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

(11) **EP 2 324 940 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
09.01.2013 Bulletin 2013/02

(51) Int Cl.:
B21F 3/02 *(2006.01)* ***B21F 3/06*** *(2006.01)*

(21) Application number: **09176966.1**

(22) Date of filing: **24.11.2009**

(54) **Spring manufacturing machine with an abutting apparatus**

Federherstellungsmaschine mit einem Werkzeughalter für das als Anschlag wirkende Formwerkzeug

Machine de fabrication de ressorts avec porte-outil pour l'outil de formage en butée

(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

(43) Date of publication of application:
25.05.2011 Bulletin 2011/21

(73) Proprietor: **Nucoil Industries Co., Ltd.**
Gueishan Hsiang
T'ao yuan (TW)

(72) Inventor: **Wu, David**
Taoyuan Hsien (TW)

(74) Representative: **2K Patentanwälte Blasberg Kewitz & Reichel Partnerschaft**
Corneliusstraße 18
60325 Frankfurt a. M. (DE)

(56) References cited:
DE-A1- 19 825 970
DE-C- 893 183
FR-A1- 2 896 439
US-A1- 2008 314 110

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 2 324 940 B1

Printed by Jouve, 75001 PARIS (FR)

Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention in general relates to a spring manufacturing machine with an abutting apparatus.

Description of Prior Art

[0002] According to the prior art, common spring manufacturing machines all have a so-called abutting apparatus adapted for forming a wire into the configuration of a coil spring by means of abutment with a wire forming tool. During the process of forming a coil spring or curled spring, wire is fed into the spring manufacturing machine via a feeding mechanism; in the meantime, an abutting apparatus is adapted for curling the wire into a spring, in particular a coil spring; finally, a cutting knife apparatus is applied to cut off the wire to complete the procedure of manufacturing a coil spring or curled spring. During the process, the function of the abutting apparatus is to curl a linear wire into a curled spring by abutment with a wire forming tool. According to common practices, a spring manufacturing machine usually has two abutting, assemblies arranged corresponding to each other at two sides thereof. By adjusting the positions of these two abutting assemblies it is possible to properly adjust the magnitude of the radius of the coil spring.

[0003] According to the prior art, the abutting apparatus of a spring manufacturing machine usually includes a sliding seat and an abutting unit connected to be slidable on the sliding seat, such that the abutting unit can make a 1-D linear movement in an oblique direction relative to the spring manufacturing machine, whereby the magnitude of the radius of the manufacture coil spring can be adjusted. However, with such an abutting apparatus not only the degree of freedom is insufficient, but also it is uneasy for the purpose of adjustment, when a 1-D linear movement is used to adjust the obliqueness relative to the spring manufacturing machine and to thereby properly adjust the magnitude of the radius of the coil spring to be manufactured.

[0004] Therefore, another kind of abutting apparatus for a spring manufacturing machine has been developed, in which not only the abutting unit can make an oblique motion relative to the spring manufacturing machine, but the abutting apparatus can also make a vertically linear motion in one dimension relative to the spring manufacturing machine. However, this kind of linear movement in two directions is still inadequate to adjust the positions of the abutting unit. In this prior art, the abutting unit can only make a small adjustment of the position relative to the spring manufacturing machine. Besides, the two abutting units of the spring manufacturing machine can also make two independent 2-D motions, whereby the positions of the abutting units relative to the wire feeding axle of the spring manufacturing machine can be adjusted at random, which indeed causes an inadequate flexibility in terms of the process of manufacturing a coil spring.

[0005] US 2008/0314110 A1 discloses a spring manufacturing apparatus according to the preamble of claim 1. The spring manufacturing apparatus includes a supporting body which moves in X, Y, and Z-axes directions of a XYZ orthogonal coordinate system wherein a moving direction of a wire rod fed from a wire rod feeding unit is represented as a Z-axis. The supporting body is formed with an opening in which the quill is arranged. The supporting body further includes a tool holder for holding a processing tool for processing the wire rod to a spring. The supporting body arranged at the vicinity of the quill is moved to accurately adjust the relative position of the quill and the processing tool, thereby manufacturing a desired spring.

[0006] This document also discusses related spring manufacturing apparatus of the prior art, wherein the relative position of the quill and the processing tool is adjusted by moving the wire rod feeding unit and the quill to process the wire rod, or wherein the relative position of the quill and the processing tool is adjusted by attaching the processing tool to the movable member and moving the tool, or wherein a quill is arranged between two movable tables, and the relative position of the processing tool is selected by the rotation of the turret and the quill is adjusted by moving the movable table.

SUMMARY OF THE INVENTION

[0007] It is an object of the present invention to provide an improved spring manufacturing machine with an abutting apparatus wherein the flexibility in manufacturing the spring can be enhanced significantly and the difficulty of configuration can be also lowered down in great scale.

[0008] This problem is solved by a spring manufacturing machine with an abutting apparatus according to claim 1. Further advantageous embodiments are the subject-matter of the dependent claims.

[0009] According to the present invention by means of a first and second axial transmission mechanisms the abutting assembly can be randomly moved in vertical and/or horizontal directions relative to the machine platform, such that the degree of freedom to adjust the abutting assembly can be enhanced significantly.

[0010] The first axial transmission mechanism comprises a first actuator, a first lead screw driven by the first actuator to rotate and a first sliding seat engaging with the first lead screw and being capable to perform a linear movement relative to the machine platform. The second axial transmission mechanism comprises a second actuator fixed to the first sliding seat, a second lead screw driven to be rotated by the second actuator and a second sliding seat engaging with the second lead screw and being configured to be moved linearly relative to the first

sliding seat. Via the first and second axial transmission mechanisms, the abutting assembly fixed to the second sliding seat can perform a 2-D movement in vertical and/or horizontal directions relative to the machine platform as desired and in accordance with the geometrical configuration of the coil spring to be manufactured.

[0011] According to another embodiment the spring manufacturing machine has a machine platform and a spring wire feeding axle, while the abutting apparatus comprises a pair of first axial transmission mechanisms, a pair of second axial transmission mechanisms and a pair of abutting assemblies. The pair of first axial transmission mechanisms, which are respectively formed at an upper and lower sides of a central line of the spring wire feeding axle, are of substantially identical configuration and each comprises a first actuator fixed to the machine platform, a first lead screw driven by the first actuator to rotate and a first sliding seat engaging with the first lead screw and being capable to perform a linear movement relative to the machine platform. Each of the pair of second axial transmission mechanisms comprises a second actuator fixed to the first sliding seat, a second lead screw driven to rotate by the second actuator and a second sliding seat engaging with the second lead screw and linearly moved relatively to the first sliding seat. Via the pair of first axial transmission mechanisms and the pair of second transmission mechanisms, the pair of abutting assemblies respectively fixed to the second sliding seat can independently make a 2-D movement in vertical and horizontal directions relative to the machine platform.

[0012] In comparison with the prior art, the invention accomplishes in particular the following functions and advantages. Firstly, the drawback of the spring manufacturing machines according to the prior art, according to which the abutting apparatus can only be adjusted by a linear movement in a single direction, can be overcome according to the present invention by an arbitrarily adjustable 2-D movement in vertical and/or horizontal directions, so that according to the present invention the positions of the abutting assemblies can be conveniently adjusted relative to the machine platform and the spring wire feeding axle to enhance the flexibility in the spring manufacturing process. Secondly, since the pair of abutting assemblies can be moved -independently and simultaneously to thereby enable many different directions of movement, coil springs with a more complicated 3-D configuration can be manufactured. Thirdly, the first and second transmission mechanisms can enhance the variability of the locations and angles of the movement of the abutting assemblies. Fourthly, since the first and second axial transmission mechanisms can be moved in a linear motion, according to the present invention a more accurate positioning can be achieved and it is easier in terms of operation. Finally, the movement of the pair of abutting assemblies can be respectively and independently controlled by using a computer, so that according to the present invention the flexibility in manufacturing the spring can be enhanced significantly and the difficulty of configuration can be also lowered down in great scale.

BRIEF DESCRIPTION OF DRAWINGS

[0013] The features of the invention believed to be novel are set forth with particularity in the appended claims. The invention itself, however, may be best understood by reference to the following detailed description, which describes a number of embodiments of the invention, taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a perspective outer view of an abutting apparatus;
Fig. 2 is a perspective view from another viewing angle of the abutting apparatus;
Fig. 3 is a perspective view (1) of the abutting apparatus;
Fig. 4 is a perspective view (2) of the abutting apparatus;
Fig. 5 is an actuating illustration (1) by viewing from the front of the abutting apparatus;
Fig. 6 is an actuating illustration (2) by viewing from the front of the abutting apparatus;
Fig. 7 is an actuating illustration (3) by viewing from the front of the abutting apparatus;
Fig. 8 is a front view of a preferred abutting apparatus;
Fig. 9 is another front view of a preferred abutting apparatus;
Fig. 10 is a perspective outer view according to a preferred embodiment of the present invention;
Fig. 11 is an actuation status illustration (1) of a cross-sectional view along the line "11-11" in Fig. 10; and
Fig. 12 is an actuation status illustration (2) of a cross-sectional view along the line "11-11" in Fig. 10.

DETAILED DESCRIPTION OF THE INVENTION

[0014] In cooperation with attached drawings, the technical contents and detailed description of the present invention are described thereinafter according to a number of preferable embodiments, not used to limit its executing scope. Any equivalent variation and modification made according to appended claims is all covered by the claims claimed by the present invention.

[0015] Please refer to Fig. 1 and Fig. 2, which respectively are a perspective outer view of the abutting apparatus and a perspective outer view from another viewing angle of the abutting apparatus . The spring manufacturing machine 1 has an abutting apparatus 2, a machine platform 10 and a spring wire feeding axle 11 (as shown in Fig. 8). The abutting apparatus 2 includes a pair of first axial transmission mechanisms 20, a pair of second axial transmission mechanisms 30 and a pair of abutting assemblies 40 configured to curl a linear metal wire into a

curled spring or coil spring by means of abutment of the wire against a wire forming tool.

[0016] The pair of first axial transmission mechanisms 20 are respectively formed at an upper and lower side of a central line of the spring wire feeding axle 11 and are of substantially identical configuration. In the meantime, the first axial transmission mechanism 20 includes a first actuator 21 fixed to the machine platform 10, a first lead screw 22 driven by the first actuator 21 to rotate and a first sliding seat 23 connected to the first lead screw 22 and able to make a linear movement relative to the machine platform 10.

[0017] The pair of second axial transmission mechanisms 30 are of substantially identical configuration and respectively include a second actuator 31 fixed to the first sliding seat 23, a second lead screw 32 driven by the second actuator 31 to rotate and a second sliding seat 33 connected to the second lead screw 32 and can make a linear movement relative to the first sliding seat 23.

[0018] The pair of abutting assemblies 40 are respectively fixed to the second sliding seat. Via the first axial transmission mechanism 20 and the second axial transmission mechanism 30, the abutting assembly 40 can perform vertical and horizontal movements, in particular linear movements in vertical and horizontal directions, relative to the machine platform 10. In addition, the abutting assembly 40 includes a fixing seat 41 fixed to the second sliding seat 33 and an abutting telescopic rod 42 screwed with the fixing seat 41, such that the abutting telescopic rod 42 can make an oblique movement relative to the second sliding seat 33 to adjust the position thereof:

[0019] Furthermore, the first actuator 21 and the second actuator 31 can be a stepping motor or a servo motor; however, the present invention shall not be limited to these two kinds of exemplary embodiments only.

[0020] Please refer to Fig. 3 and Fig. 4, which respectively are a perspective view (1) and a perspective view (2) of the abutting apparatus. Please study these drawings together with Fig. 2. The first sliding seat 23 includes a first plate body 231 and a first nut 232 connected fixedly to the first plate body 231 and screwed with the first lead screw 22 correspondingly.

[0021] The second sliding seat 33 includes a second plate body 331 and a second nut 332 connected fixedly to the second plate body 331 and screwed with the second lead screw 32 correspondingly.

[0022] In addition, the first sliding seat 23 further includes a first sliding block 233 fixed to the first plate body 231 and located at the same side of the first nut 232. The first sliding block 233 is provided with a first sliding slot 2331. The machine platform 10, in the meantime, has a slide 12. The first sliding slot 2331 is configured for the slide 12 to be slid and inset therein.

[0023] The first sliding seat 23 also includes a first slide 234 connected fixedly to another side of the first plate body 231. The second sliding seat 33 includes a second sliding block 333 fixed to the second plate body 331 and located at the same side of the second nut 332. The second sliding block 333 is provided with a second sliding slot 3331 configured for the first slide 234 to be inset therein.

[0024] Please refer to Fig. 5 and Fig. 6, which respectively are an actuating illustration (1) and an actuating illustrate (2) by viewing from the front of the abutting apparatus according to the present invention. By moving the first axial transmission mechanism 20 relative to the machine platform 10, the abutting assembly 40 can be moved vertically. By moving the second axial transmission mechanism 30 relative to the first axial transmission mechanism 20, the abutting assembly 40 can be moved horizontally. By so doing, the abutting assembly 40 can be moved in a 2-D rectangular coordinate system. The degree of freedom to adjust the abutting assembly 40 can be thus enhanced.

[0025] More specifically, the pair of abutting assemblies 40 can be moved independently in a 2-D rectangular coordinate system. For example, when processing a linear metal wire to form a curled spring or a coil spring, the abutting assembly 40 is directed towards the spring wire feeding axle 11 (as shown in Fig. 8) and only performs a horizontal movement relative to the spring wire feeding axle 11 without any vertical movement. On the other hand, the abutting assembly 40 located above the spring wire feeding axle 11 then can perform a horizontal, vertical or oblique movement. An "oblique movement" mentioned here means that the tracks of the abutting assembly 40 can be linear or curved, including an are-shaped or parabola-shaped course of the guiding tracks.

[0026] Moreover, via the simultaneous actuations of the first axial transmission mechanism 20 and the second axial transmission mechanism 30, the abutting assembly 40 can be moved obliquely so that the wire forming tools can finally get into abutment with the linear metal wire to be curled to the desired coil spring. In other words, the movement of the abutting assembly 40 can be controlled at random, in accordance with the shape of the coil spring to be manufactured. For example, if the proportion between the rightward movement of the second sliding seat 33 and the upward movement of the first sliding seat 23 is 1:1, then the abutting assembly 40 will be moved to the right with a lifting angle of 45 degrees. If the proportion is 1: $\sqrt{3}$, then the abutting assembly 40 will be moved to the right with a lifting angle of 60 degrees. As will become apparent to a person skilled in the art, by means of the above configuration an arbitrary 2D-movement of the abutting assembly 40 can be achieved, which significantly enhances the degree of freedom in manufacturing coil springs.

[0027] Please refer to Fig. 7, which is illustrates possible exemplary movements of the abutting assemblies in an abutting apparatus. As shown in this figure, the abutting assembly 40 located above the spring wire feeding axle 11 (as shown in Fig. 8) is moved obliquely, while another abutting assembly 40 directed towards the spring wire feeding axle 11 is moved horizontally.

[0028] Please refer to Fig. 8 and Fig. 9, showing two front views according to one preferred abutting apparatus. As shown in these two figures, a pair of first axial transmission mechanisms 20 and a pair of second axial transmission mechanisms 30 are arranged at an upper and lower side of the spring wire feeding axle 11, respectively. By moving the first axial transmission mechanisms 20 relatively to the machine platform 10 and moving the second axial transmission mechanisms 30 relatively to the first axial transmission mechanism 20, the position of the abutting assembly 40 can be changed, such that the magnitude of the radius of the configured spring 50 can be determined and properly adjusted.

[0029] Please refer to Fig. 10 through Fig. 12, which separately are a perspective outer view, an actuation status illustration (1) and an actuation status illustration (2) of a cross-sectional view along the line "11-11" in Fig. 10 according to a preferred embodiment of the present invention. In this embodiment, the abutting assembly 40' includes a wire configuration knife seat 41', a wire configuration knife 42' pivoted to the wire configuration knife seat 41' and a driving block 43'.

[0030] The wire configuration knife seat 41' is fixed to the second sliding seat 33, while the driving block 43' is fixed onto the machine platform 10 (not shown in the figures) and abutted against one side of the wire configuration knife 42'. In this case, when the wire configuration knife seat 41' fixed to the second sliding seat 33 is moved relatively to the driving block 43', the wire configuration knife 42' can be swung relatively to the wire configuration knife seat 41'.

[0031] More specifically, one side of the wire configuration knife 42' is arranged a bearing 421'. The driving block 43' is arranged a lead slot 431' that is shown as an oblique configuration and provided for the bearing 421' to be slid therein. The relative movement between the second sliding seat 33 and the machine platform 10 can make the wire configuration knife 42' moved upwardly and downwardly in a third axial direction. Since the wire configuration knife 42' is swung in a third axial direction, a collision phenomenon can be avoided when the spring is configured by being fed out from the spring wire feeding axle 11 (as shown in Fig. 9).

[0032] Therefore, through the constitution of aforementioned assemblies, an abutting apparatus of a spring manufacturing machine according to the present invention is thus obtained.

[0033] Summarizing the aforementioned description, the abutting apparatus according to the present invention is an indispensable component for a spring manufacturing machine indeed, which may positively reach the expected usage objective for solving the drawbacks of the prior arts.

[0034] The aforementioned description only describes a number of preferred embodiments and shall not be deemed to limit the scope of the invention as defined by the claims.

Claims

1. A spring manufacturing machine with an abutting apparatus, said spring manufacturing machine (1) having a machine platform (10), said abutting apparatus (2) comprising:

   a first axial transmission mechanism (20), which comprises a first actuator (21) fixed to the machine platform (10), a first lead screw (22) driven by the first actuator (21) to rotate and a first sliding seat (23) coupled with the first lead screw (22) and capable of performing a linear movement relative to the machine platform (10);
   a second axial transmission mechanism (30), which comprises a second actuator (31) fixed to the first sliding seat (23), a second lead screw (32) driven by the second actuator (31) to rotate and a second sliding seat (33) coupled with the second lead screw (32) and capable to be moved linearly relative to the first sliding seat (23); and
   an abutting assembly (40 or 40'), which is fixed to the second sliding seat (33) and capable of performing a 2-D movement in vertical and/or horizontal directions relative to the machine platform (10) via the first axial transmission mechanism (20) and the second axial transmission mechanism (30);
   characterized in that the abutting assembly (40') comprises

   - a wire configuration knife seat (41') fixed to the second sliding seat (33) and a wire configuration knife (42') pivoted to the wire configuration knife seat (41'), one side of the wire configuration knife (42') being provided with a bearing (421'); and
   - a driving block (43') fixed onto the machine platform (10) and provided with a lead slot (431') adapted for the bearing (421') to be connected by sliding therein, such that movement of the wire configuration knife seat (41') causes the wire configuration knife (42') to swing in a third axial direction relative to the wire configuration knife seat (41').

2. The machine according to claim 1, wherein the first sliding plate (23) comprises a first plate body (231) and a first nut (232) connected fixedly to the first plate body (231) and being in engagement with the first lead screw (22).

3. The machine according to claim 1 or 2, wherein the second sliding seat (33) comprises a second plate body (331) and a second nut (332) connected fixedly to the second plate body (331) and being in engage-

ment with the second lead screw (32).

4. The machine according to any of the preceding claims, wherein the first sliding seat (23) is configured as a first sliding slot (2331) adapted for engaging with the machine platform (10) so that the first sliding seat (23) can be slidably moved relative to the machine platform (10).

5. The machine according to claim 4, wherein the first sliding seat (23) further comprises a first slide (234) connected fixedly to the first plate body (231), and wherein the second sliding seat (33) is configured as a second sliding slot (3331) adapted for receiving and guiding a sliding movement of the first slide (234).

6. The machine according to any of the preceding claims, wherein the abutting assembly (40) comprises a fixing seat (41) fixed to the second sliding seat (33) and an abutting telescopic rod (42) screwed with the fixing seat (41), and wherein the abutting telescopic rod (42) can make an oblique movement relative to the second sliding seat (33).

7. The machine of any of the preceding claims, wherein the lead slot (431') has an oblique configuration.

8. The machine of any of the preceding claims, further comprising:

another axial transmission mechanism (20) associated with and being of identical configuration as said first axial transmission mechanism (20) such that said two axial transmission mechanisms together form a pair of first axial transmission mechanisms (20), which are respectively formed at an upper and lower sides of a central line of the spring wire feeding axle (11) and each being capable of performing a linear movement relative to the machine platform (10);
another axial transmission mechanism (30) associated with and being of identical configuration as said second axial transmission mechanism (30) such that said two axial transmission mechanisms together form a pair of second axial transmission mechanisms (30); and
another abutting assembly associated with and being of identical configuration as said abutting assembly such that said two abutting assemblies together form a pair of abutting assemblies (40), which are respectively fixed to the second sliding seat (33) and able to independently make a 2-D movement in a vertical and horizontal directions relative to the machine platform (10) via the pair of first axial transmission mechanisms (20) and the pair of second transmission mechanisms (30).

Patentansprüche

1. Ein Federherstellungsmaschine mit einer als Anschlag wirkenden Vorrichtung, wobei die Federherstellungsmaschine (1) ein Maschinengestell (10) aufweist, wobei die als Anschlag wirkende Vorrichtung (2) umfasst:

einen ersten axialen Getriebemechanismus (20), der ein erstes Betätigungsglied (21), das an dem Maschinengestell (10) befestigt ist, eine erste Gewindespindel (22), die von dem ersten Betätigungsglied (21) angetrieben wird, um sich zu drehen, und einen ersten Gleitsitz (23) aufweist, der mit der ersten Gewindespindel (22) gekoppelt ist und in der Lage ist, eine lineare Bewegung relativ zu dem Maschinengestell (10) auszuführen;
einen zweiten axialen Getriebemechanismus (30), der ein zweites Betätigungsglied (31), das an dem ersten Gleitsitz (23) befestigt ist, eine zweite Gewindespindel (32), die von dem zweiten Betätigungsglied (31) angetrieben wird, um sich zu drehen, und einen zweiten Gleitbesitz (33) aufweist, der mit der zweiten Gewindespindel (32) gekoppelt ist und in der Lage ist, sich relativ zum ersten Gleitsitz (23) linear zu bewegen; und
eine als Anschlag wirkende Anordnung (40 oder 40 '), die an dem zweiten Gleitsitz (33) befestigt ist und in der Lage ist, eine zweidimensionale Bewegung in vertikaler und/oder horizontaler Richtung relativ zu dem Maschinengestell (10) über den ersten axialen Getriebemechanismus (20) und den zweiten axiale Getriebemechanismus (30) auszuführen;
dadurch gekennzeichnet, dass die als Anschlag wirkende Anordnung (40 ') umfasst,

- eine Drahtausbildungs-Messeraufnahme (41'), die an dem zweiten Gleitsitz (33) befestigt ist, und ein Drahtausbildungs-Messer (42'), das schwenkbar an der Drahtausbildungs-Messeraufnahme (41') angeordnet ist, wobei eine Seite des Drahtausbildungs-Messers (42') mit einem Lager (421 verstehen ist; und
- einen Antriebsblock (43 '), der auf dem Maschinengestell (10) befestigt ist und mit einer Führungsnut (431') für das Lager (421') versehen ist, sodass dieses darin gleitbeweglich aufgenommen ist, derart dass die Bewegung der Drahtausbildungs-Messeraufnahme bewirkt, dass das Drahtausbildungs-Messer (42') in einer dritten axialen Richtung relativ zu der Drahtausbildungs-Messeraufnahme (41') schwingt.

2. Die Maschine nach Anspruch 1, wobei die erste Gleitplatte (23) einen ersten Plattenkörper (231) und eine erste Mutter (232) aufweist, die fest mit dem ersten Plattenkörper (231) verbunden ist und sich in einem Eingriff mit der ersten Gewindespindel (22) befindet.

3. Die Maschine gemäß Patentanspruch 1 oder 2, wobei der zweite Gleitsitz (33) einen zweiten Plattenkörper (331) und eine zweite Mutter (332) aufweist, die fest mit dem zweiten Plattenkörper (331) verbunden ist und sich in einem Eingriff mit der zweiten Gewindespindel (32) befindet.

4. Die Maschine nach einem der vorhergehenden Ansprüche, wobei das erste Gleitsitz (23) als eine erste Gleitnut (2331) ausgelegt ist, die zum Eingriff mit dem Maschinengestell (10) ausgelegt ist, so dass der erste Gleitsitz (23) gleitend relativ zu dem Maschinengestell (10) bewegt werden kann.

5. Die Maschine nach Anspruch 4, wobei der erste Gleitsitz (23) ferner einen ersten Gleiter bzw. Schieber (234)aufweist, der fest mit dem ersten Plattenkörper (231) verbunden ist, und wobei der zweite Gleitsitz (33) als eine zweite Gleitnut ausgebildet (3331) ist, die ausgelegt ist zum Aufnehmen und Führen einer Gleitbewegung des ersten Gleiters bzw. Schiebers (234).

6. Die Maschine nach einem der vorhergehenden Ansprüche, wobei die als Anschlag wirkende Anordnung (40) eine Befestigungsaufnahme (41) aufweist, die an dem zweiten Gleitsitz (33) befestigt ist, sowie eine als Anschlag wirkende Teleskopstange (42), die mit der Befestigungsaufnahme (41) verschraubt ist, und wobei die als Anschlag wirkende Teleskopstange (42) eine schräge Bewegung relativ zu dem zweiten Gleitsitz (33) ausführen kann

7. Die Maschine nach einem der vorhergehenden Ansprüche, wobei die Führungsnut (431') schräg ausgebildet ist.

8. Die Maschine nach einem der vorhergehenden Ansprüche, weiterhin umfassend:

einen weiteren axialen Getriebemechanismus (20), der dem ersten axialen Getriebemechanismus (20) zugeordnet und gleich ausgelegt ist, derart, dass die beiden axialen Getriebemechanismen gemeinsam ein Paar von ersten axialen Getriebemechanismen (20) ausbilden, die jeweils auf einer oberen Seite und einer unteren Seite einer zentralen Linie der Federdraht-Zuführachse (11) angeordnet sind und jeweils in der Lage sind, eine lineare Bewegung relativ zu dem Maschinengestell (10) auszuführen;

einen weiteren axialen Getriebemechanismus (30), der dem zweiten axialen Getriebemechanismus (30) zugeordnet und gleich ausgelegt ist, derart, dass die beiden axialen Getriebemechanismen gemeinsam ein Paar von zweiten axialen Getriebemechanismen (30) bilden; und eine weitere als Anschlag wirkende Anordnung, die der als Anschlag wirkenden Anordnung zugeordnet und gleich ausgelegt ist, derart, dass die beiden als Anschlag wirkenden Anordnungen gemeinsam ein Paar von als Anschlag wirkenden Anordnungen(40) ausbilden, die jeweils an dem zweiten Gleitsitz (33) befestigt sind und in der Lage sind, unabhängig voneinander eine zweidimensionale Bewegung in vertikaler und horizontaler Richtung relativ zu dem Maschinengestell (10) über das Paar von ersten axialen Getriebemechanismen (20) und das Paar von zweiten Getriebemechanismen (30) auszuführen.

Revendications

1. Une machine de fabrication de ressorts avec un dispositif de butée, ladite machine de fabrication de ressorts (1) ayant une plate-forme (10), ledit appareil de butée (2) comportant:

un premier mécanisme de transmission axiale (20), comprenant un premier actionneur (21) fixé à la plate-forme (10), une première vis mère (22) entraînée en rotation par le premier actionneur (21) et un premier siège coulissant (23) couplé avec la première vis (22) et pouvant effectuer un mouvement linéaire relatif à la plate-forme (10);
un second mécanisme de transmission axiale (30), comprenant un second actionneur (31) fixé au premier siège coulissant (23), une seconde vis mère (32) entraînée en rotation par le second actionneur (31) et un second siège coulissant (33) couplé à la seconde vis mère (32) et pouvant effectuer un mouvement linéaire relativement au premier siège coulissant (23); et
un ensemble de butée (40 ou 40'), qui est fixé au second siège coulissant (33) et pouvant effectuer un mouvement 2-D suivant des directions verticales et/ou horizontales relativement à la plate-forme (10) via le premier mécanisme de transmission axiale (20) et le second mécanisme de transmission axiale (30);
caractérisée en ce que l'ensemble de butée (40') comporte:

- un siège de couteau de configuration de câble (41') fixé au second siège coulissant (33) et un couteau de configuration de câble

(42') pivoté vers le siège de couteau de configuration de câble (41'), un côté du couteau de configuration de câble (42') disposant d'un palier (421'); et

- un bloc d'entraînement (43') fixé sur la plate-forme (10) et disposant d'une fente d'attaque (431') adaptée au palier (421') pour y être connecté par glissement, de telle manière que le mouvement du siège de couteau de configuration du câble entraîne en torsion le couteau de configuration de câble suivant une troisième direction axiale relativement au siège de couteau de configuration de câble (41') .

2. La machine suivant la revendication 1, dans laquelle le premier siège coulissant (23) comporte un premier corps de plaque (231) et un premier écrou fixé au premier corps de plaque (231) et étant engagé à la première vis mère (22).

3. La machine suivant la revendication 1 ou 2, dans laquelle le second siège coulissant (33) comporte un second corps de plaque (331) et un second écrou (332) fixés au second corps de plaque (331) et étant engagé à la seconde vis mère (32).

4. La machine suivant l'une quelconque des revendications précédentes, dans laquelle le premier siège coulissant (23) est configuré en tant que premier logement coulissant (2331) adapté pour un engagement avec la plate-forme (10) de telle manière que le premier siège coulissant (23) peut être coulissé relativement à la plate-forme (10).

5. La machine suivant la revendication 4, dans laquelle le premier siège coulissant (23) comporte en outre un premier coulisseau (234) fixé au premier corps de plaque (231), et dans laquelle le second siège coulissant (33) est configuré en tant que second logement coulissant (3331) adapté à la réception et au guidage du mouvement de coulissement du premier coulisseau (234).

6. La machine selon l'une quelconque des revendications précédentes, dans laquelle l'ensemble de butée (40) comporte un siège de fixation (41) fixé au second siège coulissant (33) et une tige télescopique de butée (42) visée sur le siège de fixation (41), et dans laquelle la tige télescopique de butée (42) peut effectuer un mouvement oblique relativement au second siège coulissant (33).

7. La machine selon l'une quelconque des revendications précédentes, dans laquelle la fente d'attaque (431') présente une configuration oblique.

8. La machine suivant l'une quelconque des revendications précédentes, comprenant en outre:

un autre mécanisme de transmission axiale (20) associé à et étant d'une configuration identique audit premier mécanisme de transmission axiale (20) de telle manière que les deux mécanismes de transmission axiale forment ensemble une paire de premiers mécanismes de transmission axiale (20), qui sont respectivement formés à un côté supérieur et un côté inférieur d'une ligne centrale de l'axe d'approvisionnement du câble de ressort (11) et étant chacun capable d'effectuer un mouvement linéaire relativement à la plate-forme (10);

un autre mécanisme de transmission axiale (30) associé à et étant d'une configuration identique audit second mécanisme de transmission axiale (30) de telle manière que les deux mécanismes de transmission axiale forment ensemble une paire de seconds mécanismes de transmission axiale (30); et

un autre ensemble de butée associé à et étant d'une configuration identique à l'ensemble de butée de telle manière que les deux ensembles de butée forment ensemble une paire d'ensembles de butées (40), qui sont respectivement fixés au second siège coulissant (33) et capable d'effectuer indépendamment un mouvement 2-D suivant des directions verticale et horizontale par rapport à la plate-forme (10) via la paire de premiers mécanismes de transmission axiale (20) et la paire de seconds mécanismes de transmission axiale (30).

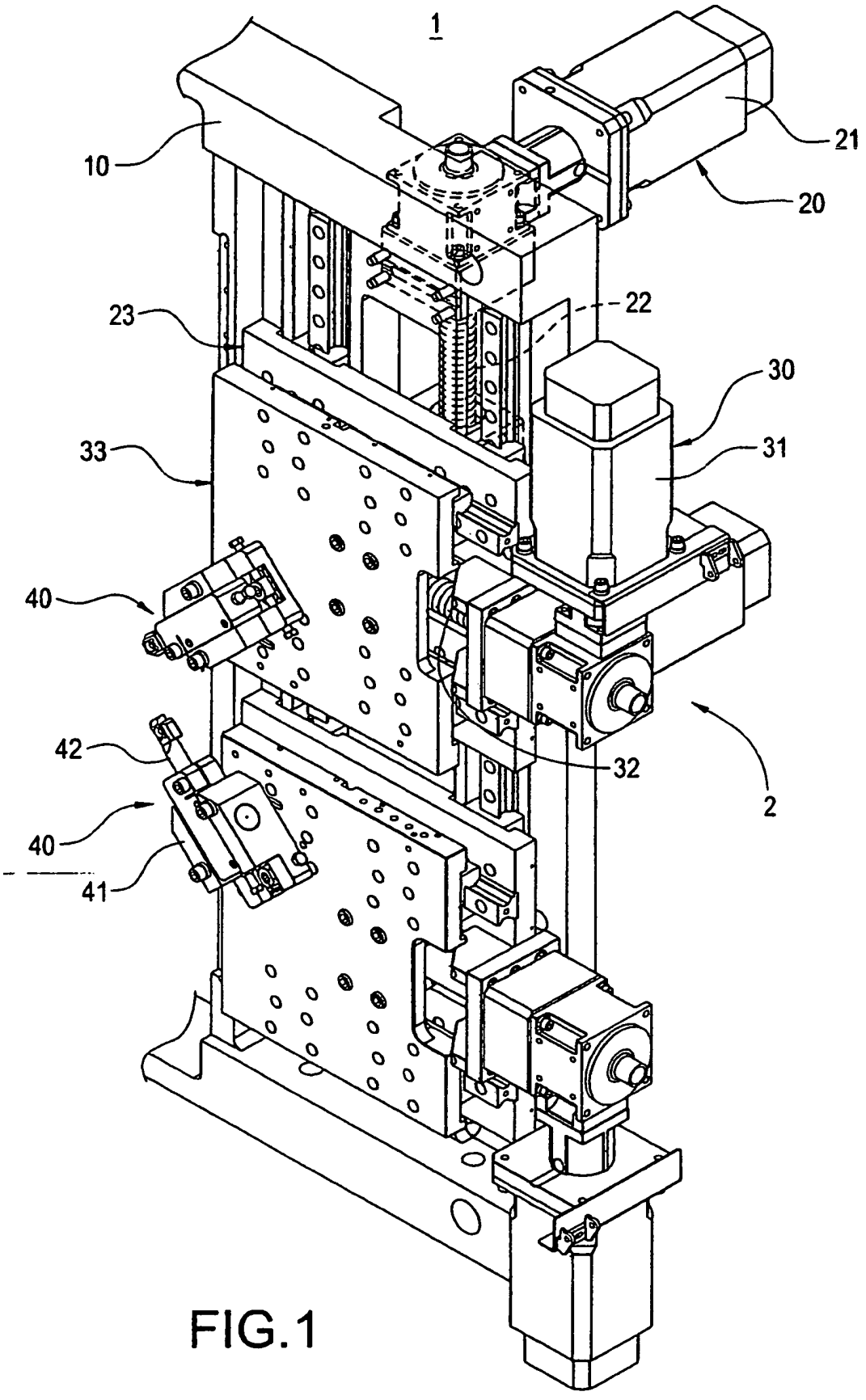


FIG.1

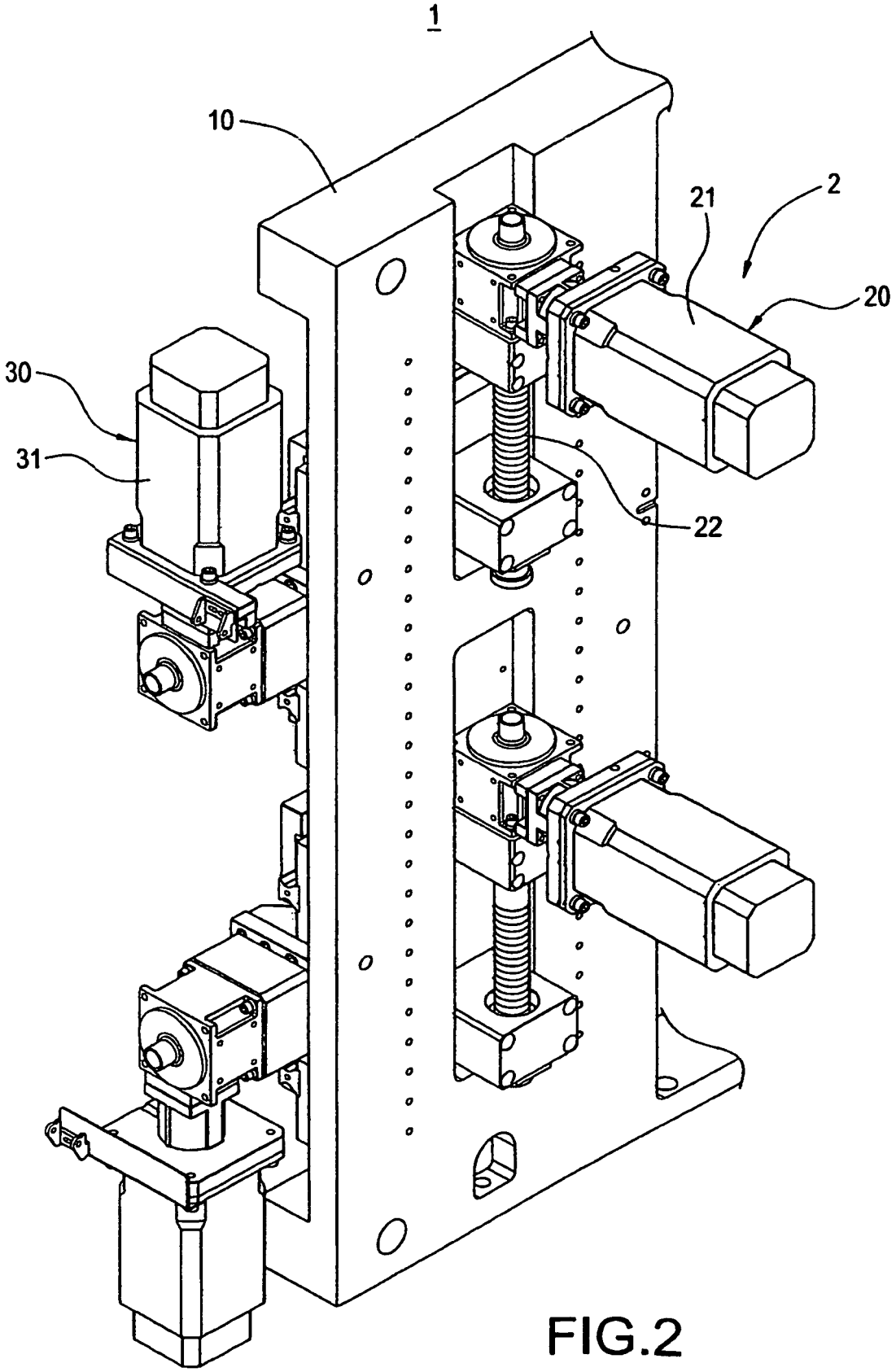


FIG.2

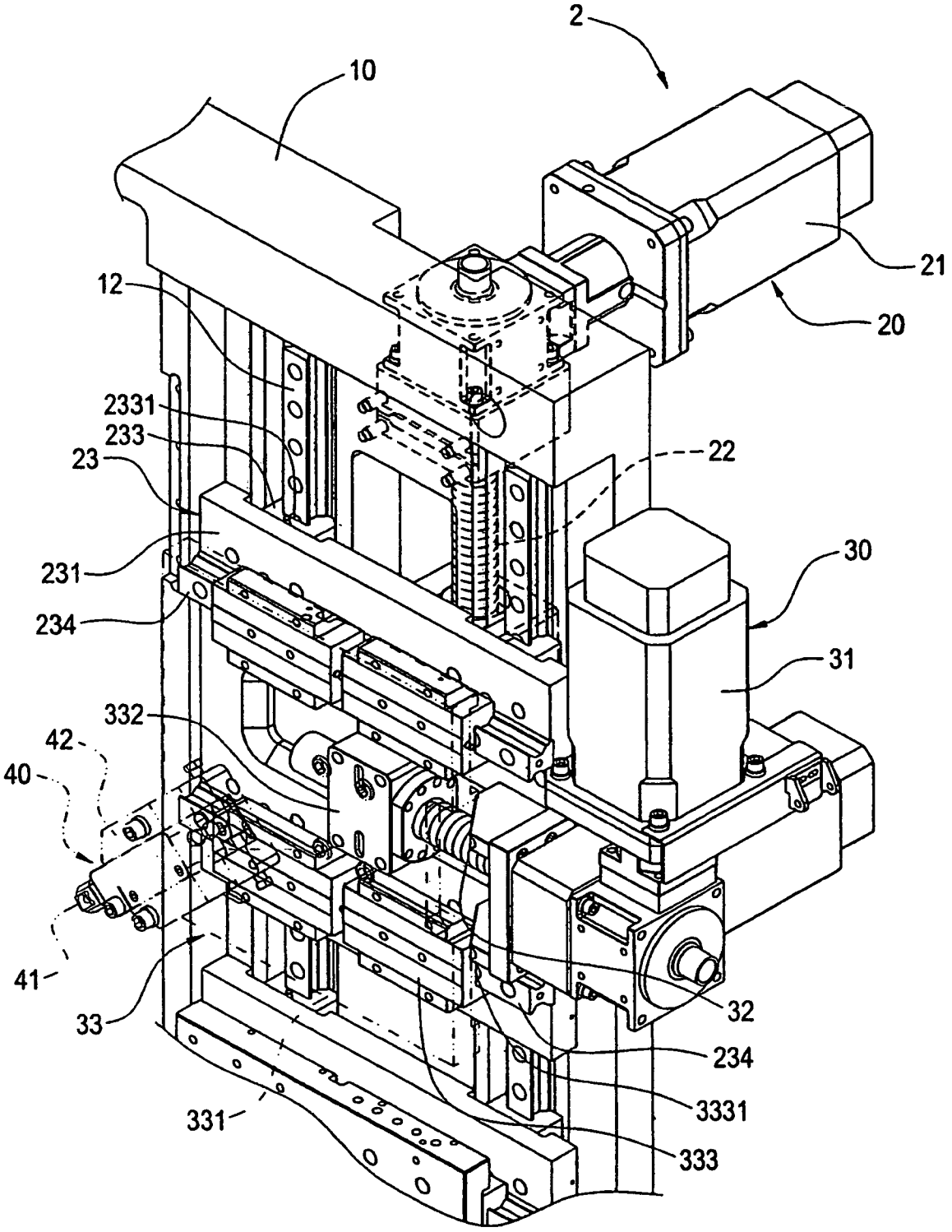

2
10
21
20
12
2331
233
23
22
231
30
234
31
332
42
40
41
33
32
234
3331
333
331

FIG.3

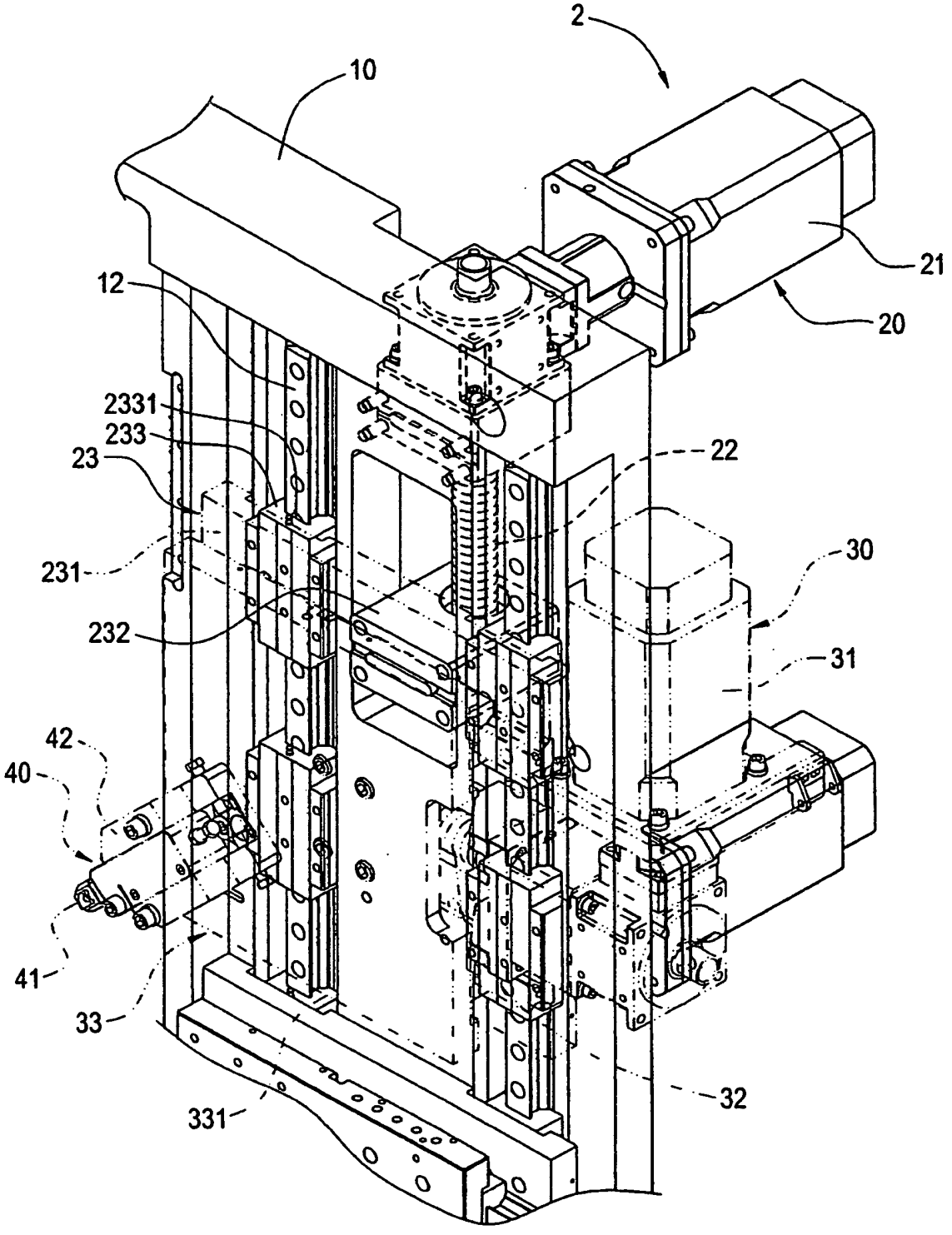


FIG.4

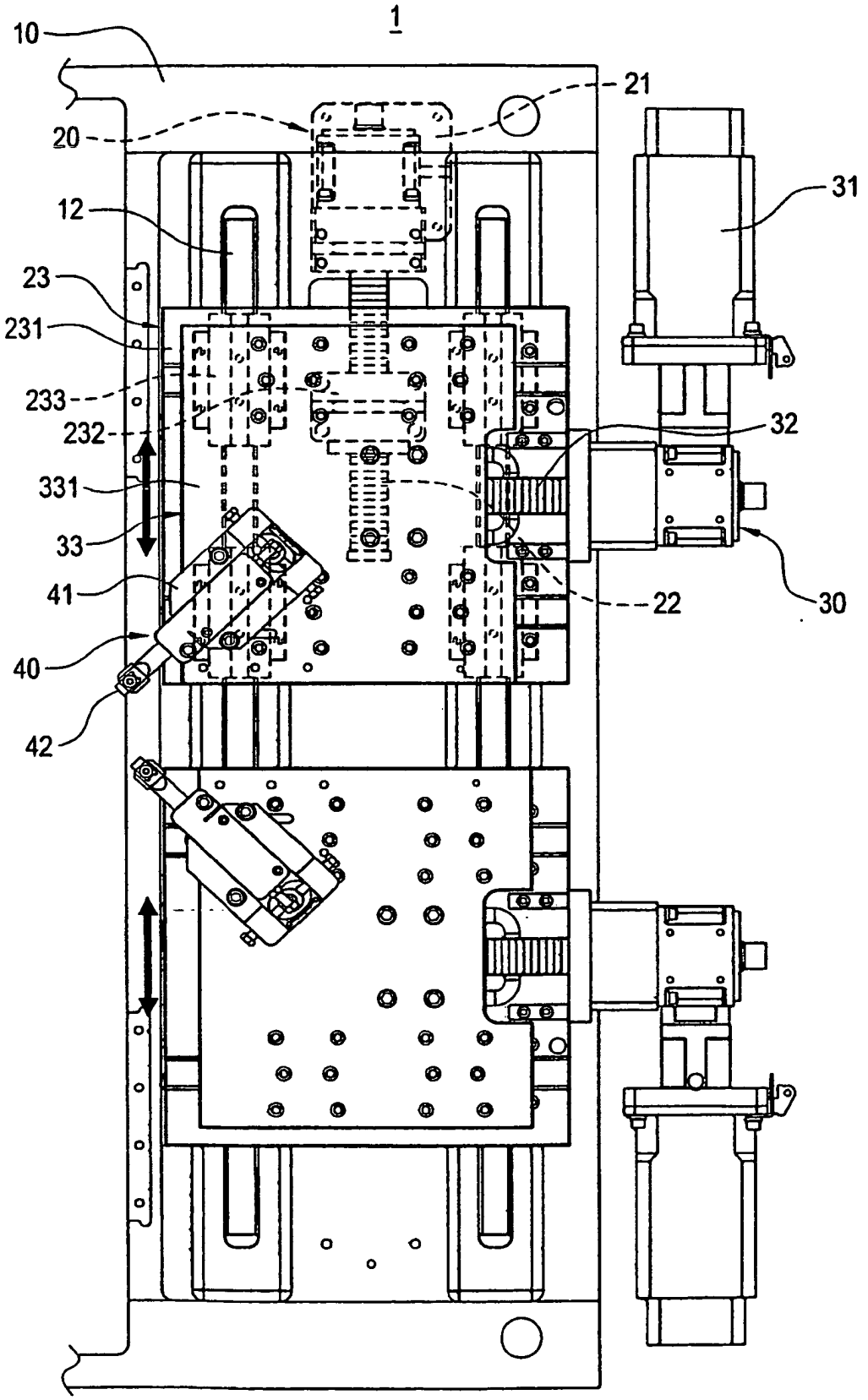


FIG.5

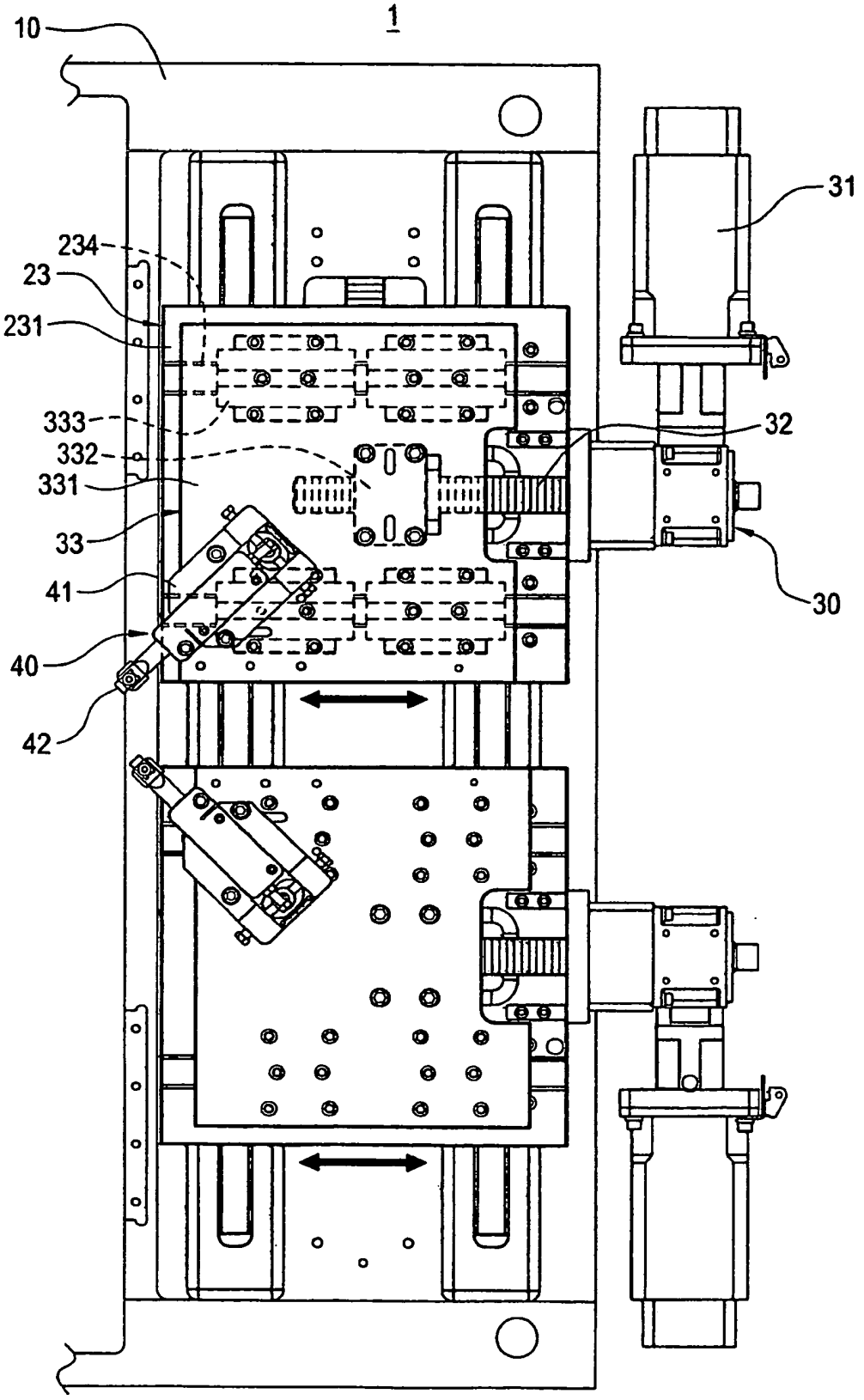


FIG.6

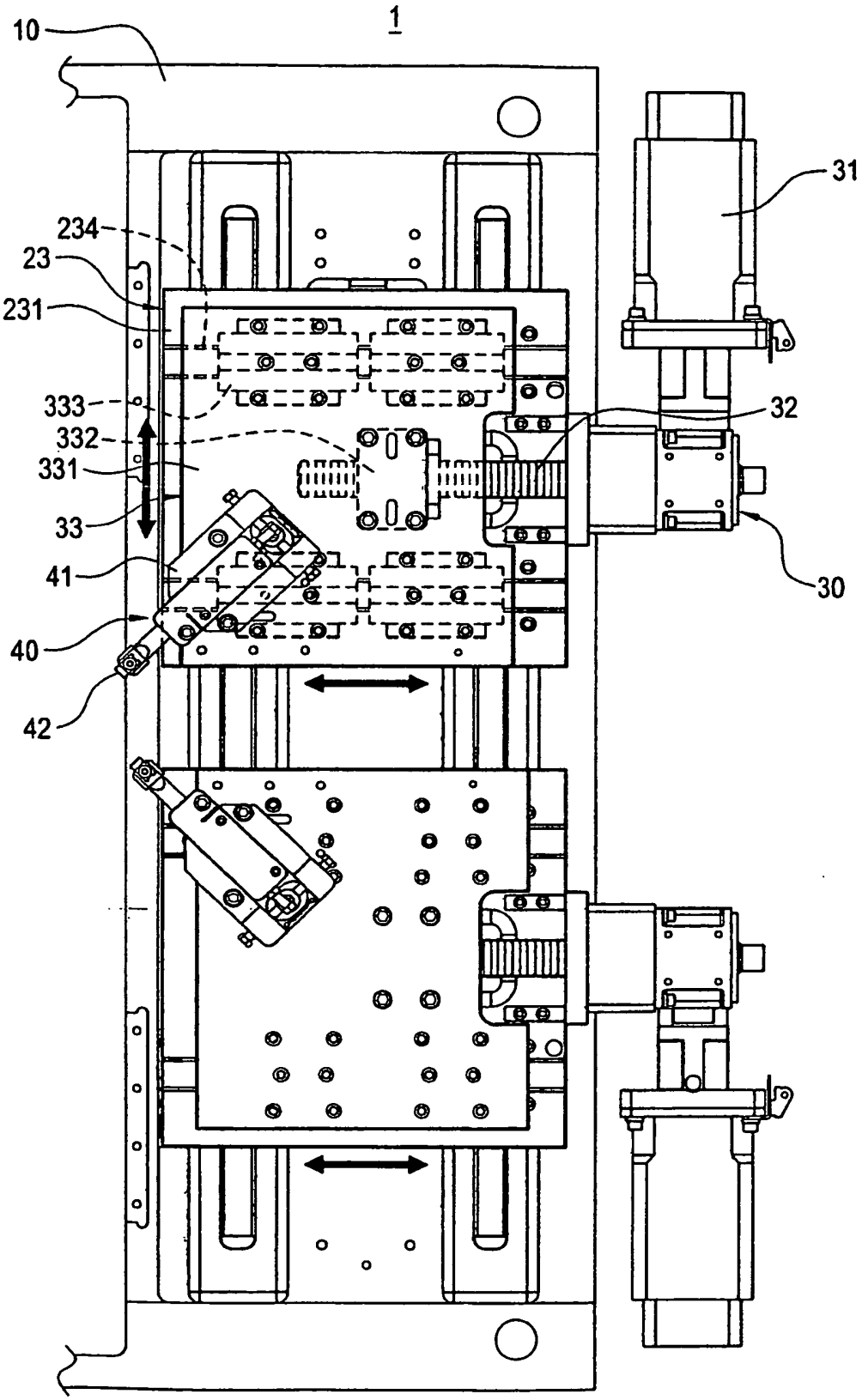


FIG.7

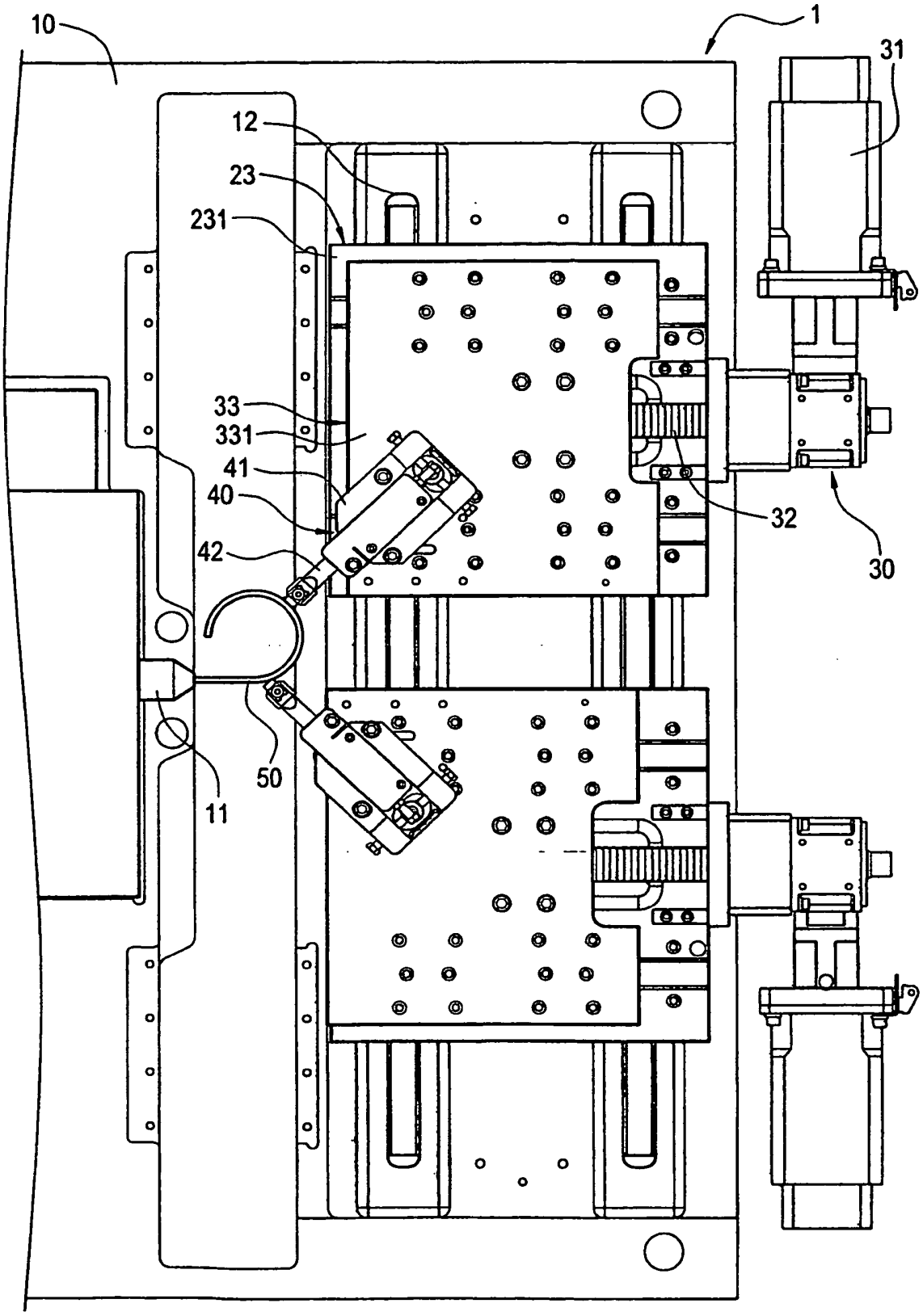


FIG.8

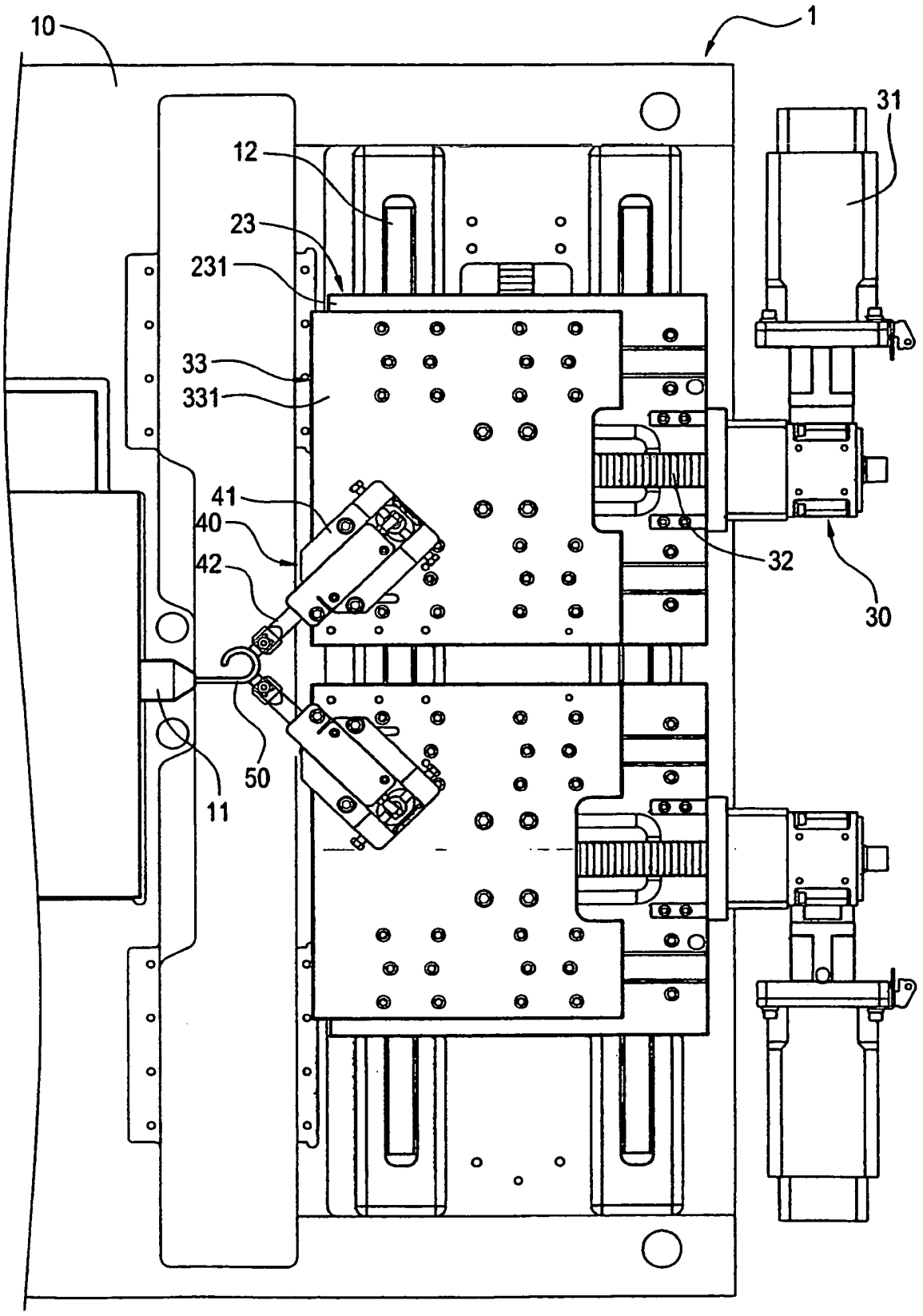


FIG.9

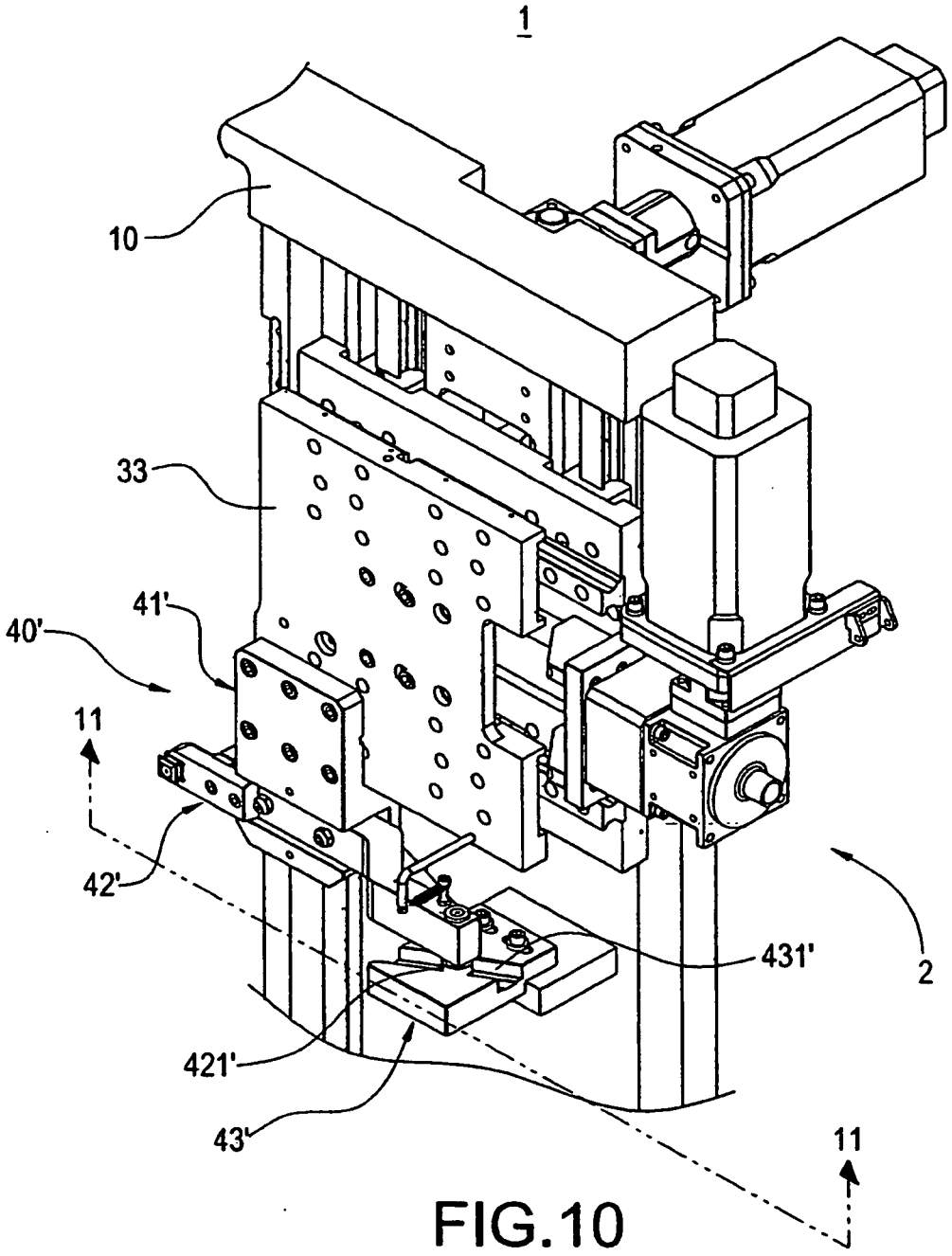


FIG.10

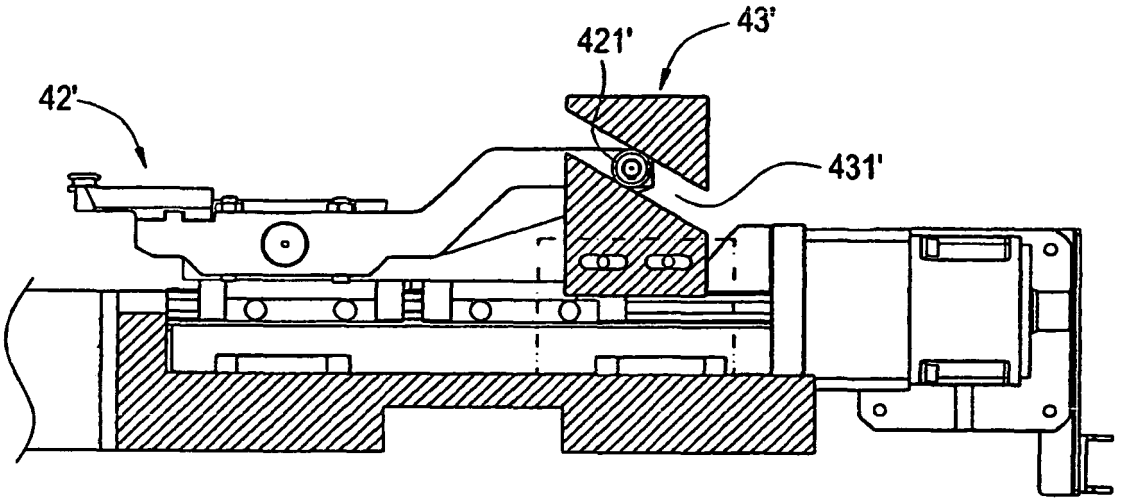


FIG.11

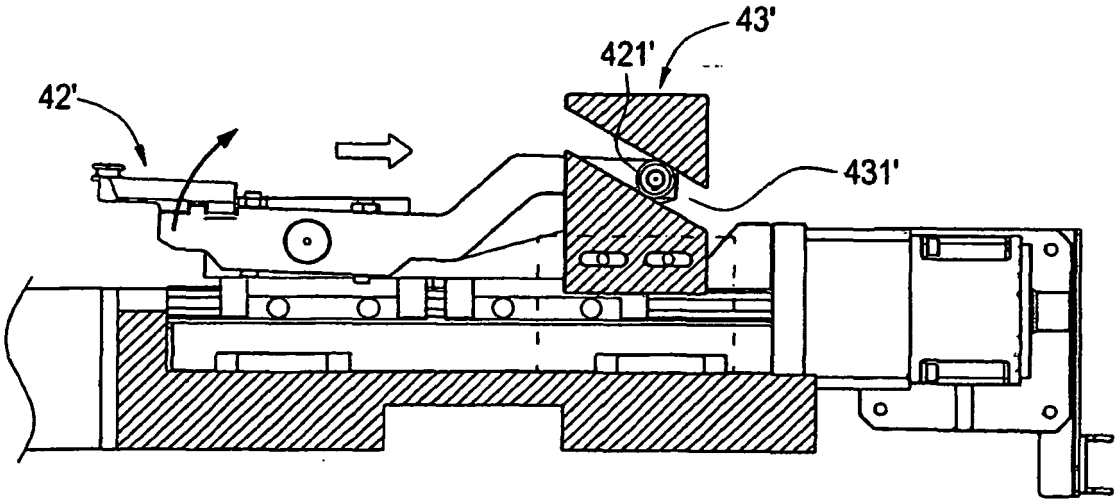


FIG.12

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 20080314110 A1 **[0005]**