(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 422 182 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
26.05.2004 Bulletin 2004/22

(51) Int Cl.[7]: **B66B 5/16**, B66B 5/28

(21) Application number: **03078566.1**

(22) Date of filing: **17.11.2003**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR
Designated Extension States:
AL LT LV MK

(30) Priority: **19.11.2002 IT MI20022457**

(71) Applicant: **Centoducati S.p.A.**
20051 Limbiate (MI) (IT)

(72) Inventor: **Centoducati, Oronzo**
20039 Varedo (MI) (IT)

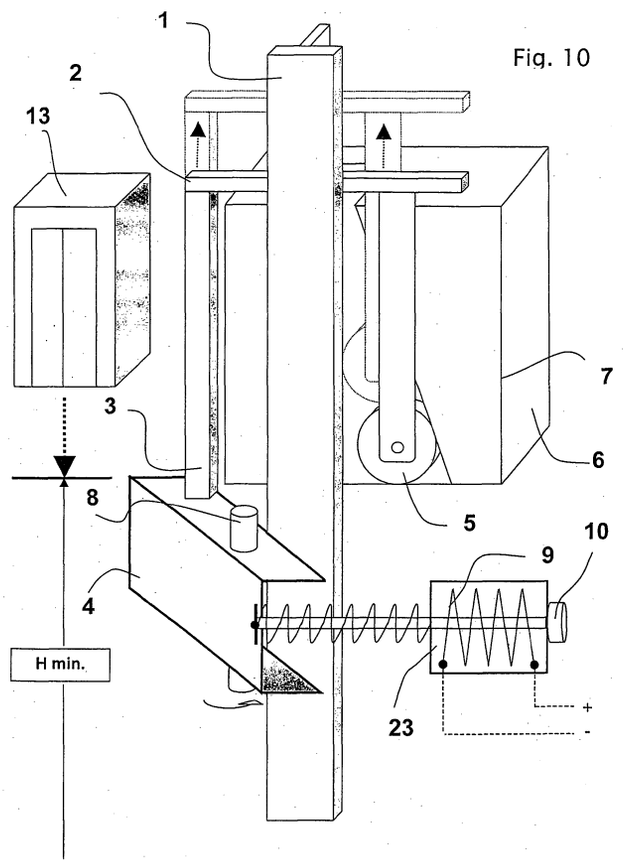
(74) Representative: **Riccardi, Sergio**
Riccardi & Co.
Via Macedonio Melloni, 32
20129 Milano (IT)

(54) Safety mechanism for reduced elevator pit

(57) A mechanism is described, which activates the parachute in an elevator with reduced pit, when the distance between the bottom of the elevator car and the bottom of the pit decreases under a minimum safety value, wherein the operation of releasing and/or retracting said mechanism is made by a remote manual operation, performable from outside the elevator shaft.

A simple and safe security device is thus obtained, which doesn't require further mechanisms except for those strictly necessary to verify safety conditions and to activate the parachute.

Fig. 10



EP 1 422 182 A1

Description

[0001] The requirement to install new elevators in existent buildings puts a question related to the respect of safety and construction provisions, provided in the present relevant laws, which are not even satisfied by existent building. In particular, when installing a new elevator, head and/or pit distances, provided for rules EN 81-1:1998 and EN 81-2:1998, §5.7, about maintenance engineer's safety, cannot be respected. And this is as an important and not to be ignored point about safety, as difficult to solve from a technical point of view. The reasons can be of different kind: for instance, the building could be protected by Monuments and Fine Arts Superintendence, or else these spaces could be obtained with expensive redevelopment works anyway, but to the detriment of the same building structural stability.

[0002] To create again the same safety conditions, the installation of one or more additional safety devices which grant shelter space must be considered.

[0003] On the market, several devices like these already exist, which allow to obtain relatively safe spaces for the maintenance. They can be catalogued in:

- mechanical, manual
- electromechanical, manual and/or automatic.

[0004] An example of mechanical manual device is shown by rafters: in such case the operation is manual only, possible from the floor threshold by a metallic rope. More evolved ones have a control by electric contact.

[0005] However, such devices don't have a pit access control system, they are cumbersome and make a very few safety space.

[0006] Among electromechanical devices actually on the market, particularly interesting are those provided by a pit access control, with elevator system locking and safety remote reset. An example of such devices is described in European Patent EP 0 725 033 B1, which shows an elevator car blocking device, mounted in the pit, working directly on the bottom of the elevator car or on the counterweight, and suitable for creating a temporary working place at the pit or at the head, respectively. It is made by a rotating arm integral with a dampening body which is released by gravity in its neutral position or during maintenance operations, while is retracted during elevator motion. Once released, if the elevator car should move in the device direction, this is able to stop its movement at a safety height for anyone who could be in the pit or in the head. These movements of the arm, member of blocking device, are continuously tested in both extreme positions by some circuit breakers which verify its functional capability.

[0007] The pit or head accesses are controlled and connected to a safety circuit: opening one of the floor doors with the proper key a memory circuit is activated, deactivating the safety one and preventing the elevator from moving in any direction. Only the inspection operation is allowed. The memory circuit can and must be reset only from the machine room by a proper key, allowing the elevator to restore operation.

[0008] The system provides for two devices for each elevator car or counterweight, and two shock absorber embodiments, according to the elevator speed.

[0009] However, such a device described in the cited European Patent, although being functional and safe, is:

cumbersome, requiring a lot of space not always available in the pit for its double application, which would be quadruple in case of contemporary reduced pit and head, considering that traditional shock absorbers are already present in the pit;
reduced in height, requiring the plan and the installation of a supporting pillar to obtain a height allowing a person entrapped to leave the pit and not only to take cover;
electrically complex, requiring a special harness to be combined with the elevator control board harness.

[0010] The device provided with the present invention is based instead on the use of a parachute, normally installed on the elevator with the purpose of stopping it if it would gain a speed greater than the nominal one (rope elevator) or if it would break one of the ropes (hydraulic elevator), as a safety system also for the reduced pits and/or heads access for ordinary or extraordinary maintenance operations.

[0011] In respect of what is already available on the market, it doesn't add further devices, except for the strictly necessary ones for the safety condition control and for parachute activation.

[0012] The device is illustrated in Figures 1-10 of the annexed drawings, which show a not limiting embodiment of the invention.

[0013] Figure 1 shows the device actuator 4, fixedly secured to the guide 1 by the rotation pin 8, in retracted position.

[0014] Figure 2 shows the device actuator 4, fixedly secured to the guide 1 by the rotation pin 8, in the released position.

[0015] Figure 3 shows the device actuator 4, in the retracted position, with the switch 20 in off position 20a and the electromagnet 21 contact 21 a in off position. In such condition the elevator is able to move normally with nobody in the pit.

[0016] Figure 4 shows the device actuator 4, in the released position, with the switch 20 in off position 20b and the electromagnet 21 contact 21a in on position. In such condition the elevator is able to move in inspection mode only and only up to a predetermined height from the pit, allowing the presence of somebody into the pit.

[0017] Figure 5 shows the device actuator 4, in the retracted position, with the switch 20 in off position 20b and the electromagnet 21 contact 21 a in on position again. Such condition occurs when the device actuator

4 is manually retracted and the remote resetting must still be actuated. In such condition the elevator cannot move normally.

[0018] Figure 6 shows the device actuator 4, in the retracted position, with the switch 20 in off position 20b and the electromagnet 21 contact 21 a in off position. Such condition occurs when the device actuator 4 is retracted by an electromechanical device, energized, as the electromagnet 21, by the remote resetting. Such condition also occurs when the device actuator 4 is manually retracted and the remote resetting has been actuated too. In such condition the elevator can move normally.

[0019] Figure 7 shows an example of a manually operating complete device integrated with the elevator system. The device actuator 4, fixedly secured to the guide 1 through the rotation pin 8, is in the retracted position, as it is constrained in position 16 by the wire 11, integral with lever 18. The spring 9, guided by the pin 10, is compressed. The red pilot light 14 on panel 12 is switched on, to show a dangerous condition (pit access forbidden). The needle 5 of the parachute safety device 6 mounted under the elevator arcade 13 is in neutral position, not being stressed the rod 3, connected by the lever 2 to the rod 7 of the needle 5. The elevator 13 can move across the shaft.

[0020] Figure 8 shows an example of a manually operating complete device integrated with the elevator system. The device actuator 4, fixedly secured to the guide 1 through the rotation pin 8, is in the released position, as the spring 9, guided by the pin 10, is not compressed, being the wire 11, integral with lever 18, constrained in the neutral position 17. The red pilot light 14 on panel 12 is switched off, while the green pilot light 15 is switched on, to show a safety condition (pit access allowed). The needle 5 of the parachute safety device 6 mounted under the elevator arcade 13 remains in the neutral position, until the elevator 13, in inspection motion, doesn't reach the safety distance H_{min}, when the actuator 4 interacts with the rod 3 causing, through the lever 2, the upward movement of the rod 7 of the needle 5, which blocks immediately the elevator 13 acting on the guide 1.

[0021] Figure 9 shows an example of an electromechanically operating complete device integrated with the elevator system. The device actuator 4, fixedly secured to the guide 1 through the rotation pin 8, is in the retracted position, as the electromagnet 23 is energized, being voltage on the circuit 19, and compresses the spring 9, guided by the pin 10. The needle 5 of the parachute safety device 6 mounted under the elevator arcade 13 is in the neutral position, not being stressed the rod 3, connected by the lever 2 to the rod 7 of the needle 5. The elevator 13 can move across the shaft.

[0022] Figure 10 shows an example of an electromechanically operating complete device integrated with the elevator system. The device actuator 4, fixedly secured to the guide 1 through the rotation pin 8, is in the released position, as the electromagnet 23 is not energized, not being voltage on the circuit 19, so the spring 9, guided by the pin 10, is free to reach its neutral position. The needle 5 of the parachute safety device 6 mounted under the elevator arcade 13 remains in the neutral position, until the elevator 13, in inspection motion, doesn't reach the safety distance H_{min}, when the actuator 4 interacts with the rod 3 causing, through the lever 2, the upward movement of the rod 7 of the needle 5, which blocks immediately the elevator 13 acting on the guide 1. In case of electromechanical control (see as example Fig. 9 and 10), in normal operation mode the device doesn't interact with the parachute during the elevator motion. At the end of each elevator stroke, the actuator puts itself in position 13.

[0023] The device essentially comprises a mechanical actuator, rotating between two defined positions referred to "retracted" (see Fig. 1) and "released" (see Fig. 2), which respectively means that "not interact" and "interact" with the parachute.

[0024] In the released position, the actuator is able to activate the parachute if the elevator car should reach a predetermined safety height.

[0025] The actuator movement can occur by manual (mechanical) or automatic (electromechanical) control.

[0026] Manual control (see as example Fig. 7 and 8) consists in an operation which the authorized person voluntarily performs in a safety place before entering into the pit, by acting on a lever which transmits the motion to the actuator, moving it to its released position and thus able to interact with the parachute. On leaving from the pit, the lever must be moved again to put the actuator in its retracted position and thus not able to interact with the parachute. The released position, in absence of external controls, is warranted by a spring, while the retracted position, by voluntary external control, provides that the spring is being compressed.

[0027] In case of manual control, in normal operation mode the device never interacts with the parachute. In case of main energy cut-off the device maintains its position, while in case of lever-actuator transmission system failure the spring allows the actuator to put itself in the released position and thus in the highest safety condition.

[0028] In case of electromechanical control (see as example Fig. 9 and 10), in normal operation mode the device doesn't interact with the parachute during the elevator motion. At the end of each elevator stroke, the actuator puts itself in the released position and thus able to interact with the parachute. In case of energy cut-off of the electromechanical transmission system, the spring allows the actuator to put itself in the released position and thus in the highest safety condition.

[0029] Whatever is the control condition, manual or electromechanical, during the inspection motion the actuator is always in released position and thus able to potentially activate the parachute.

[0030] Both positions, retracted and released, are

controlled by two electric contacts (see Fig. 3, 4, 5 and 6):

- if the actuator 4 is retracted (see Fig. 3), the spring back switch 20 is activated in position 20a and the electromagnet 21 contact 21 a remains in off position: such condition, transmitted to the control board, allows the elevator to move across the shaft.
- if the actuator 4 is released (see Fig. 4), the spring back switch 20 is activated in position 20b and the electromagnet 21 contact 21 a turns in on position: such condition, transmitted to the control board, prevents the elevator from moving normally across the shaft, allowing the inspection motion only until a predetermined height from the pit. At the end of maintenance operations into the pit, the system doesn't start up normally (see Fig. 5) until the electromagnet 21 is not remotely energized (see Fig. 6), closing the contact 21a.

[0031] In principle, the system according to the present invention considers two steps:

a) the access to the pit
b) the safety stay in the pit

[0032] The access to the pit provides for the manual opening with an emergency key of the lower floor door only, which operation activates a safety mechanism controllable and testable by an acoustic and/or visual device.

[0033] If the mechanism is manually controlled, the mechanism itself needs to be activated; if it is automatically controlled, the mechanism is independently activated by opening the floor door.

[0034] The second step, if the first one is verified, provides for the proper access and the stay in the pit, where is possible to operate in safety conditions, and also to move the elevator upward or downward maintaining a safety and easily adjustable height, according to the reference rule.

[0035] In the event that the elevator should fall for any reason, once reached the predetermined safety height, the mechanism's mechanical actuator would activate the parachute, stopping the elevator car.

[0036] After staying in the pit, if the mechanism is not manually controlled, is necessary to leave the shaft and to go to the room in which the restoring system is installed, from where it is possible, in voluntary manner, for instance using a proper key, to reset the safety system and restarting the elevator.

[0037] If the mechanism is manually controlled, before closing again the floor door the mechanism itself needs to be manually reset.

[0038] The safety test for accessing to the pit takes place in two different ways, according to whether the opening control, while the floor door is opened with the proper key, is provided.

[0039] If such a control is provided, not obviously applicable when the mechanism is manually controlled, it is integral with the key block of the floor door. The contact breakdown of the floor door involves the deactivation of the mechanism electromechanical device, which can be an electromagnet or a device with similar function, moving the actuator in released position and thus in safety condition. Leaving the shaft, to use the elevator again, the mechanism should be restored, as previously described, to retract the actuator and to restore safety contacts of the floor door and of the mechanism (detail 21 of Fig. 3).

[0040] If the opening control for the floor door is not provided, an audio-visual signal indicates a dangerous condition when the floor door is opened. Therefore the device needs to be activated manually or electrically, obtaining the operating condition change of state, from dangerous to safe, indicated by a proper permission pilot light and/or acoustic signalling.

[0041] However, leaving the shaft, the system must always be restored manually to use again the elevator.

Claims

1. A mechanism for activating the parachute in an elevator with reduced pit, when the distance between the bottom of the elevator car and the bottom of the pit decreases under a minimum safety value, wherein the operation of releasing and/or retracting said mechanism is made by a remote manual operation, performable from outside the elevator shaft.

2. The mechanism according to the preceding claim, wherein said manual operation acts on electric contacts which control an electromechanical device for releasing and/or retracting said mechanism.

3. The mechanism according to the preceding claim, wherein the electric contact operation for releasing said mechanism is caused by the manual unblocking, from outside the elevator shaft, of the floor door lock.

4. The mechanism according to the preceding claims, wherein the released and the retracted positions are electrically controlled.

5. The mechanism according to the preceding claims, wherein the achievement of the two provided positions, released and retracted, is signalled by an acoustic and/or visual device.

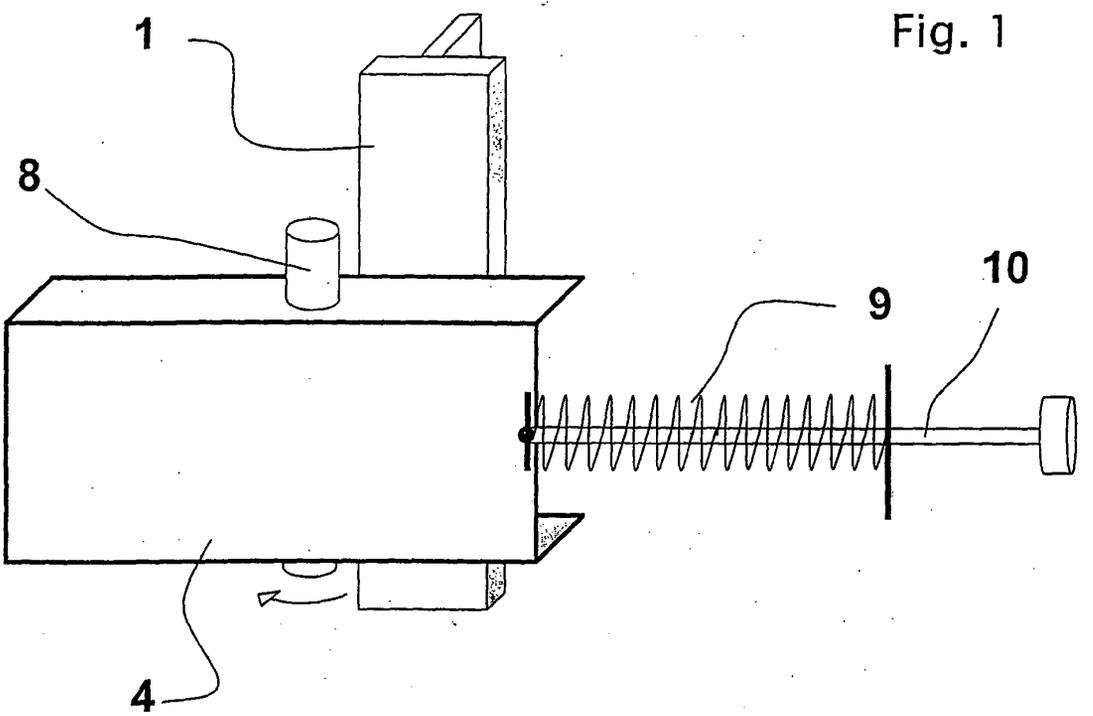


Fig. 1

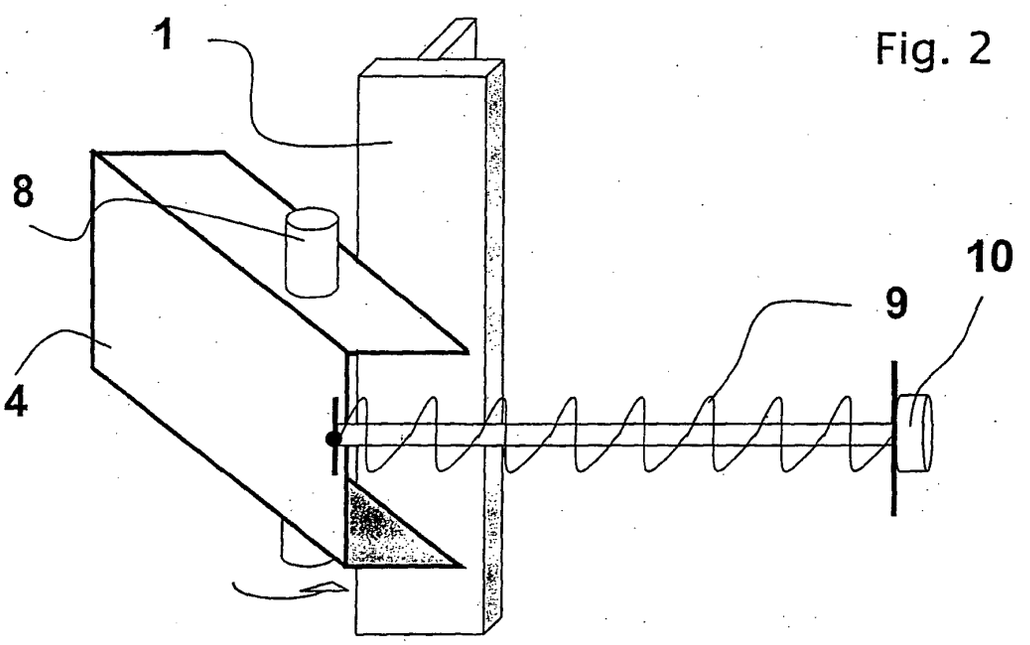


Fig. 2

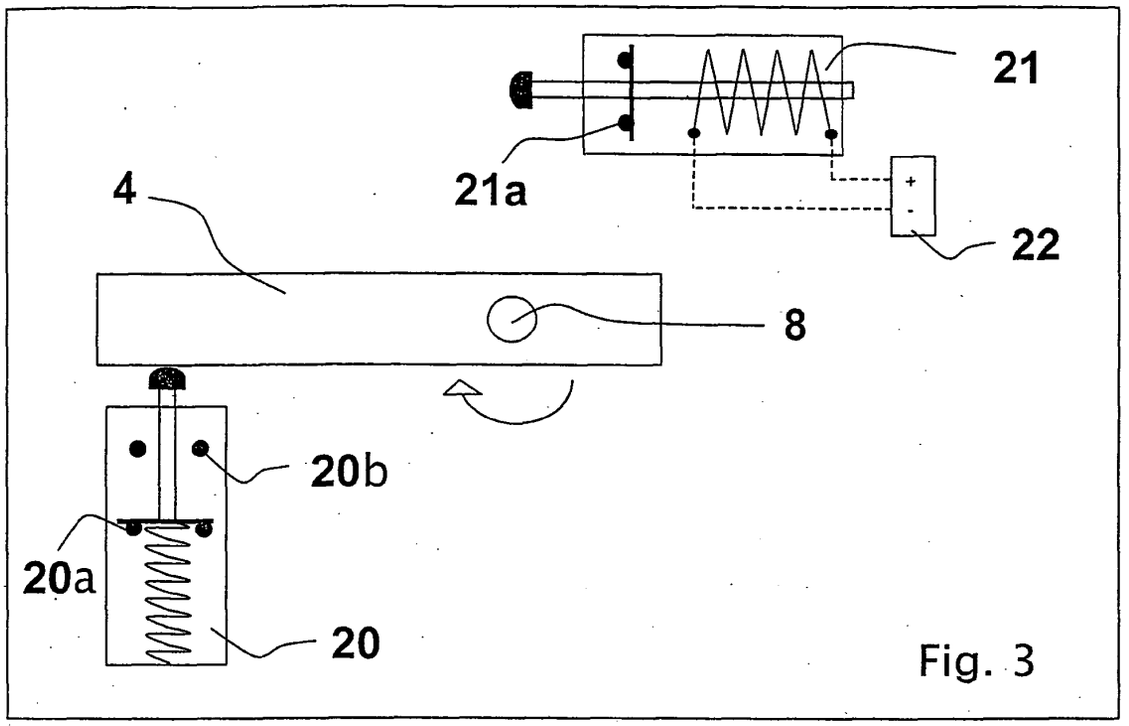


Fig. 3

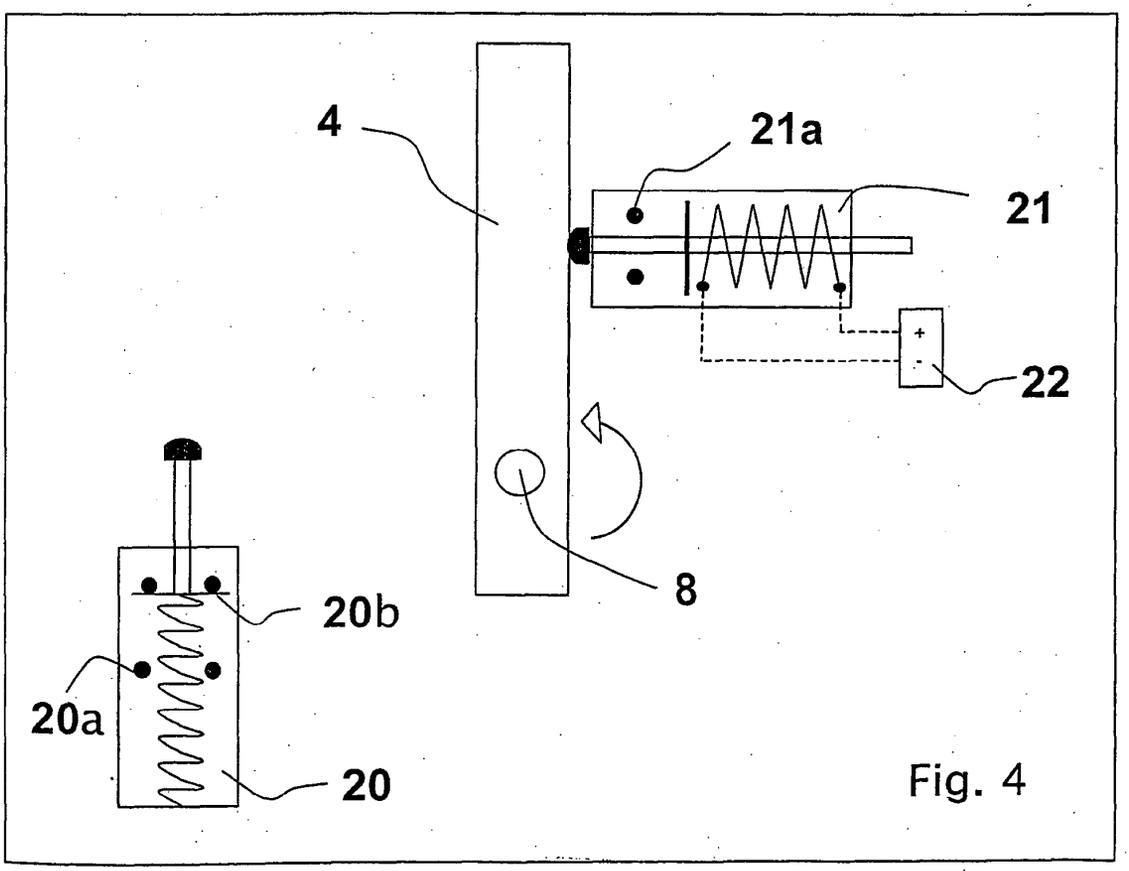


Fig. 4

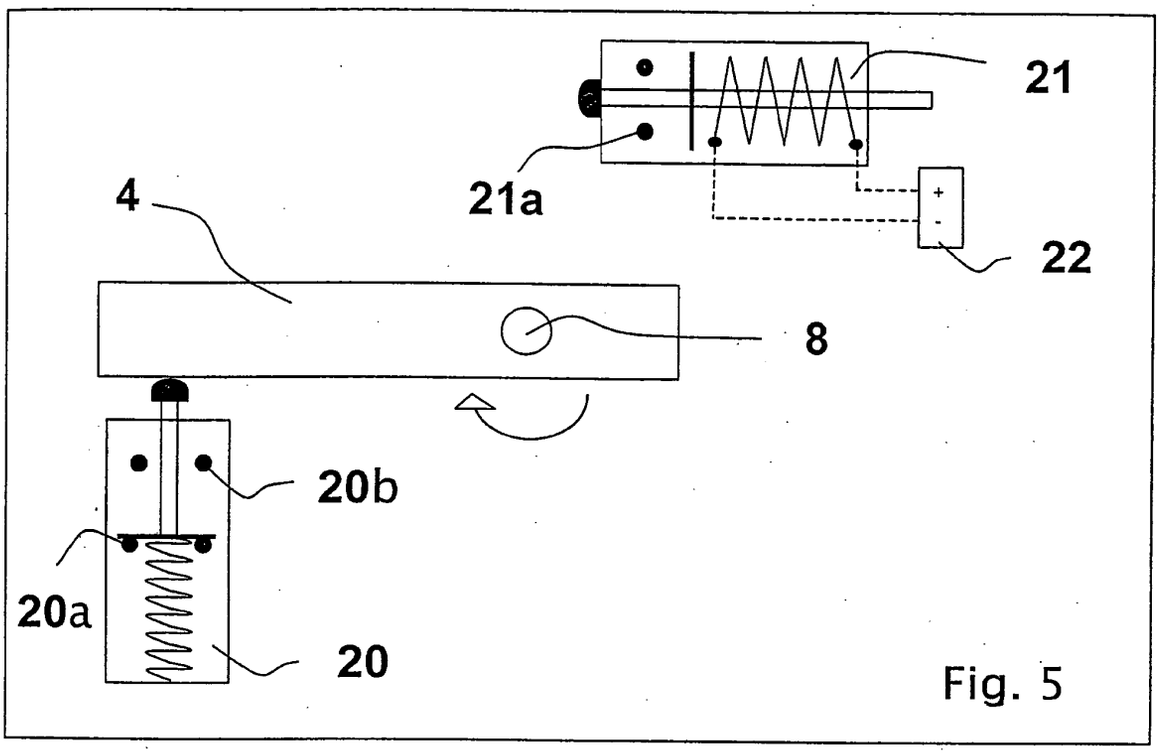


Fig. 5

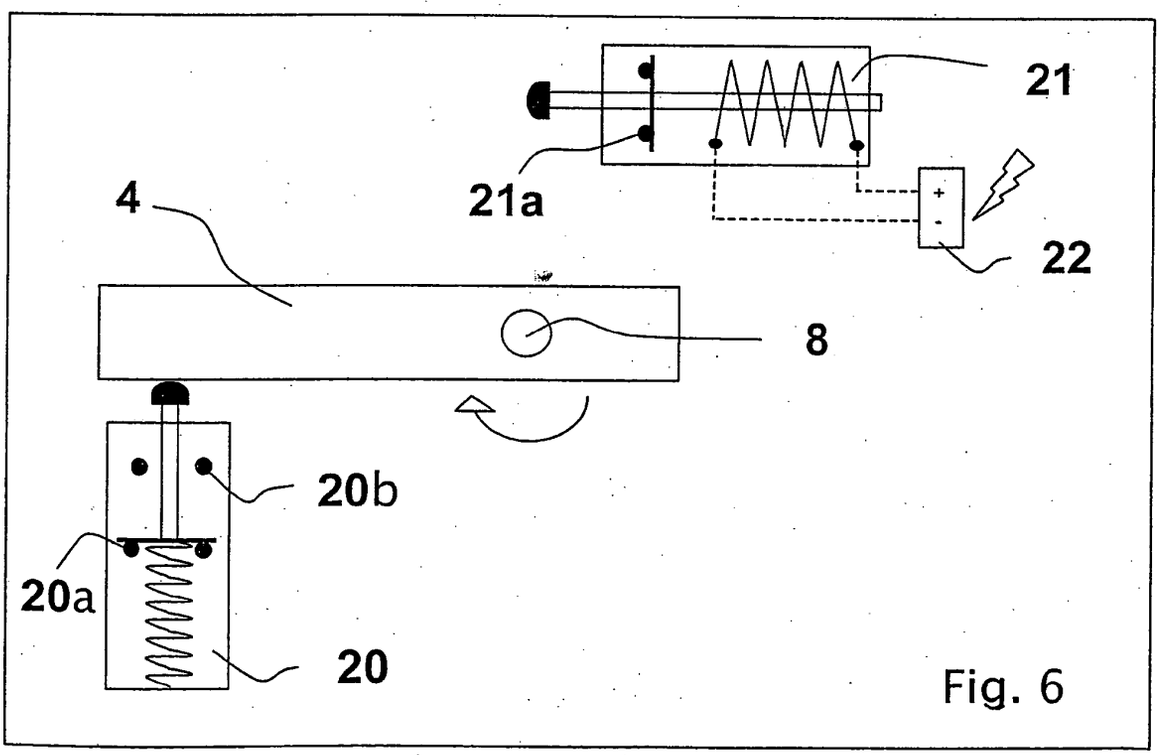


Fig. 6

Fig. 7

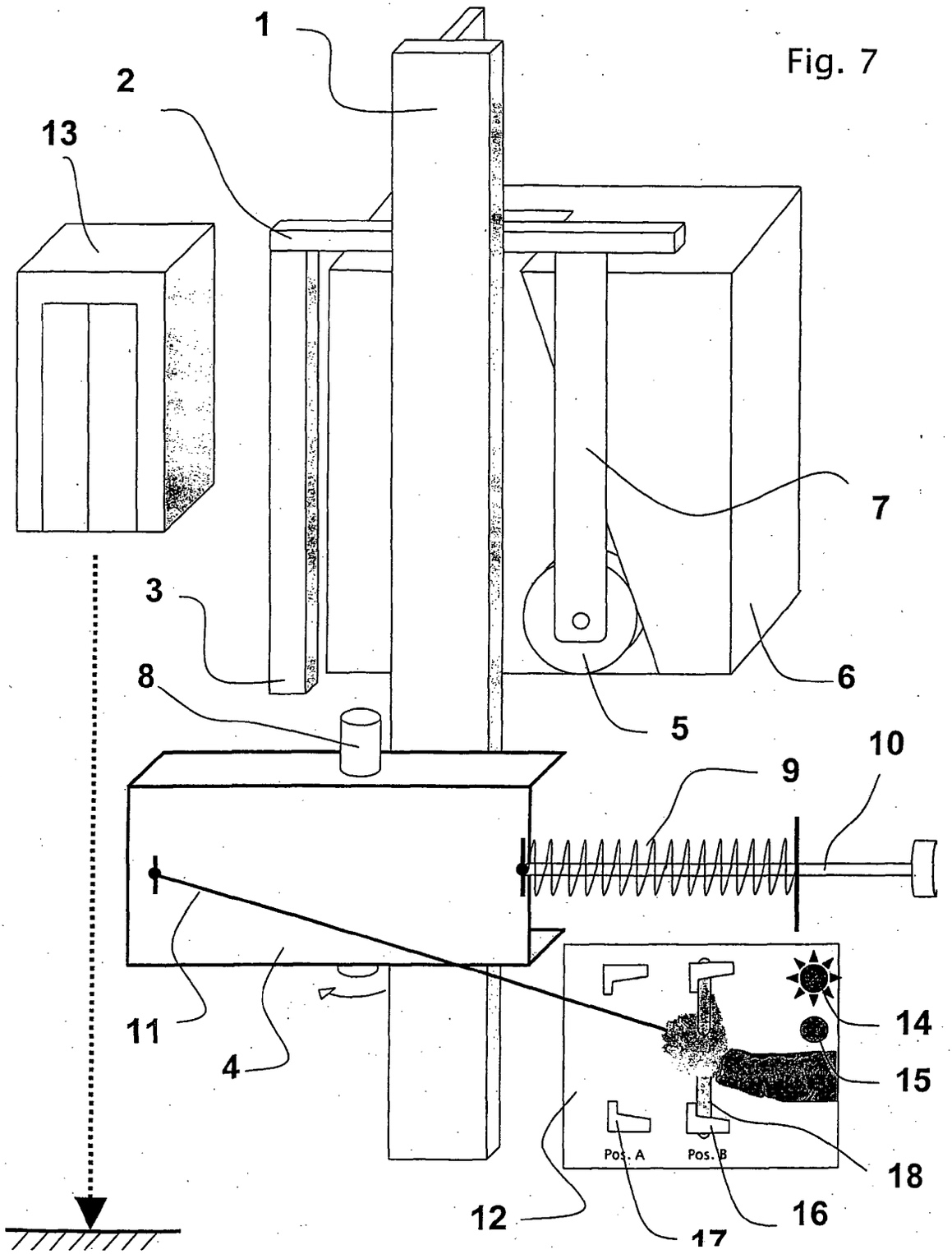


Fig. 8

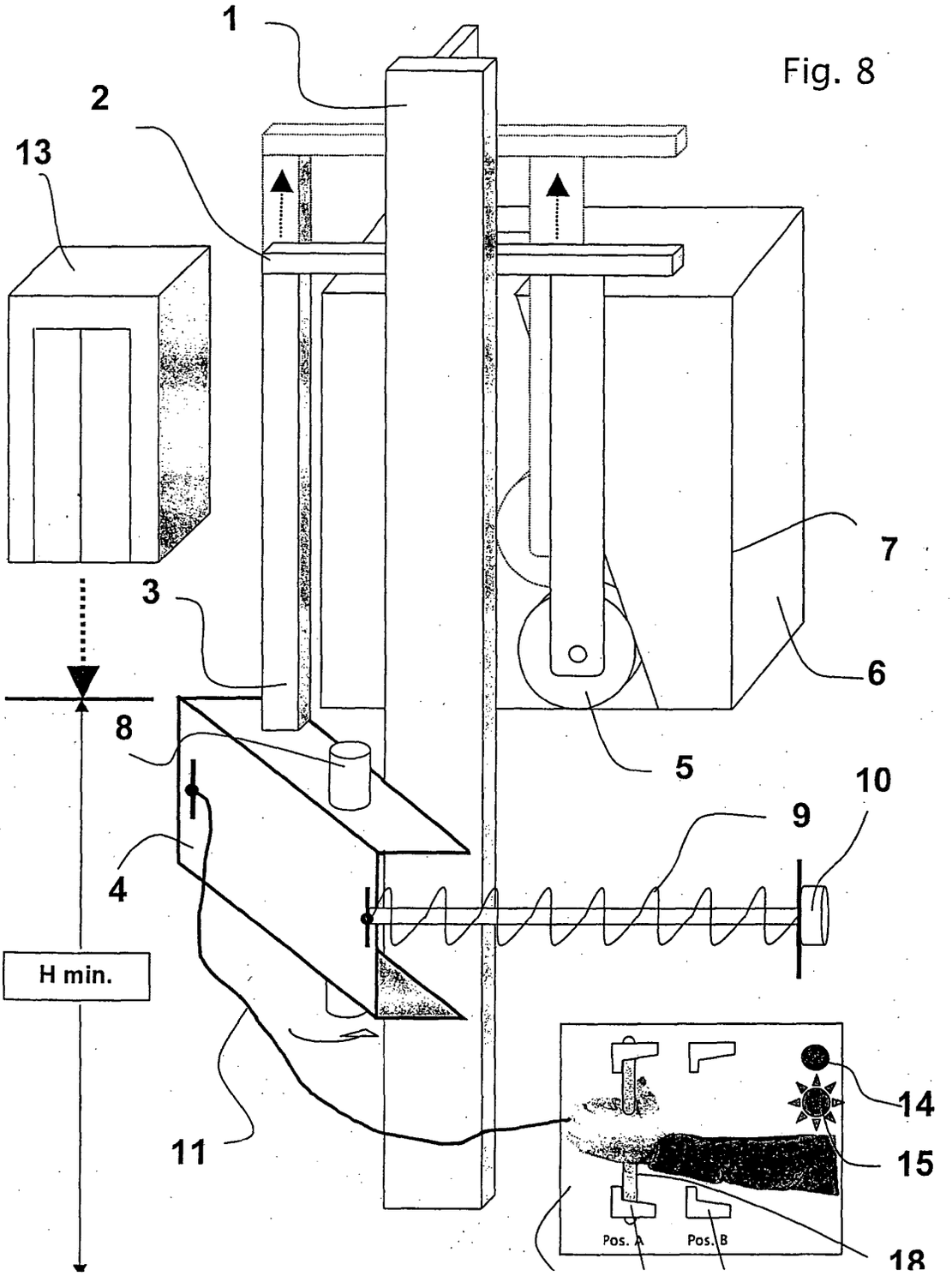


Fig. 9

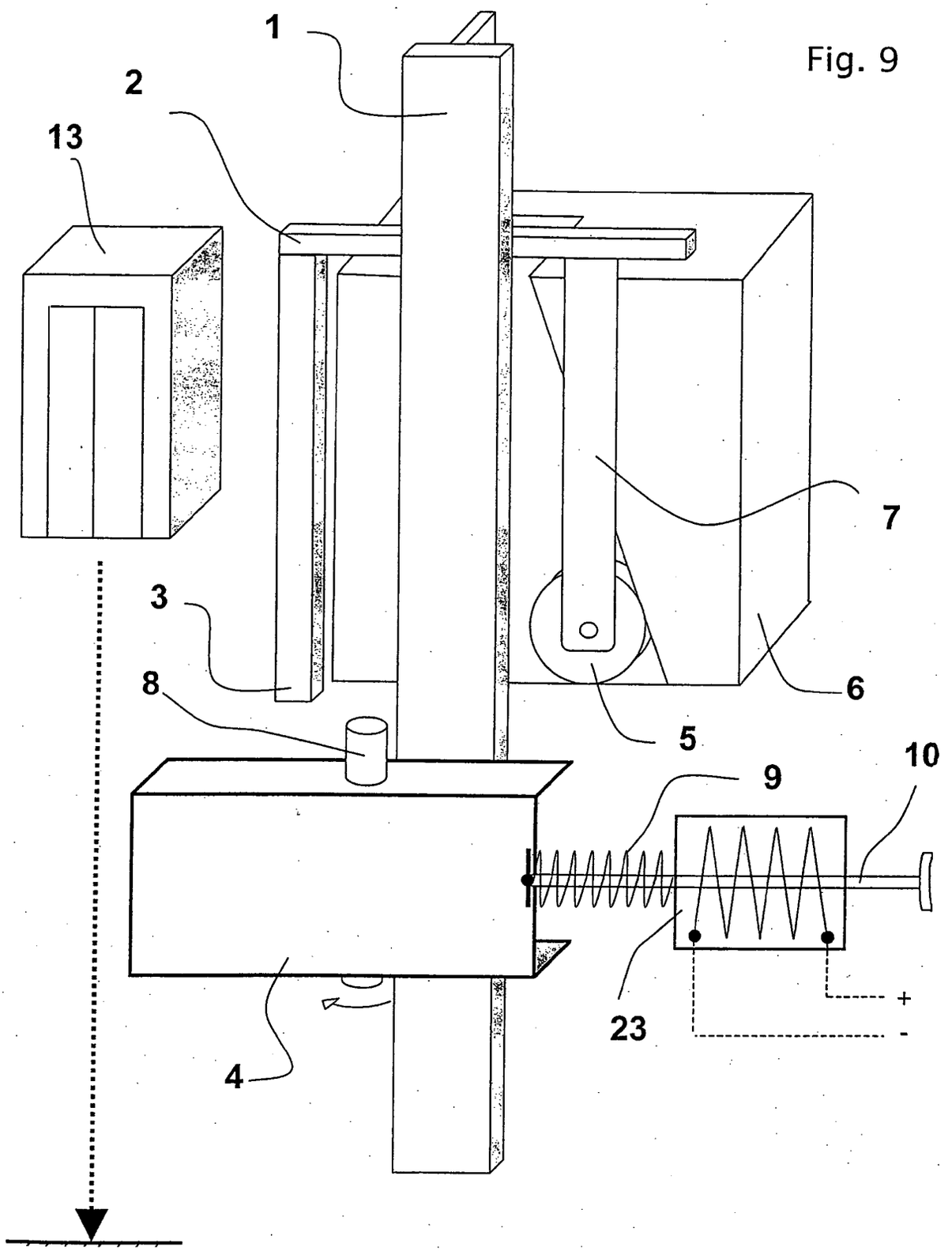
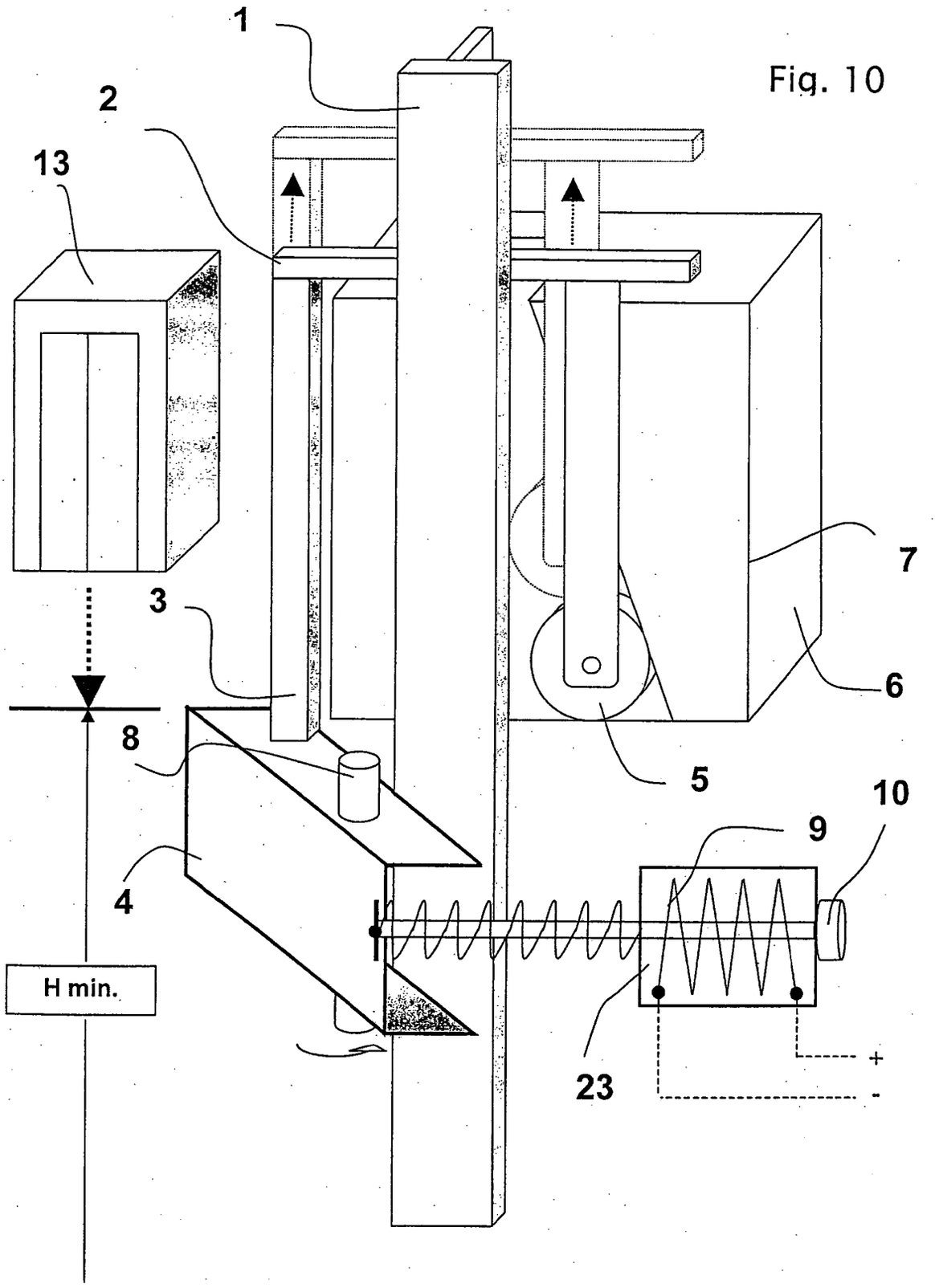


Fig. 10



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 07 8566

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	EP 0 662 445 A (KONE OY) 12 July 1995 (1995-07-12)	1,2,4,5	B66B5/16 B66B5/28
A	* column 5, line 6-29 * * column 7, line 39 - column 9, line 8 * ---	3	
A	US 6 138 798 A (MACUGA HENRY J) 31 October 2000 (2000-10-31) * abstract * -----	1-5	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)
B66B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	25 February 2004	Eckenschwiller, A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 03 07 8566

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.

25-02-2004

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0662445 A	12-07-1995	FI 94948 B	15-08-1995
		AT 179385 T	15-05-1999
		CN 1121037 A ,B	24-04-1996
		DE 69509265 D1	02-06-1999
		DE 69509265 T2	12-08-1999
		EP 0662445 A2	12-07-1995
		ES 2130453 T3	01-07-1999
		US 5565660 A	15-10-1996
US 6138798 A	31-10-2000	US 5806633 A	15-09-1998
		AU 2240397 A	17-07-1997
		WO 9723399 A2	03-07-1997

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82