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(54) **SAFETY GEAR LIFTING DEVICE, ELEVATOR CAR AND METHOD FOR USING SAME**

(57) Disclosed are a safety gear lifting device, an elevator car and a method for using the same. The safety gear lifting device comprises a linkage rod, an elastic reset member, a supporting frame and a lifting mechanism, wherein the lifting mechanism is movably mounted on the supporting frame; a first attraction member is mounted on the linkage rod, and a second attraction member is mounted on the lifting mechanism; an end, close to the lifting mechanism, of the linkage rod is an attraction end, the other end of the linkage rod is a lifting end, the first attraction member is mounted at the attraction end, the lifting end penetrates through the supporting frame, the second attraction member on the lifting mechanism is located between the attraction end and the lifting end, and the first attraction member matches the second attraction member; and one end of the elastic reset member acts on the supporting frame, and the other end of the elastic reset member acts on the linkage rod. The safety gear lifting device achieves electromechanical hybrid driving of a safety gear.

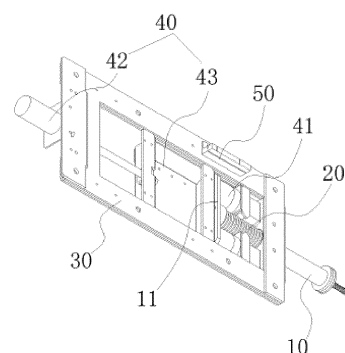


FIG. 1

Description

[0001] The application claims priority for Chinese Patent Application No.202010723929.2, filed on July 24, 2020, and Chinese Patent Application No.202021497431.0, filed on July 24, 2020, which is incorporated herein by reference in its entirety.

Technical Field

[0002] The embodiments of the disclosure belong to the field of elevators, and particularly relate to a safety gear lifting device, an elevator car and a method for using the same.

Description of Related Art

[0003] With the constant acceleration of urbanization in China, more and more high-rise buildings are equipped with elevators, so the safety of the elevators is closely associated with people's life. Traditional mechanical safety gears of elevators are mechanically driven by mechanical governors from the top of the elevator shaft. However, these traditional safety gears are complex in structure, and are driven through a traction wire, which makes the system complicated and installation and maintenance inconvenient.

[0004] Electrical safety gears of elevators come into being gradually, and part of these electrical safety gears are electrically driven to work. However, the electrical safety is difficult to check, and the quality of a power supply and the breakage of wires have a direct influence on safety action of the safety gears. In addition, the safety gears should be able to act at any time (even during a power failure) and should be able to realize safety braking in any states to guarantee the safety of elevators.

[0005] In addition, there is a strict requirement for the safety distance between the bottom of the safety gear and the bottom of the elevator shaft, so it is not suitable to set too many driving mechanisms below the safety gear.

Brief Summary of the Invention

[0006] The objective of the embodiments of the disclosure is to overcome the defects of the prior art by providing a safety gear lifting device, an elevator car and a method for using the same, which can drive a safety gear reliably.

[0007] The technical solution of the disclosure is as follows:

A safety gear lifting device comprises a linkage rod, an elastic reset member, a supporting frame and a lifting mechanism, wherein the lifting mechanism is movably mounted on the supporting frame; a first attraction member is mounted on the linkage rod, and a second attraction member is mounted on the lifting mechanism; an end, close to the lifting mechanism, of the linkage rod is an

attraction end, the first attraction member is mounted at the attraction end, the other end of the linkage rod is a lifting end, the lifting end penetrates through the supporting frame, the second attraction member on the lifting mechanism is located between the attraction end and the lifting end, and the first attraction member matches the second attraction member; the elastic reset member has an end acting on the supporting frame and an end acting on the linkage rod.

[0008] The lifting mechanism comprises a power source and a lifting member, the power source drives the lifting member, and the second attraction member is mounted on the lifting member.

[0009] When the elastic reset member is compressed to accumulate energy, the attraction end of the linkage rod is located at a first position; when the elastic reset member releases energy to at least partially restore, the attraction end of the linkage rod is located at a second position; the lifting member always avoids the second position during the moving process.

[0010] The lifting member comprises a first connecting end and a second connecting end, the first connecting end is connected to the power source, and the second connecting end is connected to the second attraction member; the first connecting end and the second connecting end are always located on two sides of the second position during the moving process.

[0011] The first connecting end and the second connecting end are edgewise connected through a plate or a rod, a receding groove is formed in the middle of the second connecting end, and the linkage rod penetrates through the receding groove.

[0012] Sides between the first connecting end and the second connecting end are sealed through plates, the first connecting end and the second connecting end are connected through at least one plate, and at least one side is open.

[0013] A connecting plate is disposed at the attraction end, and the first attraction member is mounted on the connecting plate; the second connecting end is provided with second attraction members located on two sides of the receding groove; the elastic reset member is a spring, and the spring is disposed around the linkage rod, and has an end acting on the supporting frame and an end acting on the attraction end of the linkage rod.

[0014] Slots are formed in two sides, close to the lifting member, of the supporting frame, and the lifting member slides along the slots.

[0015] The power source comprises a driving motor, a screw rod and a mating block, the driving motor is fixedly mounted on the supporting frame, an output shaft of the driving motor drives the screw rod to rotate, the mating block is mounted at the first connecting end, and the screw rod matches the mating block and drives the first connecting end to reciprocate.

[0016] The power source is an air cylinder or a hydraulic cylinder, and a piston rod of the air cylinder or the hydraulic cylinder acts on the first connecting end.

[0017] The first attraction member and the second attraction member are electromagnets or magnetic attraction members, and at least one of the first attraction member and the second attraction member is an electromagnet.

[0018] A cushion is disposed at the bottom of the supporting frame, and the lifting member abuts against the cushion when moving to a lowest position.

[0019] A stop ring is disposed at the lifting end of the linkage rod, and when the attraction end moves to the second position, the stop ring is clamped with the supporting frame.

[0020] The safety gear lifting device further comprises a position detector, wherein the position detector is mounted on the supporting frame and is used for detecting a position of the linkage rod.

[0021] An elevator car comprises a car body, a safety gear, and the safety gear lifting device, wherein the safety gear is mounted on an outer side of the car body, the safety gear lifting device is mounted on the outer side of the car body and is located above the safety gear, and the lifting end of the linkage rod acts on the safety gear.

[0022] A method for using an elevator car comprises the following steps: when it is recognized that the car body works, enabling the attraction end of the linkage rod to match the lifting mechanism through the magnetic attraction member and the electromagnet, and enabling the linkage rod to move downwards to a lowest position to make the elastic reset member in an energy accumulation state and the safety gear in a released state; and when it is recognized that the car body works abnormally, relieving the matching between the attraction end of the linkage rod and the lifting mechanism through the magnetic attraction member and the electromagnet to make the elastic reset member release energy and passively lift the linkage rod to clamp the safety gear, such that the car body stops moving.

[0023] The principle and advantages of this technical solution are as follows:

During installation, the safety gear lifting device is mounted above a safety gear, at this moment, the linkage rod protrudes out of the supporting frame towards the safety gear, and then the lifting end is connected to a lifting rod of the safety gear to drive the safety gear; and when the linkage rod moves downwards to the lowest position, the safety gear is in a released state, and an elevator can run normally; when the linkage rod moves upwards, the safety gear is driven by the linkage rod to be clamped, at this moment, the elevator cannot run, and safety locking of the elevator is completed. Here, the first attraction member matches the second attraction member, so the linkage rod will be driven to move when the lifting mechanism moves; in order to ensure that the safety gear is in the released state, the lifting mechanism is made to move downwards, the linkage rod is driven by the lifting mechanism to move downwards synchronously until the lifting end reaches the lowest position, and the lifting end is always located at the lowest position when the elevator

works normally. Once the elevator moves abnormally, for example, the elevator descends too fast, the working power supply of the safety gear lifting device will be cut off, the first attraction member will no longer match the second attraction member, the elastic reset member is released and quickly restores to drive the linkage rod to move upwards, and the safety gear is driven by the lifting end of the linkage rod to be clamped, such that the elevator is locked. Only the safety gear lifting device is used to control the safety gear, such that the structure is compact, and installation and debugging are convenient.

[0024] In addition, a motion space which does not completely intervene with a middle link rod and the elastic reset member is formed by the first connecting end and the second connecting end of the lifting member, the plate and the receding groove in the middle, such that the link rod and its elastic reset member can realize emergency braking at any time no matter which state the lifting mechanism is in, thus ensuring the motion safety of the safety gear.

[0025] Moreover, when the working power supply is cut off, the safety gear is safely driven by the elastic reset member, that is, the safety gear can act safely by means of internal energy rather than external energy, which meets safety requirements.

[0026] Furthermore, in the embodiment of the disclosure, the lifting mechanism is located above the safety gear, which is beneficial to the arrangement of the safety gear in the lower space of an elevator system, and the distance between the safety gear and the pit of an elevator shaft is effectively decreased.

Brief Description of the Several Views of Drawings

[0027] The drawings here illustrate specific examples of the technical solutions of the embodiments of the disclosure, constitute one part of the specification together with specific embodiments, and are used to explain the technical solutions, principles and effects of the embodiments of the disclosure.

[0028] Unless otherwise specifically stated or defined, identical reference signs in different drawings represent identical or similar technical features, and identical or similar technical features may be represented by different reference signs.

FIG. 1 is a three-dimensional structural view of one embodiment of the disclosure when a first attraction member matches a second attraction member;

FIG. 2 is a plan view of FIG. 1 of the embodiment of the disclosure;

FIG. 3 is a three-dimensional structural view of the embodiment of the disclosure when the first attraction member does not match the second attraction member;

FIG. 4 is a plan view of FIG. 3 of the embodiment of the disclosure;

FIG. 5 is a three-dimensional structural view of the

embodiment of the disclosure when a lifting member moves upwards;

FIG. 6 is a three-dimensional structural view of the embodiment of the disclosure after the lifting member moves upwards;

FIG. 7 is a three-dimensional structural view of the embodiment of the disclosure when the lifting member drives an attraction end to move downwards;

FIG. 8 is an enlarged view of part A in FIG. 7 of the embodiment of the disclosure;

FIG. 9 is a three-dimensional structural view of an elevator car according to one embodiment of the invention;

FIG. 10 is an enlarged view of part B in FIG. 9 of the embodiment of the disclosure.

[0029] Reference signs:

10, linkage rod; 11, first attraction member; 12, attraction end; 121, connecting plate; 13, lifting end; 131, stop ring; 20, elastic reset member; 21, spring; 30, supporting frame; 31, slot; 32, cushion; 40, lifting mechanism; 41, second attraction member; 42, power source; 421, driving motor; 422, screw rod; 423, mating block; 43, lifting member; 431, first connecting end; 432, second connecting end; 4321, receding groove; 50, position detector; 60, elevator car; 70, safety gear.

Detailed Description of the Invention

[0030] To gain a good understanding of the embodiments of the disclosure, specific embodiments of the disclosure will be described in further detail below with reference to the accompanying drawings in the specification.

[0031] Unless otherwise specially stated or defined, all technical or scientific terms used in this specification have the same meanings as those commonly understood by those skilled in the art. In actual scenarios of the technical solutions of the embodiments of the disclosure, all the technical or scientific terms used in this specification may also have meanings corresponding to the purposes to be realized by the technical solutions of the embodiments of the invention.

[0032] Unless otherwise specially stated or defined, terms such as "first" and "second" in this specification are merely used for distinguishing part names and do not indicate a specific number or sequence.

[0033] Unless otherwise specially stated or defined, the term "and/or" used in this specification includes any and all combinations of one or more of relevant items listed.

[0034] It should be noted that, when one element is regarded as being "fixed to" the other element, it may be fixed to the other element directly or through an intermediate element; when one element is regarded as being "connected to" the other element, it may be connected to the other element directly or through an intermediate element; when one element is regarded as being "mount-

ed on" the other element, it may be mounted on the other element directly or through an intermediate element; when one element is regarded as being "disposed on" the other element, it may be disposed on the other element directly or through an intermediate element.

[0035] As shown in FIG. 1 to FIG. 4, a safety gear lifting device comprises a linkage rod 10, an elastic reset member 20, a supporting frame 30 and a lifting mechanism 40, wherein the lifting mechanism 40 is movably mounted on the supporting frame 30; a first attraction member 11 is mounted on the linkage rod 10, and a second attraction member 41 is mounted on the lifting mechanism 40; an end, close to the lifting mechanism 40, of the linkage rod 10 is an attraction end 12, the first attraction member 11 is mounted at the attraction end 12, the other end of the linkage rod 10 is a lifting end 13, the lifting end 13 penetrates through the supporting frame 30, the second attraction member 41 on the lifting mechanism 40 is located between the attraction end 12 and the lifting end 13, and the first attraction member 11 matches the second attraction member 41; and one end of the elastic reset member 20 acts on the supporting frame 30, and the other end of the elastic reset member 20 acts on the linkage rod 10.

[0036] During installation, the safety gear lifting device is mounted above a safety gear 70, at this moment, the linkage rod 10 protrudes out of the supporting frame 30 towards the safety gear 70, and then the lifting end 13 extends into the safety gear 70 to drive the safety gear 70; and when the linkage rod 10 extends downwards to the lowest position, the safety gear 70 is in a released state, and an elevator can run normally; when the linkage rod 10 moves upwards, the safety gear 70 is driven by the linkage rod 10 to be clamped, at this moment, the elevator cannot run, and safety locking of the elevator is completed. Here, the first attraction member 11 matches the second attraction member 41, so the linkage rod 10 will be driven to move when the lifting mechanism 40 moves; in order to ensure that the safety gear 70 is in the released state, the lifting mechanism 40 is made to move downwards, the linkage rod 10 is driven by the lifting mechanism 40 to move downwards synchronously until the lifting end 13 reaches the lowest position, and the lifting end 13 is always located at the lowest position when the elevator works normally. Once the elevator moves abnormally, for example, the elevator descends too fast, the safety gear lifting device will receive an abnormal signal, then the first attraction member 11 will no longer match the second attraction member 41, the elastic reset member 20 is released and quickly restores to drive the linkage rod 10 to move upwards, and the safety gear 70 is driven by the lifting end 13 of the linkage rod 10 to be clamped, such that the elevator is locked.

[0037] As shown in FIG. 1 to FIG. 4, the lifting mechanism 40 comprises a power source 42 and a lifting member 43, wherein the power source 42 drives the lifting member 43, and the second attraction member 41 is mounted on the lifting member 43. The lifting member 43

is driven by the power source 42 to move to adjust the position of the linkage rod 10 through matching between the second attraction member 41 and the first attraction member 11.

[0038] When the elastic reset member 20 is compressed to accumulate energy, the attraction end 12 of the linkage rod 10 is located at a first position, and as shown in FIG. 1 and FIG. 2, the position where the attraction end 12 is located is the first position; when the elastic reset member 20 releases energy to at least partially restore, the attraction end 12 of the linkage rod 10 is located at a second position, and as shown in FIG. 3 and FIG. 4, the position where the attraction end 12 is located is the second position; and the lifting member 43 always avoids the second position during the moving process.

[0039] Wherein, the safety gear 70 is in the released state at the first position, and at this moment, the elevator can run normally; and the safety gear 70 is in a clamped state at the second position, and at this moment, the elevator is locked and cannot run. So, when the elevator runs, the attraction end 12 of the linkage rod 10 is located at the first position; once the elevator is abnormal, a safety motion will be triggered, the first attraction member 11 will no longer match the second attraction member 41, and the attraction end 12 of the linkage rod 10 is lifted to the second position to trigger the locking effect of the safety gear 70. Because the lifting member 43 avoids the second position, the attraction end 12 of the linkage rod 10 can move to the second position without hindrances.

[0040] As shown in FIG. 5 to FIG. 7, when the attraction end 12 of the linkage rod 10 needs return to the first position from the second position, the power source 42 drives the lifting member 43 to enable the second attraction member 41 on the lifting member 43 to move towards the first attraction member 11 of the linkage rod 10 until the first attraction member 11 matches the second attraction member 41; then, the power source 42 drives the lifting member 43 reversely, at this moment, the attraction end 12 of the linkage rod 10 moves towards the first position under the action of the lifting member 43 until it reaches the second position, at this moment, even if the elevator breaks down during the running process, because the lifting member 43 always avoids the second position, the attraction end 12 can return to the second position no matter where the lifting member 43 moves, ensuring that the safety gear 70 can be driven by the linkage rod 10 to be locked at any time.

[0041] Wherein, the first attraction member 11 and the second attraction member 41 are electromagnets or magnetic attraction members, and at least one of the first attraction member 11 and the second attraction member 41 is an electromagnet. In this embodiment, the first attraction member 11 is a magnetic attraction member, and the second attraction member 41 is an electromagnet, so the electromagnet can be powered on to match the magnetic attraction member; when a power failure happens to the elevator suddenly, the electromagnet will be

powered off and demagnetized, thus no longer matching the magnetic attraction member, and the attraction end 12 of the linkage rod 10 returns to the second position under the action of the elastic reset member 20.

[0042] Wherein, the magnetic attraction member may be a metal which can be magnetically attracted, or a permanent magnet. In this embodiment, the magnetic attraction member is an iron sheet.

[0043] As shown in FIG. 1 to FIG. 4, the lifting member 43 comprises a first connecting end 431 and a second connecting end 432, wherein the first connecting end 431 is connected to the power source 42, and the second connecting end 432 is connected to the second attraction member 41; and during the moving process of the lifting member 43, the first connecting end 431 and the second connecting end 432 are always located on two sides of the second position. The first connecting end 431 provides power, the second connecting end 432 is used for driving the linkage rod 10, and the first connecting end 431 and the second connecting end 432 work separately, such that interference is avoided; and during the moving process of the lifting member 43, the first connecting end 431 and the second connecting end 432 will not intervene with the second position, so the attraction end 12 of the linkage rod 10 can return to the second position smoothly.

[0044] As shown in FIG. 5 to FIG. 7, the first connecting end 431 and the second connecting end 432 are edge-wise connected through a plate or a rod, a receding groove 4321 is formed in the middle of the second connecting end 432, and the linkage rod 10 penetrates through the receding groove 4321. The first connecting end 431 and the second connecting end 432 are connected through a plate or a rod, such that the second connecting rod 432 can move synchronously when the first connecting end 431 is driven by the power source 42.

[0045] In addition, sides between the first connecting end 431 and the second connecting end 432 are sealed through plates, the first connecting end 431 and the second connecting end 432 are connected through at least one plate, and at least one side is open. By leaving one side open, the second attraction member 41 can be mounted easily, and the position of the attraction end 12 of the linkage rod 10 can be detected. The plates disposed on multiple sides can improve the tensile strength.

[0046] As shown in FIG. 5 to FIG. 7, a connecting plate 121 is disposed at the attraction end 12, and the first attraction member 11 is mounted on the connecting plate 121; the second connecting end 432 is provided with second attraction members 41 located on two sides of the receding groove 4321; and the elastic reset member 20 is a spring, and the spring 21 is disposed around the linkage rod 10, and has one end acting on the supporting frame 30 and the other end acting on the attraction end 12 of the linkage rod 10. The first attraction member 11 on the connecting plate 121 matches the second attraction members 41 which are disposed on the two sides of the receding groove 4321, such that matching between the first attraction member 11 and the second attraction

members 41 is more stable. Based on the elastic compression principle of the spring 21, a force is provided to enable the linkage rod 10 to return, such that the attraction end 12 of the linkage rod 10 can return to the second position under the action of the spring 21, and the position of the spring 21 disposed around the linkage rod 10 is fixed.

[0047] As shown in FIG. 8, slots 31 are formed in two sides, close to the lifting member 43, of the supporting frame 30, and the lifting member 43 slides along the slots 31. Under the guidance of the slots 31, the position of the lifting member 43 will not deviate when the lifting member 43 moves. Specifically, guide protrusions are outwardly disposed at the first connecting end 431 and the second connecting end 432, and the lifting member 43 matches the slots 31 through the guide protrusions. In addition, guide protrusions are disposed on two sides of the connecting plate 121, and the guide protrusions on the connecting plate 121 match the slots 31.

[0048] As shown in FIG. 5 to FIG. 7, the power source 42 comprises a driving motor 421, a screw rod 422 and a mating block 423, wherein the driving motor is fixedly mounted on the supporting frame 30, an output shaft of the driving motor drives the screw rod 422 to rotate, the mating block 423 is mounted at the first connecting end 431, and the screw rod 422 matches the mating block 423 and drives the first connecting end 431 to reciprocate. The driving motor 421 drives the screw rod 422 to control the first connecting end 431 to move, that is, the lifting member 43 is driven to move to drive the linkage rod 10 to move, such that the reciprocating motion of the lifting member 43 is realized through forward rotation and reverse rotation. In addition, after being mounted, the screw rod 422 and the driving motor 421 can only rotate and will not stretch or retreat, so the movement of the linkage rod 10 will not be disturbed when the driving motor and the screw rod 422 rotate.

[0049] In another embodiment, the power source 42 is an air cylinder or a hydraulic cylinder, and a piston rod of the air cylinder or the hydraulic cylinder acts on the first connecting end 431. When the piston rod stretches outwards, the first connecting end 431 reaches the lowest position and will not disturb the second position at this position; and the piston rod will not disturb the second position either after retreating.

[0050] As shown in FIG. 5 to FIG. 7, a cushion 32 is disposed at the bottom of the supporting frame 30, and the lifting member 43 abuts against the cushion 32 when moving to the lowest position. The cushion 32 can limit the lifting member 43 and control the position to which the lifting member 43 moves downwards. The cushion 32 is made of a soft material such as rubber and has a certain height, such that a space for receiving the compressed spring 21 is reserved between the connecting plate 121 and the bottom of the supporting frame 30.

[0051] As shown in FIG. 1 to FIG. 4, a stop ring 131 is disposed at the lifting end 13 of the linkage rod 10, and when the attraction end 12 moves to the second position,

the stop ring 131 is clamped with the supporting frame 30. The stop ring 131 controls the highest position to which the lifting member 43 rises, and can prevent the lifting end 13 from entering the supporting frame 30, which may otherwise affect normal work of the whole device.

[0052] As shown in FIG. 1, the safety gear lifting device further comprises a position detector 50, wherein the position detector 50 is mounted on the supporting frame 30 and is used for detecting the position of the linkage rod 10. The position detector 50 can detect the position of the linkage rod 10 in real time to determine whether the linkage rod 10 is located at a designated position.

[0053] As shown in FIG. 9 and FIG. 10, an elevator car comprises a car body 60, a safety gear 70, and the safety gear lifting device mentioned above, wherein the safety gear 70 is mounted on an outer side of the car body 60, the safety gear lifting device is mounted on the outer side of the car body 60 and is located above the safety gear 70, and the lifting end 13 of the linkage rod 10 acts on the safety gear 70. According to the automatic elevator car, the safety gear 70 can be controlled by the safety gear lifting device to realize braking of an elevator.

[0054] A using method of an elevator car using the automatic elevator car mentioned above, and comprises the following steps: when it is recognized that the car body 60 works, the attraction end 12 of the linkage rod 10 matches the lifting mechanism 40 through the magnetic attraction member and the electromagnet, and the linkage rod 10 moves downwards to a lowest position to make the elastic reset member 20 in an energy accumulation state and make the safety gear 70 in a released state;

When it is recognized that the car body 60 works abnormally, matching between the attraction end 12 of the linkage rod 10 and the lifting mechanism 40 through the magnetic attraction member and the electromagnet is relieved to make the elastic reset member 20 release energy and lift the linkage rod 10 to clamp the safety gear 70, such that the car body 60 stops moving.

[0055] The drawings are cited where new features are described. In order to avoid the verbosity of description caused by repeated citing of the drawings, the drawings will not be cited for features that have been described under the precondition of clear description.

[0056] The above embodiments are illustrative representations and deductions of the technical solutions of the disclosure, which are used to completely describe the technical solutions, purposes and effects of the embodiments of the disclosure to allow those skilled in the art to have a more thorough and comprehensive understanding of the contents of the embodiments of the disclosure, and are not intended to limit the protection scope of the disclosure.

[0057] The above embodiments are not all possible ones of the disclosure, and the disclosure can also be implemented through many other embodiments that are not listed here. Any substations and improvements made

without violating the concept of the embodiments of the disclosure should also fall within the protection scope of the embodiments of the disclosure.

Claims

1. A safety gear lifting device, comprising a linkage rod, an elastic reset member, a supporting frame and a lifting mechanism, wherein the lifting mechanism is movably mounted on the supporting frame;

a first attraction member is mounted on the linkage rod, and a second attraction member is mounted on the lifting mechanism;

an end, close to the lifting mechanism, of the linkage rod is an attraction end, the first attraction member is mounted at the attraction end, the other end of the linkage rod is a lifting end, the lifting end penetrates through the supporting frame, the second attraction member on the lifting mechanism is located between the attraction end and the lifting end, and the first attraction member matches the second attraction member;

the elastic reset member has an end acting on the supporting frame and an end acting on the linkage rod.

2. The safety gear lifting device according to Claim 1, wherein the lifting mechanism comprises a power source and a lifting member, the power source drives the lifting member, and the second attraction member is mounted on the lifting member.

3. The safety gear lifting device according to Claim 2, wherein when the elastic reset member is compressed to accumulate energy, the attraction end of the linkage rod is located at a first position; when the elastic reset member releases energy to at least partially restore, the attraction end of the linkage rod is located at a second position; the lifting member always avoids the second position during a moving process.

4. The safety gear lifting device according to Claim 3, wherein the lifting member comprises a first connecting end and a second connecting end, the first connecting end is connected to the power source, and the second connecting end is connected to the second attraction member; the first connecting end and the second connecting end are always located on two sides of the second position during the moving process.

5. The safety gear lifting device according to Claim 4, wherein the first connecting end and the second connecting end are edgewise connected through a plate

or a rod, a receding groove is formed in a middle of the second connecting end, and the linkage rod penetrates through the receding groove.

6. The safety gear lifting device according to Claim 4, wherein sides between the first connecting end and the second connecting end are sealed through plates, the first connecting end and the second connecting end are connected through at least one plate, and at least one side is open.

7. The safety gear lifting device according to Claim 4, wherein the power source comprises a driving motor, a screw rod and a mating block, the driving motor is fixedly mounted on the supporting frame, an output shaft of the driving motor drives the screw rod to rotate, the mating block is mounted at the first connecting end, and the screw rod matches the mating block and drives the first connecting end to reciprocate.

8. The safety gear lifting device according to Claim 5, wherein a connecting plate is disposed at the attraction end, and the first attraction member is mounted on the connecting plate;

the second connecting end is provided with second attraction members located on two sides of the receding groove;

the elastic reset member is a spring, and the spring is disposed around the linkage rod, and has an end acting on the supporting frame and an end acting on the attraction end of the linkage rod.

9. The safety gear lifting device according to Claim 2, wherein a cushion is disposed at a bottom of the supporting frame, and the lifting member abuts against the cushion when moving to a lowest position.

10. The safety gear lifting device according to any one of Claims 1-9, wherein the first attraction member and the second attraction member are electromagnets or magnetic attraction members, and at least one of the first attraction member and the second attraction member is an electromagnet.

11. The safety gear lifting device according to any one of Claims 1-9, wherein a stop ring is disposed at the lifting end of the linkage rod, and when the attraction end moves to the second position, the stop ring is clamped with the supporting frame.

12. The safety gear lifting device according to any one of Claim 1-9, further comprising a position detector, wherein the position detector is mounted on the supporting frame and is used for detecting a position of

the linkage rod.

13. An elevator car, comprising a car body, a safety gear, and the safety gear lifting device according to any one of Claims 1-12, wherein the safety gear is mounted on an outer side of the car body, the safety gear lifting device is mounted on the outer side of the car body and is located above the safety gear, and the lifting end of the linkage rod acts on the safety gear.

14. A method for using an elevator car, using the elevator car according to Claim 13 and comprising the following steps:

when it is recognized that the car body works, enabling the attraction end of the linkage rod to match the lifting mechanism through the magnetic attraction member and the electromagnet, and enabling the linkage rod to move downwards to a lowest position to make the elastic reset member in an energy accumulation state and the safety gear in a released state; and when it is recognized that the car body works abnormally, relieving the matching between the attraction end of the linkage rod and the lifting mechanism through the magnetic attraction member and the electromagnet to make the elastic reset member release energy and passively lift the linkage rod to clamp the safety gear, such that the car body stops moving.

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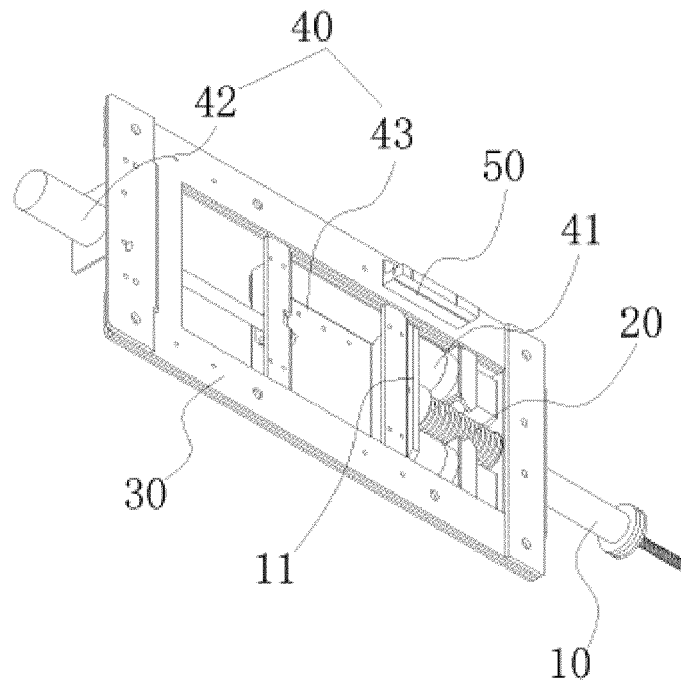


FIG. 1

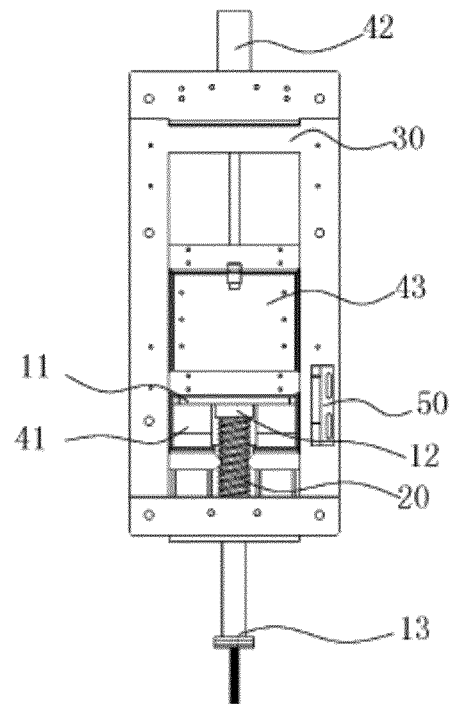


FIG. 2

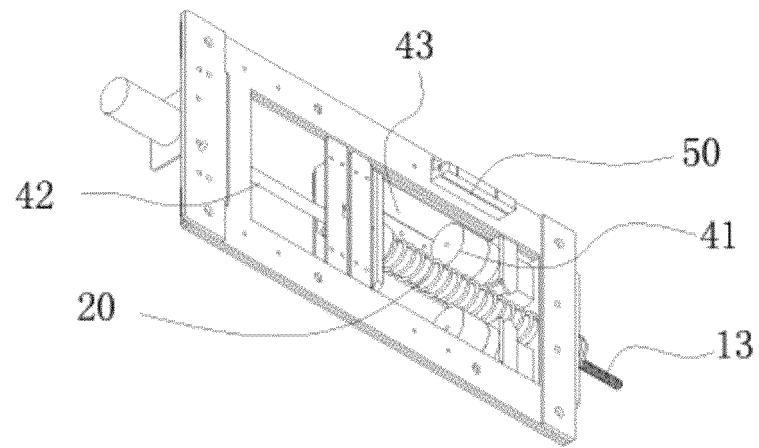


FIG. 3

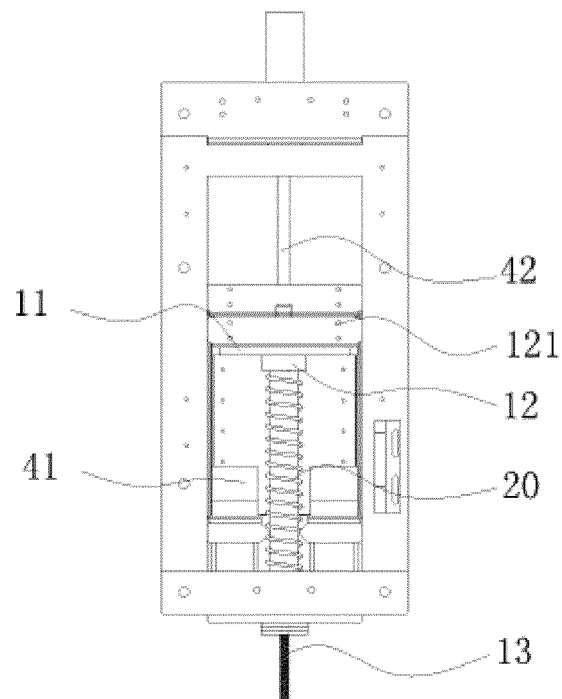


FIG. 4

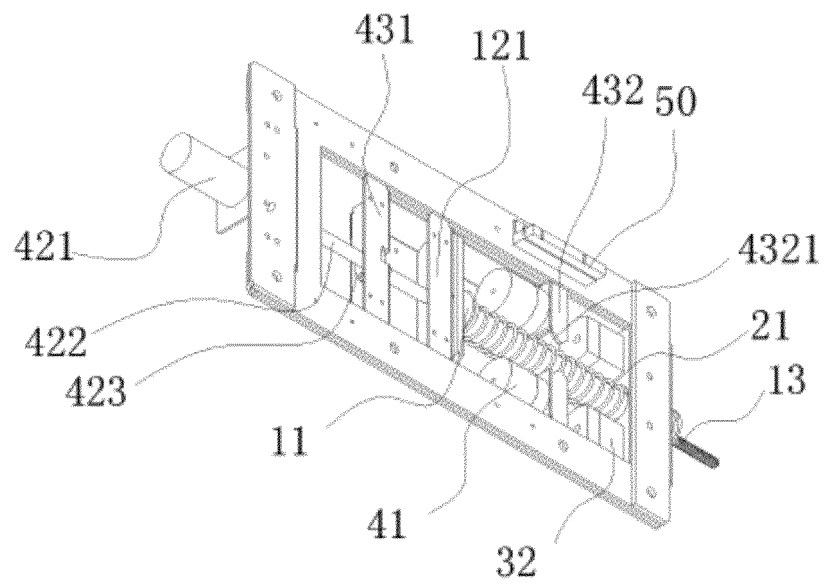


FIG. 5

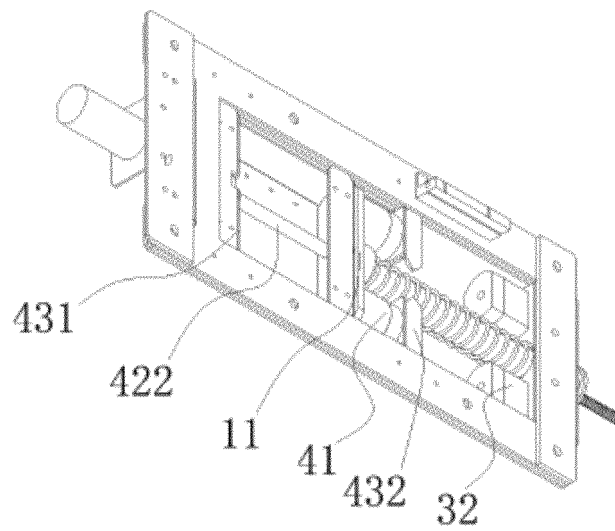


FIG. 6

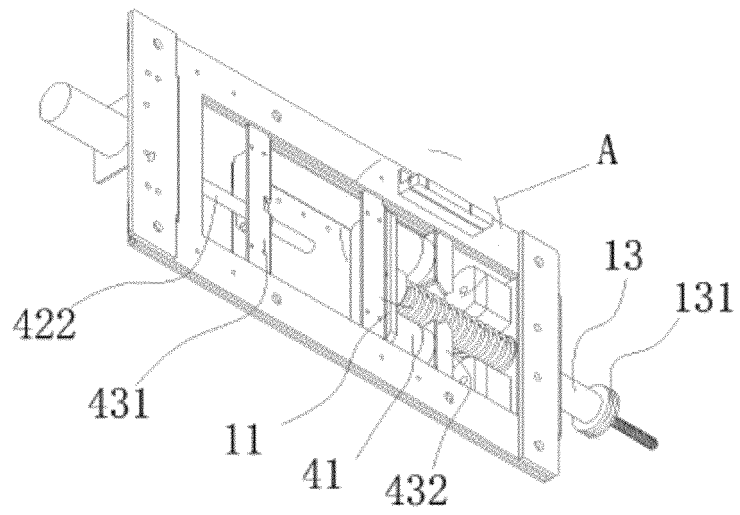


FIG. 7

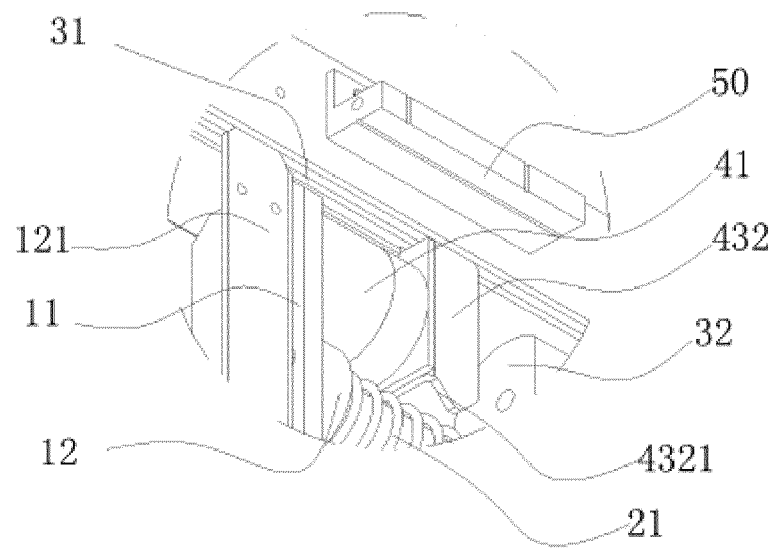


FIG. 8

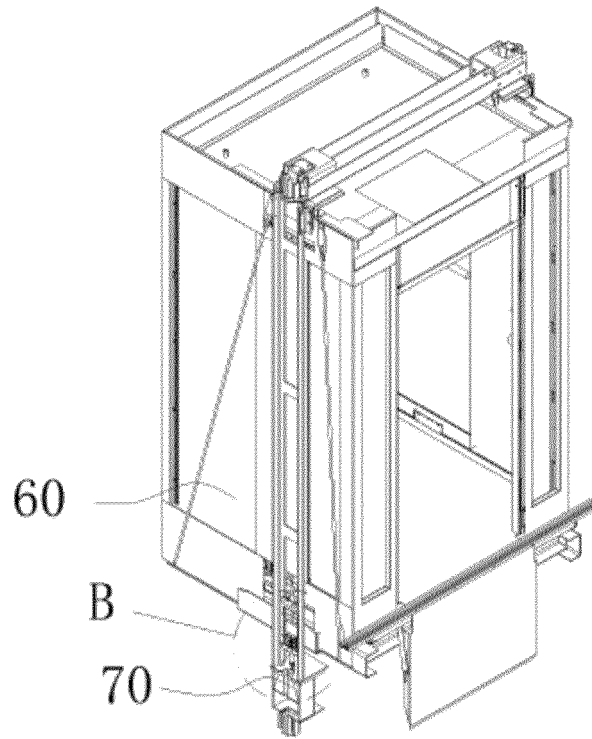


FIG. 9

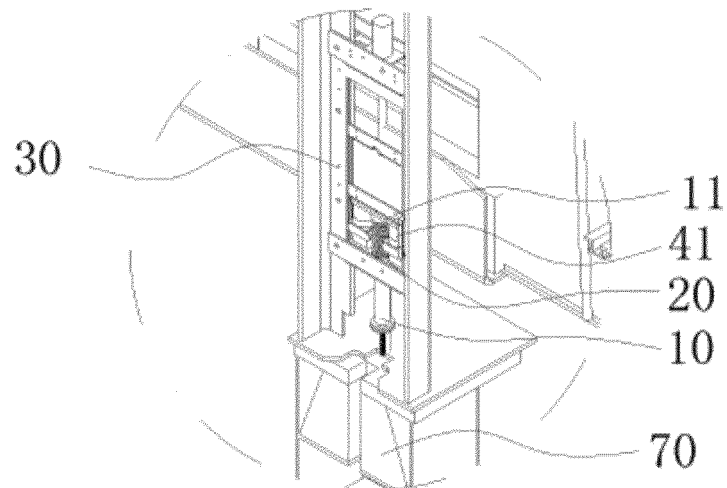


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2021/108205

A. CLASSIFICATION OF SUBJECT MATTER B66B 5/16(2006.01)i; B66B 5/06(2006.01)i 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) B66B 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) WPI, EPODOC, CNPAT, CNKI: 刘英辉, 电梯, 轿厢, 安全钳, 提拉, 磁, 吸, 弹, 簧, 驱动, 联动, 杆, 架, 升降, 滑动, elevator, car, box, safety, caliper, gear, tongs, lift+, pull+, attract+, suction, electromagnet+, magnet+, elastic+, spring, driv+, linkage, rod, frame, slid+																					
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>PX</td> <td>CN 111731964 A (LIU, Yinghui) 02 October 2020 (2020-10-02) claims 1-14</td> <td>1-14</td> </tr> <tr> <td>PX</td> <td>CN 212403063 U (LIU, Yinghui) 26 January 2021 (2021-01-26) claims 1-13, description paragraphs 7-22</td> <td>1-14</td> </tr> <tr> <td>A</td> <td>CN 207175134 U (TIANJIN JINXIANG JUXING ELEVATOR MANUFACTURING CO., LTD.) 03 April 2018 (2018-04-03) description, paragraphs 30-41, figures 1-5</td> <td>1-14</td> </tr> <tr> <td>A</td> <td>CN 111362093 A (CHONGQING MACRO LIFT CO., LTD.) 03 July 2020 (2020-07-03) entire document</td> <td>1-14</td> </tr> <tr> <td>A</td> <td>CN 109516336 A (LIU, Yinghui) 26 March 2019 (2019-03-26) entire document</td> <td>1-14</td> </tr> <tr> <td>A</td> <td>CN 207090739 U (LIAONING YOULIAN ELECTROMECHANICAL EQUIPMENT CO., LTD.) 13 March 2018 (2018-03-13) entire document</td> <td>1-14</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	PX	CN 111731964 A (LIU, Yinghui) 02 October 2020 (2020-10-02) claims 1-14	1-14	PX	CN 212403063 U (LIU, Yinghui) 26 January 2021 (2021-01-26) claims 1-13, description paragraphs 7-22	1-14	A	CN 207175134 U (TIANJIN JINXIANG JUXING ELEVATOR MANUFACTURING CO., LTD.) 03 April 2018 (2018-04-03) description, paragraphs 30-41, figures 1-5	1-14	A	CN 111362093 A (CHONGQING MACRO LIFT CO., LTD.) 03 July 2020 (2020-07-03) entire document	1-14	A	CN 109516336 A (LIU, Yinghui) 26 March 2019 (2019-03-26) entire document	1-14	A	CN 207090739 U (LIAONING YOULIAN ELECTROMECHANICAL EQUIPMENT CO., LTD.) 13 March 2018 (2018-03-13) entire document	1-14
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Date of the actual completion of the international search 27 September 2021	Date of mailing of the international search report 21 October 2021																				
Name and mailing address of the ISA/CN China National Intellectual Property Administration (ISA/CN) No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088 China Facsimile No. (86-10)62019451	Authorized officer Telephone No.																				

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/108205

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 103601055 A (HANGZHOU HUNING ELEVATOR ACCESSORIES CO., LTD.) 26 February 2014 (2014-02-26) entire document	1-14
A	EP 2837592 A1 (APLICACIONES ELECTROMECANICAS GERVAL, S.A.) 18 February 2015 (2015-02-18) entire document	1-14

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2021/108205

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 111731964 A	02 October 2020	CN 212403063 U	26 January 2021
CN 212403063 U	26 January 2021	CN 111731964 A	02 October 2020
CN 207175134 U	03 April 2018	None	
CN 111362093 A	03 July 2020	CN 212101540 U	08 December 2020
CN 109516336 A	26 March 2019	WO 2020134225 A1	02 July 2020
		CN 209507358 U	18 October 2019
CN 207090739 U	13 March 2018	None	
CN 103601055 A	26 February 2014	CN 103601055 B	12 August 2015
		WO 2015058663 A1	30 April 2015
EP 2837592 A1	18 February 2015	None	

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