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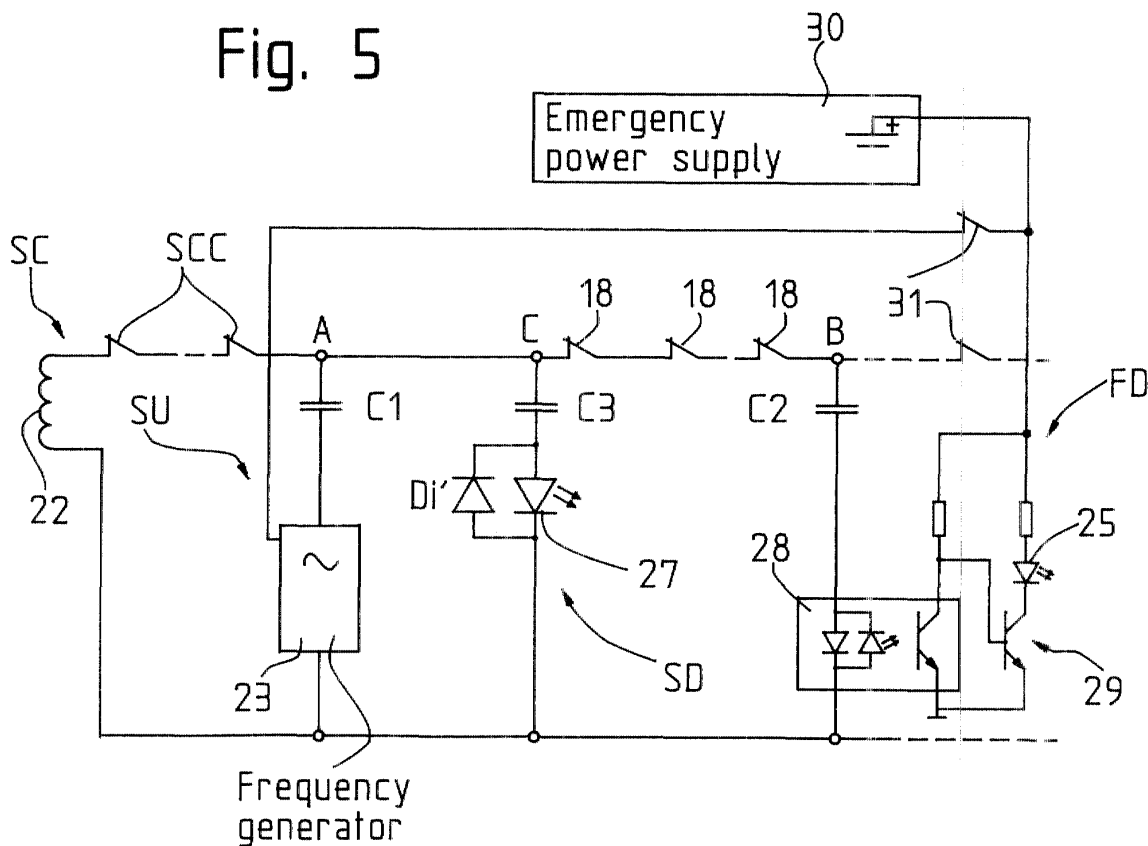
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(54) **Device for signaling the position of an elevator car in the case of passenger evacuation**

(57) The invention relates to a device for signaling the position of an elevator car (3) in the case of passenger evacuation comprising a measurement circuit (MC), which is connected to the landing door safety chain (SC)

of the elevator installation. The measurement circuit (MC) is provided with at least a LED (25) that indicates to the rescuer person the presence of the elevator car (3) at a floor (E1, E2).

Fig. 5



Description

[0001] The present invention relates to a device for signaling the position of an elevator car in the case of passenger evacuation, comprising a signal device, which indicates the presence of the elevator car at a landing door of a floor.

[0002] In the German utility model DE 296 15 921 U1 is described a device, which can be used for evacuating elevator passengers in a dangerous situation. The device is planned for elevator installations without machine room, whereby the drive unit is positioned in the elevator shaft. If the elevator car is stuck in the shaft, the brake will be manually released and the car can reach the next floor, where the elevator passengers can leave the car without danger. The actuation of the brake is done by means of an actuator placed on a landing zone, where is placed also the elevator control unit. By evacuation the elevator car moves without electric power by means of the unequal balance between the car with the load and the counterweight.

[0003] A problem of the known device is that the person, who actuates the brake must control the movement of the elevator car by means of the movement of the hoisting rope or the over speed governor rope. Such control need much experience and attention and can not be expected from an unpracticed person.

[0004] The present invention as defined in claim 1 proposes a device that solves all the above-cited problems and provides a device, which enables the evacuation of the elevator passenger safe, without danger.

[0005] An advantage of the present invention is to see in the fact, that the evacuation procedure is easy and could be made also by an unpracticed person. Another advantage is that no window in the wall of the shaft is needed to control the movement of the ropes and therefore of the car. Furthermore no markings are needed on the ropes. By the present invention no additional components in the shaft are needed, only conventional components of the elevator installation are used.

[0006] The invention is described in the following by the aid of a few embodiments by referring to the attached schematic drawings, which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

Figure 1 illustrates an elevator installation with the evacuation device according to an embodiment of the invention,

Figure 2 illustrates details of a door locking system of the elevator installation,

Figure 3 illustrates a circuit concept diagram of the signal device of present invention,

Figure 4 illustrates a circuit diagram of the signal device according to an embodiment of the invention,

Figure 5 illustrates a circuit diagram of the signal device according to another embodiment of the invention.

[0007] Figure 1 shows an elevator installation without machineroom. The device according to the present invention can be applied also by elevator installations with conventional machineroom. An elevator drive unit 1 with a drive sheave 2 moves an elevator car 3 and a counterweight 4 up and down in an elevator shaft 5 by means of ropes 6. The drive unit 1 is controlled by a drive control unit 7. The elevator car 3 moves along guide rails 8. A controller cabinet 9 provided with an elevator control unit 10 is positioned on the floor E2 near a landing door 11. The elevator control unit 10 is connected to the drive control unit 7 and via a traveling cable 12 to the elevator car 3. The elevator control unit 10 controls the movement of the elevator car 3 and ensures the safety of the elevator installation. In the controller cabinet 9 is also a turnable element or handle 13 installed, which is part of a mechanical power transmission element 14 consisting for instance in a axially rigid tube. One end of the power transmission element 14 is connected to the handle 13 and the other end of the power transmission element 14 is connectable with the drive sheave 2. In the example of figure 1 the elevator car 2 travels between two floors E1, E2. Obviously more than two floors can be also served by the car 3. In the door zone are arranged door zone elements 15. In the embodiment of figure 1 the door zone elements 15 are positioned on the top of each landing door 11 and they are operated by the interaction with a corresponding actuation element 16 located on the elevator car 3, preferably on a car door 17. When the car 3 arrives on a floor E1, E2 the corresponding actuation element 16 interacts with the door zone element 15. The presence of the car at that given floor is then therefore detected. The detection of the car 3 will then be communicated/ transmitted to the elevator control unit 10, as it will be described later. The interaction between the door zone element 15 and the corresponding actuation element 16 on the car 3 can for instance be mechanically, electrically or magnetically.

[0008] In a preferred embodiment the door zone elements 15 interact with a landing door safety contact 18 (see figure 2) located on each landing door 11. All the landing door safety contacts 18 are connected in serial and are part of the conventional safety chain SC, which takes care of the safety of the elevator installation. The state of the landing door safety contacts 18 is used by the signal device of the present invention to signalize the presence of the car 3 at a floor E1, E2.

[0009] Figure 2 shows a conventional landing door locking system, which is well known by a person skilled in the art and which is preferably used by the evacuation device of the present invention. The landing door 11 has a lock 19 linked to the landing door safety contact 18 that is closed when the landing door 11 is locked and is opened when the landing door 11 is unlock. The landing door 11 presents two roller 20 acting as door zone elements 15 and the car door 17 is provided with two clamps 21 acting as corresponding actuation element 16. The unlocking of the landing door 11 is actuated by the two clamps 21 of the car door 17 that push away the two rollers 20 mounted on the landing door locking system. When the car door 17 is lock, i.e. when the car is under power the two clamps 21 are closed and do not push on the two rollers. When the car door is unlocked (without power) the two clamps 21 open and push on the two rollers 20, that unlock the landing door, the landing door safety contact 18 is then opened.

[0010] Figure 3 shows a concept diagram of a measurement circuit MC used in the signal device of the present invention. The measurement circuit MC is on a small printed circuit board PCB and it is integrated into a conventional electric board of the elevator control unit 10. The measurement circuit MC has the objective to detect and signalize the opening of the landing door safety contacts 18. This indication is needed by the rescuer person performing the manual evacuation of the passenger in case of elevator failure. A safety chain supply 22 is connected serially to all the safety chain contacts SCC of the safety chain SC. All the landing door safety contacts 18 are connected in serial and form a chain of door contacts CC, which is therefore part of the safety chain SC. At the beginning of the chain of door contacts CC (first measurement point A) and between the safety chain SC and the earth potential PE (zero potential) is connected a supply circuit SU comprising a frequency generator 23 with a first coupling capacitor C1. The frequency generator 23 is also connected to a battery or accumulator 24. At the end of the chain of door contacts CC (second measurement point B) and between the safety chain SC and the earth PE, is connected a first detection circuit FD composed of a light emitting diode (LED) 25 and a second coupling capacitor C2. By the LED 25 is shown a diode Di in the other direction. The first detection circuit FD can also work with two LED's. If necessary the capacitors C1 and C2 could be serially connected also to resistors, which are not shown in the figure.

[0011] When all the landing doors 11 are locked, the chain of door contacts CC is closed. When the car 3 is in a door zone, a mechanical system, for instance as disclosed in figure 2, makes the coupling between the car door 17 and the landing door 11, so when the car door 17 is unlocked, it unlocks the landing door too. When there is no power on the car door operator, the car door 17 is unlocked. According to this principle, if the car 3 moves in the shaft 5 without power on the door operator, when it arrives in the door zone, the car door 17 will unlock the landing door 17 and the landing door safety contact 18 will open. By measuring the opening of the landing door safety contact 18, we can detect when the car is in the door zone.

[0012] To measure the opening of the chain of door contacts CC, a signal is introduced at the beginning of the chain of door contacts CC (point A) and the first detection circuit FD detects the presence of the signal at the end of the chain of door contacts CC (point B). The signal introduced at the beginning of the chain of contacts CC can be the safety chain supply 22 itself, if the main power is present or a signal given by a frequency generator 23 supplied by the battery 24, if there is no main power. The frequency generator signal is introduced on the safety chain SC by means of the first coupling capacitor C1 that protects the frequency generator 23 against the normal voltage with low frequency of the safety chain SC. In this way the frequency generator 23 can stay connected permanently to the safety chain SC. An activation switch 26 (see figure 4) to switch on the battery is optional. The second coupling capacitor C2 of the first detection circuit FD protects the LED 25 against normal voltage of the safety chain SC, and permit to keep the first detection circuit FD connected permanently. The first detection circuit FD and the frequency generator signal are defined so that the first detection circuit FD can work with both input signals: the normal safety chain supply signal and the frequency generator signal. The coupling capacitors C1 and C2 work as frequency depending resistors. Their resistance gets lower when the frequency gets higher.

[0013] Figure 4 shows a circuit diagram of the measurement circuit MC in a first embodiment. The chain of contacts CC is supplied by a small battery 24. The battery 24 may be activated by the activation switch 26. On principle the circuit diagram of figure 4 looks like the circuit diagram of figure 3, the difference consisting in a second detection circuit SD positioned at a third measurement point C, at the beginning of the chain of door contacts CC, the point C lying on the same potential as the first measurement point A. The second detection circuit SD is positioned parallel to the supply circuit SU. The second detection circuit SD is connected to the safety chain SC and to the earth potential PE and it is provided with an additional LED 27 and a third coupling capacitor C3. By the additional LED 27 is present an additional diode Di' in the other direction. Also here two LED's can be used. If necessary the third capacitor C3 can be also serially connected to another resistor, not represented.

[0014] In operation the additional LED 27 of the second detection circuit SD indicate that the measurement circuit MC is working, the LED 25 of the first detection circuit FD indicate that the car 3 is not at floor, i.e. if LED 25 is on then the car is not at floor, if LED 25 is off then the car is at floor.

[0015] The elevator installation can be provided with a recall control station, not represented, located in the controller cabinet 9. The recall control station can be operated for instance by aid of an up and a down button.

[0016] The elevator shaft 5 is provided, as conventional, with shaft information elements KS, not represented, which

are used by the elevator car 3 to recognize its position in the shaft 5. The shaft information elements KS can for instance serve to see if the car 3 is in a deceleration zone or in the door zone. An indication device ID, connected to such shaft information elements KS, is located on the electric board of the controller cabinet 9. The indication device ID lit on in two cases: When the car is in the door zone and when the car is between two deceleration points. The indication device may be a further LED.

[0017] By the embodiment of figure 4 the evacuation procedure contains following steps:

Without main power:

- Switch on the battery 24 by the activation switch 26. The battery is now connected.
- Move the car 3 slowly from the control cabinet 9 by checking the LED 25 and the additional LED 27. If the additional LED 27 is on, the device is working.
- Move the car until the LED 25 switches off. That indicates the car is at the floor.
- Switch off the battery 24.

With main power:

- No need to switch on the battery 24, it is working with the safety chain supply 22, but if it is switched on, it would cause no problems.
- Check the LED 25 and the additional LED 27.
- Move the car 3 with the recall control station until the LED 25 switches off. To see that the LED 25 switches off, it is necessary to release the recall control station.
- To find the door zone, move the car 3 10 cm at a time or look at the further LED of the indication device ID of the shaft information elements KS when it is on.
- If by releasing of the recall control station the LED 25 of the first detection circuit FD does not switch off, then continue to move the car with the recall control station until the next shaft information element KS. Then release the button and check the LED 25 (this time it should go off).

[0018] Figure 5 shows a circuit diagram of the measurement circuit in a second implemented embodiment. The first detection circuit FD is composed of one LED 25 connected to the second coupling capacitor C2 by means of an opto-coupler 28 and an inverter transistor 29. The inverter transistor 29 serves to have the LED 25 lit on in the door zone and off outside the door zone. In that way the indication of the presence of the car 3 at a floor is signalized in a non-ambiguous way. The second coupling capacitor C2 is dimensioned so that the measuring circuit MC receives about the same nominal current with both signals, i.e. the signal of the safety chain supply 22 and of the frequency generator 23. A second detection circuit SD is connected on the input of the chain of contacts CC at the third point C, in order to check the presence of the signal, i.e. the functioning of the measurement circuit MC. The frequency generator 23 is supplied by an emergency power supply 30 of the elevator (12VDC). As the connection of the emergency power supply 30 with the frequency generator 23 is not part of the safety chain SC, it is cut in normal operation by a double safety contact 31 activated by the handle clutch system in the controller cabinet 9. When the handle 13 is engaged, the double safety contact 31 connects the emergency power supply 30 to the frequency generator 23 and opens the safety chain SC after the measurement circuit MC, i.e. after the second measurement point B. This also avoids that the measurement circuit MC discharges the emergency power supply 30 when not needed. When the double safety contact 31 disconnects the emergency power supply 30, it closes the safety chain SC after the measurement circuit MC, so the safety chain SC is available. When the double safety contact 31 connects the emergency power supply 30 the safety chain SC is disconnected after the measurement circuit MS. In this case the safety chain SC is not required, the elevator is actually operated manually. The LED 25 of the first detection circuit FD is permanently supplied by the emergency power supply 30 in order to work with the recall control station procedure. The opto-coupler 28 is needed to galvanically isolate the emergency power supply 30 from the safety chain SC

[0019] In this embodiment two evacuation procedures are possible:

- a) With the recall control station: if there is main power and the recall control station is available and working.
- b) With the manual handle 13 when there is no main power, or if the procedure a) does not work.

[0020] Evacuation with manual handle 13:

- Engage the manual handle 13
- Check that the additional LED 27 of the second detection circuit is on
- Move the car 3 by turning the handle 13 in the preferred direction (depending on the car load) until the LED 25 of

the first detection circuit is on.

- The landing door 11 can now be opened manually and the passengers can evacuate.

Evacuation by aid of the recall control station:

[0021] With the recall control station, when the car 3 moves, the car door 17 is locked, so it will not unlock the landing door 11 by arriving at a floor and it is not possible to see the LED 25 on. To overcome this, it is necessary to use the indication device ID of the shaft information elements KS on the electric board (processor PCB) as described above.

[0022] The procedure is as follows:

- Check that the additional LED 27 is on
- Connect the Recall control station and switch it in recall mode
- Move the car 3 by pressing the up or down button until the further LED of indication device ID on the electric board is on
- Release the up or down button and check the LED 25
- If LED 25 is on, the car is in the landing zone, and the landing door can be opened manually and the passengers can evacuate.
- If the LED 25 is off, repeat the procedure by moving the car 3 until the next shaft information element (repeat this procedure from third step on).

[0023] The measurement circuit should be built to respect the following requirements:

- No device can be connected in parallel on the safety chain SC.
- The measurement circuit must be able to work with and without power
- The rescuer person has not to perform any special action to activate the circuit.
- The car in door zone indication should be indicated in a non-ambiguous way.

[0024] For the LED 25 and the additional LED 27 can be used a red LED respectively a yellow LED or viceversa. The LED's 25, 27 are low consumption LED, preferably they work with a current of 1 mA. The capacitors and the resistor have to been chosen, so that a current of 1mA can always pass therethrough for operating the LED's.

[0025] In the following is given examples of the calculation method to find out the values of the components of the measurement circuit MC.

[0026] The values of the coupling capacitor C1, C2 and C3 are such as the normal safety chain supply (U_n, F_n) generates the nominal current I in the LED 25 of the first detection circuit FD, whereby: U_n : Tension of the normal safety chain supply and F_n : Frequency of the normal safety chain supply.

$$\Rightarrow C2 = 1 / (2 \pi F_n Z) \quad \text{with } Z = U_n / I$$

[0027] To have the same current in the additional LED 27, $C3 = C2$ and let's chose $C1=C2$

[0028] The frequency of the generator 23 must be such as to generate the nominal current I in the LED 25 when there is no normal safety chain supply.

$$\Rightarrow (1 / (2 \pi F_b C1) + 1 / (2 \pi F_b C2)) \cdot I = U_b$$

$$\Rightarrow F_b = I / (\pi C2 U_b)$$

whereby: U_b : Tension of the frequency generator output signal and F_b : Frequency of the frequency generator output signal.

[0029] As example let's choose:

$$\begin{aligned} I &= 1 \text{ mA} \\ U_b &= 5 \text{ Vrms} \\ U_n &= 110 \text{ Vrms} \\ F_n &= 50 \text{ Hz} \end{aligned}$$

[0030] The formulas here above give:

$$C2 = 29 \text{ nF}$$

$$F_b = 2200 \text{ Hz}$$

[0031] It obvious to a person skilled in the art that the embodiments of the inventions are not restricted to the examples described above, but various modifications within the scope of the attached claims can be envisaged. For example instead of LED's also light bulbs or filament bulbs can be used, obviously with the corresponding necessary adaptations (like resistors and/or capacitors) of the measurement circuit. Also an acoustic signal could be applied. This acoustic signal can be used additionally to the light signal or alternatively to the light signal.

Claims

1. Device for signaling the position of an elevator car (3) in the case of passenger evacuation, comprising a signal device, which indicates the presence of the elevator car (3) at a landing door (11) of a floor (E1, E2), wherein the signal device is actuated by at least one door zone element (15) operated by the arrival of the elevator car (3).
2. Device according to claim 1, wherein the signal device comprises a measurement (MC) circuit on a printed circuit board integrated in an electric board of an elevator control unit (10).
3. Device according to claim 1 or 2, wherein the measurement circuit (MC) is connected to a safety chain (SC) of the elevator.
4. Device according to claim 3, wherein the measurement circuit (MC) comprises a supply circuit (SU) providing a frequency generator (23) with a first capacitor (C1) and/or a first detection circuit (FD) with a second capacitor (C2), each of the supply circuit (SU) and first detection circuit (FD) is connected to the safety chain (SC) and to earth potential (PE).
5. Device according to claim 4, wherein the measurement circuit (MC) comprises a second detection circuit (SD) with a third capacitor (C3) connected to the safety chain (SC) and to earth potential (PE).
6. Device according to claim 3, wherein the door zone element (15) interacts with a landing door safety contact (18) of the safety chain (SC).
7. Device according to any preceding claim, wherein the door zone element (15) is actuated by a corresponding actuation element (16) located on the elevator car (3).
8. Device according to any preceding claim, wherein the measurement circuit (MC) is provided with a light signal (25, 27) for indicating the presence of the elevator car at a floor.
9. Device according to claim 8, wherein the light signal comprises at least one LED (25, 27).
10. Device according to any preceding claim, wherein the measurement circuit (MC) is supplied by a battery or an accumulator.

Fig. 1

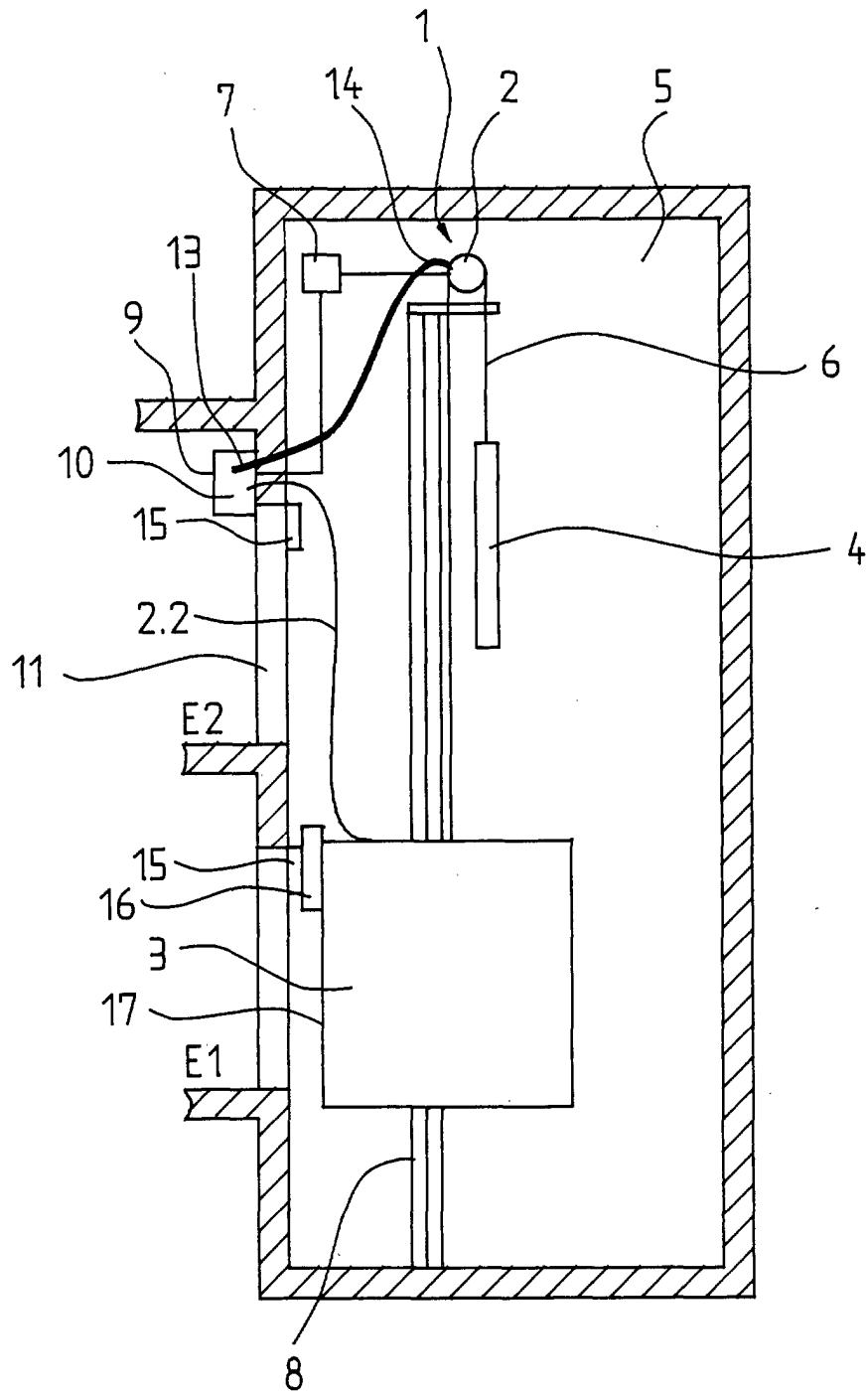


Fig. 2

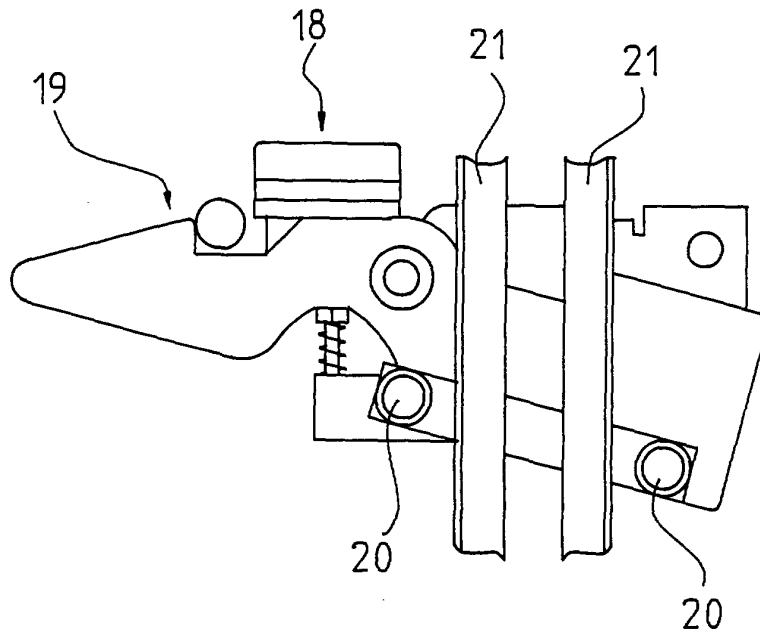


Fig. 3

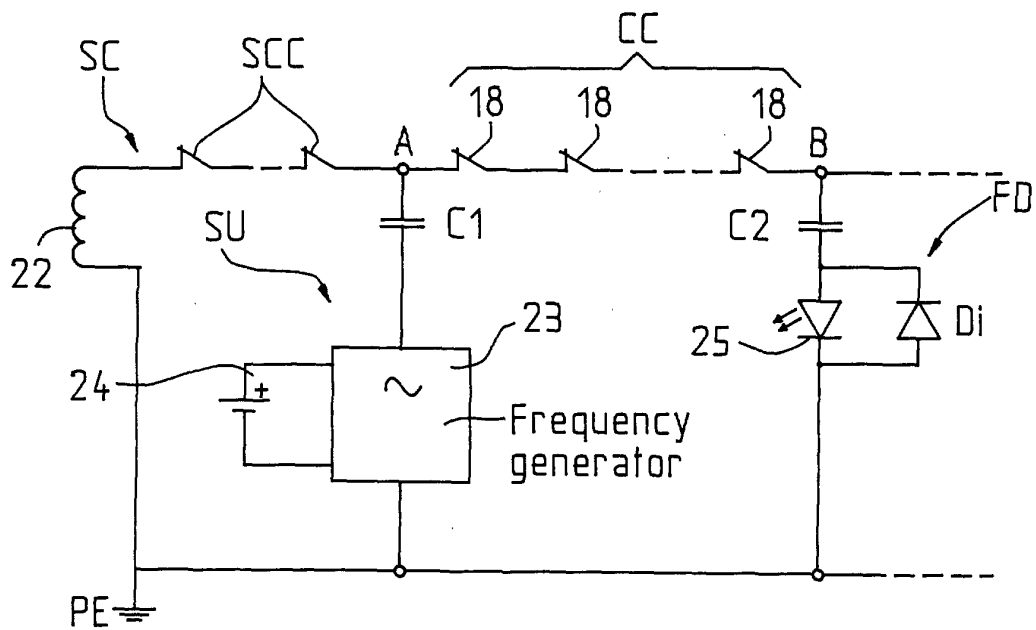


Fig. 4

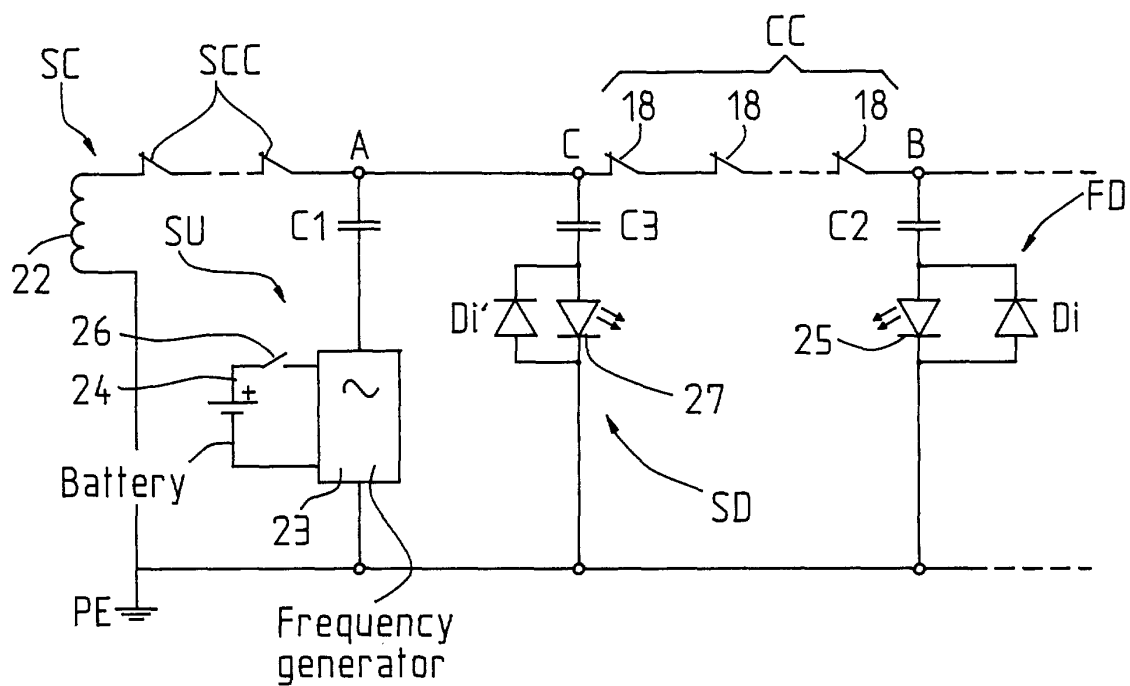
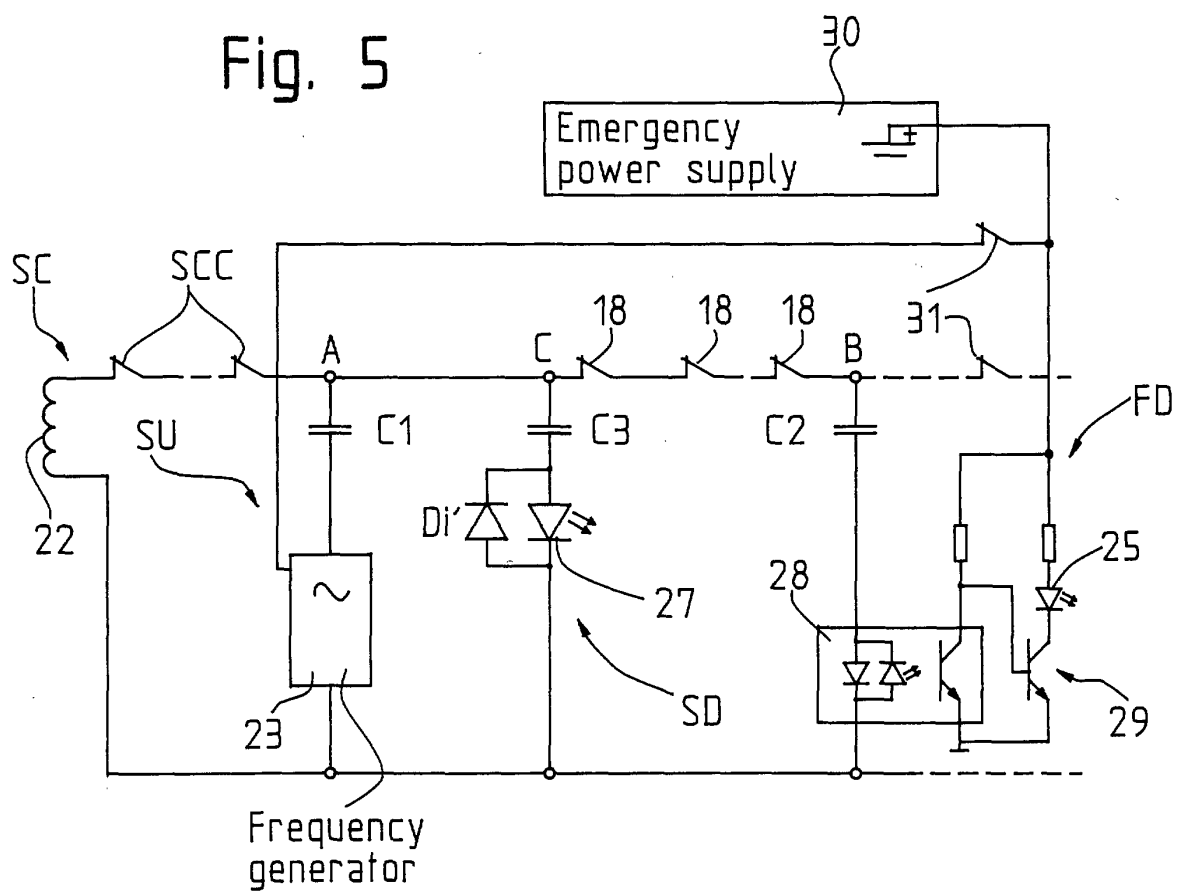


Fig. 5





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 10 9212

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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 13 June 2001	Examiner Salvador, D
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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