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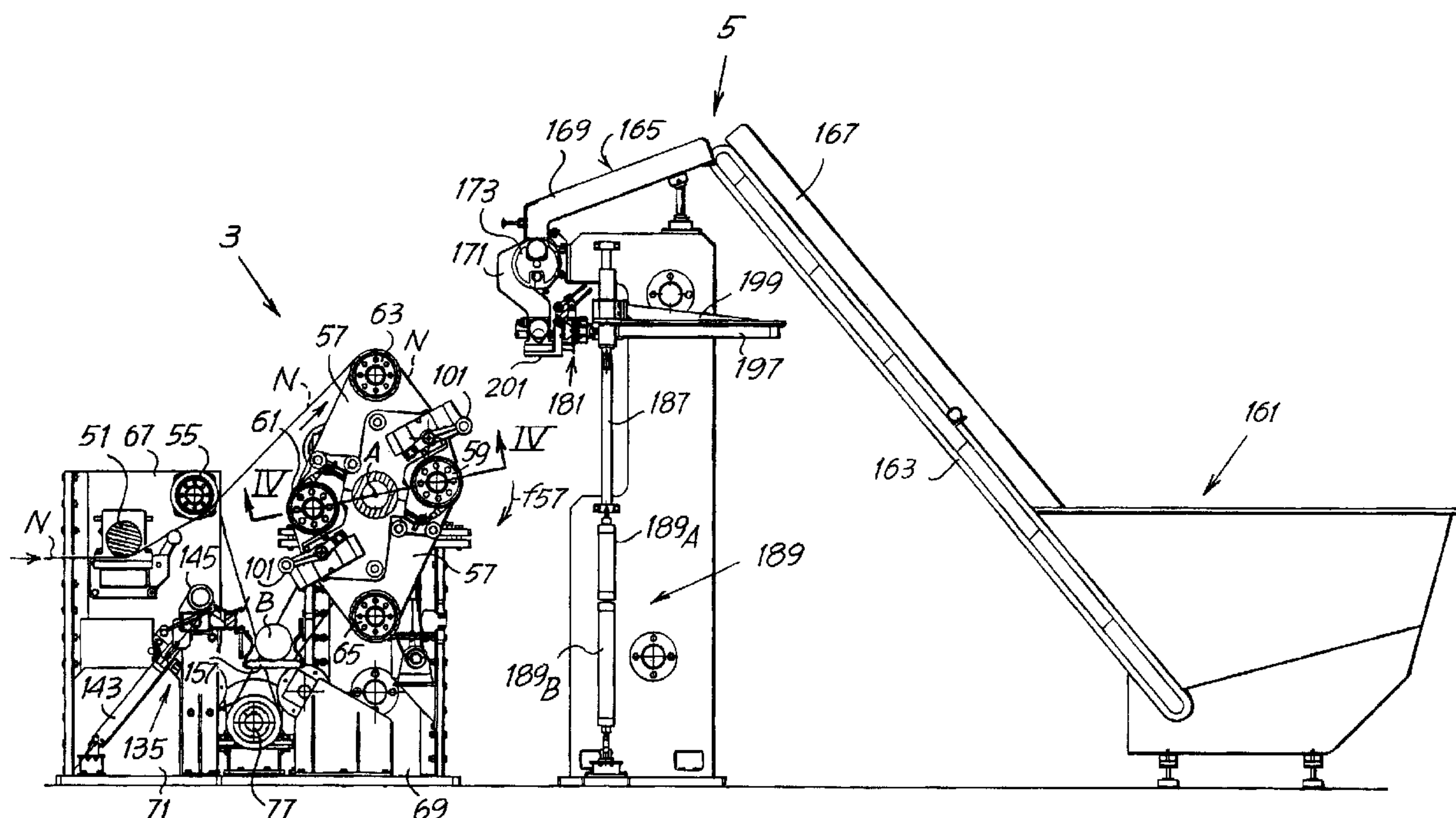
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(54) Title: RE-REELING MACHINE FOR PLASTIC FILM AND THE LIKE



(57) Abrégé/Abstract:

The re-reeling machine comprises a feed assembly (5) for feeding tubular winding cores and a re-reeling assembly (3) with a revolver unit (57) on which the tubular winding cores (C) are set in order to wind on them predetermined amounts of web-like material and form respective rolls (B) of wound web-like material. The revolver unit rotates about an axis of rotation (A) and has at least two supports (101, 102) for tubular cores, which are set in two angular positions with respect to said axis of rotation. The tubular-core feed assembly comprises a dispensing path (165, 171) for dispensing tubular cores to a core loader (181). The core loader is provided with a motion of approach to the revolver unit and a motion of following of the movement of the revolver unit, in order to transfer the tubular cores from the loader to the revolver unit.

Abstract

The re-reeling machine comprises a feed assembly (5) for feeding tubular winding cores and a re-reeling assembly (3) with a revolver unit (57) on which the tubular winding cores (C) are set in order to wind on them pre-determined amounts of web-like material and form respective rolls (B) of wound web-like material. The revolver unit rotates about an axis of rotation (A) and has at least two supports (101, 102) for tubular cores, which are set in two angular positions with respect to said axis of rotation. The tubular-core feed assembly comprises a dispensing path (165, 171) for dispensing tubular cores to a core loader (181). The core loader is provided with a motion of approach to the revolver unit and a motion of following of the movement of the revolver unit, in order to transfer the tubular cores from the loader to the revolver unit.

(Fig. 4)

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Re-reeling machine for plastic film and the like

Description

Technical field

The present invention relates to a re-reeling machine for the production
5 of rolls of wound web-like material, and in particular (but not exclusively), rolls of plastic material, for example extensible plastic film.

More in particular, the present invention relates to a re-reeling machine of the type comprising a feed assembly for feeding tubular winding cores and a re-reeling assembly with a revolver unit on which the tubular winding cores
10 are set for winding thereon pre-determined amounts of web-like material and for forming respective rolls of wound web-like material, said revolver unit rotating about an axis of rotation and being provided with at least two supports for said tubular cores, which are set in two respective angular positions with respect to said axis of rotation.

15 State of the art

In the production of reels or rolls of plastic film, the film coming from the extruder is wound in large rolls, also referred to as "jumbo rolls" or parent reels, from which it is then unreeled to be re-reeled on rolls or reels of a smaller diameter. For this purpose, re-reeling machines are used which re-
20 wind the plastic film, delivered by an unreeler, on tubular winding cores, typically made of cardboard, to form rolls of the desired final diameter and containing the required amount of film.

Frequently in re-reeling machines of the above type, feed of the film is interrupted when a roll is completed, in order to enable cutting of the film,
25 unloading of the roll, insertion of a new winding core, and anchoring of the leading edge of the film to the new core, which is then set in rotation. The cores are normally driven in rotation by a so-called central control or spindle control, namely, by applying the driving torque to the tubular winding core.

Currently known re-reeling machines do not yield optimal results in terms
30 of productivity and flexibility, understood as meaning the capacity of the machine for adapting to cores having diameters of variable length.

Object and summary of the invention

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An object of the present invention is to provide a re-reeling machine that enables one or more of the drawbacks of machines according to the prior art to be overcome.

More in particular, a purpose of the present invention is to provide a re-reeling machine that enables the changeover operations, i.e., the operations for replacing the completed roll with a new winding core in order to start winding of a new roll, in a fast and efficient way and without reducing the rate of feed of the web-like material.

Basically, according to the invention, a re-reeling machine is provided for re-reeling web-like material, in particular plastic film, of the type referred to above, characterized in that the feed assembly for feeding the tubular cores comprises a path for dispensing tubular cores to a core loader, the said core loader being provided with a movement of approach to the revolver unit and a movement of following of the motion of the revolver unit, for transferring the tubular cores from the loader to the revolver unit.

This enables one or more new winding cores to be inserted into the revolver unit while winding of the roll or rolls that are being wound is completed. By following with the loader the movement of the revolver unit, it is for example possible to carry out the step of angular acceleration of the core until the latter is brought up to a peripheral speed equal to that of the web-like material (the so-called "launching of the core") by means of a device carried by the loader itself, before the completed roll is discharged, thus also preventing the machine from being stopped in order to carry out the changeover step. With this system it is theoretically possible to maintain a practically constant feed rate of the web-like material, with a consequent increase in output. Of course, it is not ruled out that the step for changing the roll with a new core may take place with a certain reduction in the rate of feed of the web-like material, even though this is not strictly necessary.

According to an advantageous embodiment of the invention, then, a core-launching device, for example comprising a motor-driven rotating member, may be set on the core loader.

In a practical embodiment of the machine according to the invention, the

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loader has at least one resting cradle for the cores that are to be loaded into said revolver unit, said resting cradle being mobile so as to be removed from the core once the latter is engaged by the respective support on the revolver unit. In this way, the core-launching device can cause angular acceleration of the core, which is already engaged by the supporting means on the revolver unit, without the movement of the core being hindered by friction against the resting cradle.

In a possible embodiment, the loader may be provided with a dual translation movement, namely both in the horizontal direction and in the vertical direction, to approach the revolver unit. The said dual movement may be obtained in a simple way with two linear actuators, for instance two cylinder-piston actuators. By adopting more precise actuators, for example stepper motors, it is theoretically possible to control movement of the loader in such a way that it will follow the movement of the revolver unit during the operations of transfer of the core from the loader to the revolver unit and during the core-launching step. However, this solution presents the drawback of a considerable cost and a certain difficulty in programming the movements.

According to a preferred embodiment of the invention, instead, the loader and the revolver unit comprise mechanical members for mutual engagement, so as to co-ordinate the movement of the revolver unit with the movement of the loader during the step of transfer of the core from the loader to the revolver unit and of launching of the cores. In this way, the loader is temporarily mechanically constrained to the revolver unit, which controls movements thereof. This may be achieved, for instance, with a bidirectional constraint, such as a hook or the like. However, in a preferred embodiment, the constraint is a supporting constraint, and the loader is kept in contact with the revolver unit by means of the thrust exerted by the same actuator which controls movement of approach of the loader to the revolver unit. For the mutual engagement between the loader and the revolver unit, in a practical embodiment there may be provided a bracket and a first idler wheel on the loader, and a second idler wheel on said revolver unit, in the position of mutual engagement the second wheel resting on said bracket and on said first

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wheel so as to exert a thrust on the loader, said loader being in turn pushed against the revolver unit.

Advantageously, the loader may be associated to core-centring means. For example, a centring system may be provided comprising at least one pair
5 of side walls between which the said cores are made to pass, the distance between said side walls being approximately equal to or slightly greater than the maximum axial length of the cores. In order to be able to handle tubular cores even of a smaller length, the centring system may advantageously
10 comprise also a pair of actuators for centring the winding cores. The pair of actuators may also be used as an alternative to the side walls.

In a possible embodiment of the core-loading system, along the path of delivery to the loader there may be provided a core-dropping path and an oscillating dispenser which enables passage of individual cores from said
15 core-dropping path to the loader. The said dispenser may be interchangeable, or else may be provided with seats of different sizes; in this way it is possible to handle cores of different radial dimensions simply by modifying the angular position of the dispenser.

In a possible embodiment, the loader may comprise a horizontal cross member which can slide along vertical guides and is associated to a first
20 actuator or system of actuators that controls movement of translation along said vertical guides. Supported on said cross member is a carriage, horizontally mobile in a direction orthogonal to said cross member, to which a second actuator that controls horizontal movement of the carriage with respect to the cross member is associated. Supported on the carriage is the
25 resting cradle for the cores. The second actuator may be used to push the loader against the constraint for resting on the revolver unit during the core transfer and launching step.

In practice, the core-resting cradle may be carried by a bracket (either a single one or a double one) hinged to the carriage, an actuator being provided
30 for controlling the oscillation of said bracket with respect to the carriage.

According to a different aspect of the invention, the revolver unit may comprise, for each core support, a winding roller, which turns at a peripheral

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speed that basically corresponds to the rate of feed of the web-like material, the tubular core or else the roll being formed on said core being supported idle by the corresponding support and being pressed by the latter against the cylindrical surface of said winding roller in order to be kept rotating. In this way, winding of the rolls is of a peripheral type, instead of being of a central type as in traditional re-reeling machines provided with revolver units, and in particular in re-reeling machines for winding plastic film.

In a practical embodiment, the core supports, provided on the revolver unit, comprise a pair of oscillating arms which carry respective heads for frontal engagement of the cores, the oscillating arms being displaced from a position where the core is picked up from the loader to a position where the core is brought up to the respective winding roller in order to obtain transmission of motion by friction.

Advantageously, the revolver unit may be provided with at least one pair of guide rollers over which the web-like material is run, said guide rollers and winding rollers being set in alternated positions about the axis of rotation of the revolver unit. Advantageously, also the guide rollers may be motor-driven, and preferably a common motor-power drive will be used for controlling rotation of all the rollers carried by the revolver unit.

The aforesaid characteristics of the revolver unit may be adopted also in a re-reeling machine having a different type of core loader.

According to yet another aspect of the present invention, on the revolver unit there may be supported, for each support of the winding cores, an assembly for cutting the web-like material and applying the leading edge of the web-like material on the winding core. The above feature can be implemented also with a revolver unit that does not present the characteristics referred to above, and irrespective of the type of core loader used.

In a practical and advantageous embodiment, each of said assemblies for cutting the web-like material and applying the leading edge of the web-like material on the winding core comprises a pair of guide members over which the web-like material is run, that are parallel to one another and are set at a distance apart, and between which a cutting member is set. To the cutting

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member it is possible to associate a blower member for pushing the free edge of the web-like material, generated by the cutting member, to wrap around the winding core.

5 In practice, the pair of guide members and the cutting member set between them may be mobile from a position set back within the path of the web-like material around the revolver unit, to an extracted position, in which the guide members deviate the web-like material around a new core on which winding is to be started. For this purpose the guide members and cutting member can be supported on respective oscillating sides, which are hinged
10 so that they can turn about the axis of the respective winding roller. The guide members may be cylinders or rollers, or else they may be made up of bars on which idle sleeves can be supported for take-up of the web-like material.

The re-reeling machine can be configured for handling the web-like material coming from a single jumbo roll, and hence for forming a single roll at
15 a time. However, in order to obtain a higher output it is possible to provide a double-acting machine, i.e., one that is able to receive two webs of material that wind in parallel on two cores axially aligned with one another. Likewise, the core-feed system will be double in order to feed two cores simultaneously to the re-reeling assembly.

20 The re-reeling machine may be advantageously equipped with an assembly for discharging the rolls from the revolver unit. The discharging assembly may comprise, for instance, a mobile slide provided with a cradle for resting the finished rolls, the mobile slide being displaceable in such a way as to be brought close to the revolver unit and removed from the latter towards a
25 roll-discharging area. The slide may moreover be provided with a braking roller to brake the roll when the latter is still supported by the revolver unit, in such a way that it can be released on the cradle of the slide after it has stopped turning about its own axis.

Further advantageous characteristics and embodiments of the re-reeling
30 machine according to the invention are specified in the attached claims.

Brief description of the drawings

A better understanding of the present invention will be provided by the

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following description and by the attached drawings, which illustrate a practical non-limiting embodiment of the invention. More in particular, in the drawing:

Fig. 1 is an overall and schematic side view of the re-reeling machine equipped with the corresponding unreeler and complete with the re-reeling
5 assembly and feed assembly for feeding the winding cores;

Fig. 2 is a perspective view, from the side of the support of the jumbo rolls, of the unreeler of Fig. 1;

Fig. 3 is a perspective view, from the side of output of the web-like material, of the unreeler of Fig. 1;

10 Fig. 4 shows a longitudinal cross section of the re-reeling assembly and feed assembly for feeding the tubular cores;

Fig. 4A is an enlarged view of the re-reeling assembly 3 in the same cross section as in Fig. 4;

Fig. 4B is a cross-sectional view according to the line IV-IV of Fig. 4 and
15 4A;

Fig. 5 is a perspective view of the system for transmitting motion to the re-reeling assembly;

Fig. 6 is a side view of a detail of the re-reeling assembly;

Fig. 7 is a sectional view, according to a vertical plane, of one of the
20 winding rollers carried by the revolver unit of the re-reeling assembly, of the corresponding support for the winding cores, and of the devices for cutting the web-like material and transferring it onto the new core;

Figs. 8 and 9 are sectional views similar to that of Fig. 7 in two different positions during the step for changing the core and cutting the web-like
25 material;

Fig. 10 is a side view of the core-dispensing path and of the core loader in a position where the latter is waiting to receive a pair of new tubular winding cores;

Fig. 11 is a cross-sectional view according to the line XI-XI of Fig. 10;

30 Fig. 12 is a sectional view, according to a vertical plane, of the core-dispensing path and of the core loader in the position of Fig. 10;

Fig. 13 is a perspective view of the loader for loading the tubular winding

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cores, isolated from the remaining elements of the core-feed assembly;

Figs. 14 and 15 are two cross-sectional views of the loader of Fig. 13 according to two planes orthogonal to the axis of the cores;

Fig. 16 is a perspective view of the discharge assembly for discharging
5 finished rolls;

Fig. 17 is a sectional view of the roll-discharging assembly, according to a plane orthogonal to the axis of the rolls; and

Fig. 18 is a schematic side view of the core loader in three different positions with respect to the revolver unit during the step of introduction of the
10 new winding cores.

Detailed description of the preferred embodiment of the invention

The invention is described in what follows in an embodiment which envisages a double machine, i.e., a machine that is able to handle two webs of material each of which is unwound from a respective jumbo roll, to form two
15 rolls of wound material in parallel.

Fig. 1 illustrates the entire line for unreeling and re-reeling the web-like material. The reference number 1 designates the unreeler, 3 designates the re-reeling machine, and 5 an assembly for feeding the tubular winding cores. Two axially aligned parent reels or jumbo rolls are set in the unreeler for
20 unreeling two webs of material towards the re-reeling assembly 3, where pairs of rolls of web-like material of a diameter smaller than that of the jumbo rolls are formed in sequence, by being wound on cores supplied by the feed assembly 5.

As may be noted in Fig. 1, the plant is modular and can be equipped
25 with further assemblies, set between the unreeler and the re-reeling assembly, or even between the two components of the re-reeling assembly. In this way, dinking assemblies or other assemblies may be provided along the path of the web-like material.

The unreeler

30 The configuration of the unreeler 1 is illustrated in detail in Figs. 2 and 3, where this component of the line is shown isolated in two different perspective views. The unreeler 1 has two sides 7 joined together by cross members 9.

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The two sides 7 support two delivery rollers 11, 13, over which two unwinding belts are run. The bottom delivery roller 11 is motor-driven in the way described in what follows, and draws along the belts 15, and consequently the top roller 13.

5 Two parent reels are pressed against the corresponding belts 15. One of said parent reels rolls is partially illustrated in Fig. 1 and designated by BM. The web-like material N is delivered, by the parent reels, to be wound into rolls of a smaller diameter by means of the re-reeling assembly 3. The parent reels BM are each held by a pair of idle centres, designated by 17, 19, and carried
10 by respective arms 21, 23 connected together by torsion bars 25. A cylinder-piston actuator 27 (Fig. 3) acts on the arm ensemble to move the arms 21, 23 alternatively into a loading position or into an unreeling position. In the latter position, the arms press the parent reels BM, which are carried by the respective centres 17, 19, against the belts 15. Movement of the latter brings
15 about unreeling of the web-like material. Above the delivery roller 13 is a feed roller 29 around which the web-like material unwound from the parent reels BM is run.

On the opposite side of the unreeler with respect to the arms 21, 23 for supporting the parent reels BM, there are two pairs of idle guide rollers, one of
20 which is designated by 31 and the other by 33, around which the web-like material coming from the parent reels BM is run. The path of the web-like material is illustrated in Fig.1 and designated by N. One of the rollers of each pair has an axis which can be inclined by means of an actuator (not illustrated) and a sensor for detecting the edge position of the web-like
25 material running over the guide roller. By means of the sensor it is possible to check that the web-like material always remains properly guided. Any swerving of the web-like material is corrected by modifying the inclination of the axis of the inclinable roller.

On one of the two sides of the unreeler is the motor-power drive and
30 transmission of movement to the various members, illustrated in particular in Fig. 2. The reference number 35 (see also Fig. 3) designates the main motor, which transmits motion to the members of the unreeler by means of a belt 37

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run over a series of pulleys, which are shown in Fig. 2. Of the latter, the ones designated by 39 and 41 are the pulleys set respectively on the shaft of the feed roller 29 and on the shaft of the bottom delivery roller 11.

Set above the feed roller 29 are two arms 43 to which printing units (not shown) are applied to print wordings or other markings on the web-like material that is being unreeled.

The re-reeling assembly

The re-reeling assembly 3 is illustrated in detail in Figs. 4, 4A and 4B. Set at intake to the re-reeling assembly is a hump roller 51 for stretching the web-like material N in the transverse direction and eliminating any longitudinal creases. Downstream of the hump roller is a guide roller 55 which deflects the path of the web-like material N towards a revolver unit 57 supported so that it can turn about a horizontal axis A, which develops in the direction of the width of the web-like material N, i.e., in a direction orthogonal to the plane of Figs. 4 and 4A.

Supported on the revolver unit 57 are two winding rollers 59, 61 and two guide rollers 63, 65. The two winding rollers 59, 61 are set with their own axes in a plane in which the axis A of rotation of the revolver unit lies. Likewise, the axes of the guide rollers 63, 65 are set in a plane in which the axis A lies. The latter rollers are at a distance from the axis A greater than that of the winding rollers 59, 61.

All the winding rollers 59, 61 and guide rollers 63, 65 are motor-driven by a single motor which also drives the guide roller 55. The corresponding transmissions are set on the outside of the sides 67 and 69, as may be seen in Figs. 4 and 4A. Fig. 5 is a perspective view of the motor and drives isolated from the other members of the re-reeling assembly 3. The reference number 71 designates the motor which transmits, by means of a belt 73 and a pulley 75, motion to a main shaft 77. From the latter, by means of a belt 79, the motion is transmitted to the guide roller 55, at the corresponding end of which a pulley 81 is fitted. From the same shaft 77, by means of a pulley 83, the motion is transmitted to a pulley 85 which is supported idle on the shaft of the revolver unit. The pulley 85 is double, and a further belt 87 is run over it,

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which transmits motion to four pulleys 89, 90, 91 and 92. The pulleys 89 and 90 are fitted on the shafts of the winding rollers 59, 61, whilst the pulleys 91, 92 are fitted on the shafts of the guide rollers 63, 65. In this way, all the rollers carried by the revolver unit are motor-driven and rotate at the same speed, 5 which is controlled by the motor 71. The peripheral speed of the rollers is approximately equal to the rate of feed of the web-like material N. Fitted on the shaft with axis A of the revolver unit is a chain wheel 93 over which a chain 95 is run, the said chain being driven by a motor reducer 97. The motor reducer is responsible for the rotational movement of the revolver unit 57 10 about its own axis, for the purposes which will be clarified in what follows. This rotation takes place at a much lower speed than the rate of feed of the web-like material.

On the revolver unit 57 there are provided, for each of the winding rollers 59, 61, respective supports for winding rolls. As may be seen in particular in 15 the cross section of Fig. 4B, associated to each winding roller 59, 61 are two pairs of heads 101, 102. Each pair of heads 101, 102 has the function of engaging a respective tubular winding core; in this way, alongside each winding roller 59, 61 there are two axially aligned winding cores. Each head is carried by a respective oscillating arm, designated by 103 and pivoted about 20 an axis 105 parallel to the axis A of the revolver unit 57. The heads can move in a direction parallel to the axis A of the revolver unit, so that they can engage a respective winding core and disengage therefrom.

Each pair of heads 101, 102 and the corresponding oscillating arms 103 form a support for a winding core and for the roll that forms thereon during 25 feed of the web-like material. An actuator (not illustrated) can take the pairs of oscillating arms with the corresponding heads from the position shown in Fig. 4 to a position whereby the tubular winding core engaged by the heads comes to press against the surface of the respective winding roller 59, 61. This movement is shown in particular in Figs. 7, 8 and 9. In Fig. 7, the head 30 101 is shown in the position where it is at some distance away from the respective winding roller 57, whilst in Figs. 8 and 9 it is brought up to the winding roller. In this configuration, the core C supported by the heads, or the

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outer surface of the roll being formed thereon, is pressed against the winding roller 59 for receiving, by friction, the drawing torque that keeps the core and the roll being formed thereon rotating, thus enabling re-reeling to be carried out.

5 The movement of approach the winding core to the second winding roller 61 takes place in a similar way.

Pivoted around the shafts of each of the two winding rollers 59, 61 are two sides 111 (one of which is shown in Figs. 4, 4A, 7, 8, and 9, the other being identical and being set at the opposite end of the respective roller).
10 Each of the two sides 111 supports two bars 113, 115 on each of which idle sleeves 117, 119 are set, over which, in the roll-changeover step, web-like material is run, as will be clarified hereinafter. The two sides 111, and consequently the members supported thereby, oscillate about the axis of the respective winding roller 59 or 61 by means of an actuator (not illustrated),
15 which takes the sides 111 and the members supported thereby from the position of Fig. 7 to the position of Fig. 8 in order to carry out changeover of the winding cores, as will be clarified in what follows.

Set between each pair of sides 111 is also a cutting member, designated as a whole by 121 (see in particular Figs. 7-9), which comprises a pair of
20 oscillating arms, only one of which may be seen in the drawing and is designated by 123. The oscillating arms are pivoted about an axis X (Figs. 8 and 9) fixed with respect to the sides 111 and carry a bar 125, which extends between the sides 111 and carries a cutting blade 127 heated by an electrical resistor 129 in contact therewith. The bar 125 also carries, alongside the
25 cutting blade 127, a series of compressed-air nozzles, designated by 133.

The oscillating arms are controlled by an actuator 131, which is also carried by one of the sides 111. The actuator 131 causes the cutting blade 127 to assume two alternative positions with respect to the bars 115. One of these alternative positions is shown in Figs. 7 and 8 and the other in Fig. 9.
30 The movement controlled by the actuator 131 has the purpose of cutting the web-like material at the moment of change of the winding core, as will be clarified later.

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The ensemble made up of the elements 111-133 forms a cutting assembly for cutting the web-like material and applying the leading edge of the web-like material on the new winding core.

Operation of the members described above with particular reference to
5 Figs. 4, 4A, 4B, 7, 8, and 9 will be illustrated in further detail in what follows.

Provided on the revolver unit 57, in an intermediate position along its axis A and approximately at the height of each of the two assemblies of winding-core supporting heads, are two respective projecting arms 104, one of which may be seen in particular in Figs. 8 and 9, whilst the other is
10 symmetrical with respect to the axis A of the revolver unit. Each projecting arm 104, which is rigidly constrained to the revolver unit, carries an idler wheel 106 which has the function of creating a constraint between the revolver unit and the core loader during the step of replacement of the winding rolls, in the way that will be clarified hereinafter. The two arms 104 and the respective
15 wheels 106 protrude beyond the overall dimensions of the revolver unit 57, as may be seen in Fig. 6.

The re-reeling assembly 3 moreover comprises an assembly for discharging the finished rolls, which is designated as a whole by 135 and shown in detail in Figs. 16 and 17. The discharging assembly 135 has a
20 mobile slide 137 fixed to two tubular guide bars 139 which are guided by means of shaped rollers 141 (cf. Fig. 16) that are idly supported on shafts fixed to the load-bearing structure of the re-reeling assembly. Movement of the slide is controlled by a cylinder-piston actuator 143. The slide can assume a retracted position (Figs. 4 and 4A) and a position where it is brought up to
25 the revolver unit 57 for receiving a finished roll and removing it from the revolver unit, according to modalities which will be described in greater detail in what follows.

Carried on the slide 137 is a braking roller 145 with an electromechanical brake 147. When the slide 137 is in the position close to the revolver unit, the
30 braking roller 145 is in contact with the completed roll, which is still supported by the heads 101, 102 that engage the corresponding core. The heads have been brought into a position at a distance from the respective winding roller

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59 or 61, and hence the contact of the roll with the braking roller 145 will cause arrest of the inertia rotation of the roll itself.

The slide 137 also carries a cradle for resting the finished roll, or the two axially aligned finished rolls, when the latter are released from the heads 101, 102. The cradle is designated by 151 for both of the rolls and is formed by
5 respective pairs of lengths of open V-shaped section, designated by 151A. Set between the two lengths of V-shaped section is a side wall 153, which can move vertically under the control of a cylinder-piston actuator 155. In the raised position illustrated in Figs. 16 and 17, the mobile side wall prevents
10 accidental dropping of the roll that is positioned on the cradle, whereas, when it comes down it enables discharge of the roll from the cradle onto a discharge conveyor belt set underneath. Between each pair of lengths of V-shaped section 151A and on the opposite side with respect to the mobile side wall 153, there is set a pusher 159 operated by a cylinder-piston actuator 161. The
15 pusher 159 pushes the finished roll out of the respective cradle 151 and causes it to drop onto the conveyor belt 157.

The core-feed assembly

The tubular cores are fed to the re-reeling assembly 3 by the feed assembly 5, which is shown in particular in Figs. 4 and 10 to 15. This
20 assembly comprises a double hopper 161 from which the tubular cores are picked up by a double conveyor belt 163 which takes them to a double chute 165. The arrangement is double to make it possible to pick up and feed pairs of axially aligned tubular cores, which receive the web-like material delivered by the two parent reels BM unwound in parallel in the unreeling assembly 1.

25 Along the conveyor belt 163 there develop side walls 167, and along the chute 165 there develop side walls 169 for centring the tubular cores. Centring is obtained when the tubular cores have a length approximately equal to or slightly smaller than the distance between the side walls, i.e., the width of the conveyor belt 163 and chute 165. When the cores have a smaller
30 length, they must be re-centred with a special centring system described hereinafter.

Connected underneath the chute 165 is a dropping channel or path 171

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for dropping the cores, within which an oscillating dispenser 173 is set, which is shown in detail in the enlarged cross section of Fig. 12. The oscillating dispenser 173 oscillates about its own axis 173X under the control of a cylinder-piston actuator 175 (Fig. 10). As may be seen in Fig. 12, the oscillating dispenser 173 has two seats 173A and 173B of different sizes for receiving tubular cores C having different diameters. Fig. 12 illustrates the tubular cores C respectively with the maximum diameter – designated by C1 – and the minimum diameter – designated by C2 – that can be handled by the machine. In the configuration represented in Fig. 12, the oscillating dispenser is positioned angularly in such a way as to handle the cores C1 of larger diameter. The latter are picked up from the chute 165 and transferred into the dropping channel or path 171 by means of an oscillation, as indicated by the arrow f173, of the oscillating dispenser 173. When the device is to handle cores C2 of a smaller diameter, its angular position is modified by 180° to change round the positions of the two seats 173A and 173B. The core C2 shown in Fig. 12 is therefore represented only in order to illustrate how the machine is able to handle tubular cores having even widely variable diameters.

The tubular core unloaded by the oscillating dispenser 173 comes down along the dropping path 171 until it reaches the position C1' (for the core C1) or C2' (for the core C2) on a core loader 181 illustrated in detail and isolated from the other elements of the assembly 5 in Figs. 13 to 15. When the core reaches the bottom position along the dropping path, it can be centred (when its size is considerably smaller than the distance between the sides 169 of the chute 165) by means of centring devices controlled by pairs of actuators 180 (Fig. 11) positioned at the bottom of the dropping channel 171.

The loader 181 comprises a horizontal cross member 183 which is fixed to guide bushings 185 that slide along vertical guide bars 187. The movement in the vertical direction is supplied to the cross member 183 by a cylinder-piston actuation system 189 which controls the movement of vertical translation of the loader 181, as indicated by the double-headed arrow f181. In the example of embodiment illustrated, the actuation system 189 consists

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of two cylinder-piston actuators 189A, 189B set in series, the operation of which is explained in greater detail in what follows.

Applied underneath the horizontal cross member 183 are two guide bushings 191, in which there slide bars 193 of a carriage 195, which carries
5 the cradles for resting the cores that are to be inserted into the re-reeling assembly. A cylinder-piston actuator 197, the cylinder of which is constrained to a bracket 199 fixed to the cross member 183, and the stem of which is constrained to the carriage 195, controls movement of the carriage 195 in the direction indicated by the double-headed arrow f195, the said direction being
10 orthogonal to the cross member 183 and to the guide bars 187.

Hinged to the carriage 195 are two double L-shaped brackets, designated by 201, which oscillate with respect to the carriage 195 about an axis 201A (see in particular Figs. 12 and 15) that is parallel to the cross member 181. The oscillation of each double bracket 201 about the axis 201A
15 is controlled by a respective cylinder-piston actuator 203, the stem of which is constrained to a cross member 205 that joins the two parts of the double L-shaped bracket 201 together. The double bracket 201 oscillates in the direction indicated by the arrow f201 in Figs. 14 and 15. A pair of lengths of section 202 is constrained to the double bracket. The lengths of section 202
20 constrained to each double bracket 201 form respective cradles for the tubular winding cores C.

Fixed to each double bracket 201 is an upright 207 which supports a further cylinder-piston actuator 209. Each upright 207 and the corresponding actuator 209 thus oscillate rigidly together with the respective bracket 201
25 when the actuator 203 is operated. The stem of each actuator 209 is constrained to a shaft 211 with interposition of a bearing that enables the shaft 211 to turn about its own axis and to be displaced at right angles to the axis itself as a result of the action of the actuator 209.

Fitted on the shaft 211 are two friction wheels 215, which have the
30 function, as will be described later, of imparting an angular acceleration on the winding core before this comes into contact with the web-like material that is to be wound thereon. The rotation of each shaft 211, and hence of the friction

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wheels 215, is controlled by a motor 217 axially aligned with the shaft itself. Each shaft 211 is supported by a pair of oscillating arms 213, which are pivoted to the double bracket 201 about the axis of the cross member 205. The actuator 209 can thus cause an oscillation of the shaft 211 about the axis
 5 of the cross member 205. The two positions of the shaft 211 are represented one in Figs. 13-15 and the other in Fig. 12. This oscillation makes it possible to bring the friction wheels 215 into a position in which they do not interfere with the dropping of the winding cores C along the path 171.

Mounted on the carriage 195, in an intermediate position between the
 10 two pairs of brackets 201, is a bracket 221, through which the cross-sectional plane of Fig. 15 passes. An idler wheel 223 is supported idle on the bracket 221. The bracket 221 and the idler wheel 223 are designed to co-operate with either one or the other of the idler wheels 106 (Figs. 8 and 9) of the revolver unit for creating a temporary constraint between the core loader and the
 15 revolver unit itself.

Operation of the machine

The machine so far described operates as explained in what follows. Set on the unreeler 1 are two parent reels or jumbo rolls BM, which are pressed against the unwinding belts 15. The movement of the latter, controlled by the
 20 motor 35, causes gradual unreeling of the web-like material N which is fed as far as the revolver unit 57 of the re-reeling assembly 3 to be wound into rolls B of a smaller diameter around the winding cores C.

Fig. 4A shows the re-reeling assembly 3 in a step of completion of a pair of axially aligned rolls B. The two rolls being completed, on which the web-like
 25 materials coming from the two parent reels BM are being wound, are supported by the two pairs of heads 101, 102, which are in the position closest to the unreeler 1 and closest to the discharge conveyor belt 157, i.e., at the bottom left in Fig. 4A. In this configuration, the web-like material N coming from each of the two parent reels BM is run over the guide rollers 63,
 30 65 and the winding roller 59. The rolls are pressed by the corresponding supports against the winding roller 61, which furnishes the winding motion.

The angular position of the revolver unit 57 shown in Fig. 4B is actually

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reached upon completion of the rolls B, when the new cores have already been inserted into the re-reeling assembly for carrying out the changeover, i.e., cutting of the web-like material and transfer of the leading edge onto the new core.

5 During the step of winding of a core, two winding cores C have been prepared on the core loader 181 (on the cradles 202) and will be transferred to the revolver unit 57 once winding of the rolls B has been completed.

10 When the desired amount of web-like material is wound on the rolls B, the changeover step starts, i.e., the step of replacement of the completed rolls with the new winding cores. In the changeover step, for each core and for each finished roll, the following operations are to be carried out:

- insertion of the new cores into the revolver unit 57;
- angular acceleration of the new cores;
- cutting of the web-like material;
- 15 • winding of the free leading edge of the cut web-like material on the corresponding core; and
- discharge of the completed roll.

20 For this purpose, the loader 181 with the new cores is brought up to the revolver unit 57 until it reaches, with the core-supporting cradles, the position indicated by P1 in Fig. 18, by means of a combined horizontal and vertical movement (respectively controlled by the actuators 197 and 189A) of the carriage 195. The revolver unit 57 is in an angular position whereby the heads 101, 102 associated to the winding roller 59 (temporarily inoperative) are aligned with the cores carried by the carriage of the loader to the position P1.

25 At this point, the heads can engage the cores themselves, which are thus withheld on the revolver unit 57 and no longer require the resting position provided by the cradles formed by the lengths of section 202.

30 In this step, the position of the carriage 195 of the core loader with respect to the revolver unit 57 is such that the idler wheel 106 associated to the winding roller 59 comes to rest against the bracket 221 and against the idler wheel 223, which are supported by the carriage itself. There is thus created a unidirectional constraint between the carriage 195 of the loader 181

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and the revolver unit 57. The constraint is guaranteed by the fact that the carriage is constantly pressed against the revolver unit by the (reduced) pressure, which is in any case maintained in the cylinder of the actuator 197 and in the actuator 189B.

5 The two cylinder-piston actuators 189A, 189B making up the system 189 thus have two distinct functions: the former controls the movement of vertical translation necessary for bringing the carriage into the position P1 of Fig. 18, whilst the latter has the function of applying the horizontal reaction force for maintaining contact between the engagement members, with mutual
10 engagement between the carriage of the loader and the revolver unit.

From the above configuration, the revolver unit starts turning in the clockwise direction (Figs. 4, 4A, 7, 8, 9, and 18), as indicated by the arrow f57, about its own axis A. Thanks to the constraint formed in the way described above between the revolver unit 57 and the carriage 195 of the
15 loader 181, the carriage itself follows the movement of the revolver unit. In this step, the rollers carried by the revolver unit keep rotating at normal running speed, feeding the web-like material, which is delivered by the unreeler to the respective roll B that is being formed and is about to be completed.

As rotation of the revolver unit 57 proceeds, until it reaches the position
20 illustrated in Figs. 4 and 4A, the brackets 201 carried by the carriage 195 are made to oscillate downwards by the cylinder-piston actuator 203, so that they will lose contact with the respective core C. This movement of oscillation also brings the friction wheels 215 into contact with the cylindrical surface of the corresponding core, which is withheld in position by the heads 101, 102 of the
25 revolver unit 57.

Actuation of the motor 217 causes the rotation of the corresponding core thanks to the friction between the latter and the friction wheels 215. The operation of angular acceleration of the cores (and of the heads supporting them) is referred to as "core launching" and has the function of bringing the
30 peripheral speed of the core up to a value approximately equal to the rate of feed of the web-like material, so that the subsequent contact between the latter and the core will take place without any mutual sliding, or at least with

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only minimal sliding.

When the core-launching operation has been completed, i.e., when the core has reached the required peripheral speed, the carriage 195 has reached (following the rotation of the revolver unit 57) the position P2 of Fig. 18. In this position, the oscillating arms 103 are made to oscillate until the core C, withheld by the heads 101, 102, is brought into contact with the web-like material N that is run over the winding roller 59. The movement of approach of the core is represented in Fig. 7 (arrow f101).

When each of the two coaxial tubular cores touches the web-like material N run over the surface of the winding roller 59, it receives motion via the web-like material as a result of the underlying winding roller 59, so that the carriage 195 of the loader 181 can be moved away, by means of the actuators 197 and 187, to return to the initial position underneath the dropping path 171 of the cores, for receiving a new pair of cores.

When the new cores are in the position in which the launching operation has been completed (position P1 in Fig. 18), the pair of almost completed rolls B is in the discharging position, ready to be discharged after prior cutting of the web-like material.

The operation of cutting of the web-like material and of winding of the leading edge on the new core C is carried out according to the sequence illustrated in Figs. 7 to 9. When the core C is in contact with the web-like material N run over the winding roller 59, the sides 111 carrying the bars 113, 115 oscillate in the counter-clockwise direction (Figs. 7-9), as indicated by the arrow f111, about the axis of the winding roller 59 to pass from the position of Fig. 7 to the position of Fig. 8. During this movement, the web-like material N rests on the internal surface of the web-like material N, namely on the surface facing the axis of the revolver unit 57, and, at the end of the movement of the sides 111, the web-like material comes to describe a path which embraces the core C for approximately three quarters of the circumferential development thereof, and which then develops around the sleeves 117, 119 supported idle on the bars 113 and 115.

At this point, cutting of the web-like material can be carried out by means

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of extraction of the cutting blade 137, which moves from the set-in position of Fig. 8 to the extracted position of Fig. 9. In particular, when the web-like material is a plastic film, the blade 127 is appropriately heated in order to facilitate the cutting operation. Alternatively, a hot wire or another suitable
5 cutting means could be used.

The free leading edge that is formed with the cutting operation is wound around the core C with the aid of jets of air generated by the blower nozzles 133. The trailing edge is recalled around the completed roll B, in so far as the latter is kept in contact with the winding roller 61 until the trailing edge has
10 been completely re-wound.

When the trailing edge is completely wound on the roll B, the latter is moved away from the winding roller 61 and discharged, by means of opening of the heads 101, 102, onto the cradle 151 of the slide 135, which in the meantime has moved to the roll-pickup position. Before the heads 101, 102
15 are opened, and hence before the completed roll is discharged onto the cradle 151, inertial rotation of the roll is braked by means of the braking roller 145.

After the roll B has been discharged onto the cradle 151, the slide 135 is brought back into the low position (Fig. 4), and, by means of the pusher 159,
20 the roll is discharged onto the discharge belt 157.

At this point, the revolver unit 57 can start approaching the angular position in which the winding rollers 59 and 61 swap their positions to carry out the next roll-changeover cycle.

It is understood that the drawings only illustrate only a practical
25 embodiment of the invention, which may vary in its embodiments and arrangements without thereby departing from the scope of the underlying idea. The possible presence of reference numbers in the attached claims has the sole purpose of facilitating reading thereof in the light of the foregoing description and of the annexed drawings, and in no way limits the scope of
30 protection represented by the claims.

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CLAIMS

1. A re-reeling machine for re-reeling a web-like material, in particular plastic film, comprising a feed assembly for feeding tubular winding cores and a re-reeling assembly with a revolver unit on which the tubular winding cores are set for winding thereon pre-determined amounts of web-like material and for forming respective rolls of wound web-like material, said revolver unit rotating about an axis of rotation and being provided with at least two supports for said tubular cores, which are set in two respective angular positions with respect to said axis of rotation,
- 5 characterized in that said feed assembly for feeding the tubular cores comprises a path for dispensing tubular cores to a core loader, said core loader being provided with a motion of approach to the revolver unit and a motion of following the movement of the revolver unit, in order to transfer the tubular cores from the loader to the revolver unit.
- 10 2. The machine according to Claim 1, characterized in that said loader comprises a core-launching device for setting the tubular cores in rotation before starting winding of the web-like material on the cores.
- 15 3. The machine according to Claim 2, characterized in that the core-launching device comprises a motor-driven rotatable member.
- 20 4. The machine according to one or more of the foregoing claims, characterized in that said loader and said revolver unit comprise members for mutual engagement in order to co-ordinate the movement of the revolver unit with the movement of the loader in the step of transfer of the core from the loader to the revolver unit and of launching of the cores.
- 25 5. The machine according to one or more of the foregoing claims, characterized in that said loader has at least one cradle for resting the cores that are to be loaded onto said revolver unit, said resting cradle being movable so as to be removed from the core once the latter has been engaged by the respective support on the revolver unit.
- 30 6. The machine according to one or more of the foregoing claims, characterized in that said loader is provided with a dual motion of translation, namely both in the horizontal direction and in the vertical direction, so as to

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come up to the revolver unit.

7. The machine according to Claim 4, characterized in that said members for mutual engagement comprise, on the loader, a bracket and a first idler wheel, and, on said revolver unit, a second idler wheel, in a position
5 of mutual engagement between said loader and said revolver unit, the second wheel resting on said bracket and on said first wheel so as to exert a thrust on the loader, said loader being in turn pushed against the revolver unit.

8. The machine according to one or more of the foregoing claims, characterized in that said loader comprises means for centring the cores.

10 9. The machine according to one or more of the foregoing claims, characterized in that said path for dispensing the cores to the loader comprises a path for dropping the cores and an oscillating dispenser which enables passage of individual cores from said dropping path to the loader.

15 10. The machine according to Claim 9, characterized in that said oscillating dispenser comprises two distinct seats for receiving individual cores that are to be transferred to the loader, said two seats having different dimensions and being used alternatively according to the size of the diameters of the cores.

20 11. The machine according to one or more of the foregoing claims, characterized in that said loader comprises a horizontal cross member, which can slide along vertical guides, and in that supported on said cross member is a carriage which can move horizontally in a direction orthogonal to said cross member, said at least one cradle for resting the cores being supported on said carriage.

25 12. The machine according to Claim 11, characterized in that said cradle for resting the cores is carried by a bracket hinged to said carriage, an actuator being provided for controlling oscillation of said bracket with respect to the carriage.

30 13. The machine according to Claims 2 and 12, characterized in that supported on said bracket is said core-launching device, the movement of oscillation of the bracket bringing the launching device into contact with the cylindrical surface of the core when the latter is supported by the revolver unit.

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14. The machine according to Claim 13, characterized in that said launching device is carried by a pair of oscillating arms hinged to said bracket, an actuator being provided for causing said arms to oscillate with respect to said bracket.

5 15. The machine according to one or more of the foregoing claims, characterized in that said revolver unit comprises, for each core support, a winding roller, which turns at a peripheral speed substantially corresponding to the rate of feed of the web-like material, the tubular core, or else the roll being formed on said core, being supported idle by the corresponding support
10 and being pressed by the latter against the cylindrical surface of said winding roller so as to be kept in rotation.

16. The machine according to Claim 15, characterized in that each of said core supports comprises a pair of oscillating arms which carry respective heads for frontal engagement of the cores, the oscillating arms
15 being displaced from a position where they take the core from the loader to a position where the core is brought up to the respective winding roller.

17. The machine according to Claim 15 or Claim 16, characterized in that said revolver unit has at least one pair of guide rollers over which the web-like material is run, said guide rollers and said winding rollers being set in
20 alternated positions about the axis of rotation of the revolver unit.

18. The machine according to Claim 17, characterized in that said guide rollers are motor-driven.

19. The machine according to Claim 18, characterized in that said guide rollers and said winding rollers are driven into rotation by means of a
25 single belt which receives motion from the shaft of the revolver unit.

20. The machine according to one or more of the foregoing claims, characterized in that supported on said revolver unit, for each support for the winding cores, is an assembly for cutting the web-like material and applying the initial or leading edge of the web-like material on the winding core.

30 21. The machine according to Claim 20, characterized in that each of said assemblies for cutting the web-like material and applying the leading edge of the web-like material on the winding core comprises a pair of

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members over the web-like material is run, which are parallel to one another and set at a distance apart, and between which a cutting member is set.

22. The machine according to Claim 21, characterized in that associated to said cutting member is a blower member for pushing the free
5 edge of the web-like material, generated by said cutting member, to wrap round the winding core.

23. The machine according to Claim 21 or Claim 22, characterized in that said pair of guide members and said cutting member set between them can move from a position set back within the path of the web-like material
10 around the revolver unit, to an extracted position, in which the guide members deflect the web-like material around a new core on which winding is to start.

24. The machine according to Claims 15 and 23, characterized in that said pair of guide members and said cutting member are supported by respective oscillating sides, which are hinged about the shaft of the respective
15 winding roller.

25. The machine according to one or more of Claims 21 to 24, characterized in that said guide members are made up of bars on which idle sleeves are supported over which the web-like material is run.

26. The machine according to one or more of the foregoing claims,
20 characterized in that the supports for the cores are double so that each supports one of the two axially aligned winding cores, and in that two parallel paths are provided for two web-like materials that are fed simultaneously to the machine.

27. The machine according to Claim 26, characterized in that the
25 loader is double so as to present simultaneously to the revolver unit two winding cores that are substantially axially aligned.

28. The machine according to one or more of the foregoing claims, characterized in that it comprises a discharge assembly for discharging the cores from said revolver unit, said discharge assembly comprising a mobile
30 slide, provided with a resting cradle for the finished rolls, the mobile slide being approachable to the revolver unit and removable from the latter to a core-discharging area.

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29. The machine according to Claim 28, characterized in that said slide carries a braking roller for braking the roll.

30. The machine according to Claim 28 or Claim 29, characterized in that said cradle has at least one safety bracket for retention of the roll in said cradle, the said safety bracket being associated to an actuator for it to be opened and closed.

31. The machine according to Claim 30, characterized in that associated to said slide is a pusher for expelling the roll from said cradle to a discharge conveyor.

32. The machine according to one or more of the foregoing claims, characterized in that associated to said core loader is a centring system for centring the cores before they are introduced into the revolver unit.

33. The machine according to Claim 32, characterized in that said centring system comprises at least one pair of side walls between which said cores are made to pass, the distance between said side walls being approximately equal to or slightly greater than the maximum axial length of the cores.

34. The machine according to Claim 31 or Claim 32, characterized in that said centring system comprises at least one pair of actuators for centring of the winding cores.

35. The machine according to one or more of the foregoing claims, characterized in that it has a modular structure.

36. The machine according to one or more of the foregoing claims, characterized in that it comprises an unreeler equipped with one or more printing heads.

37. The machine according to Claim 36, characterized in that said unreeler has a dual support for two parent reels of web-like material that are to be unwound simultaneously.

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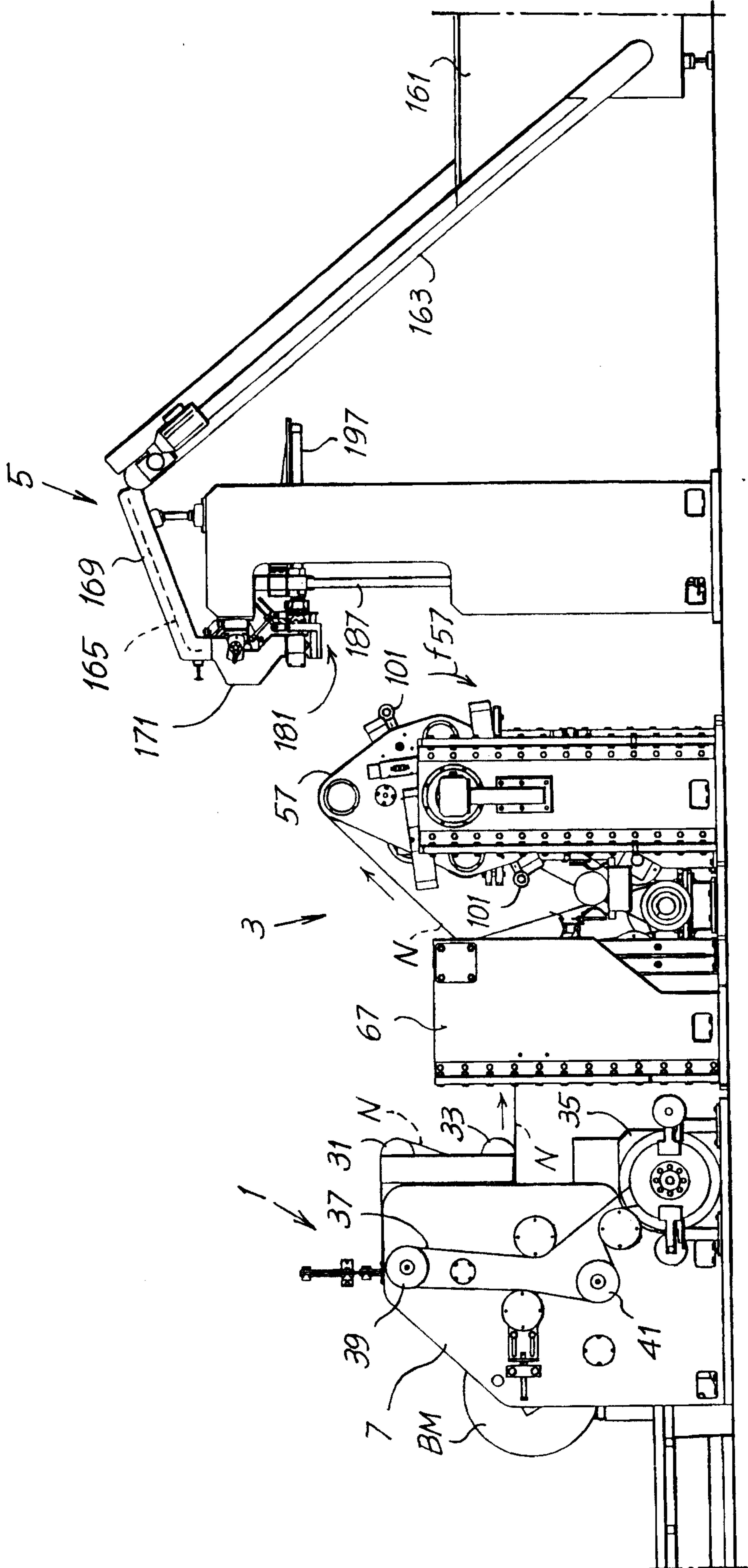


Fig.1

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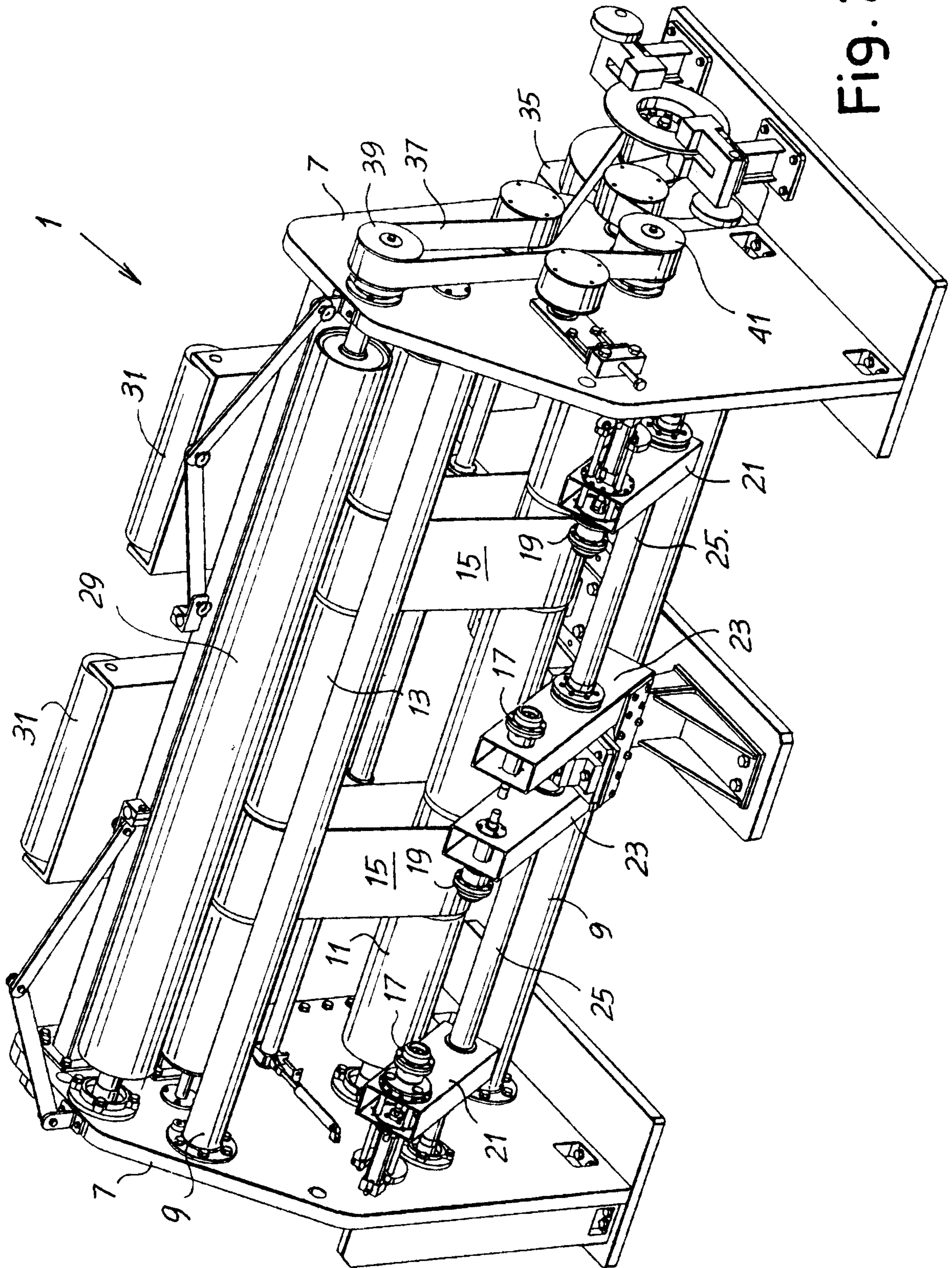


Fig. 2

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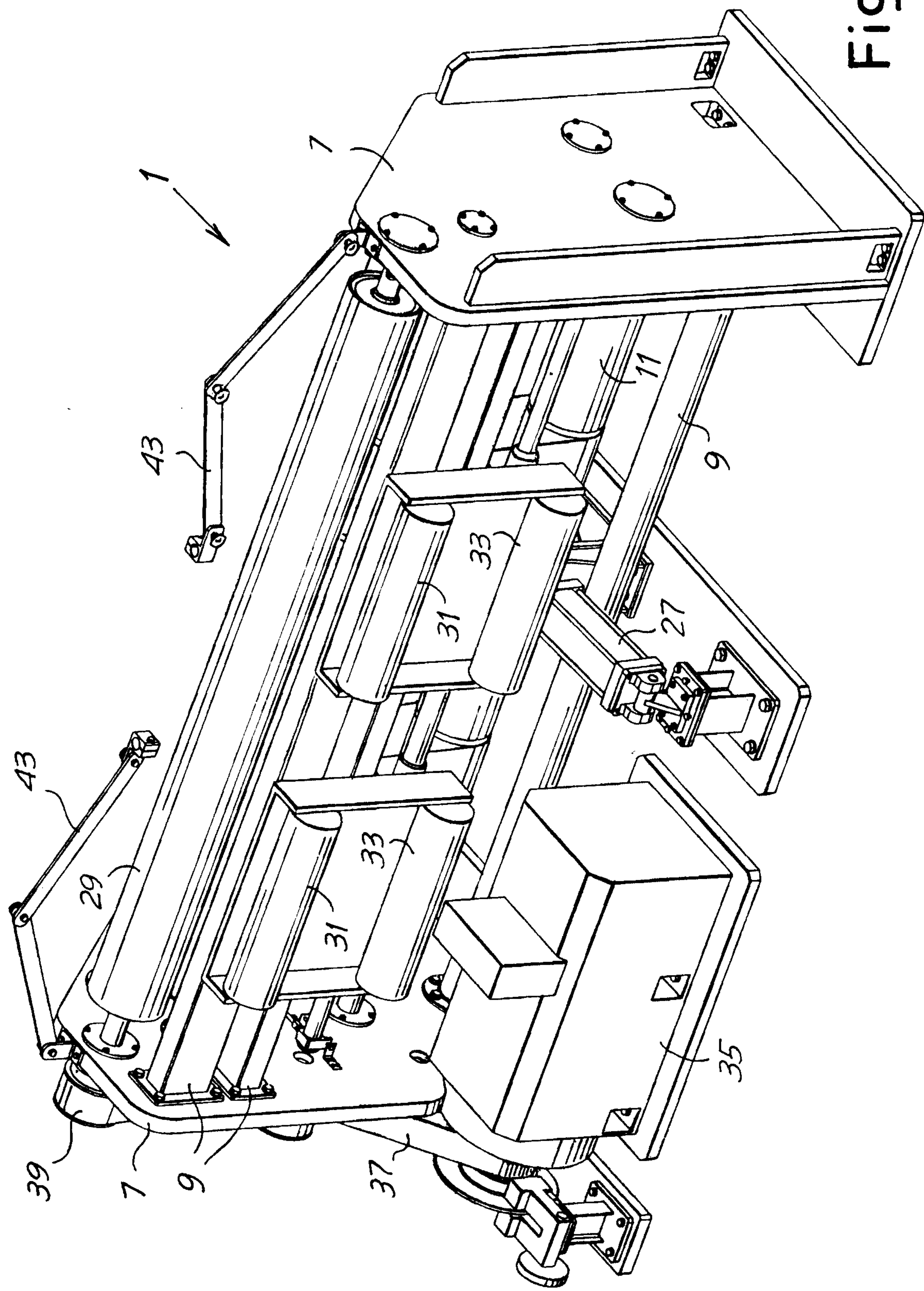


Fig. 3

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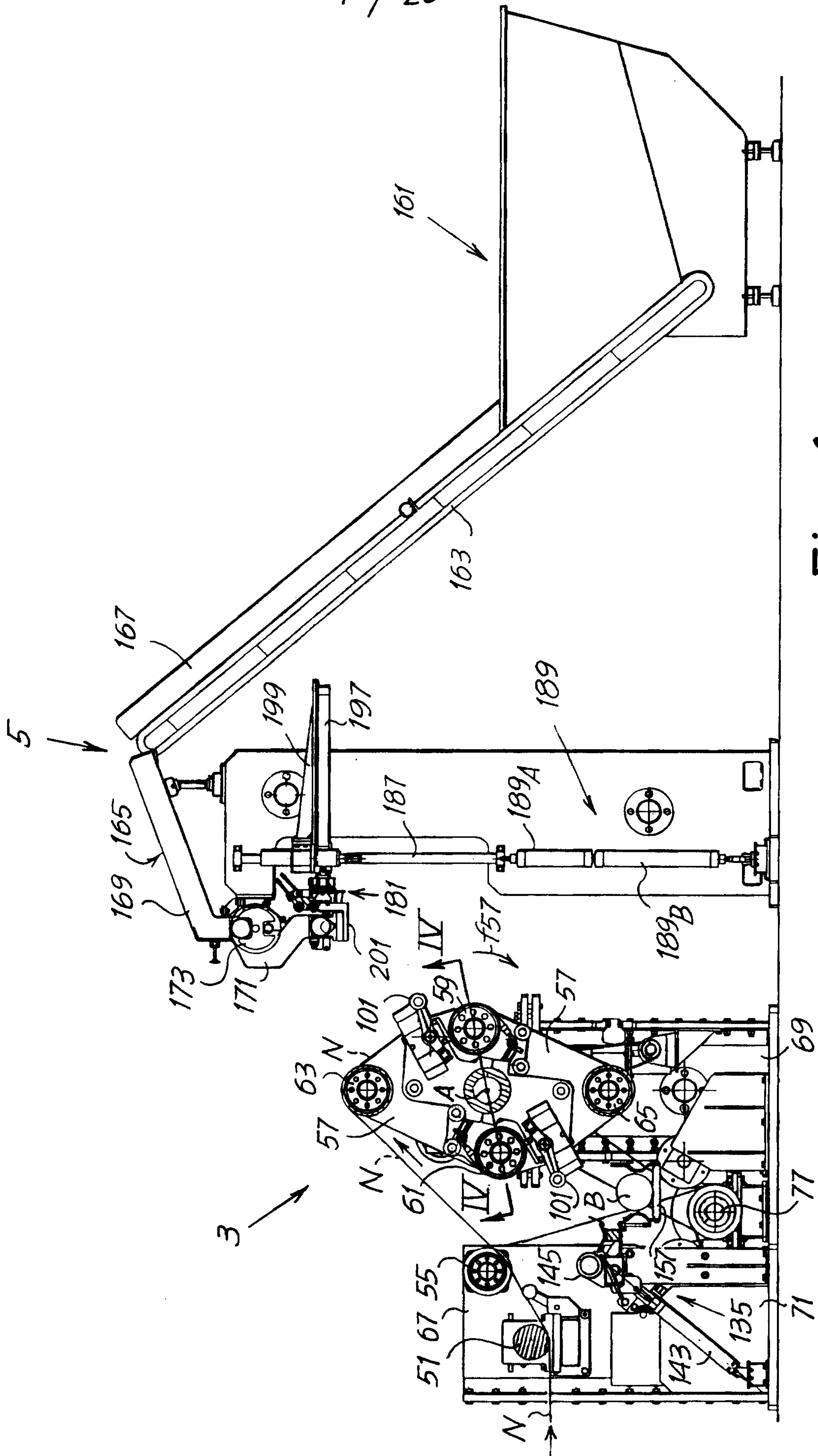
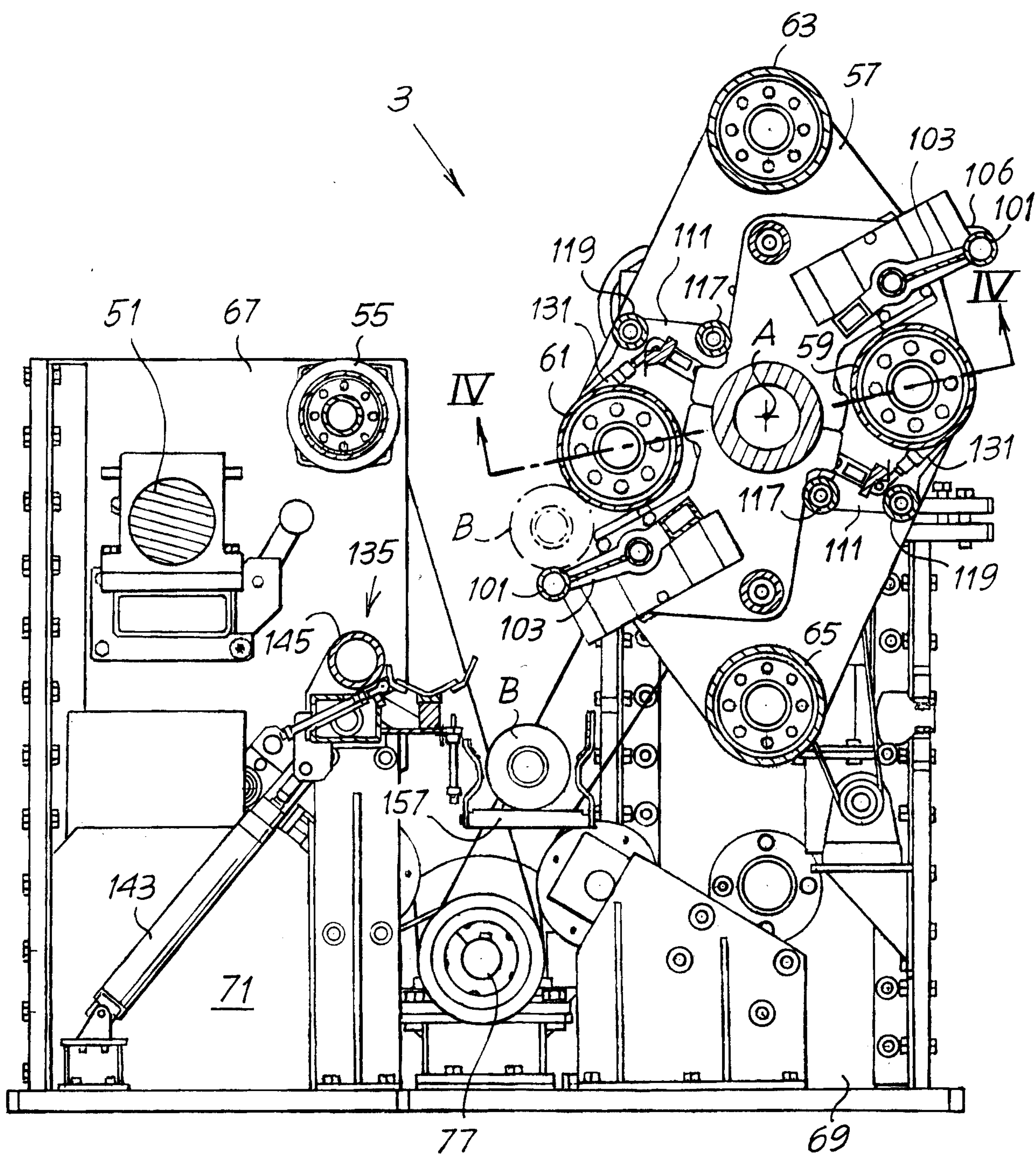


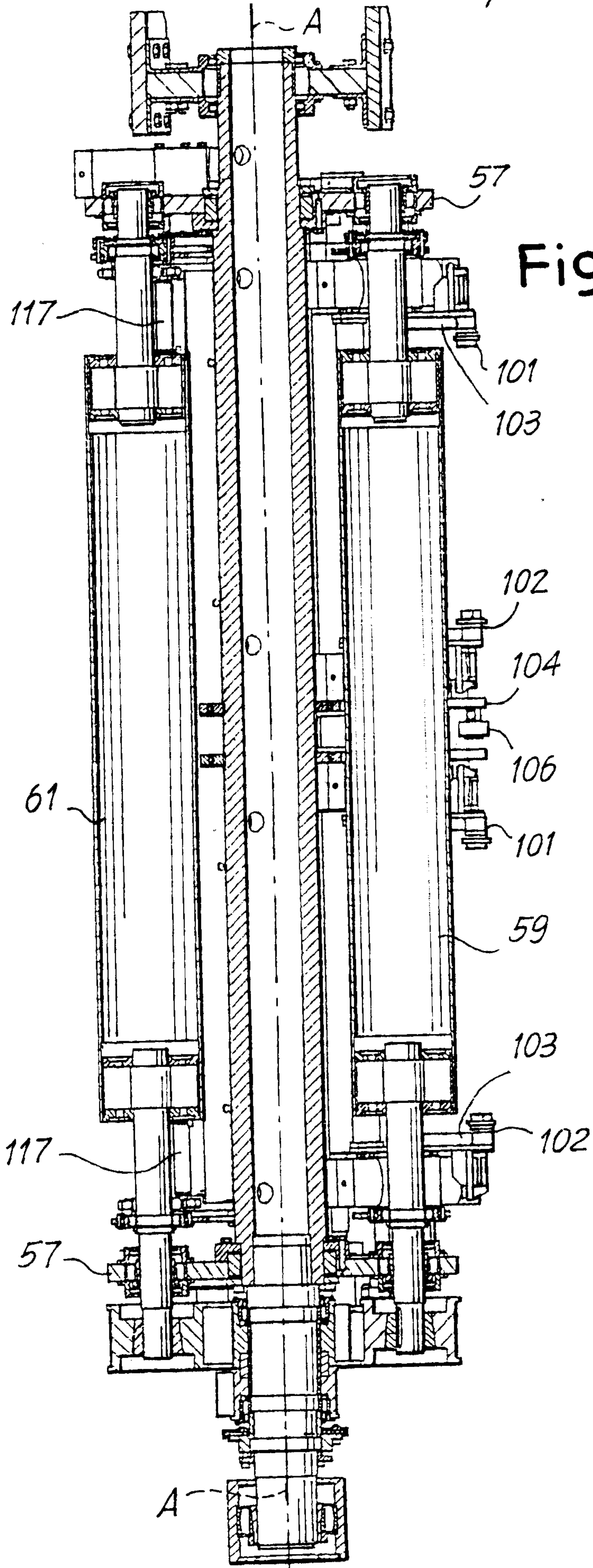
Fig. 4

Fig. 4A



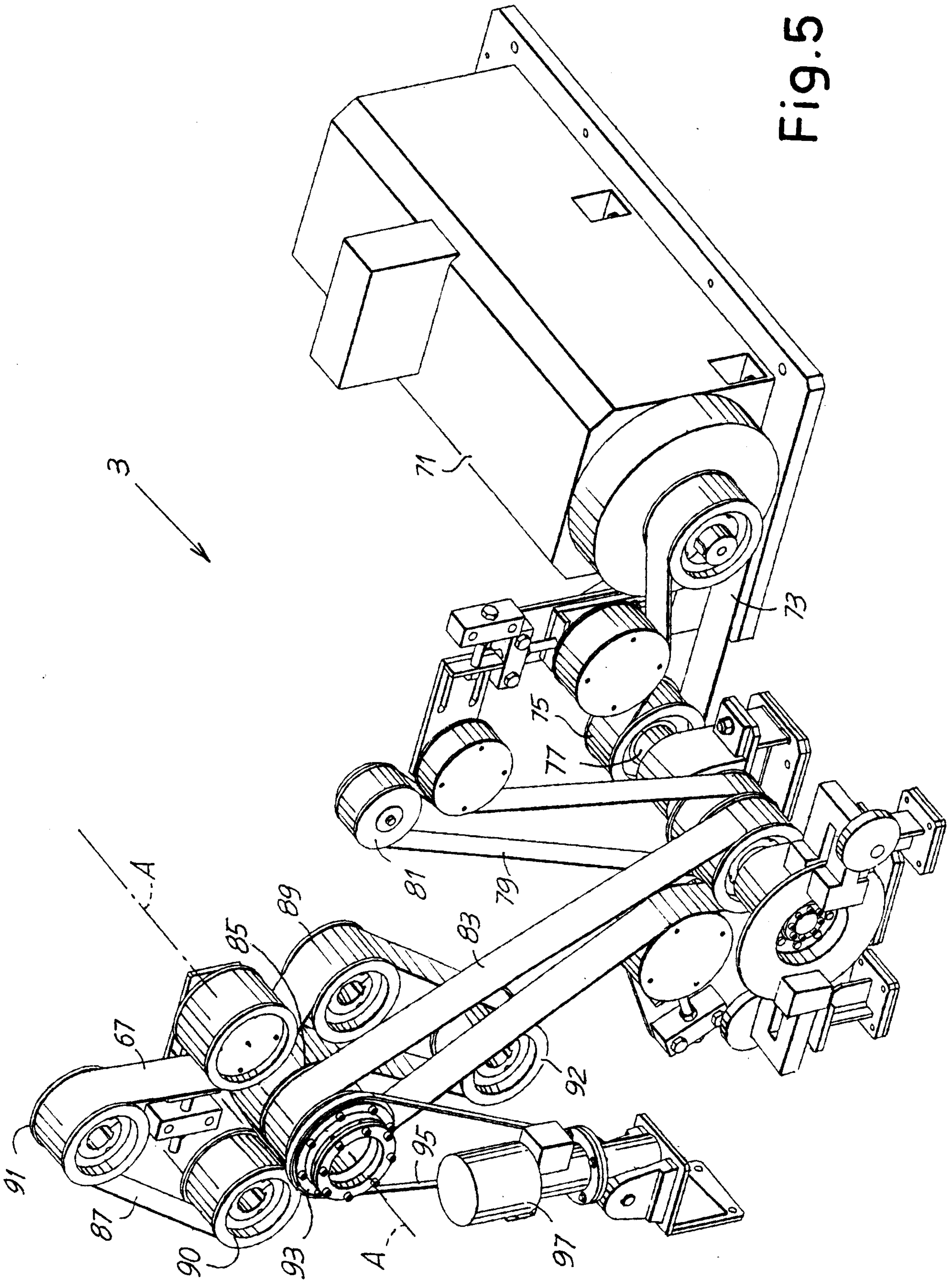
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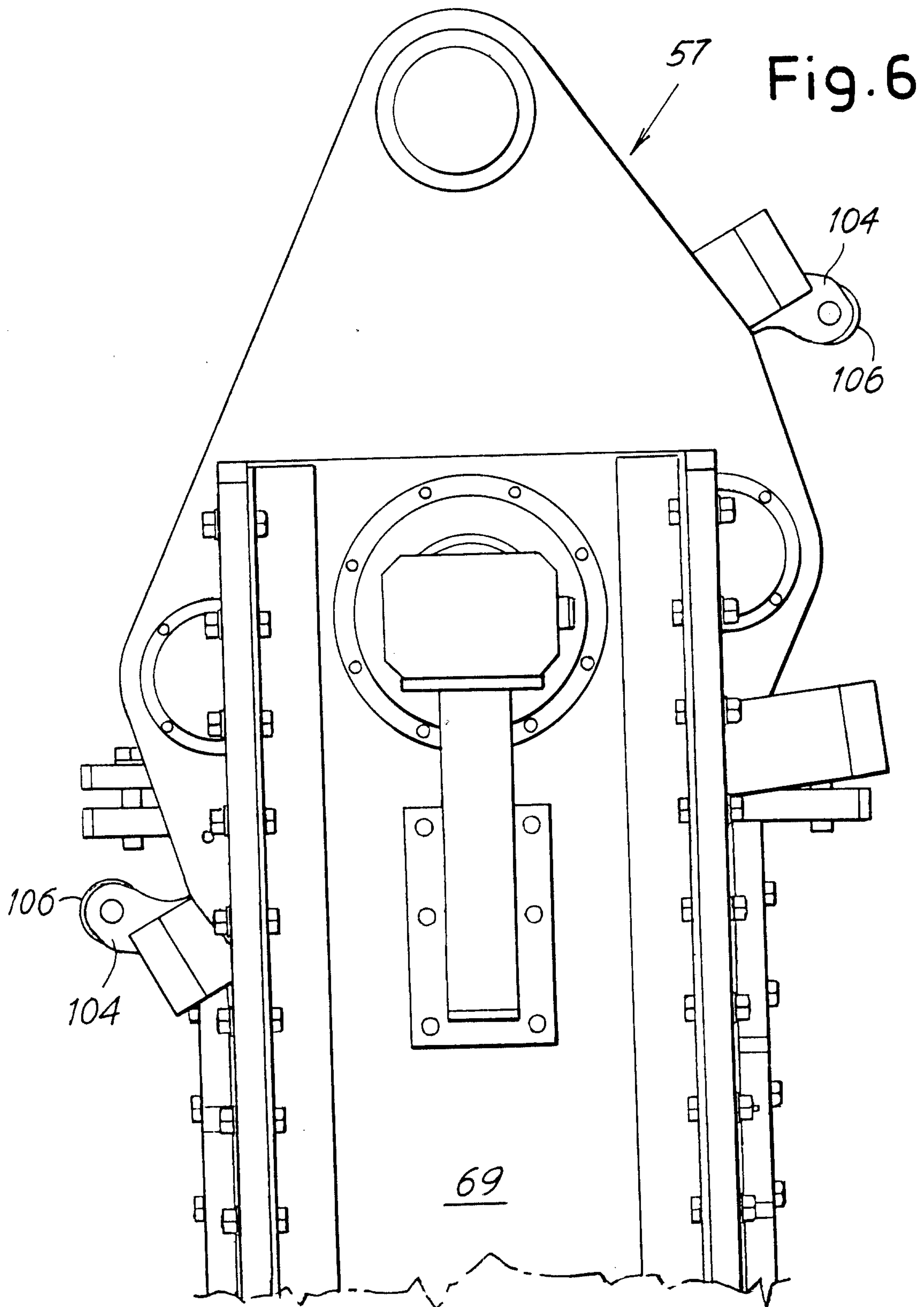


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Fig.5



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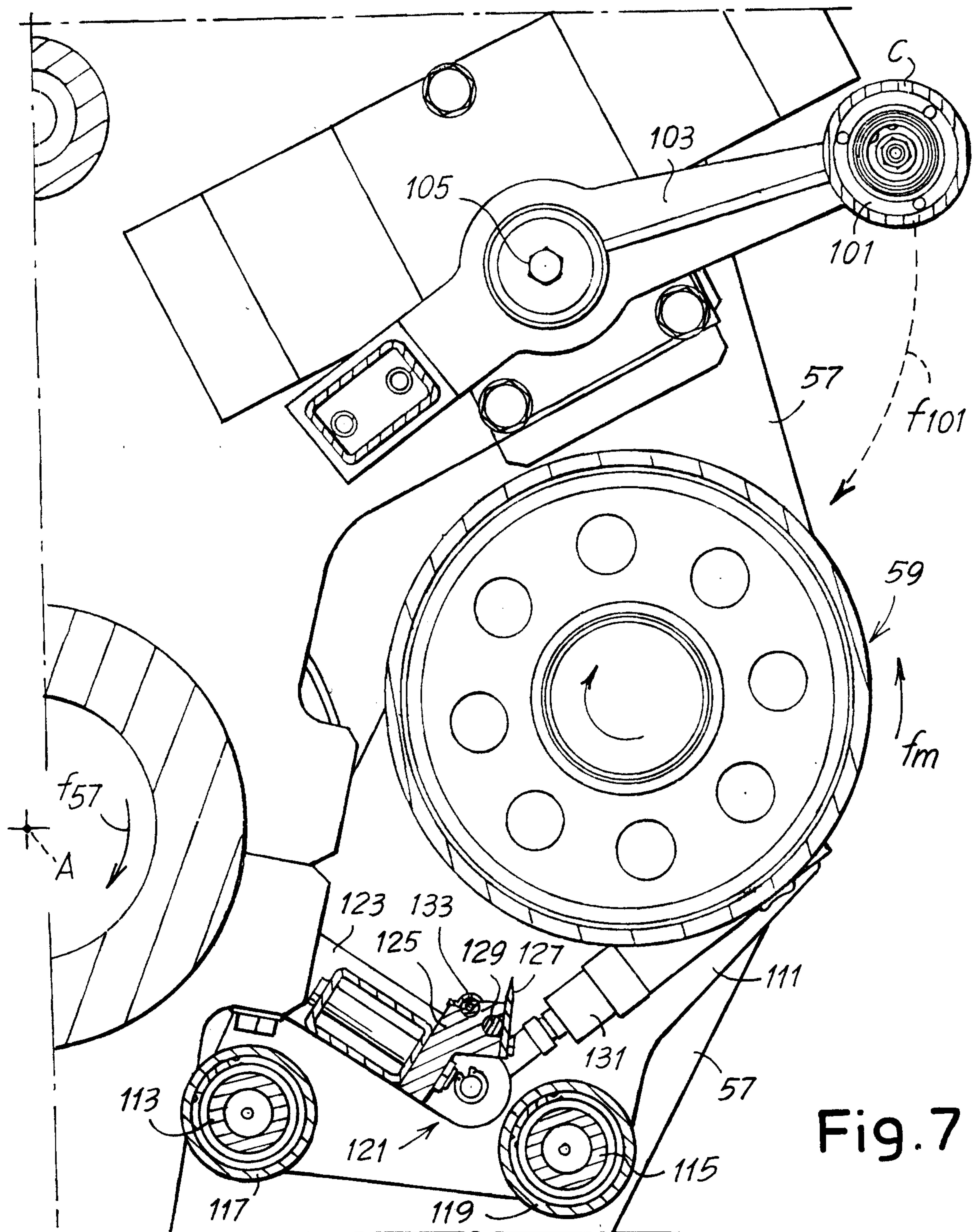


Fig. 7

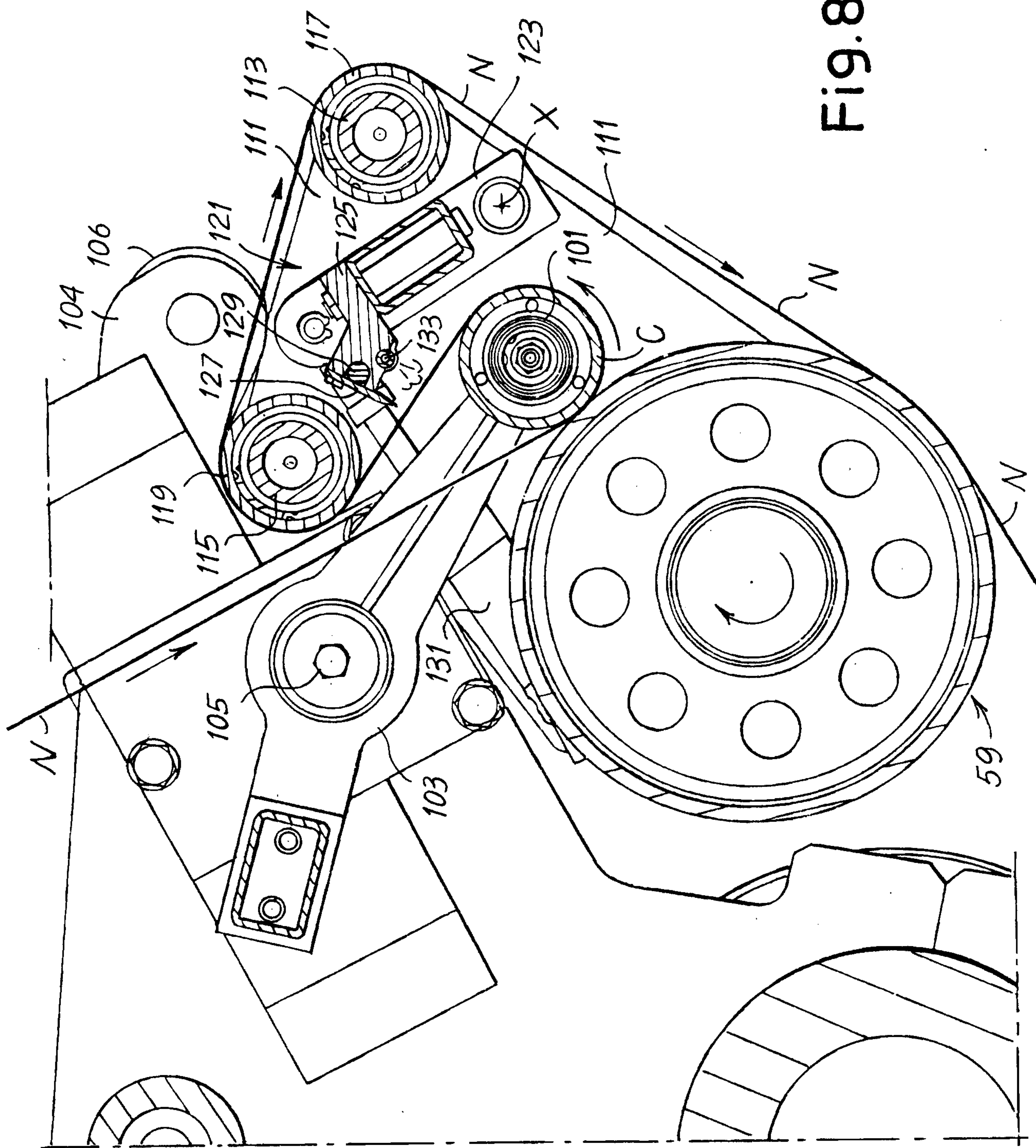


Fig. 8

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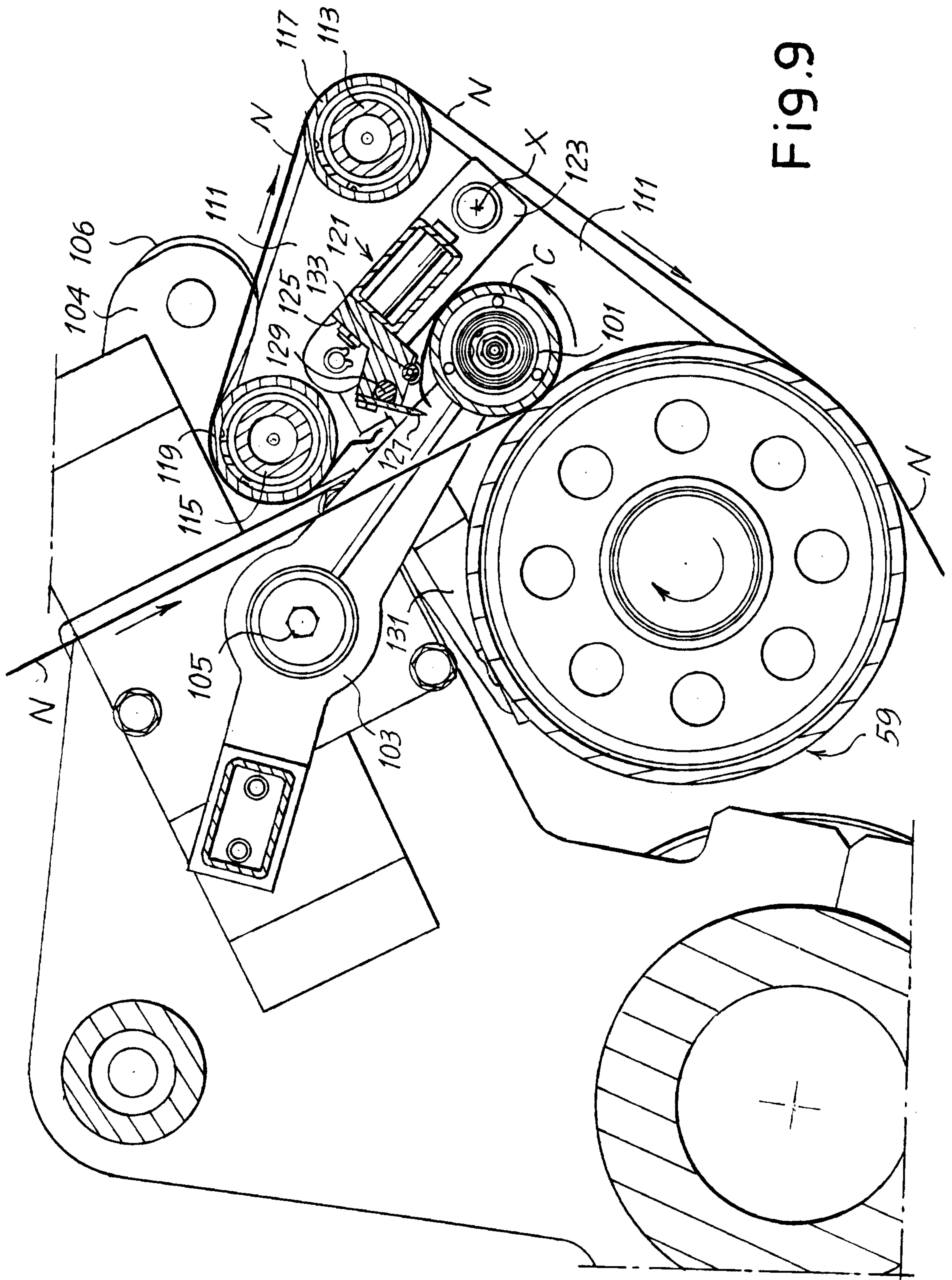
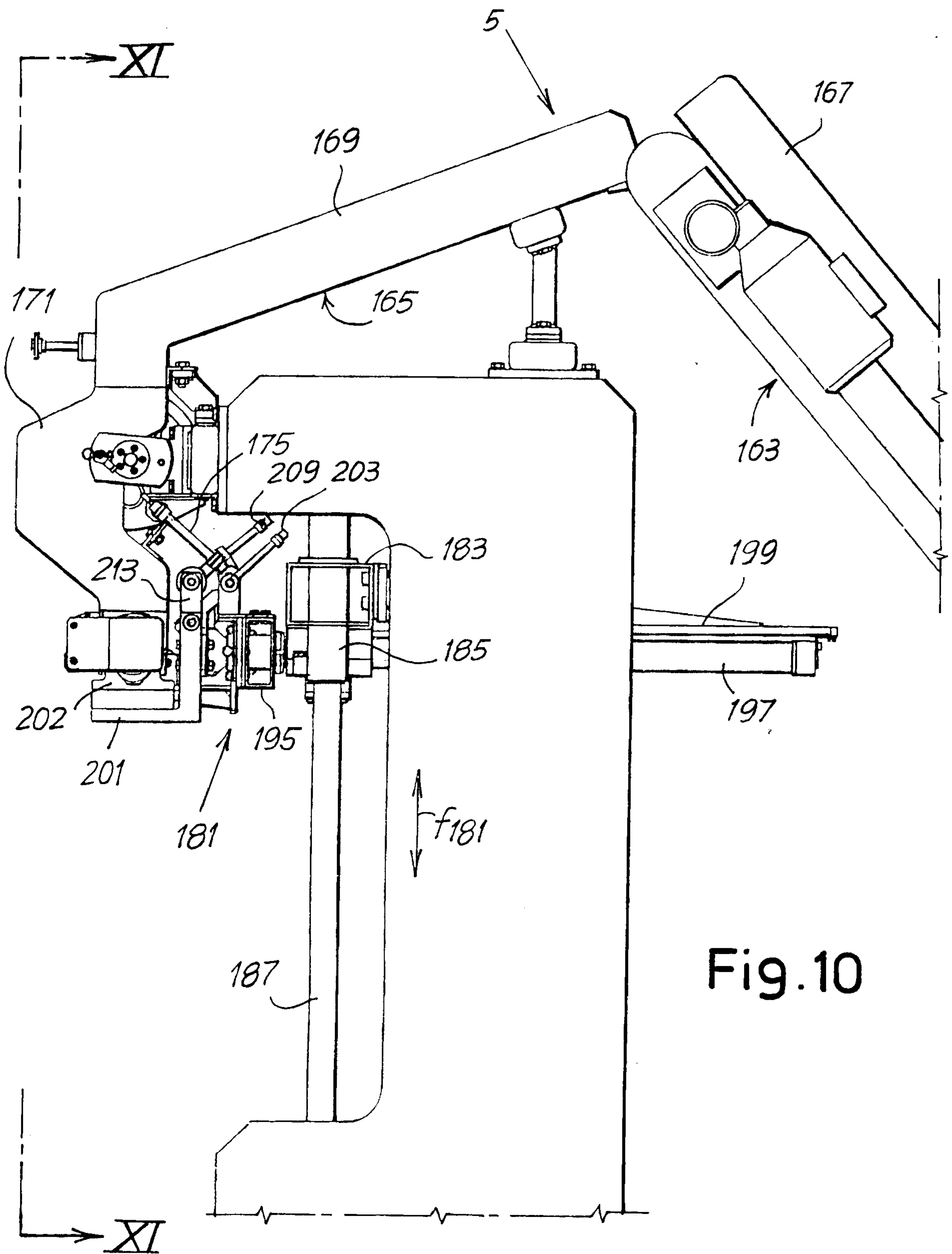


Fig.9.9

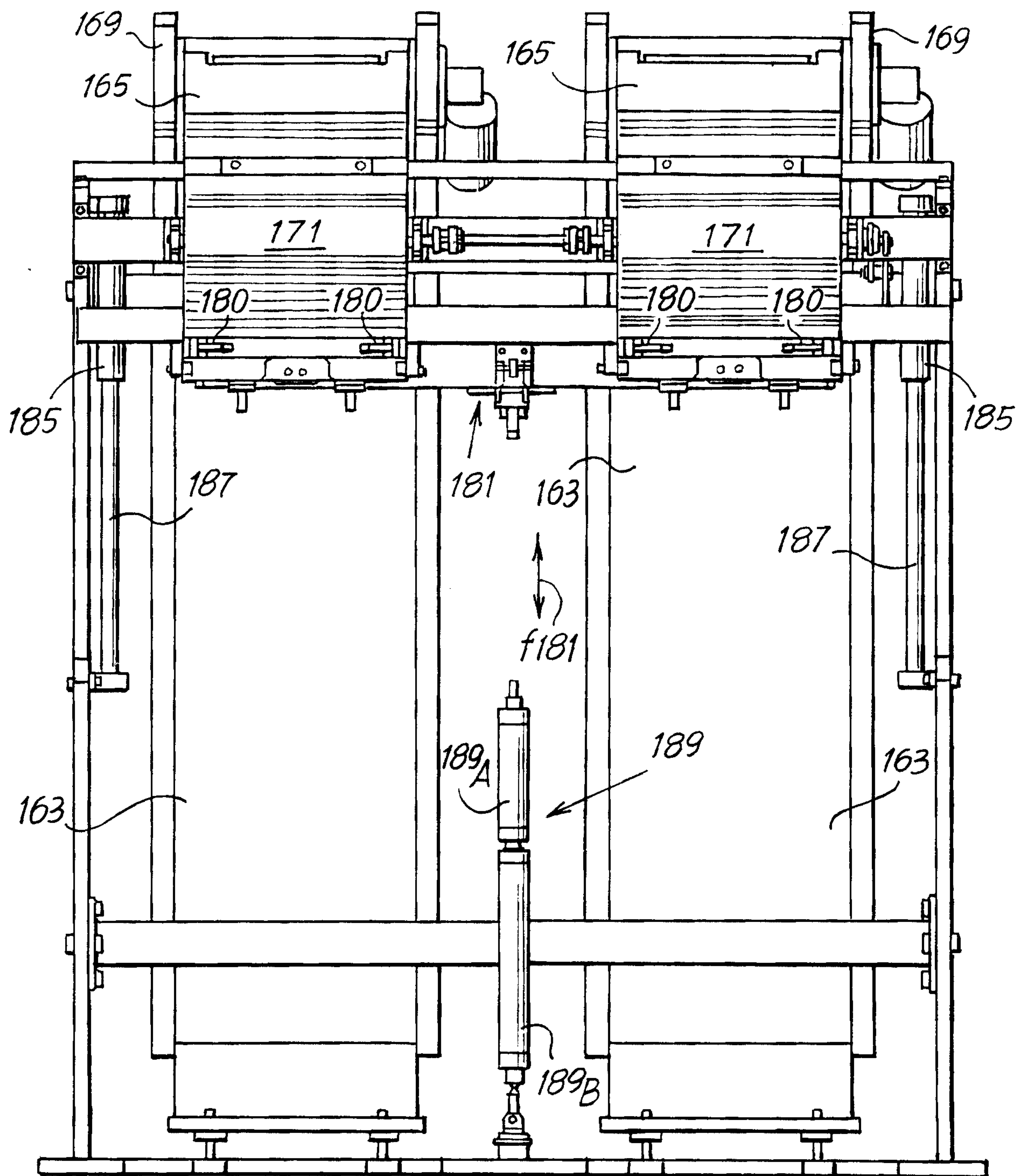
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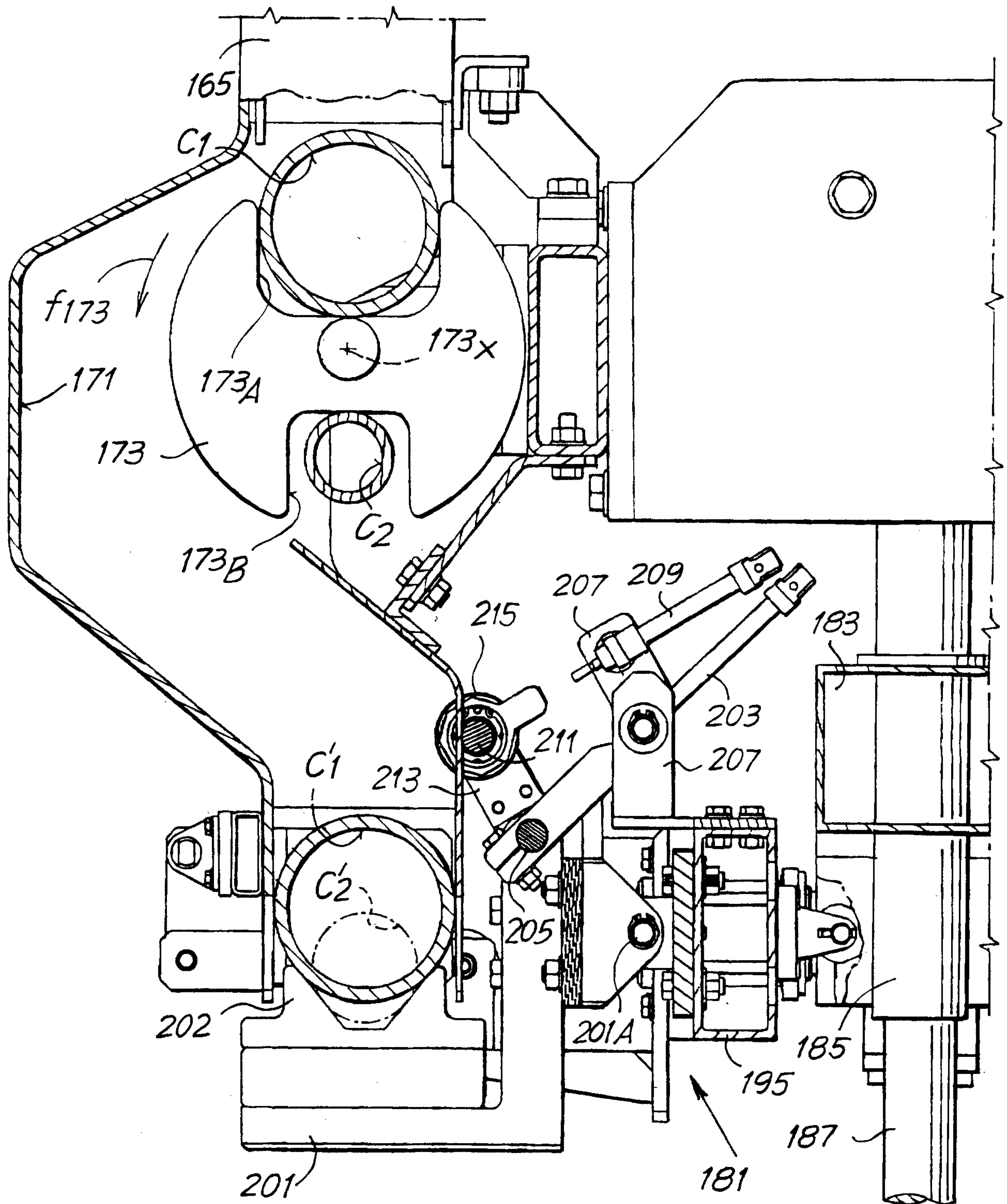
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Fig.11



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Fi9.12



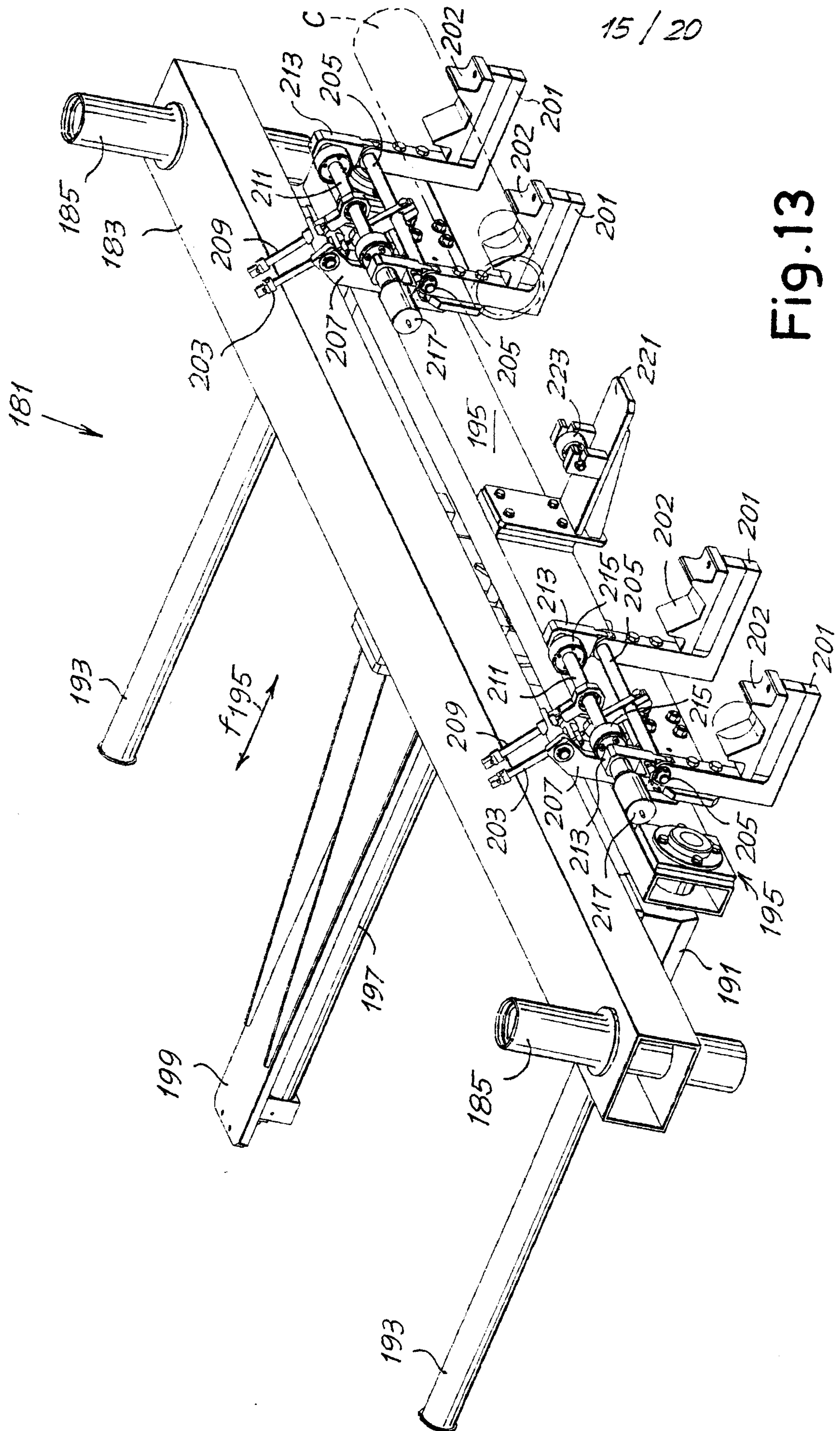
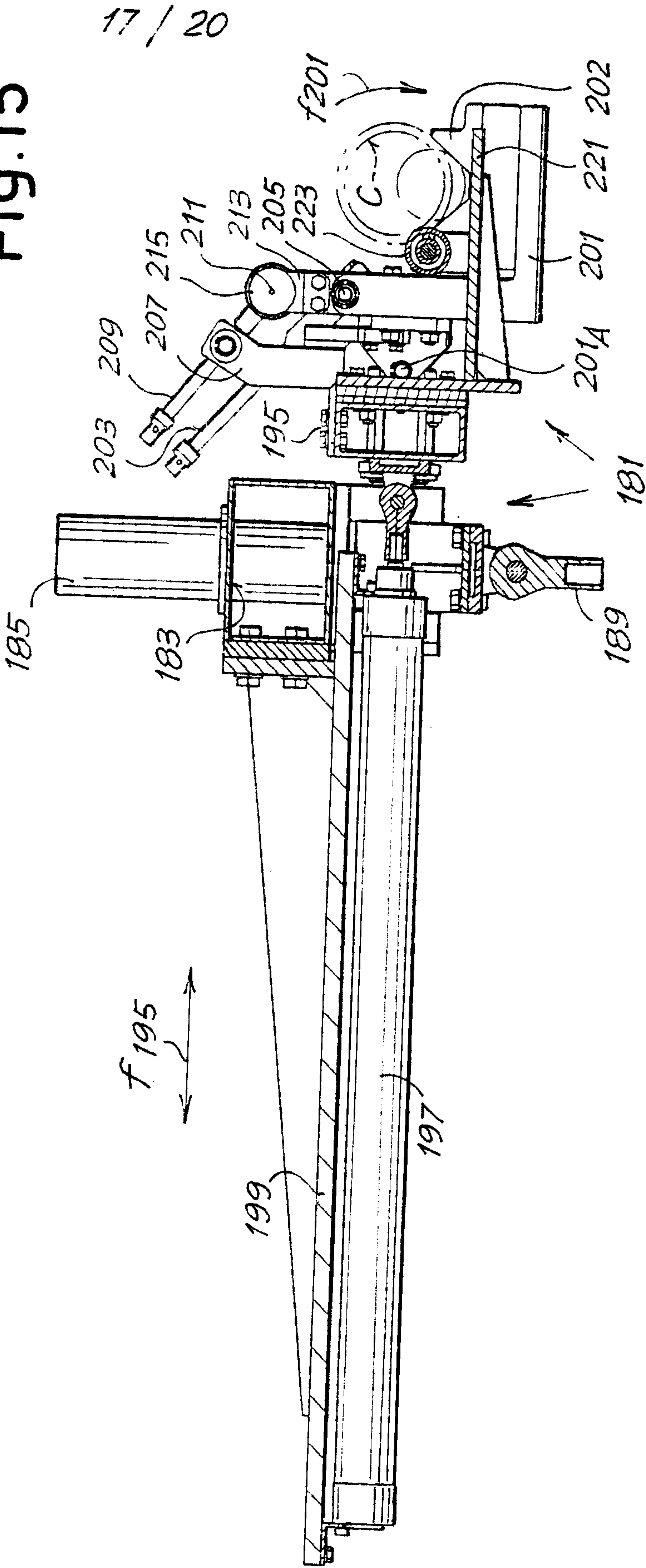


Fig.15



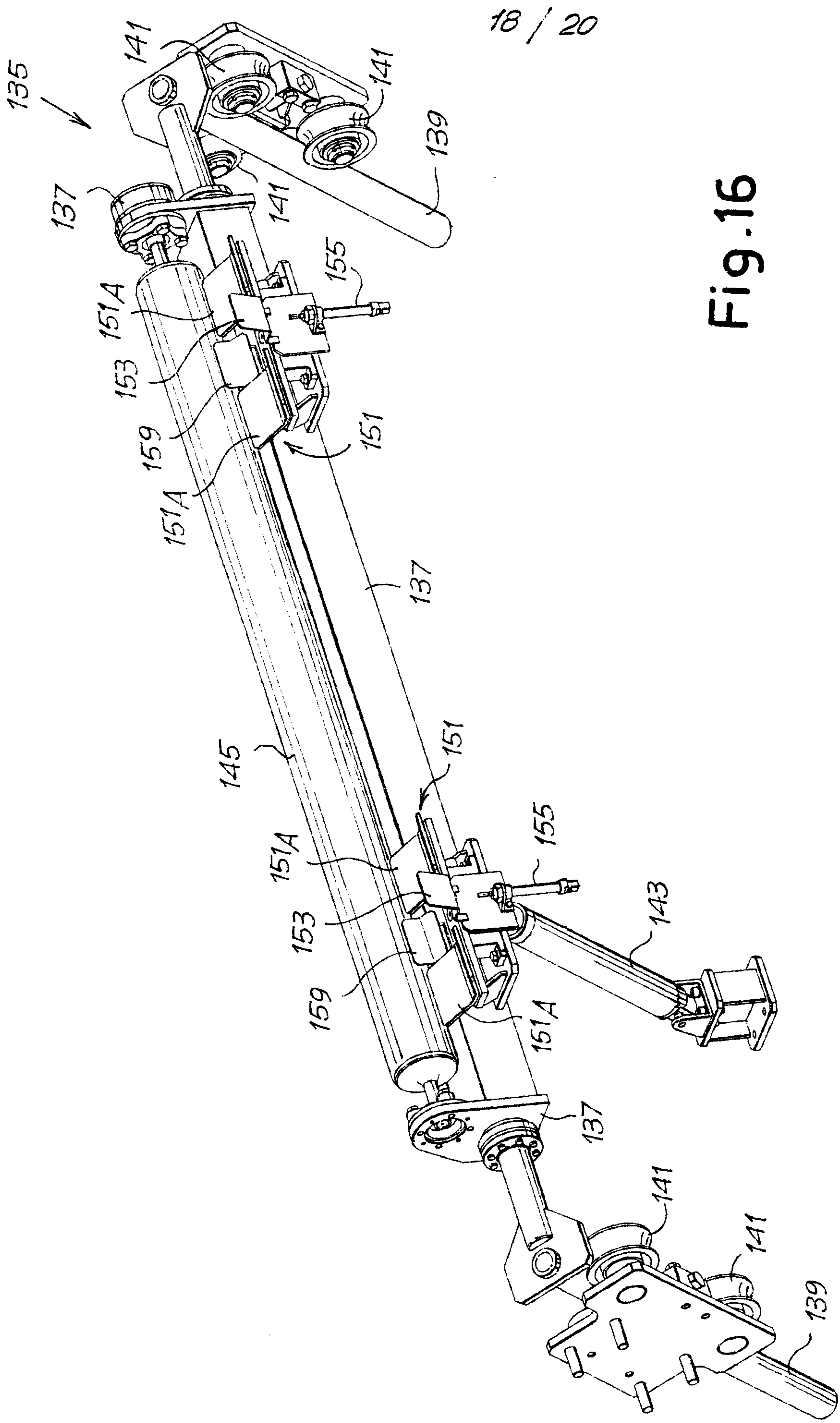


Fig.16

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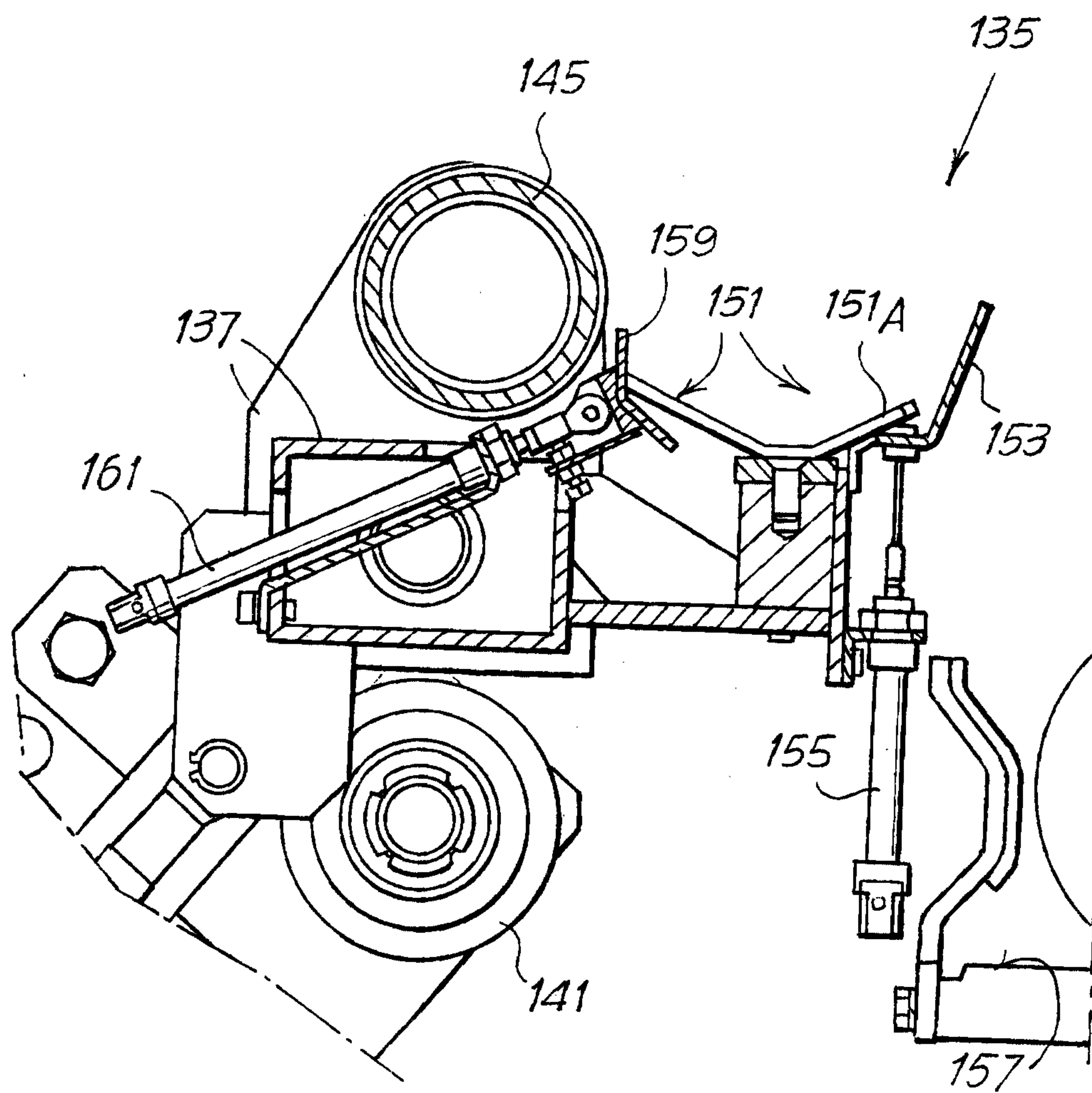


Fig.17

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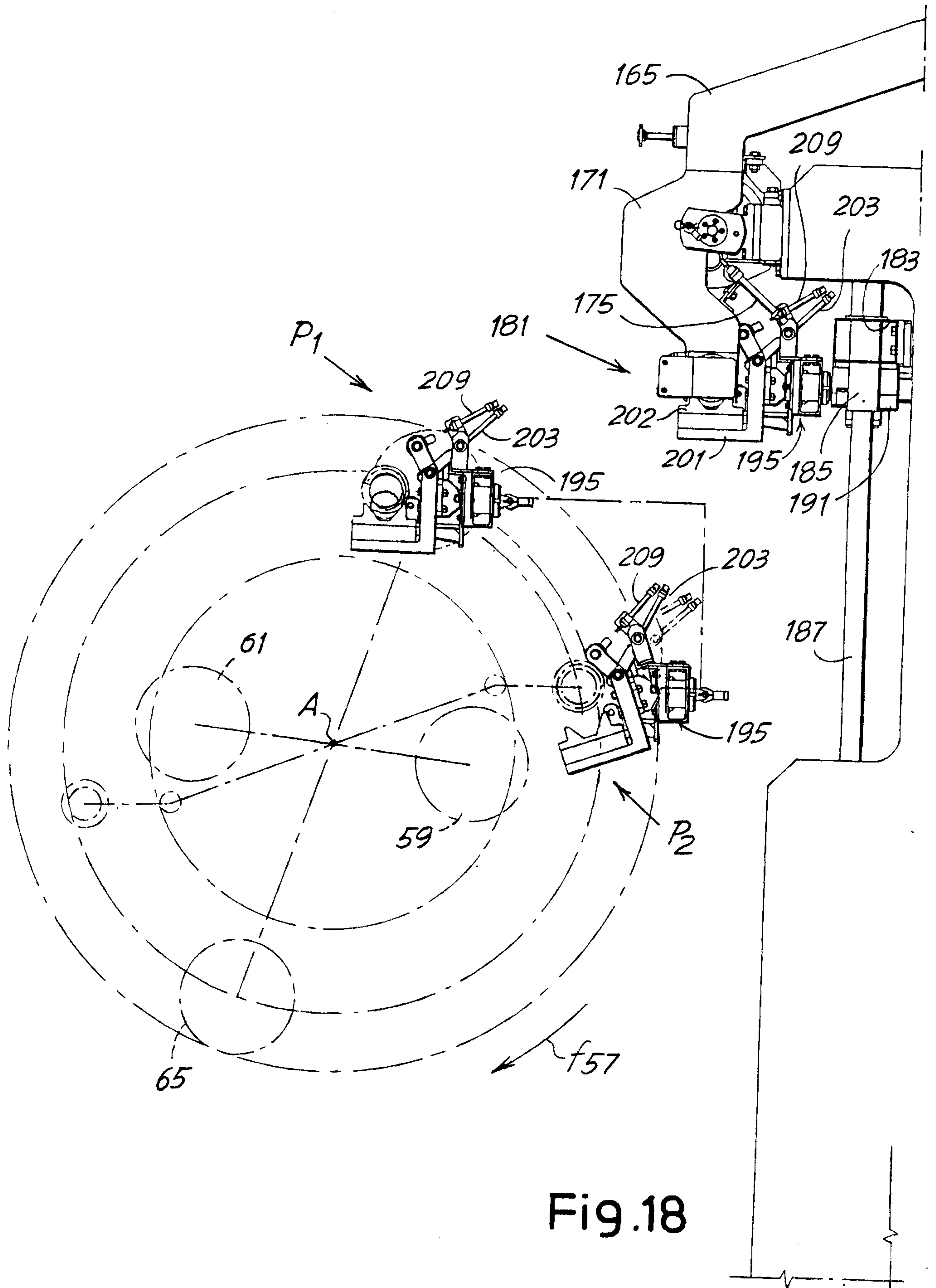


Fig.18

