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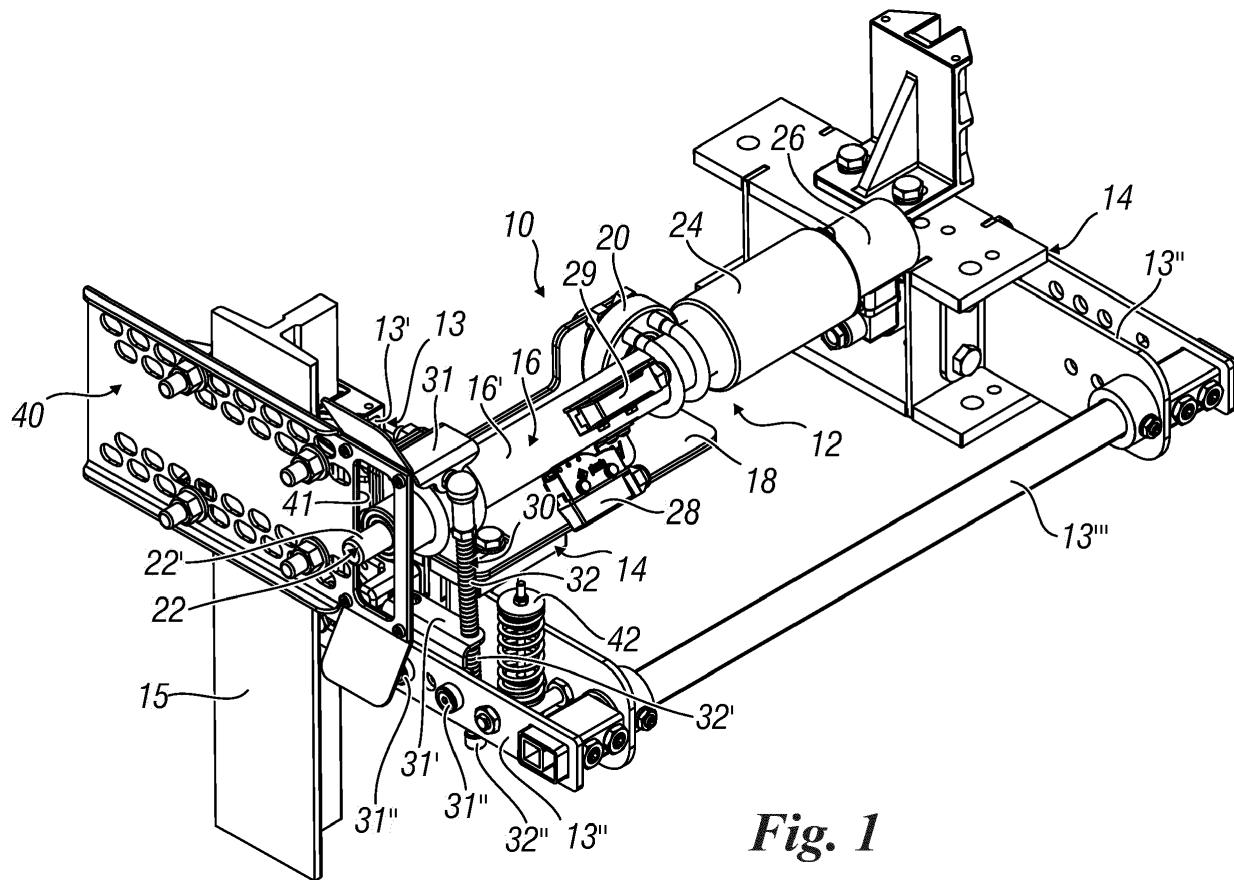
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(54) SAFETY DEVICE FOR STOPPING AN UNCONTROLLED MOVEMENT AWAY OF AN ELEVATOR CAR

(57) A safety device (10, 10') for stopping an uncontrolled movement away of an elevator car, comprising an actuator means (12) and a safety brake (13) of a bidirec-

tional type connected to each other and securable with respect to the structure of an elevator car frame.



Description

[0001] The present invention refers to a safety device for stopping an uncontrolled movement away of an elevator car.

[0002] More specifically, the present invention refers to a safety device for stopping an uncontrolled movement away of an elevator car from the level of a floor of the building wherein the elevator is installed, the hoistway door not being blocked or the elevator entrance door not being in the closed position because of a fault occurred in the elevator system.

[0003] The present invention also refers to a safety device suitable for allowing to stop an uncontrolled movement of an elevator car whenever operators are present inside the hoistway to perform maintenance or repair operations.

[0004] As is known, an elevator is a system the function of which is to lift/lower people and/or things from one floor to another or to different levels of a building and comprises a car suitable for receiving people and things, movable inside a hoistway, said car being moved by means of hoistropes driven by an electric motor or by means of hydraulically operated telescopic plungers, which lift and make the car itself go down.

[0005] Being it a system used to lift not only things, but also people, safety is a fundamental aspect for the operation of the elevator system.

[0006] An aspect related to safety is represented, for instance, by the need for an emergency stop of the elevator car in the case of a fault or the like, said stop taking place by way of an emergency braking system comprising a safety brake which slows down or blocks the elevator system in the case of an emergency or, in the case of hydraulic elevators, comprising shut-off valves which act directly onto hydraulic plungers.

[0007] A further aspect related to safety is represented by the need for stopping the elevator car and preventing uncontrolled movements thereof during test and maintenance operations in order to make those in charge for such operations safe and unharmed; in this connection, safety is guaranteed by way of devices which identify any uncontrolled movements of the elevator car and stop and hold it stationary.

[0008] Providing safety is also a requirement set forth by the regulations in force in this art, which specify to setup devices suitable for stopping any uncontrolled movements of an elevator car from a floor while the hoistway door is not blocked or is not in the closed position.

[0009] Traditionally any uncontrolled movement of an elevator car is stopped by using an electronic device placed above the elevator car and provided with magnetic sensors, which sense the elevator car being subjected to an uncontrolled movement away and enable such device to trigger braking means which, for instance, act onto the slow shaft of the hoist or operate actuator means of a safety brake.

[0010] Such solution has a number of drawbacks re-

lated to the fact that the electronic device is placed above the elevator car and, consequently, once an uncontrolled movement situation has occurred, the operator shall access the roof of the elevator car in order to make the elevator fit for use again.

[0011] A further drawback related to the safety devices of traditional types is in that the elevator control panel shall also conforms with the regulations in order for the elevator system to meet and conform with the regulations, which might entail the need for replacing the elevator control panel already in use, which means increased costs.

[0012] It is also worth emphasizing that new and recent regulations and extensions of existing regulations ordered the application of safety devices for stopping any uncontrolled movements away of an elevator car also for elevator systems manufactured before the year 1999.

[0013] These aspects resulted in further major drawbacks related to the need for replacing safety brakes or, in some cases, the complete lifting member, which means substantial complications not only for that which concerns assemblies, but also their related costs.

[0014] A further drawback related to the traditional solutions is in that the above-mentioned replacements of the safety brake or of the complete lifting system might even be found impossible to perform because of the dimensions of the new components presently available on the market.

[0015] An object of the present invention is to obviate the above-mentioned drawbacks.

[0016] More specifically, an object of the present invention is to provide such safety device for stopping an uncontrolled movement away of an elevator car as to be easily secured to the elevator car frame, so as to make the test, maintenance and/or replacement/repair operations, in the case of faults, easy and quick to perform.

[0017] A further object of the present invention is to provide a safety device that does not necessarily require the presence of movement detection systems or devices and consequently is fully independent of the elevator control panel.

[0018] A further object of the present invention is to provide a safety device that can be easily installed even on types of elevators manufactured before the year 1999.

[0019] A further object of the present invention is to provide a safety device that is compact in size and space occupation.

[0020] A further object of the present invention is to put at users' disposal a safety device for stopping an uncontrolled movement away of an elevator car suitable for guaranteeing a high value of strength and reliability over time and also such as to be implemented in an easy and cost-effective manner.

[0021] These objects and others are achieved by the invention, which presents the characteristics according to claim 1. According to the invention, a safety device is provided for stopping an uncontrolled movement away of an elevator car, comprising an actuator means and a

safety brake of a bidirectional type, connected to each other and stabilized with respect to the structure of an elevator car frame. Advantageous embodiments of the invention are apparent from the dependent claims.

[0022] The constructional and functional characteristics of the safety device for stopping an uncontrolled movement away of an elevator car according to the present invention can be better understood from the following detailed description, wherein reference is made to the attached drawings, which illustrate a preferred, non-limitative embodiment thereof, and wherein:

figure 1 schematically shows an axonometric view of a safety device for stopping an uncontrolled movement away of an elevator car according to the present invention mounted in accordance with a first mounting configuration;

figure 2 schematically shows the safety device according to the invention mounted in accordance with a second mounting configuration.

[0023] With reference to the mentioned figures, the safety device for stopping an uncontrolled movement away of an elevator car according to the present invention, indicated by the reference numeral 10 as a whole in the mentioned figures, comprises an actuator means 12 and a safety brake 13 connected to each other and stabilized with respect to the structure of the elevator car frame as described in details below.

[0024] The actuator means 12 and the safety brake 13 which make up the device according to the invention are secured to the structure of the elevator car and conveniently to the upper part of a traditional elevator car frame (not represented in the figures) or, alternatively, to the lower part of the car frame, said elevator car being movable and slideable along guides or uprights 15, said actuator means 12 and safety brake 13 being secured to said car frame by way of fixing blocks or brackets 14.

[0025] Figure 1 illustrates a condition wherein the device according to the invention is connected to the structure of the elevator car in correspondence with the upper part of the car frame by way of the above mentioned fixing blocks or brackets 14 by using screws or equivalently known retention elements.

[0026] The actuator means 12 comprises a guide means 16, substantially consisting of a metal pipe 16' secured to one of the fixing blocks or brackets 14 by way of a support element 18, the guide means 16 being connected to the support element 18 by way of a hinge 20 featuring a horizontal axis of rotation suitable for enabling said guide means 16 to oscillate in a vertical plane as described in more details below.

[0027] Inside the metal pipe 16' and coaxially thereto there is arranged a cursor or pin 22, an end 22' of which projects from the pipe 16' by a certain length; inside said metal pipe there are arranged means suitable for allowing the cursor or pin 22 to slide, said means not being described in details in that they consist of anti-friction means

of the bushing type or the like, commonly known to those skilled in this art.

[0028] The metal pipe 16' thus defines a guide means for the cursor or pin 22.

[0029] To the end of the metal pipe 16' opposite to that which the end 22' of the cursor or pin 22 projects from, a sleeve 24, coaxial to the metal pipe, is secured, the function of which is to make it possible the connection of a means suitable for displacing the cursor or pin 22, said means consisting of an electric actuator 26, more specifically an electromagnetic actuator; said electric actuator 26, when energized, allows to hold the cursor or pin 22 in a position close to said electromagnet (first position), i.e. a retracted position with respect to the metal pipe 16', opposite to a second position wherein said cursor or pin 22 in the extended position with respect to the metal pipe 16'.

[0030] On the metal pipe 16' of the guide means 16 a pair of microswitches 28 and 29 are also arranged the function of which is to detect the position of the cursor or pin 22 in the first and second positions.

[0031] The safety brake 13, not described in details in that it is a known device, is of a bidirectional type, is secured to one of the fixing blocks or brackets 14, and comprises a body 13', activation levers 13" secured to both fixing blocks or brackets 14, and a synchronization shaft 13'''.

[0032] The connection between the actuator means 12 and the safety brake 13 is implemented by way of a connection means 30 which comprises a contact plate 31 and a further contact plate 31' substantially parallel to each other and to a shock absorbing element for said two plates, consisting of a first elastic element 32, a second elastic element 32', and a connection pin 32" for interconnecting said elastic elements.

[0033] The first elastic element 32 is arranged between the contact plate 31 and the further contact plate 31', and the second elastic element 32' is arranged in contact with the further contact plate 31' on the opposed side with respect to the contact plate 31, the connection pin 32" being inserted coaxially to said first and second elastic elements so as to hold them in line.

[0034] The further contact plate 31' is secured to the lever 13" by way of screws 31" or equivalent retention elements.

[0035] A metal plate 40, secured to one of the guides or uprights 15 or to the wall of the hoistway within which the elevator car moves, comprises a through opening 41 which the end 22' of the pin or cursor 22 can engage whenever said pin or cursor is in the second position, i.e. is extended with respect to the end of the pipe 16'; said through opening is of a slotted type to make it possible to accommodate and compensate for any inaccurate stops or leveling movements with respect to the level of the elevator.

[0036] An elastic element 42, preferably consisting of a helical spring, is secured to one of the levers 13" on the safety brake fixing side and its function is to bring the

lever 13" back to the central position (i.e. to the horizontal or rest position) whenever the device 12 stops operating. [0037] With reference to figure 2, this shows a safety device according to the invention, indicated by the reference numeral 10' as a whole, according to a different mounting mode and, more specifically, in correspondence with the lower part of the elevator car frame.

[0038] The operation of the safety device for stopping an uncontrolled movement away of an elevator car according to the present invention, described above with reference to the constructional details and in accordance with two possible mounting configurations, in the upper part and in the lower part of the elevator car frame respectively, is illustrated here below.

[0039] Whenever the elevator car is going to reach the level of a floor of the building where the elevator is installed, the electric actuator 26 is energized and consequently, as described above, the cursor or pin 22 is in the first position (i.e. in the position whereby it is retracted with respect to the end of the tubular element 16').

[0040] Upon reaching the level of the floor, the electric actuator 26 deenergizes and, consequently, the cursor or pin 22 gets out with respect to the end of the tubular element 16' and its end 22' engages the through opening 41 of the metal plate 40.

[0041] If there are uncontrolled movements of the elevator car with respect to the level of the floor, for instance downwards, the cursor or pin 22 slides along the through opening 41 (said opening is of a slotted type) and, upon reaching the end of the opening (one of the two ends of the slot) the guide means 16 will start rotating upwards with respect to the hinge means 20 and, considering that the connection means 30 connects the guide means 16 to the safety brake 13 via the contact plate 31 and the further contact plate 31', the safety brake 13 will be operated, whereby the elevator car is firmly blocked with respect to the guide elements thereby firmly holding it.

[0042] The function of the shock absorbing element is that of absorbing the shocks resulting from the movement of the two connection plates whenever the safety brake is activated and, substantially, it accompanies the braking action.

[0043] The operation of the device is fully similar should the uncontrolled movement be directed upwards, in that the safety brake 13 is a bidirectional one.

[0044] The position of the cursor or pin 22, i.e. whether the cursor or pin is in the first or in the second position, is controlled by the microswitches 28 and 29 in order to inhibit the operation of the elevator or not.

[0045] The advantages the safety device for stopping an uncontrolled movement away of an elevator car according the present invention are apparent from the foregoing.

[0046] The safety device for stopping an uncontrolled movement away of an elevator car according to the present invention can be advantageously secured to the elevator car frame, in a simple manner, so as to make test, maintenance, and/or replacement/repair opera-

tions, in the presence of faults, easy and quick to perform.

[0047] Further advantageously is the fact that the device according to the invention comprises and integrates both the uncontrolled movement detection means and the safety brake in one structure, said structure being easily connectable to the structure of the elevator car frame both in the upper part and in the lower part of said elevator car frame, and this allows to secure said device also to elevators installed before the year 1999 without requiring onerous works for the operators in charge and without a possible complete replacement of the elevator car frame.

[0048] A further advantage of the device according to the invention is related to the fact that it is secured to the elevator car frame and, consequently, it moves integrally therewith and at the same speed and does not depend on the operation of any other electronic and/or mechanical components not fixed to the elevator car frame; thanks to this circumstance, it is not necessary to declare the time delay within which the movement shall be detected, time delay to which one should add the time within which the electric devices in charge of operating the brake and the remaining elevator car stopping devices are operated. In addition, this advantage makes it possible for a device according to the invention to comply with the regulations that specify that an elevator car shall stop within a space not exceeding 1,2 meters from the level of the floor at which the uncontrolled movement of the elevator car has been detected.

[0049] A further advantage of the device according to the invention is in that it operates directly onto the safety brake without requiring the presence of movement detection systems or devices and, consequently, it is fully independent of the elevator control panel.

[0050] Even though the invention has been described above with a special reference to an embodiment thereof, given for explanatory, non-limitative purposes only, numerous modifications and variants will be apparent to those skilled in the art in the light of the above description.

[0051] Therefore, the present invention is to be construed to embrace all modifications and variants that fall in the scope of the following claims.

45 Claims

1. A safety device (10, 10') for stopping an uncontrolled movement away of an elevator car, characterized in that it comprises, in one device, an actuator means (12) and a safety brake (13) of a bidirectional type connected to each other and stabilized with respect to the structure of an elevator car frame of any types without any specific presetting, the connection between said actuator means (12) and said safety brake (13) being implemented by way of a connection (30) which comprises a contact plate (31) and a further contact plate (31') parallel to each other and a shock absorbing element for said contact plate (31)

and further contact plate (31').

2. The safety device according to claim 1, **characterized in that** it is stabilized to the elevator car frame in correspondence with either the upper part or the lower part of the elevator car frame. 5

3. The device according to claim 1 or 2, **characterized in that** it is secured to the elevator car frame by way of fixing blocks or brackets (14). 10

4. The device according to claim 1, **characterized in that** the actuator means (12) comprises a guide means (16) consisting of a metal pipe (16') internally to which there is arranged a cursor or pin (22), an end (22') of which projects with respect to the pipe (16') over a length, the metal pipe (16') comprising, in correspondence with an end opposed to that from which the end (22') of the cursor or pin (22) projects, a coaxial sleeve (24) suitable for connecting a means suitable for displacing the cursor or pin (22) between a first position wherein the cursor or pin (22) is retracted with respect to the metal pipe (16') and a second position wherein the cursor or pin (22) is in an extended position with respect to the tubular element (16'), said means consisting of an electric actuator (26), the guide means (16) comprising a pair of microswitches (28, 29) suitable for detecting the position of the cursor or pin (22) in the first and second positions. 15 20 25 30

5. The device according to claim 4, **characterized in that** the electric actuator (26) is an electromagnetic actuator. 35

6. The device according to claim 4, **characterized in that** the guide means (16) is secured to one of the fixing blocks or brackets (14) by way of a support element (18), said guide means (16) being connected to the support element (18) by way of a hinge (20) featuring a horizontal axis of rotation suitable for enabling said guide means (16) to oscillate in a vertical plane. 40

7. The device according to claims 1 thru 3, **characterized in that** the safety brake (13) is secured to one of the fixing blocks or brackets (14) and comprises a body (13'), opposed and parallel activation levers (13'') secured to both fixing blocks or brackets (14), and a synchronization shaft (13'''). 45 50

8. The device according to claim 7, **characterized in that** the further contact plate (31') is secured to one of the levers (13'') by way of screws (31'') or equivalent retention elements. 55

9. The device according to claim 1, **characterized in that** the shock absorbing element comprises a first elastic element (32), a second elastic element (32'), and a connection pin (32''), the first elastic element (32) being arranged between the contact plate (31) and the further contact plate (31'), and the second elastic element (32') being arranged in contact with the further contact plate (31') on an opposite side with respect to the contact plate (31), the connection pin (32'') being inserted coaxially to said first and second elastic elements so as to hold them in line.

10. The device according to one or several of the previous claims, **characterized in that** it comprises a metal plate (40) secured to a guide or upright (15) or to a wall of the hoistway within which the elevator car moves, said metal plate (40) comprising a through opening (41) of a slotted type to accommodate any inaccurate stops or releveling movements, which is engaged by the end (22') of the pin or cursor (22) whenever said pin or cursor is in the second position, the end portion (22) of the pin or cursor being extended with respect to the pipe (16').

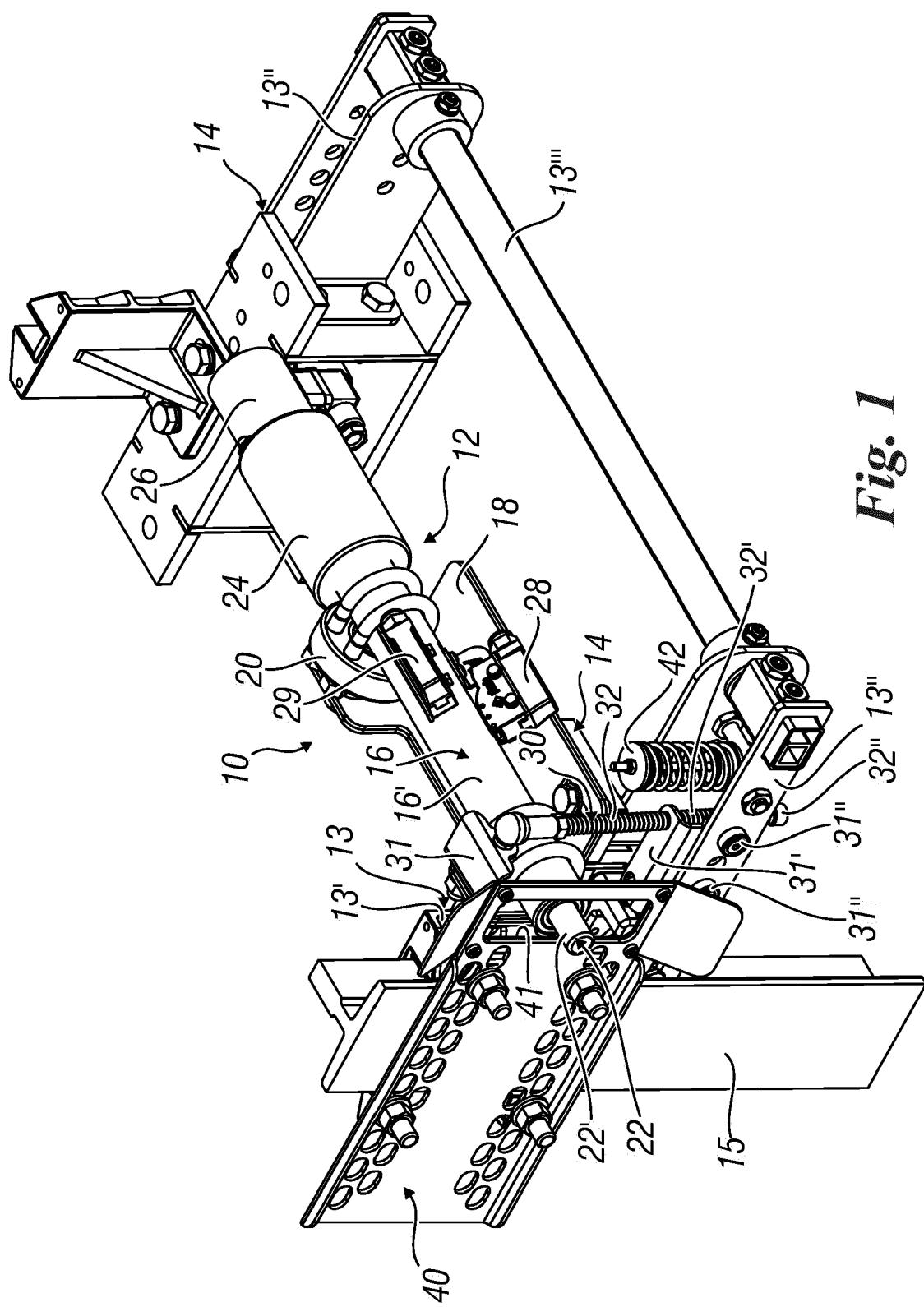
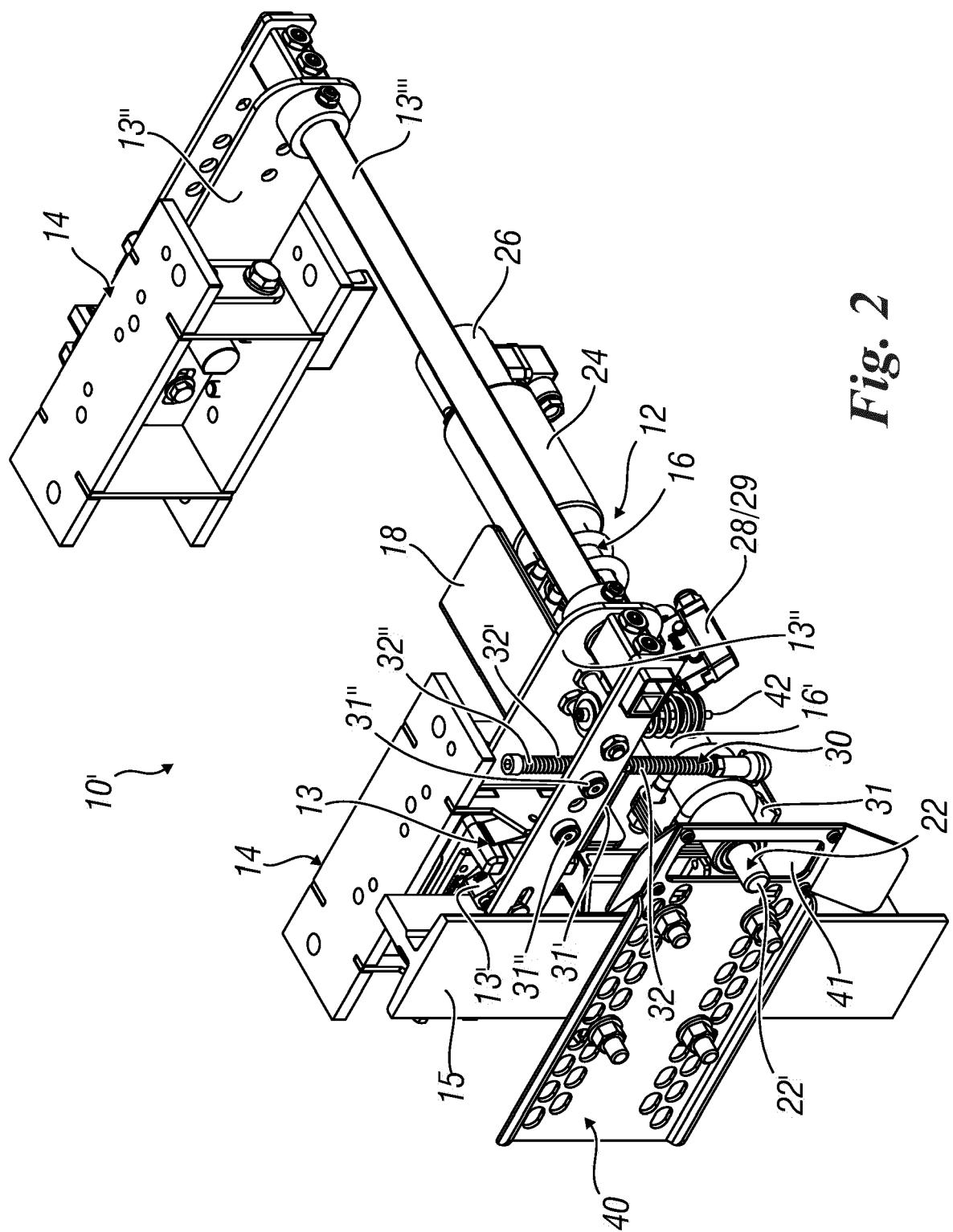


Fig. 1





EUROPEAN SEARCH REPORT

Application Number

EP 18 17 1524

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 2 154 096 A1 (MITSUBISHI ELECTRIC CORP [JP]) 17 February 2010 (2010-02-17)	1-9	INV. B66B5/18
A	* abstract; figures 1-19 *	10	B66B17/34

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A	CN 103 420 247 B (SHANGHAI WEIPINLAI ELECTROMECHANICAL TECHNOLOGY CO LTD) 29 July 2015 (2015-07-29)	1-10	
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			TECHNICAL FIELDS SEARCHED (IPC)
			B66B
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search		Examiner
The Hague	21 November 2018		Bleys, Philip
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X : particularly relevant if taken alone	T : theory or principle underlying the invention		
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 17 1524

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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