(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 166 146 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
**24.03.2010 Bulletin 2010/12**

(51) Int Cl.:
***D06F 65/06*** *(2006.01)*

(21) Application number: **09170575.6**

(22) Date of filing: **17.09.2009**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR**

(30) Priority: **19.09.2008 IT TV20080115**
**19.09.2008 IT TV20080116**
**19.09.2008 IT TV20080117**

(71) Applicant: **IMESA SPA**
**31040 Cessalto (TV) (IT)**

(72) Inventor: **Gerotto, Sandro**
**30020 Venezia (IT)**

(74) Representative: **Dragotti, Gianfranco et al**
**Dragotti & Associati srl**
**Via Paris Bordone 9**
**31100 Treviso (IT)**

# (54) Industrial ironing machine

(57) The invention relates to a machine (20) for industrial linen ironing. The machine comprises an ironing roller (24), a shoe (26) and an apparatus (28) for moving the shoe (26). The shoe is radially movable between a predefined rest position (A) in which the shoe is distant from the roller and a working position (B) in which the shoe is close to the roller. The apparatus for moving the shoe (26) comprises means (50, 52) for controlling the force applied to the shoe during its movement towards the roller and able to maintain a constant pressure between ironing roller (24) and shoe (26), and contrast means (32) tending to move the shoe (26) from the working position (B) to the rest position (A).

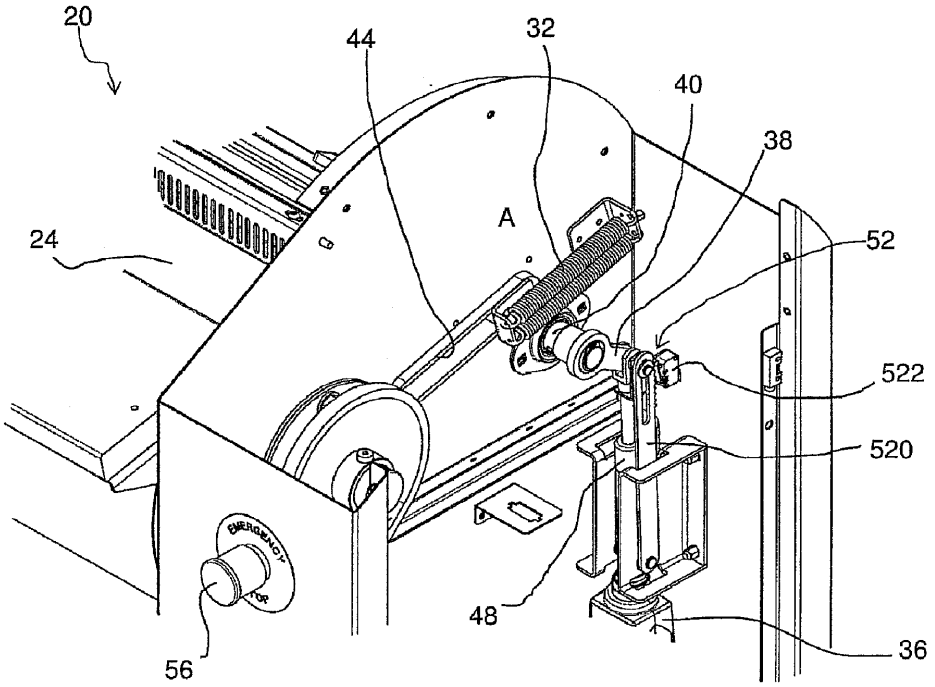


Fig. 6

EP 2 166 146 A2

## Description

**[0001]** The present invention relates to a machine for ironing linen and in particular relates to a machine for industrial or professional use, also known as a "mangle".

**[0002]** The mangle comprises in a manner known per se a rotating roller lined with steel wool and a heated shoe. The heated shoe, resting on the roller, performs the ironing action, while rotation of the roller allows feeding of the linen to be ironed and release of the linen once ironed.

**[0003]** In mangles of the known type, motor-driven means allow displacement of the shoe from a predefined rest position distant from the roller into a predefined working position close to the roller.

**[0004]** This type of shoe movement system, although widely used, is not defect-free.

**[0005]** In fact, the working position is predefined depending on the nominal diameter of the roller and the average thickness of the linen to be ironed.

**[0006]** During the working life of the mangle, however, the actual diameter of the roller decreases owing to gradual compaction of the layer of steel wool.

**[0007]** Similarly, the thickness of the linen to be ironed may vary substantially depending on the type of fabric and the number of layers of fabric, for example in the case where the linen is already folded.

**[0008]** In view of the abovementioned factors, the predefined working position is not able to ensure an ironing pressure which is constant over time, owing to the reduction in the diameter of the roller and does not allow ironing of linen which has a considerable thickness, for example linen which is already folded.

**[0009]** In machines of the known type, the movement of the shoe towards the roller is imparted only to one end of the shoe.

**[0010]** It will therefore be entirely clear to the person skilled in the art that the ironing pressure will be maximum at the end of the shoe to which the movement is transmitted.

**[0011]** An important aspect is therefore that of achieving a substantially uniform ironing pressure along the entire contact surface between shoe and ironing roller, so that the fabric may be uniformly ironed in the axial direction.

**[0012]** The known motor-driven system for moving the shoe from the working position into the rest position also has other drawbacks with regard to ensuring the undamaged state of the linen and the safety of the operator. In particular, the emergency procedure for moving the shoe away from the roller usually requires fairly complex operations and therefore takes a relatively long amount of time. For example, some mangles of the known type comprise emergency switches which interrupt the power supply to the roller motor and to the shoe resistances, while movement of the shoe away from the roller is performed manually by means of a special crank handle.

**[0013]** In the event of a sudden interruption of the power supply, the linen may remain pressed between the locked roller and the shoe which is still hot. This condition may seriously damage the linen or, in the worst case, cause a fire.

**[0014]** An even more serious condition is that where the operator's hands remain trapped between the roller and the shoe; the emergency operations, for example those described above, usually require the intervention of another person or in any case, in the best of circumstances, require that the operator him/herself is able to use freely at least one hand.

**[0015]** The object of the present invention is therefore to overcome the drawbacks of the

prior art.

**[0016]** In particular, one task of the present invention is to provide a mangle which is able to ensure that a constant ironing quality is maintained during the entire working life of the machine.

**[0017]** Furthermore, a task of the present invention is to provide a mangle which is able to allow the ironing of different thicknesses of linen, as for example in the case of folded linen.

**[0018]** Furthermore, a task of the present invention is to provide a mangle which envisages simple and rapid emergency manoeuvres compared to those which are required for the mangles of the known type.

**[0019]** The abovementioned object and tasks are achieved by an ironing machine in accordance with that claimed in Claim 1 and in Claim 12.

**[0020]** The characteristic features and the further advantages of the invention will emerge from the description provided below, of a number of examples of embodiment, provided by way of a non-limiting example, with reference to the accompanying drawings in which:

- Figure 1 shows a perspective view of an ironing machine according to the invention;
- Figure 2 shows a perspective view of an alternative embodiment of an ironing machine according to the invention;
- Figure 3 shows a cross-sectional view of the machine according to the invention with the shoe in the rest position;
- Figure 4 shows a view, similar to that of Figure 3, in which the shoe is in the working position;
- Figure 5 shows a detail of the shoe movement apparatus in a machine according to the invention;
- Figure 6 shows a detail of the shoe movement apparatus in a machine according to the invention, where the outer cover has been partially removed, with the shoe in the rest position;
- Figure 7 shows the detail of Figure 6, with the shoe in the working position;
- Figure 8 shows a detail of the shoe movement apparatus in to a first embodiment of the machine according to the invention, where the outer cover has

been partially removed;
- Figure 9 shows the detail of the actuator indicated by VII in Figure 8;
- Figure 10 shows another view of the actuator according to Figure 9;
- Figure 11 shows a view of an actuator, similar to that of Figures 9 and 10, in the rest position;
- Figure 12 shows a view of the actuator according to Figure 11, in the working position;
- Figure 13 shows a detail of the shoe movement apparatus in a second embodiment of the machine according to the invention, where the outer cover has been partially removed;
- Figure 14 shows the detail of the actuator indicated by XII in Figure 13;
- Figure 15 shows another view of the actuator according to Figure 14;
- Figure 16 shows a detail of the shoe movement apparatus in a third embodiment of the machine according to the invention, where the outer cover has been partially removed;
- Figure 17 shows the detail of the actuator indicated by XV in Figure 16;
- Figure 18 shows another view of the actuator according to Figure 17;
- Figure 19 shows a first end of an emergency control device according to the invention;
- Figure 20 shows a second end of an emergency control device according to the invention.

**[0021]** With reference to the accompanying figures, an ironing machine or mangle is indicated in its entirety by 20.

**[0022]** The ironing machine 20 comprises a roller 24, a shoe 26 and an apparatus 28 for moving the shoe 26. In particular, the shoe 26 is movable radially with respect to the roller 24, between a rest position and a working position. In the rest position (indicated by A in Figure 3) the shoe 26 is distant from the roller 24, while in the working position (indicated by B in Figure 4) the shoe 26 is close to the roller 24. The apparatus 28 for moving the shoe 26 according to the invention comprises means for controlling the force applied to the shoe 26 during its movement towards the roller 24 and able to maintain a constant pressure between ironing roller 24 and shoe 26. Furthermore, the apparatus 28 comprises contrast means 32 which tend to bring the shoe 26 from the working position into the rest position.

**[0023]** The cylindrical form of the roller 24 defines specifically the axis of rotation and symmetry. Here and below "axial direction" is understood as meaning the direction of a straight line parallel to the axis. Similarly, radial direction is understood as meaning the direction of a straight half-line which is perpendicular to the axis and has its origin on the axis itself. "Transverse plane" is understood as meaning any plane which lies perpendicular to the axial direction.

**[0024]** In accordance with a possible embodiment, which can be clearly seen in Figures 3 and 4, the roller 24 comprises a rigid drum 240 lined with a layer of steel wool 242; the steel wool 242 is in turn lined with an outer fabric 244 intended to come into contact with the linen to be ironed. The interior of the drum 240 is preferably connected by means of a manifold 34 to a suction unit. It is thus possible to achieve the dual effect of helping the linen to adhere to the outer surface of the roller 24 and of evacuating the contaminated air from inside the drum 240.

**[0025]** The machine 20 comprises, in a manner known per se and not shown in the figures, an electric motor which is kinematically connected to the roller 24 and intended to cause rotation thereof.

**[0026]** In a manner known per se the shoe 26 can be heated by means of a heating device, for example electric resistances or steam coils or the like. The shoe 26 can be heated to an operating temperature of between about 100°C and about 200°C.

**[0027]** The apparatus 28 for moving the shoe 26 comprises an actuator 36, which is preferably a linear actuator. The linear actuator may be of the electromechanical type, shown in Figures 6 to 15, or of the type comprising a piston moved by a pressurised fluid, shown in Figures 16, 17 and 18.

**[0028]** In the electromechanical actuator, an electric motor operates a worm screw which meshes with a rack, thus causing the linear movement of one end of 362 of the actuator. The electromechanical actuator also comprises a control device for disengaging the worm screw from the rack if necessary, for example should it be required to free the movement of the end 362 with respect to rotation of the worm screw and the associated electric motor. This disengaging control device is preferably of the mechanical type. A linear actuator of the type described above, suitable for use in the machine 20, is marketed by Linak Italia s.r.l. under the name LA31.

**[0029]** The electromechanical actuator is characterized by its poor elasticity in relation to the typical requirements for the use described. In other words, once the actuator has been brought into the working position, small modifications in the position of the shoe (due, for example, to variations in the thickness of the linen) result in substantial variations in the pressure exerted by the shoe 26 itself. For this reason, a spring 48 which is able to ensure the necessary elasticity is preferably mounted, in series with the actuator. Advantageously the spring 48 is a gas spring.

**[0030]** The second type of linear actuator comprises a piston preferably operated by compressed air. The circuit for supplying compressed air to the piston may be configured in different ways, depending on the specific requirements. For example, it is possible to envisage a dedicated compressor mounted on the machine 20; alternatively, the machine 20 may not have its own compressor and may simply comprise a socket for connection to an external unit able to provide compressed air at the desired pressure.

**[0031]** The linear actuator of the pneumatic type comprises preferably a monostable solenoid valve 54, visible in Figure 18. This solenoid valve 54, in the working condition, keeps the pneumatic circuit closed, while in the rest condition it automatically opens said circuit, releasing the internal pressure externally. Furthermore, the pneumatic actuator preferably comprises a flow regulator 46 which, by limiting the flow rate of the incoming compressed air, limits the speed of the piston.

**[0032]** The pneumatic piston is characterized by an optimum elasticity which makes it suitable for the use described. In other words, once the actuator has been brought into the working position, small modifications in the position of the shoe (due, for example, to variations in the thickness of the linen) result in negligible variations of the pressure exerted by the shoe 26 itself. Reference should be made, in this connection, to the description given below of the compressed-air pressure regulator. With the pneumatic solution, therefore, the use of a spring 48 positioned in series with the actuator 36 is not required.

**[0033]** In accordance with the embodiments shown in Figures 11 to 18, the body of the linear actuator 36 is fixed to the structure of the machine 20. One end 362 of the linear actuator 36 is free to move, relative to the structure of the machine 20, between a working position and a rest position. The end 362 of the actuator 36 is connected to a lever 38 rigidly connected to a bar 40. The bar 40 is arranged in an axial direction along the shoe 26, while the lever 38 extends in a direction perpendicular to the bar 40. The bar 40 is connected to the structure of the machine 20 so as to be free to rotate about its axis. The bar 40 is connected to the shoe 26 by means of at least one hinging mechanism 42 situated between the axial ends of the shoe 26.

**[0034]** The hinging mechanism 42 comprises a plurality of rigid parts.

**[0035]** With reference to Figures 3, 4 and 5, the ironing shoe 26 is rigidly connected to a plate 27 with a polygonal profile mounted on the longitudinal members 29 and 31.

**[0036]** In the preferred embodiment, a bracket 49 projects radially from the plate 27 and has, connected thereto, via a first pin 51 one end of a connecting rod 53.

**[0037]** The second end of the connecting rod 53 is connected via a second pin 55 to a crank 57 which is rigidly fixed to the bar 40.

**[0038]** Preferably, the connection between the crank 57 and the bar 40 is bolted so as to allow rapid disassembly and repositioning of the hinging mechanism 42 along the bar 40.

**[0039]** The shoe 26 is restrained at its ends inside guides 44 arranged radially with respect to the roller 24. In particular, the ends of the shoe 26 are free to slide along the radial guides 44, but are not free to rotate.

**[0040]** To summarise, in the light of the above description and the accompanying drawings, the person skilled in the art can understand how the linear actuator 36 produces rotation of the bar 40 and how rotation of the bar 40 produces rigid displacement of the shoe 26 radially, away from or towards the roller 24.

**[0041]** The hinging mechanisms 42 are at least one in number, but in the preferred embodiment said hinging mechanisms 42 are three in number: two are arranged close to the axial ends of the shoe 26 and one close to the central zone thereof.

**[0042]** It will be clear to the person skilled in the art that at least one hinging mechanism 42 ensures that the actuating movement of the shoe 26, although imparted to only one end of the bar 40, is transmitted uniformly along the entire axial length of the shoe 26.

**[0043]** The force exerted by the shoe 26 on the roller 24 is therefore constant in the axial direction.

**[0044]** As already mentioned above, the apparatus 28 for moving the shoe 28 comprises means for controlling the force which is applied to the shoe 26 during its movement towards the roller 24.

**[0045]** If the linear actuator 36 is of the pneumatic type (with reference therefore to Figures 16 to 18), the means for controlling the force comprise a regulator (not shown in the figures) for regulating the pressure of the compressed air which pushes the piston. Knowing the surface area of the piston acted on by the compressed air, by regulating the air pressure it is possible to regulate the force exerted by the linear actuator 36 on the shoe 26 via the associated kinematic chain. The compressed-air pressure regulator can be preferably adjusted by the user so as to obtain different ironing pressures.

**[0046]** As mentioned above, the presence of the pressure regulator allows the pneumatic actuator to compress should the shoe 26 be subject to a thrusting force which tends to move it away from the roller 24. Such a thrusting force may arise, for example, when there is an increase in thickness of the linen. In this case the thrust acting on the shoe 26 is converted into a thrust acting on piston. The thrust acting on piston tends to produce an increase in the air pressure, but the pressure regulator is able to release the excess air. In this way, despite the increase in the thickness of the linen, the pressure acting on the piston and, consequently, the ironing pressure remain constant.

**[0047]** In accordance with one embodiment of the machine 20 where the linear actuator 36 is of the electromechanical type (with specific reference to Figures 13 to 15), control of the force may be achieved by means of a load cell 50 arranged in series between the linear actuator 36 and the structure of the machine 20. In this way, the load cell 50 is able to measure directly the force applied by the linear actuator 36 to the following kinematic chain.

**[0048]** In accordance with different embodiments of the machine 20 where the linear actuator 36 is of the electromechanical type (with specific reference to Figures 6 to 12), control of the force may be achieved indirectly via means 52 for controlling compression of the spring 48 arranged in series with the actuator 36. Knowing the behaviour of the spring 48, by measuring its compression it is possible to determine the force imparted to

the following kinematic chain.

**[0049]** In accordance with the embodiment shown in the accompanying Figures 6 to 12, the means 52 for controlling the compression of the spring 48 comprise a comb 520 arranged in parallel with the spring 48 and a microswitch 522 mounted on the end of the spring itself. During compression of the spring 48, the comb 520 slides on the microswitch 522, forcing the leaf 524 of the latter to perform a series of successive stepped movements. The microswitch 522, taking into account the stepped movements of the leaf 524, is able to measure and quantify the compression of the spring 48.

**[0050]** Both the load cell 50 and the means 52 for controlling the compression of the spring 48 are configured so as to generate a signal able to control the actuator 36 itself.

**[0051]** In the case (not shown), where the apparatus 28 for moving the shoe 26 comprises a rotary instead of a linear actuator, all the above considerations must be simply revised so as to adapt the force control means to the different configuration. In particular, it would be required to ensure an adequate torsional elasticity, for example by using a torsion spring. Knowing the behaviour of the torsion spring, by measuring its twisting force it would be possible to determine the force imparted to the following kinematic chain. In this embodiment also it is preferable that the rotary actuator should have a control device for disengaging the movement of the end from the rotation of the associated electric motor.

**[0052]** In accordance with certain embodiments, the actuator 36 also comprises a safety device 58. The safety device ensures that under no circumstances the actuator 36 pushes its end 362 beyond a nominally predefined end-of-travel stop. The means for controlling the force exerted on the shoe 26 may suffer damage and/or be subject to malfunctioning as a result. In such a case, the actuator 36 would no longer receive any commands and would continue to push its end 362 indefinitely, with the real risk of being damaged itself or of it damaging the machine 20. The safety device 58, for example that shown in Figures 11 and 12, may comprise a microswitch 582 which has a leaf 584 sliding on a profile integral with the end 362 of the actuator 36. The profile comprises a relief 580 which marks the nominally defined end-of-travel stop. When the leaf 584 reaches the relief 580, the microswitch 582 interrupts the power supply to the actuator 36 so as to avoid any possible damage.

**[0053]** The presence, in the apparatus 28, of the means for controlling the force allows the shoe 26 to adapt its actual working position to the different conditions which may arise during the operating life of the machine 20. In other words, the working position of the shoe 26 is no longer predefined, but is defined in each case depending on the specific requirements.

**[0054]** As already explained and with reference to Figures 6 and 7, the apparatus 28 for moving the shoe 26 comprises contrast means 32 which tend to bring the shoe 26 from the working position B (Figure 7) into the rest position A (Figure 6). The ends of the shoe 26 are restrained by guides during their movement from A to B. In accordance with the embodiment shown in Figures 6 and 7, the contrast means 32 comprise springs, in particular cylindrical-helix springs arranged along the radial guides 44. In general, the contrast means will be operated by a potential energy source so that operation is independent of any power supply. In the case described, the energy used is elastic potential energy, while in other possible embodiments it could consist of gravitational potential energy or the like.

**[0055]** The presence of the contrast means 32 guarantees a high degree of safety. In particular, the presence of the contrast means 32 help simplify significantly the emergency procedure for moving the shoe 26 away from the roller 24, for example in the case of an interruption in the mains power supply.

**[0056]** This interruption in power may arise accidentally or occur following operation of an emergency control device, as described below.

**[0057]** For example, in the case where the linear actuator 36 is a pneumatic actuator, the interruption in the power supply automatically opens the monostable solenoid valve 54, discharging the supply air externally. In this way, the force applied by the linear actuator 36 to the shoe 26 is immediately eliminated, allowing the contrast means 32 to bring back autonomously the shoe from the working position into the rest position. Prolonged contact of the linen with the shoe which is still hot is thus avoided.

**[0058]** From the above the person skilled in the art may easily understand how, also in a danger condition for the operator, simple interruption of the power supply is able to set the machine 20 to a completely safe condition.

**[0059]** The machine 20 comprises in a manner known per se an emergency switch 56 which allows the operator to interrupt the power supply both to the apparatus 28 for moving the shoe 26 and to the resistances of the shoe 26. As described with reference to the prior art, this switch does not guarantee a satisfactory level of safety.

**[0060]** In accordance with an embodiment of the invention shown in Figures 2, 19 and 20, the machine 20 comprises an emergency control device 101 which, by means of a single operation, allows the operator to interrupt the power supply (both to the apparatus 28 for moving the shoe 26 and to the resistances of the shoe 26) and at the same time to zero the force imparted by the actuator 36 to the shoe 26 itself. In particular, in the case where the linear actuator 36 is a pneumatic actuator, the emergency control device 101 is a switch which interrupts the power supply to the monostable solenoid valve 54. As mentioned above, the interruption in the power supply results automatically in opening of the pneumatic circuit, zeroing of the force applied to the shoe and therefore the movement of the latter away from the working position. In the case where the linear actuator 36 is instead an electromechanical actuator, the emergency control device is a switch combined with a mechanical control

mechanism. The switch interrupts the power supply, while the mechanical control mechanism disengages the worm screw from the rack.

**[0061]** The control device 101 may be in the form of a handle (not shown), a bar 103 or a pedal (not shown) arranged in front of the machine in a position which can always be reached easily by the operator and in particular by the operator's knee. In particular, the control device has a length which is more or less equal to the axial length of the machine 20.

**[0062]** Figure 19 shows a first end of the control device 101 in the case of motor means of the electromechanical type. The control device 101 is situated inside a support frame 105 with a side surface 107.

**[0063]** The side surface 107 of the support frame 105 is rigidly fixed inside the side 25 of the machine 20.

**[0064]** The control device 101 is connected to the support frame 105 by means of two fixing guides 109 situated at its two ends and each consisting of a U-shaped plate 111 with two sides 113 and 115.

**[0065]** The sides 113 and 115 of each guide 109 are provided with two eyelet holes 117 and 119 inside which two pins 121 rigidly fixed to the control device 101 can be displaced.

**[0066]** A bracket 123 is rigidly fixed to the rear surface of the control device 101 and is connected to one end of a connecting rod 125 so that the connecting rod 125 is able to rotate within the transverse plane. The other end of the connecting rod 125 is connected to a crank 127 rigidly fixed to a rod 129. The rod 129 extends in the axial direction, parallel to the direction of the control device 101, and has a length substantially the same as the latter.

**[0067]** The connection between the connecting rod 125 and the crank 127 allows relative rotation of said parts. The rod 129 is fixed to the support frame 105 such that it is able to rotate about its axis.

**[0068]** From the above the person skilled in the art may easily understand how displacement of the control device 101, achieved by pressing on its front surface, causes the pins 121 to slide inside the eyelet holes 117 and 119 of the guides 109, causing rotation of the rod 129.

**[0069]** Figure 20 shows the second end of the rod 129 where the connection to the means for disengaging the movement of the shoe 26 from the action of the motor means is provided.

**[0070]** A lever 131 connects the rod 129 to a wire 133. The lever 131 is rigidly fixed to the end of the rod 129 and extends in the transverse plane.

**[0071]** The wire 133 is partially covered by a sheath 135.

**[0072]** Said wire 133 is able to slide on a stop member 137 which has the function of stopping the sheath 135 of the wire 133.

**[0073]** With reference to Figures 19 and 20, it can be noted how a pressure applied to the control device 101 produces a rotation of the rod 129 and therefore a rotation of the lever 131, causing displacement of the wire 133 out of the sheath 135.

**[0074]** The wire 133 is connected to the device for disengaging the movement of the ironing shoe 26 from the action of the motor means.

**[0075]** In the case where the linear actuator 36 is of the electromechanical type, simple operation of the mechanism for disengaging the worm screw from the rack allows free movement of the latter, irrespective as to whether the worm screw and the associated motor are disabled by the absence of electric power. In a similar manner to that described above, once the rack 32 is freed, the contrast means 32 autonomously bring back the shoe itself from the working position into the rest position. Prolonged contact of the linen with the shoe 26 which is still hot is thus avoided.

**[0076]** From the above the person skilled in the art may easily understand how, even in a danger condition for the operator, interruption of the power supply and disengagement of the worm screw from the rack are able to set the machine 20 to a completely safe condition.

**[0077]** In an entirely similar manner in the embodiment comprising the rotary actuator instead of a linear actuator, the disengaging control device allows free movement of the end of the actuator, irrespective as to whether the motor is disabled by the absence of a power supply. In this case also, therefore, the machine 20 may be easily set to a safe condition.

**[0078]** In the case where the actuator 36 is of the pneumatic type, the control device 101 acts on a switch connected to the monostable solenoid valve 54, resulting in zeroing of the force applied to the pneumatic piston. In the case where the compressed-air source is a compressor, the switch will act on the power supply of the compressor.

**[0079]** If the compressed-air supply is external, the switch will act by opening the safety solenoid valve.

**[0080]** In the case where the operating system consists of a gear motor, use of a friction clutch is envisaged, this being able to be operated by the emergency control device in a manner similar to that seen above.

**[0081]** This solution is therefore applicable also to the known ironing machine structures.

**[0082]** The present emergency control device 101 offers the following advantages over the prior art, i.e. at the same time it:

- allows disengagement of the movement of the shoe 26 from the action of the apparatus 28;
- allows or in particular causes the movement of the shoe 26 away from the ironing roller 24; and
- allows the device which heats the ironing shoe 26 to be switched off.

**[0083]** A second advantage consists in that, in one possible embodiment, by operation of the emergency control device 101, it is possible to switch off also the gear motor operating the roller 24 and the other electrical devices of the machine 20.

**[0084]** A further advantage consists in positioning of

the emergency control device in a position which can be reached from any working position by the operator.

**[0085]** In a further embodiment, the control device 101 may therefore be positioned in other positions or at different heights.

**[0086]** With regard to the embodiments of the mangle described above, the person skilled in the art may, in order to satisfy specific requirements, make modifications to and/or replace elements described with equivalent elements, without thereby departing from the scope of the accompanying claims.

## Claims

**1.** Machine (20) for industrial linen ironing, comprising

- an ironing roller (24);
- a shoe (26) radially movable between a predefined rest position (A) in which the shoe is distant from the roller (24) and a working position (B) in which the shoe (26) is close to the roller (24);
- an apparatus (28) for moving the shoe (26);

**characterized in that** the apparatus (28) for moving the shoe (26) comprises means (50, 52) for controlling the force applied to the shoe (26) during its movement towards the roller (24) and able to maintain a constant pressure between ironing roller (24) and shoe (26), and contrast means (32) tending to move the shoe (26) from the working position (B) to the rest position (A).

**2.** Machine (20) according to Claim 1, in which the apparatus (28) for moving the shoe (26) comprises a linear actuator (36) of the electro-mechanical type.

**3.** Machine (20) according to Claim 2, in which the electro-mechanical linear actuator (36) comprises a worm screw, a rack, and a control device for disengaging the worm screw from the rack.

**4.** Machine (20) according to Claim 1, in which the apparatus (28) for moving the shoe (26) comprises a linear actuator (36) of the pneumatic type comprising a monostable solenoid valve (54) configured so as to keep the pneumatic circuit closed in the working condition and to open automatically the pneumatic circuit in the rest condition.

**5.** Machine (20) according to Claim 4, in which the means for controlling the force applied to the shoe (26) during its movement towards the roller (24) comprises means for controlling the pressure of the pneumatic actuator (36).

**6.** Machine (20) according to any one of the preceding claims, in which the apparatus (28) for moving the shoe (26) comprises a spring (48) arranged in series with the linear actuator (36).

**7.** Machine (20) according to Claim 6, in which the means for controlling the force applied to the shoe (26) during its movement towards the roller (24) comprises means (52) for controlling the compression of the spring (48).

**8.** Machine (20) according to Claim 7, in which the means (52) for controlling the compression of the spring (48) comprises a comb (520) arranged in parallel with the spring (48) and a microswitch (522) having a leaf (524), arranged so that during the compression of the spring (48) the comb (520) slides on the microswitch (522) forcing the leaf (524) to perform a series of successive stepped movements, the microswitch (522) being able to take into account the stepped movements of the leaf (524) so as to measure and quantify the compression of the spring (48).

**9.** Machine (20) according to Claim 1, in which the means for controlling the force applied to the shoe (26) during its movement towards the roller (24) comprises a load cell (50).

**10.** Machine (20) according to Claim 1, in which the shoe (26) is movable along radial guides (44) and in which the contrast means (32) comprise springs placed along the guides (44).

**11.** Machine (20) according to Claim 10, further comprising an emergency control device able to interrupt the power supply to the actuator (36) and zero the force applied to the shoe (26) by the actuator (36).

**12.** Machine for industrial linen ironing, comprising:

- an ironing roller (24);
- a shoe (26) movable radially movable between a predefined rest position (A) in which the shoe is distant from the roller (24) and a working position (B) in which the shoe (26) is close to the roller (24);
- an apparatus (28) for moving the shoe (26);

**characterized in that** said apparatus (28) for moving the shoe (26) comprises an actuator (36) and a bar (40) rotatable about its axis and fastened to the machine, the bar (40) being parallel to the shoe (26) and connected thereto by means of at least one hinging mechanism (42) positioned between the axial ends of the ironing shoe (26), said bar (40) being connected to said actuator (36).

**13.** Machine according to the preceding claim, **characterized in that** said hinging mechanism comprises:

a polygonal plate (27) connected rigidly to the ironing shoe (26), said polygonal plate (27) being equipped with a bracket (49) projecting radially and connected via a first pin (51) to one end of a connecting rod (53), the second end of the connecting rod (53) being connected by means of a second pin (55) to a crank (57) rigidly fixed to the bar (40).

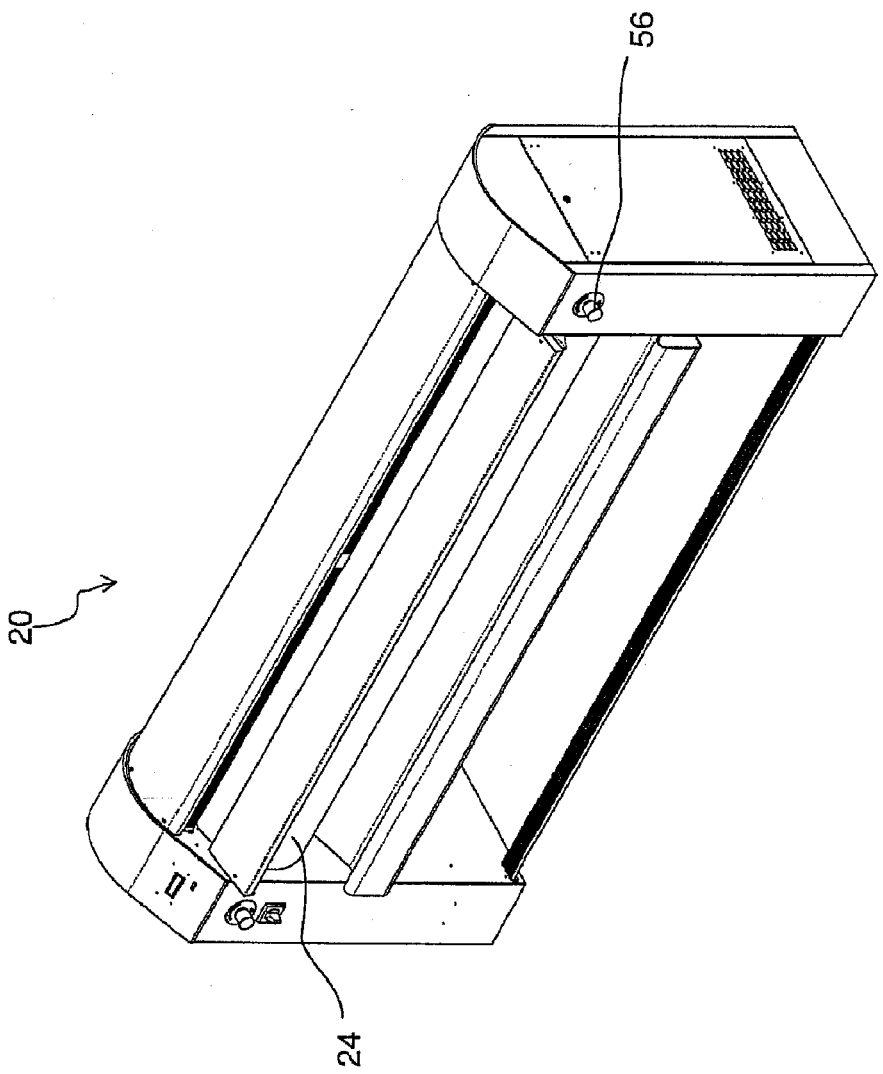


Fig. 1

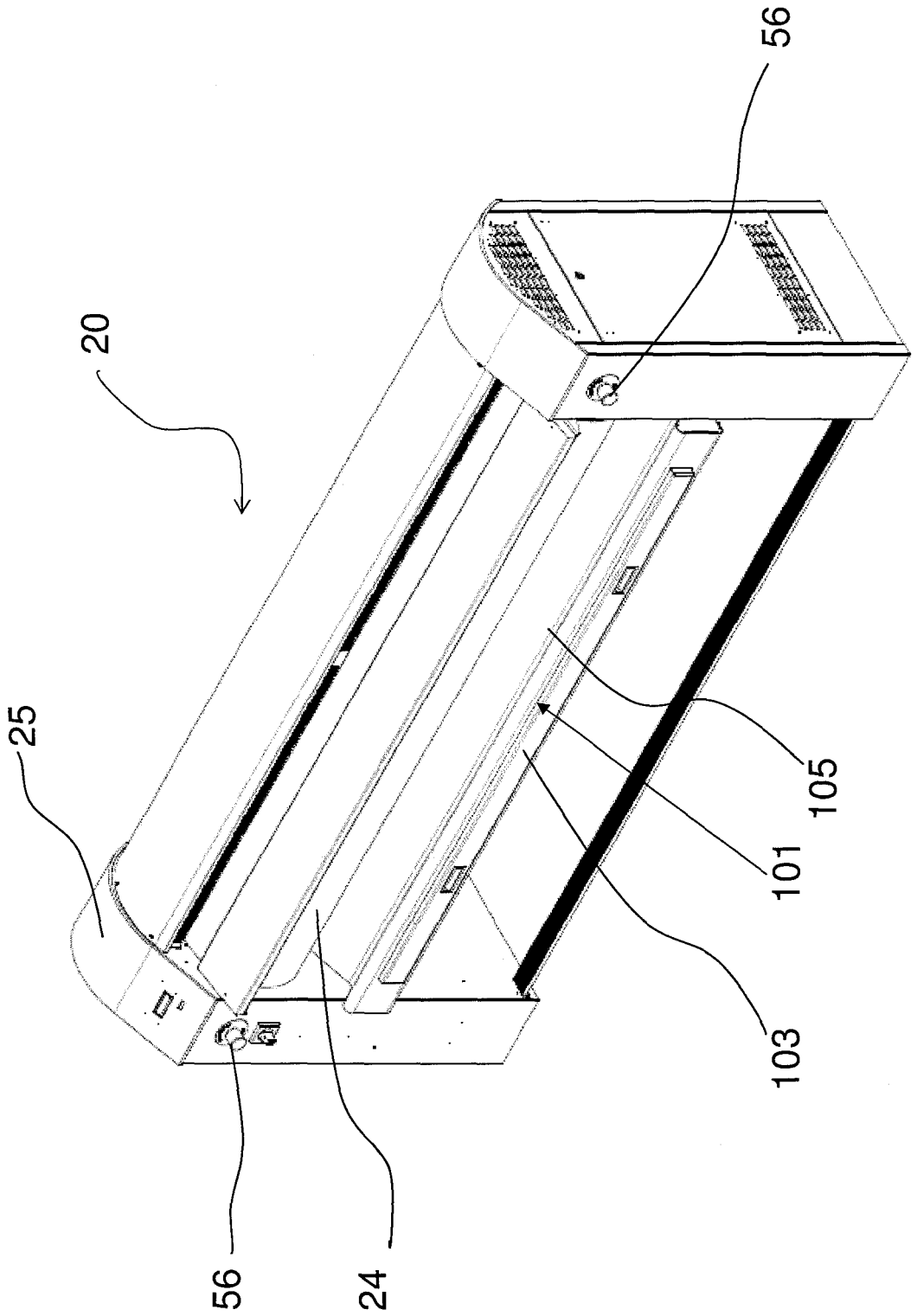


Fig. 2

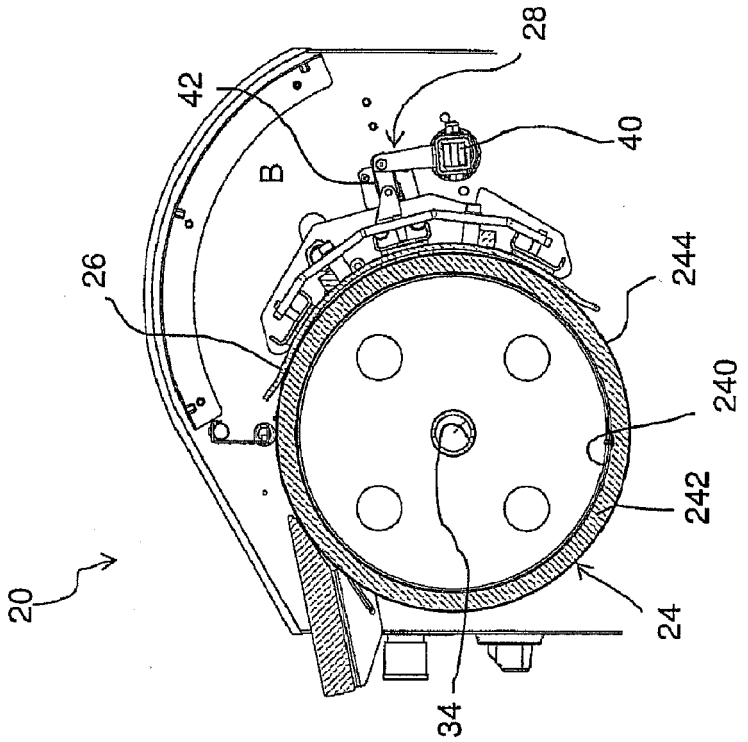


Fig. 4

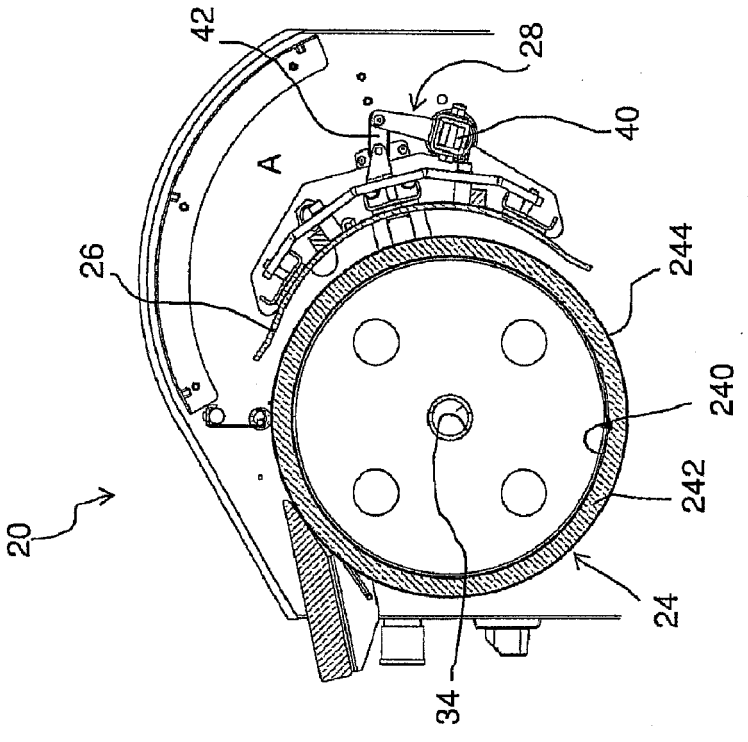


Fig. 3

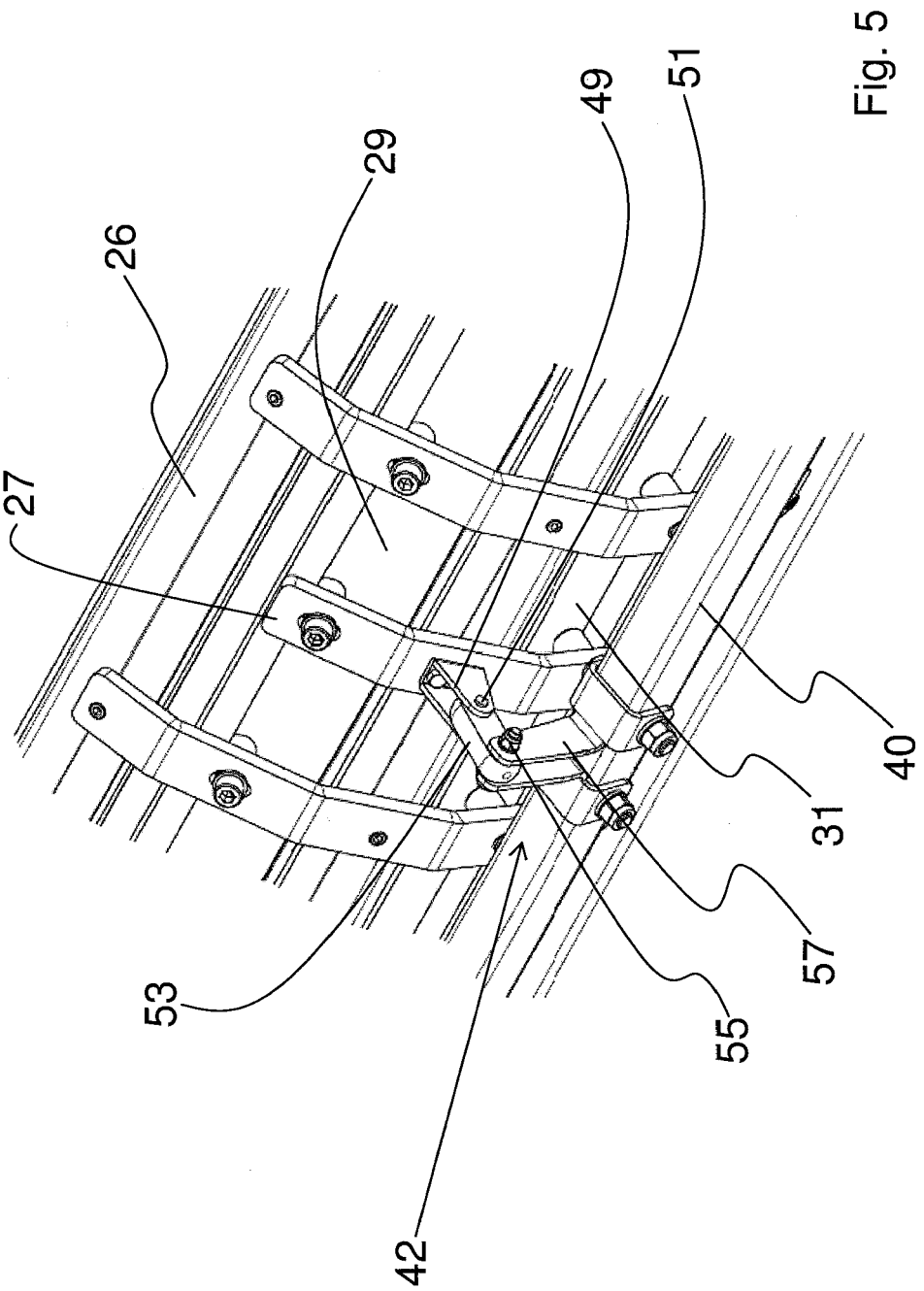


Fig. 5

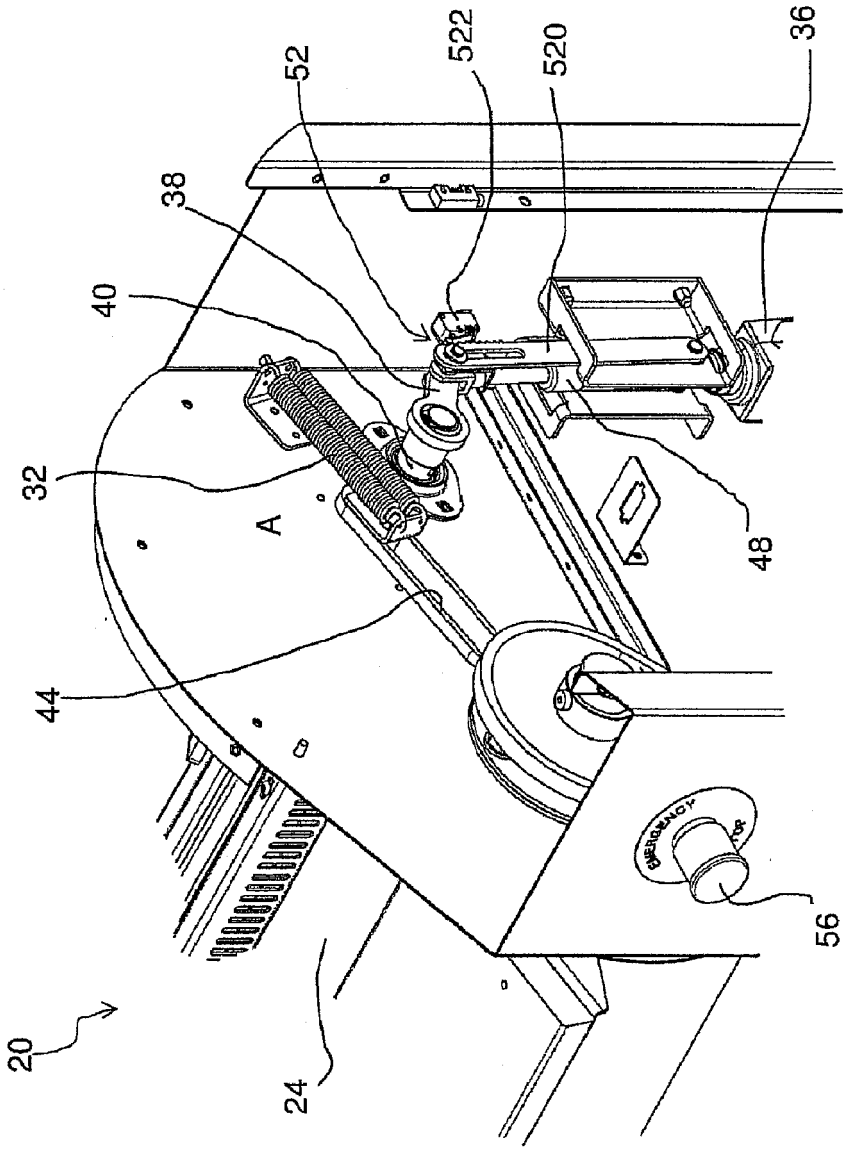


Fig. 6

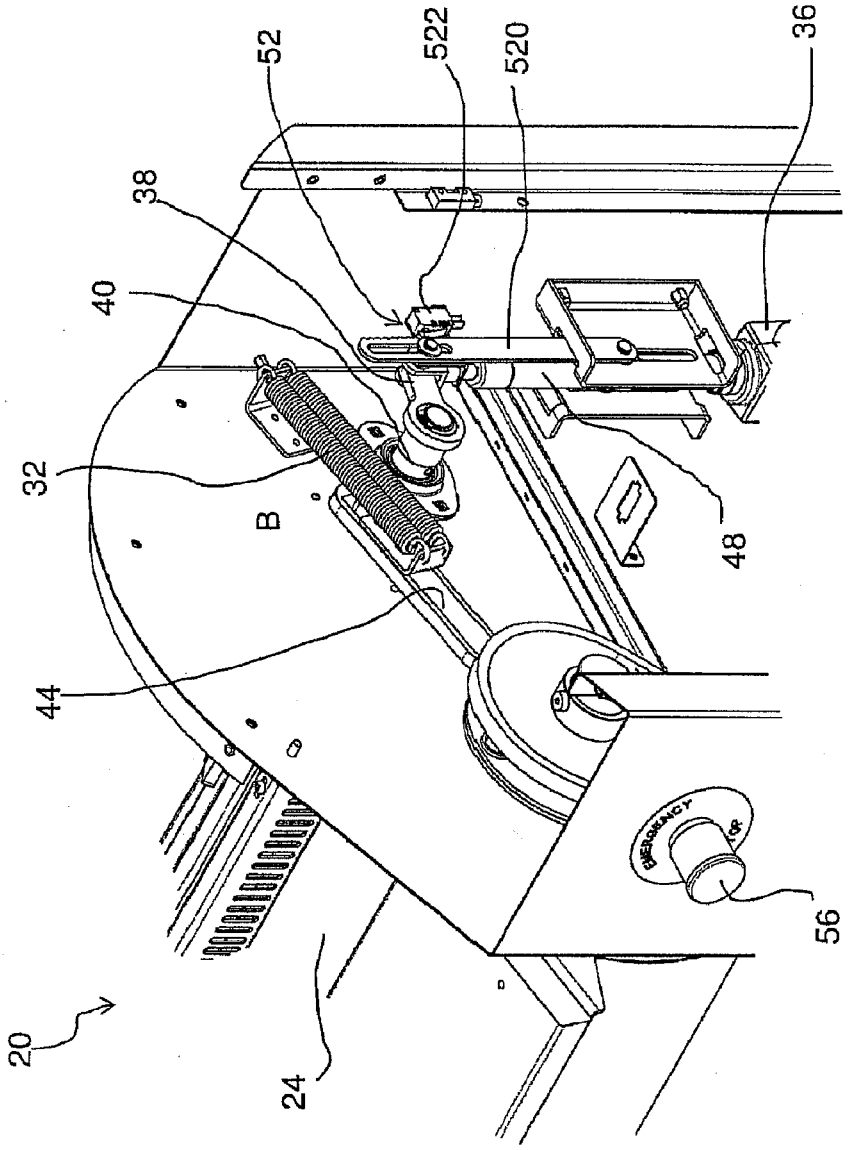


Fig. 7

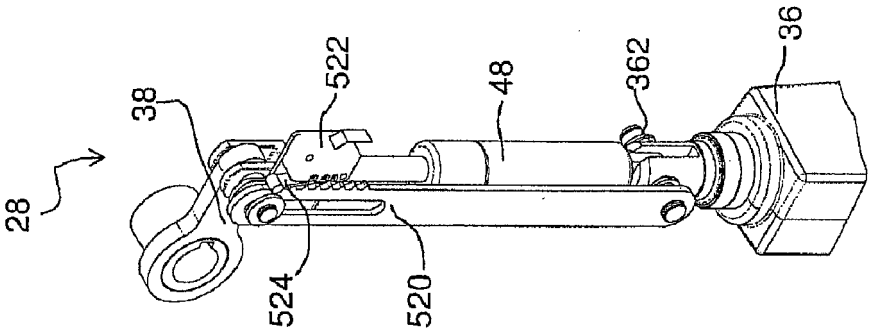


Fig. 10

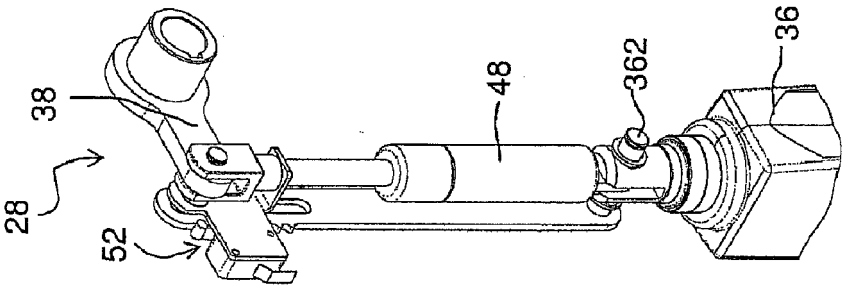


Fig. 9

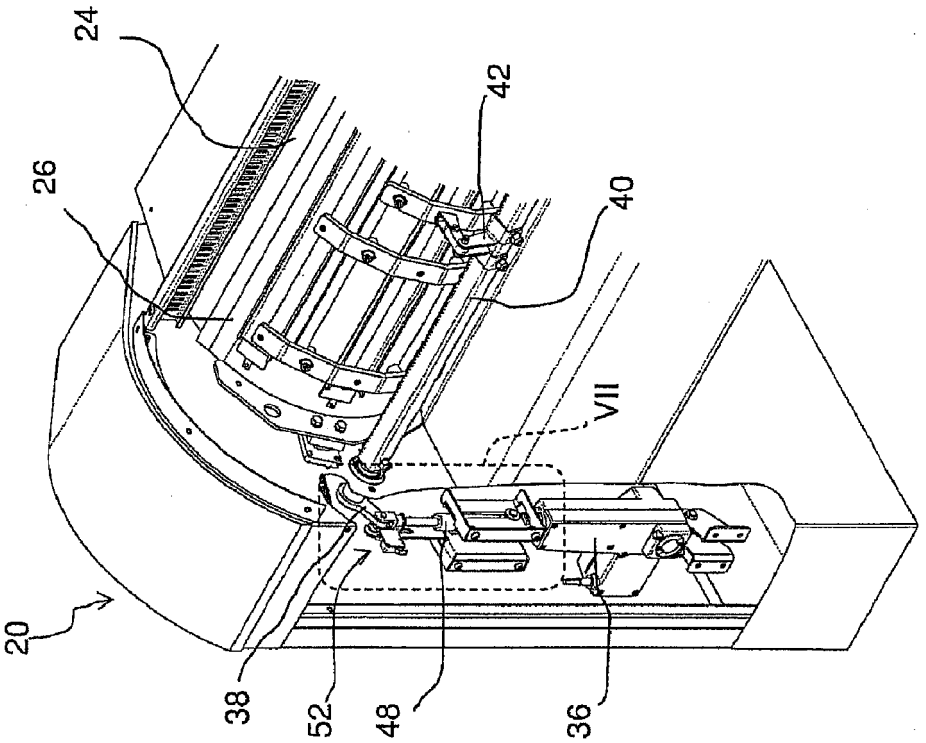


Fig. 8

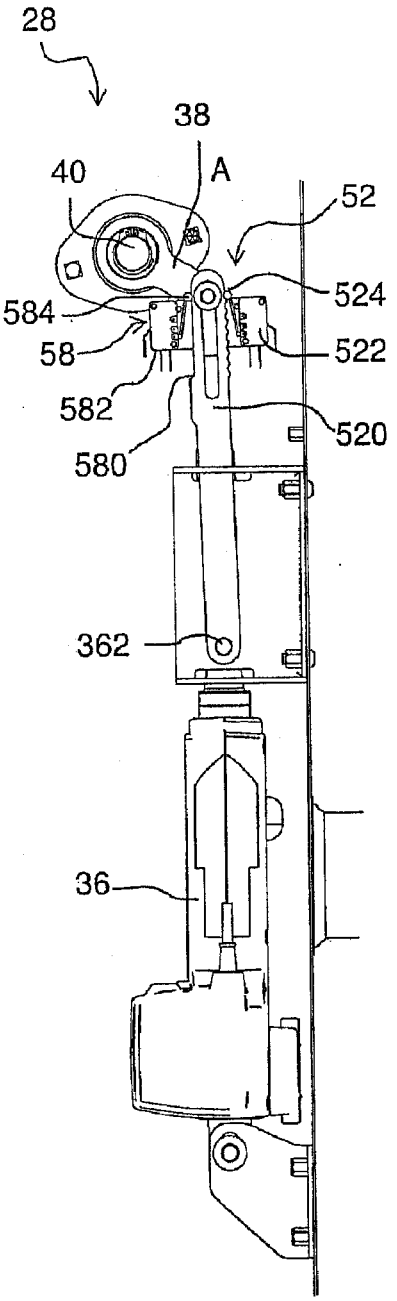
28
38
A
40
52
524
584
58
522
582
520
580
362
36

Fig. 11

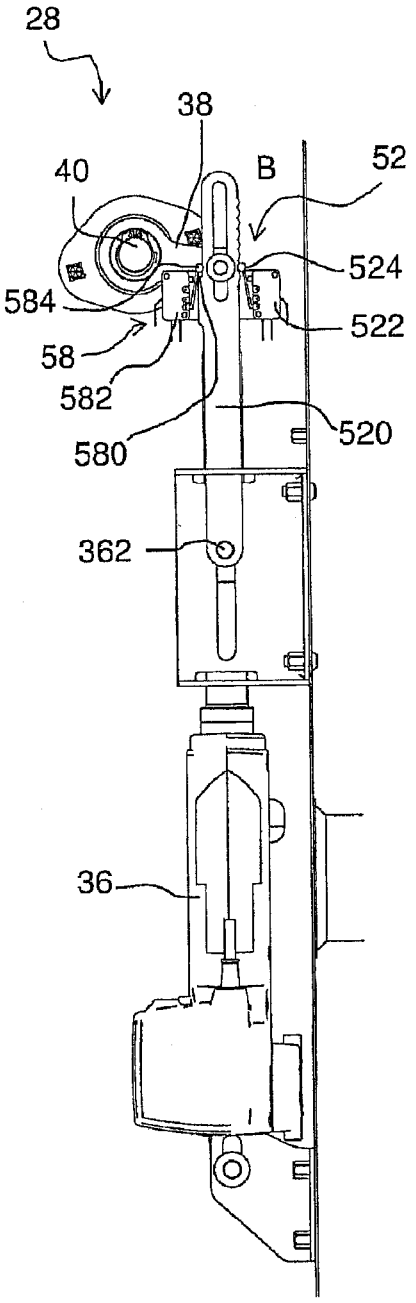
28
38
B
40
52
524
584
522
58
582
520
580
362
36

Fig. 12

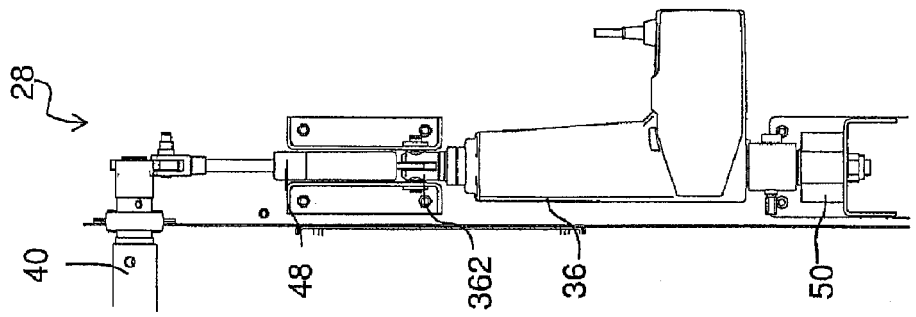


Fig. 15

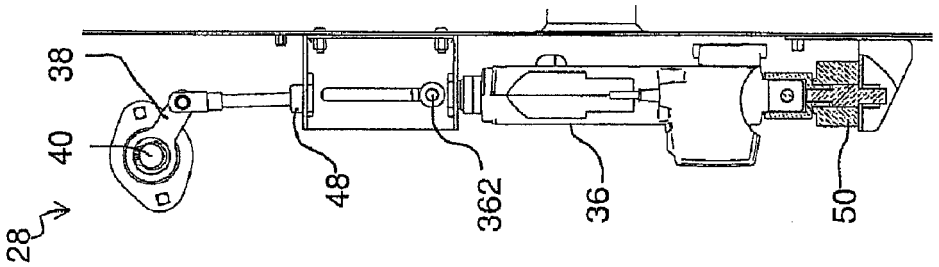


Fig. 14

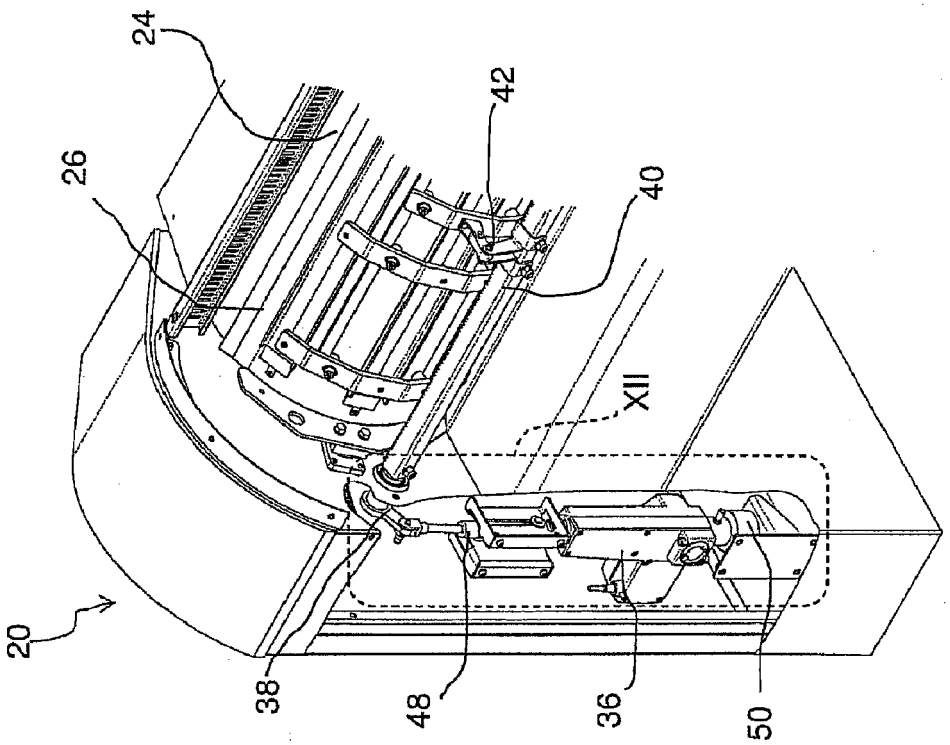


Fig. 13

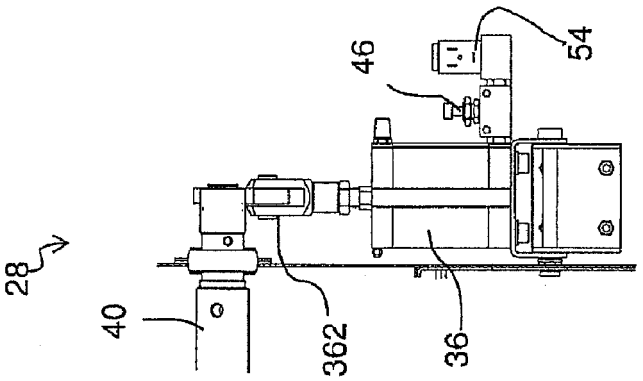


Fig. 18

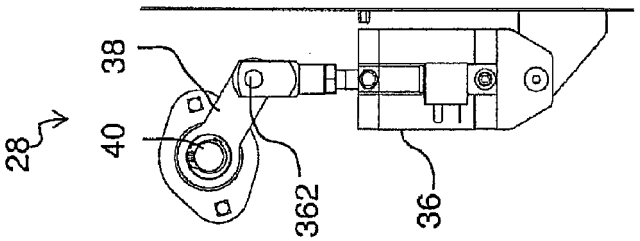


Fig. 17

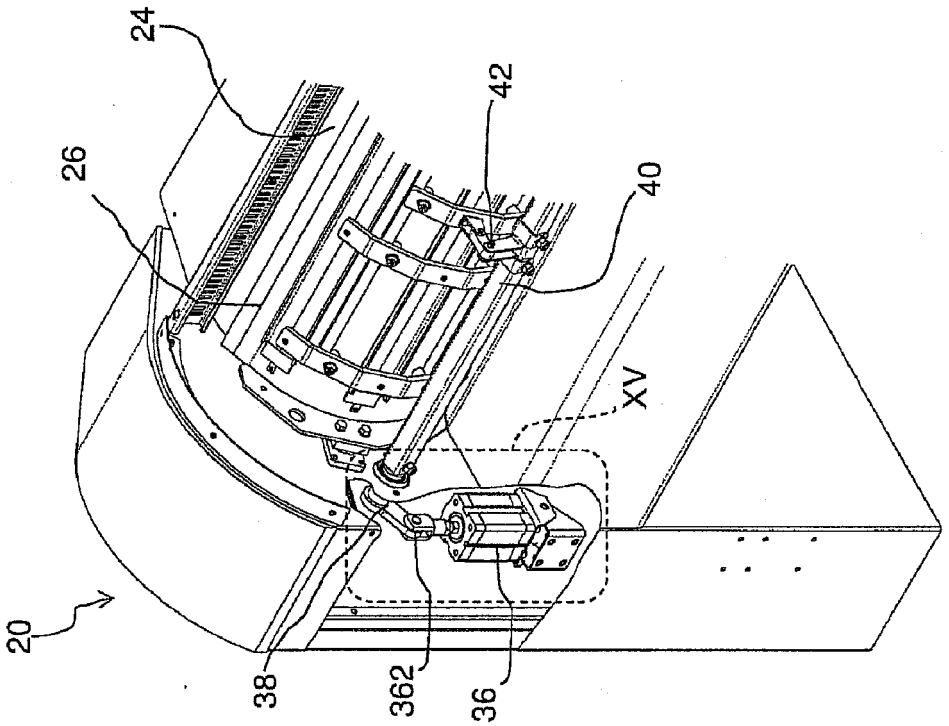


Fig. 16

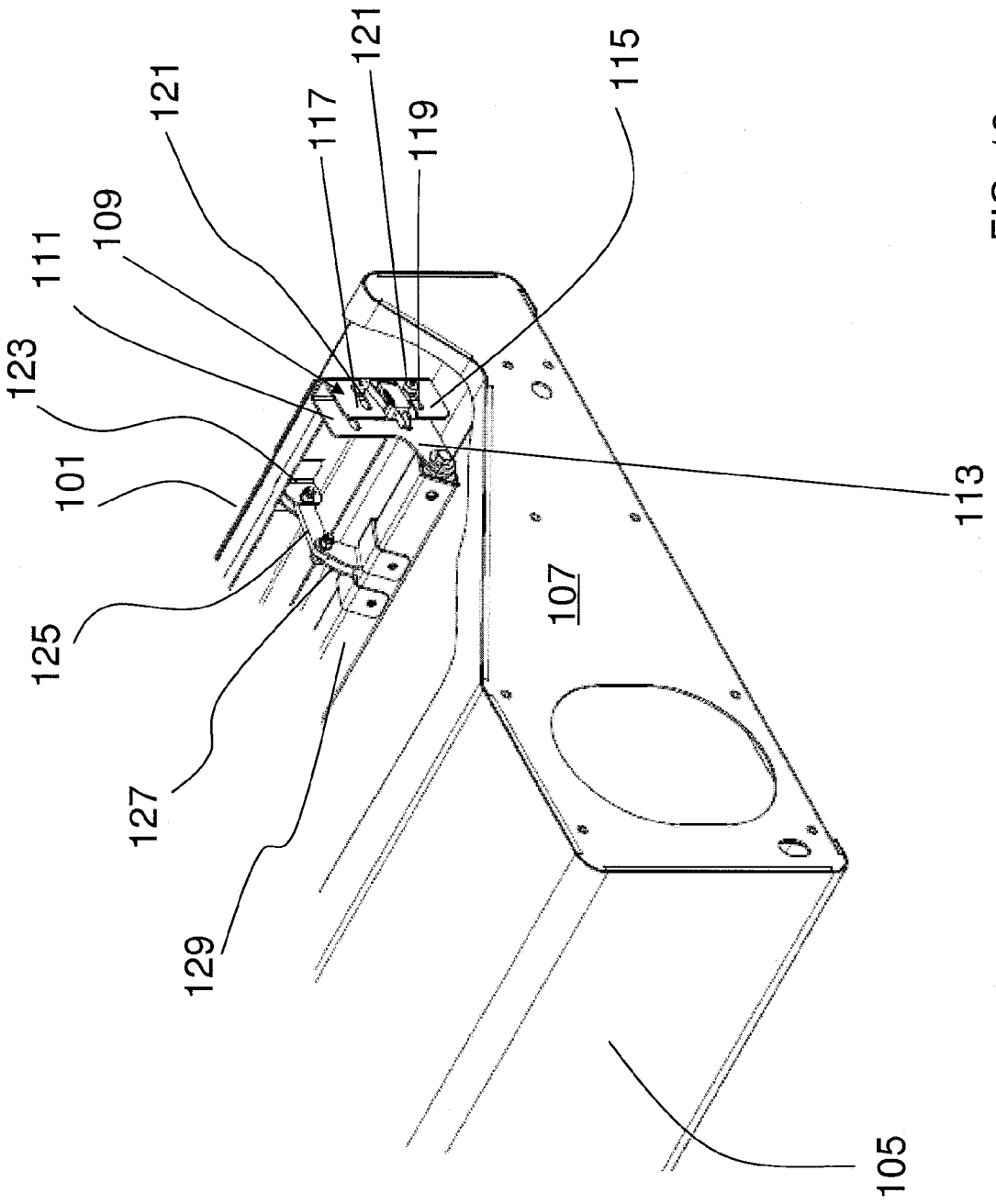


FIG. 19

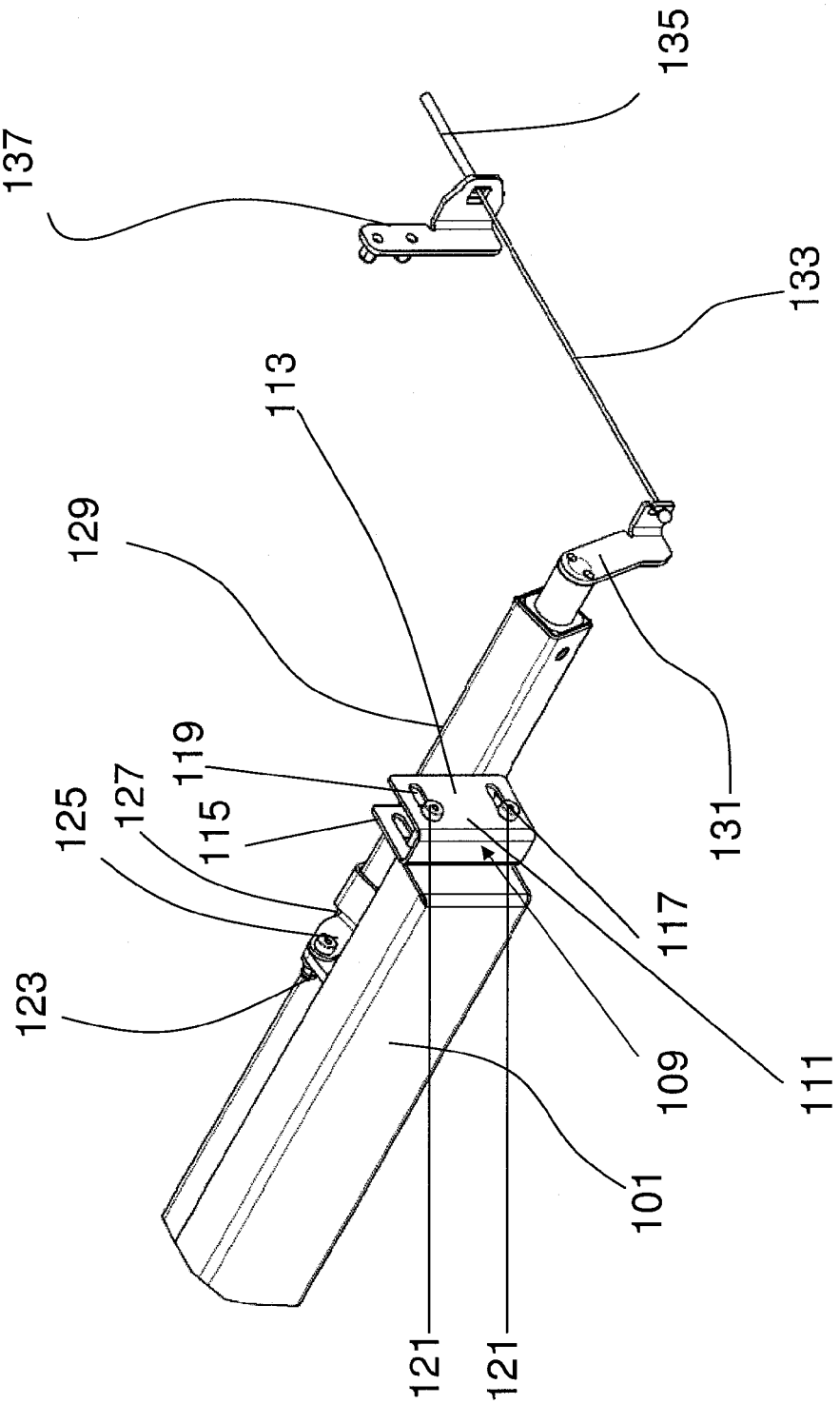
135
137
133
113
129
119
127
125
115
131
117
123
109
111
101
121
121

FIG. 20