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DESCRIPTION

[0001] The object of this invention is a safety lock as defined in the preamble of claim 1, a method for fitting the safety lock into the safety arrangement of an elevator as defined in the preamble of claim 12, and also an elevator as defined in the preamble of claim 15.

[0002] Safety locks are used as a part of the safety arrangements of a building, e.g. in connection with the landing doors of an elevator. In this case monitoring appliances, with which the safety of the locking is verified, are needed in addition to the locking appliance in order to ensure safety. For example, elevator regulators require that the locking system of the landing doors of an elevator must be monitored both by measuring the status of the locking and by measuring the position of the landing door to be locked. The position of the landing door is conventionally measured with a separate safety switch, which is fitted to open under forced control when the landing door opens. The aforementioned safety switch is installed separately to the landing door.

[0003] Publication EP1441091 describes a safety lock, in which the operation of the manually-operated emergency release appliance is measured with a first safety switch and the locking is measured with a second safety switch.

[0004] Publication EP1473511 describes a measuring arrangement implemented with Hall sensors e.g. for monitoring the position of a landing door.

[0005] Publication EP1110900 describes a safety arrangement of the service spaces of an elevator shaft, wherein the safety device monitoring the position of the landing door is mechanically in connection with the door operator.

[0006] Further, document US1,896,541 relates to an electromechanical interlock for an elevator door having a bar which moves with the door upon a manually opening and closing thereof. Within the housing of the interlock installed on the wall side there is an electromagnet which when energized moves a catch lock which in turn releases a detent. In case the detent is released, the bar then can be manually moved to open the door.

[0007] The purpose of this invention is to disclose a new type of safety lock, in which both the monitoring of the locking and the measurement of the position of the landing door is done with a safety switch fitted inside the frame section of the safety lock. Another purpose of the invention is to present the fitting of a safety lock to the safety system of an elevator, more particularly in connection with the landing doors of the elevator.

[0008] The safety lock according to the invention is characterized by what is disclosed in the characterization part of claim 1, the method according to the invention for fitting the safety lock into the safety arrangement of an elevator is characterized by what is disclosed in the characterization part of claim 12, and the elevator according to the invention is characterized by what is disclosed in the characterization part of claim 15. Other embodiments of the invention are characterized by what is disclosed in the other claims. Some inventive embodiments are also discussed in the descriptive section of the present application.

[0009] The safety lock according to the invention comprises a frame section, and also a lock latch in connection with the frame section; additionally the safety lock comprises a catch lever guided via a guide interface, as well as a safety switch fitted inside the frame section. A beak part is made in connection with the guide groove of the lock latch, and the guide of the catch lever is fitted to move in the guide groove in relation to the lock latch in essentially the first position of the catch lever, and the guide of the catch lever is fitted to lock to the beak part in essentially the second position of the catch lever. A guide force, by means of which the catch lever can be moved to a second position, can be exerted on the catch lever via the guide interface. The guide interface can comprise e.g. a guide magnet fixed to the catch lever, which guide magnet exerts a force on the catch lever between the guide magnet and a countermagnet that is in the vicinity. The countermagnet can be e.g. in the door jamb of the landing door, in which case the guide magnet is fitted immediately facing the countermagnet when the door is closed, and when the door opens the aforementioned guide force ceases to be exerted. Similarly, the guide force can be achieved with e.g. a spring instead of a magnet. A safety switch in this context refers to a switch that opens under forced control, which can comprise one or more switch elements.

[0010] In one embodiment of the invention the lock latch comprises a guide part, which guide part comprises a guide surface and also a guide groove.

[0011] In one embodiment of the invention the safety switch comprises an operating lever of the safety switch, which operating lever of the safety switch is supported via a roller on the guide surface of the lock latch.

[0012] In one embodiment of the invention the catch lever is fitted to turn around its hinge point and the catch lever comprises a guide, which is fitted into a guide groove.

[0013] In one embodiment of the invention the catch lever comprises an arrester spring and also a closing magnet.

[0014] In one embodiment of the invention the safety lock comprises a countermagnet of the closing magnet fitted into the door jamb, the polarity of which countermagnet is repellent to the closing magnet.

[0015] In one embodiment of the invention the safety lock comprises a closing spring, which closing spring is fitted between the frame section and the lock latch.

[0016] In one embodiment of the invention the safety lock comprises an operating lever of the lock latch, which operating lever is fitted to transmit a force effect exerted on itself to turn the lock latch in relation to the hinge point.

[0017] In one embodiment of the invention the safety lock comprises a position switch (25), which is fitted to change its state on the basis of the position of the lock latch.

[0018] In one embodiment of the invention the lock latch comprises a separate guide part, which guide part is fixed elsewhere on the lock latch.

[0019] In one embodiment of the invention the safety lock comprises an electrical interface in the frame section.

[0020] In one embodiment of the invention the safety switch comprises a protective casing, as well as a first and a second switch element fitted inside the protective casing.

[0021] In the method according to the invention for fitting a safety lock in the safety arrangement of an elevator, a frame section is fitted to the safety lock, and also a lock latch in connection with the frame section; a catch lever guided via the guide interface is fitted to the safety lock; and also a safety switch is fitted inside the frame section of the safety lock; a beak part is made in connection with the guide groove of the lock latch; the guide of the catch lever is fitted to move in the guide groove in relation to the lock latch in essentially the first position of the catch lever; and the guide of the catch lever is fitted to lock to the beak part in essentially the second position of the catch lever; the safety lock is fitted to the landing door of the elevator; and also a signal comprising the position data of the first switch element of the safety switch is taken to the safety circuit of the landing doors of the elevator via the electrical interface of the frame section. The aforementioned signal comprising the position data of the first switch element can be any prior-art signal whatsoever that indicates the position of the switch. The signal can be an analog signal or a digital signal, in parallel or serial form, and it can be transmitted with a signal conductor or e.g. wirelessly, in which case the electrical interface of the safety lock also comprises a transmitter. The aforementioned first switch element can also be fitted into the serial circuit together with the first switch elements of the safety switches of the other landing doors, in which case the aforementioned switch elements together comprise the safety circuit of the landing doors.

[0022] In one method according to the invention the safety arrangement of the elevator is fitted to prevent, if necessary, movement of the elevator car by disconnecting the power supply to the elevator motor as well as by controlling the mechanical braking appliance of the elevator car on the basis of the position data of at least the first switch element of the safety switch; and the safety arrangement of the elevator is fitted to limit movement of the elevator car in the elevator shaft to outside the service spaces of the elevator shaft on the basis of the position data of at least the second switch element of the safety switch.

[0023] In one method according to the invention the signal comprising the status data of the position switch of the lock is taken to the control of the door operator of the elevator car via the electrical interface of the frame section; and the door operator of the elevator car is fitted to be controlled on the basis of the signal comprising at least the aforementioned status data of the position switch of the lock.

[0024] The elevator according to the invention comprises a safety lock fitted to a landing door of the elevator. The safety lock comprises: a frame section, and also a lock latch in connection with the frame section; a catch lever guided via a guide interface; and also a safety switch fitted inside the frame section. A beak part is made in connection with the guide groove of the lock latch, and the guide of the catch lever is fitted to move in the guide groove in relation to the lock latch in essentially the first position of the catch lever, and the guide of the catch lever is fitted to lock to the beak part in essentially the second position of the catch lever. The signal comprising the position data of the first switch element of the safety switch is taken to the safety circuit of the landing doors of the elevator via the electrical interface of the frame section of the safety switch.

[0025] In one embodiment of the invention the aforementioned safety lock comprises two safety switches, of which the first safety switch comprises the aforementioned first switch element and the second safety switch comprises the aforementioned second switch element. In this case both the first and the second switch element are fitted to change their switch status on the basis of the movement of the guide part of the lock latch.

[0026] With the invention at least one of the following advantages is achieved:

- Since it is possible by means of the safety lock to monitor both the locking and the position of the door to be locked, it is not necessary to install in the door a separate measuring arrangement of the position of the door required by the safety regulations.
- Since the safety switch can be enclosed as presented in the invention in a separate protective enclosure inside the frame section, the protection of the safety switch e.g. against dirt and moisture improves, in which case the reliability of the safety switch also improves.
- The safety lock according to the invention is structurally compact in all its dimensions, so that it is easy to fit in the door, also e.g. when modernizing existing doors to make them compliant with new safety regulations. In this case the mechanical interface of the lock can also be designed such that the lock fits into the existing fixing. The material of the frame section of the lock can also be selected freely, and it can be of steel, in which case the lock will be durable.
- The cover of the frame section of the lock can be made e.g. from transparent plastic, in which case the structure of the lock can be inspected visually without opening the frame section.
- The electrical interface of the frame section of the lock can be designed such that the lock can be fitted into the electrical control systems and the safety systems of the building, such as into the safety system of the elevator system as well as into the control system of the door operator of the elevator.
- Since the safety lock comprises a closing spring instead of a conventional closing weight, the position of the lock does not affect the closing force, in which case the position of the lock can be freely selected.
- Since the safety lock comprises a measurement of the position of a door, such as the landing door of the elevator shaft, from the safety switch fitted inside the frame section, it is possible by means of the safety lock to form monitoring information about a fitter moving into the elevator shaft, and then movement of the elevator car in the elevator shaft can be limited to outside the service spaces of the elevator shaft on the basis of the monitoring information.

[0027] In the following, the invention will be described in more detail by the aid of an embodiment with reference to the attached drawings, wherein

Fig. 1 presents a safety lock according to the invention.

Fig. 2 presents a safety lock according to the invention.

Fig. 3 presents the guide part of the lock latch according to the invention.

Fig. 4 presents a safety arrangement of an elevator according to the invention, in which is a safety lock according to the invention.

[0028] Fig. 1 presents a safety lock 1 according to the invention in the closed position. Fig. 2 presents a safety lock according to the invention in the open position. Fig. 3 presents a guide part 9 of the lock latch according to the invention. The safety lock is here fitted to the landing door of the elevator. The safety lock 1 comprises a frame section 2 and also a lock latch 4 in connection with the frame section. The lock latch is fitted to turn around its hinge point 5. The lock latch comprises a stem part 6, a beak part 7 and also a separate guide part 9, which is fixed elsewhere on the lock latch. The guide part 9 is here a separate plastic part to the rest of the lock latch 4 to facilitate manufacture, but it can also be integrated into the rest of the lock latch. The guide part 9 comprises a guide surface 10 and also a guide groove 11. A beak part 20 is made in connection with the guide groove 11. The safety lock also comprises an operating lever 24, of the lock latch, which operating lever is fitted to transmit the force effect exerted on itself to turn the lock latch in relation to the hinge point 5. This force effect can, e.g. in an elevator system, be achieved with the door motor of the elevator, in which case the operating lever 24 of the lock latch is in connection elsewhere to the door operator of the elevator. On the other hand the force effect can also be achieved e.g. manually with the emergency release appliance of the door.

[0029] The safety lock also comprises a catch lever 3, by means of which the lock latch 4 can be latched into the open position

when the door is open. The safety lock comprises a guide interface in which is a closing magnet 17 fixed to the catch lever. When the door is closed the pushing force from the counter magnet 19, which is fitted into the door jamb 18 at the position of the closing magnet, is exerted on the closing magnet 17. An arrester spring is fitted around the hinge point of the catch lever, which arrester spring in turn exerts a latching force on the catch lever 3 that opposes the pushing force of the closing magnet. When the pushing force of the closing magnet starts to be exerted on the catch lever 3, the catch lever turns to essentially its first position 21, in which case the guide 15 of the catch lever is able to move in relation to the lock latch 4 in the guide groove 11. In the case the lock latch can turn freely and the lock can be opened and closed.

[0030] When the lock is turned into the open position and the door is opened, the pushing force of the countermagnet 19 of the closing magnet fitted into the door jamb 18 ceases to be exerted. In this case the opposing latching force exerted on the catch lever by the arrester spring turns the catch lever essentially into its second position 22. Now the guide 15 of the catch lever moves to the beak part 20 in connection with the guide groove, and the catch lever 3 locks the lock latch 4 in the open position. The locking can be cancelled by closing the door and thus bringing the closing magnet 17 and the countermagnet 19 into the vicinity of each other, in which case the pushing force turns the catch lever into its first position 21, the guide 15 of the catch lever moves into the guide groove and the locking of the catch lever ceases.

[0031] The safety switch 8 comprises a first and a second switch element, that open under forced control, and in connection with these an operating lever 12 of the safety switch, which operating lever is supported via a roller 13 on the guide surface 10 of the lock latch. The operating lever 12 moves as the roller 13 moves along the guide surface when the lock latch is turned. When the lock latch 4 is in the closed position the lock beak 7 is out, locking the door. In this case the first and the second switch element of the safety switch 8 are closed. When the lock latch turns to the open position, the operating lever 12 of the safety switch moves according to the movement of the guide surface 10, and the change in position of the operating lever forces the switch elements of the safety switch open. In this case the opened switch elements inform that the lock latch is in the open position. This information is transmitted to the safety arrangement of the elevator, in which the information is compared to at least the control command of the car door of the elevator, and if the information does not match, the safety arrangement deduces that the landing door has opened to the elevator shaft. In this case movement of the elevator car in the elevator shaft is limited. One of the two switch elements of the safety switch 8 is also in the safety circuit of the landing doors, so that opening of the switch element disconnects the safety circuit of the landing doors. In this case driving with the elevator is prevented by disconnecting the power supply to both the brake control circuit 29, 31 of the mechanical brake and to the elevator motor 27.

[0032] Since the catch lever 3 locks the lock latch in the open position when the landing door is open, also the open switch elements of the safety switch 8 indicate the position of the landing door. The switch elements of the safety switch can change their state only after the landing door has closed, in which case locking of the lock latch is cancelled and the lock latch can be moved to the closed position.

[0033] The safety lock 1 also comprises a closing spring 23, which is fitted between the frame section 2 and the lock latch 4. The closing spring exerts a force on the lock latch 4, which force endeavors to keep the lock latch in the closed position. The position switch 25 presented in Fig. 1 is disposed in the safety lock such that when the lock latch 4 moves to the open position, the guide part 9 presses against the position switch, in which case the position switch 25 changes its state on the basis of the position of the lock latch 4.

[0034] Fig. 4 presents a safety arrangement of an elevator according to the invention. Here the elevator car 30 is moved in the elevator shaft 33 with an elevator motor 27 via elevator ropes. The power supply of the motor 27' is controlled with a frequency converter 28. In the safety arrangement safety locks according to the invention are fitted to the landing doors 26. The safety locks comprise safety switches 8 according to the invention, and the signal comprising the position data of the first switch element of each safety switch 8 is taken to the safety circuit 27 of the landing doors of the elevator via the electrical interface of the frame section 2. The safety circuit 27 in this embodiment of the invention comprises a safety circuit of first switch elements connected in series, and the first switch elements are connected to the safety circuit with conductors led through the electrical interface of the frame section of the safety lock. The signal comprising the position data of the second switch element of each safety switch 8 is taken by a conductor to the measuring circuit of the landing doors of the elevator via the electrical interface of the frame section 2 of the safety lock 1. The measuring circuit comprises a resistor 29 connected in parallel with each second switch element. The parallel connections of the resistors and the second switch elements are connected in series and connected to each other with conductors, and the position of the landing doors is determined by measuring the impedance of the serial circuit. The signal comprising the status data of the position switch element 25 of each safety lock 1 is taken, via the electrical interface of the frame section 2 of the lock, by a signal conductor to the control 32 of the door operator of the elevator car, and the control of the door operator receives information about the position of the landing door from the status data of the position switch 25.

[0035] The safety arrangement of the elevator is fitted to prevent, if necessary, movement of the elevator car 30 by

disconnecting the power supply to the elevator motor 27' as well as by controlling the mechanical braking appliance of the elevator car, such as a machinery brake 29' or a wedge brake 31 of the elevator car, on the basis of the position data of at least the first switch element of the safety switch 8. The safety arrangement of the elevator is also fitted to limit movement of the elevator car in the elevator shaft 33 to outside the service spaces of the elevator shaft on the basis of the position data of at least the second switch element of the safety switch 8.

[0036] The safety lock according to the invention can be used generally for locking the doors in any building whatsoever, especially in situations in which the safety regulations require locking and monitoring of the position of the door to be locked.

[0037] It is obvious to the person skilled in the art that the different embodiments of the invention are not limited solely to the example described above, but that they may be varied within the scope of the claims presented below.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- [EP1441091A \[0003\]](#)
- [EP1473511A \[0004\]](#)
- [EP1110900A \[0005\]](#)
- [US1896541A \[0006\]](#)

PATENTKRAV

1. Sikkerhedslås (1), der omfatter:
 - en rammesektion (2), og i forbindelse med rammesektionen:
 - en låserigel (4),
- 5 - en fangarm (3) styret via en føringsforbindelse, og
 - en sikkerhedsomskifter (8) fastgjort inde i rammesektionen (2)hvor en næbdel (20) er dannet i forbindelse med en føringsrille (11) af låserigelen (4), og ved at en føring (15) af fangarmen er tilpasset til bevæges i føringsrillen (11) i forhold til låserigelen hovedsagelig i en første position af fangarmen, hvilket
- 10 betyder en lukket position af fangarmen (3) i hvilken en låsning af låserigelen (4) er ophævet, **kendetegnet ved at** fangarmens føring (15) er tilpasset til låse til næbdelen (20) hovedsagelig i en anden position (22) i hvilken fangarmen (3) låser låserigelen (4) i en åben position.
2. Sikkerhedslås ifølge krav 1, **kendetegnet ved at** låserigelen (4) omfatter
- 15 en føring part (9), hvilken føringsdel omfatter en føringsflade (10) såvel som en føringsrille (11).
3. Sikkerhedslås ifølge krav 1 eller 2, **kendetegnet ved at** sikkerhedsomskifteren (8) omfatter en betjeningsarm (12) af sikkerhedsomskifteren, hvilken betjeningsarm af sikkerhedsomskifteren er støttet
- 20 via en valse (13) af låserigelens føringsflade (10).
4. Sikkerhedslås ifølge et hvilket som helst af de foregående krav, **kendetegnet ved at** det ovennævnte fangarm (3) er tilpasset til at dreje rundt om sit hængslingspunkt, og ved at fangarmen omfatter en føring (15), der er fastgjort ind i føringsrillen (11).
- 25 5. Sikkerhedslås ifølge krav 4, **kendetegnet ved at** fangarmen omfatter en spærrefjeder såvel som en lukkemagnet (17).
6. Sikkerhedslås ifølge et hvilket som helst af de foregående krav, **kendetegnet ved at** sikkerhedslåsen omfatter en kontramagnet (19) af låsemagneten fastgjort inde i dørkarmen (18), hvor kontramagnetens polaritet er
- 30 frastødende til låsemagneten (17).

7. Sikkerhedslås ifølge et hvilket som helst af de foregående krav,
kendetegnet ved at sikkerhedslåsen omfatter en betjeningsarm (24) af låserigelen, der er tilpasset til at overføre kraftpåvirkningen udøvet på den selv til at dreje låserigelen (4) i forhold til et hængslingspunkt (5).
- 5 8. Sikkerhedslås ifølge et hvilket som helst af de foregående krav,
kendetegnet ved at sikkerhedslåsen omfatter en positionsomskifter (25), der er tilpasset til at ændre sin tilstand på basis af låserigelens (4) position.
9. Sikkerhedslås ifølge et hvilket som helst af de foregående krav,
kendetegnet ved at låserigelen (4) omfatter en separat føringsdel (9), hvilken
 10 føringsdel er fastgjort andetsteds på fangarmen.
10. Sikkerhedslås ifølge et hvilket som helst af de foregående krav,
kendetegnet ved at sikkerhedslåsen omfatter en elektrisk interface inde i rammesektionen (2).
11. Sikkerhedslås ifølge et hvilket som helst af de foregående krav,
 15 **kendetegnet ved at** den ovennævnte sikkerhedsomskifter (8) omfatter et beskyttelseshus, såvel som et første og et andet omskifterelement fastgjort inde i beskyttelseshuset.
12. Fremgangsmåde til tilpasning af en sikkerhedslås (1) ind i en elevators sikkerhedsanordning, hvor:
- 20 - en rammesektion (2) tilpasses til sikkerhedslåsen (1), og også en låserigel (4) i forbindelse med rammesektionen,
 - en fangarm (3) ført via et føringsinterface (17, 19) tilpasses til sikkerhedslåsen (1), og
 - en sikkerhedsomskifter (8) fastgøres inde i rammesektionen (2) af
 25 sikkerhedslåsen,
 - en næbdel (20) dannes i forbindelse med en føringsrille (11) af låserigelen (4),
 - en føring (15) af fangarmen (3) tilpasses til at bevæges i føringsrillen (11) i forhold til låserigelen (4) i hovedsagelig en første position (21) af fangarmen, hvilket betyder en lukket position af fangarmen (3) i hvilken en låsning af
 30 låserigelen (4) er ophævet, og
 - fangarmens føring (15) tilpasses til at låse til næbdelen (20) i hovedsagelig en

anden position (22) af fangarmen, hvilket betyder at fangarmen (3) låser låserigelen (4) i en åben position,

- sikkerhedslåsen tilpasses til elevatorens skaktdør (26),
- et signal omfattende positionsdata for det første omskifterelement af

5 sikkerhedsomskifteren (8) føres til sikkerhedskredsløbet (27) af elevatorens skaktdør via rammesektionens elektriske interface.

13. Fremgangsmåde ifølge krav 12, **kendetegnet ved at:**

- signalet omfattende positionsdataet for det andet omskifterelement af sikkerhedsomskifteren (8) føres til elevatorens skaktdørs målekredsløb via

10 rammesektionens elektriske brugerflade.

14. Fremgangsmåde ifølge krav 12 eller 13, **kendetegnet ved at:**

- elevatorens sikkerhedsanordning tilpasses til om nødvendigt at forebygge bevægelse af elevatorstolen (30) ved afbrydelse af energitilførsel til en elevatormotor (27) såvel som ved styring af en mekanisk bremseanordning (29,

15 31) af en elevatorstol på basis af positionsdata for mindst det første omskifterelement af sikkerhedsomskifteren (8),

- elevatorens sikkerhedsanordning tilpasses til at begrænse bevægelse af elevatorstolen i elevatorskakten (33) til uden for elevatorskaktens servicenum på basis af positionsdata for mindst det andet omskifterelement af

20 sikkerhedsomskifteren (8).

15. Elevator, der omfatter en sikkerhedslås (1), ifølge krav 1, tilpasset til elevatorens skaktdør (26), **kendetegnet ved at** et signal omfattende positionsdata for sikkerhedsomskifterens (8) første omskifterelement føres til sikkerhedskredsløbet (27) af elevatorens skaktdør via et elektrisk interface af

25 sikkerhedsomskifteren.

DRAWINGS

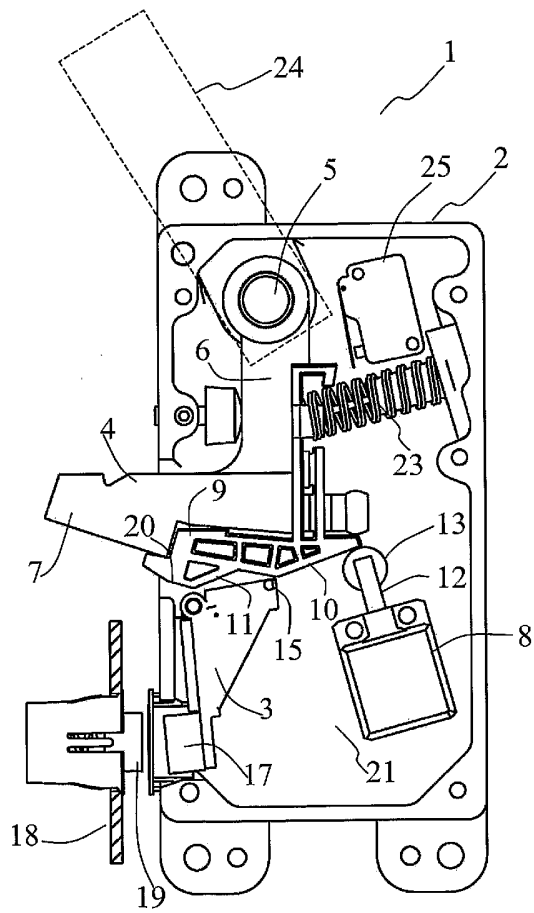


FIG. 1

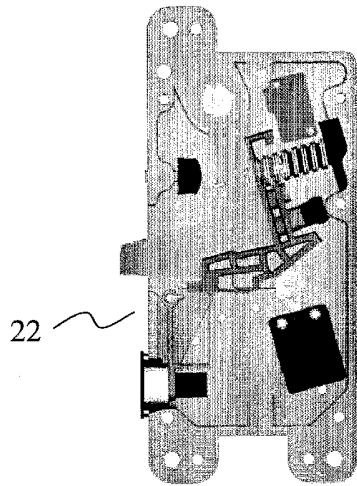


FIG. 2

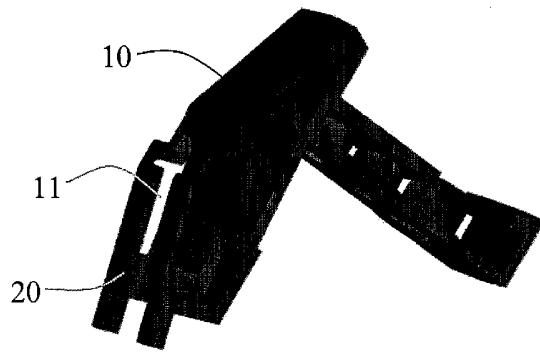


FIG. 3

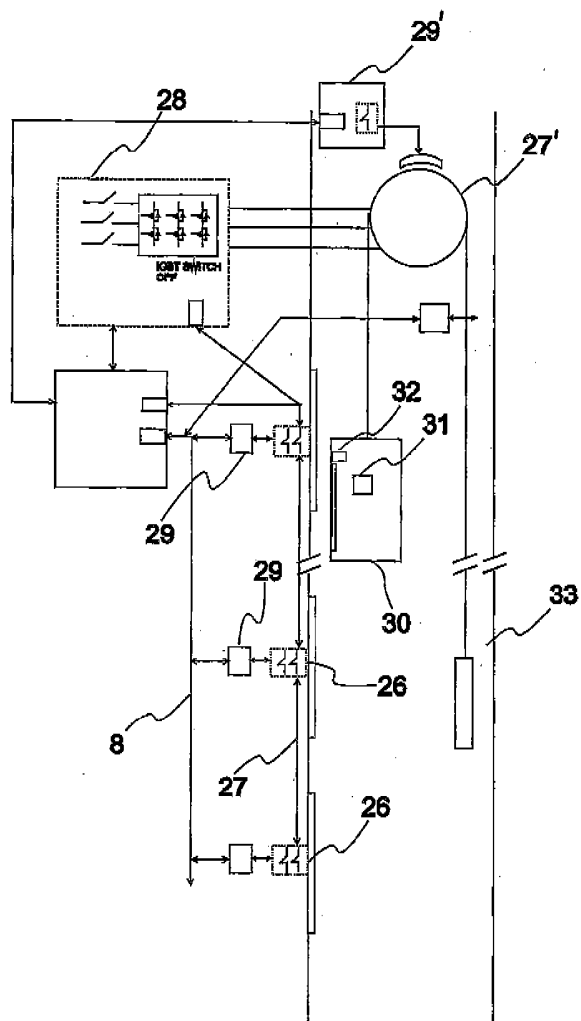


FIG. 4