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## (54) A process and a device for winding thread on a cop that lacks the thread length necessary for automatic reconnection in a ring spinning machine.

(57) The present invention relates to a procedure for placing a spare or reserve winding consisting of a number of coils on a cop (2) that lacks wound thread or lacks thread wound of sufficient length for being suitable to the operation of automatic reconnection with the small bundle of textile fibers coming out of the last pair of drawing rollers, and it also relates to a device for carrying this procedure into effect.

More particularly, said device comprises an auxiliary pivot (6) which is driven for rotation and is arranged near an auxiliary spool (3) which last is laterally provided with a reciprocating thread guide (9). Said device also comprises a variable profile radial cam (21) for guiding the nippers or gripping tools (15) into a number of operative positions.

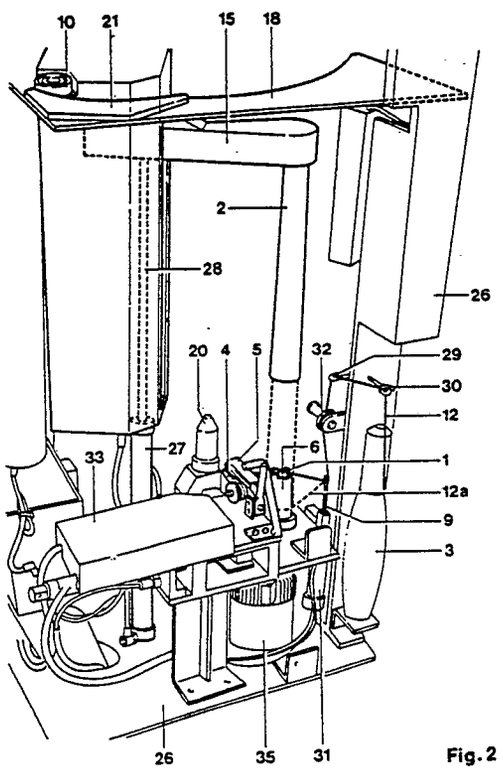


Fig. 2

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This invention relates to a procedure as well as to a device for winding thread on a cop that lacks wound thread or carries wound thread of a length insufficient to the operation of automatic reconnection of the thread itself to the small bundle of textile fibers that comes out of the last pair of drawing rollers in a ring spinning machine. It is well known that for various reasons, at the start or during the spinning operation the thread that winds on the spools can break. More particularly, the breaking can occur quite often at the beginning of the spinning process, i.e. after removal of spools and after loading the empty cops around which the thread winds again, after automatic restarting of the spinning procedure. The pneumatic-electronic sensing devices, or the electronic sensing devices, or any other similar sensors have the task of giving the stop signal to the reconnection automatic carriage in correspondence to the spinning spindle that is lacking the thread which the process is going to produce, or that is lacking the thread under treatment.

For the operation of automatic reconnection the presence is necessary of a number of thread turns or coils wound on the cop in order to unwind the same to obtain a length of thread sufficient to restart the spinning procedure. The operation mentioned above is necessary for causing the proper thread to contact a small bundle of textile fibers, which bundle has no consistence in itself till the twist actions exerted by the traveller do not link the individual fibers together. As the small bundle of textile fibers cannot be removed from the feeding zone when coming out of the drawing rollers, due to certain breaking of the bundle, it is absolutely necessary to use a thread piece, that should be already wound on the cop, so that a sufficient length of it can be unwound to arrive at the zone for connection with the small bundle of textile fibers. Accordingly, the cop on the spindle is not to lack wound thread or to bear wound thread of insufficient length, i.e. of too short length. Again, for obtaining automatic reconnection, it is necessary that the cop carries some turns of spare thread. Hence, the present invention has the task of providing a procedure and a device that are capable of realizing automatically, in a simple and economic way, the accumulation of some reserve thread when the cop mounted on the spindle and subjected to automatic reconnection happens to lack wound thread completely or wound thread of length sufficient to allow the spinning process to restart.

It is not to be forgotten that just in the initial step of starting the spindle after automatic removal the traveller must be accelerated up to steady state speed in a very short time, so that the thread is subjected to very strong stresses as a result of the high values of accelerations produced. This and other various causes make the number of breakages of the thread quite high when starting the process, i.e., before putting some turns of thread wound on the cop itself. A breakage of thread of such type practically gives no possibility to carriages of the type known of reconnecting threads and of restarting automatically the spinning process. Indeed, the cop inserted is not provided with any thread that can be brought back, or said cop carries very few turns which are not sufficient to give thread length necessary to the devices of the automatic apparatus for reconnection. In that case, it is absolutely necessary that the operation of restarting the spinning process be carried out manually by the personnel, which fact means a remarkable employment of labour; moreover, an automatic device can intervene in a more accurate way and at a more constant frequency than the technical staff. Thus the present invention has the object of increasing the extent of automation in ring spinning, a technique that at the present time requires the employment of personnel so that it is onoreous, and in addition the invention has the object of avoiding simultaneously and safely the poor accuracy of manual operations. These and other advantages are reached with the process of the present invention to form a small amount of reserve or spare thread on a cop lacking wound thread, or having wound thread of insufficient length, by means of operation that are activated one after another by the members of a device arranged on a carriage which is movable along the front part or the front parts of the spinning spindles; and said procedure is characterized in that it comprises the operations of:

- inserting on an auxiliary pivot the cop removed from the spindle after checking the need for supplying the same with a small reserve of wound thread for allowing the operation of automatic reconnection to be performed;
- transferring the thread from an auxiliary spool from which it is unwound to the basis of said cop around which a small reserve of wound thread is formed;
- successively transferring the cop, already provided with said small reserve of wound thread, from the auxiliary pivot to the pivot of a suction station.

The device for carrying out in practice the procedure mentioned above comprises the following operative members:

- an auxiliary pivot driven for rotation, about which a thread gripping member moves, said gripping members being associated to a thread cutting member, both said members being driven together by lever means which give rise to a set of motions which are suitable to hold the end of the thread coming from the auxiliary spool and also suitable to

locate and arrange diametrically said end of the thread at the top of the auxiliary pivot, blocking said end at the moment when the cop inserts on said auxiliary pivot;

- an auxiliary spool which is full of wound thread and provided laterally with a reciprocating thread guide which is caused to move with a to-and-fro motion in the vertical direction by the rod of a pneumatic actuator or a similar driving member;
- a variable profile radical cam for guiding the gripping tool or nippers from the position of the spindle of the spinning front to the position of the auxiliary pivot, from this last to the pivot of the suction station, and from this last to the starting spinning spindle.

According to a preferred embodiment of the device of the present invention, the auxiliary pivot has a toothed top. According to a further preferred embodiment of the present invention, said device is assembled in the movable carriage of the apparatus for automatic reconnection of the thread with the bundle of the textile fibers coming out of the last pair of drawing rollers of a ring spinning machine.

The device employed for the practical embodiment of the present invention is associated with some programming means for the coordination of the starting sequence of the various operative members.

This invention will be disclosed in the following in a detailed way and on the basis of the exemplary embodiment which is shown schematically in the enclosed drawings of the figures which illustrate briefly the features of the invention, but it is to be pointed out that all the enclosed drawings as well as the disclosure of the same that will be given in the following correspond to a preferred embodiment of the invention for making its realization easier to understand, but all structural variants included in the general idea which is disclosed in the enclosed drawings are to be considered as included in the scope for which a priority right is claimed:

- Figure 1 illustrates a schematic top view of the gripping tool associated in operative cooperation with the variable profile radial cam with the presence of lever means and of actuators which activate their motions, said figure also illustrating the moment when the gripping tool is in the vertical position on the spinning spindle;

- Figure 2 illustrates an axonometric perspective schematic view of the device prearranged for obtaining the formation of a small reserve of thread wound on the cop from the corresponding spinning spindle, with the presence of the auxiliary spool, said figure also illustrating the moment when the cop manipulated by the gripping tool or nippers is going down vertically for insertion on the auxiliary pivot while the end of the feed thread coming from the auxiliary spool is already arranged and subject to tensile stress diametrically at the top of said auxiliary pivot by means of the grip exerted by the thread gripping member, such member being already arranged externally with respect to said auxiliary pivot and on the opposite part of the auxiliary spool;

- Figure 3 illustrates an axonometric perspective view of the device of the present invention and it also illustrates the moment when the small reserve of thread is forming on the top inserted on the auxiliary pivot, said thread being wound by the simultaneous rotation of the auxiliary pivot itself and the reciprocating to-and-fro motion of a thread guide;

- Figure 4 illustrates an axonometric perspective schematic view of the device according to the present invention, and it also illustrates the moment when the small reserve of wound thread has already been placed on the cop while the thread gripping member associated as an operative group to the thread cutting member has transferred together with the latter to a position for gripping and cutting the thread in the taut length between said cop and the thread guiding member;

- Figure 5 illustrates an axonometric perspective schematic view of the device of the present invention and it also illustrates the moment when the cop carrying the small reserve of wound thread is going down, after being taken by the auxiliary pivot, in the vertical direction for insertion onto the underlying pivot at the suction station, while the group of the thread gripping member and of the thread cutting member has moved to reach a position external to the auxiliary pivot and on the opposite part of the auxiliary spool, so forcing the end of the feed thread to arrange diametrically at the top of said auxiliary pivot;

- Figure 6 illustrates an axonometric perspective sche matic view of the device according to the present invention, and it also illustrates the moment when the cop provided with said small reserve of wound thread is already located under the bell of the suction station and under the action of the blowing nozzles for the operation of starting the proper reconnection in order to restart the spinning process;

- Figure 7 illustrates a schematic top view of the gripping tool or nippers associated in operative cooperation to the variable profile radial cam by means of the presence of lever means and of actuators, which activate their motions, said figure also illustrating the moment when the gripping tool is in the vertical position on the spindle after translating said cop from the position of the pivot of the suction station to the spinning spindle from which it had been taken away at the start in order to put on

the same a small reserve of wound thread that is necessary for obtaining the automatic reconnection in a ring spinning machine.

In the enclosed figures, equal members are pointed out with equal reference numerals.

Moreover, for the sake of clearness of the whole device, the details that are not necessary for understanding the invention have been omitted from the figures or they have been shown in a general way as they are already known per se.

In the enclosed figures:

1 is the toothing or knurling of the top of the auxiliary pivot for arranging and holding firmly as regards the diametrical position the end of the feed thread 12;

2 is the cop removed from its own spindle after check ing the same for the absence of wound thread;

3 is the auxiliary spool that collects the feed thread 12 to bring a small reserve of wound thread onto the cop 2;

4 is a scissors-type member for cutting the feed thread 12 after the same has wound to form the small reserve 34;

5 is the thread gripping member or the nippers-type member that can be of any suitable shape for performing the task of gripping and holding the feed thread 12 to cut the same with said scissors-type member 4 after the reserve amount of thread 34 has collected on said cop 2; the thread gripping member and the thread cutting member are both associated into a single operative block driven by lever means for motion around the auxiliary pivot 6;

6 is the auxiliary pivot on which the cop 2 is inserted;

7 is the path of the casing of the operative front of the ring spinning machine;

8 points out the spinning spindles;

9 is the reciprocating thread guide which is driven by a pneumatic actuator 31 into a to-and-fro motion in the vertical direction;

10 is a wheel or any other similar member that guides the motion of the gripping member or nippers for the manipulation of the cop 2 through the fixed profile 18 and the variable profile 21 of the radial cam;

11 is the rod of the actuator 14 activating the arc shift 23;

12 is the feed thread that is fed by the auxiliary spool 3;

12a is the position of the thread held fast by the cop when the latter is inserted on the auxiliary pivot;

15 is the gripping member or nippers that grips the cop 2 to locate the same at suitable points in the various operative stages;

16 is the bell-crank lever rotating about the pivot 19 and driven by the actuator 14;

16a is the position, shown with a dashed line of the lever means 16 after undergoing the shift 23 for causing the gripping member to shift from the position of the spindle 8 to the position on the vertical of the auxiliary pivot 6;

18 is the fixed part of the radial cam whose guide profile through the wheel 10 guides said gripping member 15 when the same shifts operatively;

20 is the pivot underlying the suction station;

21 is the movable part of the radial cam that is shiftable around the fulcrum or pin 25 along an angular path by means of the rod 22 of the actuator means 24;

21a is the position of the movable part 21 of the radial cam for guiding the cop-gripping nippers from the position 15a to the position 15b and from the latter to the position 15;

16b is the position of the lever means 16 when the wheel 10 comes at lOb and the gripping member 15 is at 15b, a position corresponding to the position 21a of the movable profile of said radial cam;

26 is the supporting casing of the device of the present invention;

27 is the actuator that raises and lowers the rod 28 for shifting vertically the cop-gripping member 15;

29 and 30 are the guide and deviation eyes of the path of the feed thread 12;

31 is the actuator means that drives the thread guide 9 giving the same a reciprocating to-and-fro motion in the vertical direction;

32 points out washers of conventional design for stretching the feed thread 12 when it passes through the auxiliary spool 3 and the cop 2;

33 is the block of the actuator and the lever means which are suitable to move the thread gripping member 6 and the thread cutting member 4 both for holding and cutting the thread 12, and for arranging said members 5 and 4 at accurately determined points around said auxiliary pivot 6;

34 is the small reserve of wound thread which is necessary for allowing the automatic reconnection operation to occur;

35 is the source of motion for driving the auxiliary pivot 6 into rotation;

36 is the suction bell;

38 points out the blowing nozzles which are prearranged in a suitable way at the suction station under which the cycle of finding and catching the end of the thread for performing the automatic reconnection starts.

The disclosure of the operation given in the following, with reference to the figures mentioned

above, refers above all to novelties and then it takes into consideration just the device according to the present invention that performs the operation of winding a number of thread reserve turns on cops which lack wound thread, or which lack wound thread of length sufficient to carry the automatic reconnection operation into effect, being understood that for the operation of said device some complementary devices are necessary which will not be disclosed herein.

The technique of assooiating a ring spinning machine to a carriage apparatus for reconnecting automatically broken threads during the operation of the spinning spindle is well known. Said carriage is made movable along the spinning front or fronts by means of shift ways comprising one or more tracks of any shape cooperating with suitable rolling means such as wheels or rollers or equivalent means. During the operation of the spinning machine, the carriage for thread reconnection is moved continuously in a reciprocating way in front of the spindle line, so performing a patrol-like oscillating attendance. During such attending action the carriage apparatus checks with detector means of conventional type each spinning spindle for the presence or absence of thread on the same. When it detects lack of one of threads to form, it stops the carriage at the point of the spindle where the broken thread is present and it also checks, with detecting means again of standard kind the cop for the absence of wound thread or for the presence of wound thread of length insufficient to carry out the automatic reconnection operation, which is already technically known, to restart the spinning process. If the absence of thread is detected or if the presence of a limited number of thread turns is detected, the device of the present invention is activated.

The gripping member 15 comes out of the carriage-borne casing 26 to go to the spindle 8 carrying the cop 2 on which the absence was detected of a small reserve of wound thread. The whole operation is obtained through the activation of actuator means 14 which, shifting the bell-crank lever 16 through an angle by means of the rod 11 causes the wheel 10 to roll on the front profile of the fixed part 18 of the radial cam, so that as a result the gripping member 15 is guided to said spindle 8. At the end point of said shift, the actuator 27 is activated, and it lowers vertically by means of the rod 28 the gripping member 15 to a point at which the same grips the upper end of the cop 2. Said gripping member can be of any shape already known. When said cop 2 is gripped, the actuator 27 is activated again to raise the same cop 2 removing it from its spindle just to the extent that makes it free to go far from the operative front 7 of the ring spinning machine. Such removal is performed by activating the actuator 14 that pushing the rod 11 out causes the bell-crank lever 16 to rotate through an angle along the direction of the arrow 23, so as to arrange the same at 16a. Said gripping member during such shift is again guided by means of the rolling motion of the wheel 10 against the front profile of the fixed part 18 and of the movable part 21 (see Figure 1). The gripping member 15 that grips the cop 2 comes to the position 15a corresponding to the position 16a of the lever means 16 and to the position 10a of the wheel 10 (see Figure 1). At the position 15a, the gripping member supports the cop 2 along the vertical line of the auxiliary pivot 6.

During the shifts mentioned above, the feed thread 12 is maintained in position and is put under tension along a precise predetermined path by the guide and transmission eyes 30 and 29 as well as by the small tension plates 32, so that it reaches the upper end of the thread guide 9 that sends it between the teeth 1 of the top of the auxiliary pivot 6 by means of the shifts and of the station point of the block joining the thread gripping member 5 and the thread cutting member 4. Indeed, said block is arranged at a point waiting for a cop that is inserted on the pivot 6 (see Figure 2). Then the activation follows of the actuator 27 which, through the rod 28, causes the gripping member or nippers 15 to lower till inserting the cop 2 on the auxiliary pivot 6 so as to grip the thread between the cop and the pivot and to force it into the position 12a (see figure 2). After the cop has been inserted, the gripping member 15 releases the upper grip of the cop and then it is raised by activating the actuator means 27 (see Figure 3). At the same time, just after the release of said gripping action, both the motion source 35 and the actuator 31 are simultaneously activated, said motion source 35 driving the auxiliary pivot 6 and then the cop 2 into rotation, while said actuator 31 drives the thread guide 9 into reciprocating motion in a to-and-fro vertical path. Said rotation as well as the to-and-fro vertical motions force the thread 12 to unwind from the auxiliary spool 3 to wind on the cop 2 forming a small reserve of wound thread near the basis of the same. Just after few to-and-fro shifts of the thread guide 9 a small reserve of wound thread 23 is formed, so that the motion source 35 and the actuator means 31 are disactivated. The actuator 27 is activated to cause the gripping member 15 to lower so that the same grips the cop 2 at its upper end. At the same time that said gripping member 15 is lowered, the actu ator means and the lever means of the block 33 are activated, which means initially open the clamps or any other similar device of the thread gripping member 5 so setting the end of the wound thread free, which means also successively shift to the part opposite to the auxiliary

pivot 6 both the thread gripping member and the thread cutting member. Indeed, such members are at a point between the cop that already bears the small reserve 34, and the thread guide 9. When the members 5 and 4 reach said position, they enclose the length of taut thread between the winding 34 and thread guide 9 (see Figure 4).

The clamps of the thread gripping member 5 close and they grip and hold fast the thread located between them. At the next moment the thread is cut at a point after the clamps by the side of the cop 2, by the action of the thread cutting member that operates with its own cutting blades. At that moment the other end of the turns making up the small reserve 34 is also free and hence it is no longer joined to the feed thread 12 coming from the auxiliary spool 3; in the meanwhile the end of the feed thread 12 is kept gripped by the clamps of the thread gripping member 5. At the moment after said cutting action, the actuator 27 is activated, so that it raises the gripping member 15 carrying the cop 2. Then the activation of the actuator 24 follows immediately, which actuator, shifting through the rod 22 the movable part 21 into the position 21a forces the gripping member 15 to go into the position 15b corresponding to the position 16b of the lever means 16 and to the position 10b of the wheel 10 (see Figure 7). When the gripping member is at the position 15b it supports the cop 2 carry ing a reserve of wound thread 34, on the vertical line of the pivot 20 underlying the suction bell 36. During the last mentioned shifts, the thread gripping member 5 and the thread cutting member 4 are shifted together by means of the levers and of the actuators of the block 33 towards the part opposite to the auxiliary pivot 6 in order to reset the preceding position, so forcing the end of the thread 12 to lie down and to insert itself into the space between the teeth 1 of the top of said auxiliary pivot 6 and in diametrical position (see Figure 5). The feed thread 12, kept taut and gripped between the clamps of the thread tension member 5 is in a position waiting for another successive cycle of winding of a small reserve of wound thread on another cop which is itself lacking wound thread or which carries wound thread of a length that is not enough for allowing automatic reconnection. At the moment after the position 15b of the gripping member has been reached, the actuator 27 is activated, which causes through the rod 28 the gripping member 15 to lower so forcing the cop to become inserted on the pivot 20 at the position 2a. Then the gripping action is released and the gripping member 15 is raised into a position of operative waiting. At the next moment, a control device is actuated which causes the cop 2 bearing the small reserve of wound thread 34 to be vertically raised under the suction bell 36 (see Figure 6). Incidentally, it can be observed that the various operative stages mentioned above can be superposed temporally at least partially to one another in order to obtain time optimization of the whole operative cycle. When the raising under the suction bell 36 is finished, the other op erative stages follow according to a programmed cycle by the action of the various known devices to complete the automatic reconnection in order to restart the spinning process on the spindle. The embodiment disclosed above has been shown just for exemplification and not for limitative purposes of the invention. It is evident that variants, modifications and additions can be introduced by those who are skilled in the art as regards details of the device without departing from the basic idea of the present invention.

## Claims

1. A process for winding thread on a cop lacking wound thread or having wound thread of length insufficient to allow the automatic reconnection to be performed of said thread to the small bundle of textile fibers coming out of the last pair of the drawing rollers in a ring spinning machine, said process being characterized in that:

- the cop removed from its own spindle is inserted on an auxiliary pivot after ascertaining that the cop has no wound thread or that it carries turns of thread of limited length which does not allow the automatic reconnection operation to be performed;
- the thread is transferred from an auxiliary spool from which it is unwound to the basis of the cop inserted on the auxiliary pivot and around which the thread itself is wound to form a number of turns which is largely enough to warrant the proper length of sucked thread necessary for performing the well known automatically reconnection operation in a ring spinning machine;
- then transferring the cop that already bears a number of thread turns from the auxiliary pivot to the pivot underlying a suction station prepared for the search of the end of the thread and for the catching of such end to perform the automatic reconnection operation.

2. A device for carrying the process according to claim 1 into effect, said device being characterized in that it comprises:

- an auxiliary pivot which is motor driven into rotation, just like a mandrel around which a thread gripping member moves which is associated to a thread cutting member, both such members being caused to move together by lever means which give rise to a set of motions to hold the end of the thread coming from the auxiliary spool and for putting the thread in position, causing the same to

lie down diametrically at the top of the auxiliary pivot in order to allow the cop to grip the same holding it fast at the moment when the cop is inserted on said auxiliary pivot;

- an auxiliary spool adjacent to said auxiliary pivot and provided on its side with a reciprocating thread guide which is caused to move in a vertical to-and-fro motion by the rod of a pneumatic actuator or any other similar driving member;
- a variable profile radial cam for guiding the gripping member or nippers, such cam being caused to move by pneumatic actuators or by any other similar actuators, from the position of the spindle up to the position of said auxiliary pivot, from the same up to the pivot underlying the suction station and from this last up to the starting spinning spindle.

3. A device according to claim 2, characterized in that the auxiliary pivot has a toothed top.

4. A device according to claim 2, characterized in that it is housed within the movable carriage of the apparatus for performing the automatic reconnection operation of the thread to the small bundle of textile fibers coming out of the last pair of the drawing rollers of a ring spinning machine.

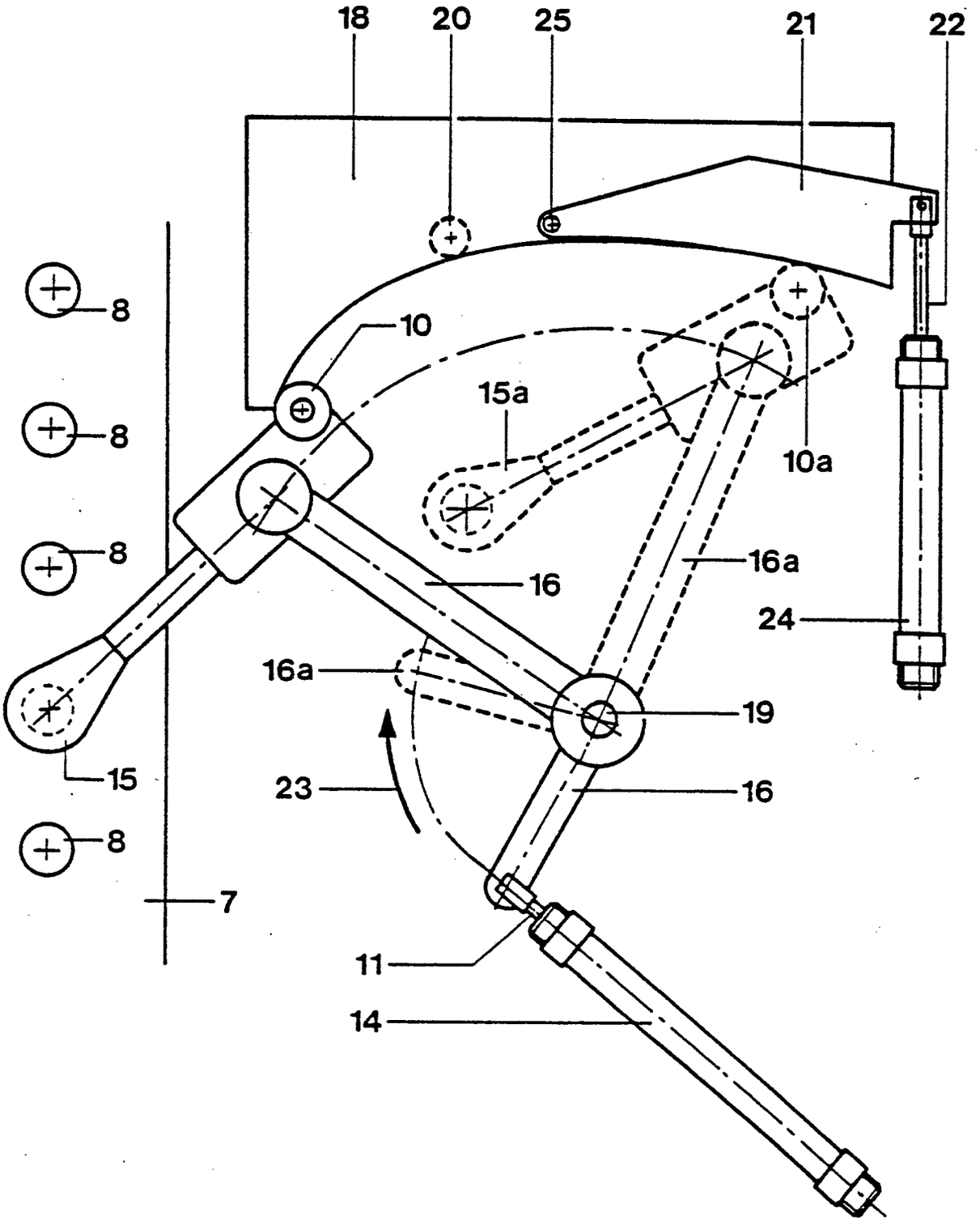


Fig. 1

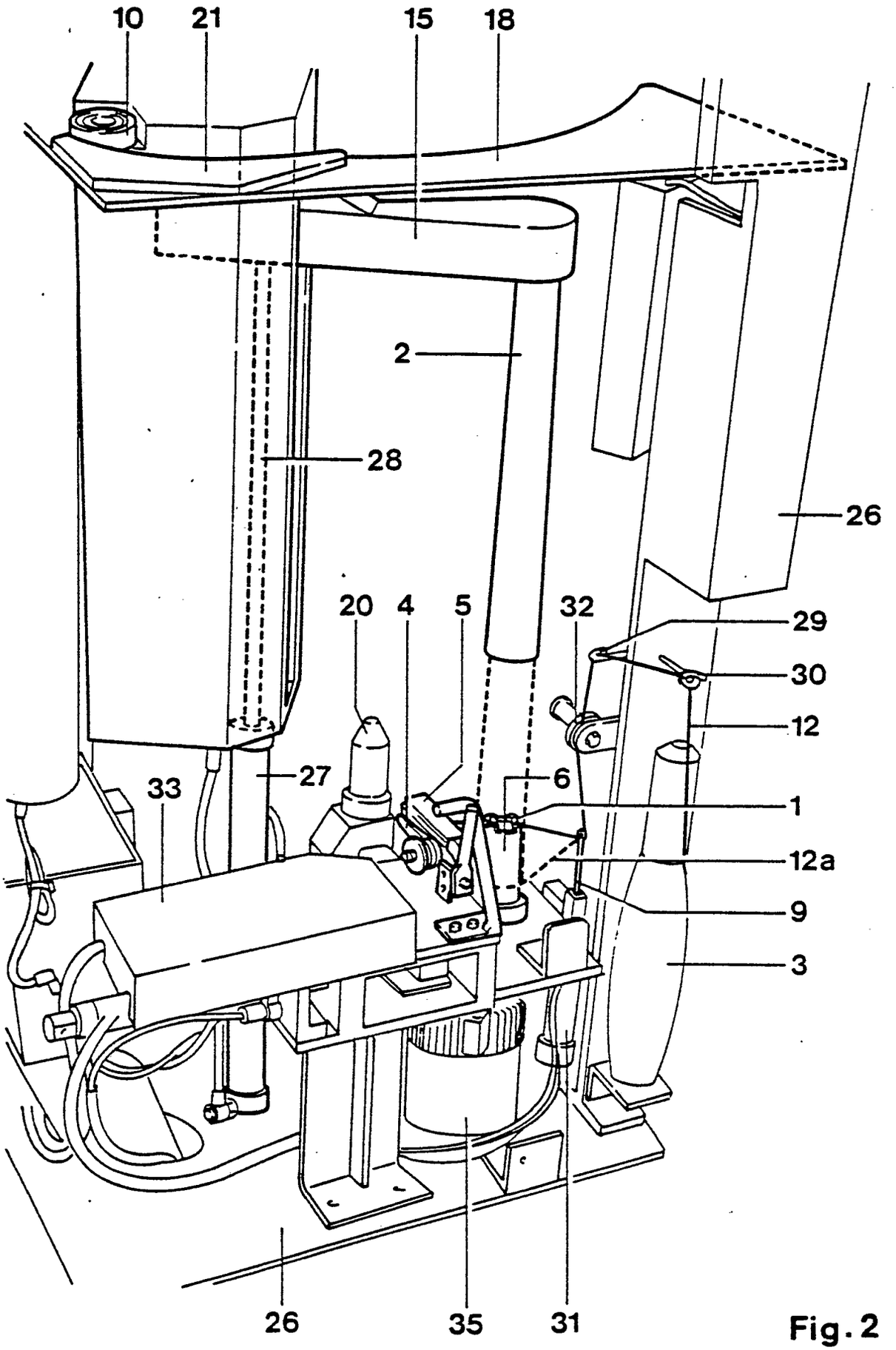


Fig. 2

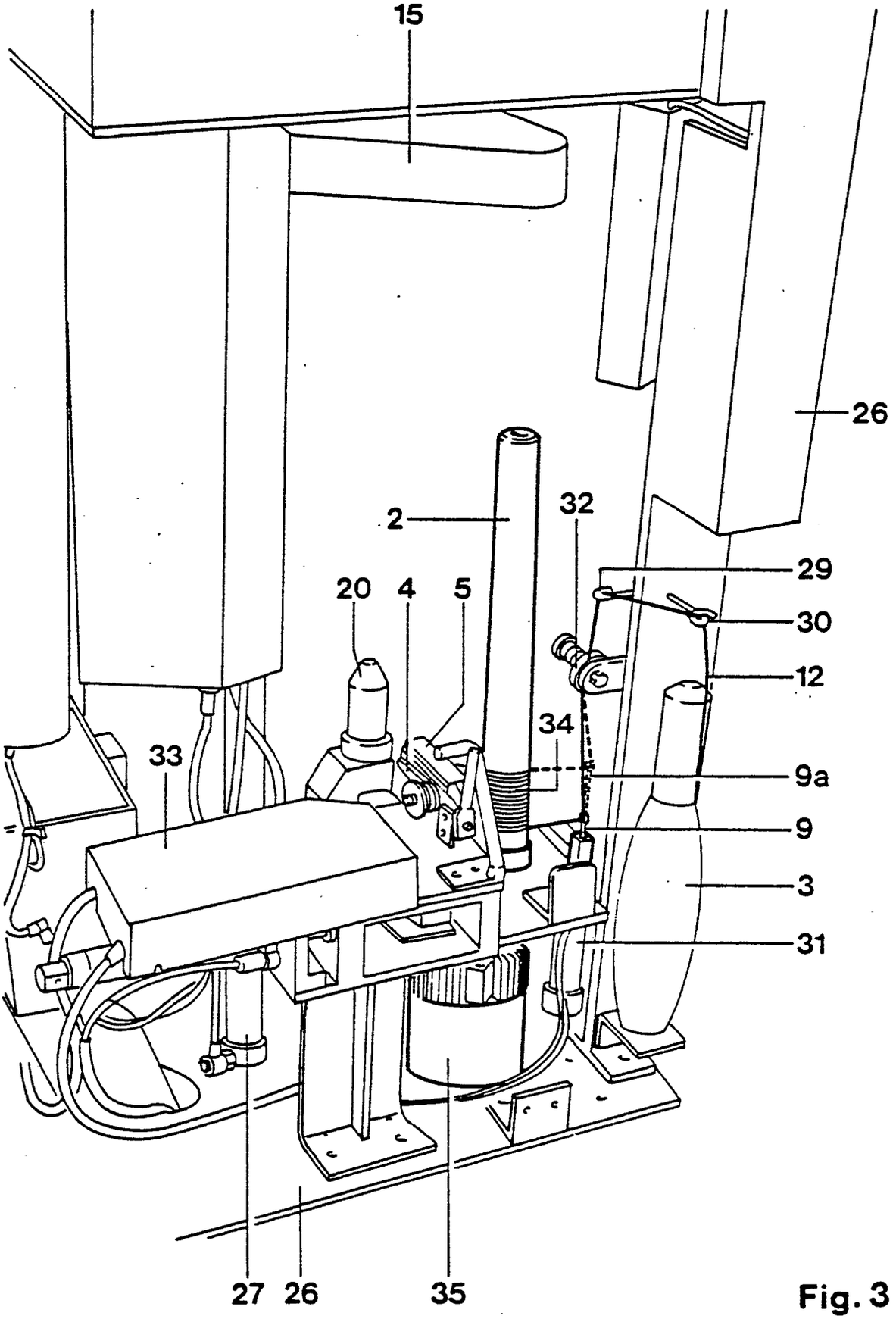


Fig. 3

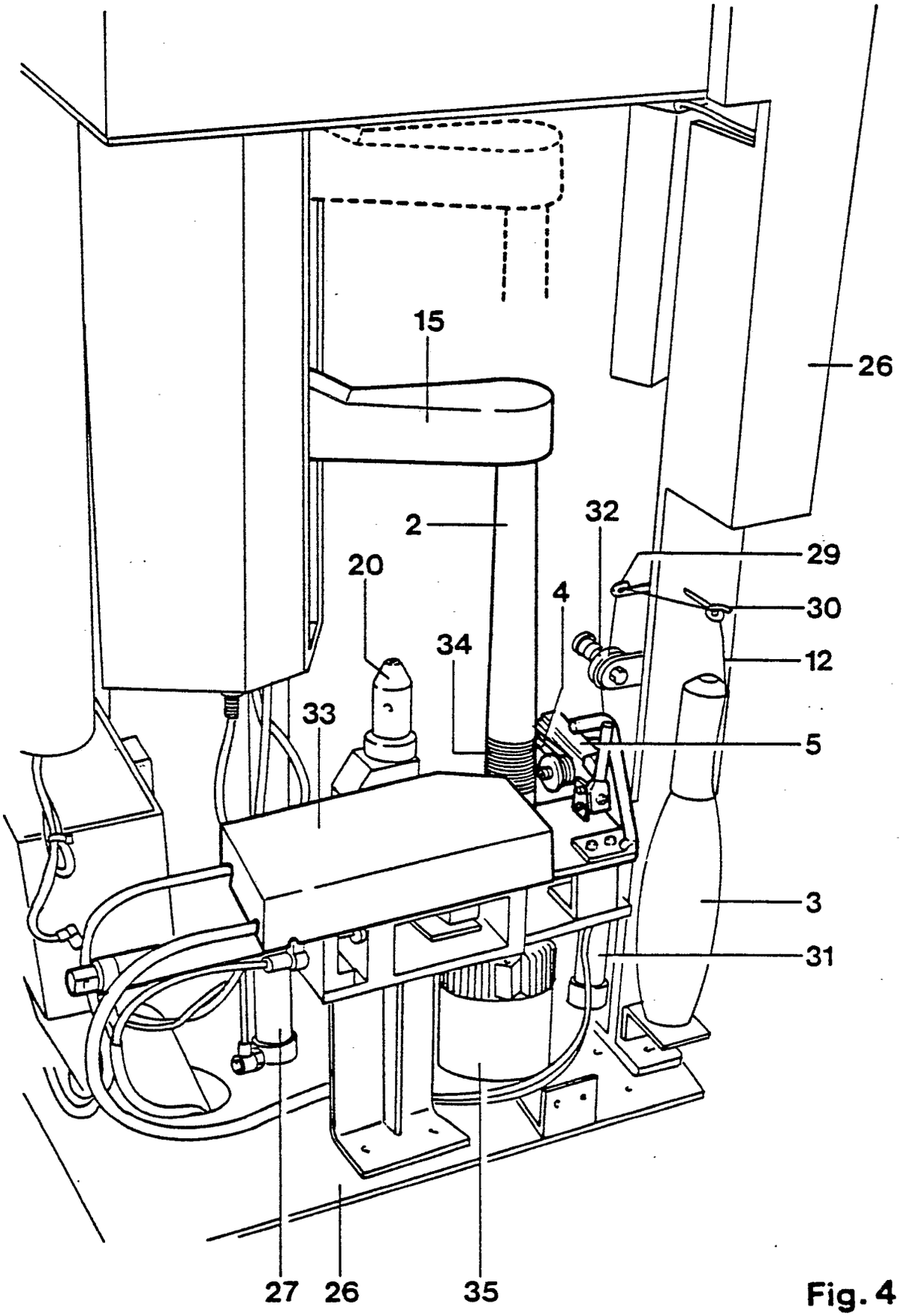


Fig. 4

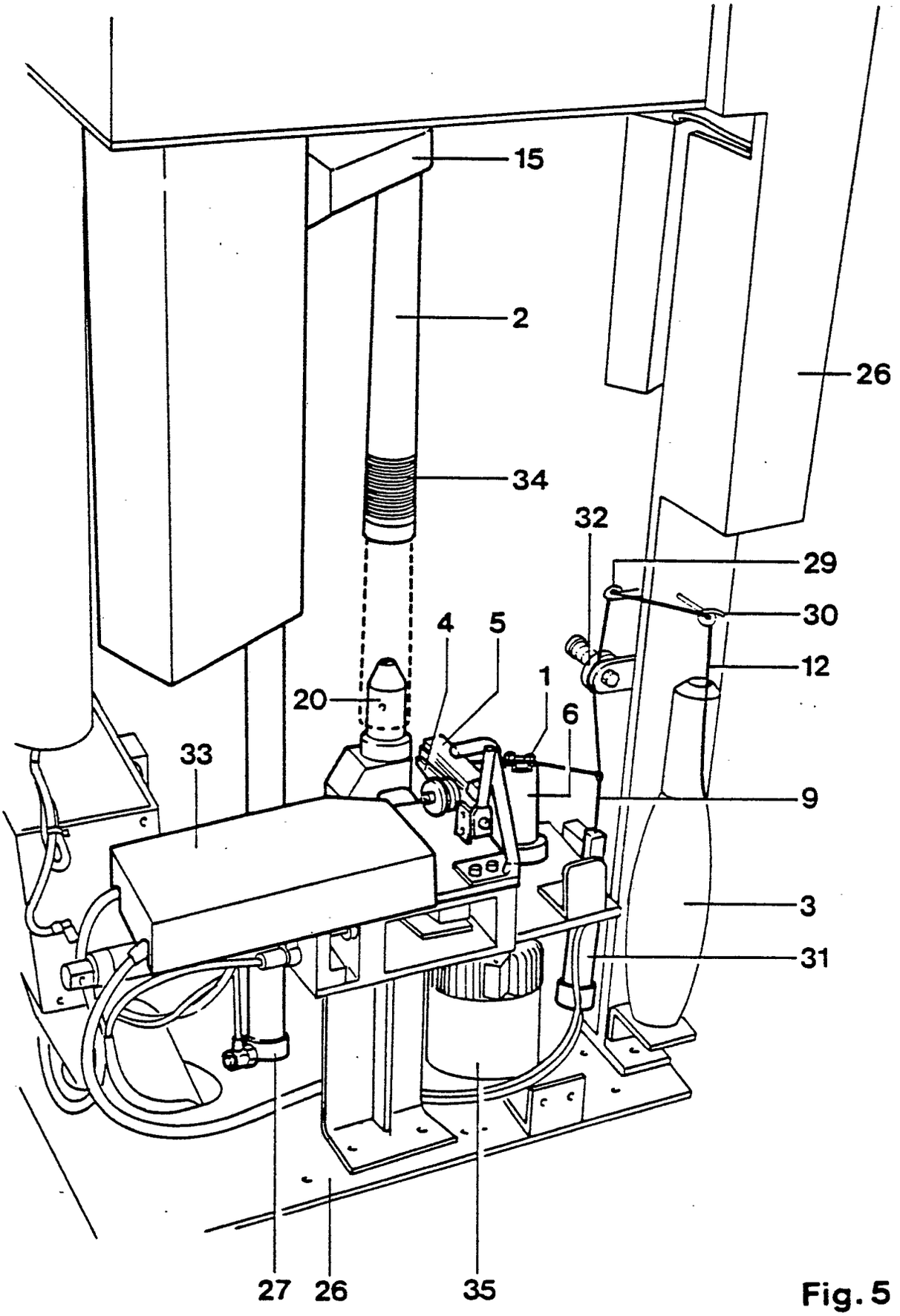


Fig. 5

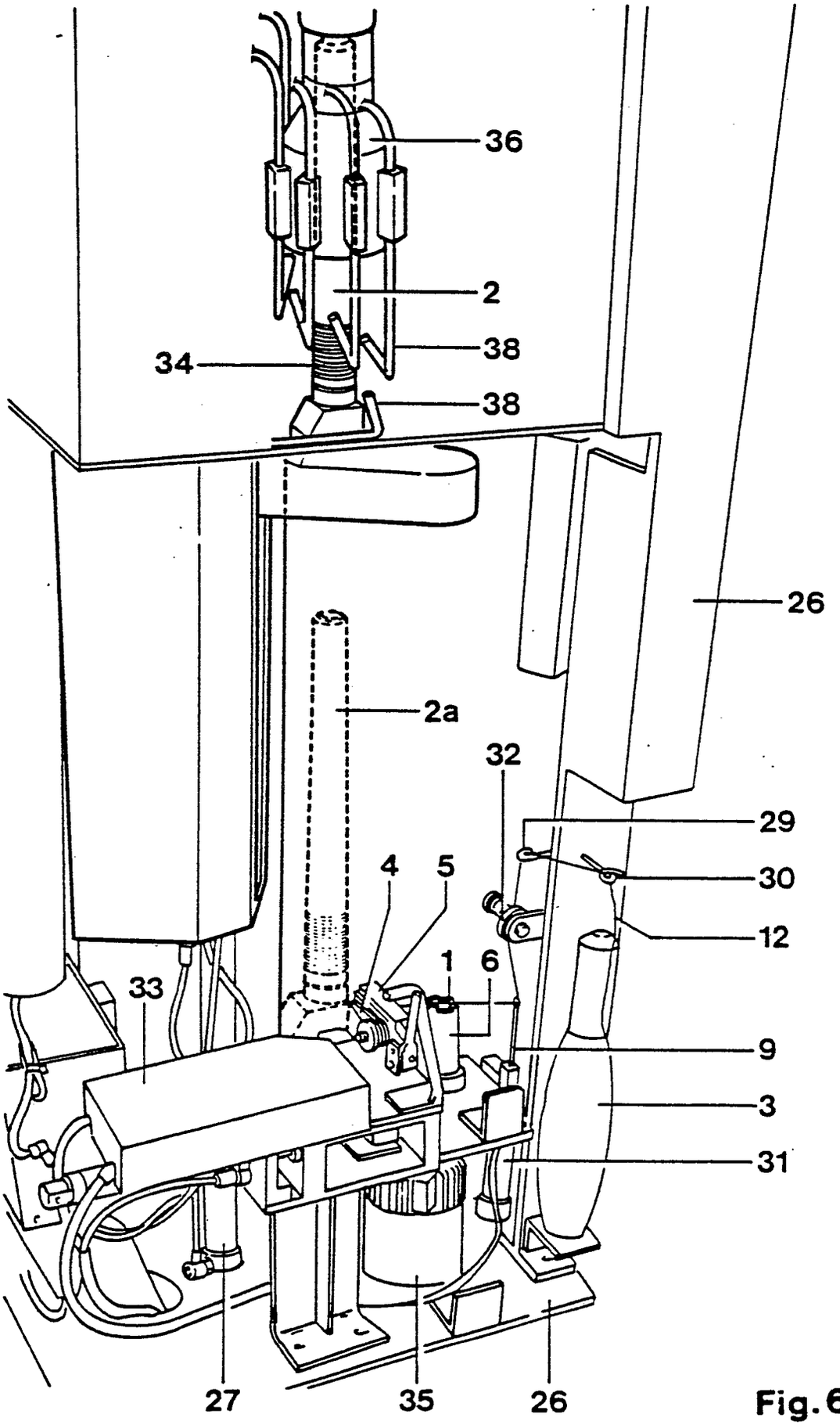


Fig. 6

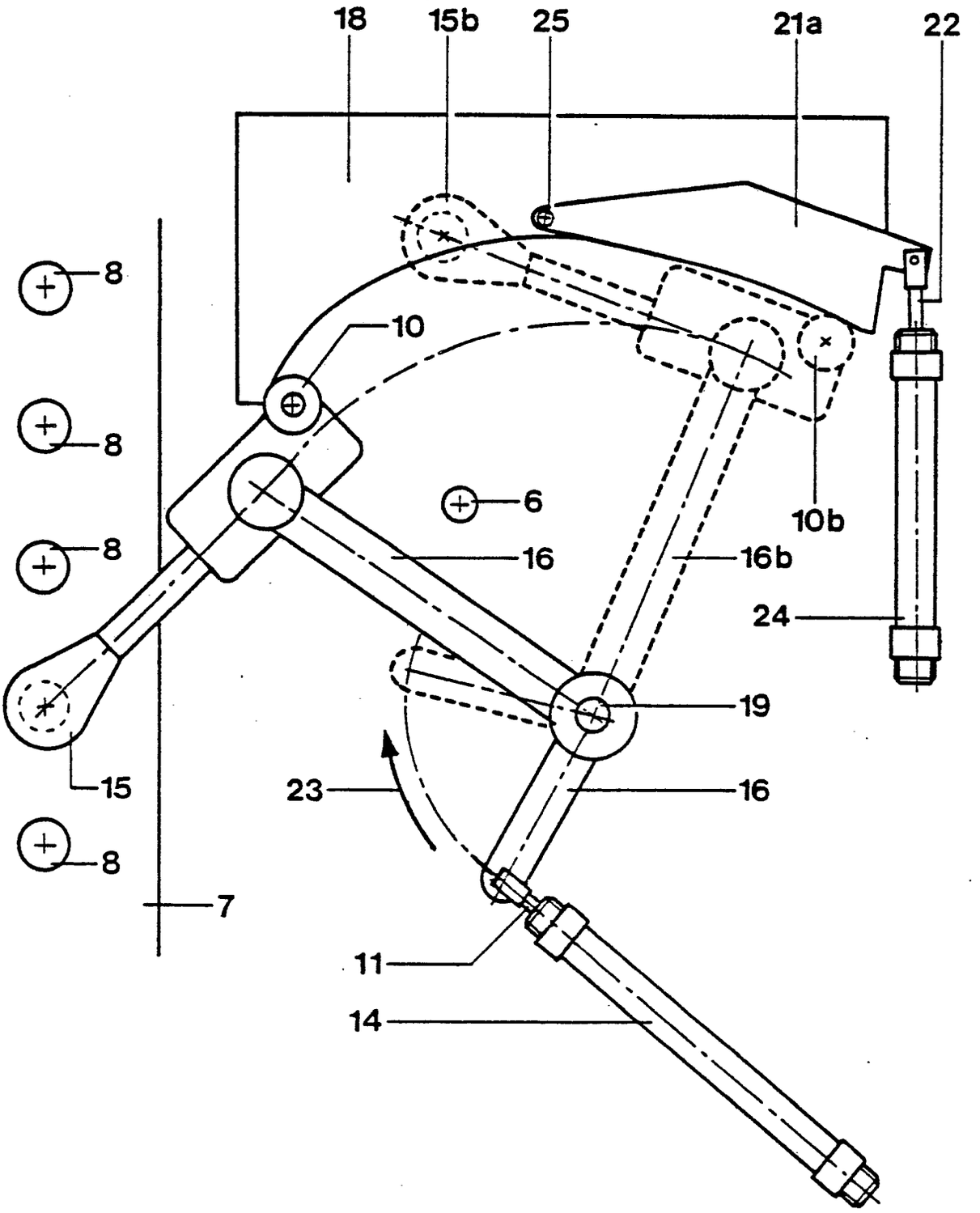


Fig.7

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# EUROPEAN SEARCH REPORT

Application Number

EP 88 20 2767

## 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.4 ) |
|---|---|---|---|
| A | DE-A-2612660 (COGNETEX)<br>* claim 1; figures 1-2, 8, 16 *<br>--- | 1-2 | D01H15/00 |
| A | FR-A-1582077 (LEESONA CORP.)<br>* figures 1-19 *<br>--- | 1-2 | |
| A | DE-A-1932014 (PARKS-CRAMER)<br>----- | | |

TECHNICAL FIELDS SEARCHED (Int. Cl.4 )

D01H
B65H

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 21 FEBRUARY 1989 | RAYBOULD B.D.J. |

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