

(19)



(11)

EP 4 150 159 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:

24.01.2024 Bulletin 2024/04

(21) Application number: **21728297.9**

(22) Date of filing: **12.05.2021**

(51) International Patent Classification (IPC):

E01F 13/06^(2006.01) B61L 29/02^(2006.01)

(52) Cooperative Patent Classification (CPC):

E01F 13/06; B61L 29/04

(86) International application number:

PCT/IB2021/054043

(87) International publication number:

WO 2021/229459 (18.11.2021 Gazette 2021/46)

(54) **BARRIER MECHANISM**

SPERRMECHANISMUS

MÉCANISME DE BARRIÈRE

(84) Designated Contracting States:

AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **14.05.2020 PT 2020116380**

(43) Date of publication of application:

22.03.2023 Bulletin 2023/12

(60) Divisional application:

23182136.4 / 4 253 191

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Description

Technical domain

[0001] The present application describes a barrier mechanism for level crossing control systems.

Prior art

[0002] Currently most of the level crossing barriers use as a balance system for the boom the conventional bulky counterweights. The use of the counterweight is a widely used method, whereby there exists more knowledge about this technique and consequently trust in the system. However, when increasing the length of the boom, there is the need to have more robust, bulky counterweights, and/or which are placed further away from the intermediary fixation point. This intrinsic need to occupy more working space can lead to more inconvenient and embarrassing situations, such as damaging material goods of the passers-by and technicians and of causing, inadvertently, damage to the physical integrity of the road users and collaborators of the railway network.

[0003] The increase in the size of the counterweights also leads to an increase in setbacks when the meteorological conditions are not favourable, particularly when there is precipitation of ice flakes and crystals, which leads to the formation of solid crystalline layers that block the regular movement of the boom.

[0004] CN 204 059 230 U discloses a prior art barrier mechanism comprising a compression spring set replacing the counterweight.

Summary

[0005] The present application describes a barrier mechanism comprising a mechanism; and a boom, which is fixed at one of the extremities to the mechanism by means of a fixation system; wherein the mechanism comprises an equalizer system, comprising a main shaft comprising a wheel and a connecting cam, a set of compression springs, a set of transmission chains, mechanically interconnecting the set of compression springs to the main shaft by means of the connecting cam; and a reduction set, comprising a DC motor comprising a reel, a shaft comprising a crown wheel and a wheel, and a shaft comprising a wheel and a wheel, wherein the motor provides connection to the shaft by means of the mechanic connection between the reel and the crown wheel, wherein the shaft provides rotation to the shaft by means of the mechanic connection between the wheel and the wheel, and wherein the shaft provides rotation to the main shaft by means of the mechanical connection between the wheel and the wheel of the equalizer system.

[0006] In one proposed embodiment, the mechanism comprises an automaton that commands the rising and lowering of the boom by means of the action of the DC motor which transmits rotation to the main shaft.

[0007] In another embodiment, the barrier mechanism comprises additionally a metallic skirt.

[0008] In another embodiment, the boom comprises the use of two or more profiles that are compatible with each other, being an inner profile and an outer profile.

[0009] In yet another embodiment, the outer profile of the boom allows the installation of light signals and/or a metallic skirt.

[0010] In yet another embodiment, the inner profile of the boom allows the junction of two outer profiles of the boom and the adjustment of the length of the boom at the place of installation.

[0011] In yet another embodiment, the set of transmission chains comprises a set of four chains bolted to the connection brace which is still welded to the main shaft.

[0012] In yet another embodiment, the connection brace transmits the swaying movement of the main shaft to the chains by means of a dowel which operates as a mechanical joint pin.

[0013] In yet another embodiment, the main shaft comprises additionally a manual drive system comprised of a conical set with a 2:1 transmission ratio to the respective main shaft, wherein the referred system is activated by a handle.

[0014] In yet another embodiment, the main shaft comprises additionally a position detection system of the boom comprising eccentric components and microswitches, wherein the eccentric components activate the referred microswitches throughout the rotation movement of the main shaft.

[0015] The present application further describes the automatic operating method for the barrier mechanism, wherein the mechanism, after receiving an electric command from the control system, comprises the steps of: the DC motor transmits the rotation movement to the auxiliary shaft of the motor, by means of a flexible coupling, which, by means of the worm screw transmits rotation to the reel which in turn will activate the main transmission system; - the transference of the rotation movement is made by means of a reduction with a 40:1 rotation to the crown wheel installed in the shaft 1, wherein the maximum binary of the system is controlled by means of the binary limiter and the reduction in speed and the progressive increase in torque are provided by the wheel 2; the rotation movement provided on shaft 2, transmitted by the wheel 3 by means of the existing connection with the wheel 2, will in turn move the shaft 2, transmitting the rotation movement to the wheel 4;

- the wheel 4 transmits the rotation of the shaft 2 to the main shaft by means of the existing connection with the gear wheel 5, which in turn, by means of the existing connection with the connection braces which will transmit the movement to the equalizer system, comprised of the set of compression springs which is activated by the flexible intermediary connection existing between the referred set and the connection braces;

- the upwards or downwards movement of the chains will cause the upwards or downwards movement of the M20 rod by means of the existing connection with the connection profile of the forks, causing the ascension or lowering, of the sliding plate, which compresses, or decompresses, the set of compression springs.

[0016] The manual operating method of the barrier mechanism is further described, wherein the mechanism comprises the steps of: - Electrically turning off the mechanism; - Unblocking the passage of the handle for manual drive; - Engaging the manual drive system to the main transmission system, so that the engagement point is made by means of a direct transmission using cylindrical gearings with straight teeth; - The rotation movement is transmitted from the reel to the auxiliary shaft of the motor from the worm screw, whereby the sequence of movements henceforth is equal to that of the automatic drive.

[0017] The present application further describes a boom comprising at least one outer profile comprising a lower support rail, and at least one socket cavity, and at least one inner profile comprising a lower projection socket, and at least one socket rectangle, wherein the at least one outer profile and the at least one inner profile are coupled by means of the mechanical union between the at least one socket cavity and the at least one socket rectangle, and between the lower support rail and the lower projection socket.

Brief description

[0018] The present application describes a barrier mechanism for level crossing control systems. It is an equipment that is designed to maximize the protection in level crossings, mitigating risk behaviour and situations.

[0019] This is distinct from the overwhelming majority of the competing counterpart products for level crossings, since the stability of the movement is internally guaranteed, resulting in the elimination of the workspace of the vulgar counterweights and in the elimination of the risks originating from the conventional solution. The static and dynamic balance of the main shaft is obtained by means of a set of mechanical elements comprised of steel cams, chains, forks, and a set of compression springs which, when compressed have the function of compensating the moment of force caused by the boom on the main shaft.

[0020] The mechanism is controlled by an automaton which, when it receives the information that the train is approaching, it commands the barrier to lower (obstructing the passage of road vehicles or pedestrians to the railway line), and when it receives the indication of the effective passing of the train, again commands the barrier, this time to rise, enabling once more the road and pedestrian circulation.

[0021] The equalizer system of the main shaft was the solution developed with the purpose of complying with

the requirement of absence of conventional counterweights, which are usually used in this type of application. The fact that the counterweights are not used results in a reduction of the working space of the arm of the mechanism, and this reduction mitigates the risk of material damage and harm to physical integrity, thus resulting in a system that is conducive to the well-being of all the passers-by on the road and the professionals in the area of railway signalization. The function of the equalizer system of the main shaft is to balance the moment of force on the main shaft. This mechanical system compensates the torque generated by the weight of the boom when it is in the horizontal position and balances the forces that are applied to the main shaft when the boom is moving. This compensation of the force applied results in a considerably stable movement of the boom.

[0022] The distinctive factor of the mechanism developed resides in applying a set of compression springs, to guarantee the static balance and the dynamic stability of the boom of the barrier mechanism of a level crossing.

[0023] The solution developed is designed as an integral part of the level crossing system, whereby it is possible to configure lengths, types of signalling and other secondary accessories to better adapt to each scenario and type of installation.

Brief Description of the Figures

[0024] For an easier understanding of the present application there are figures attached which represent embodiments that, however, do not intend to limit the technology herein disclosed.

Figure 1 shows a view of the barrier mechanism (100) - perspective 1 - wherein the boom (101) and the mechanism (102) are referenced.

Figure 2 shows a view of the barrier mechanism (100) - perspective 2 - wherein the boom (101) and the mechanism (102) are referenced.

Figure 3 is a front view of the barrier mechanism (100) wherein the boom (101) and the mechanism (102) are referenced.

Figure 4 is a rear view of the barrier mechanism (100) wherein the boom (101) and the mechanism (102) are referenced.

Figure 5 shows a right lateral view of the barrier mechanism (100) wherein the boom (101) and the mechanism (102) are referenced.

Figure 6 shows a left lateral view of the barrier mechanism (100) wherein the boom (101) and the mechanism (102) are referenced.

Figure 7 shows a top view of the barrier mechanism

(100)) wherein the boom (101) and the mechanism (102) are referenced.

Figure 8 shows a lower view of the barrier mechanism (100)) wherein the boom (101) and the mechanism (102) are referenced.

Figure 9 shows an upper view of the mechanism (102) wherein there are represented: main shaft (1020), wheel 5 (1021), connection cam (10201), shaft 2 (10212), wheel 3 (10211), wheel 4 (10213) and handle (1022).

Figure 10 shows a lower view of the mechanism (102) wherein the support mass is represented (1023).

Figure 11 shows a lateral view of the mechanism (102) - profile A - wherein there are represented: main shaft (1020), wheel 5 (1021), handle (1022), support mass (1023), set of transmission chains (1024), set of compression springs (1025), DC motor (1028), shaft (10212), shaft (10214), connecting profile (10253), upper fixed plate for spring compression (10254), mobile plate compression rod (10252) and mobile plate for spring compression (10251).

Figure 12 shows a lateral view of the mechanism (102) - profile B - wherein there are represented: main shaft (1020), wheel 5 (1021), handle (1022), support mass (1023), set of transmission chains (1024), set of compression springs (1025), position detection system (1026), anchor-fork for chains (10241), mobile plate for spring compression (10251), connecting profile (10253), and upper fixed plate for spring compression (10254).

Figure 13 shows a lateral view of the mechanism (102) - profile C - wherein there are represented: main shaft (1020), wheel (1021), handle (1022), support mass (1023), set of transmission chains (1024), set of compression springs (1025), position detection system (1026), DC motor (1028), connecting profile (10253), upper fixed plate for spring compression (10254), mobile plate compression rod (10252) and mobile plate for spring compression (10251).

Figure 14 shows a lateral view of the mechanism (102) - profile D - wherein there are represented: main shaft (1020), wheel (1021), handle (1022), support mass (1023), set of transmission chains (1024), set of compression springs (1025), position detection system (1026), and DC motor (1028),

Figure 15 shows an oblique lateral view of the mechanism (102) - profile E - wherein there are represented: main shaft (1020), wheel (1021), support mass (1023), set of transmission chains (1024), set of com-

pression springs (1025), position detection system (1026), connecting profile (10253), mobile plate compression rod (10252) and mobile plate for spring compression (10251).

Figure 16 shows an oblique lateral view of the mechanism (102) - profile F - wherein there are represented: main shaft (1020), handle (1022), support mass (102), set of transmission chains (1025), connecting terminal plate (1027), DC motor (1028), shaft 2 (10212), shaft (10214), connecting profile (10253), fixed plate for spring compression (10254) and mobile plate for spring compression (10251).

Figure 17 shows an oblique lateral view of the mechanism (102) - profile G - wherein there are represented: main shaft (1020), support mass (1023), set of transmission chains (1024), set of compression springs (1025), connecting terminal plate (1027) and DC motor (1028).

Figure 18 shows an oblique lateral view of the mechanism (102) - profile H - wherein there are represented: main shaft (1020), wheel (1021), handle (1022), support mass (1023), set of transmission chains (1024), set of spring compression chains (1024), position detection system (1026), connecting profile (10253), upper fixed plate for spring compression (10254) and mobile plate for spring compression (10251).

Figure 19 shows an oblique upper lateral view of the mechanism (102) - profile I - wherein there are represented: main shaft (1020), wheel (1021), handle (1022), set of transmission chains (1024), set of compression springs (1025), position detection system (1026), wheel (10213), connecting profile (10253), upper fixed plate for spring compression (10254), mobile plate for spring compression (10251), wheel (10211), shaft (10212) and shaft (10214).

Figure 20 shows an upper oblique lateral view of the mechanism (102) - profile J - wherein there are represented: main shaft (1020), wheel 5 (1021), handle (1022), set of transmission chains (1024), set of compression springs (1025), position detection system (1026), connecting profile (10253), upper fixed plate for spring compression (10254) and mobile plate for spring compression (10251).

Figure 21 shows an upper oblique lateral view of the mechanism (102) - profile K - wherein there are represented: main shaft (1020), wheel (1021), handle (1022), support mass (1023), set of compression springs (1025), connecting terminal plate (1027) and DC motor (1028).

Figure 22 shows an upper oblique lateral view of the

mechanism (102) - profile L - wherein there are represented: main shaft (1020), wheel (1021), handle (1022), support mass (1023), set of compression springs (1025), connecting terminal plate (1027) and DC motor (1028).

Figure 23 shows an exemplary view of the metallic skirt (103) for optionally applying to the barrier boom (101).

Figure 24 shows a view of the equalizer system (104) of the mechanism (102), wherein there are represented: main shaft (1020), wheel (1021), cam/connecting braces (10201), set of transmission chains (1024), set of compression springs (1025), mobile plate compression rod (10252), anchor-fork for chains (10241), reinforcement profile (10242), fork connecting profile (10253), upper fixed plate for spring compression (10254) and mobile plate for spring compression (10251).

Figure 25 shows an outer profile view (1011) of the boom (101), lower support rail (10111) and socket cavity (10112).

Figure 26 shows an inner profile view (1012) of the boom (101), lower projection socket (10121) and socket rectangle (10122).

Figure 27 shows a view of the main transmission system of the mechanism (102) wherein the following elements are represented: main shaft (1020), wheel (1021), DC motor (1028), flexible coupling (10282), worm screw (10283), auxiliary motor shaft (10284), reel (10285), crown wheel (10216), binary limiter (10217), wheel (10211), wheel (10213), shaft (10212), shaft (10214) and wheel (10215).

Description of embodiments

[0025] Referring to the figures, some embodiments are now described in a more detailed manner, which do not intend, however, to limit the scope of the present application.

[0026] The present application describes a barrier mechanism (100) for level crossing control systems. The barrier mechanism (100), in one of the proposed embodiments, comprises the use of three components, the mechanism (102) itself, the boom (101) and the metallic skirt (103).

[0027] The main function of the barrier mechanism (100) is to protect users in circulation on the road from a situation of imminent danger whenever it is necessary to cross the railway lines. The mechanism (100) is characterized by the conventional movement, wherein a boom (101) describes a circular movement of 0° (barrier in closed position - horizontal position) to 90° (barrier in open position - vertical position), there existing a boom

fixation point (101) to the main shaft (1020) of the mechanism. The torque and the speed provided on the main shaft (1020) of the mechanism are resulting from the transmission of the mechanical power of a DC motor (1028), and of a reduction set, comprised by a three-floor reduction, resulting in the mechanical efforts necessary to generate the boom movement. However, this mechanism differs from the overwhelming majority of the equipment in this field of application since the balance system of the main shaft is not made in the conventional manner, resorting to the use of bulky and heavy solid counterweights on the opposite side of the road, which is a solution that is used worldwide. This traditional solution, due to its robustness and the volume of working space of the counterweights, can cause certain inconveniences to the passers-by and workers that are skilled in the mechanism. These constraints can result in harm to the physical integrity of a passer-by/maintenance technician and in material damages. In the mechanism that is developed the stability of the movement is internally guaranteed, resulting in the elimination of the volume of working space of the counterweights and in the elimination of the risk deriving from the conventional solution. The static and dynamic balance of the main shaft is obtained by means of a set of mechanical elements (steel cam, chains, forks, and spring pack) which have the function of compensating the moment of force caused by the boom on the main shaft.

[0028] The boom (101), used together with the mechanism (102), consists in two profiles that are compatible with each other: the outer profile (1011) and the inner profile (1012).

[0029] The outer profile (1011) is constructively designed to resist the adverse meteorological conditions and has the function of being sufficiently visible to the road users to indicate the presence of a level crossing barrier, allow the installation of light signals as well as the installation of a metallic skirt to obstruct the passage of passers-by through the lower part of the boom.

[0030] The outer profile (1011) of the boom (101) presents, in the lower area, a lower support rail (10111) which is destined to the fixation of accessories, namely, the metallic skirt (103).

[0031] The inner profile (1012) of the boom (101) has two functions: the first one is to unite two modules of the outer boom profile (1011), so that it is possible to configure the boom (101) in several lengths, and the second function is to guarantee that, apart from the fixed length originating from each boom configuration (101), there exists the possibility of customizing and adjusting the final length of the boom (101) at the location of the installation.

[0032] Since to fulfil each function the inner boom profile (1012) must have different lengths, while a physical part will have two distinct names: Profile Union and Telescopic Point.

[0033] The metallic skirt (103) acts as an accessory and it is conceived to supplement the obstruction of passage exerted by the boom preventing the road users from

passing through the lower part of the boom. This component is optional and the fixation thereof to the boom can be made by means of screws.

Main transmission system

[0034] Main transmission system is the designation given to the set of mechanical elements of the mechanism which has the primary function in the movement of the level crossing barrier. This set is permanently demanded, whether during automatic drive, whether during the manual drive of the mechanism.

[0035] The movement of the mechanism is generated from the electric drive of a motor organ (1028) (CC Motor, 24V, 1500rpm, >1.2 N.m), which has the flange vertically fixed to the metallic structure that gives body to the mechanism. This motor organ is responsible for creating the rotation movement (the translation movement is restricted to the three shafts and the rotation axis is perpendicular to the XZ plan) necessary for the automatic operation of the barrier mechanism (101).

[0036] After generating this first movement, it is necessary to transmit it to a second shaft, the auxiliary motor shaft. This transmission is made with a shaft union joint, which has three purposes: transmit rotation, mitigate vibrations, and compensate axial or angular misalignments. The auxiliary motor shaft is a propelled element which has a rotation speed and rotation direction that is equal to that debited by the motor. The worm screw is fixed to the auxiliary shaft of the motor, since it is necessary to transmit the movement to the shaft (10214), by means of the semi-globoid crown wheel, wheel, which is fixed to the binary limiter that is found keyed to the shaft (10214).

[0037] The movement transmission is transversal, irreversible, and has a 40:1 transmission relation. This transmission corresponds to a movement by direct contact by means of a gear joint.

[0038] In shaft (10214) there is a pinion installed which has the function of a motor on the second transmission floor (4:1 ratio), when transmitting the movement of shaft 1 to shaft 2, by means of a cylindrical gear joint with straight teeth. The third transmission floor is the last step in the main transmission, and it guarantees that the upwards movement and the declining movement of the boom are executed, according to the swaying movement of the main shaft. Apart from the welding of the cylindrical gear joint with straight teeth there is also fixed to shaft 2 a pinion for transmitting the rotation movement to the main shaft, which as in the second transmission floor, has a 4:1 transmission relation.

Main shaft equalizer system - set of springs

[0039] The equalizer system of the main shaft is the solution developed with the purpose of meeting the requirement of absence of conventional counterweights, which are commonly used in this type of application. The

fact that the counterweights are not used results in a reduction in the working space of the mechanism. This reduction has the main effect of mitigating the risk of material damage and damage to the physical integrity, thus resulting in a system that is conducive to the well-being of all the road passers-by and the workers in the area of railway signalling. The function of the main shaft equalizer system is to balance the moment of force in the main shaft. This mechanical system compensates the torque generated by the weight of the boom when it is in the horizontal position and balances the forces applied to the main shaft when the boom is moving. This instantaneous compensation of the moment of force in the main shaft results in a considerably stable movement of the boom.

[0040] This equalizer system consists in a set of cylindrical compression springs with a configurable distribution, whereby the number thereof can vary between the use of 0 and 14 springs, always in even numbers and distributed in a specific manner, so that the exertion of the springs is always distributed symmetrically and uniformly in the structure that surrounds them. By submitting each spring to an axial exertion in the direction of the mass of the component, a deformation is originated, which has an elastic constant of 18,9 N/mm, which allows creating a force in the main shaft that can vary between 0 kgf up to 2500 kgf to compensate all the exertion resulting from the weight of the boom, weight of the metallic skirt and by the illumination sources installed along the boom.

[0041] The movement responsible for the compression of the set of springs is initiated by the DC motor and is transmitted by the main shaft to the spring pack by means of a flexible intermediary connection, using a set of four transmission chains, which are bolted to the connecting braces, which are components that are directly welded to the main shaft. The connecting brace transmits the swaying movement of the main shaft to the chains by means of a dowel which operates as a mechanical joint pin. This swaying movement of the connecting brace cam is converted in the translation movement in height of the sliding plate, which is the component that compresses the springs when it is subjected to the exertion of the chains in the upwards direction. The movement of the sliding plate is made possible and conducted by two M20 rods, which operate with a translation joint and guarantee the lightness and uniformity of the movement.

[0042] The compression springs, in one of the proposed embodiments, present 410mm length, 73mm outer diameter and one compresses 1mm when 18,915 N are applied in the direction of the spring shaft.

[0043] The movement that originates the compression of the spring set is generated in the main shaft and transmitted to the spring set by means of a semi-flexible chain of mechanical elements (connecting brace welded to the shaft, chains, forks, connecting profile and M20 rods), particularly dimensioned and designed for this application. The resulting force of this compression maintains the flexible part in constant traction and allows balancing

the moment of force in the main shaft.

Manual drive system

[0044] To manually drive the system, it is necessary to attach the handle on the horizontal shaft of the manual drive and apply a rotation movement, whereby this movement is transmitted by a conical set with a 2:1 transmission ratio for the respective vertical shaft. The wheel (10215) is fixed to the main shaft of the drive which transmits the movement of the manual drive to a reel which is fixed to the auxiliary motor shaft. By transmitting the movement to the auxiliary shaft, we have the main transmission of the mechanism in operation. This transmission corresponds to a direct contact movement by a gear joint.

Position detection system of the boom

[0045] For the position detection of the boom, the movement of the main shaft is used to mechanically validate the position of the boom. The connecting braces are eccentric fixed components having a thickness that is capable of mechanically driving the microswitches. The movement that is made by these eccentric components is an alternating curvilinear shuttle movement. It is an upper contact, since the contact is made by means of a line that corresponds to the intersection of the microswitch rolling head and the outer perimeter of the connecting brace.

Automatic mechanism movement sequence

[0046] In the automatic driving of the mechanism, the movement is originated after receiving an electric command from the control system, this command initiates the succession of movements described sequentially:

I. The movement of the mechanism is produced by the DC motor (1028), which transmits the rotation movement to the auxiliary shaft of the motor (10284), by means of a flexible coupling (10282). Fixed to the auxiliary shaft of the motor (10284) is the worm screw (10282) and on the upper part of this shaft is the reel (10285) which makes the interconnection of the manual drive with the main transmission system. All these components (10282, 10283, 10284 and 10285) have their rotation speed and torque commanded by the motor;

II. After the movement is produced by the motor (1028), there is the first step of the mechanical transmission, by means of a reduction with a 40:1 ratio to the crown wheel (10216) installed in the shaft (10214). In order to enable the maximum admissible binary calibration in the system a binary limiter is installed (10217) and to continue the reduction in speed and the progressive increase of the available torque, the wheel is used (10215), part of the set of gears responsible for the second step of the me-

chanical power transmission;

III. After the second transmission step, the rotary movement remains available in the shaft (10212), where the wheel (10211) receives the movement of wheel f (10215) and by means of the shaft (10212) that transmits the rotary movement to the wheel (10213);

IV. The wheel (10213) transmits the rotation of the shaft (10212) to the main shaft (1020) which, due to the geometry of the gearwheel 5 (1021), will not have a rotation movement - since none of the points of the main shaft describe a circular trajectory around the rotation axis - in this case the movement of the main shaft (and consequently of the boom) must be characterized as being a swaying movement, since it is limited within a certain amplitude (approximately 0° - 90°, and not the usual 360° that characterizes the rotation movement). In the main shaft (1020) there are welded four connecting braces (10201) which are responsible for interconnecting the exertion of the boom on the main shaft to the equalizer system (104), comprised of the spring set (1025);

V. The main shaft (1020) is one of the components with most mechanical demand, since there is the combination of the last step of the reduction (where there is the highest binary of the transmission system), the exertion of the boom and the effect of the counterweight by the spring set. Due to the geometry of the connection braces (10201) there is a conversion of the swaying movement of the boom to the translation movement in height (YY' axis) by means of a mixed mechanical interconnection which includes a flexible intermediary chain connection (1024) and a rigid connection with M20 steel rods (10252). The interface between these two types of connection is made by two components: the fork connection profile (10253) and the reinforcement stainless steel plate (10242).

VI. The M20 rod (10252) together with the chains (1024) raises the sliding plate (10251), which presses the compression spring set (1025) when the boom (101) makes the downward movement (90° / vertical position ---> 0° / horizontal position). When the boom makes the upwards movement (0° / horizontal position ---> 90° / vertical position) the spring set (1025) must return to the L0 length (the length of the springs when they are not under the effect of any force).

Manual mechanism movement sequence

[0047] To manually drive the mechanism, it is necessary to follow the established procedure and carry out the gear manoeuvre, which comprises the following steps:

- Electrically turning off the mechanism (to avoid electric command during manual use by the user);
- Unblocking the passage of the handle for the manual

drive;

- Engaging the manual drive system to the main transmission system, so that it is possible to transmit the movement to the boom;

[0048] Subsequently to the gear manoeuvre, the handle is installed in the horizontal shaft of the manual drive, and by means of the application of a rotation in the horizontal shaft it is possible to operate the mechanism. In the manual drive of the mechanism, the movement is originated by the user (maintenance technician of the railway network). The engagement point is made by means of a direct transmission using cylindrical gears with straight teeth.

[0049] The rotation movement is transmitted from the reel (10285) to the auxiliary shaft of the motor (10284). The components (10282, 10283, 10284 and 10285) have a rotation speed and torque commanded by the user. From the worm screw (10283), the sequence of movements remains the same as that of the automatic drive.

[0050] The present description is not, naturally, in any way restricted to the embodiments presented in this document and a person skilled in the art can foresee many possibilities of altering the same without moving away from the scope of the claims. The preferred embodiments described above are obviously changeable among themselves. The following claims additionally define preferred embodiments.

Claims

1. Barrier mechanism (100) comprising

a mechanism (102); and
a boom (101), which is fixed at one of the extremities to the mechanism (102) by means of a fixation system;

wherein the mechanism (102) comprises

an equalizer system (104), comprising

a main shaft (1020) comprising a fifth wheel (1021) and a connection cam (10201),
a set of compression springs (1025),
a set of transmission chains (1024), mechanically interconnecting the set of compression springs (1025) to the main shaft (1020) through the connection cam (10201); and

a reduction set, comprising

a DC motor (1028) comprising a reel (10285),
a first shaft (10214) comprising a crown wheel (10216) and a second wheel (10215),

and

a second shaft (10212) comprising a third wheel (10211) and a fourth wheel (10213), wherein the motor (1028) provides connection to the first shaft (10214) by means of the mechanical connection between the reel (10285) and the crown wheel (10216), wherein the first shaft (10214) provides rotation to the second shaft (10212) by means of the mechanical connection between the second wheel (10215) and the third wheel (10211), and wherein the second shaft (10212) provides rotation to the main shaft (1020) by means of the mechanical connection between the fourth wheel (10213) and the fifth wheel (1021) of the equalizer system.

2. Barrier mechanism (100) according to claim 1, wherein the mechanism (102) comprises an automation that commands the ascension or lowering of the boom (101) by means of the action of the DC motor (1028) which transmits rotation to the main shaft (1020).

3. Barrier mechanism (100) according to claim 1, comprising additionally a metallic skirt (103).

4. Barrier mechanism (100) according to claim 1, wherein the boom (101) comprises the use of two or more profiles that are compatible with each other, being an inner profile (1012) and an outer profile (1011).

5. Barrier mechanism (100) according to claims 1 and 4, wherein the outer profile (1011) of the boom comprises the installation of light signals and/or a metallic skirt (103).

6. Barrier mechanism (100) according to claims 1, 4 and 5, wherein the inner profile (1012) of the boom enables the junction of two modules of the outer profile (1011) of the boom and the adjustment of the length of the boom (101) at the place of installation.

7. Barrier mechanism (100) according to claim 1, wherein the set of transmission chains (1024) comprises a set of four chains bolted on a connecting brace (10201) which is welded to the main shaft (1020).

8. Barrier mechanism (100) according to claim 1 and 7, wherein the connecting brace (10201) transmits the swaying movement of the main shaft (1020) to the set of transmission chains (1024) through a dowel which operates as a mechanical joint pin.

9. Barrier mechanism (100) according to claim 1,

wherein the main shaft (1020) comprises additionally a manual drive system comprised of a conical set with a 2:1 transmission ratio to the respective vertical shaft, wherein the referred system is activated by a handle (1022).

10. Barrier mechanism (100) according to claim 1, wherein the main shaft (1020) comprises additionally a position detection system (1026) of the boom (101) comprising eccentric components and microswitches, wherein the eccentric components drive the said microswitches throughout the rotation movement of the main shaft (1020).

11. Method for automatic operation of the barrier mechanism (100) according to any of the preceding claims, wherein the mechanism (102) after receiving an electric command from a control system, comprises the steps of:

- the DC motor (1028) transmits the rotation movement to an auxiliary shaft of the motor (10284), by means of a flexible coupling (10282), where, by means of a worm screw (10283) transmits rotation to the reel (10285) which in turn will activate the main transmission system;
- the transference of the rotation movement is made by means of a reduction with a 40:1 ratio to the crown wheel (10216) installed on the first shaft (10214), wherein a maximum torque of the system is controlled by means of a torque limiter (10217) and a reduction in speed and a progressive increase in torque are provided by the second wheel (10215);
- the rotation movement provided on the second shaft (10212), transmitted by the third wheel (10211) by means of the existing connection with the second wheel (10215), will in turn move the second shaft (10212) transmitting the rotation movement to the fourth wheel (10213);
- the fourth wheel (10213) transmits the rotation of second shaft (10212) to the main shaft (1020) by means of the connection existing with the gear fifth wheel (1021), which in turn, by means of the existing connection with the connecting braces (10201) which will provide the movement to the equalizer system (104) comprised of the set of compression springs (1025) which is driven by the flexible intermediary connection existing between the referred set of compression springs (1025) and the connecting braces (10201);
- the upwards or downwards movement of the set of transmission chains (1024) will cause the upward, or downward, movement of a mobile plate compression rod (10252) by means of an existing connection with a fork connection profile

(10253), causing the ascension or lowering, of a sliding plate (10251), which compresses or decompresses the set of compression springs (1025).

12. Method for manual operation of the barrier mechanism (100) according to claim 9, wherein the method comprising the steps of:

- Electrically turning off the mechanism (102);
- Unblocking the passage of the handle (1022) for manual drive;
- Engaging the manual drive system to the main transmission system, so that the engagement point is made by means of the direct transmission using cylindrical gearings with straight teeth;
- a rotation movement is transmitted from the reel (10285) to the auxiliary shaft of the motor (10284) from a worm screw (10283), whereby the sequence of movements henceforth is equal to that of the automatic drive.

25 Patentansprüche

1. Schranken Antrieb (100), bestehend aus

einer Antriebseinheit (102) und einem Schrankenbaum (101), der an einem Ende an der Antriebseinheit (102) mittels eines Befestigungssystems befestigt ist; worin die Antriebseinheit (102) Folgendes umfasst ein Ausgleichssystem (104), bestehend aus einer Hauptwelle (1020) mit einem Verbindungsnocken (10201), einem Satz von Druckfedern (1025), einem Satz Getriebeketten (1024), der den Satz von Druckfedern (1025) über den Verbindungsnocken (10201) mechanisch mit der Hauptwelle (1020) verbindet; und einem Reduziergetriebe, bestehend aus einem Gleichstrommotor (1028) mit einem Rad (10285), einer ersten Welle (10214), bestehend aus einem Schneckenrad (10216) und einem zweiten Zahnrad (10215), und einer zweiten Welle (10212), bestehend aus einem dritten Zahnrad (10211) und einem vierten Zahnrad (10213), worin der Motor (1028) eine Verbindung mit der ersten Welle (10214) mittels der mechanischen Verbindung zwischen der Rolle (10285) und dem Schneckenrad (10216) bereitstellt, worin die erste Welle (10214) die Drehung der zweiten Welle (10212) mittels der mechanischen Verbindung zwischen dem zweiten Zahn-

- ad (10215) und dem dritten Zahnrad (10211) bewirkt, und
 worin die zweite Welle (10212) die Drehung der Hauptwelle (1020) mittels der mechanischen Verbindung zwischen dem vierten Zahnrad (10213) und dem fünften Zahnrad (1021) des Ausgleichsystems bewirkt.
2. Schrankentrieb (100) gemäß Anspruch 1, worin die Antriebseinheit (102) einen Automaten beinhaltet, der das Anheben oder Absenken des Schrankenbaums (101) mittels der Betätigung des Gleichstrommotors (1028) steuert, der die Drehung auf die Hauptwelle (1020) überträgt.
3. Schrankentrieb (100) gemäß Anspruch 1, der zusätzlich eine metallische Schürze (103) umfasst.
4. Schrankentrieb (100) gemäß Anspruch 1, worin der Schrankenbaum (101) die Verwendung von zwei oder mehr miteinander kompatiblen Profilen umfasst, die aus einem Innenprofil (1012) und einem Außenprofil (1011) bestehen.
5. Schrankentrieb (100) gemäß Anspruch 1 und Anspruch 4, worin das äußere Profil (1011) des Schrankenbaums die Installation von Lichtsignalen und/oder einer metallischen Schürze (103) ermöglicht.
6. Schrankentrieb (100) gemäß den Ansprüchen 1, 4 und 5, worin das Innenprofil (1012) des Schrankenbaums die Verbindung von zwei Modulen des Außenprofils (1011) des Schrankenbaums und die Einstellung der Länge des Schrankenbaums (101) am Einbauort ermöglicht.
7. Schrankentrieb (100) gemäß Anspruch 1, worin der Satz von Getriebeketten (1024) einen Satz von vier Ketten umfasst, die an einer Verbindungsflasche (10201) angeschraubt sind, die mit der Hauptwelle (1020) verschweißt ist.
8. Schrankentrieb (100) gemäß Anspruch 1 und 7, worin die Verbindungsflasche (10201) die Pendelbewegung der Hauptwelle (1020) auf den Satz von Getriebeketten (1024) über einen Dübel überträgt, der als mechanischer Gelenkbolzen funktioniert.
9. Schrankentrieb (100) gemäß Anspruch 1, worin die Hauptwelle (1020) zusätzlich ein manuelles Antriebssystem umfasst, das aus einem Kegelsatz mit einem 2:1 Übersetzungsverhältnis zur entsprechenden vertikalen Welle besteht, worin das genannte System durch eine Kurbel (1022) angetrieben wird.
10. Schrankentrieb (100) gemäß Anspruch 1, worin die Hauptwelle (1020) zusätzlich ein Positionserfassungssystem (1026) des Schrankenbaums (101) umfasst, das exzentrische Komponenten und Mikroschalter enthält, worin die exzentrischen Komponenten die genannten Mikroschalter während der Drehbewegung der Hauptwelle (1020) betätigen.
11. Verfahren zum automatischen Betrieb des Schrankentriebs (100) gemäß einem der vorhergehenden Ansprüche, worin die Antriebseinheit (102) nach Empfang eines elektrischen Befehls von einem Steuersystem die folgenden Schritte ausführt:
- Der Gleichstrommotor (1028) überträgt die Drehbewegung über eine flexible Kupplung (10282) auf eine Hilfwelle des Motors (10284), wobei mittels einer Schnecke (10283) die Drehung auf das Rad (10285) übertragen wird, das wiederum das Hauptübertragungssystem aktiviert;
 - die Übertragung der Drehbewegung erfolgt durch eine Untersetzung mit einem Verhältnis von 40:1 auf das Schneckenrad (10216), das auf der ersten Welle (10214) montiert ist, wobei ein maximales Drehmoment des Systems mittels eines Drehmomentbegrenzers (10217) gesteuert und eine Verringerung der Drehzahl sowie eine progressive Erhöhung des Drehmoments durch das zweite Zahnrad (10215) vorgenommen wird.
 - die auf der zweiten Welle (10212) vorgesehene Drehbewegung, die vom dritten Zahnrad (10211) mittels der bestehenden Verbindung mit dem zweiten Zahnrad (10215) übertragen wird, bewegt wiederum die zweite Welle (10212), welche die Drehbewegung auf das vierte Zahnrad (10213) überträgt;
 - das vierte Zahnrad (10213) überträgt die Drehung der zweiten Welle (10212) auf die Hauptwelle (1020) durch die bestehende Verbindung mit dem fünften Zahnrad (1021), die wiederum mittels der vorhandenen Verbindung mit den Verbindungsnocken (10201) die Bewegung des Ausgleichsystems (104), bestehend aus dem Satz Druckfedern (1025), ermöglicht, das durch die flexible Zwischenverbindung zwischen dem genannten Satz Druckfedern (1025) und den Verbindungsnocken angetrieben wird (10201);
 - die Aufwärts- oder Abwärtsbewegung des Getriebekettensatzes (1024) bewirkt die Aufwärts- oder Abwärtsbewegung einer beweglichen Platten-Druckstange (10252) mittels einer vorhandenen Verbindung mit einem gabelförmigen Verbindungsprofil (10253), wodurch das Heben oder Senken einer Gleitplatte (10251) verursacht wird, die den Satz von Druckfedern (1025) komprimiert oder dekomprimiert.

12. Verfahren zur manuellen Betätigung des Schranken-antriebs (100) gemäß Anspruch 9, worin das Ver-fahren die folgenden Schritte umfasst:

- Elektrische Abschaltung der Antriebseinheit (102);
- Freigabe der Passage der Kurbel (1022) für den manuellen Antrieb;
- Eingreifen des manuellen Antriebssystems in das Hauptgetriebssystem, so dass der Eingriffspunkt mittels der Direktübertragung unter Ver-wendung einer Stirnradverzahnung mit geraden Zähnen erfolgt;
- Eine Drehbewegung wird vom Rad (10285) auf die Hilfswelle des Motors (10284) von einer Schnecke (10283) übertragen, wobei der Bewe-gungsablauf fortan derselbe wie der des auto-matischen Antriebs ist.

Revendications

1. Mécanisme de barrière (100) comprenant

un mécanisme (102) ; et
 une lisse (101), qui est fixée à l'une des extré-mités au mécanisme (102) au moyen d'un sys-tème de fixation ;
 dans lequel le mécanisme (102) comprend un système d'égalisation (104), comprenant un arbre principal (1020) comprenant une came de connexion (10201),
 un ensemble de ressorts de compression (1025),
 un ensemble de chaînes de transmission (1024), reliant mécaniquement l'ensemble de ressorts de compression (1025) à l'arbre princi-pal (1020) par l'intermédiaire de la came de con-exion (10201) ; et
 un ensemble de réduction, comprenant un moteur à courant continu (1028) comprenant une bobine (10285),
 un premier arbre (10214) comprenant une cou-ronne dentée (10216) et une deuxième roue (10215), et
 un deuxième arbre (10212) comprenant une troisième roue (10211) et une quatrième roue (10213),
 dans lequel le moteur (1028) assure la con-exion avec le premier arbre (10214) au moyen de la connexion mécanique entre la bobine (10285) et la couronne dentée (10216),
 dans lequel le premier arbre (10214) assure la rotation du deuxième arbre (10212) au moyen de la connexion mécanique entre la deuxième roue (10215) et la troisième roue (10211), et
 dans lequel le deuxième arbre (10212) assure la rotation de l'arbre principal (1020) au moyen

de la connexion mécanique entre la quatrième roue (10213) et la cinquième roue (1021) du sys-tème d'égalisation.

2. Mécanisme de barrière (100) selon la revendication 1, dans lequel le mécanisme (102) comprend un automate qui commande l'ascension ou l'abaisse-ment de la lisse (101) au moyen de l'action du moteur à courant continu (1028) qui transmet la rotation à l'arbre principal (1020).
3. Mécanisme de barrière (100) selon la revendication 1, comprenant en outre une jupe métallique (103).
4. Mécanisme de barrière (100) selon la revendication 1, dans lequel la lisse (101) comprend l'utilisation de deux profils ou plus qui sont compatibles entre eux, s'agissant d'un profil interne (1012) et d'un profil ex-terne (1011).
5. Mécanisme de barrière (100) selon les revendica-tions 1 et 4, dans lequel le profil externe (1011) de la lisse comprend l'installation de signaux lumineux et/ou d'une jupe métallique (103).
6. Mécanisme de barrière (100) selon les revendica-tions 1, 4 et 5, dans lequel le profil interne (1012) de la lisse permet la jonction de deux modules du profil externe (1011) de la lisse et le réglage de la longueur de la lisse (101) sur le lieu d'installation.
7. Mécanisme de barrière (100) selon la revendication 1, dans lequel l'ensemble de chaînes de transmis-sion (1024) comprend un ensemble de quatre chaî-nes boulonnées sur une entretoise de connexion (10201) qui est soudée à l'arbre principal (1020).
8. Mécanisme de barrière (100) selon les revendica-tions 1 et 7, dans lequel l'entretoise de connexion (10201) transmet le mouvement de balancement de l'arbre principal (1020) à l'ensemble de chaînes de transmission (1024) par l'intermédiaire d'un goujon qui fonctionne comme un boulon d'articulation mé-canique.
9. Mécanisme de barrière (100) selon la revendication 1, dans lequel l'arbre principal (1020) comprend en outre un système d'entraînement manuel constitué d'un ensemble conique avec un rapport de transmis-sion de 2:1 avec l'arbre vertical respectif, dans lequel le système en question est activé par une poignée (1022).
10. Mécanisme de barrière (100) selon la revendication 1, dans lequel l'arbre principal (1020) comprend en outre un système de détection de position (1026) de la lisse (101) comprenant des composants excentri-ques et des microrupteurs, dans lequel les compo-

sants excentriques entraînent lesdits microrupteurs tout au long du mouvement de rotation de l'arbre principal (1020).

11. Procédé de fonctionnement automatique du mécanisme de barrière (100) selon l'une quelconque des revendications précédentes, dans lequel le mécanisme (102), après la réception d'une commande électrique provenant d'un système de commande, comprend les étapes suivantes :

- le moteur à courant continu (1028) transmet le mouvement de rotation à un arbre auxiliaire du moteur (10284), au moyen d'un accouplement flexible (10282), où, au moyen d'une vis sans fin (10283), il transmet la rotation à la bobine (10285) qui, à son tour, activera le système de transmission principal ;

- le transfert du mouvement de rotation est effectué au moyen d'une réduction avec un rapport 40:1 à la couronne dentée (10216) installée sur le premier arbre (10214), dans lequel un couple maximum du système est contrôlé au moyen d'un limiteur de couple (10217) et une réduction de la vitesse et une augmentation progressive du couple sont fournies par la deuxième roue (10215) ;

- le mouvement de rotation fourni sur le deuxième arbre (10212), transmis par la troisième roue (10211) au moyen de la connexion existante avec la deuxième roue (10215), déplacera à son tour le deuxième arbre (10212) transmettant le mouvement de rotation à la quatrième roue (10213) ;

- la quatrième roue (10213) transmet la rotation du deuxième arbre (10212) à l'arbre principal (1020) au moyen de la connexion existant avec la cinquième roue d'engrenage (1021), qui à son tour, au moyen de la connexion existant avec les entretoises de connexion (10201), fournira le mouvement au système d'égalisation (104) constitué de l'ensemble de ressorts de compression (1025) qui est entraîné par la connexion intermédiaire flexible existant entre l'ensemble de ressorts de compression en question (1025) et les entretoises de connexion (10201) ;

- le mouvement vers le haut ou vers le bas de l'ensemble de chaînes de transmission (1024) provoquera le mouvement vers le haut ou vers le bas d'une tige de compression de plaque mobile (10252) au moyen d'une connexion existante avec un profil de connexion de fourche (10253), provoquant l'ascension ou l'abaissement d'une plaque coulissante (10251), qui comprime ou décompresse l'ensemble de ressorts de compression (1025).

12. Procédé de fonctionnement manuel du mécanisme

de barrière (100) selon la revendication 9, dans lequel le procédé comprend les étapes suivantes :

- l'extinction électrique du mécanisme (102) ;

- le déblocage du passage de la poignée (1022) pour un entraînement manuel ;

- l'engagement du système d'entraînement manuel avec le système de transmission principal, de sorte que le point d'engagement soit réalisé au moyen de la transmission directe utilisant des engrenages cylindriques à dents droites ;

- un mouvement de rotation est transmis de la bobine (10285) à l'arbre auxiliaire du moteur (10284) à partir d'une vis sans fin (10283), moyennant quoi la séquence de mouvements est désormais égale à celle de l'entraînement automatique.

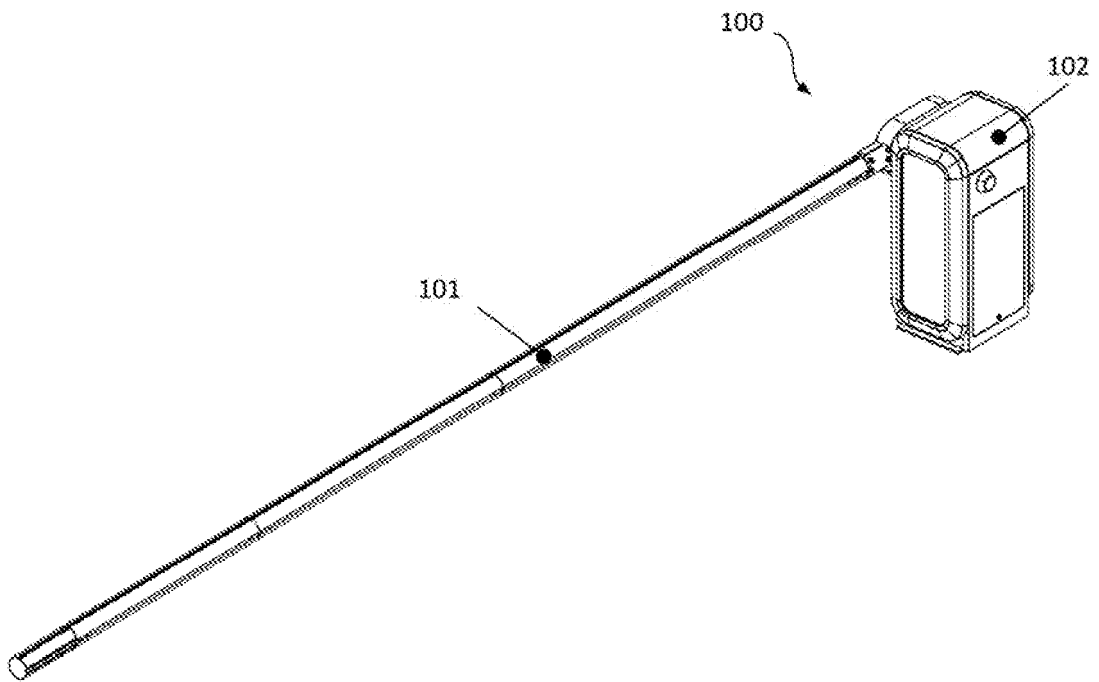


Fig. 1

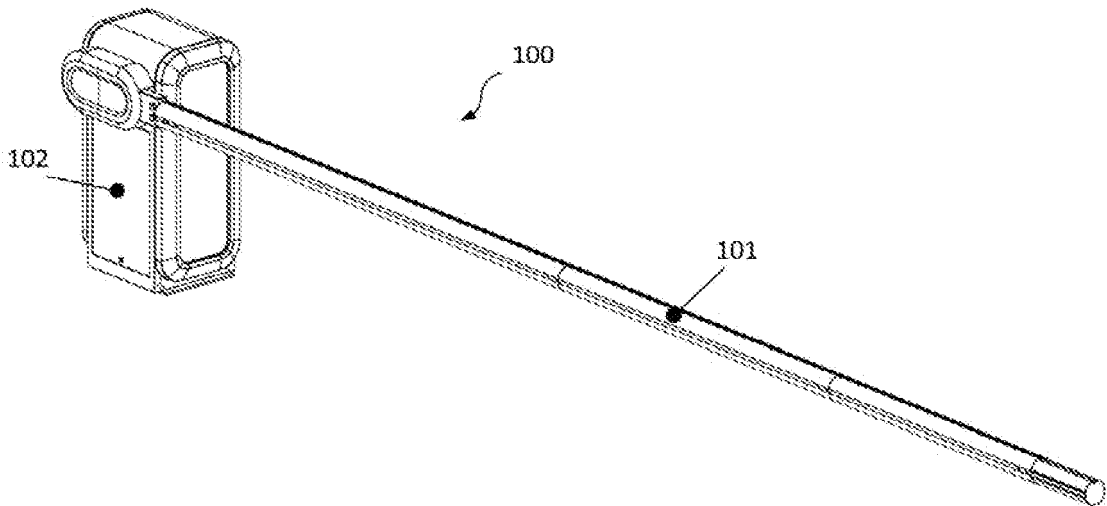


Fig. 2

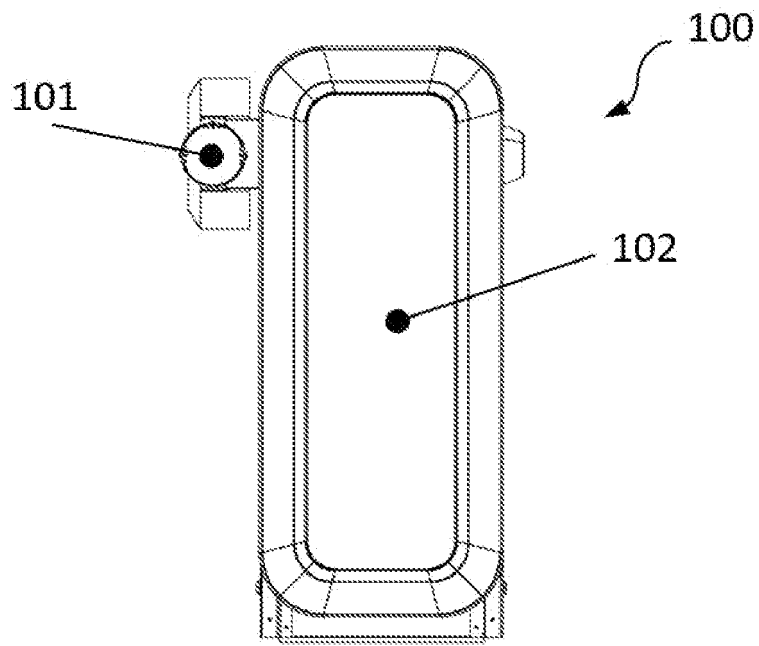


Fig. 3

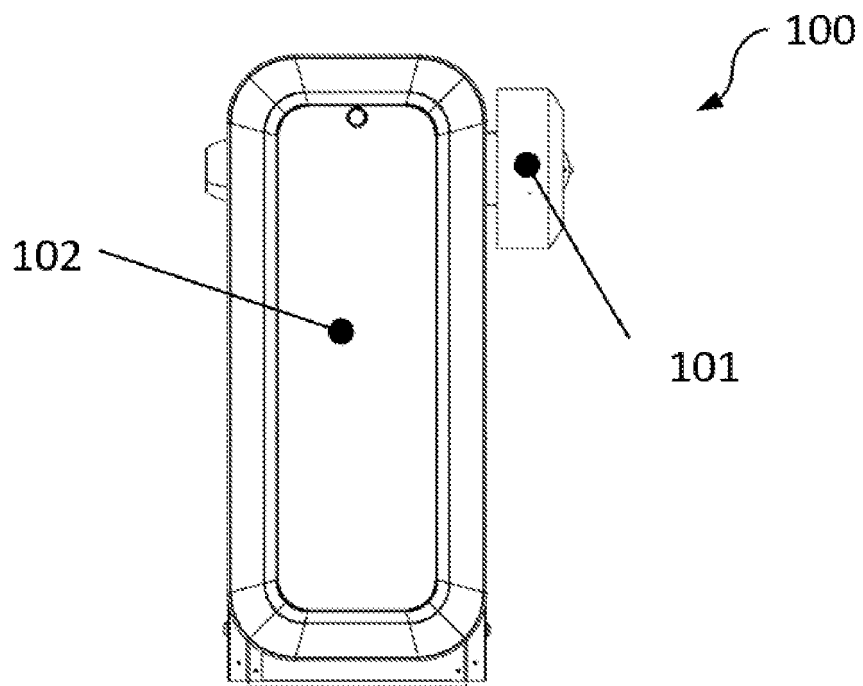


Fig. 4

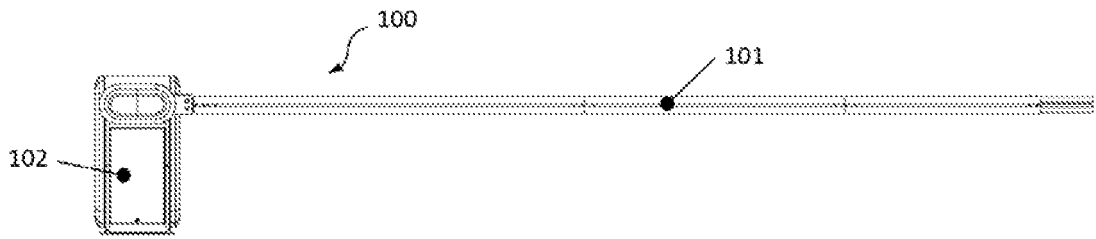


Fig. 5

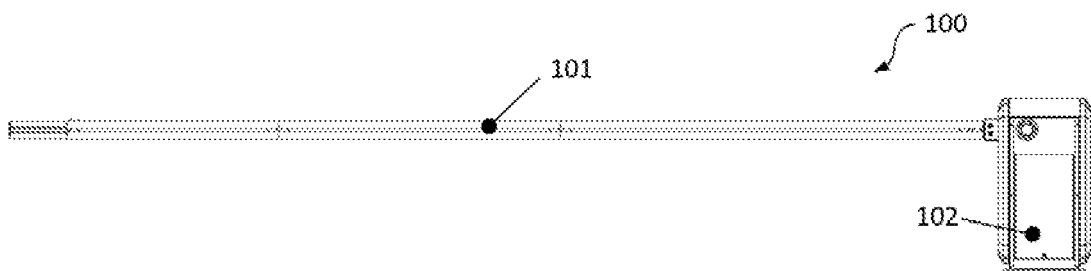


Fig. 6

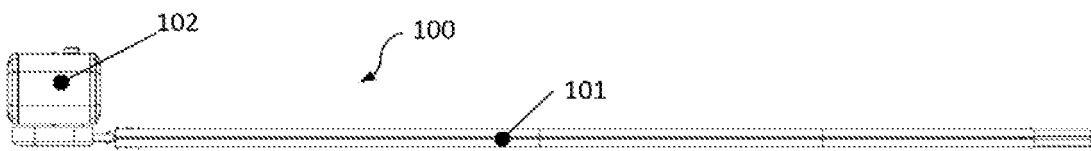


Fig. 7

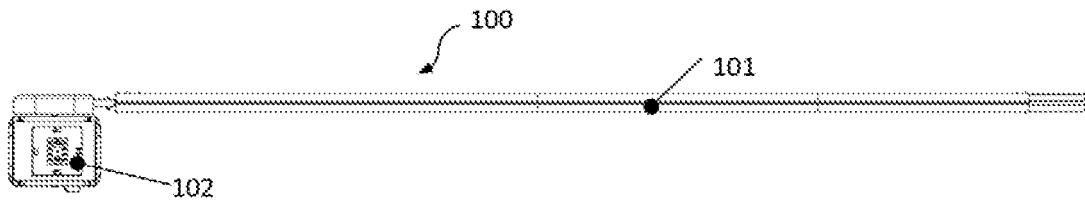


Fig. 8

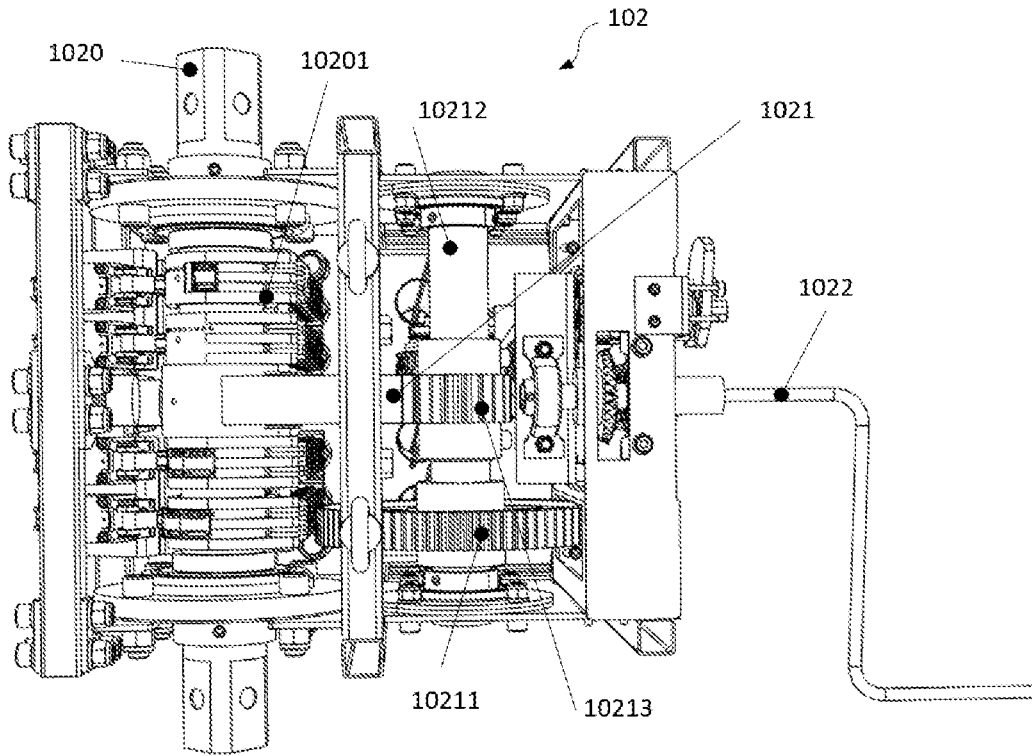


Fig. 9

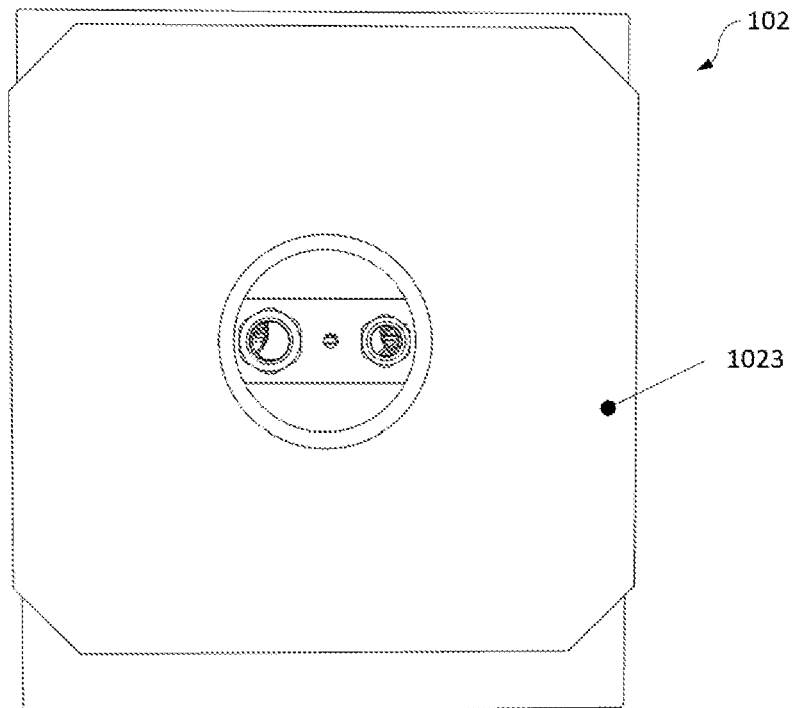


Fig. 10

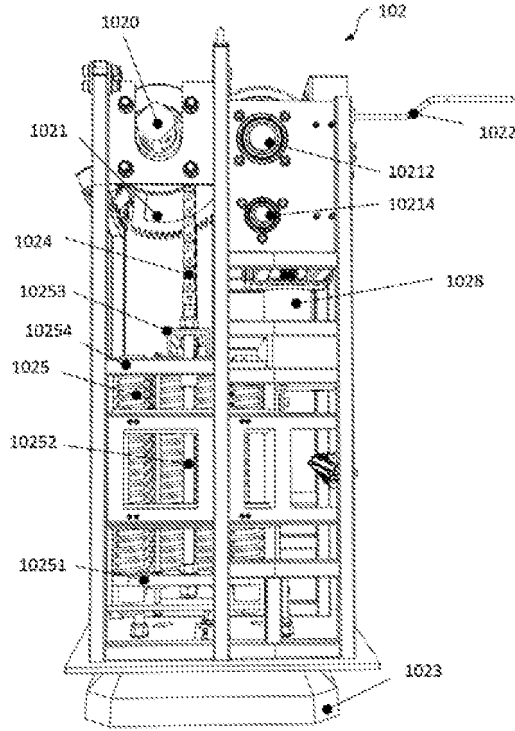


Fig. 11

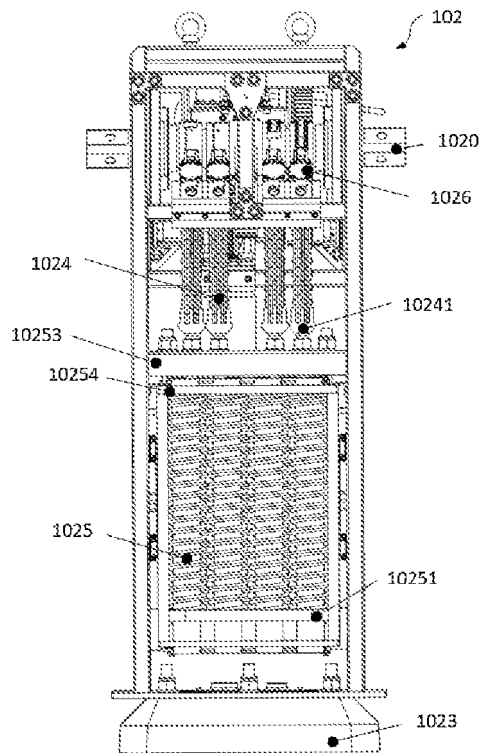


Fig. 12

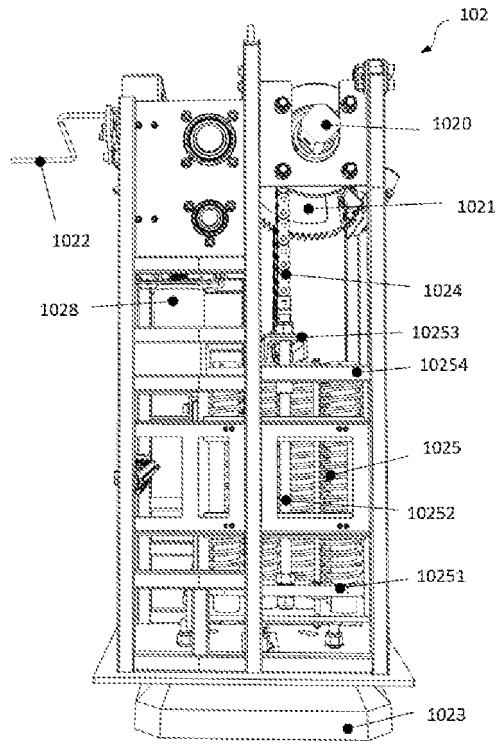


Fig. 13

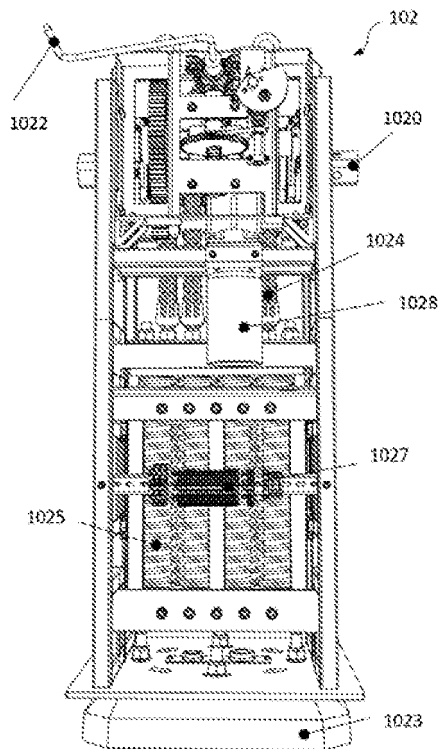


Fig. 14

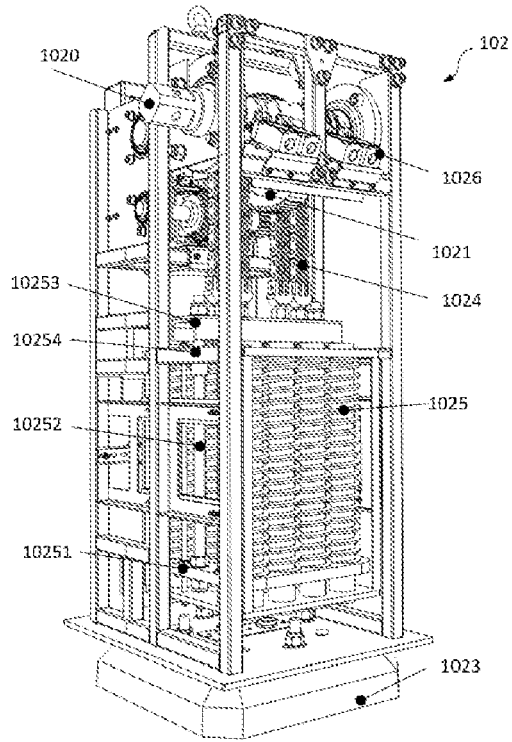


Fig. 15

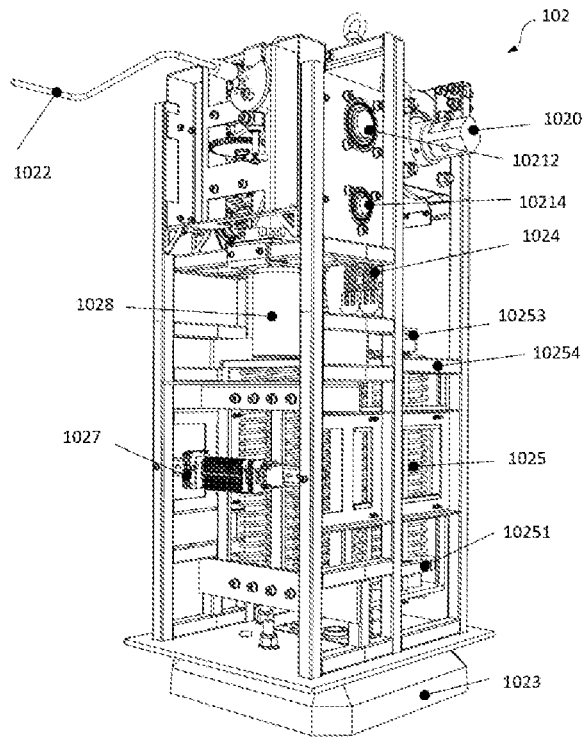


Fig. 16

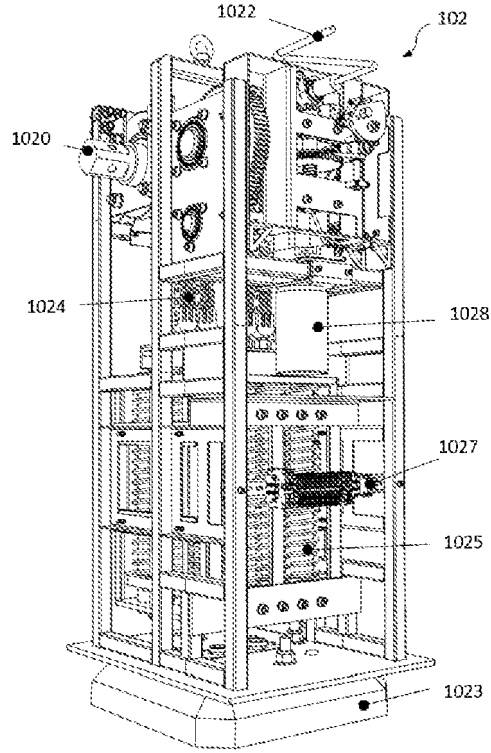


Fig. 17

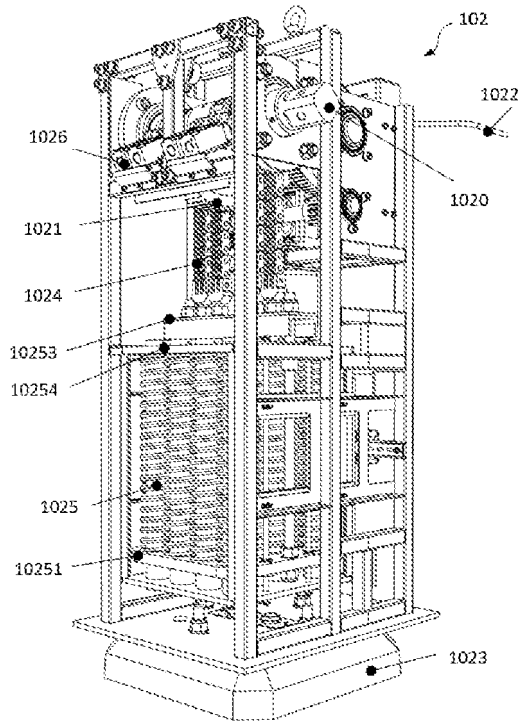


Fig. 18

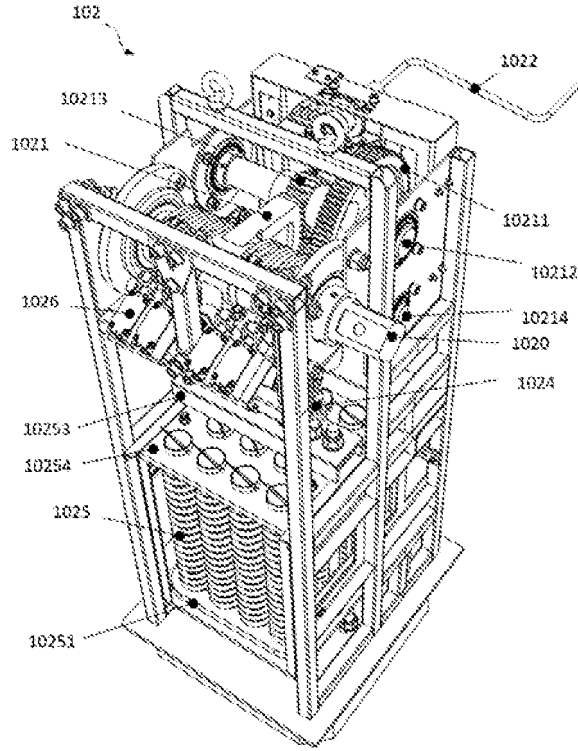


Fig. 19

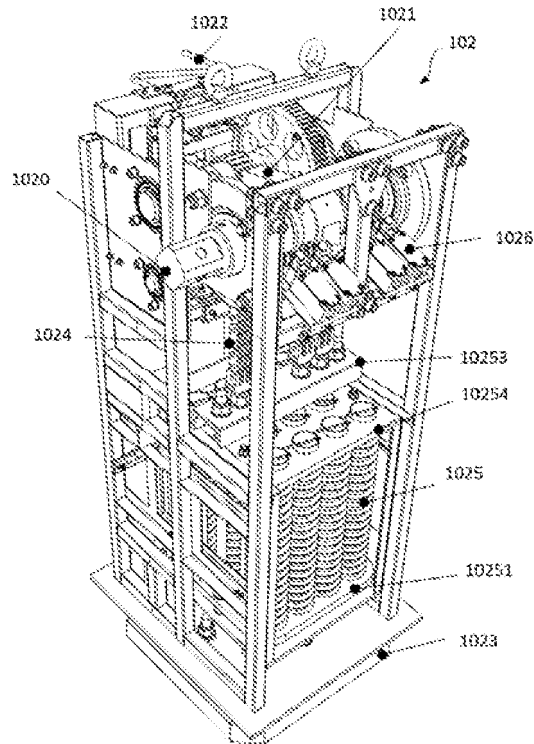


Fig. 20

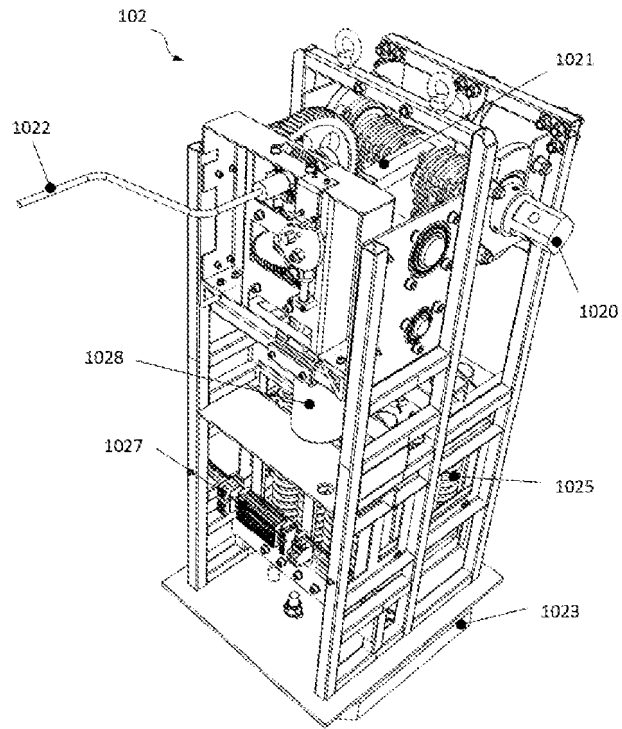


Fig. 21

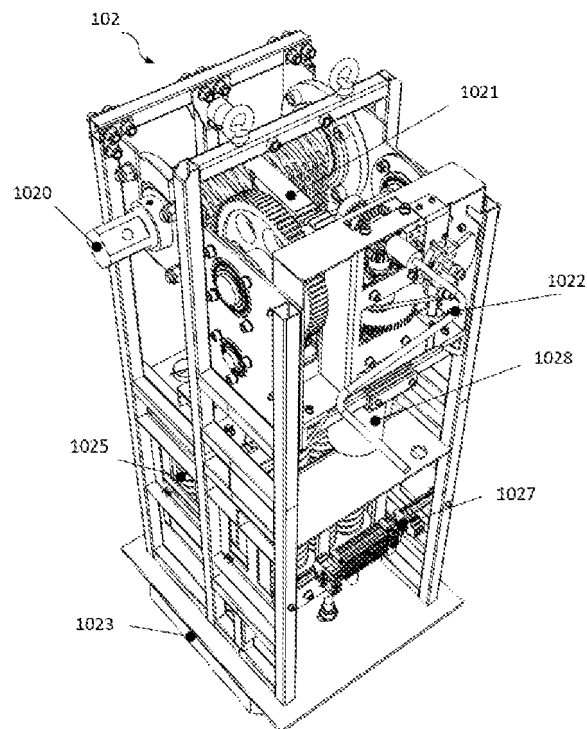


Fig. 22

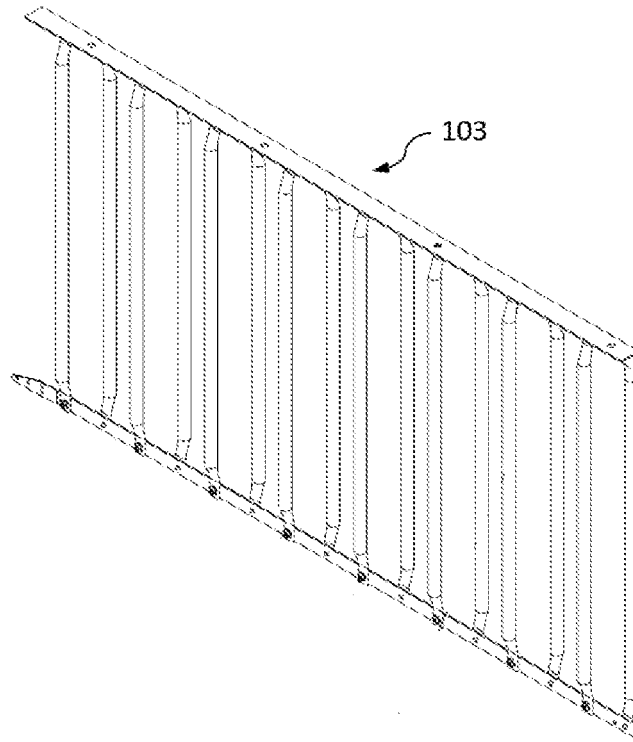


Fig. 23

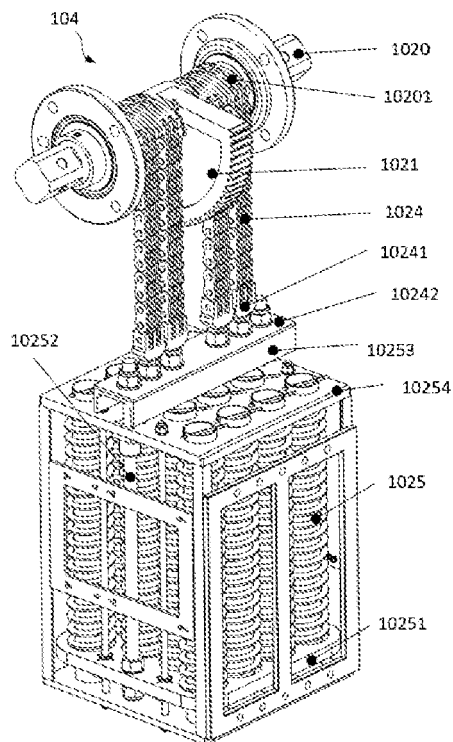


Fig. 24

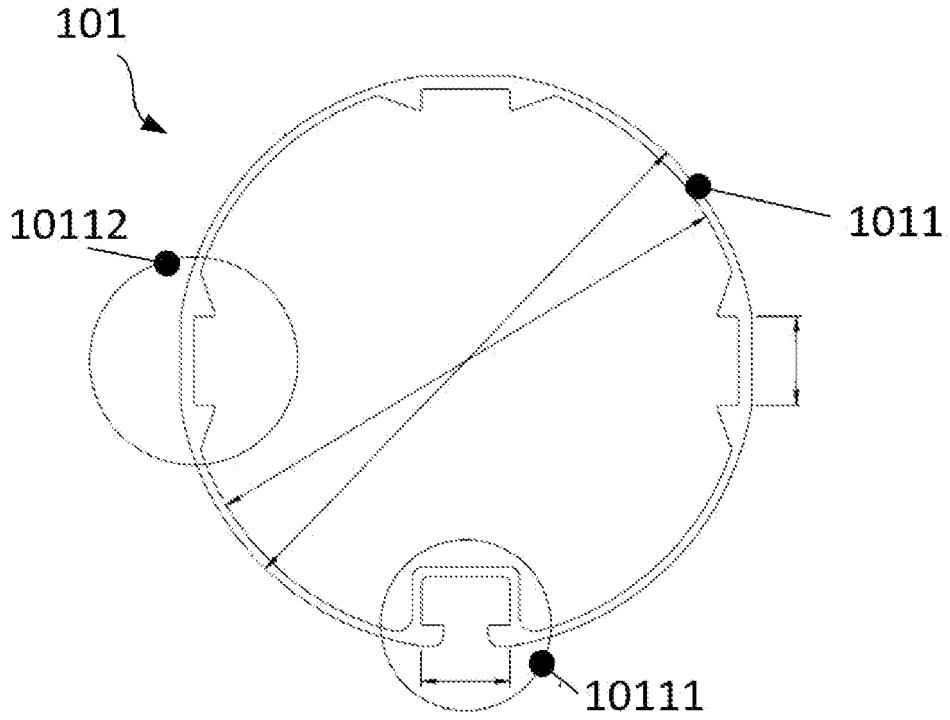


Fig. 25

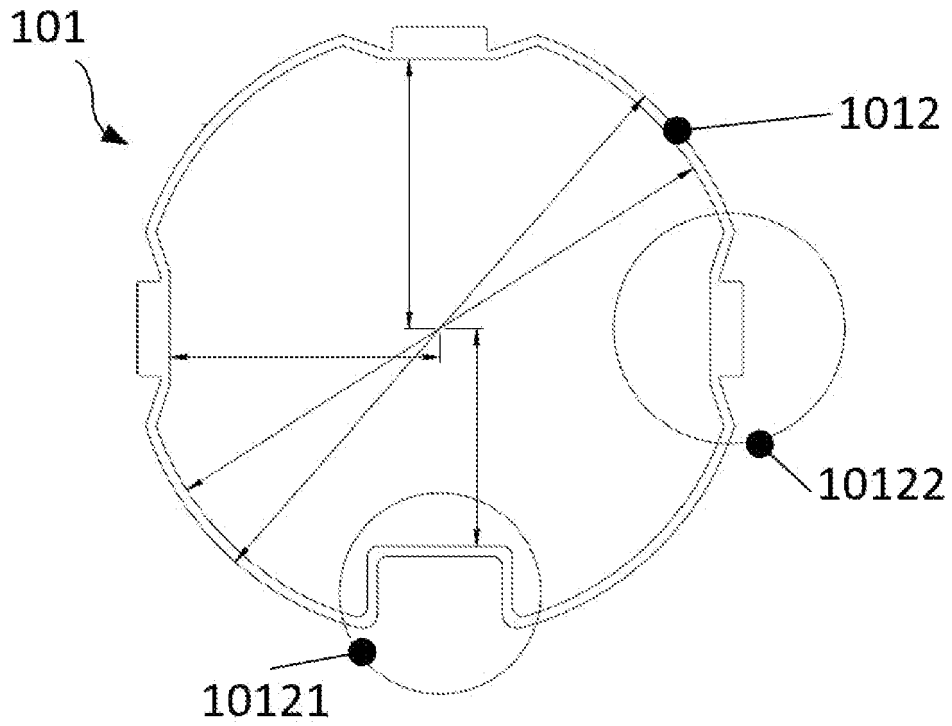


Fig. 26

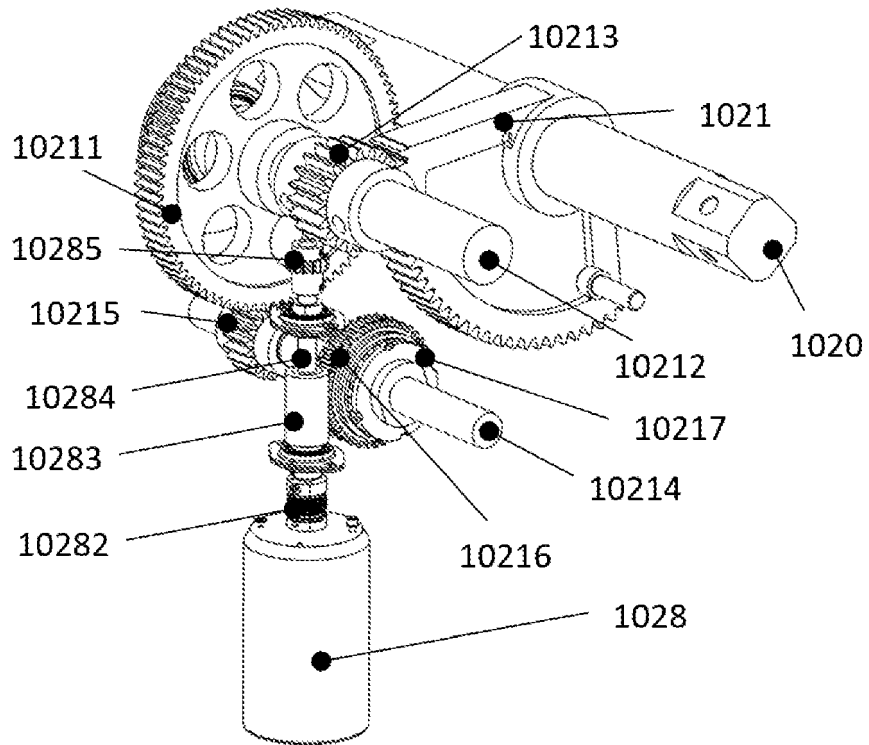


Fig. 27

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 204059230 U [0004]