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(54) LIFTING SYSTEM

(57) A lift (1) for loads that comprises a lifting group (10) and a generator group (20). The lifting group (10) comprises: a rotating drum (11); a lifting cable (13) associated with the drum (11), and an electric motor (15) operatively connected to the rotating drum (11) to impart a rotation on it. The generator group (20) comprises an endothermic engine (21) and an energy converter (23) operatively connected to the endothermic engine (21). Advantageously, the energy converter (23) of the generator group (20) is operatively coupled with the electric motor (15) of the lifting group (10) to supply electrical energy to it.

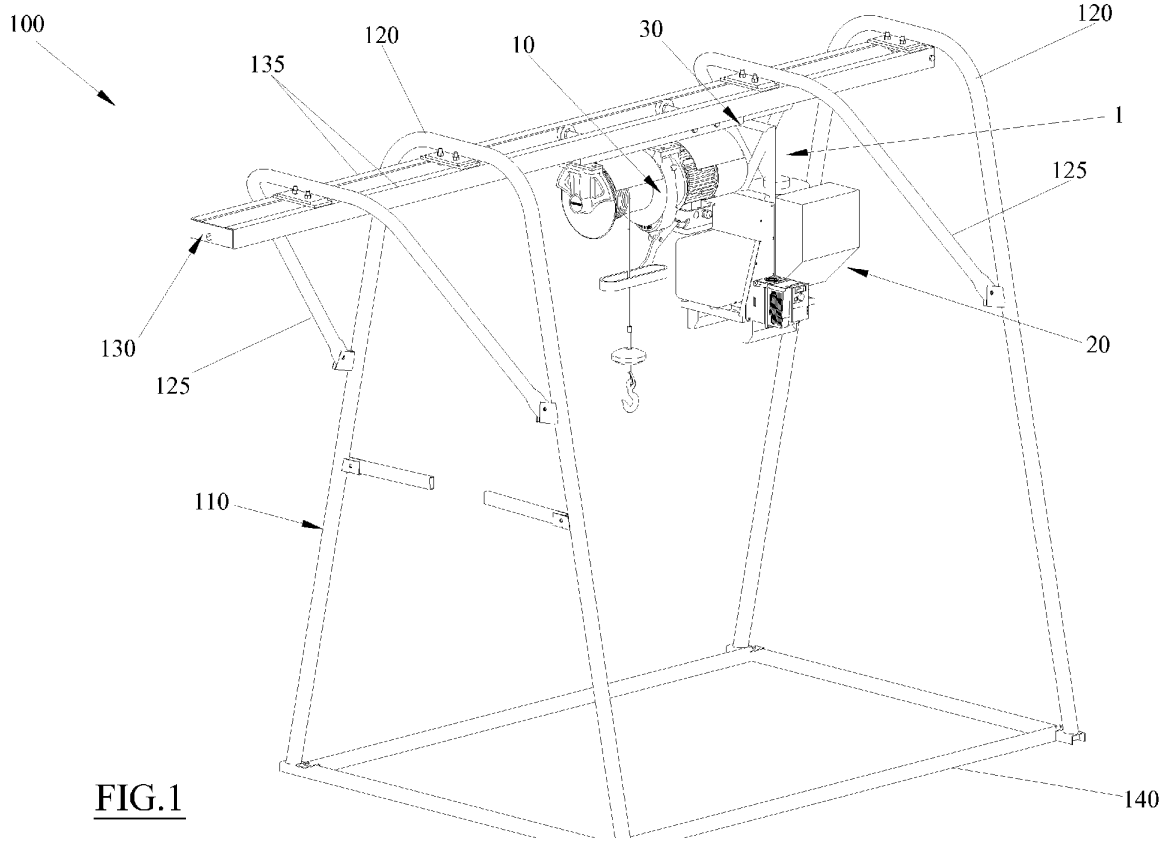


FIG.1

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Description

TECHNICAL FIELD

[0001] The present invention concerns the field of machines for moving loads. In greater detail, the solution in accordance with the embodiments of the present invention refers to a lift for moving loads and a lifting system comprising the same.

PRIOR ART

[0002] As known, lifts are widely used, in particular in the field of building, for transferring heavy loads to different heights.

[0003] Lifts generally comprise a rotating drum around which a cable is wound or unwound, at a free end of which the load to be lifted (or lowered) is fixed. The rotating drum is actuated by an electric motor. Consequently, the possibility of operating a lift depends on the availability of an adequate electricity source close by.

[0004] Unfortunately, in worksite areas access points to the electrical mains are often unavailable, for example the supply of energy can be suspended in the work area or the electrical mains does not reach the work area. In addition, the generator sets normally used are not easy to transport and position at great heights, like for example upper floors of a building under construction. In the technical field, in order to overcome such a drawback, lifts have been proposed comprising an internal combustion or endothermic engine, as an alternative to the electric motor. The endothermic engine of these lifts is usually actuated through levers, handles and/or buttons, provided on the endothermic engine or connected to it. This configuration reduces practicality and simplicity of use, since an operator must be located close to the lift to be able to actuate it, a situation that complicates the lifting of bulky loads. Moreover, lifts are mounted projecting from a building or other construction, usually at great heights, therefore the operator actuates the lift in a condition of low safety.

[0005] A purpose of the present invention is to overcome the aforementioned drawbacks of the prior art, with a simple, rational and low-cost solution. Such purposes are accomplished by the characteristics of the invention given in the independent claim. The dependent claims outline preferred and/or particularly advantageous aspects of the invention.

SUMMARY OF THE INVENTION

[0006] The invention, particularly, provides a lift for loads comprising a lifting group and a generator group. The lifting group comprises: a rotating drum, a lifting cable associated with the drum, and an electric motor operatively connected to the rotating drum to impart a rotation on it. The generator group comprises an endothermic engine and an energy converter operatively connected to the endothermic engine. Advantageously, the energy converter of the generator group is operatively coupled with the electric motor of the lifting group to supply electrical energy to it.

[0007] Thanks to such a solution, the lift can operate completely independently from the presence of an electrical energy source in the area of use.

[0008] In an embodiment, the generator group further comprises a fuel tank operatively connected to the endothermic engine.

[0009] In this way, the generator group can supply electrical energy converting the chemical energy stored in the fuel contained in the tank. Moreover, the autonomy of the lift can be controlled through a suitable selection of the volume of the tank.

[0010] In an embodiment, the generator group further comprises an inverter operatively connected to the energy converter and to the electric motor of the lifting group.

[0011] Thanks to such a solution, it is possible to deliver electrical energy by efficiently and reliably controlling one or more electrical voltage and electrical current values associated with the electrical energy.

[0012] In an embodiment, the lift further comprises a control module operatively connected to the electric motor. Preferably, the control module comprises a user interface.

[0013] In this way, the operation of the lift is easily controlled by an operator.

[0014] In an embodiment, the inverter is coupled with the control module to supply it with a voltage equal to or less than 24 V.

[0015] Thanks to such a solution, the control module is safe; in particular, the risk of an operator suffering an electric shock is substantially zero.

[0016] In an embodiment, the lift further comprises a support frame. Advantageously, the generator group and the lifting group are fixed to the support frame.

[0017] In this way the generator group and the lifting group can be moved as a single piece. This substantially simplifies the use of the lift.

[0018] In an embodiment, the support frame comprises a first portion connected to the lifting group and a second portion connected to the generator group. Preferably, the first portion and the second portion comprise a first coupling element and a second coupling element, respectively, suitable for coupling together.

[0019] Thanks to such a solution the lift is a modular element adaptable to different usage methods and requirements. In particular, the generator group can be used and associated with the lifting group selectively. For example, the lifting group can be used without the generator group where an electrical current source is present, reducing the weight and bulk of the lift. Moreover, maintenance and/or repair operations can be carried out more simply and without needing to move the entire lift. Finally, the possibility of separating the generator group from the lifting group simplifies the transportation

and storage operations of the lift.

[0020] In an embodiment, the first coupling element comprises a first tubular element in which the second coupling element comprises a second tubular element. Preferably, the second tubular element can be inserted in the first tubular element.

[0021] Thanks to such a solution, the two portions of the support frame are simple to make but, at the same time, ensure a reliable coupling and a strong structure.

[0022] In an embodiment, the first coupling element and the second coupling element comprise respective mutual fixing elements.

[0023] Thanks to such a solution, it is possible to increase reliability and safety of the coupling of the portions of the support frame. In particular, the fixing elements make it possible to lock the two portions of the support frame in a coupled configuration against mechanical stresses to which the lift is subjected during operation and/or other occasional stresses, like impacts.

[0024] A further aspect of the invention provides a lifting system comprising the aforementioned lift and a suspension structure. The suspension structure in turn comprises a guide element. Moreover, the support frame further comprises a moving element, which can be slidably coupled with the guide element.

[0025] In this way a lifting system is obtained that is equipped with the aforementioned advantages and, moreover, such as to allow a simple movement of the lift. Consequently, the lifting system makes it possible to move loads along the path defined by the guide element in addition to, or as an alternative to, the height movement.

[0026] In an embodiment, the moving element comprises one selected among: a roller; a sliding block; a belt; a chain, and a slide.

[0027] In an embodiment, the suspension structure further comprises two or more elements for spacing from the ground. Advantageously, the spacing elements have a first end for resting on a surface and a second end, opposite to the first end, coupled with the guide element.

[0028] Thanks to such a solution the resting structure makes it possible to suspend the lift with respect to a resting surface with a simple and stable structure.

[0029] In an embodiment, the moving element comprises a pair of idle rollers arranged opposite with respect to a longitudinal axis of the first portion of the support frame. Moreover, the guide element comprises a pair of guides with C-shaped profile arranged symmetrically with respect to a longitudinal axis of the suspension structure. Advantageously, each C-shaped guide is suitable for receiving a respective idle roller of the moving element while rolling. Thanks to such a solution it is possible to easily move the lift even manually by applying a low force.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] Further characteristics and advantages of the invention will become clear from reading the following description provided as an example and not for limiting purposes, with the help of the figures illustrated in the attached tables.

Figure 1 is an axonometric view of a lifting system according to an embodiment of the present invention.

Figure 2 is an axonometric view of a lift according to an embodiment of the present invention.

Figure 3 is an axonometric view of the generator group mounted on a respective portion of the support frame of the lift of Figure 2.

Figure 4 is a side view of the lift of Figure 2.

Figure 5 is a view from above of the lift of Figure 2.

BEST EMBODIMENT OF THE INVENTION

[0031] With particular reference to such figures, a lift for loads according to an embodiment of the present invention has been globally indicated with 1.

[0032] The lift 1 comprises a lifting group 10 and a generator group 20. Preferably, the lift also comprises a support frame 30, to which the generator group 10 and the lifting group 20 are or can be fixed - as described in greater detail hereinafter.

[0033] The lifting group 10 comprises a rotating drum 11, a lifting cable 13 associated with the rotating drum 11, and an electric motor 15.

[0034] In the embodiment considered, the rotating drum 11 has a reel-type structure suitable for receiving the lifting cable 13 while it winds. Moreover, the rotating drum 11 is axially coupled with the electric motor 15. In other words, the rotating drum 11 is coupled, preferably axially, with the shaft (not visible) of the electric motor 15 to be set in rotation by it.

[0035] The electric motor 15 comprises a motor block 151, a feeding block 153, equipped with a connector for an electric cable, and, possibly, a reducing block 155 arranged between the motor block 151 and the rotating drum 11. In this case, the rotating drum 11 is operatively connected to the shaft of the electric motor 15 through the reducing block 155.

[0036] The lifting cable 13 comprises a first end, which is fixed to the rotating drum 11, and a second free end, opposite the first end. An operative element 40, like a hook or a basket, is preferably fixed to the second end of the lifting cable 13. In addition, an end stop element 50, for example a disc-shaped element made of metal, can be fixed close to the second end of the lifting cable 13.

[0037] Optionally, the lifting group 10 comprises an end stop assembly 60 comprising a rod or lever 61 hinged to the electric motor 15 and a ring 63 fixed to a first end of the lever 61 itself. The lever 61 projects transversally to the electric motor 15 towards the rotating drum 11 so that, in operative position, the ring 63 is beneath the rotating drum and crossed by the lifting cable 13. Moreover, a second end of the lever 61 is operatively coupled with a switch of the feeding block 153 of the electric motor 15.

[0038] The generator group 20 comprises an endothermic engine 21 and an energy converter 23 operatively connected to the endothermic engine 21, so as to transform the mechanical energy of the endothermic engine 21 into electrical energy. Preferably, the generator group 20 also comprises a fuel tank 25 operatively connected to the endothermic engine 21. Advantageously, the energy converter 23 comprises a shaft (not illustrated) connected to a corresponding shaft (not illustrated) of the endothermic engine 21, possibly through a corresponding reducer (not illustrated).

[0039] In the embodiment considered, the generator group 20 further comprises an inverter 27 operatively connected to the energy converter 23 and coupled, or able to be coupled, with the electric motor 15 of the lifting group 10. Preferably, the inverter 25 is coupled, or can be coupled, with the feeding block 153 of the electric motor 15. For example, the inverter 25 can be coupled with the feeding block 153 through an electric cable (not illustrated). In addition, the lift 1 can comprise a control module (not illustrated), electrical or electronic, operatively connected to the electric motor 15 and, possibly, to the endothermic engine 21. Advantageously, the control module comprises a user interface, for example a keypad. Preferably, the inverter 27 is coupled with the control module to feed it with electrical energy; in particular, extremely ow voltage electrical energy, or ELV. For example, the inverter 27 is configured to supply the control module with electrical energy at a voltage value equal to or less than 24 V.

[0040] In an embodiment (not illustrated), the control module, or at least the user interface, can be separated from the lift 1, for example it comprises an (electrical) connection cable of predetermined length or a radio frequency transmission system. In this way, the operator can actuate the lift a desired distance from it.

[0041] The support frame 30 comprises a first portion 31 connected to the lifting group 10 and a second portion 33 connected to the generator group 20.

[0042] In the embodiment considered, the first portion 30 of the support frame 31 comprises a body 311 with an elongated shape extending longitudinally. In a preferred embodiment, the body 311 is a tubular element, having a square section in the non-limiting example of the figures. Preferably, the rotating drum 11 and the electric motor 15 are mounted along an axial direction of the first portion so that the rotation axis of the rotating drum 11 and of the shaft of the electric motor 15 are parallel to the longitudinal axis of the first portion 31 of the support frame 30. The rotating drum 11 is fixed to the first portion 31 of the support frame 30 so as to rotate around its own rotation axis. For example, the rotating drum 11 can be hinged to a pair of brackets 313 arranged at opposite sides of the rotating drum 11 and fixed to the first portion 31 of the support frame 30. The electric motor 15 can be fixed directly - for example, through a body thereof - or through other brackets 313 to the first portion 31 of the support frame 30.

[0043] In addition, the first portion 31 of the support frame 30 can comprise protective elements 315, like canopies - for example formed from curved plates - projecting from opposite sides of the first portion 31 so as to at least partially protect the rotating drum 11 and the electric motor 15 from contact with foreign bodies and/or atmospheric agents (in particular rain).

[0044] The second portion 33 of the support frame 30 comprises a bearing element 331 and a connection element 333.

[0045] The bearing element 331 of the second portion 33 is configured to support the generator group 20. Preferably, the bearing element 331 comprises a support base 335 suitable for receiving and/or allowing the attachment of the endothermic engine 21 - with which the tank 25 is coupled -, the energy converter 23 and the inverter 27. Moreover, the bearing element 331 comprises a constraining portion 337 transversal to the resting base 335 with a first end coupled with the resting base and a second end, opposite the first, coupled with the connection element 333. Preferably, the bearing element 331 also comprises a resting portion 339 - connected to the resting base 335 and projecting from it in the opposite direction with respect to the constraining portion 337 - suitable for keeping the second portion 33 in a stable position on a resting surface, at the same time keeping the generator group 20 spaced from the surface itself.

[0046] For example, the bearing element 331 of the second portion 33 comprises tubes and/or rods coupled together.

[0047] Optionally, the bearing element 331 can be equipped with a plate 70 suitable for defining a barrier - for example to protect and/or prevent a contact by foreign bodies at at least one part of the endothermic engine 21 and/or of the energy converter 23 and/or limiting the heat dispersion from the endothermic engine 21 to the energy converter 23 (and vice-versa).

[0048] The connection element 333 has an elongated shape extending longitudinally. Preferably, the connection element 333 is coupled with the constraining portion 337 with its longitudinal (main) axis arranged transversally with respect to a main axis of extension of the constraining portion 337.

[0049] In a preferred embodiment, the connection element 333 is a tubular element with section - square in the non-limiting example of the figures - smaller than the section of the body 311 of the first portion 31 of the frame 30. Advantageously, the section of the connection element 333 is such as to allow the insertion, preferably snug, thereof in the body 311 of the first portion 31 of the support frame 30. In other words, the body 311 of the first portion 31 and the connection element 333 of the second portion 33 operate as a first coupling element and a second coupling element, respectively, suitable for coupling together.

[0050] In a preferred embodiment, the body 311 and the connection element 333 each comprise fixing elements suitable for ensuring mutual fixing. In the illustrated

embodiment the body 311 and the connection element 333 comprise through holes, four in the example considered. The through holes are formed so as to define (two) pairs of through holes coaxial and transversal to the longitudinal axes of the body 311 and of the connection element 333. Moreover, each pair of holes of the body 311 is coaxial to a corresponding pair of holes of the connection element 333, when the connection element 333 is inserted in the body 311. In this way it is possible to keep the body 311 and the connection element 333 firmly coupled through a joining element like a bolt 80. For example, a screw of the bolt 80 is slotted in the aligned pairs of through holes and the nut is fixed to a (threaded) free end of the screw.

[0051] In the embodiment considered, the support frame 30 comprises one or more moving elements 90, two in the example considered, to allow a sliding coupling with the suspension structure. Preferably, the moving elements 90 comprise one or more among: a roller; a sliding block; a belt; a chain, and a slide. In the example considered, every moving element 90 comprises a pair of rollers, preferably idle, projecting from opposite sides to the support frame 30 with respect to the longitudinal axis thereof.

[0052] Preferably, the moving elements 90 are fixed to the first portion 31 thereof, even more preferably on one side of the first portion 31 opposite to the side to which the lifting group 10 is fixed with respect to the longitudinal axis of the first portion 31.

[0053] In an embodiment of the present invention, the lift 1 can form part of a lifting system 100 comprising a suspension structure 110 with which the support frame 30 of the lift can be associated, preferably in a sliding manner. Once the frame 30 is associated with the suspension structure 110, the latter keeps both the lifting group 10 and the generator group 20 spaced from the resting surface at a predetermined height.

[0054] In the embodiment considered, the suspension structure 110 comprises one or more, for example two, spacing elements 120, a guide element 130 and, preferably, a base element 140.

[0055] The spacing elements 120 have a first end for resting on the resting surface and a second end, opposite to the first end, coupled with the guide element 130. Preferably, the spacing elements 120 are associated transversal to the base portion 140 and, consequently, transversal to the resting surface. For example, the spacing elements 120 are shaped like an '∩' (i.e. an inverted U) with a pair of resting ends facing towards the resting surface and a distal curved portion with which the guide element 130 is coupled. Moreover, an additional element 125 for the distribution of the weight can be associated with each spacing element 120. For example, the additional element 120 is also shaped like a '∩' but with reduced extension with respect to the spacing element 120 and is hinged to it at a predetermined height, for example greater than half the extension of the spacing element 120 from the resting ends thereof.

[0056] The guide element 130 comprises a pair of guides 135 arranged symmetrically with respect to a longitudinal axis of the suspension structure. In particular, the guides 135 are sized so as to slidably receive the moving elements 90 of the support frame 30. In the example considered, the guides 135 have a C-shaped profile suitable for receiving the rollers of the moving elements 90 and allowing the rolling thereof. Preferably, the guides are fixed to the spacing elements 120 at a concavity of the respective curved portions. The base element 140, if provided, is suitable for coming into contact with the resting surface. In the example considered, the base portion 140 comprises (four) rods constrained together so as to define a parallelogram arrangement (in plan), preferably rectangular. Advantageously, the resting ends of the spacing element 120 are coupled with the base element 140 at the vertices thereof, so as to obtain a support structure 110 that is particularly strong and capable of supporting a great weight for example of the order of one thousand kilograms (1000 Kg).

[0057] In light of what is described above, it will be clear to those skilled in the art that the lifting group 10 coupled with the first portion 31 of the support frame 30, the generator group 20 coupled with the second portion 33 of the support frame 30, and the suspension structure 110 can be transported as separate elements and mounted at the location of use. During mounting, the second portion 33 is inserted in the first portion 31 that are thus fixed together by means of the bolts 80 as described earlier. The generator group 20 is electrically connected to the lifting group 10. In particular, the inverter 27 of the generator group 20 is connected to the feeding block 153 of the electric motor 15, for example through an electric cable (not illustrated).

[0058] Thereafter, the support frame 30 can be fixed to a fixed and/or hinged support (not illustrated) - known in the field and not described here for the sake of brevity - or can be slidably associated with the suspension structure 110 to define the lifting system 100 as described above.

[0059] The lift 1 - or the lifting system 100 - is thus completely mounted and ready for use to lift and lower loads (not illustrated) fixed to the operative element 40, in a way that can be controlled by an operator through the user interface of the control module. In particular, once the generator group 20 is started the operation of the lift 1 can be completely controlled by the control module, possibly remotely.

[0060] Advantageously, if the lifting cable 13 were excessively retracted, the counterweight 50 or the operative element 40 would make contact with the end stop assembly 60 making the latter rotate about its pin. This rotation leads to the actuation of the switch of the feeding block of the feeding block 153 and thus to switching off the electric motor 15, preventing the lifting group 10 from being hit by the operative element 40 and/or by a lifted load connected to it.

[0061] Moreover, in the case in which an adequate

mains power supply is available, the generator group 20 can be removed or not associated with the lifting group 10, i.e. the first portion 31 and the second portion 33 of the support frame 30 are not coupled or are separated, and the feeding block can be connected to the electrical mains through an electric cable.

[0062] The invention thus conceived can undergo numerous modifications and variants all encompassed by the inventive concept.

[0063] For example, in an embodiment (not illustrated), the feeding block of the electric motor can be integrated in the motor block thereof. Similarly, alternatively or additionally, the inverter can be integrated in the energy converter.

[0064] In an alternative embodiment (not illustrated), the lift can comprise, for example in the generator group, one or more batteries, preferably rechargeable by the energy converter and operatively connected to the inverter.

[0065] In an embodiment (not illustrated), the moving element and/or the guide element can comprise a brake or another stop element to ensure the parking of the lift in a desired operative position.

[0066] In an alternative embodiment, the moving element can be motorised, for example it can comprise motorised rollers or wheels, operatively connected to the electric motor to receive actuation energy from it.

[0067] Moreover, all of the details can be replaced by other technically equivalent elements.

[0068] In practice, the materials used, as well as the contingent shapes and sizes, can be whatever according to the requirements without for this reason departing from the scope of protection of the following claims. In particular, the materials used are suitable for interaction with heavy loads, for example of the order of one thousand kilograms; for example, at least the support frame, the rotating drum, the lifting cable, the operative element and the suspension structure are formed from a strong material like steel or another metal alloy.

Claims

1. Lift (1) for loads comprising a lifting group (10) and a generator group (20), wherein the lifting group (10) comprises: a rotating drum (11), a lifting cable (13) associated with the drum (11), and an electric motor (15) operatively connected to the rotating drum (11) to impart a rotation on it, the generator group (20) comprises an endothermic engine (21) and an energy converter (23) operatively connected to the endothermic engine (21), the energy converter (23) of the generator group (20) being operatively coupled with the electric motor (15) of the lifting group (10) to supply electrical energy to it.

2. Lift according to claim 1, wherein the generator group (20) further comprises an inverter (27) operatively connected to the energy converter (23) and to the electric motor (15) of the lifting group (10).

3. Lift (1) according to one of claims 1 or 2, further comprising a control module operatively connected to the electric motor (15), the control module comprising a user interface.

4. Lift (1) according to claims 2 and 3, wherein the inverter (27) is coupled with the control module to supply it with a voltage equal to or less than 24 V.

5. Lift (1) according to any one of the previous claims, further comprising a support frame (30), and wherein the generator group (20) and the lifting group (10) are fixed to the support frame (30).

6. Lift (1) according to claim 5, wherein the support frame (30) comprises a first portion (31) connected to the lifting group (10) and a second portion (33) connected to the generator group (20), the first portion (31) and the second portion (33) comprising a first coupling element (311) and a second coupling element (333), respectively, suitable for coupling together.

7. Lift (1) according to claim 6, wherein the first coupling element (311) comprises a first tubular element (311) and wherein the second coupling element (333) comprises a second tubular element (333), the second tubular element (333) being able to be inserted in the first tubular element (311).

8. Lift (1) according to claim 6 or 7, wherein the first coupling element (311) and the second coupling element (333) comprise respective mutual fixing elements.

9. Lifting system (100) comprising the lift (1) according to any one of the previous claims and a suspension structure (110) in turn comprising a guide element (130), wherein the support frame (30) of the lift (1) further comprises a moving element (90), which can be slidably coupled with the guide element (130).

10. Sistema lift (100) according to claim 9, wherein the moving element (90) comprises one selected among:

    - a roller;
    - a sliding block;
    - a belt;
    - a chain, and
    - a slide.

11. Lifting system (100) according to claim 9 or 10, wherein the suspension structure (110) further comprises two or more elements for spacing from the

ground (120), the spacing elements having a first end for resting on a surface and a second end, opposite the first end, coupled with the guide element (130).

12. Lifting system (100) according to any one of claims 9 to 11, wherein the moving element (90) comprises a pair of idle rollers arranged opposite with respect to a longitudinal axis of the first portion (30) of the support frame (30), and wherein the guide element (130) comprises a pair of guides (135) with C-shaped profile arranged symmetrically with respect to a longitudinal axis of the suspension structure (110), each guide (135) with C-shaped profile being suitable for receiving a respective idle roller of the moving element (90) while rolling.

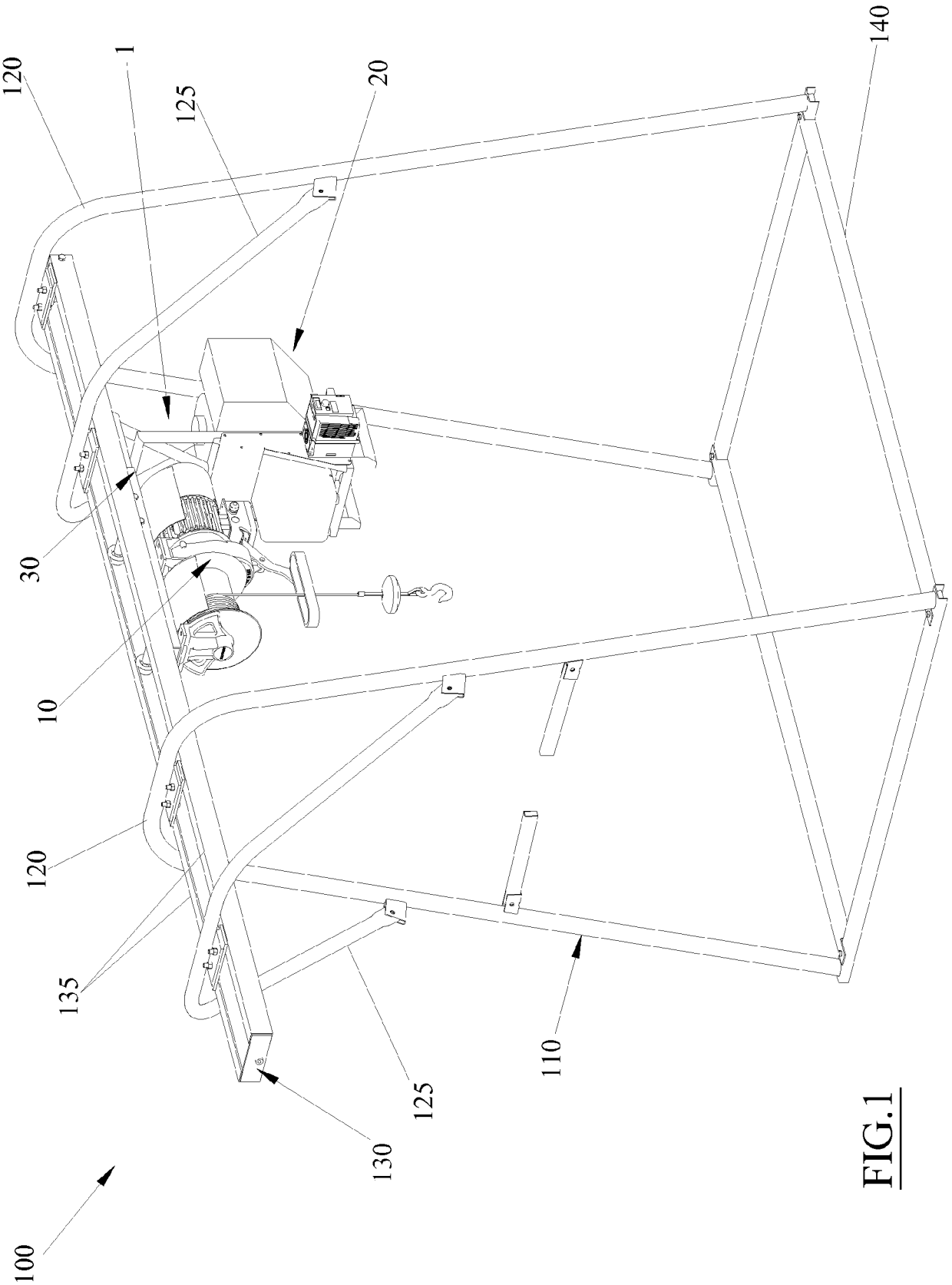


FIG.1

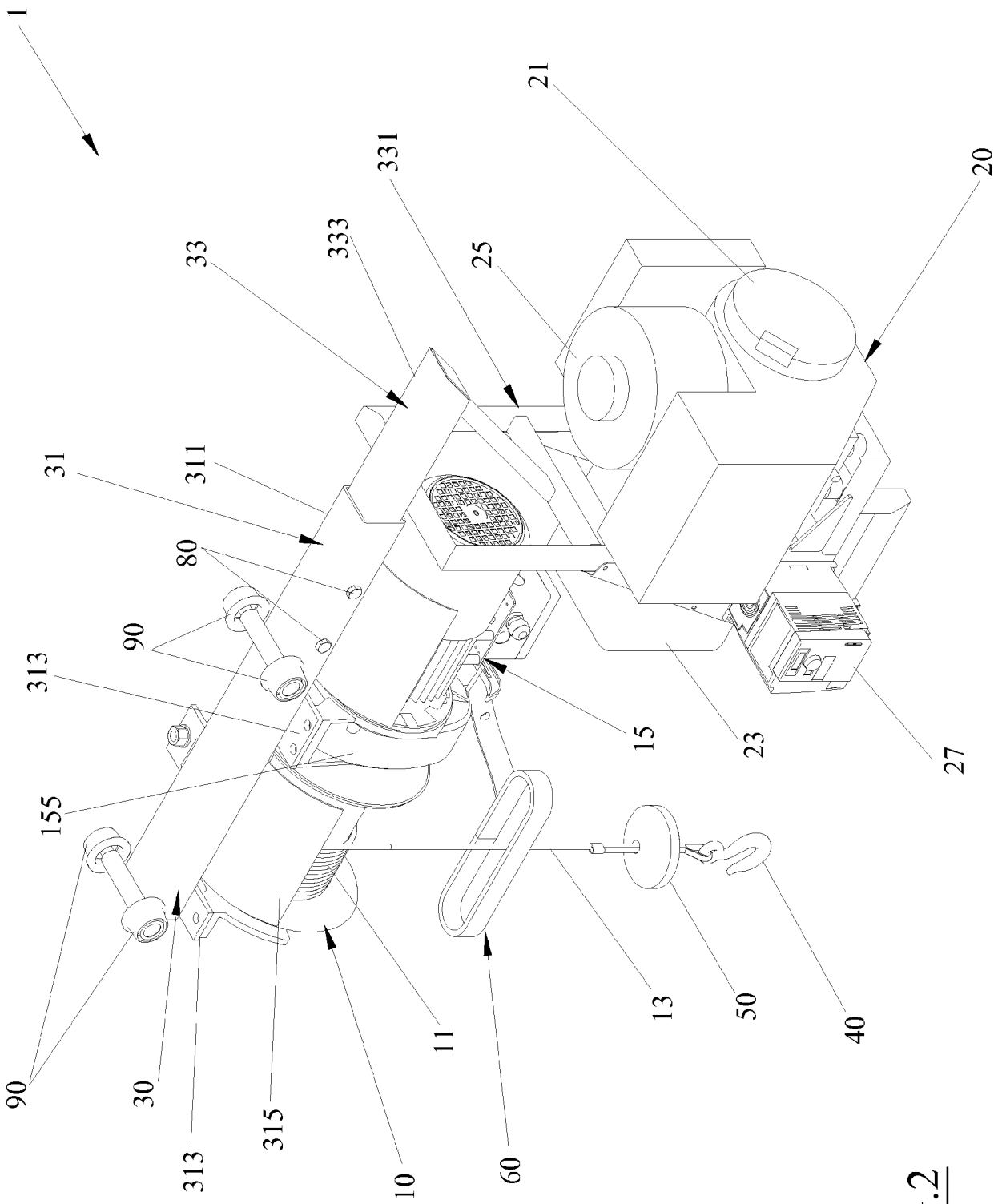

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FIG.2

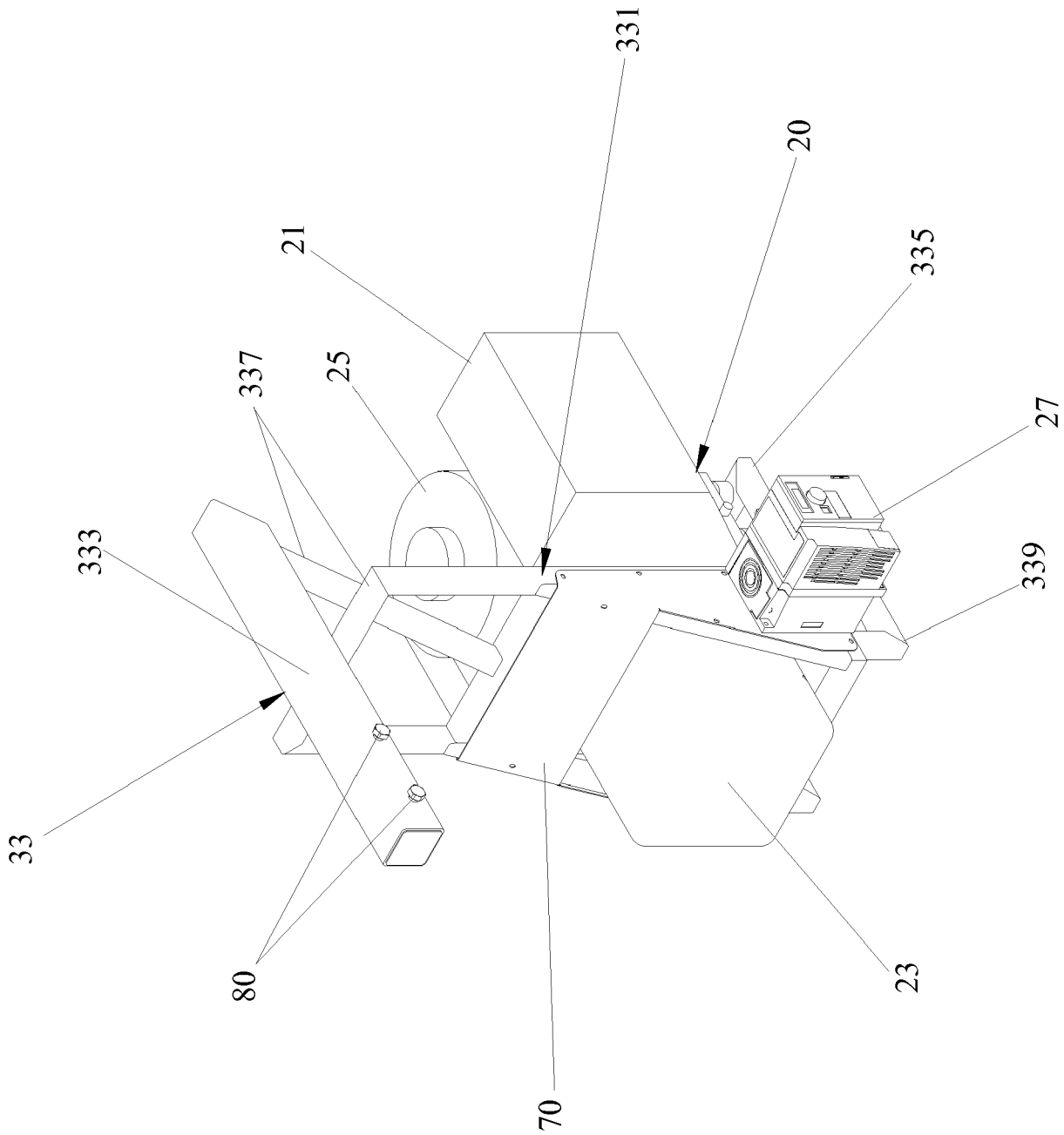


FIG.3

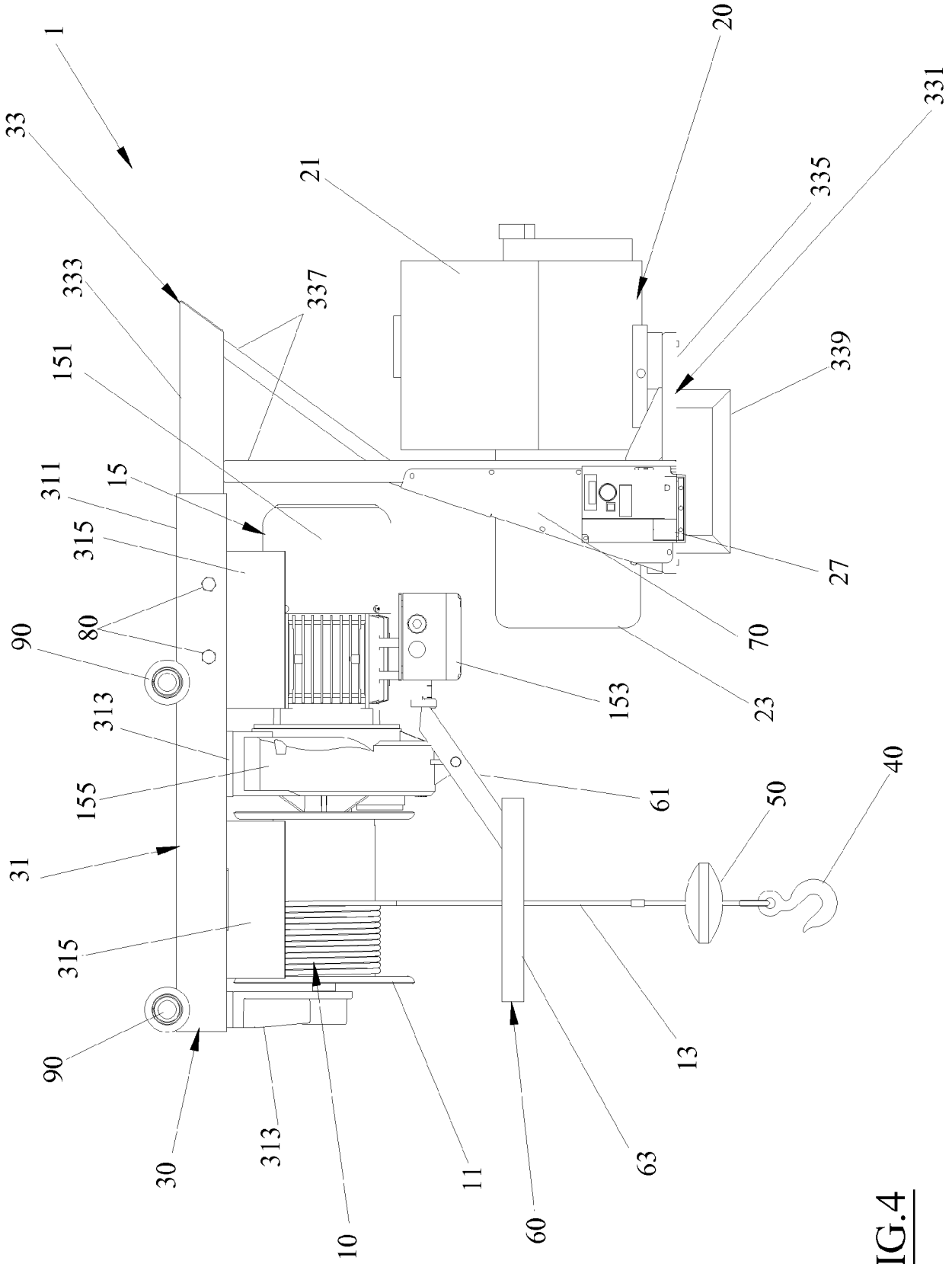

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FIG.4

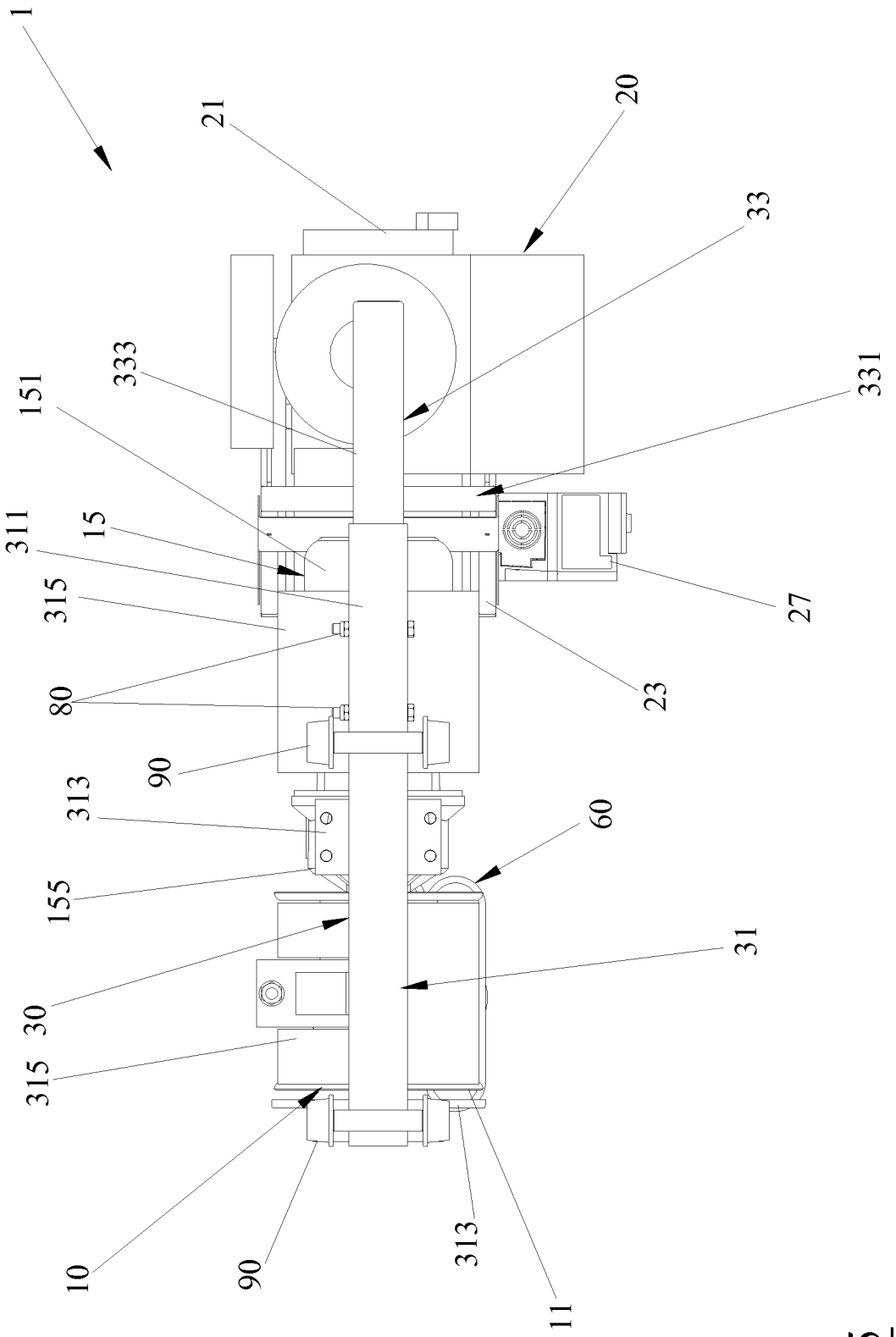

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FIG.5

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 19 17 1514

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	DE 10 2015 116506 A1 (OLKO-MASCHINENTECHNIK GMBH [DE]) 30 March 2017 (2017-03-30) * abstract; figure 2 * * page 10, line 18 - page 11 *	1-5 9-11	INV. B66C13/18 B66D1/08 B66D1/12
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A	* The main image and the third image on top left of the web page are considered *	1	
A	WO 2006/113844 A1 (ATLAS DEVICES LLC [US]; BALL NATHAN [US]; FOFONOFF TIMOTHY [US]; SCHMI) 26 October 2006 (2006-10-26) * abstract * * page 1, line 22 - page 2, line 6 *	1,3	TECHNICAL FIELDS SEARCHED (IPC) B66C B66D
A	EP 2 990 573 A1 (CHAMPION DOOR OY [FI]) 2 March 2016 (2016-03-02) * the whole document *	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	23 May 2019	Verheul, Omiros

CATEGORY OF CITED DOCUMENTS

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