conveys the meshes, the method comprising the following working steps:

- the halting at a binding position of the package (11) of metallic mesh arriving on a suitable conveyor means,
- the insertion of straight free segments of a preset and determinable length of a binding element (20) into preselected links of the package (11), such segments having their ends protruding from the two sides of the package (11),
- the bending of such ends of the binding elements (20) towards the outside of the package (11) in opposite directions so as to form a portion of the binding element (20) on the outside of the package (11) and substantially parallel to a segment of the binding element (20) located on the inside of the links, such portion comprising partially superimposed segments of those ends,
- the gripping and clamping of the partially superimposed segments,
- the twisting of the partially superimposed segments,
- the unclamping of the partially superimposed segments so as to release the tension induced in the binding element (20) during the twisting step, and
- removal of the package (11) thus bound,

these working steps being capable of being carried out at the same time or in succession at a plurality of points arranged for the binding of the package (11), the length of the inserted segment of the binding element being fully capable of being preset according to the height of the package (11) to be bound.

Apparatus (10) to bind packages (11) of metallic mesh, the binding being carried out by the insertion of binding elements (20) normally into lateral links of the meshes and being completed by reciprocal twisting of the ends of the binding elements (20), the packages (11) of metallic mesh arriving from plants which produce and stack the metallic meshes or from any system that conveys the meshes, the apparatus (10) employing the above method and consisting of the following main working assemblies:

- a structure (14) to support a movable trolley unit (15) able to move in relation to the package (11) being bound,
- an assembly (17) able to move in relation to the movable trolley unit (15) and bearing

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means to straighten (19), draw (22) and shear (23) the binding element (20),

- means (24-32) to bend the binding element (20),
- guide means (31) for the bent segments of the binding element (20), and
- an assembly (27) to unite the binding element (20), this assembly (27) bearing movable gripper means (29) and movable twisting means (28).

METHOD TO BIND PACKAGES OF METALLIC MESH AND APPARATUS WHICH EMPLOYS THE METHOD

This invention concerns a method to bind packages of metallic mesh and concerns also an apparatus that employs that method. To be more exact, the invention concerns a method suitable for the automatic binding of packages of mesh by insertion of a straight measured segment of metallic wire into the package and by the bending and twisting of that wire thereafter.

The invention is applied downstream of plants which produce and stack metallic meshes of any type.

The invention can also be applied to the binding with metallic wire of other materials packaged in various forms, such as, for instance, wound bodies such as rolls, bundles, etc.

The state of the art covers many methods and devices for the automatic binding of materials by means of metallic elements such as thin tapes, wires, etc.

Such known methods and devices include production steps and forms of embodiment of various kinds but all of them can be derived essentially from one single working principle, according to which the binding element is arranged peripherally about the material to be bound and is tightened thereafter about that material, and the ends of the binding element are tied together.

The binding element is normally fed continuously to the position or positions where the various tying operations are carried out and arrives at that position or positions from an appropriate supply store.

Suitable shearing means shear the binding element when the latter is positioned about the material to be bound; thereafter a twisting device or another device suitable to, make a joint acts on the sheared ends.

The joint is made after the binding element has been suitably drawn and tightened about the body of the material to be bound.

The positioning of the binding element about the material to be bound takes place by means of and within guides which, at the moment when the binding element has to be tightened about the material to be bound and has to be tied together thereafter, enable the binding element to emerge quickly.

Thus these guides too have to be arranged about the material to be bound and therefore have considerable overall dimensions together with great constructional complexity owing to the functions which they have to perform.

Moreover, where the materials to be bound are such as packages of metallic meshes, to which we shall refer in the description that follows, further problems arise.

In fact the packages have to be tied by passing the binding element through the outer links of the meshes of the package and then outside the package for the binding to be carried out.

The system with the guides of the state of the art is ill-adapted to this kind of operation and indeed cannot be used in many cases with its meshes of tight links and lateral projections.

Furthermore, the packages of mesh in the areas provided for the binding can travel substantially only at floor level and therefore any employment of the systems of the state of the art presupposes the making of foundation works below the floor level so as to make space for the passage of the guides.

Besides, the employment of the known devices with packages of mesh presupposes the technical necessity of tying together the ends of the binding element above or below the package but in any case at the point of insertion of the binding element into the links of the meshes.

This entails the presence of several segments of the binding element protruding above or below each package, thus forming a serious obstacle to the stacking of a plurality of packages of mesh, the stacking being required for more economical handling of the packages within or without the production units.

A partial attempt to overcome the problems of the state of the art provided embodiments whereby binding elements of a suitable length are preformed with a "U" shape and thereafter are inserted astride the links where the binding operation is to be carried out.

In these cases too the ties are made with the ends of the U-shaped elements protruding from the upper or lower face of the package, and this leads to the drawbacks described above.

The present applicant has studied, tested and brought about a method and an apparatus suitable to overcome all the problems of the state of the art.

The invention is set forth in the main claims, while the dependent claims describe various features of the invention.

The method according to the invention provides for the vertical insertion of straight segments of a binding element, for instance metallic wire to which we shall refer in the description that follows, through the lateral links of the package within which the binding operation is to take place.

The binding wire is fed continuously in preset and predeterminable lengths which are substantially twice the height of the package plus the superimposed segments of wire used for the union

of the package.

In fact, the binding wire passes freely through the circumscribed spaces of the meshes, from above downwards for instance, and then, as it emerges from the lower surface of the package, is suitably bent towards the outside edge of the package so as to be able to ascend by a required value.

The feed of the wire is halted when the length required for the binding has been reached, namely when the segment above the package on the side of the feed of the wire has such a length that with a successive downward bend it is superimposed on the segment of wire previously bent upwards from below.

The length of the segment bent upwards from below is preferably constant with packages of any height; to take that height into account and to keep unchanged the position at which the wire is tied, the length of the segment bent downward from above is altered accordingly.

The wire is then sheared and the upper segment of wire is bent outwards from the package and downwards.

By means of the method of the invention no guide of the type used for the wire in the state of the art is required.

The binding wire passes freely inside and outside the package of mesh, and the area of union of the wire is in a position outside the package and perfectly accessible for the means provided to make the union.

When required and depending on special properties of the binding wire and on the height of the package, a partial guide for insertion of the wire may be provided at the upper surface of the package.

The package can be moved substantially at ground level and it is not necessary to carry out any foundation works for the means that insert the binding wire in the links of the mesh, as are required instead in the state of the art. Merely a simple means to bend and direct the wire is provided at ground level.

Moreover, the operation of drawing the wire to tighten it closely to the links is obviated, thereby entailing a further saving of specific equipment together with a reduction in overall size owing to the smaller length of wire required for each binding operation.

Furthermore, the union of the wire is always at the lateral faces of the package, thereby providing no obstacle if packages of mesh are to be stacked.

The binding can be carried out on packages of any type of mesh and can be performed on any position of the links.

The apparatus to carry out the method according to a preferred embodiment of the invention comprises a stationary support structure for a vertically movable unit able to position itself in correspondence with the package of mesh to be bound.

The movable unit in turn bears a vertically movable assembly which determines the length of the binding wire according to height of the package to be bound. This movable assembly comprises means to feed and shear the wire and means to perform the upper bending of the wire thus sheared.

A plurality of stationary support structures may be comprised together with their relative movable units, depending on the number of binding operations to be carried out at the same time on a single package to be bound.

According to a variant the structure to support the movable unit can be traversed in relation to the package of mesh so that it can perform binding operations at different places.

According to another variant it is the movable unit which can be traversed horizontally in relation to the package of mesh so as to perform binding operations at different places.

The apparatus according to the invention comprises at least one tying unit positioned in correspondence with the lateral faces of the package; this tying unit twists the ends of the binding element.

A further part of the apparatus according to the invention is a lower assembly to bend the binding wire.

These and other special features of the invention will be made clearer in the description that follows.

The attached figures, which are given as a non-restrictive example, show the following:-

- Fig.1 is a diagram of the main working assemblies of the apparatus to bind packages according to the invention;
- Fig.2 shows a side view of a movable unit with a trolley and a movable head assembly of the apparatus shown in Fig.1;
- Fig.3 is a view of Fig.2 from above;
- Fig.4 is a front view of the movable head assembly;
- Fig.5 is a side view of the head assembly of Fig.4;
- Fig.6 is a side view of a bending assembly to bend the wire;
- Fig.7 is a plan view of the bending assembly of Fig.6;
- Fig.8 gives a side view of a detail of the bending assembly of Fig.6;
- Fig.9 shows a lengthwise section of the detail of Fig. 8 along the line A-A;
- Fig.10 is a side view of an assembly that

ties the wire;

Fig.11 is a plan view of the tying assembly of Fig.10;

Fig.12 is a plan view of a gripper belonging to the tying assembly of Fig.10;

Fig.13 is a lengthwise section of the gripper of Fig.12 along the line B-B;

Fig.14 is a plan view of a twisting element belonging to the tying assembly of Fig.10;

Fig.15 is a lengthwise section of the twisting element of Fig.14 along the line C-C;

Fig.16 is a plan view of a guide assembly for the binding wire;

Fig.17 is a front view of the guide assembly of Fig.16.

The diagram of Fig.1 shows an apparatus 10 to to bind packages of metallic mesh 11 according to the invention. In this example the package 11 is fed on a roller conveyor 12 in a direction orthogonal to the plane of Fig.1; the roller conveyor 12 can be positioned substantially at ground level 13.

Obviously, the position of the package 11 in relation to the ground 13 may be different, depending on the equipment located upstream of the apparatus 10 of the invention.

The apparatus 10 comprises a support structure 14 for a trolley 15, which can move vertically in relation to the structure 14 according to the arrows 16.

The trolley 15 in turn supports a head assembly 17 which can move vertically according to the arrows 18 in relation to the trolley 15.

In this case the movable head assembly 17 is equipped with means 19 positioned orthogonally to each other and carrying out straightening of a binding wire element 20 arriving from a suitable supply according to the arrow 21.

The movable head assembly 17 is also equipped with drafting means 22 and shears 23 for the wire 20.

Upper bending means 24 are solidly fixed to the movable trolley unit 15 and consist of a bending element 25 and an abutment pin 26, which is advantageously retractable.

An assembly 27 to unite the binding wire element 20 is included in a lateral position generally at the side of the package 11 and outside the same 11 in the area where the binding wire 20 is united.

This assembly 27 bears a twisting means 28 and a pair of clamping grippers 29 positioned immediately above and below the twisting means 28.

The grippers 29 and twisting means 28 can be moved momentarily in the directions of the arrows 30 to cooperate with the wire 20 in the area where the wire 20 is tied together.

While the twisting means 28 is twisting the wire 20, the grippers 29 can be displaced according to the arrows 75, while still engaging the wire 20, so as to compensate the natural shortening of the ends of the wire during the tying operation.

Guide means 31 are also located in the area of union of the wire 20 so as to guide the ends of the wire 20 previously bent and can be removed momentarily while the twisting means 28 is at work.

A lower bending means 32 analogous to the upper bending means 24 is positioned in correspondence with the lower surface of the package 11 at the point of emergence of the wire 20 from the links of the mesh.

A plurality of apparatuses 10 of the type described according to the invention may be included, depending on the numbers of ties to be made at the same time on each package 11.

The apparatuses 10 are normally positioned at the lateral sides of the package 11 and have to unite the wire 20 in correspondence with the outer lateral links of the meshes.

The apparatuses 10 located at one side of the package 11 are advantageously stationary transversely in relation to the direction of feed of the package 11, whereas the apparatuses 10 located at the opposite side of the package 11 can be made transversely movable so as to be adapted to the various widths of the packages 11 to be processed.

Adaptation of the height of the package 11 being processed is carried out by the trolley 15 and the head assembly 17, which determines the length of the segment of wire 20 to be sheared for the binding of the package 11.

According to a variant one or more apparatuses 10 can be traversed horizontally to make a plurality of ties of wire in succession in different areas.

The structure 14 alone together with means connected thereto may be capable of being traversed, whereas a plurality of wire uniting assemblies 27 and lower bending means 32 may be immovably positioned at points where the wire 20 is to be tied together.

According to a further variant the movable trolley 15 alone will be traversed in relation to the support structure 14 to make a plurality of ties of wire in succession in different areas.

According to the above description a series of combinations will be possible in the application of one or more apparatuses 10 according to the invention but will only be variants of design which are readily understandable for a person skilled in this field and therefore included within the scope of the invention.

The working steps of the apparatuse 10 may follow the sequence described below after the processing parameters have been decided according to the height and width of the package 11:

- the halting of a package 11 arriving on the

roller conveyor 12 by means of a link counter, for instance;
- the positioning of abutment pins 26 of the upper 24 and lower 32 bending means;
- the descent of the movable trolley 15 until it comes into contact with the upper surface of the package 11, and its halting in position by a suitable end-of-travel signalling means;
- the feed of the binding wire 20 according to the arrow 21 and the halting of the wire at a required length;
- the positioning of the guide means 31 in its working step;
- the making of the lower bend in the wire 20;
- the shearing and making of the upper bend in the wire 20;
- movement of the grippers 29 in the direction 30 and the clamping in position of the two ends of the binding wire 20 in the guide means 31;
- retraction of the abutment pins 26 and guide means 31;
- advance of the twisting means 28 in the direction 30 and accomplishment of the union of the wire 20 with displacement of the grippers 29 in the direction 75 at the same time;
- the opening of the grippers 29 to release the tensions induced in the wire 20 during the union thereof, and the return of the twisting means 28 to its inactive position;
- the return of the grippers 29 to their inactive position;
- the ascent of the movable trolley 15 and preparation for a new binding operation;
- removal of the bound package 11.

The above working steps are repeated automatically in each binding operation until action is taken to preset new processing conditions.

Figs.2 and 3 show a form of embodiment of the structure 14 which supports the movable unit 15, in this case a trolley, and the movable assembly 17, in this instance a head.

The trolley 15 can run vertically in the direction 16 on wheels 35 and is actuated by a threaded shaft 33 suitably driven by a motor 34.

A frame 36 is integrally fixed to the trolley 15 and bears the movable head assembly 17, which can run along the frame 36 on wheels 38 in runners 37.

Figs.4 and 5 show the movable head assembly 17 in detail. It is possible to see in succession from the top downwards a first straightener assembly 119 to straighten wire 20, a second straightener assembly 219 orthogonal to the first 119, a drafting assembly 22 and a shears assembly 23.

The drafting assembly 22 in this case consists of a pair of drafting rolls 39 driven by their own drive unit, such as a gearmotor 40. So as to enable the wire 20 to be inserted, one of the drafting rolls 39 can be displaced sideways by a lever system 41 actuated by a drive means 42 and kept in position by a clamping means 43.

Figs.6 and 7 show, in a scale enlarged as compared to the preceding figures, a bending means which, when adapted as necessary for fixture to the movable trolley 15 or to the floor 13 or at another suitable position, can be either the upper bending means 24 or lower bending means 32.

In this example the bending means is connected to the trolley 15 and is the upper bending means 24. It comprises a bending element 25, a movable arm for instance, which is actuated by a jack 45 so as to swing about a pivot 46. During its oscillation the arm 25 engages the wire 20 by means of its grooved roll 47 and takes the wire to be bent U-shaped about the abutment pin 26.

Figs.8 and 9 show an embodiment of the retractable abutment pin 26 which cooperates with the movable arm 25 in bending the wire 20. The pin 26 is solidly fixed to an articulated system 44 actuated by a jack 48 and, together with its relative actuators, can form part advantageously of the upper 24 and lower bending means 24-32.

Figs.10 and 11 show an assembly 27 to unite the wire, the assembly 27 comprising a pair of grippers 29 and a twisting means 28.

The two grippers 29 are integrally fixed to a slider 76 able to be moved on guides 77 by a jack 78; the slider 76 obtains the temporary displacement of the grippers 29 in the direction 30 during the step of union of the wire 20.

Each gripper 29 can move freely in the direction 75 during the twisting step, as we said above, orthogonally to its own movement in the direction 30 so as to compensate the shortening of the wire 20. For this purpose each gripper 29 can run in relation to the the other gripper 29 along a pair of guide shafts 79 by overcoming a resilient contrast force applied, for instance, by a spring 80.

The twisting means 28 consists of a casing 56 able to be moved on guides 81 in the direction 30 by a jack 82.

Figs.12 and 13 show in a larger scale than Figs.10 and 11 a gripper 29 of the assembly 27 that unites the wire 20; the gripper 29 consists of a pair of double levers 49 and 50 respectively, both of which are pivoted on a pivot 51.

The levers 49 are also pivoted at 52 on a support 53 of the grippers 29 of the assembly 27 that unites the wire 20; whereas the levers 50 at pivoted at 54 on an actuator such as a jack 55.

Movement of the pivot 54 towards the right as shown in the lower half of Fig. 12 entails closure of the levers 49 on the two ends of the wire 20 positioned for the union of the wire.

The upper half of Fig.12 shows, instead, the

position corresponding to the opening of the levers 49.

The support 53 of the gripper 29 is capable of traversing motion in the direction 30 so as to reach the tying area, the support 53 being integrally fixed to the slider 76.

A block 74 forms an abutment element for the united wire 20 during return of the twisting means 28 to its inactive position from the area of union of the wire.

Figs.14 and 15 show in a larger scale than Figs.10 and 11 the twisting means 28, which forms part of the assembly 27 uniting the wire 20 and consists of a casing 56 able to move in the direction 30 on guides 81 so as to reach the area of union of the wire.

The twisting means 28 is actuated by its own actuator 58 and comprises an assembly of gearwheels 57-157-257-357 to drive a twisting roll 59, which, as in the state of the art, includes a radial notch 60 in which the ends of the wire 20

to be united are inserted.

Figs.16 and 17 show guide means 31 to hold the ends of the wire 20 in position in the tying area during the wire bending steps. These guide means 31 can be retracted temporarily or be rotated to leave their position free for the wire twisting means 28.

The grippers 29 are positioned momentarily above and below the guide means 31 before the twisting means 28 takes action.

The guide means 31 consists of a pair of sidewalls 61 formed with two parts, namely an inclined portion 62 to form a lead-in 63 for the wire 20 and a straight portion 64 with bent ends 65. The inclined portion 62 is integrally attached to a movable arm 66, to which the straight portion 64 is also attached but can rotate about a pivot 67. This rotation is made possible by a jack 68 which is also fixed to the movable arm 66.

The movable arm 66 consists of a base portion 71, an upright portion 70 and an upper wing 69 to which the sidewalls 61 are connected. By means of a pivot 72 the base portion 71 cooperates with a jack 73 able to rotate the arm 66 by a desired angle, for instance 90° in Fig.16 according to the position of the arm 66 shown with lines of dashes, so as to make possible the temporary access of the twisting means 28 to the area where the wire is united, namely the position normally occupied by the guide means 31 when inactive.

Claims

1. Method to bind packages of metallic mesh, the binding being carried out by the insertion of binding elements normally into lateral links of the meshes and being completed by the reciprocal twisting of the ends of the binding elements, the packages of metallic mesh arriving from plants which produce and stack the metallic meshes or from any system that conveys the meshes, the method being characterized in that it comprises the following working steps:
   - the halting at a binding position of the package (11) of metallic mesh arriving on a suitable conveyor means,
   - the insertion of straight free segments of a preset and determinable length of a binding element (20) into preselected links of the package (11), such segments having their ends protruding from the two sides of the package (11),
   - the bending of such ends of the binding elements (20) towards the outside of the package (11) in opposite directions so as to form a portion of the binding element (20) on the outside of the package (11) and substantially parallel to a segment of the binding element (20) located on the inside of the links, such portion comprising partially superimposed segments of those ends,
   - the gripping and clamping of the partially superimposed segments,
   - the twisting of the partially superimposed segments,
   - the unclamping of the partially superimposed segments so as to release the tension induced in the binding element (20) during the twisting step, and
   - removal of the package (11) thus bound, these working steps being capable of being carried out at the same time or in succession at a plurality of points arranged for the binding of the package (11), the length of the inserted segment of the binding element being fully capable of being preset according to the height of the package (11) to be bound.

2. Method as claimed in Claim 1, in which the length of the binding element (20) employed in the binding of a package (11) is substantially twice the height of the package (11) plus the superimposed segments of the binding element (20).

3. Method as claimed in Claim 1 or 2, in which the feed of the binding element (20) is aligned with the open space circumscribed by the links of the meshes of the package (11) into which the binding element (20) is inserted.

4. Method as claimed in any claim hereinbefore, in which the binding element (20) is sheared

when the length thereof usable for the binding of the package (11) has been reached.

5. Method as claimed in any claim hereinbefore, in which one of the bent segments of the binding element (20) has a constant length irrespective of the height of the package (11).

6. Method as claimed in any claim hereinbefore, in which the bent ends of the binding element (20) are guided in the area of their union during the bending step.

7. Method as claimed in any claim hereinbefore, in which the segments of the binding element (20) during the twisting step are kept clamped also during their natural period of being shortened.

8. Method as claimed in any claim hereinbefore, in which the package (11) can move substantially at floor level.

9. Method as claimed in any claim hereinbefore, in which the union of the ends of the binding element (20) is located at the sides of the package of the mesh (11).

10. Apparatus (10) to bind packages (11) of metallic mesh, the binding being carried out by the insertion of binding elements (20) normally into lateral links of the meshes and being completed by reciprocal twisting of the ends of the binding elements (20), the packages (11) of metallic mesh arriving from plants which produce and stack the metallic meshes or from any system that conveys the meshes, the apparatus (10) employing the method of the claims hereinbefore and being characterized in that it consists of the following main working assemblies:
    - a structure (14) to support a trolley unit (15) able to move in relation to the package (11) being bound,
    - an assembly (17) able to move in relation to the movable trolley unit (15) and bearing means to straighten (19), draw (22) and shear (23) the binding element (20),
    - means (24-32) to bend the binding element (20),
    - guide means (31) for the bent segments of the binding element (20), and
    - an assembly (27) to unite the binding element (20), this assembly (27) bearing movable gripper means (29) and movable twisting means (28).

11. Apparatus (10) as claimed in Claim 10, in which the support structure (14) is stationary.

12. Apparatus (10) as claimed in Claim 10, in which the support structure (14) is movable.

13. Apparatus (10) as claimed in any of Claims 10 to 12 inclusive, in which the movable trolley (15) can traverse according to at least one cartesian axis.

14. Apparatus (10) as claimed in any of Claims 10 to 13 inclusive, in which the movable assembly (17) can traverse according to at least one cartesian axis.

15. Apparatus (10) as claimed in any of Claims 10 to 14 inclusive, in which the bending means (24-32) consist of oscillatory levers (25) and abutment pins (26).

16. Apparatus (10) as claimed in any of Claims 10 to 15 inclusive, in which the abutment pins (26) are retractable.

17. Apparatus (10) as claimed in any of Claims 10 to 16 inclusive, in which one of the bending means (24-32) is connected to the movable trolley unit (15).

18. Apparatus (10) as claimed in any of Claims 10 to 17 inclusive, in which one (32) of the bending means (24-32) is located at floor level (13).

19. Apparatus (10) as claimed in any of Claims 10 to 18 inclusive, in which the guide means (31) consist of retractable sidewalls (61).

20. Apparatus (10) as claimed in any of Claims 10 to 19 inclusive, in which the movable gripper means are two grippers (29) able to be positioned on planes above and below respectively the guide means (31).

21. Apparatus (10) as claimed in any of Claims 10 to 20 inclusive, in which the movable twisting means (28) are a cascade of gearwheels (57-157-257-357) which actuate a twisting roll (59).

22. Apparatus (10) as claimed in any of Claims 10 to 21 inclusive, in which the movable twisting means (28) are positioned in the assembly (27) that unites the binding element (20) and at an intermediate position between the two grippers (29).

23. Apparatus (10) as claimed in any of Claims 10 to 22 inclusive, in which each of the two grippers (29) comprises a block (74) to abut

against the end of the binding element (20).

24. Apparatus (10) as claimed in any of Claims 10 to 23 inclusive, in which the two grippers (29) are solidly fixed to a slider (76) able to move on guides (77).

25. Apparatus (10) as claimed in any of Claims 10 to 24 inclusive, in which guide elements (79) with return springs (80) are interposed between the two grippers (29).

26. Apparatus (10) as claimed in any of Claims 10 to 25 inclusive, in which the cascade of gear-wheels (57-157-257-357) is contained in a casing (56), which can move on guides (81) and is equipped with its own actuation means (58).

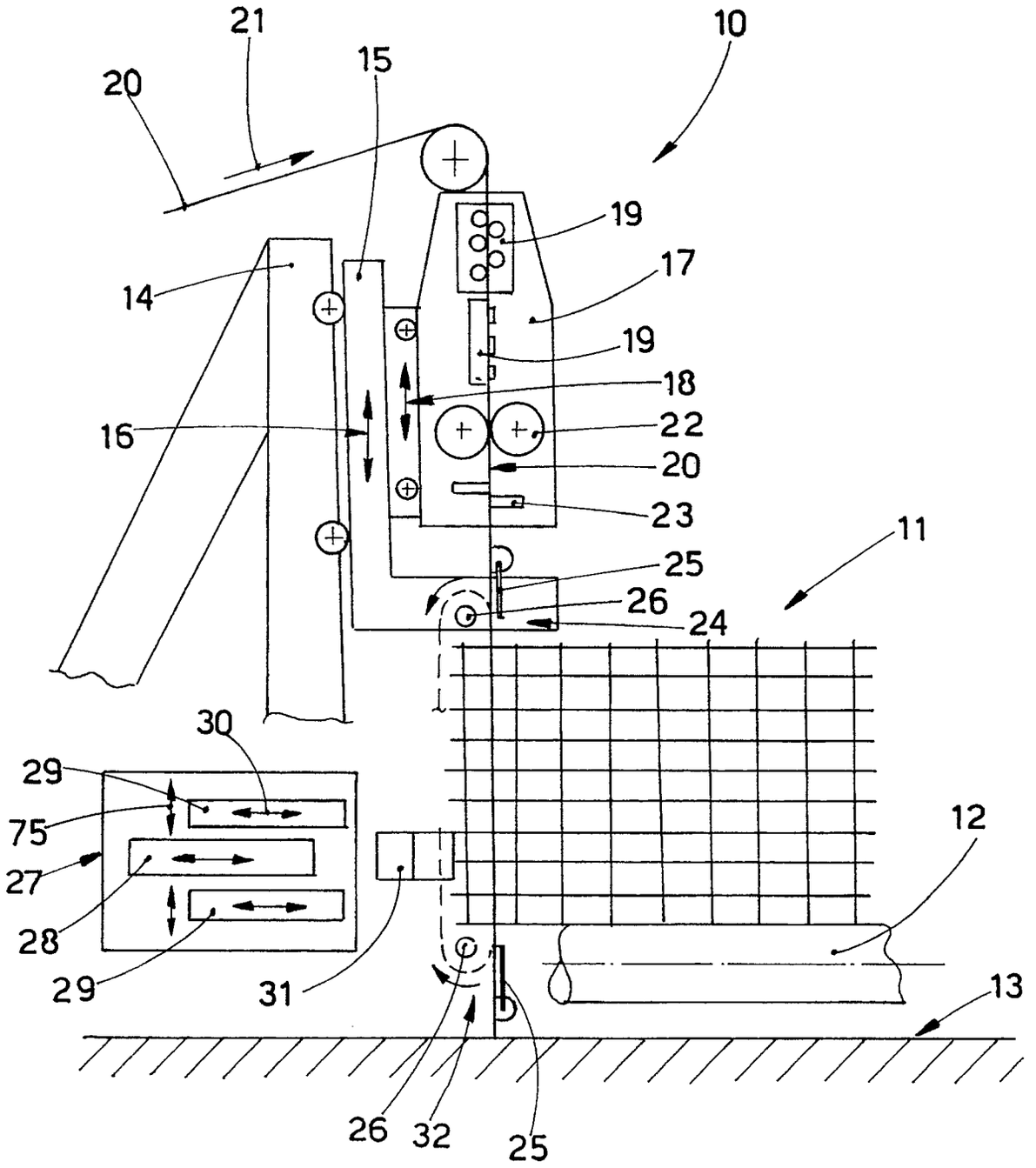
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fig.1

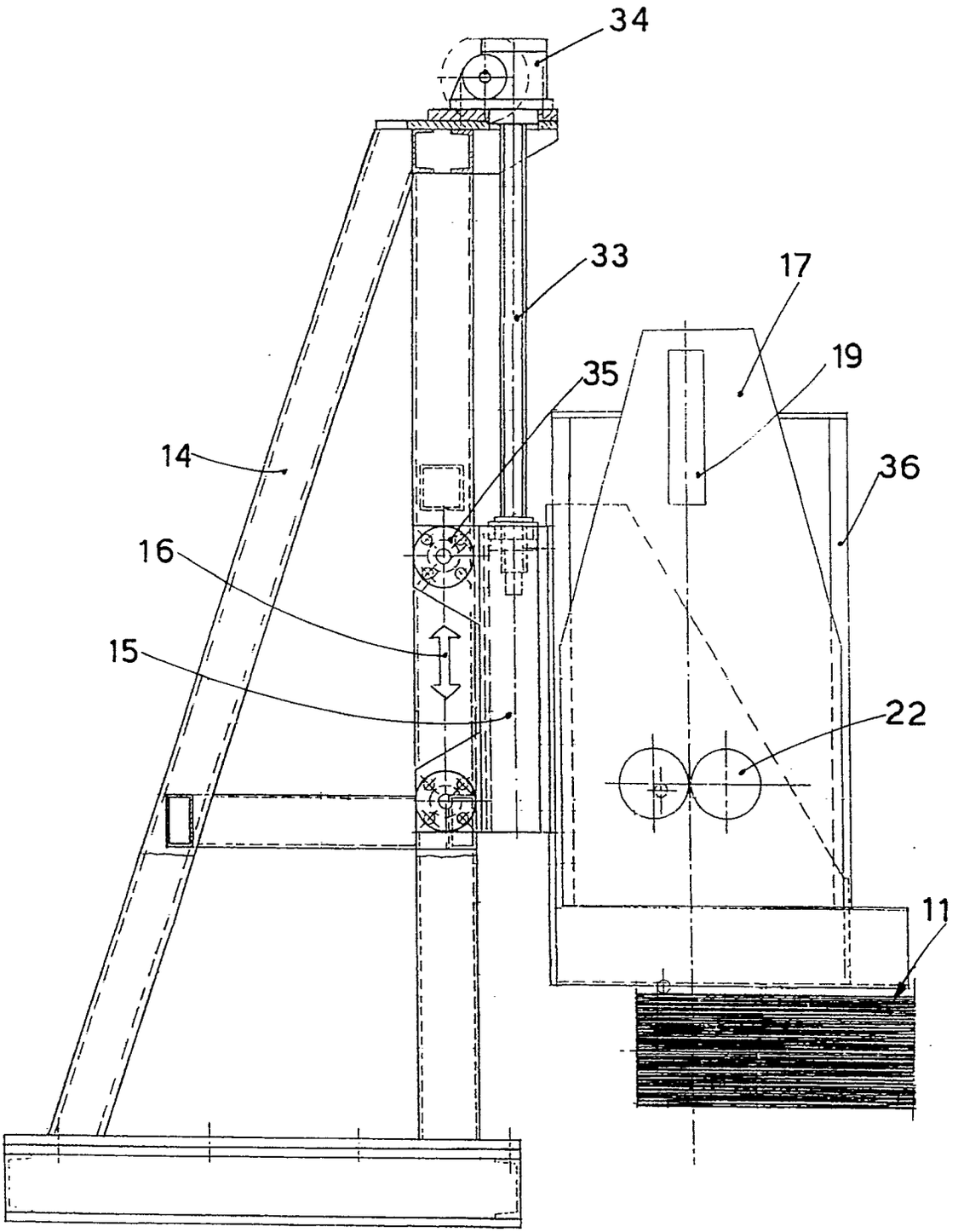

fig. 2

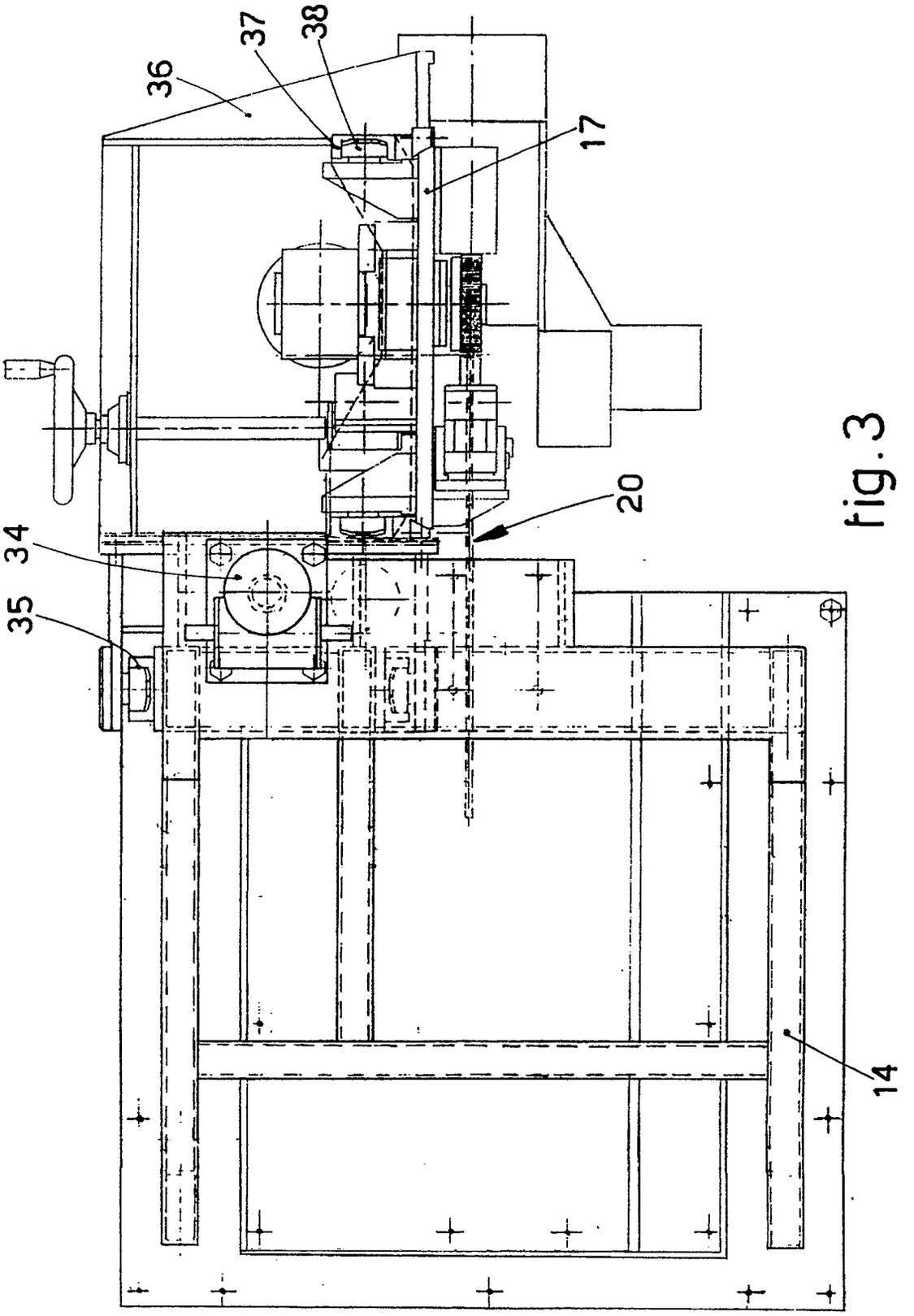

fig.3

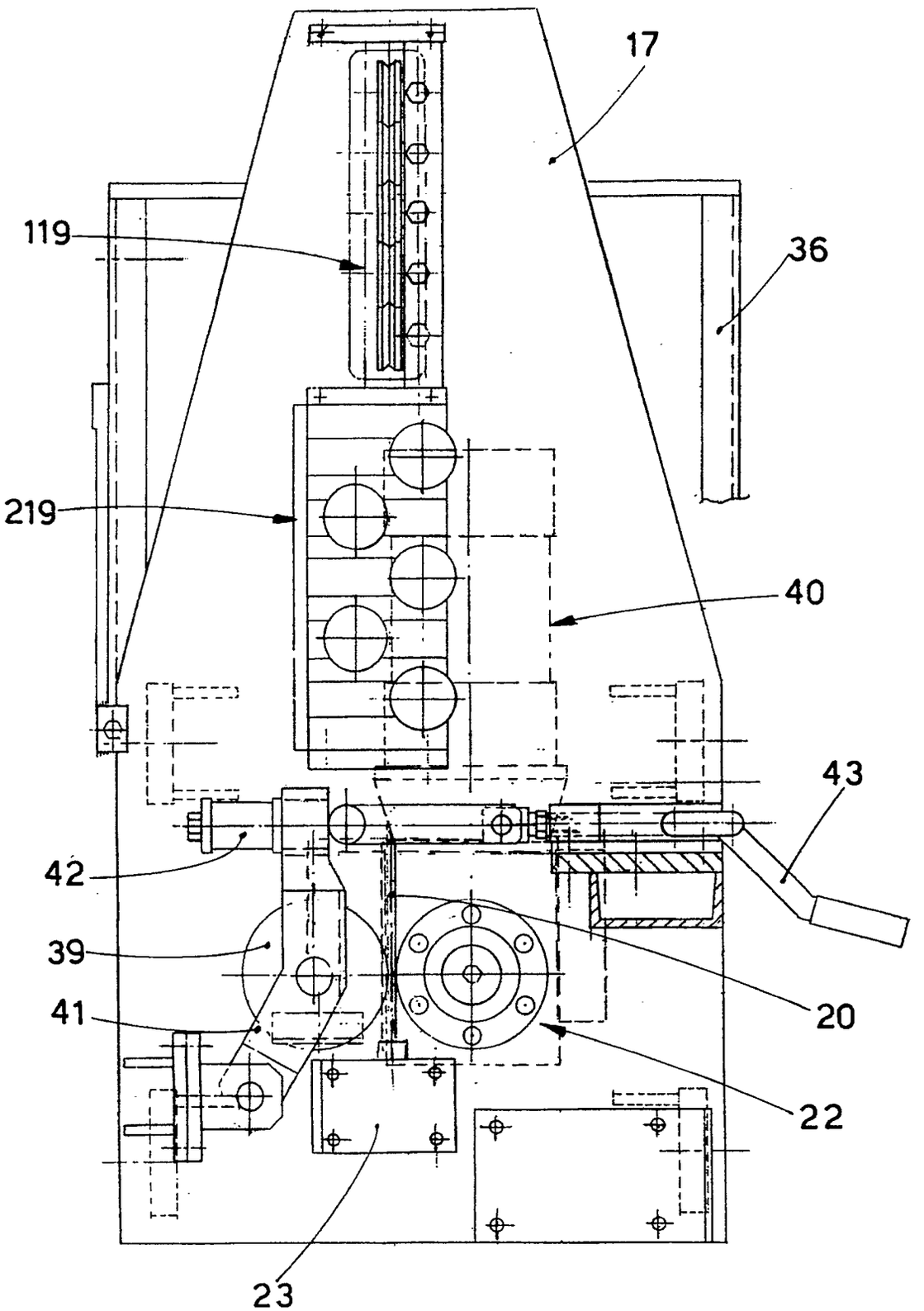

fig.4

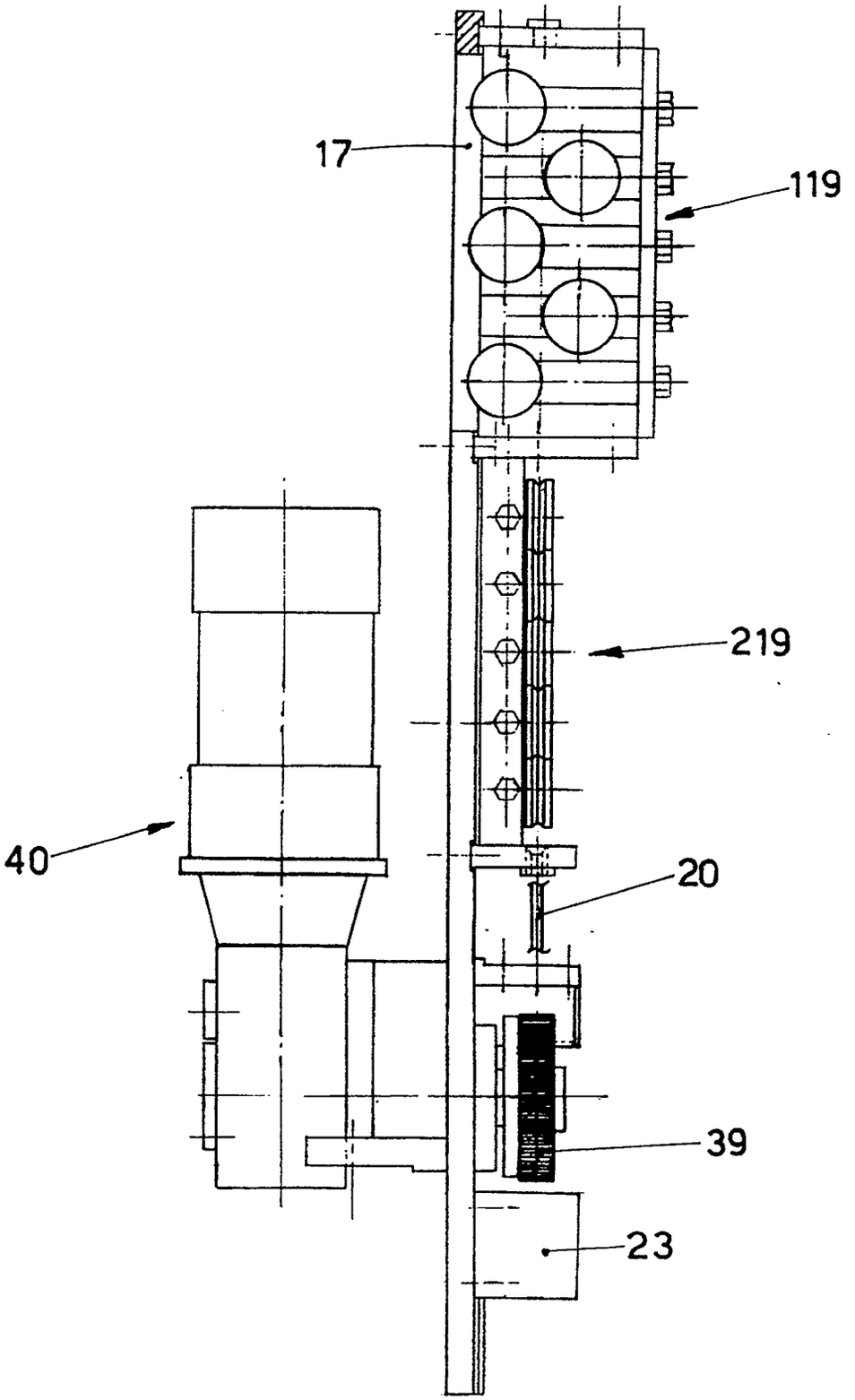

fig. 5

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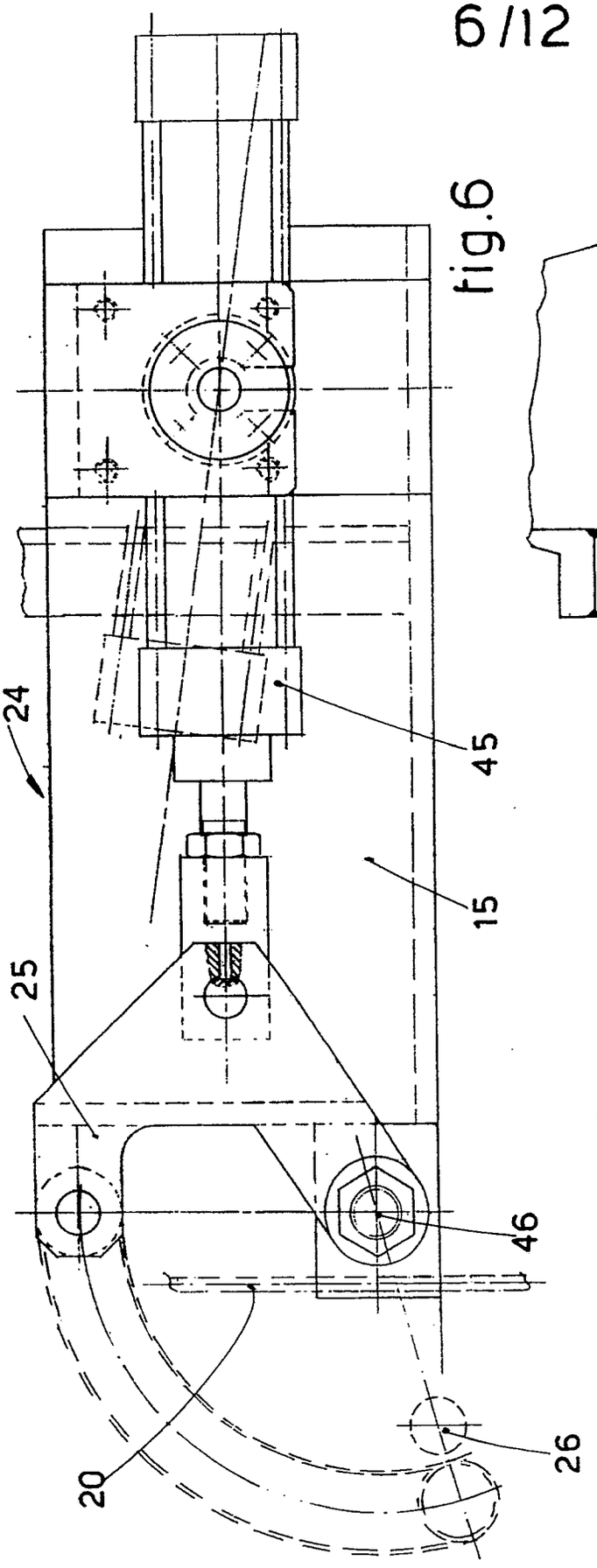

fig.6

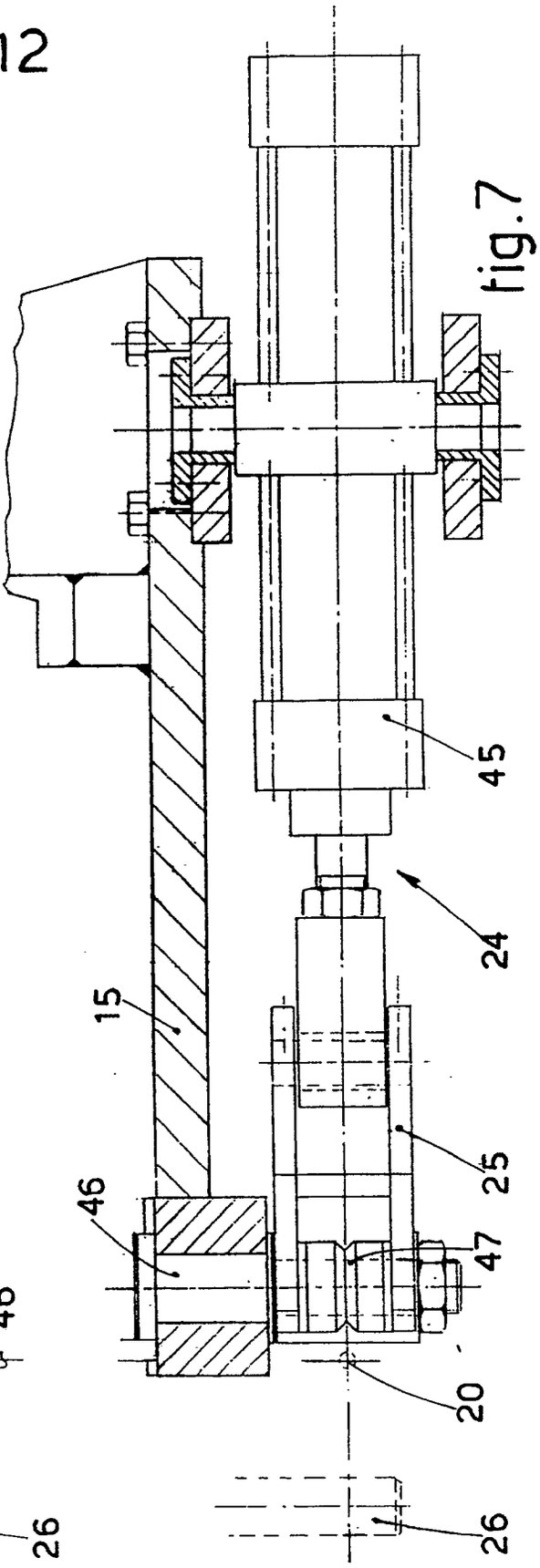

fig.7

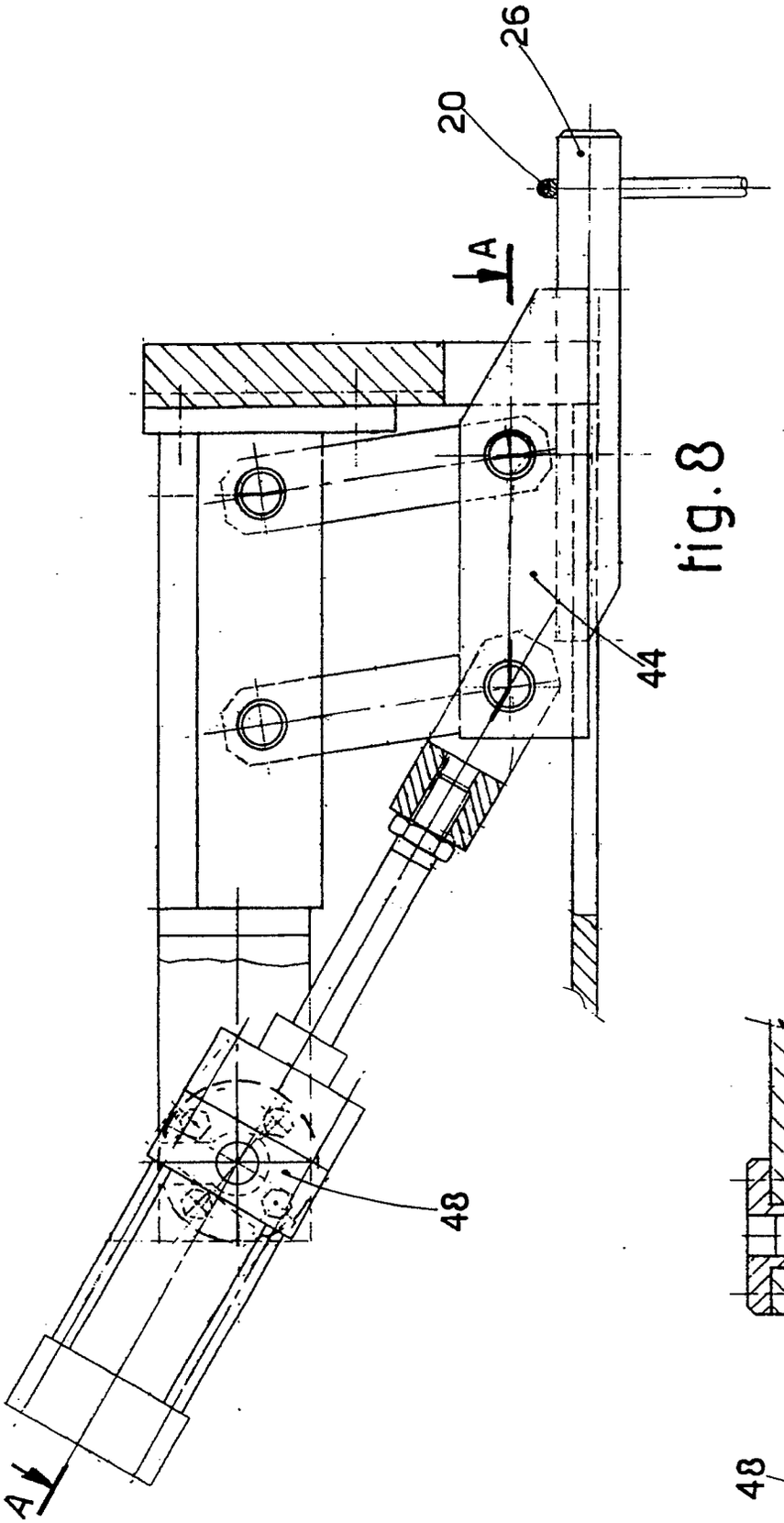

fig.8

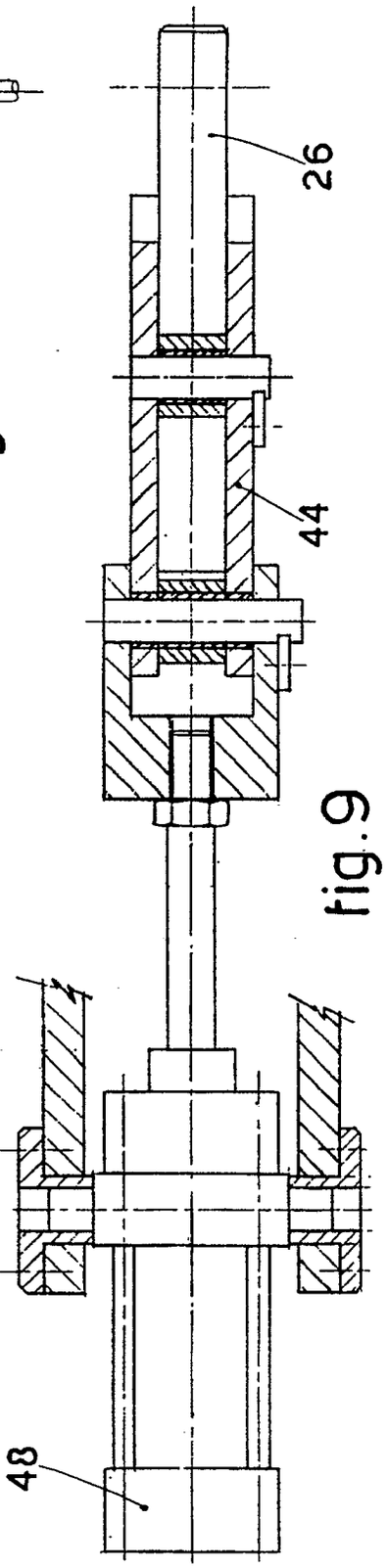

fig.9

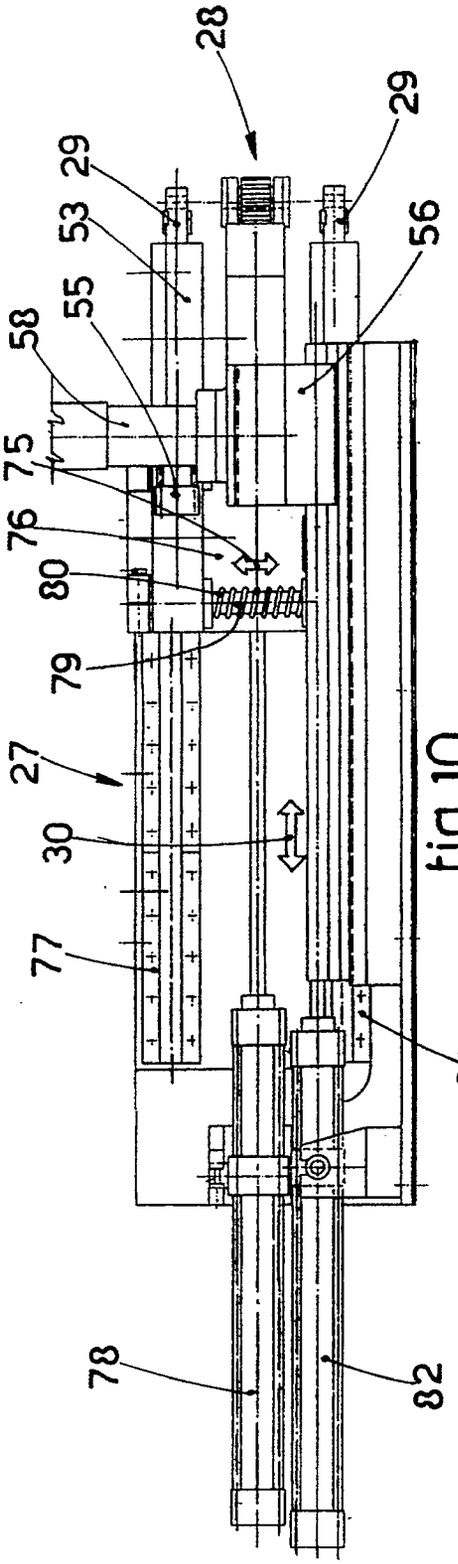
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fig.10

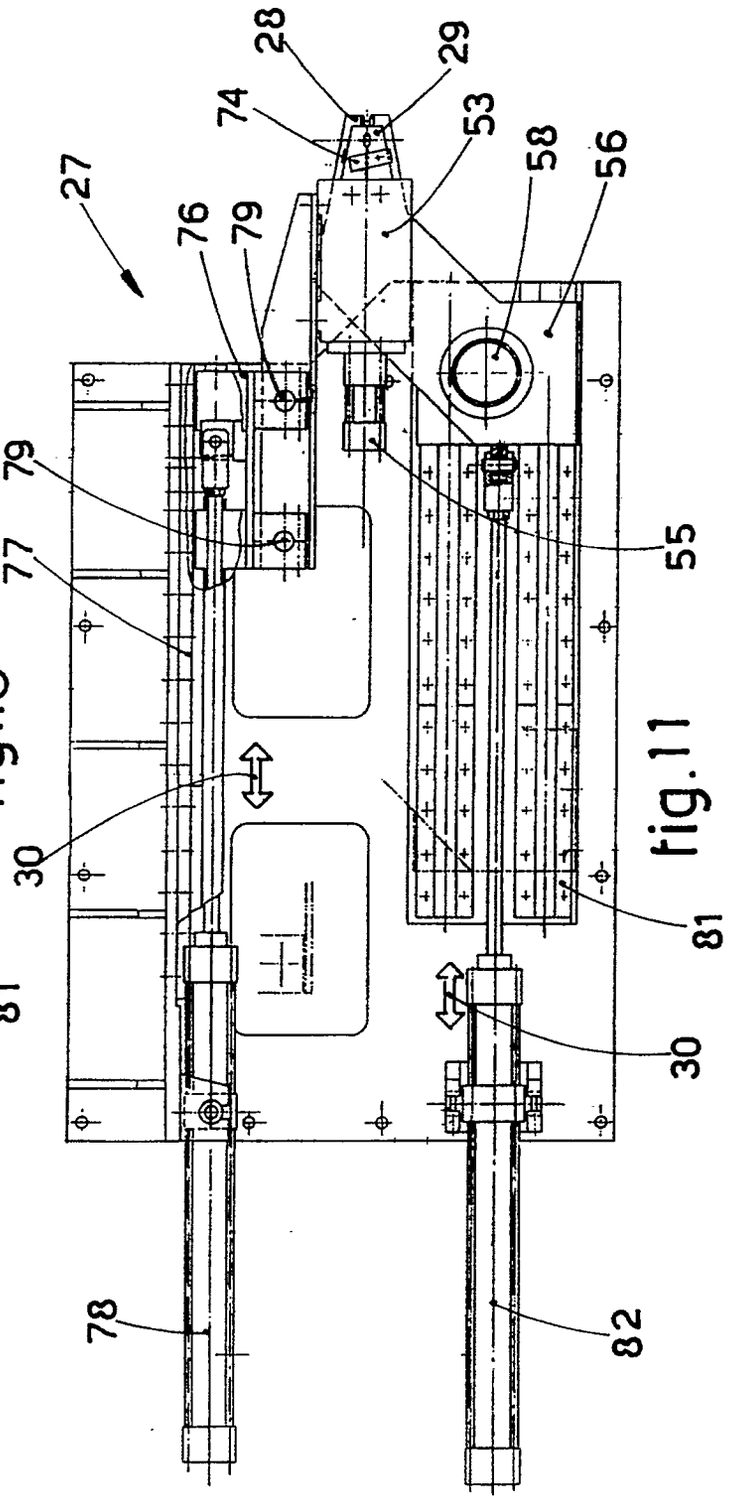
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fig.11

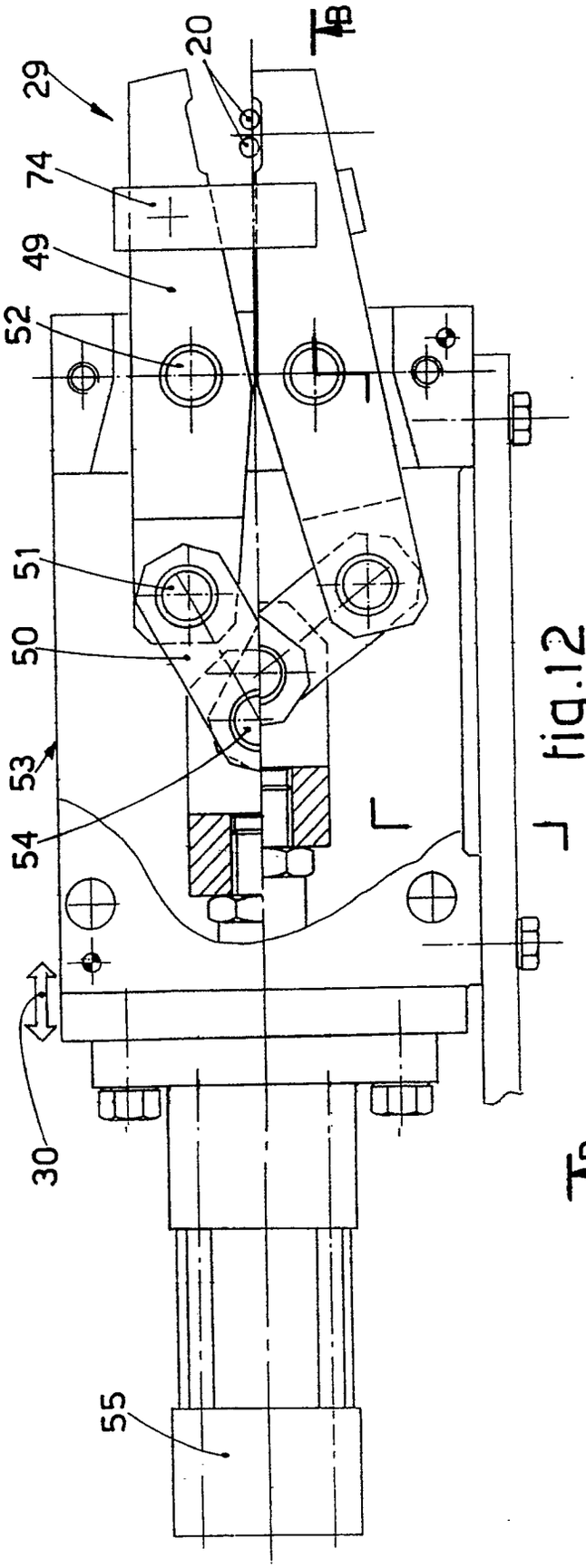

fig.12

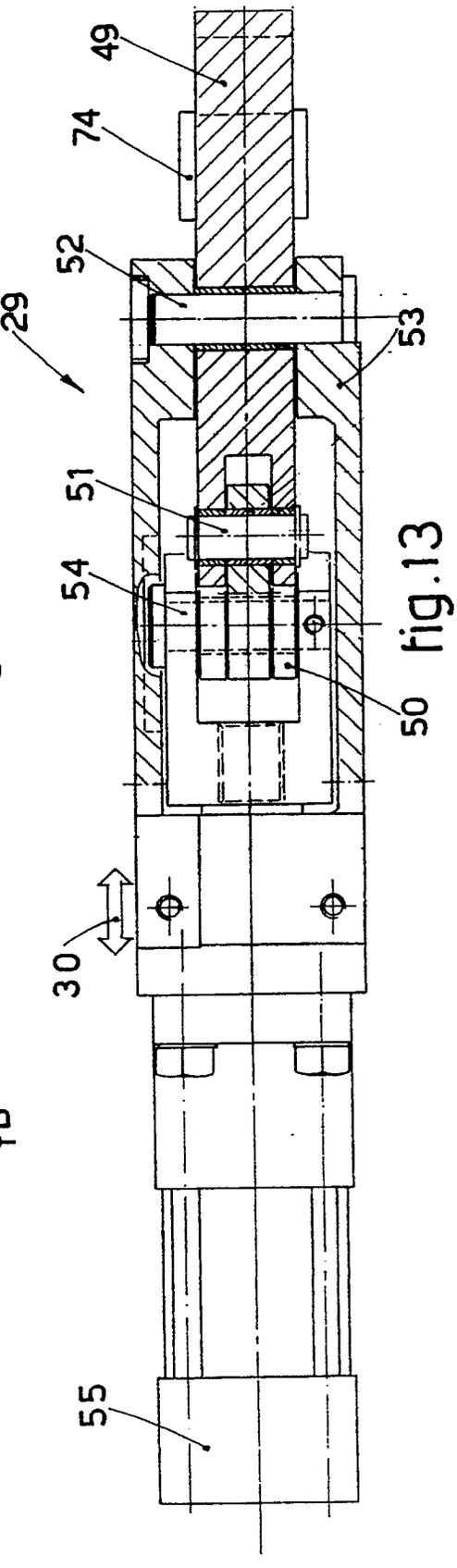

fig.13

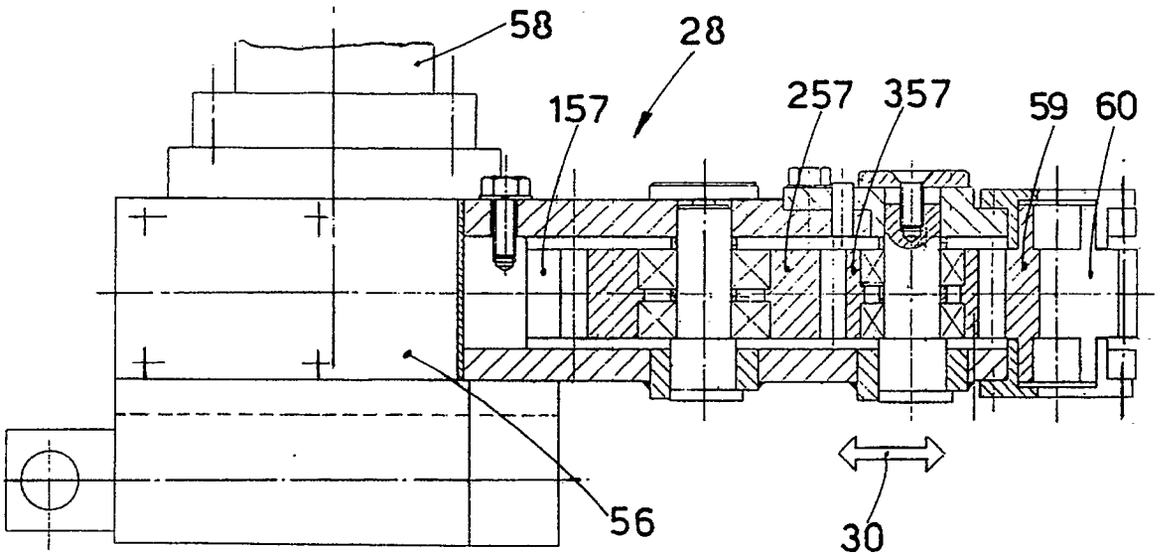

fig.15

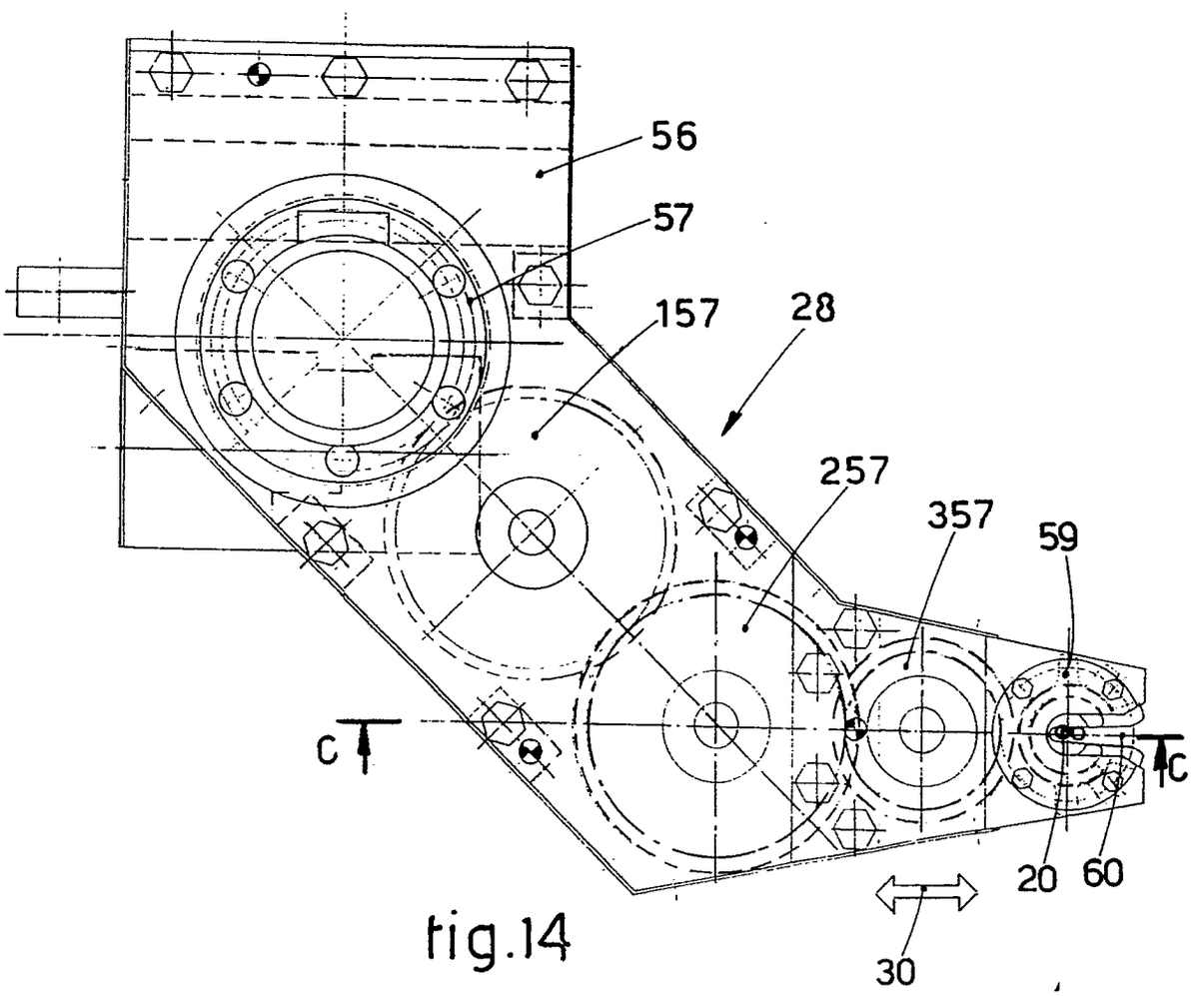

fig.14

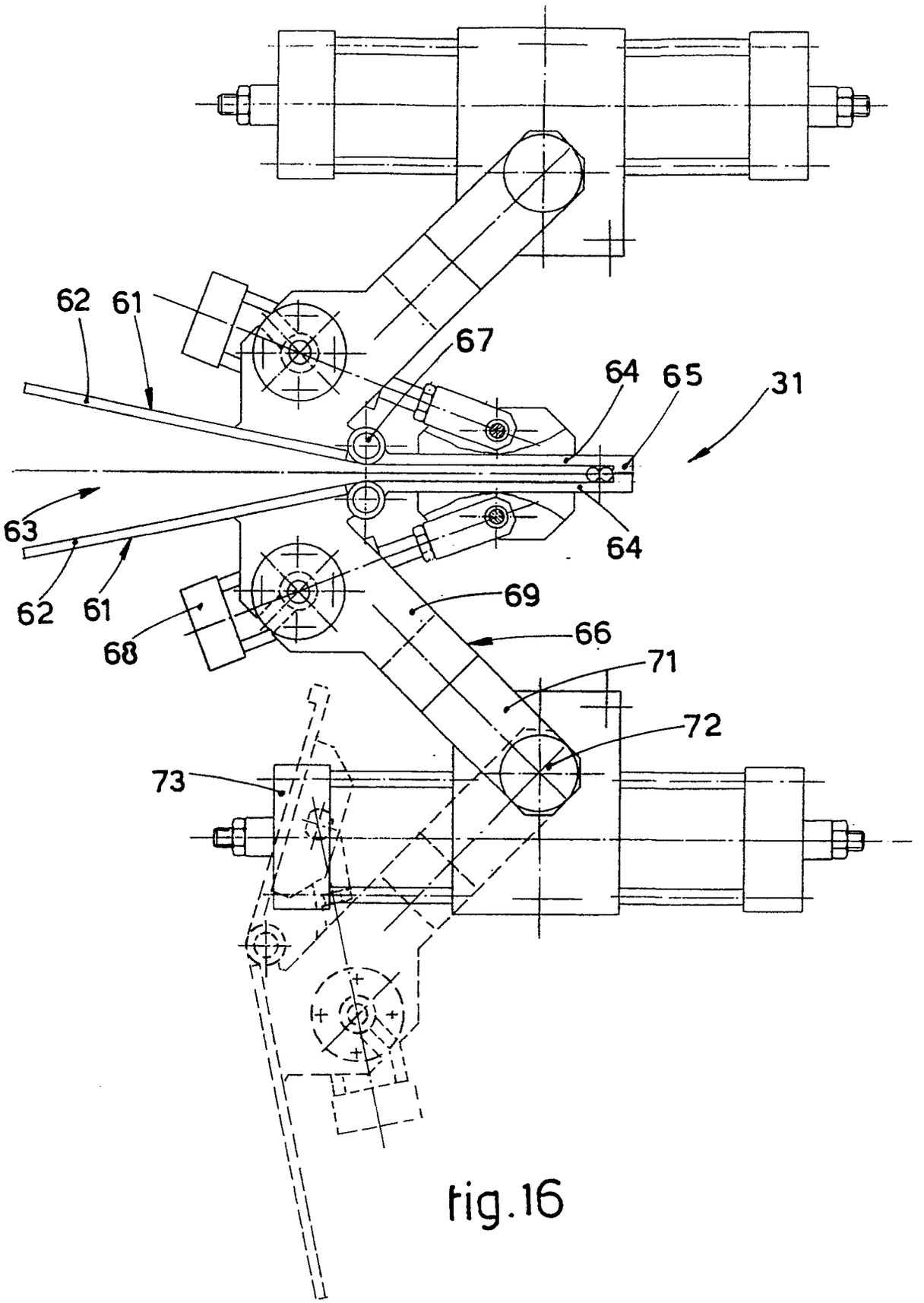

fig.16

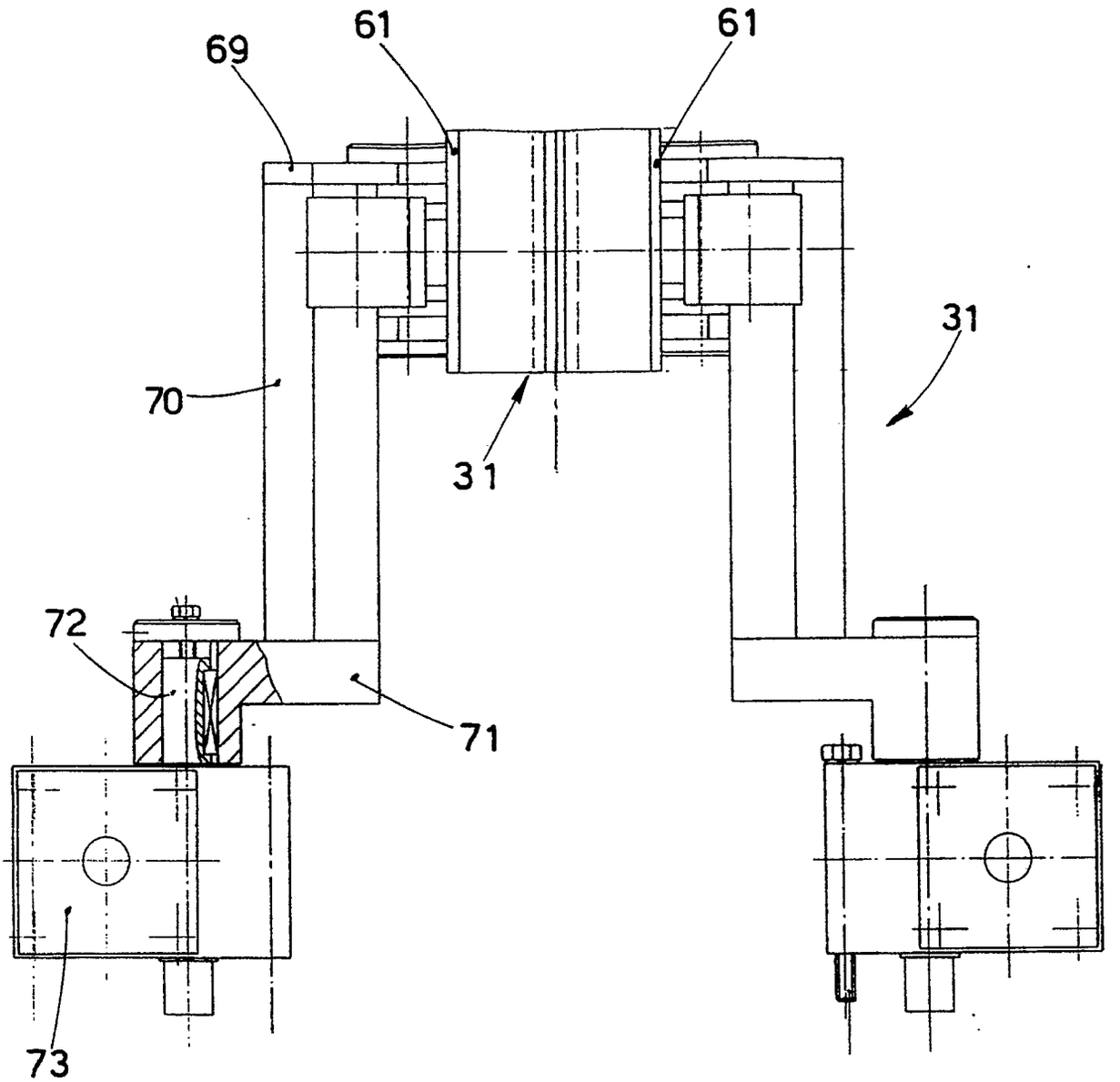

fig. 17

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 12 5428

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)
A	FR-A-2 190 669 (EVG) * Page 5, line 31 - page 6, line 7; fig. *	1,2,4,6, 10,11,14	B 65 B 27/08 B 65 B 13/02

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 65 B

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	16 May 91	JAGUSIAK A.H.G.

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
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P: intermediate document
T: theory or principle underlying the invention

E: earlier patent document, but published on, or after the filing date
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