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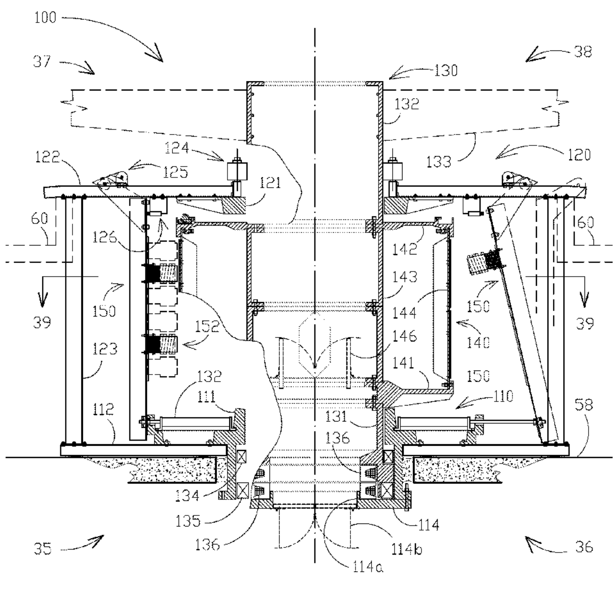

FIG. 34

(57) Abstract: A base-load mass turbine and electric generator, wherein a turbine with exponential net energy gain converts a predetermined mass to a stored kinetic energy that eventually drive the generator to generate electricity; preferably the generator comprises a vertical-axis armature and retractable stators which abrogate the physical phenomena a.k.a. Lenz's Law while the turbine is at the initial stage of acceleration - thereby created a self-powered renewable power generation system that could effectively address: a sustainable and competitive economy development, energy security, prosperity, climate change, etc.; and given that a very large fraction of the electricity produced is deliverable, the so - called "exponential net energy gain" is in effect analogous to an "exponential capital gain" or simply and for the first time... a proactive income on top of a foreseeable profit.

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TURBINE WITH EXPONENTIAL ENERGY GAIN AND DIRECT DRIVE GENERATOR

CROSS-REFERENCE TO RELATED APPLICATIONS

This application relates to the Related Invention as described and claimed by the U.S. Patent No. 8,878,382 B2, issued Nov. 4, 2014 and Provisional Application No. 62,391,981, filed May16, 2016.

The following is a copy of the said U.S. Patent, which has been amended and upgraded, and wherein the drawings and description of the said Related Invention are shown and described under the heading, “RELATED INVENTION”.

FIELD OF THE INVENTION

This present invention relates to a utility-scale power generation system, in particular, it relates to a turbine with exponential energy gain and direct drive generator, wherein the turbine efficiently converts a predetermined mass to an inexhaustible clean energy and uses much of the kinetic energy to power the generator of what further is a self-powered turbine; wherein the generator comprises essentially of a vertical-axis armature and a predetermined number of vertical segment stators, wherein the stators are retractable to at least abrogates the Lenz’s Law effect while the turbine is at the initial stages of acceleration powered by small motors - thereby exponentially increases the system’s net energy gain.

BACKGROUND OF THE INVENTION

The performance of prior power generation systems like all other machines in the industry, are rated in terms of efficiency… in general the 100% efficiency is known as an unreachable ceiling.

Surprisingly, the present invention however had surpassed exponentially the 100% efficiency… and instead rated in terms of net energy gain and correspondingly the system’s energy output or energy production.

For over a century, power generation systems that supply electricity to our homes and businesses fundamentally had not changed that much. We’re still more on, either burning a finite and toxic fuels or harnessing the kinetic energy of water or wind.

Thermal-based Power Plants

The majority of our power generation systems are powered by the respective heat engine that burns fossil or nuclear fuel to generate electricity and the process is relatively longer and quite expensive - say from the procurement of fuel, the conversion of fuel to heat, the conversion of heat to mechanical energy and finally to electricity. In addition, the process continues but shifted on how to address the issue of waste disposal, its impacts to the environment, and other externalities.

Renewables

Renewables on the other hand are environmentally friendly and the conversion respectively is shorter. The most relevant are: hydroelectric, wind turbine and solar energy. However and world is aware of, all those technologies have constraints as well: the excessiveness of space, issues on water rights and the competing demands for water, inconsistency of supply, and then comes the immerging pollutions and the potential increase in the cost of electricity.

Exponential Energy Gain

The idea of a turbine with exponential energy gain is quite misleading and based on the conventional engineering practiced, that seems to contradict with the laws of Physics and it appears the world has had no experienced with this kind of machine, ever, but the following scenarios may shed some lights.

You may have watched a building under construction lately, in particular, had noticed a steel beam which at the midpoint tied to a cable and horizontally suspended in the mid-air by a crane, and with almost no friction is free to move about the cable.

And noticed also a person with his bare hand pulls the beam at one end and pushes it against the column as he assembled the structure - seemingly with ease.

Technically, as the person pulls and pushes the beam at one end he apply a force, known in Physics as, $F = ma$ or in angular momentum, $F = m\ (v^2/r)$, which is a lineal equation. Correspondingly, as the beam moves along it generates a kinetic energy. And the equation for kinetic energy is exponential and in this case, $E = ½\ m\ r^2\ (v/r)^2$, which indicate that its potential kinetic energy may either less or more than the applied force relative to the length of the beam, and for now, just assumed that the beam has a high density mass on both ends.

Similarly and given a rotor of different sizes - from small to a very large in diameter, mathematically the graph of the two equations (not shows) illustrate the relation of two lines, namely: a parabola for energy and a slope for force; wherein the parabola which starts quite below the slope but as it moves further to the right… the line correspondingly goes exponentially upward and towering over a slope, which again indicates that a turbine of the right configuration, an exponential energy gain is profoundly achievable - more on Mechanics later in this specification.

Objective

Knowing that some types of rotor has exponential energy gain, it is therefore the object of the present invention to provide a turbine that will efficiently convert a predetermined mass to stored kinetic energy, and use much of the stored energy to power a generator and to generates a reliable and sustainable electricity.

SUMMARY OF THE INVENTION

A turbine of the present invention comprises an enclosure and a rotor with exponential net energy gain, wherein the rotor is driven peripherally by an appropriate initiator drive equipped with small electric motors connected to a power, thereby exponentially increases the efficiency in transforming a predetermined mass to kinetic energy.

An Enclosure

An enclosure could either be a building or an offshore structure or a large ocean-going vessel, wherein said enclosure comprises at least a bottom floor, a peripheral upright member, and a ceiling. Said ceiling is defined as a predetermined horizontal plane aligned with the upper-end of the rotor, and wherein a space is created in between the ceiling and the roof or equivalent.

Preferably an enclosure is provided with one intermediate floor, wherein a space is created in between the intermediate floor and the bottom floor, and another space in between the intermediate floor and the ceiling. Also much preferred is an access space created below the bottom floor wherein the floor pivotal assembly is installed.

Both the bottom floor and intermediate floor are also known as the stationary lateral members or stationary transverse members. In some application, a stationary member could just be a plain concrete on the ground or any suitable structure.

A Rotor with Exponential Energy Gain

The present invention essentially features a vertical-axis rotor. A vertical-axis rotor circumferentially is equidistant to the horizontal plane or to the earth's center of gravity, and wherein the centripetal forces are all mathematically positive at any point peripherally, thereby it enable the rotor of the right configuration to add-ups these forces and achieved an energy gain.

A rotor with exponential energy gain comprises a vertical shaft member and a plurality of lateral lever members. Said vertical shaft member has an upper-end and lower-end and held coaxially pivotal by a means disposed at a predetermined vertical axis of rotation of said enclosure.

Each lateral lever member is configured with a mountable-end and oppositely an effort-end, wherein the mountable-end is attached to a predetermined point on the said vertical shaft member. The effort-end is configured with a predetermined high density point mass or mass assembly, and wherein the effort-end is disposed to a predetermined effective horizontal path in space about said vertical axis of rotation.

Each said high density point mass or mass assembly is defined by a predetermined quantity of matter, and wherein the high density point mass collectively enable the rotor achieved its operational output energy.

The said effective horizontal path is defined by the size of the space about said vertical axis of rotation, and wherein the said effective horizontal path enable the rotor achieved an energy gain.

The said net energy gain or energy gain is defined by a positive difference in the quantity of energy, wherein the rotor has its output energy correspondingly greater than the required input energy per unit of velocity or at least per unit of initial velocity.

An Initiator Drive System

The said input energy that includes a force to cancel potential frictions is a relatively small and sustained input force applied to the rotor by an appropriate initiator drive system. The initiator drive system comprises a rim member, a plurality of lateral spoke member, and plurality of space apart stationary drive assemblies, and wherein each lateral spoke member is configured with a mountable-end and oppositely an effort-end.

The said mountable-end is attached to the vertical shaft member, and oppositely the effort-end is disposed to a predetermined effective horizontal path in space about the vertical axis of rotation and attached to the rim member, and wherein the lateral spoke members and rim member unitary defined a wheel assembly.

Each stationary drive assembly is attached to the respective peripheral upright member of said enclosure and at least supporting the wheel assembly. Each stationary drive assembly is powered by a small electric motor connected to a power, and wherein said stationary drive assembly is configured to drives the wheel assembly about the vertical axis of rotation.

BREIF DESCREPTION OF THE DRAWINGS

Fig. **1**, an elevation view of an enclosure in the form of a building with a cut-out showing the partial view of the turbine, according to the present invention;

Fig. **2**, a section thru line **2-2** of Fig. **1**;

Fig. **3**, an enlarged partial view at point **3** of Fig. **2**;

Fig. **4**, an enlarged partial view of Fig. **2**;

Fig. **5**, a further enlarged view at point **5** of Fig. **4**;

Fig. **6**, an alternate detail of the spoke members of Fig. **4**;

Fig. 7, another alternate detail of spoke and lever members of Fig. **4**;

Fig. **8**, a cross section view thru line **8-8** of Fig. **2**;

Fig. **9**, an enlarged partial view at point **9** of Fig. **8**;

Fig. **10,** an enlarged view at point **10** of a mass assembly **68** of Fig. **9**;

Fig. **11**, a section view thru line **11-11** of Fig. **10**;

Fig. **12**, an enlarged partial view at point **12** of Fig. **8**;

Fig. **13**, an enlarged partial view at point **13** of a stationary drive assembly **70** of Fig. **12**;

Fig. **14**, an enlarged partial view at point **14** of Fig. **8**;

Fig. **15**, an enlarged partial view at point **15** of Fig.**14**;

Fig. **16** to Fig. **31,** were cancelled;

Fig. **32**, is a cross section view of a turbine similar to Fig. **8**;

Fig. **33**, is an enlarged partial view at point **33** of Fig. **32**;

RELATED INVENTION

Fig. **34**, is a cross section view of the turbine and direct drive generator;

Fig. **35**, is an enlarged partial view at point **35**, of Fig. **34**;

Fig. **36**, is an enlarged partial view at point **36**, of Fig. **34**;

Fig. **37**, is an enlarged partial view at point **37**, of Fig. 34;

Fig. **38**, is an enlarged partial view at point **38**, of Fig. **34**;

Fig. **39**, is a plan of the generator through line **39-39**, of Fig. **34**;

Fig. **40**, is an enlarged view at point **40** of Fig. **39**; and

Fig. **41**, is an alternative induction coil assembly.

ILUSTRATIVE EMBODIMENT

Accordingly the invention will now be described, by way of example, with reference to the accompanying drawings and equations, in which:

Fig. **1**, is the elevation view of an illustrative embodiment, an enclosure in the form of a building **50**, with a cut-out view of the interior of the turbines **50A** and **50B**. The building further has an optional service space **51** and optional plants or trees **53**.

An Enclosure

Fig. **2, 3** and **4** are layouts of the building **50**, in particular, the said enclosure comprises a plurality of space apart columns **54**, walls **55**, and said optional service space **51**, that houses an elevator **51a**, and stair **51b**.

The said columns **54** are made of concrete or equivalent and respectively measured from a predetermined common point, also known as the vertical axis of rotation.

Fig. **8, 9** and **12**, wherein said column **54** and wall **55** are shown with the bottom floor **58**, a ceiling, a roof or top member **59**, and an intermediate floor **60**, wherein said bottom **58** and intermediate floor **60** are respectively provided with pivotal means **64**, and **65**, and wherein said pivotal means are disposed coaxially with said vertical axis of rotation.

In some application, the roof is either directly connected to or detached from wall **55** or column **54** but at least it has to protect the system from the elements such as rain or snow.

As mentioned previously, said ceiling is defined as a predetermined horizontal plane which is aligned with the upper-end of the rotor. The space in between the upper-end of the rotor and top member **59** is defined as an access space, wherein said access space is to facilitate the installation and future maintenance of the pivotal means, also known as a floor pivotal assembly of the other unit above, Fig. **8**.

Additional intermediate floors **61**, and **62**, with respective shaft raceway **61a, 62a**, are coaxially provided, Fig. **8**. And as mentioned previously, said floors or at least the said intermediate floor **60** is defined by the size of a predetermined space wherein it enable the said rotor achieved its potential energy gain.

The floors are made of concrete or equivalent and are provided with optional beam members **58b, 59b, 60b, 61b, and 62b**, disposed respectively in between the respective said columns **54**, Fig. **8** and **9**. Alternately, the said beam members may be replaced by intermediate columns (not shown) if desirable.

A Rotor with Exponential Energy Gain

Fig. **8** is a section view thru line **8-8** of Fig. **2**. A building **50**, comprises of turbines **50A** and **50B**, wherein the turbines are configured one above the other to illustrate on how the present invention may optimized the value of a parcel of land, particularly in the urban area.

Fig. **9, 12 and 14,** are enlarged views of the turbine, in particular, a rotor comprises a vertical shaft member **63**, and a plurality of lateral lever members **66**. The said vertical shaft member **63** has an upper-end and lower-end and unitary held by a pair of pivotal means or floor pivotal assembly **64**, and **65**.

The vertical shaft member **63** is further defined by its capacity to hold the said lateral lever members **66** in placed and able to transfer the required torque: regardless of its configuration, regardless of the kind of mounting means employed, regardless of the kind of material but within the scope and spirit of the present invention.

Still from Fig. **9**, and also Fig. **4, 5, 6** and 7, each said lateral lever member is configured with a mountable-end **66a**, and oppositely an effort-end **66b**. Said mountable-end is mounted to the respective hub **632** of the said vertical shaft member **63**, and the said effort-end **66b** is configured with a predetermined high density point mass or high density mass assembly **68,** wherein said effort-end is disposed to a predetermined effective horizontal path in space about the said vertical axis of rotation.

Another configuration of the said lateral lever member **66** is shown in Fig.7, wherein two units of said lateral lever members **66** were combined into a common mountable-end **66**a, and provided with a bridge **66e,** wherein the bridge **66e** is connected to the adjacent lever member that all together defined a unitary rotor assembly.

A pie-shaped lateral lever member may be used as well, wherein two or more of the said lateral lever members (not shown on drawings) are combined into a unitary lateral lever member of a much wider effort-end.

Fig. **3, 9, 10, 11** and **9**, wherein each said lateral lever member **66** is equipped with an optional stay member **67**, wherein the stay member is attached to means **66c** of the lateral lever member **66** and to means **631a** of said vertical shaft member **63**, wherein the stay member is supporting the lateral member against gravity and into a state of equilibrium.

The stay member may also come in different material, shape, size, particularly; a cable wire, a steel rod, or an appropriate panel-shaped.

Fig. **3, 10** and **11**, shows a high density mass assembly **68**, wherein the respective said mass assembly is made in such a way that it allows the reconfiguration of the mass assembly on site, in particular, wherein changes to the rotor’s capacity may requires. Said mass assembly comprises a plurality of steel plates **681** with means that secured it to the effort-end of said lateral lever member **66**, wherein said means further comprises of a minding plate **682,** an integral locking means **682a**, supporting block **683**, and nuts and bolts **683a**.

An Initiator Drive System

Fig. **5, 6, 7, 12, 13, 14** and **15**, are enlarged partial views of an initiator drive system, which comprises a wheel assembly **69**, and a plurality of space apart stationary drive assemblies **70**. The said stationary drives are attached respectively to the respective said column **54**, Fig.**4**, and are programmed to operate alternately at least with each other or each other group.

A group comprises at least of two equally spaced-apart drive assemblies and driving the said wheel assembly about the vertical axis of rotation while the other groups stay idle and for the heat to dissipate, wherein for a predetermined moments other group has to re-place and to make sure that the turbine is running non-stop for a predetermined long duration.

Fig. **3, 4, 5, 12, 13** and **15**, wherein the said wheel assembly **69** comprises a plurality of spoke members **691**, and rim member **692**, wherein each said spoke member **691** has a mountable-end **691a** mounted to said vertical shaft member **63,** and an effort-end **691b** connected to the rim member **692**, wherein said wheel assembly is leveled with and in between the respective group of lever members **66,** or mass assemblies **68**.

Fig. **3, 4, 5, 6** and **15**, wherein said rim member **692** comprises a corresponding number of elongated strips **692a**, wherein each said strips has one end attached to the respective spoke member **691** and its long and slender body circumferentially disposed outwardly and over-lapping with the adjacent typical strip member **692a,** wherein the said over-lapping strips are held by means **693,** and all together defined a unitary wheel assembly **69**.

Fig. **3** and **15** are enlarged partial views of a stationary drives **70**, wherein each drive assembly **70** comprises a small electric motor **701a**, and an integral roller-drive **701b,** wherein the said roller-drive **701b** is disposed vertically retractable over the rim member **692** and through the use of a plate **701c**, wherein the plate **701c** is attached to a stationary mounting means**705**, and wherein the said mounting means **705** is finally attached at least to the respective column **54.**

An idler member **703** is provided supporting the said rim member **692** through a stationary shaft member **704**, and finally said shaft member **704** is likewise attached to the said means **705**.

As mentioned previously, the said rim member 693 with respective spoke members 691are leveled with the respective said mass assembly or assemblies 68, wherein the respective stationary drives 70 drives the said wheel assembly 69 about the vertical axis of rotation and in the process the said spoke members transfers the forces to the corresponding group of lateral lever members, that finally equates to a torque on the said rotating vertical shaft member of the said rotor or unitary known as the turbine.

Gearbox Assisted Electric Generator

In one particular configuration, Fig. **8** and **9,** a floor mounted electric generators with appropriate electronic converters were provided, each comprises a generator **71**, a gearbox **72,** and the respective drive belt **73**.

The drive belt **73** transfers the mechanical energy of the rotating vertical shaft member to the respective generator to generate electricity through the help of a retractable idler member **74**, and wherein the idler regulates the belt's tension and/or operation of the gearbox **72** from a continuously rotating shaft.

Another configuration, Fig. **32** and **33**, the shaft **63** is equipped with two drive gears **638**, wherein each drive gear is engaged to a plurality of driven gears/clutch **94**.

The clutch **94** is fixed to the input shaft of gearbox **95**. The gearbox **95** is connected to the generator **97** by a means **96**, the gearbox and generator are attached to the platforms **98**, and wherein the respective platform **98** is finally mounted to the respective floor **58** and **61**.

Mechanics and Benefits of a Rotor with
Exponential Energy Gain

Without going into too much details, the mechanics of the invention, in particular, a rotor having a radius of 10.00m, a peripheral high density point mass of 20,000.00kg, and normally operating at speed of 20 rpm, are as follows;

where:

A	approximate skin area of rotor (areas near the vertical-axis excluded),
a_{fd}	acceleration at final displacement in meter per second square,
C	drag coefficient - say 2.0,
E_{fd}	peripheral output energy at final velocity,
E_i	peripheral initial output energy,
F_{fd}	force or energy required for rotor to maintain its velocity,
F_i	initial input force or input energy,
J	Joule = Newton-meter,
kg	kilogram,
MJ	Mega-Joules,
m	meter,

m_{fb} friction on bearing in equivalent mass - equation (5),

m_p point mass in kg (mass of levers excluded to simplify the calculations),

m_t assumed total mass of the rotor including the shaft - say 200,000.00kg,

μ coefficient of friction on bearing - say 0.06,

N Newton or Normal force,

Nm Newton-meter,

p air density - say 1.30 kg/m^3,

r radius to the center of point mass,

rad radian,

rpm revolution per minute,

s second,

v_{fd} angular velocity at final displacement,

v_i initial angular velocity,

½ a constant.

$$F_i = [(m_p + m_{fb}) (v_i^2 / r)] - [- (½ C p A v_i^2)] \quad (1)$$
$$= [(20,000.00kg + 1,200.00kg) ((0.15m/s)^2 / 10.00m)]$$
$$- [- ((1/2) (2.00) (1.30kg/m^3) (600m^2) (0.15m/s)^2)]$$
$$= [(21,200.00kg) (0.00225m/s^2)]$$
$$- [-((1/2) (2.00) (1.30kg/m^3) (600m^2) (0.0225))]$$
$$= 48.70J + 17.60J$$
$$\mathbf{= 66.00Nm}.$$

$$E_i = ½ m_p r^2 (v_i / r)^2 \quad (2)$$
$$= ½ (20,000.00kg) (10.00m)^2 ((0.15m/s) / 10.00m)^2$$
$$= ½ (20,000.00) (100.00) (0.015rad/s)^2$$
$$\mathbf{= 225.00J}.$$

$$E_{fd} = ½ m_p r^2 (v_{fd} / r)^2 \quad (3)$$
$$= ½ (20,000.00kg) (10.00m)^2 ((20.933m/s) / 10.00m)^2$$
$$= ½ (20,000.00) (100.00) (2.093rad/s)^2$$
$$\mathbf{= 4,381,904.00J}.$$

$$F_{fd} = [(m_p + m_{fb}) a_{fd}] - [- (½ C p A v_{fd}^2)] \quad (4)$$
$$= [(20,000.00kg + 1,200.00kg) (20.933m/s^2)]$$

$- [- ((1/2)\ (2.00)\ (1.30kg/m^3)\ (600m^2)\ (20.933m/s)^2)]$

$= [(21{,}200.00kg)\ (20.933m/s^2)]$

$- [- ((1/2)\ (2.00)\ (1.30kg/m^3)\ (600m^2)\ (438.19))]$

$= 443{,}780.00J + 341{,}789.00J$

$= \mathbf{785{,}569.00Nm}$.

$$M_{fb} = [\ \mu\ m_t N / r\ ] / N \qquad (5)$$

$= [(0.06)\ (200{,}000.00kg)\ (9.8) / 10.00m] / 9.8$

$= 11{,}760.00J / 9.8$

$= \mathbf{1{,}200.00kg}$.

According to equation (**1**), the rotor operating at an initial velocity of say **0.15m**/second without load but potential frictions, requires an input force of **66.00Nm** to initiates an acceleration, while the corresponding output energy peripherally is equal to **225.00J**, equation (**2**).

As expected the output energy is indeed greater than the input energy, which equates to a positive difference or net energy gain of **159.00J**.

Overtime and had the rotor reached its desired velocity, the energy it stored due to an increased in displacement is shown in equation (**3**), while the estimated energy it consumed just to maintain that velocity is shown in equation (**4**). Equation (**4**) is stored kinetic energy and therefore it is a free energy.

Subtract equations (**4**) from equation (**3**) and the net stored energy peripherally is equal to **3,596,335.00J**. Multiply that energy by a radius of **10.00** meters and it equates to a rotor having a torque of **36,000,000.00Nm^2** or a power output of at least **36MW**.

Interestingly and according to Newton's Laws of Motion, by doubling the velocity of the turbine – from 20rpm to 40rpm, the potential power output of the system increases to **144 MW**, enough to power at least **144** thousands Americans' homes. And all these power is derived from an input force of just **66.00Nm**, equation (**1**).

Further you may double the mass as well, and/or double the number of the poles in the armature… and probably you may end up closed to a Gigawatt capacity system.

In practice however a larger input force is recommend, say a group of three equally spaced-apart stationary drives equipped with electric motor of say **2hp** each connected to a power, and wherein a stronger stationary drive further facilitate the necessity of a turbine having a longer start-up… reduced to as short as possible.

RELATED INVENTION

This configuration as it turns out is quite amazing, wherein the turbine is connected to a direct drive generator, which increase its benefit particularly in the long run and considered that it uses virtually no external input energy, no gearboxes to replace… , and potentially operates exponentially efficient 24/7 all year round, etc.

Turbine with Exponential Energy Gain
and Direct Drive Generator

Figs. **34** is a cross section of a related power system **100**, comprises: a floor pivotal assembly **110**, an upper pivotal assembly **120**, a rotor with exponential energy gain assembly **130**, a vertical-axis armature assembly **140**, and the vertical segment stator assemblies **150**.

The floor pivotal assembly 110, Fig. **34**, **35** and **36**, comprises a pivotal housing **111**, a predetermined number of floor-spreaders **112**, a predetermined number of gas or hydraulic cylinders **113** and a supporting plate **114**.

The pivotal housing **111** has a top **111a** and bottom end **111b**, an axial opening **111c**, and an upper flange **111d**, wherein the pivotal housing is configured with various kind of attachment holes, wherein a pivotal housing is installed on to the at least floor **58** coaxially with the predetermined vertical axis of rotation inside an enclosure, wherein the enclosure is defined at least by the U.S. Patent No. US 8,878,382 B2, issued Nov. 4, 2014.

Each floor-spreader **112** is radially attached by at least nuts and bolts **115** to the respective attachment holes of the pivotal housing **111**, thereby created a stator-space laterally well beyond the pivotal housing **111**of said floor pivotal assembly **110**, wherein the stator-space is configured to accommodate a retractable said vertical segment stator assembly 150.

Each cylinder **113** is attached by at least nuts and bolts to the respective attachment holes on the pivotal housing **111** of said floor pivotal assembly **110**, to accommodate a retractable said vertical segment stator assembly **150**.

The bottom end of the pivotal housing **111** is provided with a removable supporting plate **114** attached therewith by nuts and bolts. The supporting plate **114** has an access opening **114a** that provides access for a person working at the interior of the generator during and as required after the installation. As desired the supporting plate **114** is provided with a pair of shutter **114b**.

The upper pivotal assembly 120, Fig. **34**, **37** and **38**, comprises a pivotal housing **121**, a predetermined number of upper-spreaders **122**, and at least a predetermined number of stator-uprights **123**.

Fig. **34**, **37** and **38** pivotal housing **121** has a top **121a** and bottom **121b** faces, an axial opening **121c**, and a flange **121d** configured with attachment holes, wherein the pivotal housing **121** is coaxially aligned with the pivotal housing **111** of said floor pivotal assembly **110**.

Each upper-spreader **122** is attached radially by at least nuts and bolts to the respective attachment holes of the pivotal housing **121** and vertically aligned with the respective floor-spreader **112** of said floor pivotal assembly **110**, thereby created a stator-space laterally well beyond the pivotal housing **121** of said upper pivotal assembly **120**, wherein the stator-space is to accommodate a radially retractable said vertical segment stator assembly **150**.

The said upper pivotal assembly **120** is configured with at least bearing assemblies **124,** which comprises a pivotal shaft **124a** and wheel bearing **124b**. The pivotal shaft **124a** is attached by at least nuts and bolts to the at least end of the respective upper-spreader **122**.

Further each upper-spreader **122** is configured with means comprises at least a latch assembly **125** and an adjustable stop assembly **126,** that together holds the respective said vertical segment stator assembly **150** with respect to said vertical-axis armature assembly **140**.

The peripheral or end portion of each upper-spreader **122** is attached to the at least respective stator-upright **123** and unitary supporting said upper pivotal assembly **120** with respect to at least the floor **58**.

It is also within the scope of the invention that the peripheral portion of each upper-spreader **122** is attached to the intermediate floor **60** of the enclosure and supporting the said upper pivotal assembly **120** with respect to the bottom floor **58**.

A space is created in between said upper pivotal assembly **120** and said floor pivotal assembly **110**, wherein the space is configured to accommodate the said vertical-axis armature assembly **140** and said vertical segment stator assembly **150**.

Fig. 39, optional upright-panels **127** are respectively attached in between respective stator-uprights **123,** which enclosed, stabilized and aligned the said upper pivotal assembly **120** with respect to said floor pivotal assembly **120**.

In other configuration, the stator-uprights **123** and upright-panels **127** are replaced (not shown) by a circular concrete wall supporting the said upper pivotal assembly **120**. Another alternative is wherein the stator-uprights **123** and upright-panels **127** are replaced by a circular concrete wall supporting the said upper pivotal assembly **120,** and wherein the circular concrete wall and said floor pivotal assembly **110** are embedded into the ground.

The rotor with exponential energy gain assembly ***130***, Fig. **34**, **36** and **38**, wherein the original rotor with potential energy gain which comprises a continuous vertical shaft member **63** and a plurality of lateral lever members **66** has been upgraded, in particular, wherein a new vertical shaft member is configured into segments comprises at least one lower shaft segment **131**, at least one upper shaft segment **132**, at least one lateral lever member **133**, and integrally connected to said vertical-axis armature assembly **140**.

A lower shaft segment **131** is a hollow vertical cylinder with a top and bottom ends and held pivotal by said floor pivotal assembly **110**. The top end of the shaft **131** is configured with a flange while the bottom end is configured according to the type of bearing employed.

In one particular embodiment, Fig. **36**, a ball bearing **134** is installed in between the pivotal housing **111** and the lower shaft segment **131**, a roller bearing **135** is installed between the bottom end of the shaft **131** and the supporting plate **114** of the pivotal housing **111**, and a pair of electromagnetic bearing **136** is installed next to the roller bearing **135**.

The bearings are serviced by releasing the supporting plate **114** of the pivotal housing **111** which is held by at least nuts and bolts.

Fig. **34, 37** and **38** the upper shaft segment **132** is a hollow vertical cylinder with a top and bottom end and held pivotal by said upper pivotal assembly **120** and coaxially aligned with the lower shaft segment **131**.

A space is created in between the lower shaft segment **131** and upper shaft segment **132**, to accommodate the said vertical-axis armature assembly **140**.

Fig. **37** and **38** a lateral lever member **133** of desired configuration is attached laterally by at least nuts and bolts to the upper shaft segment **132**, and wherein the lateral lever member is peripherally engaged to the at least initiator drive system as described by the above mentioned U.S. Patent.

The vertical-axis armature assembly ***140***, Fig. **34**, **36** and **38**, comprises a lower disk **141**, an upper disk **142**, at least one intermediate shaft segment **143**, and at least one induction assembly **144**.

Fig. **34** and **36** a lower disk **141** is defined by a predetermined radius and has a top and bottom faces, and configured with various kind of attachment holes, wherein the lower disk **141** is coaxially attached at least by nuts and bolts to the top end of the lower shaft segment **131** of said rotor with exponential energy gain assembly **130**.

Fig. **34**, **37** and **38** the upper disk is defined by a predetermined radius and has a top and bottom faces, and configured with various kind of attachment holes, wherein the upper disk **142** is coaxially attached at least to the bottom end of the upper shaft segment **132** of said rotor with exponential energy gain assembly **130.**

Both the lower disk **141** and upper disk **142** of said vertical-axis armature assembly **140** are configured with opening that matches the respective shaft segments.

Further the upper disk **142** is configured with an optional peripheral channel **142a** to accommodate a pair of movable damper assemblies **145**. Each damper assembly **145** is held in place by means and movable along the channel **142a**.

A space is created in between the lower disk **141** and upper disk **142**, to accommodate the induction assembly **144**.

An intermediate shaft segment **143** is attached coaxially in between the lower disk **142** and the upper disk **142** of the said vertical-axis armature assembly **140**, which structurally brings the loads of said rotor with exponential energy gain assembly **130,** straight down to the pivotal housing **111** of said floor pivotal assembly **110**.

The induction assembly **144** as shown in, Fig. **34**, **36**, **38**, **39** and **40**, comprises a cylindrical induction housing **144a**, predetermined number of magnetic elements **144b** and a predetermined number of vertical stiffeners **144c**.

The induction housing has an outside and inside faces, a lower and upper end, and configured with various kind of attachment holes. The outside face of the induction housing **144a** is defined by a predetermined radius measured from the vertical axis of rotation and provided with a predetermined number of vertically elongated magnetic elements **144b** also known as magnetic poles.

The designated polarity of the respective magnetic elements are alternately arranged one after the other circumferentially and facing the said vertical segment stator assembly **150**, Fig. **40**, wherein the polarity arrangement is marked **N** and **S** for north and south poles respectively. The lower end of the induction assembly **144** is attached at least by nuts and bolts to the lower disk **141**, and the upper end is attached to the upper disk **142**. The cylindrical induction assembly**144** is divided into a predetermined number of vertical segments as shown on the drawings.

The magnetic elements **144b** are either a permanent magnets or electromagnets. Electromagnets (not shown) are employed, in particular, wherein the generator in consideration is a synchronous type.

A stator-space is created in between the respective induction assembly **144** and the stator-upright **123** of said upper pivotal assembly **120**, to accommodate a retractable said vertical segment stator assembly **150**. A platform and a pair of shutter **146** is provided as desired.

*The vertical segment stator assembly **150**,* Fig. **34** to **38**, comprises a mounting rail assembly **151**, and at least one induction coil assembly **152**.

The mounting rail assembly **151** comprises a mounting rail **151a**, and a supporting means **151b.**

Fig. **34** to **38** the mounting rail **151a** is at least a channel and strong enough to withstand the magnetic forces applied to by the magnetic elements **144b** of said vertical-axis armature assembly **140.** The mounting rail is configured with various attachment holes to accommodate at least one induction coil assembly, and wherein the lower portion is attached to the respective gas or hydraulic cylinder **113** of said floor pivotal assembly **110**.

The supporting means **151b** is a pair of arms disposed respectively on each side of the respective upper-spreader **122** of said upper pivotal assembly **110** and each arm has a lower and upper ends. The lower end is attached by at least nuts and bolts to the respective upper portion of the mounting rail and the respective upper end is extended upwardly and at least outwardly well over the upper-spreader.

The supporting means **151b** is equipped with supporting rod **151c** disposed horizontally on top of the upper-spreader **122** and is attached in between the upper end of both arms **151b,** and defined a mounting rail assembly **151**. The supporting rod **151c** is held in place by the at least latch assembly **125** of the respective upper-spreader **122** of said upper pivotal assembly **120**.

Other configuration of a mounting rail assembly **151** may be employed as long as it served the same purpose.

The latch assembly **125** is spring assisted, which enable the said vertical segment stator assembly **150** to be moves against the stator-upright **123** of said upper pivotal assembly **120**. While the vertical segment stator assembly **150R** is held against the stator-upright **123**, a service-space is created in between said vertical segment stator assembly **150** and said vertical-axis armature assembly **140**, and wherein the service-space enable the installation and/or removal of either parts of the generator.

Fig. **34**, **37**, **38**, **39** and **40,** an induction coil assembly **152** comprises an iron core **152a**, and at least one wire coil **152b**, and unitary defined having a top **152c**, bottom **152d**, front **152e**, back **152f** and two sides **152g** and **152h**. The assembly is attached having the back **152f** against the mounting rail **151a** by means. A spacer-space **153**, Fig. **40**, is created in between the mounting rail **151a** and back **152f** of the induction coil assembly **152**, which provides a means for an effective air gap **154** finally configured on site.

Fig. **40,** an iron core **152a** is defined as a crab core for having a u-shape-multi-legs configuration, wherein a crab core has at least two legs **152k** and **152m** separated by a space respectively on both sides of the iron core relative to the radial centerline of the respective said vertical segment stator assembly **150**. Both legs **152k** and **152m** of the iron core are respectively aligned to a like polarity marked **S** (for south) and the space in between legs is aligned to unlike polarity marked **N** (for north) of the induction assembly **144**, standing still.

The configuration of the iron core is subject to changes and limited only by the scope of the invention. Fig. **41** is another iron core configuration, which is a simple crab core.

Another possible configuration is a u-shape-single-leg iron core, wherein a u-shape-single-leg iron core (not shown) has one leg on both side of the iron core relative to the radial centerline of the respective said vertical segment stator assembly **150**.

Further the iron core **152a** comes in various phase configurations (not shown) in order for said vertical segment stator assembly **150** to generate at least a three phase power output.

Fig. **40** and **41,** a wire coil **152b** also known as winding is attached to all four legs of the respective iron core **152a** and connected electrically to generate a predetermined magnetic field in communication with the stand still said vertical-axis armature assembly **140**.

Fig. 40, the air gap **154** is defined as the space in between front **152e** of the respective induction coil assembly **152** and the magnetic element **144b** of the induction assembly **144.** And while the air gap **154** is predetermined during the manufacture, it is beneficial that a more efficient air gap is finally configured on site during the installation.

Said vertical segment stator assembly **150** is provided with at least one induction coil assembly **152**, wherein said vertical segment stator assembly **150** is electrically connected to generate a single phase power output in communication with the rotating said vertical-axis armature assembly **140**.

Fig. **34**, **37** and **38** said vertical segment stator assembly **150** is provided with at least three induction coil assemblies **152** respectively of a different phase configuration, namely: the first phase, the second phase and the third phase, wherein said vertical segment stator assemblies are electrically connected to generate a unitary three phase power output in communication with the rotating said vertical-axis armature assembly **140**.

Fig. **39,** a predetermined number of said vertical segment stator assemblies are provided, wherein each said vertical segment stator assembly **150** is connected electrically as a unitary generator able to generate electricity in communication with the rotating said vertical-axis armature assembly**140**.

Also a predetermined number of said vertical segment stator assemblies are provided, wherein at least two of said vertical segment stator assemblies are connected electrically as a unitary generator able to generate electricity…

Fig. **34**, **36**, **38** and **39,** said vertical segment stator assembly **150** is configured retractable and is retracted at least off the air gap **154** such that it at least abrogates the Lenz's Law effect while the turbine is at the initial stage of acceleration.

Another advantageous feature of the said vertical segment stator assembly **150, Fig. 34** and **39,** is that it enables the upgrade of at least one of said vertical segment stator assembly **150** while the others twenty-three, for this particular configuration, are in service.

Fig. **39** illustrates that some of said vertical segment stator assembly **150** are retracted from said vertical-axis armature **140** while others maintained an operational air gap with the armature **140**, and still others were removed to clearly show the floor-spreaders **112** of said floor pivotal assembly **110.**

Still another advantageous feature of the said vertical segment stator assembly **150** is on power distribution, wherein each said vertical segment stator assembly **150** or a group of assemblies are configured as an independent power generator and services one particular area of consumers, say six (6) of said vertical segment stator assembly are electrically connected as a unit generator and services the north region…, then another six (6) services the south… and so on.

And still another advantageous feature of the said vertical segment stator assembly **150** is on the structure of the stator, wherein the traditional monolithic, large, heavy, static, and initially energy intensive stator had evolved to a segmental and modular stators… easy to manufacture, transport and install.

You may conclude, this power generation system is similar to an oil rig in terms of energy production but clean, predictable, and the energy is limitless. cbt

* * *

As shown and described what is claimed is:

1. A turbine with exponential energy gain and direct drive generator, comprising:

a floor pivotal assembly;

an upper pivotal assembly;

a rotor with exponential energy gain;

a vertical-axis armature assembly; and

at least one vertical segment stator assembly.

said floor pivotal assembly, wherein the said floor pivotal assembly created a predetermined number of stator-spaces, wherein at least one of the stator-space enable to accommodate the respective said vertical segment stator assembly, wherein said floor pivotal assembly comprising at least:

a pivotal housing, wherein a pivotal housing has a top and bottom end, an axial opening, and a modified upper flange, wherein a pivotal housing is configured with various attachment holes and means, wherein the bottom end of the pivotal housing is provided with a removable supporting plate, wherein the pivotal housing is installed coaxially with the predetermined vertical axis of rotation on the at least bottom floor of an enclosure, wherein the enclosure is defined by the at least U.S. Patent No. US 8,878,382 B2, issued Nov. 4, 2014;

said upper pivotal assembly comprising:

a pivotal housing, wherein a pivotal housing has a top and bottom end, an axial opening, and a flange, wherein a pivotal housing is configured with attachment holes, wherein the pivotal housing is aligned coaxially with the pivotal housing of said floor pivotal assembly;

at least three upper-spreaders, wherein each upper-spreader is attached radially to the at least respective attachment holes of the pivotal housing, wherein each upper-spreader created a stator-space laterally beyond the pivotal housing, wherein the peripheral end of each upper-spreader is attached to the at least stator-upright, wherein the stator-upright is supporting the said upper pivotal assembly above the at least bottom floor;

a space created in between the said upper pivotal assembly and at least the pivotal housing of said floor pivotal assembly, wherein the space enable to accommodate the said vertical-axis armature assembly and said vertical segment stator assembly;

said rotor with exponential energy gain assembly comprising:

at least one lower shaft segment, wherein a lower shaft segment is a vertical cylinder with a top and bottom ends and held pivotal by the at least pivotal housing of said floor pivotal assembly;

at least one upper shaft segment, wherein an upper shaft segment is a vertical cylinder with a top and bottom ends and held pivotal by said upper pivotal assembly, wherein the upper shaft segment is aligned coaxially with the lower shaft segment;

a space created in between the lower shaft segment and the upper shaft segment, wherein the space created enable to accommodate the said vertical-axis armature assembly;

at least one lateral lever member, wherein the lateral lever member is attached to the upper shaft segment, wherein the lateral lever member is driven about the vertical axis of rotation as described by the at least above mentioned patent;

said vertical-axis armature assembly comprising:

a lower disk, wherein a lower disk is defined by a predetermined radius and has a top and bottom faces, wherein the lower disk is configured with attachment holes and means, wherein the lower disk is attached coaxially to the at least top end of the lower shaft segment of said rotor with exponential energy gain assembly;

an upper disk, wherein an upper disk is defined by a predetermined radius and has a top and bottom faces, wherein the upper disk is configured with attachment holes and means, wherein the upper disk is attached coaxially to the at least bottom end of the upper shaft segment of said rotor with exponential energy gain assembly;

a space created in between the lower disk and upper disk;

at least one induction assembly, wherein the induction assembly comprises:

at least one induction housing, wherein an induction housing has an outside and inside faces, a lower and upper ends, wherein the outside face of the induction housing is defined by a predetermined radius measured from the vertical axis of rotation, wherein the induction housing is configured with attachment holes and means, wherein the lower end of the induction housing is fixed to the lower disk, and the upper end is fixed to the upper disk by the at least respective nuts and bolts;

a predetermined number of magnetic elements, wherein each magnetic element is configured vertically elongated and fixed to the outside face of the induction housing, wherein the designated south and north polarity of the respective magnetic elements are arranged alternately one next to the other circumferentially and facing the said vertical segment stator assembly;

a stator-space created in between the induction assembly and the at least respective stator-upright of said upper pivotal assembly;

said vertical segment stator assembly, wherein said vertical segment stator assembly is attached to the said upper pivotal assembly, wherein the said vertical segment stator assembly maintained an air gap with the magnetic elements of said vertical-axis armature assembly, wherein said vertical segment stator assembly comprises:

a mounting rail assembly;

at least one induction coil assembly;

said mounting rail assembly comprising:

a mounting rail, wherein a mounting rail is of at least a channel configuration vertically oriented structure and strong enough to withstand the magnetic force of the said vertical-axis armature assembly, wherein the mounting rail is configured with attachment holes and means enable to accommodate the induction coil assembly;

a supporting means, wherein the supporting means attaches the mounting rail to the at least respective upper-spreader of said upper pivotal assembly;

said an induction coil assembly is defined by a top, bottom, front, back and two sides of the assembly, wherein the back of the induction coil assembly is attached facing the mounting rail assembly by means, wherein the front of the induction coil assembly maintained an air gap with said vertical-axis armature assembly, wherein the induction coil assembly comprises:

an iron core, wherein an iron core is defined as a crab core, wherein a crab core has a u-shape-multi-legs configuration, wherein a crab core has at least two legs separated by a space respectively on both sides of the iron core relative to the radial centerline of said vertical segment stator assembly, wherein both legs on either side of the crab core are respectively aligned to like polarity and the space in between legs is unlike polarity of the respective magnetic elements of a stands still said vertical-axis armature assembly;

at least one wire coil, wherein a wire coil also known as winding is attached to at least one of the leg of the crab core and connected electrically to generate a magnetic field in communication with the stand still said vertical-axis armature assembly.

2. The turbine with exponential energy gain and direct drive generator of claim 1, wherein said floor pivotal assembly is provided with at least three floor-spreaders, wherein each floor-spreader created a stator-space laterally beyond the pivotal housing of said floor pivotal assembly.

3. The turbine with exponential energy gain and direct drive generator of claim 1, wherein the said floor pivotal assembly is configured with a predetermined number of gas or hydraulic cylinders.

4. The turbine with exponential energy gain and direct drive generator of claim 1, wherein a stator-space created in between the at least respective stator-upright of said upper pivotal

assembly and said vertical-axis armature assembly, wherein the stator-space is to accommodate a retractable said vertical segment stator assembly.

5. The turbine with exponential energy gain and direct drive generator of claim 1, wherein the said vertical segment stator assembly is attached by means to the said upper pivotal assembly and defined an air gap with the said vertical-axis armature assembly.

6. The turbine with exponential energy gain and direct drive generator of claim 1, wherein the said vertical segment stator assembly is retractable, attached partly to the respective gas or hydraulic cylinder of the said floor pivotal assembly.

7. The turbine with exponential energy gain and direct drive generator of claim 1, wherein said vertical segment stator assembly is retracted at least off the air gap and at least reduced the Lenz's Law effect on the generator while the turbine is at the initial stage of acceleration.

8. The turbine with exponential energy gain and direct drive generator of claim 1, wherein the said vertical segment stator assembly is configured with at least one induction coil assembly, wherein the induction coil assembly comprises:

an iron core, wherein an iron core is defined by a u-shape-single-leg configuration, wherein an iron core has one leg on both side of the iron core relative to the lateral centerline of the respective said vertical segment stator assembly;

at least one wire coil, wherein a wire coil is attached to at least one of the leg of the iron core and connected electrically to generate a magnetic field in communication with the stand still said vertical-axis armature assembly.

9. The turbine with exponential energy gain and direct drive generator of claim 1, wherein the rotating said vertical-axis armature assembly is in communication with plurality of said vertical segment stator assemblies, wherein each said vertical segment stator assembly is electrically connected as a unitary generator.

10. The turbine with exponential energy gain and direct drive generator of claim 1, wherein the rotating said vertical-axis armature assembly is in communication with plurality of said vertical segment stator assemblies, wherein at least two of the said vertical segment stator assemblies are electrically connected as a unitary generator.

11. The turbine with exponential energy gain and direct drive generator of claim 1, wherein a service-space created in between said vertical-axis armature assembly and front of the induction coil assembly while the said vertical segment stator assembly is retracted, and wherein the service-space enable the at least removal of the induction coil assembly from the mounting rail assembly.

12. The turbine with exponential energy gain and direct drive generator of claim 1, wherein the stator-uprights are replaced by a circular concrete wall, wherein the concrete wall is supporting the upper-spreaders of said upper pivotal assembly.

13. The turbine with exponential energy gain and direct drive generator of claim 1, wherein the stator-uprights are replaced by a circular concrete wall, wherein both the circular concrete wall and the said floor pivotal assembly are embedded below ground.

14. The turbine with exponential energy gain and direct drive generator of claim 1, wherein the lateral lever member of said rotor with exponential energy gain is a wheel, wherein a wheel is defined by a predetermined diameter and has a mountable central means, wherein the wheel is mounted to the upper shaft segment of the said rotor with exponential energy gain assembly, wherein the wheel is configured with a high density point mass also known as high density rim, wherein the rim is concentrically disposed to said effective horizontal path in space about said vertical axis of rotation.

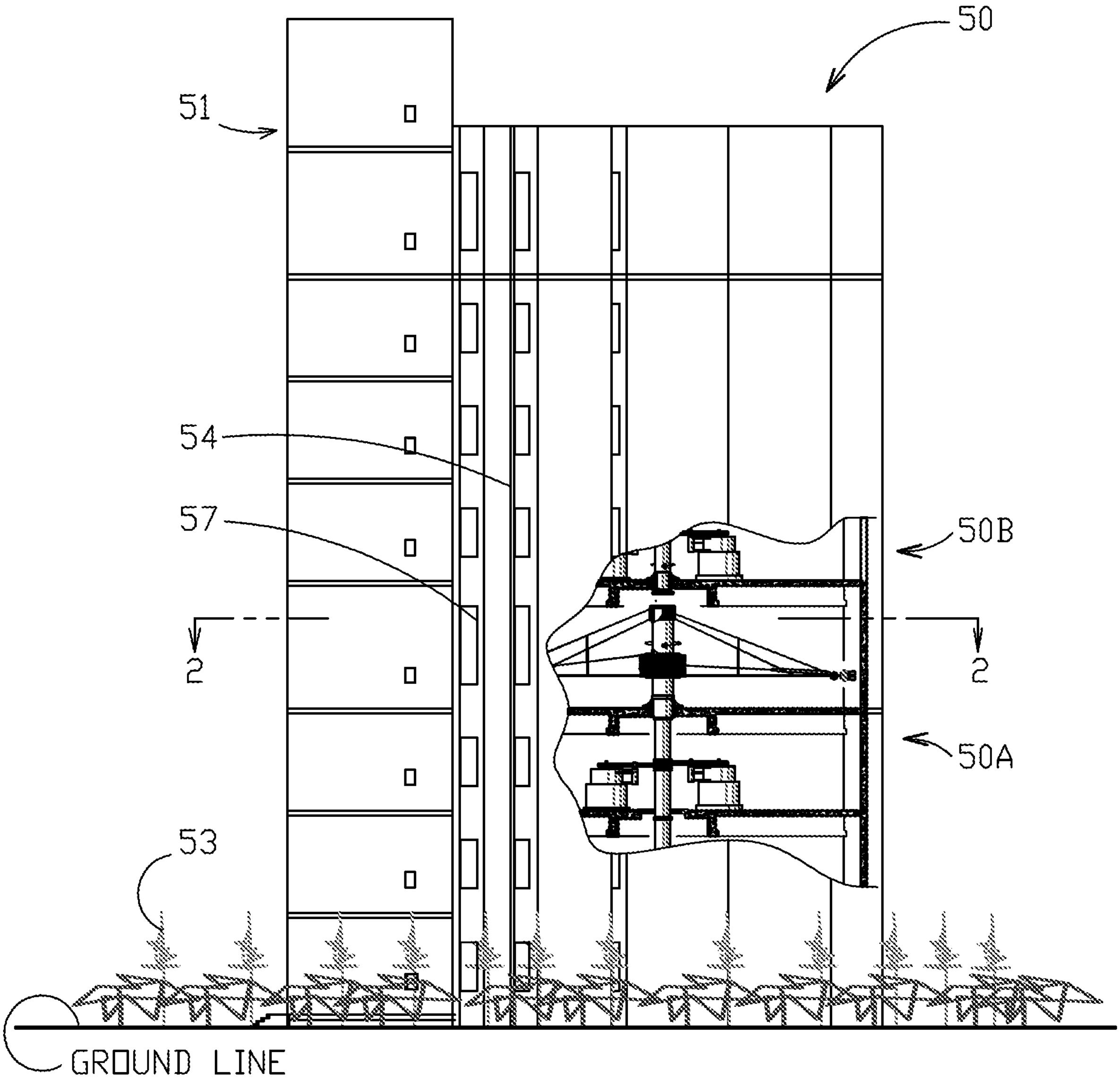

Fig. 1

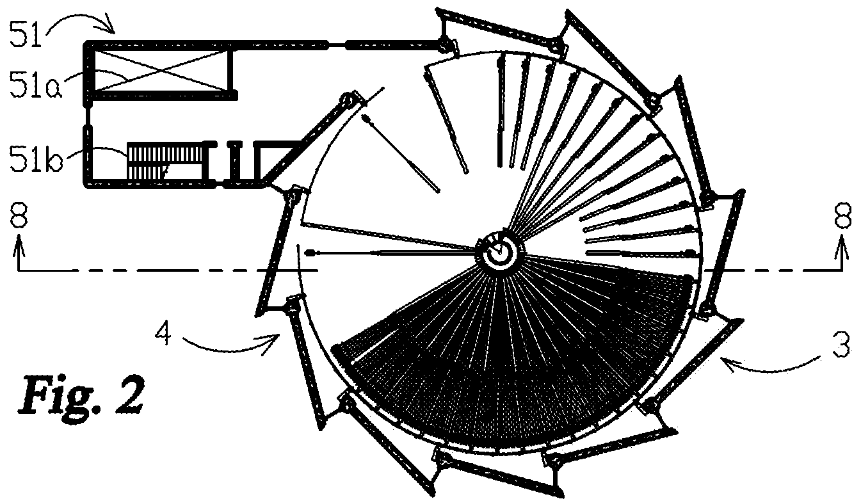
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Fig. 2

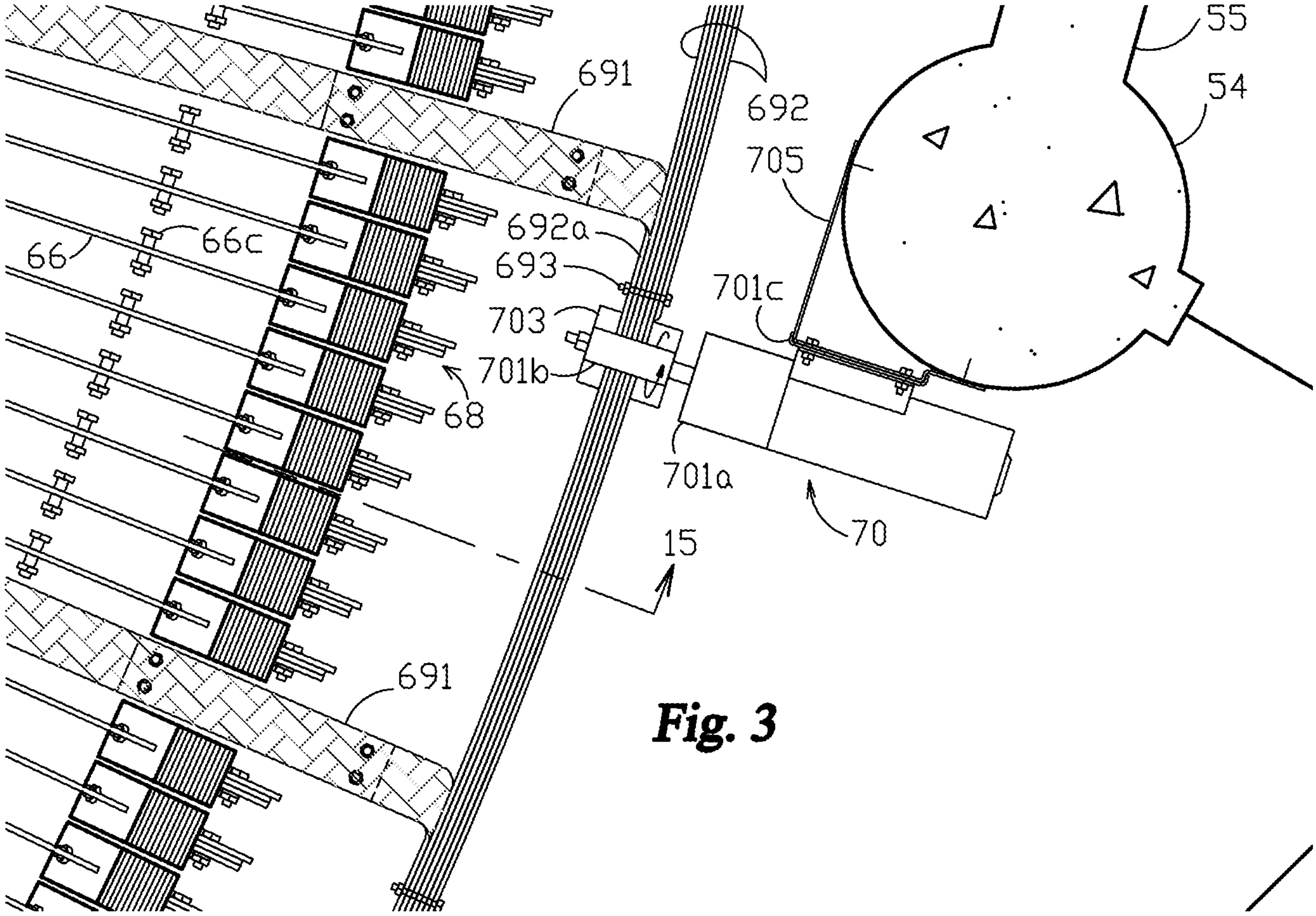
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Fig. 3

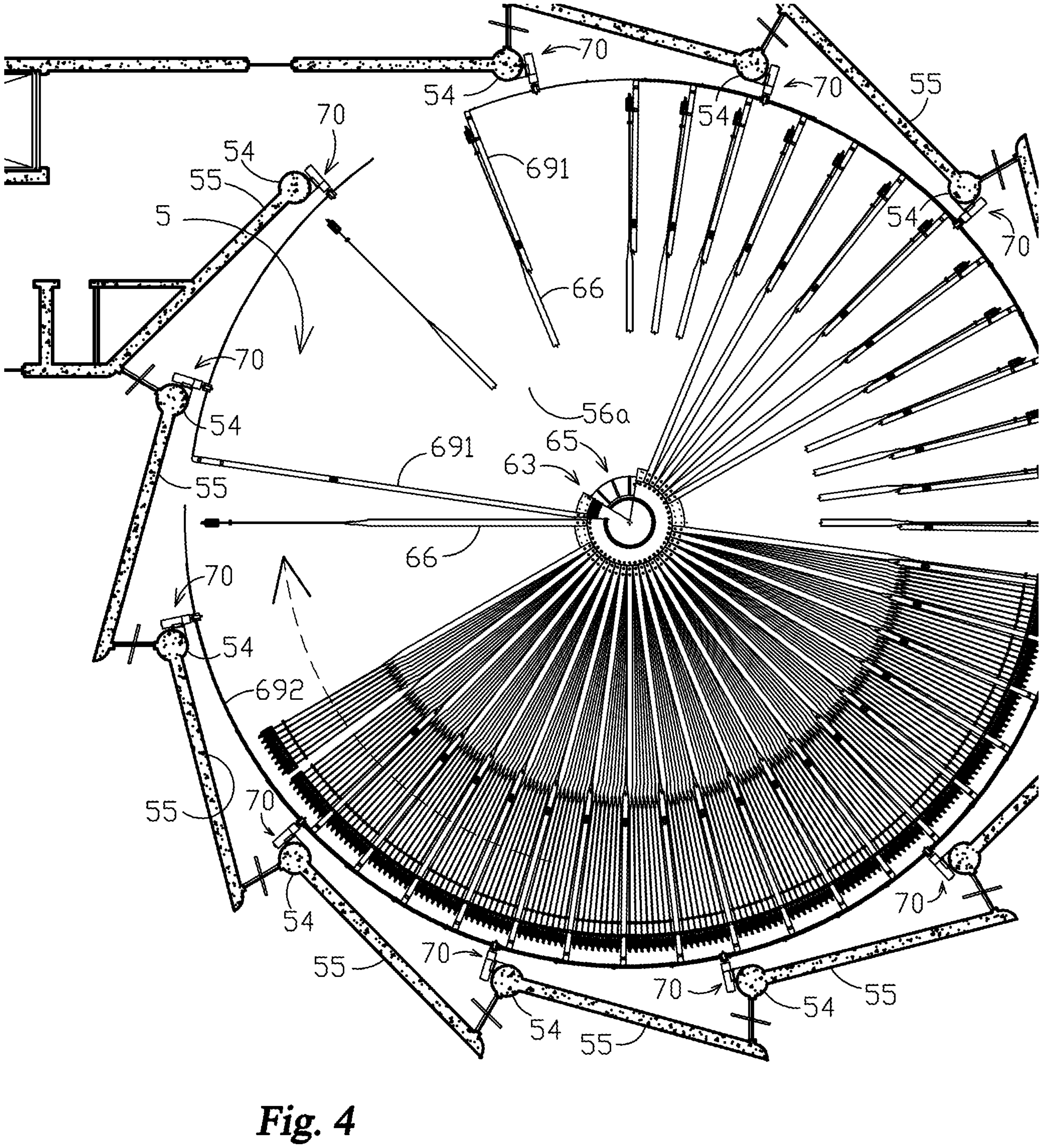
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Fig. 4

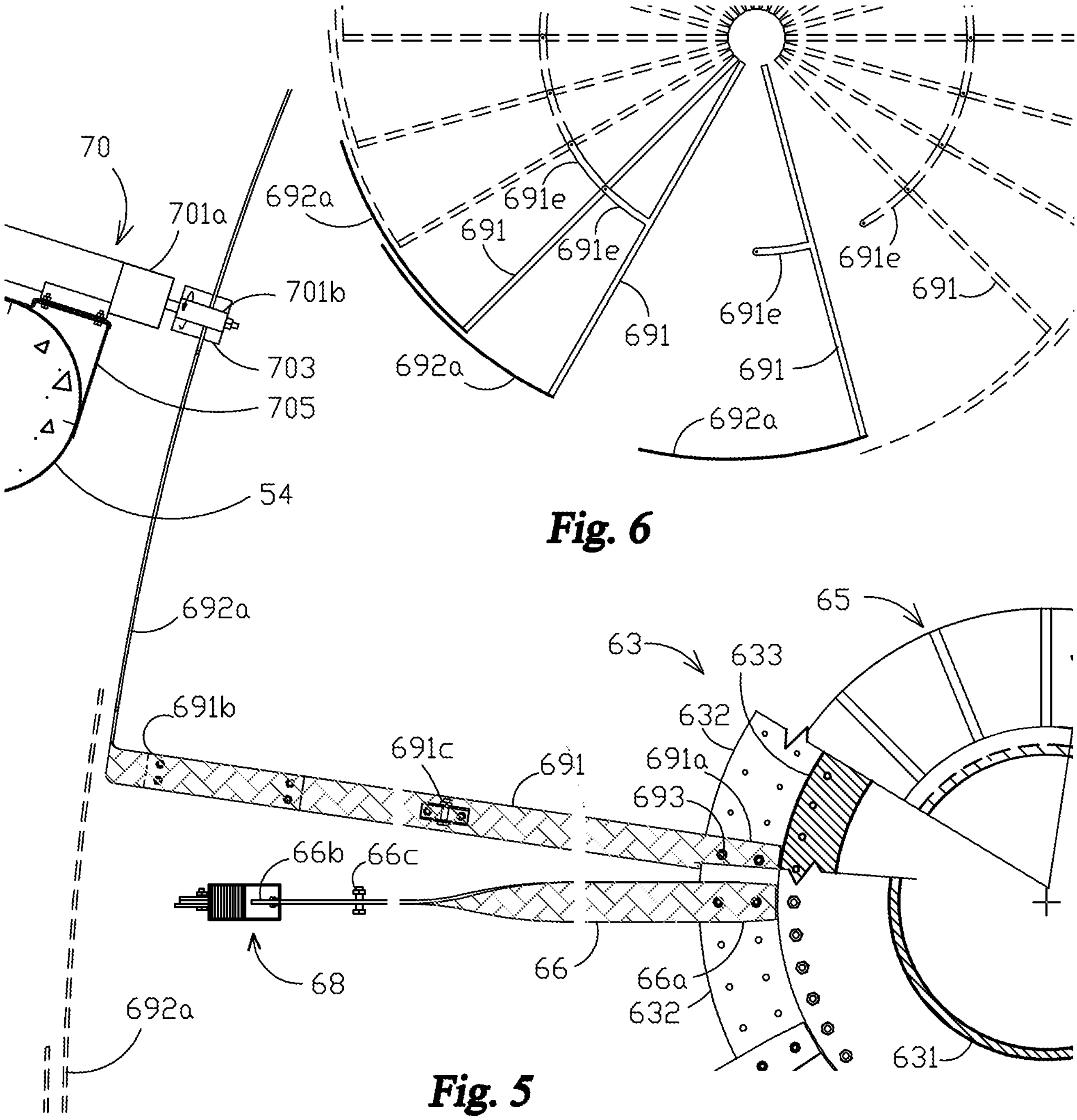
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Fig. 6

Fig. 5

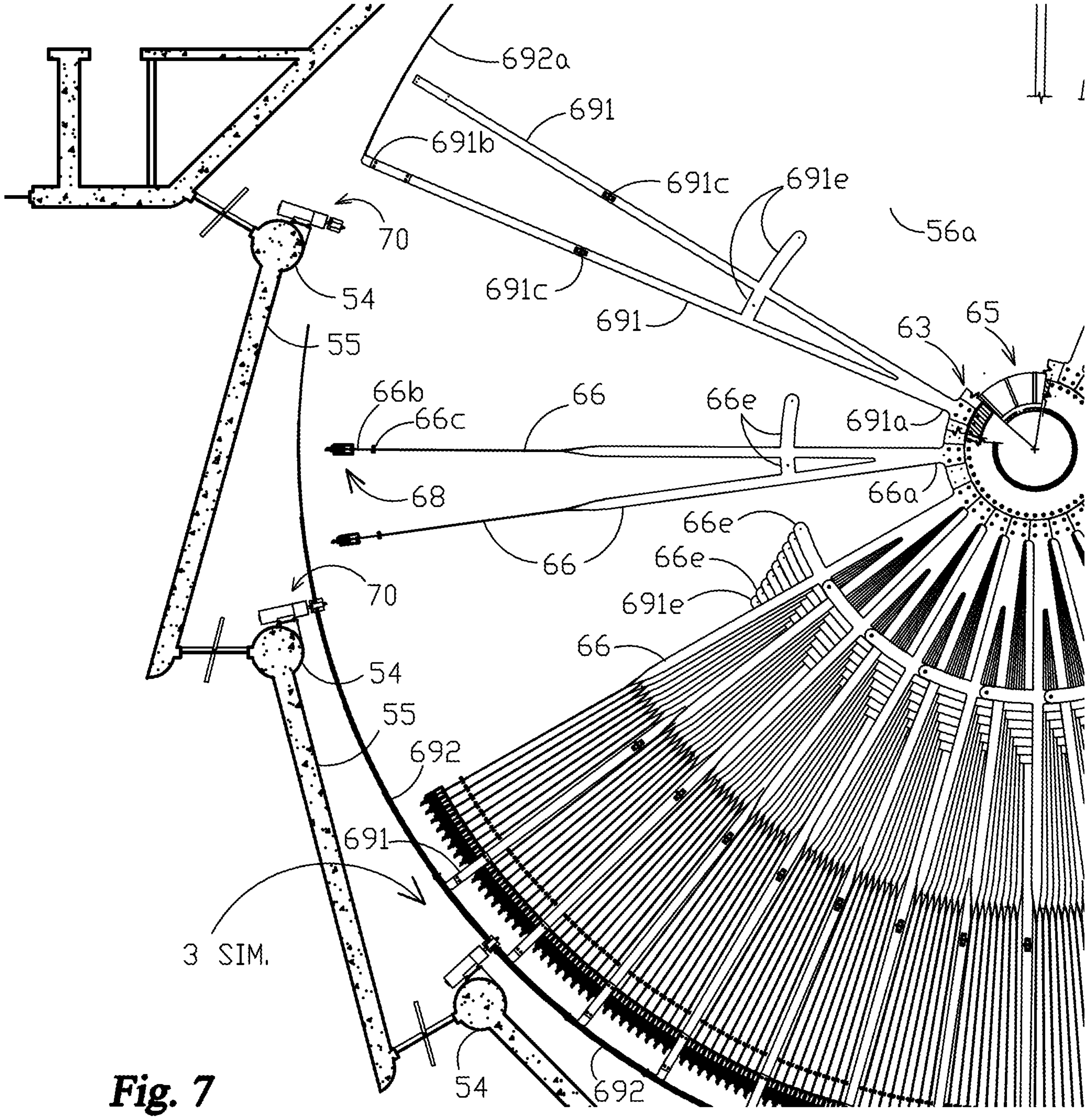
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Fig. 7

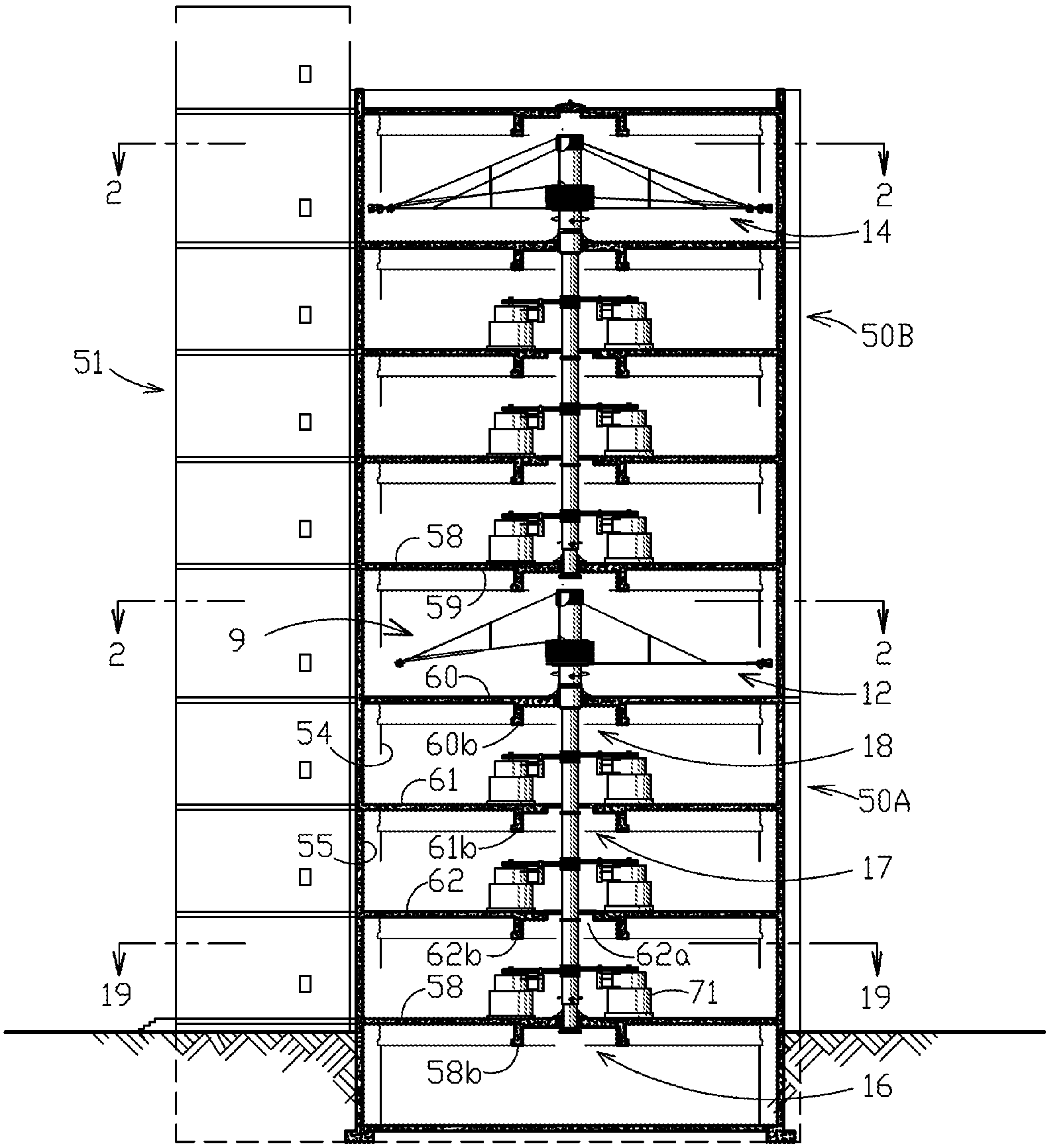
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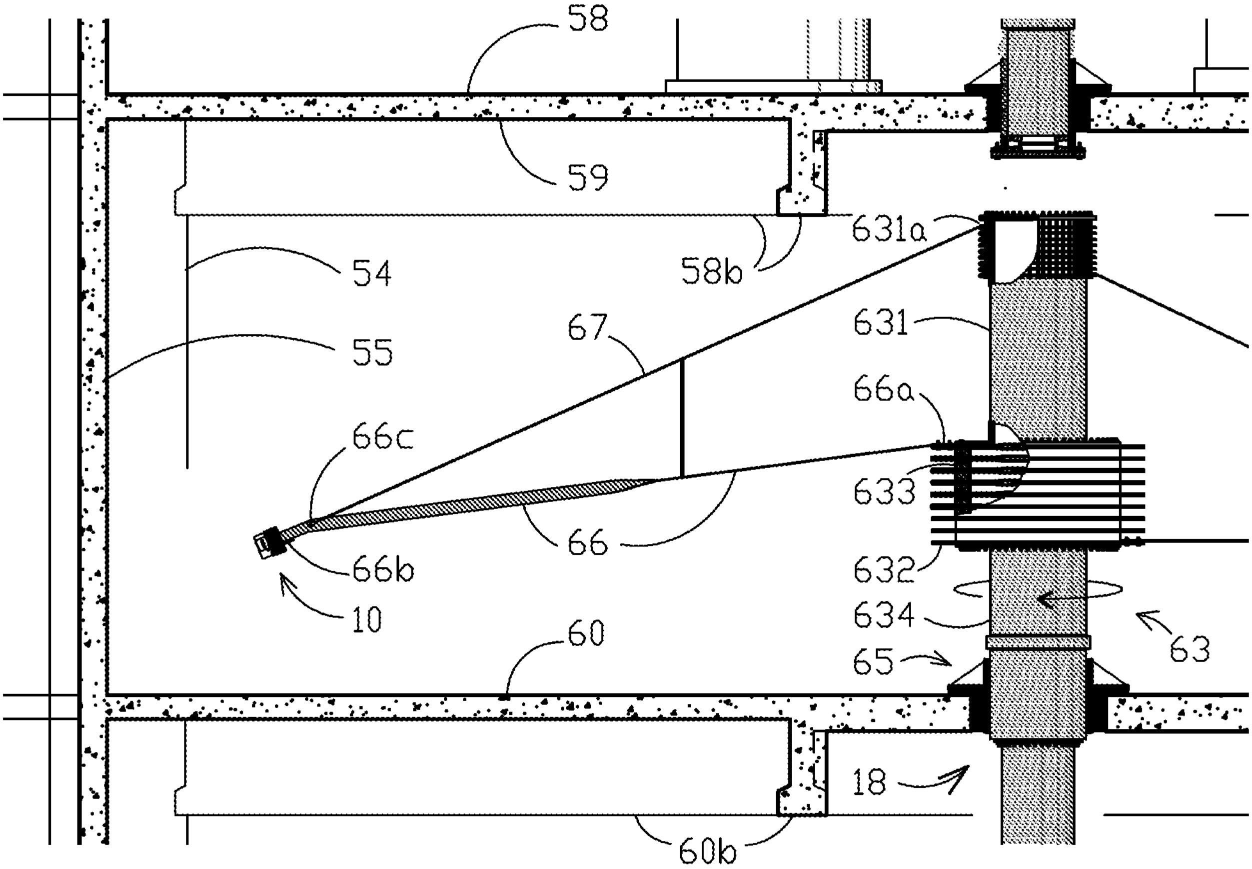
Fig. 8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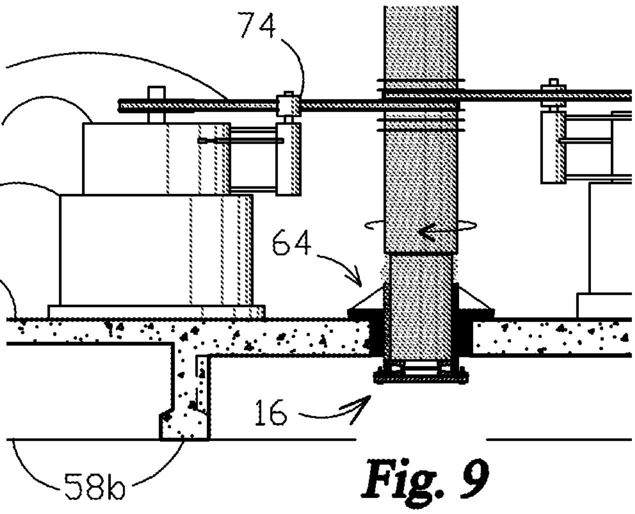
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Fig. 9

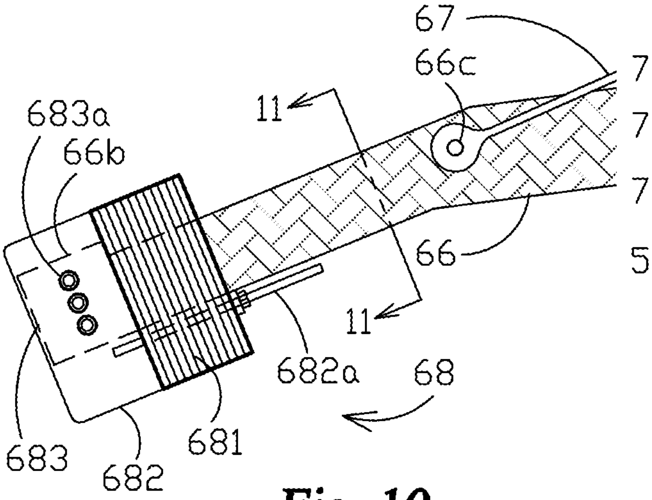
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Fig. 10

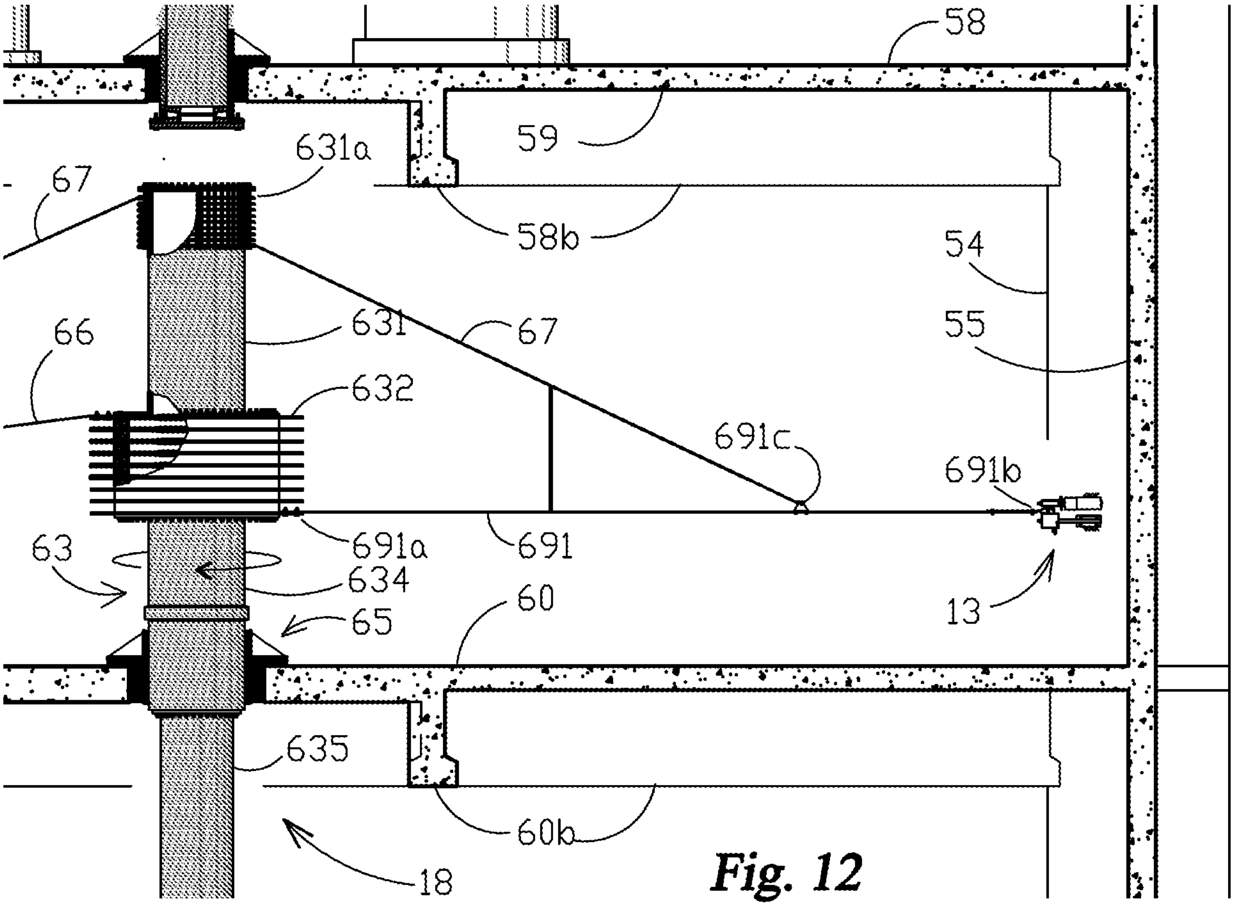

Fig. 12

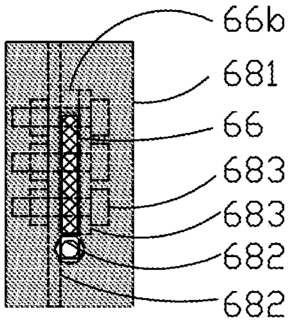

Fig. 11

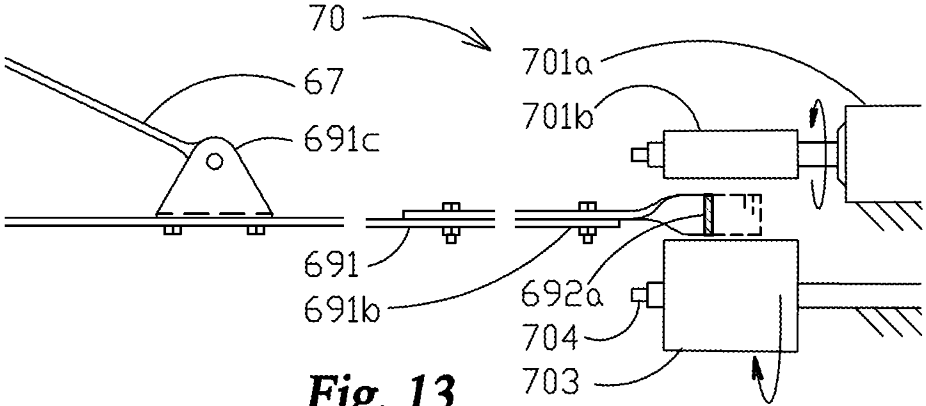

Fig. 13

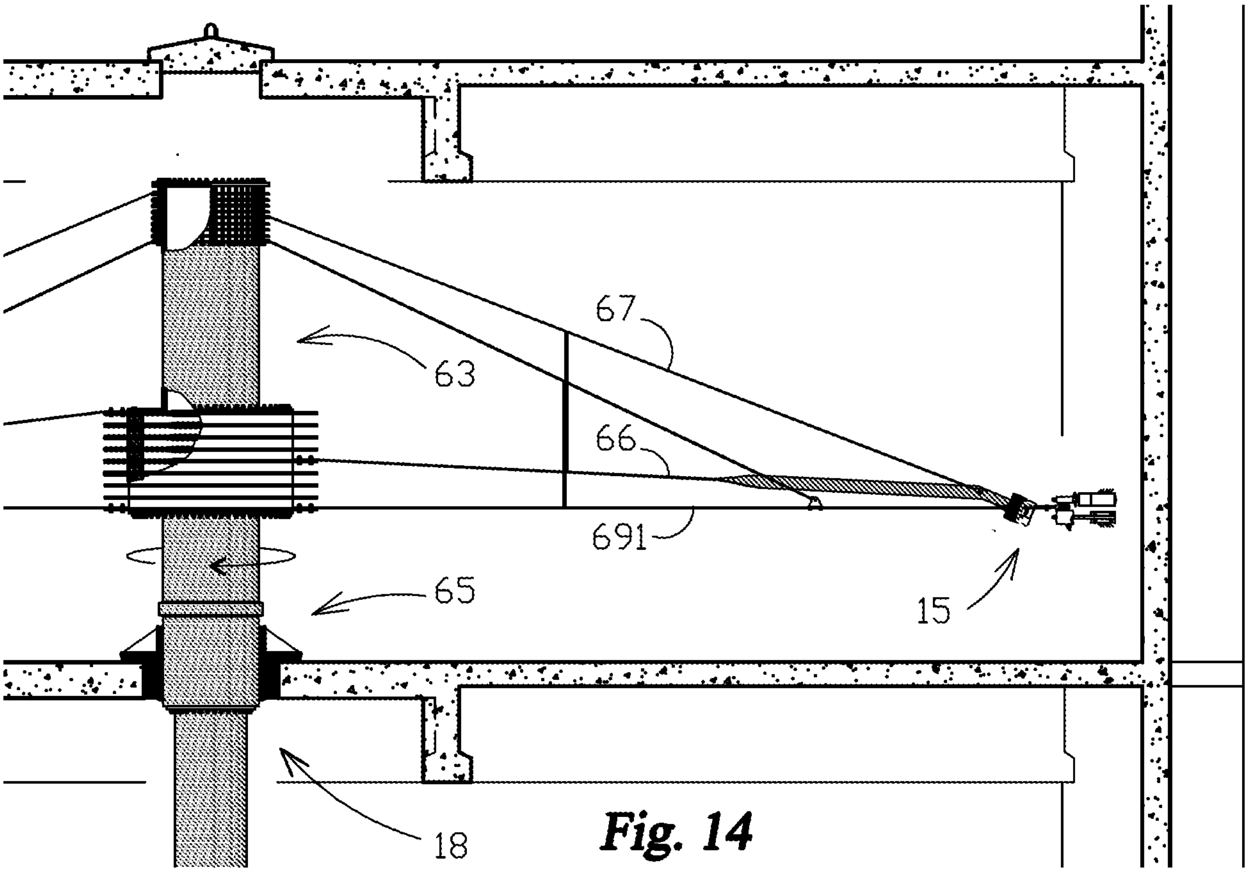

Fig. 14

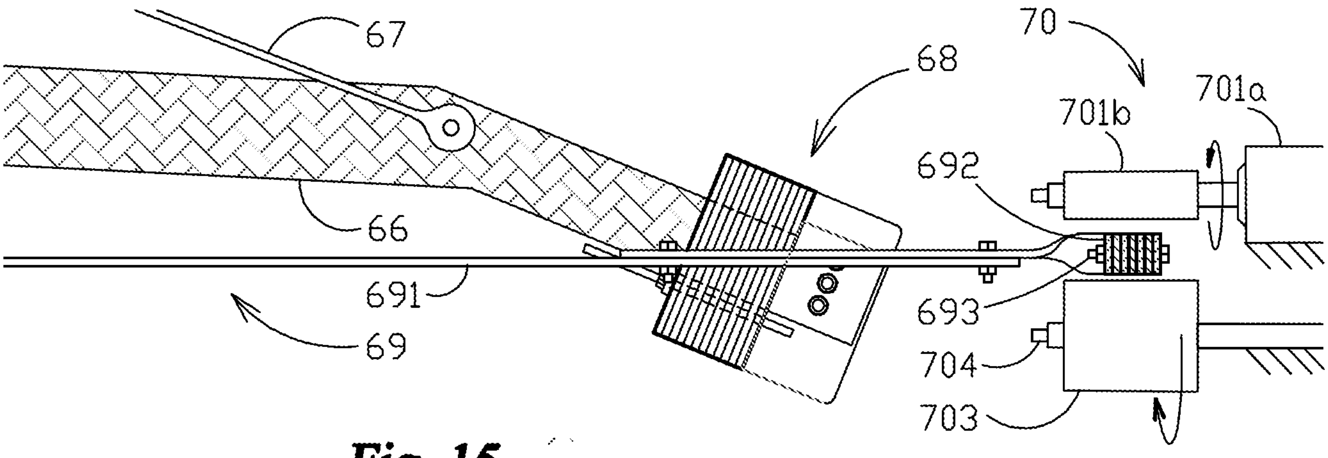

Fig. 15

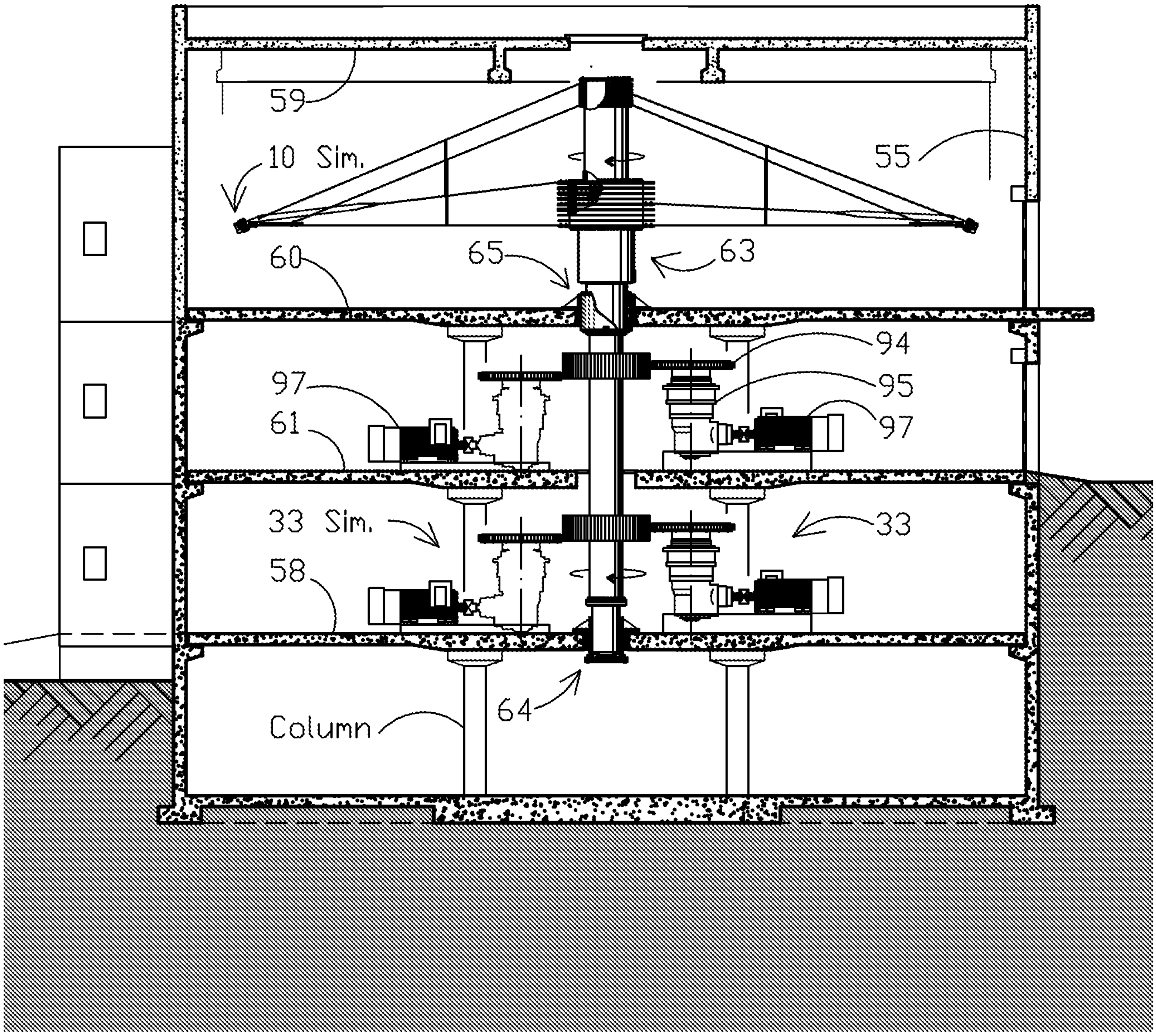

FIG. 32

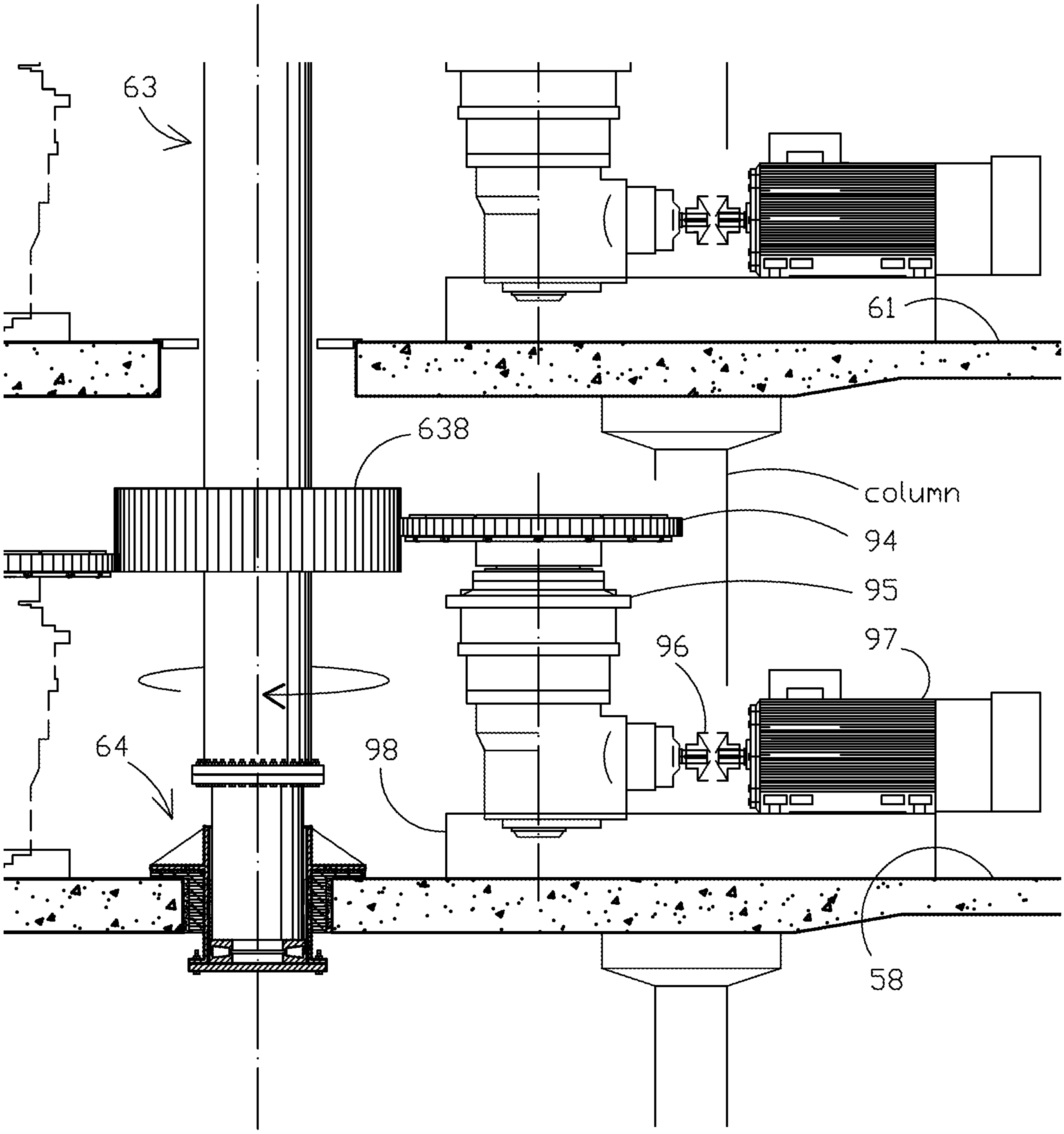

FIG. 33

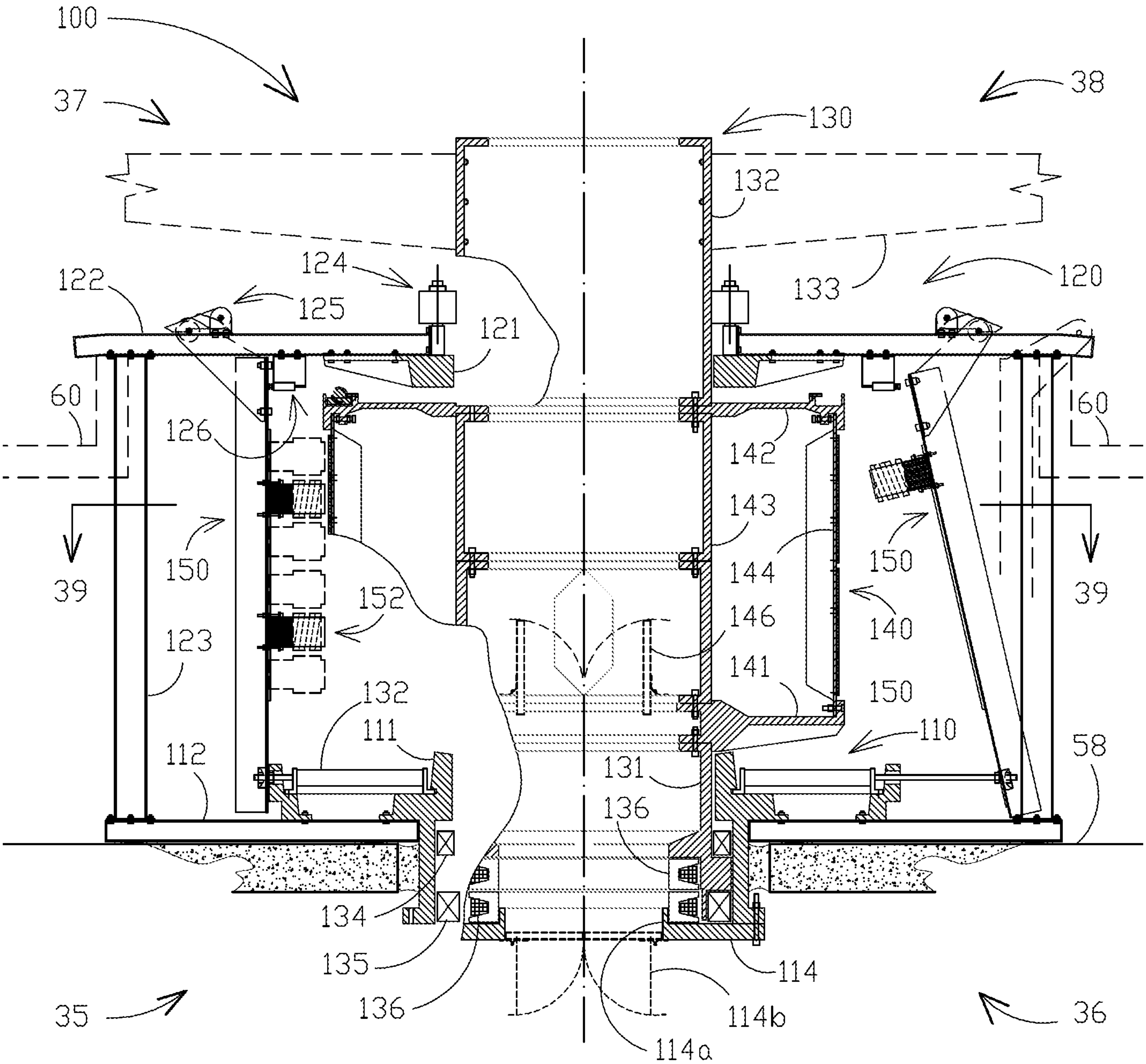
100
37
38
130
132
133
120
124
122
125
121
60
60
126
142
143
144
150
150
39
39
152
146
140
123
141
150
132
111
110
112
131
58
136
134
135
114
136
114b
35
36
114a

FIG. 34

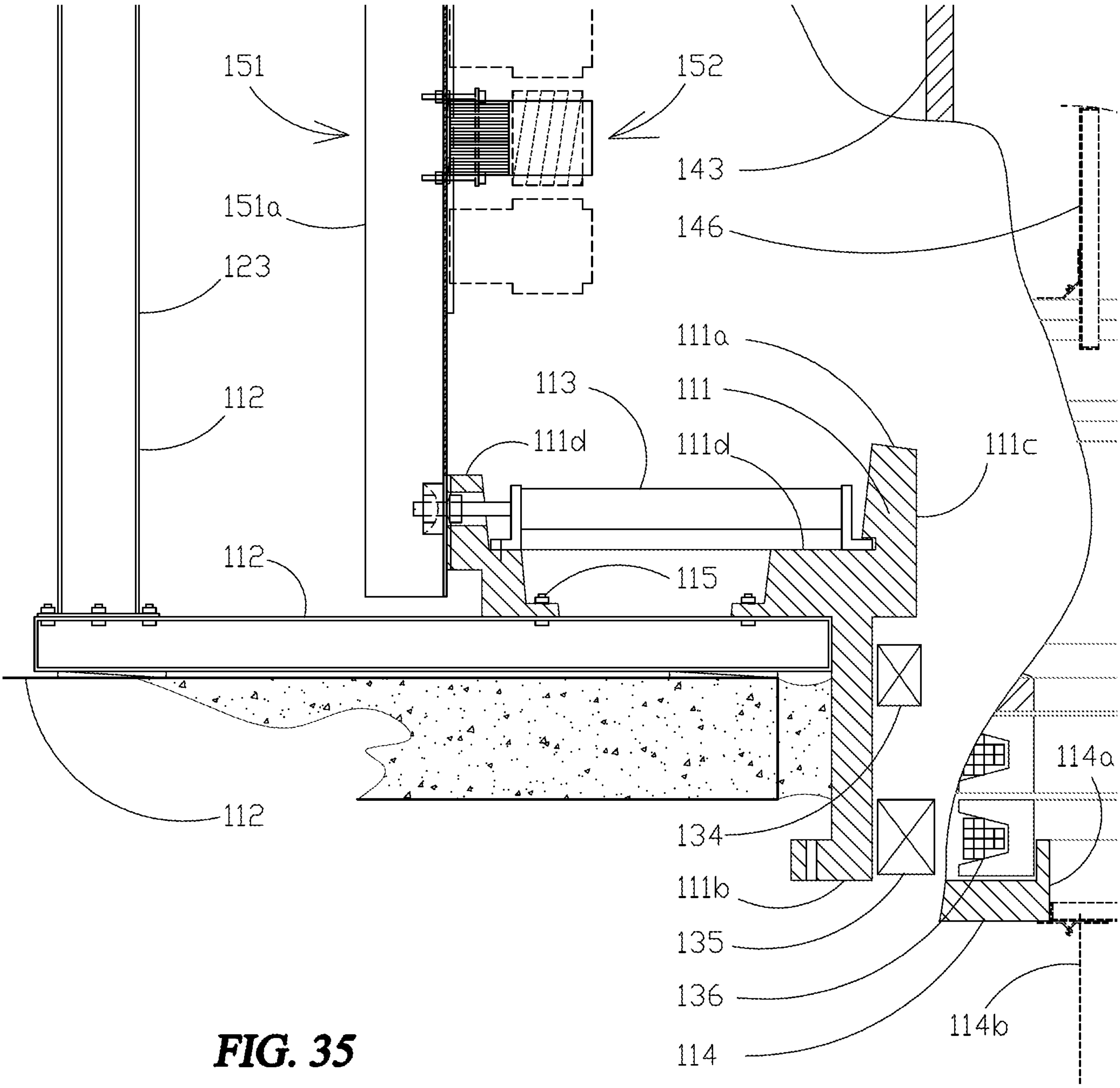
151
152
143
151a
146
123
111a
113
111
112
111d
111d
111c
112
115
112
134
114a
111b
135
136
114b
114

FIG. 35

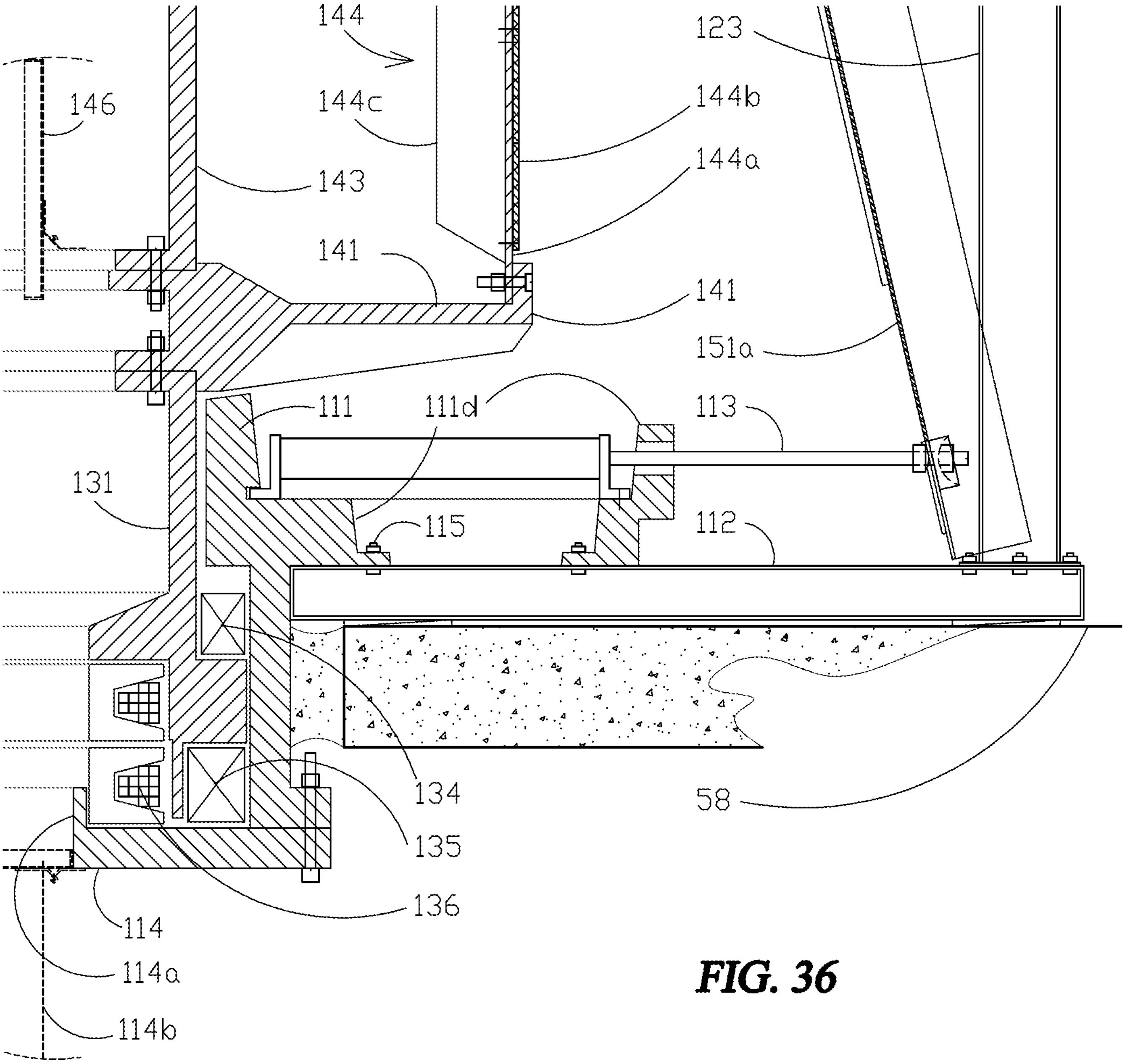
144
123
146
144c
144b
143
144a
141
141
151a
111
111d
113
131
115
112
134
58
135
136
114
114a
114b

FIG. 36

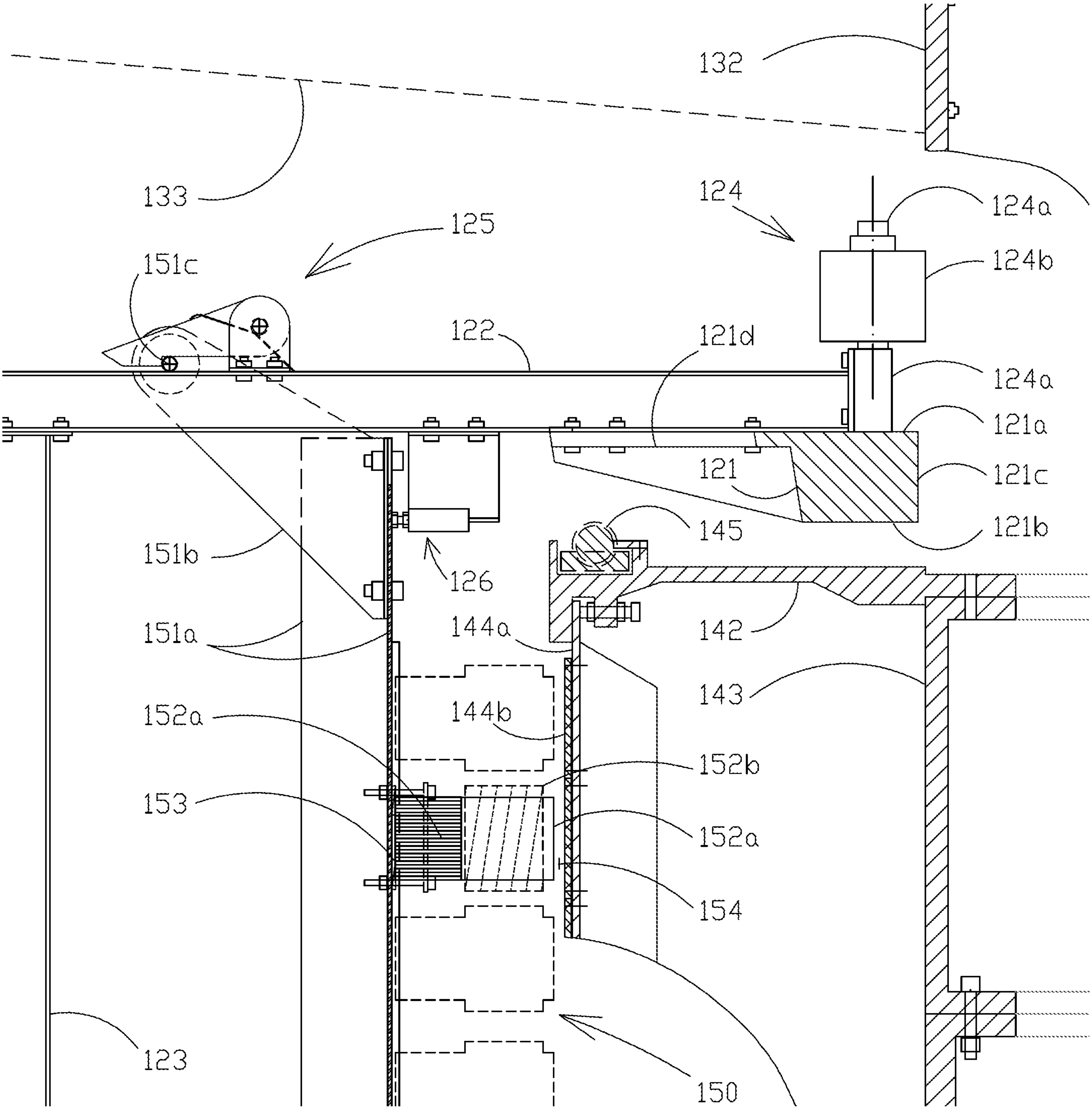
132
133
124
124a
125
124b
151c
122
121d
124a
121a
121
121c
145
121b
151b
126
142
151a
144a
143
152a
144b
152b
153
152a
154
123
150

FIG. 37

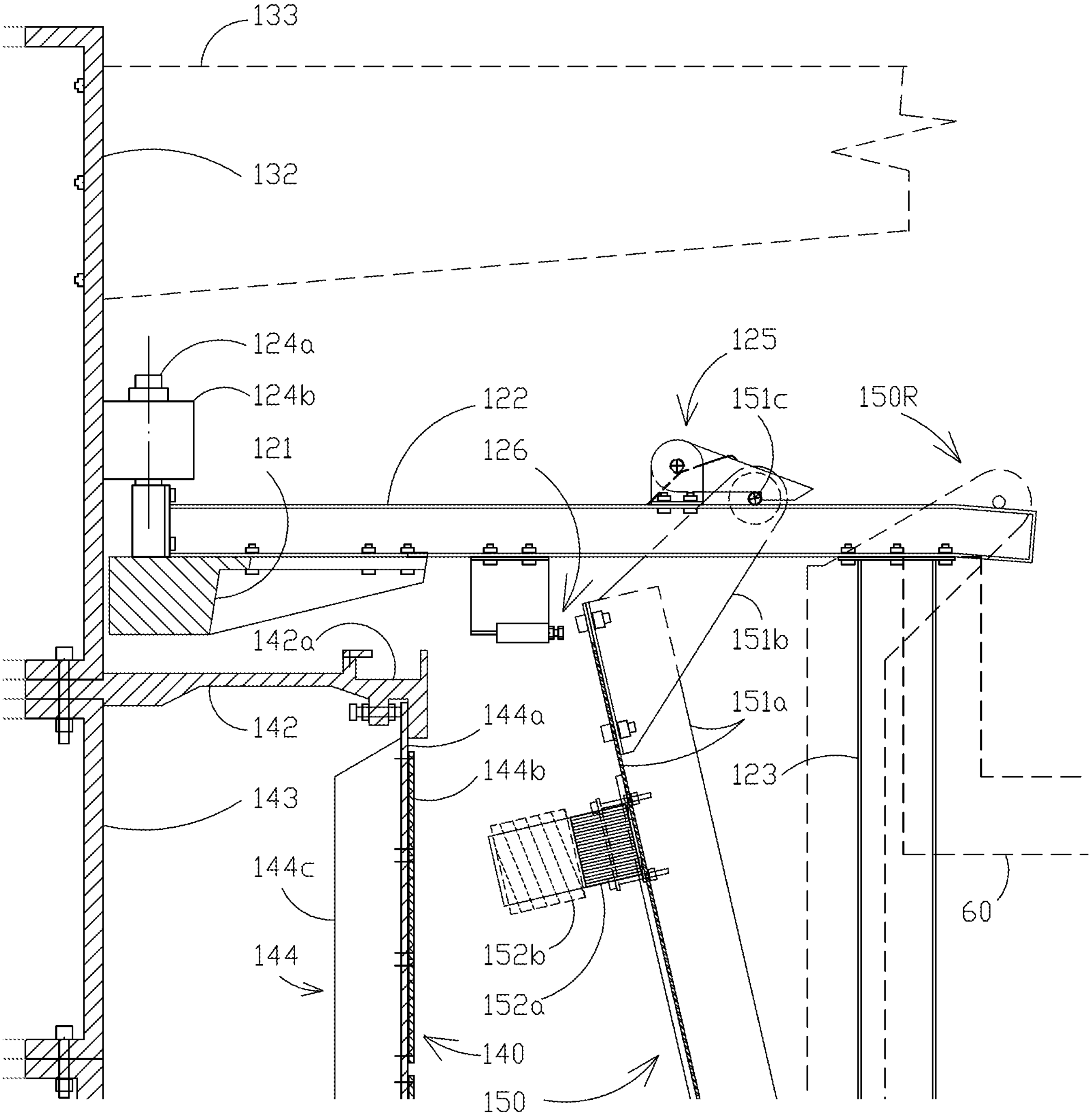
133
132
124a
124b
125
122
151c
150R
121
126
142a
151b
142
144a
151a
144b
123
143
144c
60
144
152b
152a
140
150

FIG. 38

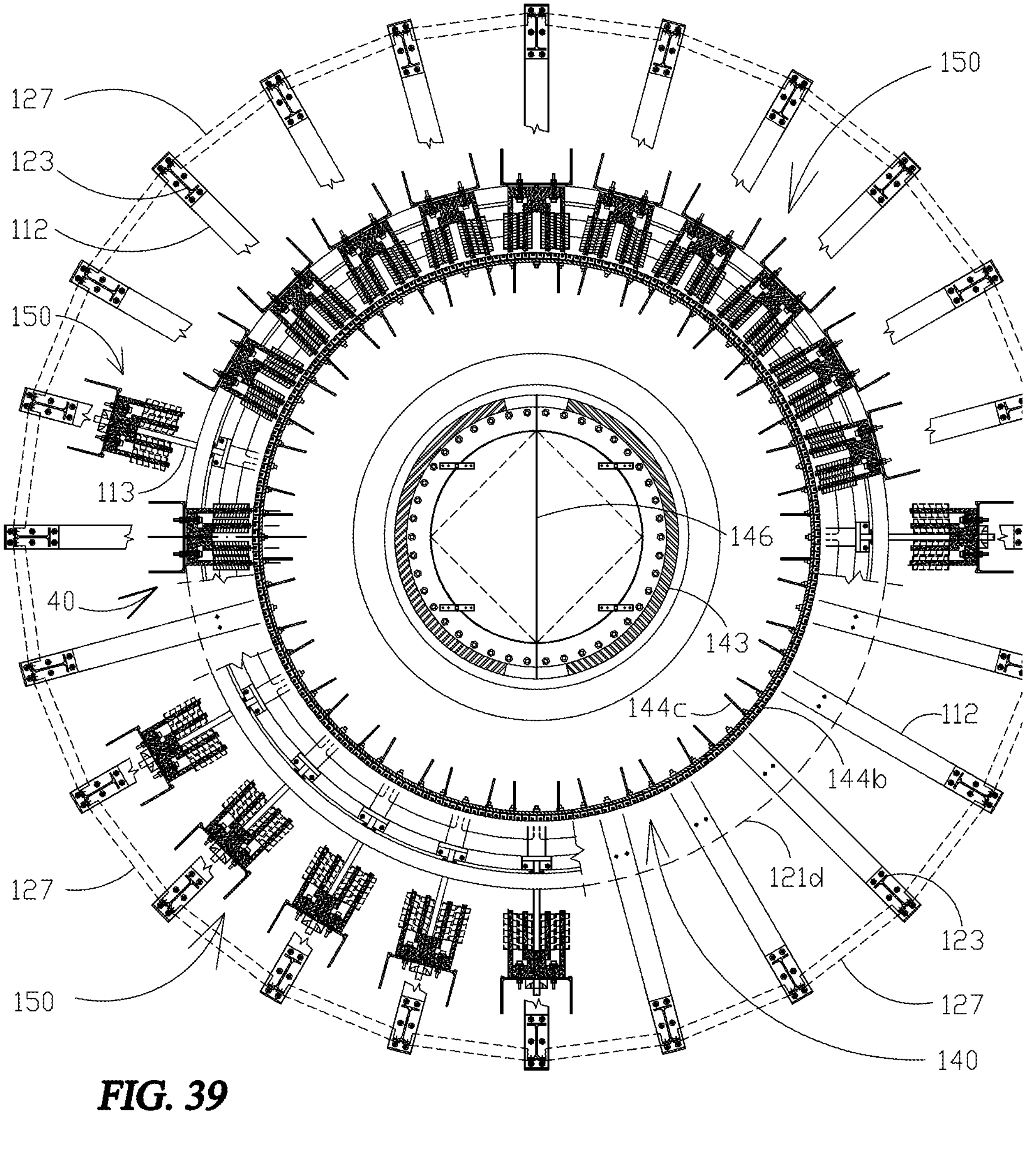
127
123
112
150
113
40
127
150
150
146
143
144c
112
144b
121d
123
127
140

FIG. 39

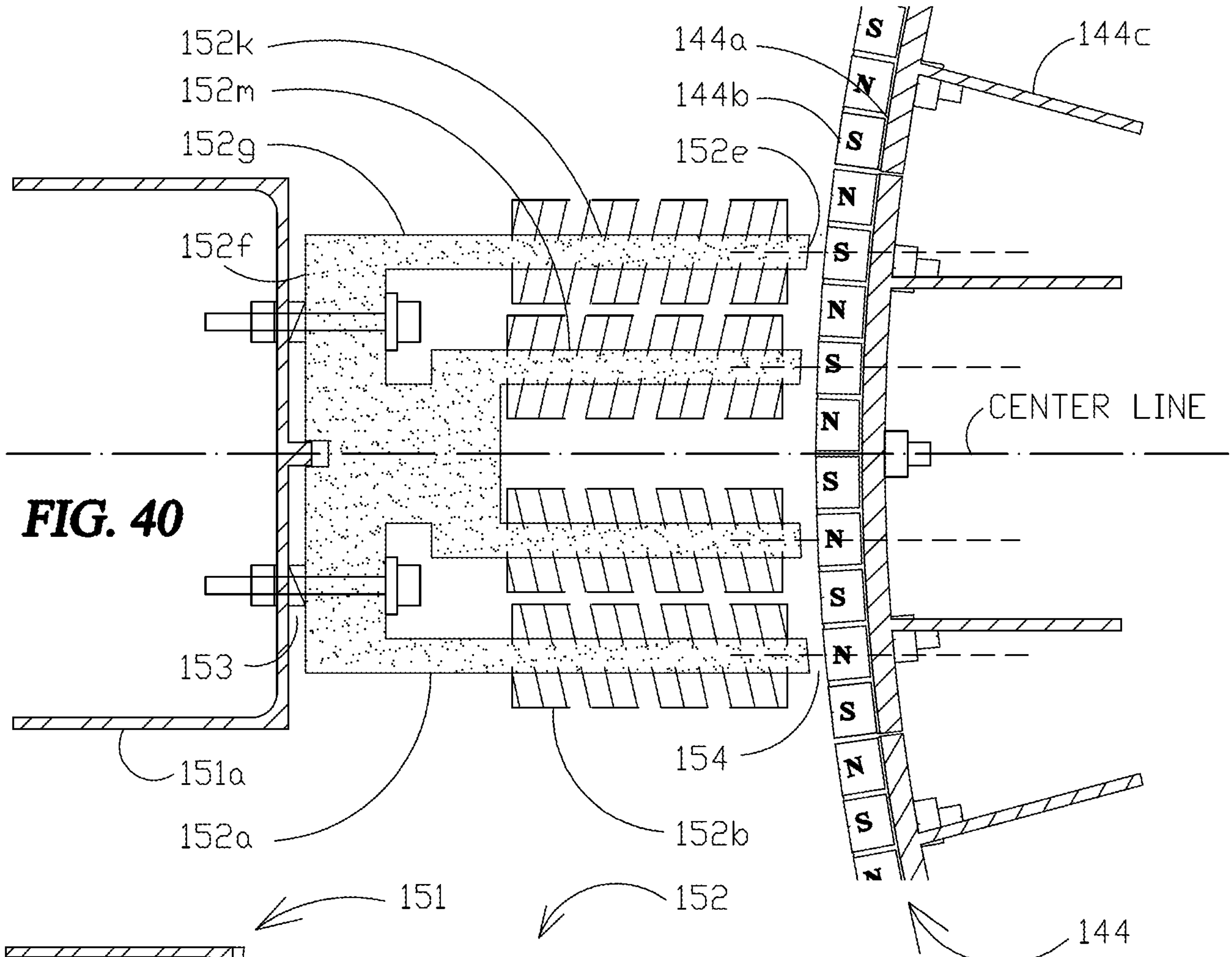
152k
152m
152g
152f
144a
144b
144c
152e
CENTER LINE
S
N
153
151a
152a
154
152b
144

FIG. 40

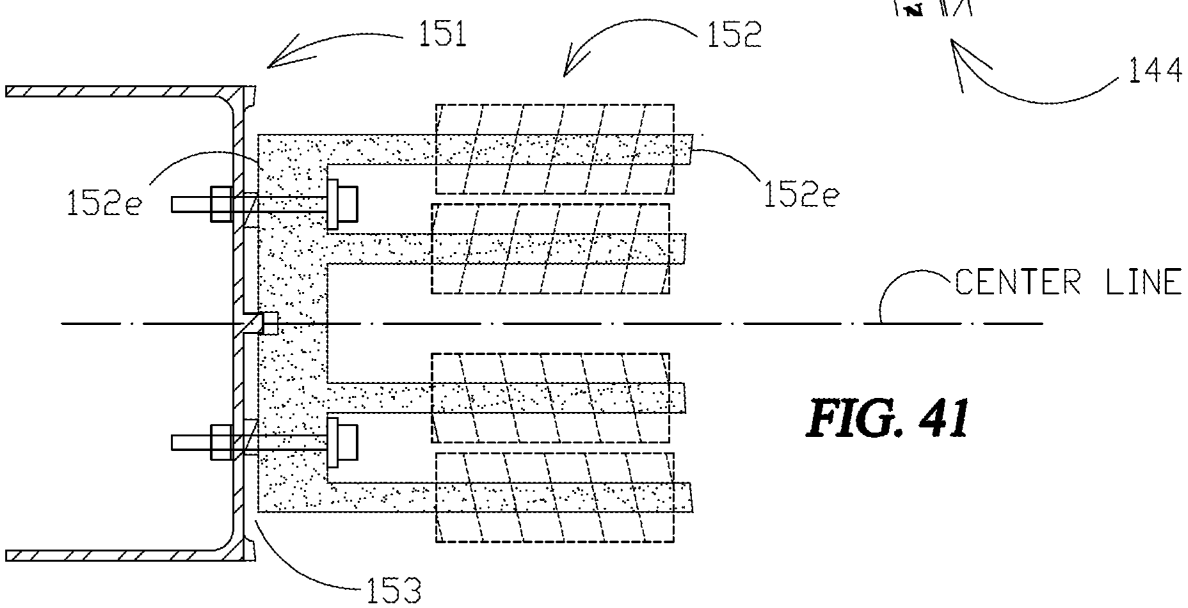
151
152
152e
152e
CENTER LINE
153

FIG. 41

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US16/45418

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - H02K 16/00, 21/26, 35/04; F03D 9/00 (2016.01)
CPC - H02K 16/00, 21/26, 35/04; F03D 9/002

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8): H02K 16/00, 21/26, 35/04; F03D 9/00 (2016.01)
CPC: H02K 16/00, 21/26, 35/04; F03D 9/002

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatSeer (US, EP, WO, JP, DE, GB, CN, FR, KR, ES, AU, IN, CA, INPADOC Data); Google; Google Scholar; EBSCO; KEYWORDS: turbine generator floor pivotal assembly rotor vertical-axis armature assembly vertical segment stator assembly stator-spaces housing axial opening flange coaxially upper-spreader vertical cylinder disk induction mounting rail air gap coil assembly

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2016/043794 A1 (TIANCHON, C.) March 24, 2016; figures 1-4; page 2, lines 29-32; page 5, lines 18-20; page 8, lines 1-8; claims 1-4 and 11	1-14
A	US 2012/0242430 A1 (WU, S.) September 27, 2012; figures 1-3; paragraphs [0021-0028]	1-14
A	US 2013/0039742 A1 (WILSON, E. et al.) February 14, 2013; figures 3 and 5; paragraphs [0020-0021]	1-14

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

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"E" earlier application or patent but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 September 2016 (22.09.2016)	14 October 2016

Name and mailing address of the ISA/US	Authorized officer
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Shane Thomas PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774