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(54) Emergency drive unit for an elevator machinery

(57) An emergency drive unit (16) for an elevator motor, used to move an elevator by means of a drive unit and a gear rim mounted on the rotor disc (6). The drive unit consists of a drive motor (17). When the motor is started, the power of the motor is transmitted by means of a gear wheel (18) to the gear rim (19), placed in conjunction with the brake rim (20) on the periphery of the rotor (6). The emergency drive unit is provided with a drive unit containing buttons for moving the elevator in the up and down directions as well as the required means for locking the electric drive of the elevator. The drive unit may also consist of a manual latch placed on the gear rim.

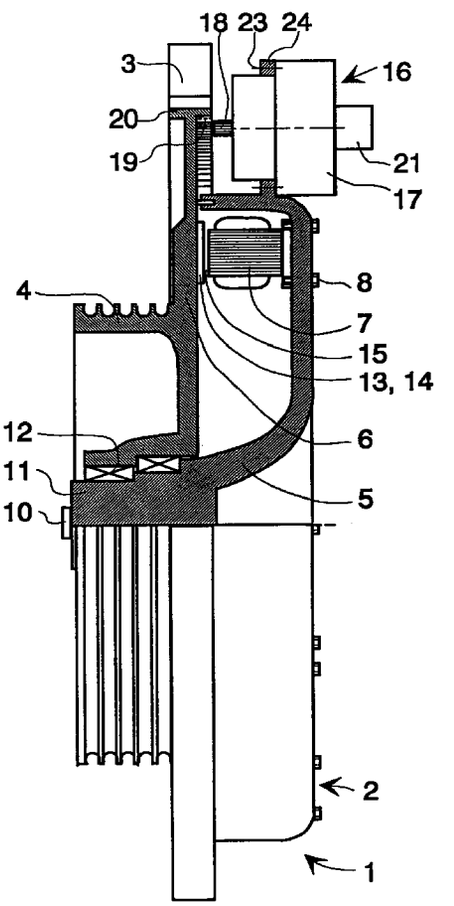

Fig. 1

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Description

The present invention relates to a device as defined in the preamble of claim 1 for driving an elevator machinery in an emergency, such as a power failure.

According to elevator regulations, when an elevator stops between floors, there must be a possibility to move the elevator car to a suitable floor. To achieve this, several methods are used, such as releasing the brake manually by means of a suitable tool. If the position and load of the elevator are such that the elevator will start moving, then releasing the brake is an applicable method. If the elevator and its counterweight are in equilibrium, it is necessary to rotate the elevator motor by means of a suitable device.

For this purpose, battery operated inverters can be used. However, they are expensive and more susceptible to failure than simpler electric drives and manual methods. Specification US 4,376,471 presents a solution based on the use of an inverter in an emergency. The inverter is used to drive the elevator motor, so it does not provide a solution to an interruption of operation caused by the motor.

The object of the present invention is to produce a simple and low-cost solution especially for driving an elevator motor provided with a discoidal rotor in an emergency, e.g. in a situation where the elevator car has stopped between floors.

To achieve the above objects, the device of the invention is characterized by what is said in the characterization part of claim 1. Other embodiments of the invention are characterized by the features presented in the other claims.

In the emergency drive unit of the invention, the rotor disc is provided with a gear rim which is driven by means of power transmission device, which in one of the embodiments of the invention consists of a manual drive latch. In another embodiment, the gear rim is engaged by a gear wheel driven by a motor, said gear wheel being driven by an application of a device used for the starting of combustion engines, known in itself. The emergency drive unit is very advantageous in respect of price and it is independent of the equipment controlling the elevator during normal operation.

In the following, the invention is described by the aid of two embodiments, in which

- Fig. 1 presents an electric emergency drive unit as provided by the invention, applied to a discoidal motor,
- Fig. 2 presents a manual emergency drive unit as provided by the invention,
- Fig. 3 presents a circuit diagram for the electric emergency drive unit, and
- Fig. 4 presents the manual emergency drive unit in side view.

Fig. 1 presents an elevator machinery 1 comprising an elevator motor 2 shown in a partly sectioned form, a brake 3, a traction sheave 4 and an emergency drive unit 16 as provided by the invention. The elevator motor 2 comprises a stator 5 and a rotor 6. The stator is a trough-shaped body of revolution with one side open, with a stator core packet 7 attached to it by means of fixing elements 8. Between the outer circles of the stator and rotor there is either a sliding seal or a labyrinth seal. The motor is fixed in place by the stator by means of fixing bolts 10. Bearings 12 are provided between the stator shaft 11 and the rotor 6. The rotor 6 is of a discoidal construction and its magnetization is implemented using e.g. permanent magnets 14 mounted in a circle on the rotor surface. Between the permanent magnets 14 and the stator core packet 7 is a planar air gap 15, the plane of which is perpendicular to the stator shaft 11. The traction sheave 4 is attached to the rotor 6.

The emergency drive unit 16 comprises a drive motor 17, a solenoid 21, and a power output of the motor, a gear wheel 18 and, attached to the rotor 6, a gear rim 19 by means of which the emergency drive unit 16 rotates the rotor 6. The gear rim 19 is placed on the inside of the brake rim 20. The drive motor 17 of the emergency drive unit 16 together with its auxiliary equipment is fixed to a flange 24 in the stator structure 5 by means of screws 23. The drive motor 17 with its auxiliary equipment is a starter motor, known in itself, as used for the starting of combustion engines, such as car engines, comprising the required motor, solenoid, switch and Bendix gear. The starter motors used in cars are generally direct-current series motors and are normally driven in one direction only. Fig. 3 shows a diagram of a reversing circuit designed for use in an elevator drive.

The operation of the emergency drive unit is as follows: Electric power is supplied to the drive motor 17 and solenoid 21, causing the gear wheel 18 to move onto the gear rim 19. At the same time, the brake 3 is released, with the result that the drive motor 17 begins to rotate the rotor and the elevator starts moving in a direction determined by the direction of rotation of the drive motor.

Fig. 2 presents an alternative placement of the gear rim together with a manual drive latch. The gear rim 19a is now placed beside the brake rim 20. The traction sheave 4, brake rim 20 and gear rim 19a are preferably manufactured as an integrated structure with the rotor 6. It is naturally possible in the case of both Fig. 1 and Fig. 2 to manufacture the gear rim as a separate part which is then attached to the rotor. In this embodiment, the gear rim is provided with wedge-shaped teeth (Fig. 4). In this case, the gear rim 19a is driven by a manual emergency drive unit 16a, which comprises a wedge-shaped latch 39 (Fig. 4), which is moved backwards and forwards by means of a manual lever 47. The power from the lever to the latch is transmitted by means of a flexible wire or wire cable 45 placed in a flexible tube 44. The emergency drive unit 16a is fixed to a flange 24 in the stator structure 5 by means of fixing elements 42, preferably screws.

Fig. 3 presents the circuit diagram of an electric emergency drive unit 16 designed for bidirectional operation. The operating voltage DC+ and DC- for the emergency drive unit is obtained from a d.c. source 26, e.g. a 12 V battery, via a main switch 27. The negative terminal DC- is not connected to earth because the change of running direction of the drive motor is effected by changing the polarity by means of two contactors 31 and 32. Connected in series with the coils of the contactors is a contactor 28 for locking the elevator drive 25. By pressing button 29, the elevator is driven upwards via contactor 31, and by pressing button 20, it is driven downwards via contactor 32. In each of these contactors, one contact 33 and 34 passes a current to the solenoid 21, which moves the gear wheel 18 into mesh with the gear rim 19 (Fig. 1-2). Starter motors usually have their own contact, which is not used in this circuit. The brake 3 is connected in parallel with the solenoid 21. In normal elevator operation, the brake receives its operating voltage through the elevator drive 25. In each contactor 31 and 32, the other two contacts, 35-36 and 37-38, form part of the reversing circuit, i.e. they change the polarity of the voltage supplied to the motor 17.

Fig. 4 presents a manual emergency drive unit 16a as seen from direction A shown in Fig. 2. Beside the brake rim 20 on the circumference of the rotor 6 is a gear rim 19a provided with wedge-shaped teeth. The gear rim is driven by a manual emergency drive unit 16a. The emergency drive unit comprises a wedge-shaped latch 39, which is moved back and forth by means of a manual lever 47. The power from the lever to the latch is transmitted by means of a flexible wire or wire cable 45 placed in a flexible tube 44, one end of the wire or cable being attached to the lever and the other to the latch 39. The emergency drive unit 16a is fixed to a flange 24 in the stator structure 5 by means of fixing elements 42. The lever 47 is pivoted on a base 46. The lever is turned back and forth in directions L and R, causing the wire 45 in the flexible tube 44 to move back and forth as well and therefore the latch to move with it. The latch is supported by a sleeve bearing 40 laid in the direction of the movement. The sleeve bearing 40 is pivoted on the frame 43 and provided with a spring 41. When the lever is pulled in direction R, the wire 45 draws the latch 39 and the tooth engaged by it, causing the rotor to turn through a corresponding distance and thus moving the elevator. When the lever is pushed in direction L, the latch rises over the wedge-shaped tooth of the gear rim and then slips down again, engaging the next tooth. The brake 3 of the elevator is released when the lever is pulled in direction R, and when the lever is pushed in direction L, the brake is closed by means of a separate device, e.g. a separate wire/tube arrangement or a separate electric control signal to the brake to release it. The elevator is driven in this manner until it has reached the desired landing. The manual emergency drive unit 16a is provided with a shifter enabling the whole emergency drive unit to be shifted up so that the wedge-shaped latch 39 is completely out of contact with the gear rim 19a. However, this shifter is not shown in the figures. The manual emergency drive unit 16a can additionally be provided with an arrester 48 to prevent the rotor 6 from turning backwards while the lever is being pushed in direction L. The arrester 48 is mounted with a joint 49 on the stator 5. A spring 50 is mounted between the arrester 48 and the stator 5 to press the arrester against the gear rim 19a. Using an arrester provides the advantage that the brake 3 need not be closed to prevent reverse rotation, but the brake can remain released all the time when the manual emergency drive unit is being operated.

It is obvious to a person skilled in the art that the embodiments of the invention are not restricted to the examples described above, but that they may instead be varied in the scope of the following claims.

Claims

1. Emergency drive unit for an elevator motor to move an elevator, said elevator motor comprising a stator (5) and a discoidal rotor (6) with a planar air gap (15) between them, the plane of which air gap is substantially perpendicular to the shaft (11) of the elevator motor (2), **characterized** in that the emergency drive unit (16) consists of a gear rim (19) attached to the rotor (6) and placed in conjunction with its periphery and a drive unit used to rotate the rotor (6) by means of the gear rim (19).

2. Emergency drive unit (16) as defined in claim 1, **characterized** in that the gear rim (19) is on the underside of a brake rim (20) placed in conjunction with the periphery of the rotor disc.

3. Emergency drive unit (16) as defined in claim 1, **characterized** in that the gear rim (19) is on the top side beside a brake rim (20) placed in conjunction with the periphery of the rotor disc.

4. Emergency drive unit (16) as defined in any one of claims 1 - 3, **characterized** in that the drive of the emergency drive unit (16) consists of a drive motor (17) provided with a direct current source (26), a solenoid (21) and a gear wheel (18), which gear wheel is moved in an emergency situation into mesh with the gear rim (19) by means of the solenoid and which drive motor (17) is supplied with direct current from the direct current source (26).

5. Emergency drive unit (16) as defined in any one of claims 4, **characterized** in that the emergency drive unit (16) is formed from a starter motor as used with combustion engines, known in itself.

6. Emergency drive unit (16) as defined in claim 4, **characterized** in that the direct voltage (DC+, DC-) of the d.c. source (26) is supplied to the drive motor (17) via a reversing circuit.

7. Emergency drive unit (16) as defined in any one of claims 1 - 3, **characterized** in that the gear rim (19a) is provided with wedge-shaped teeth and the emergency drive unit (16a) is of a manually operated type, having a wedge-shaped latch (39) engaging a wedge-shaped tooth, and that, to rotate the rotor (6), said latch is pushed and pulled by means of a wire (45) placed in a flexible tube (45) and a pivoted lever (47) connected to the wire.

8. Emergency drive unit (16a) as defined in claim 7, **characterized** in that the emergency drive unit (16a) is provided with an arrester (48) designed to stop the rotor (6) from turning in the other direction.

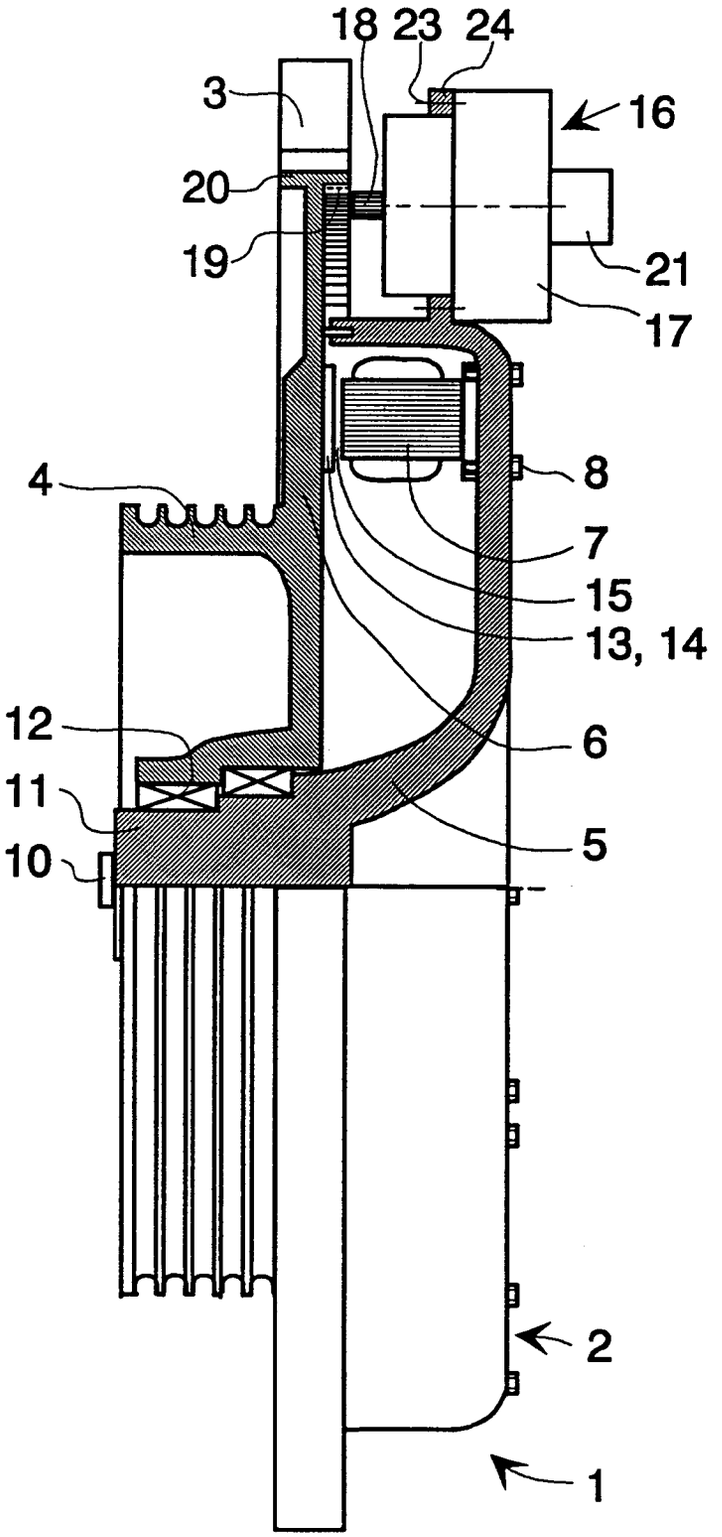

Fig. 1

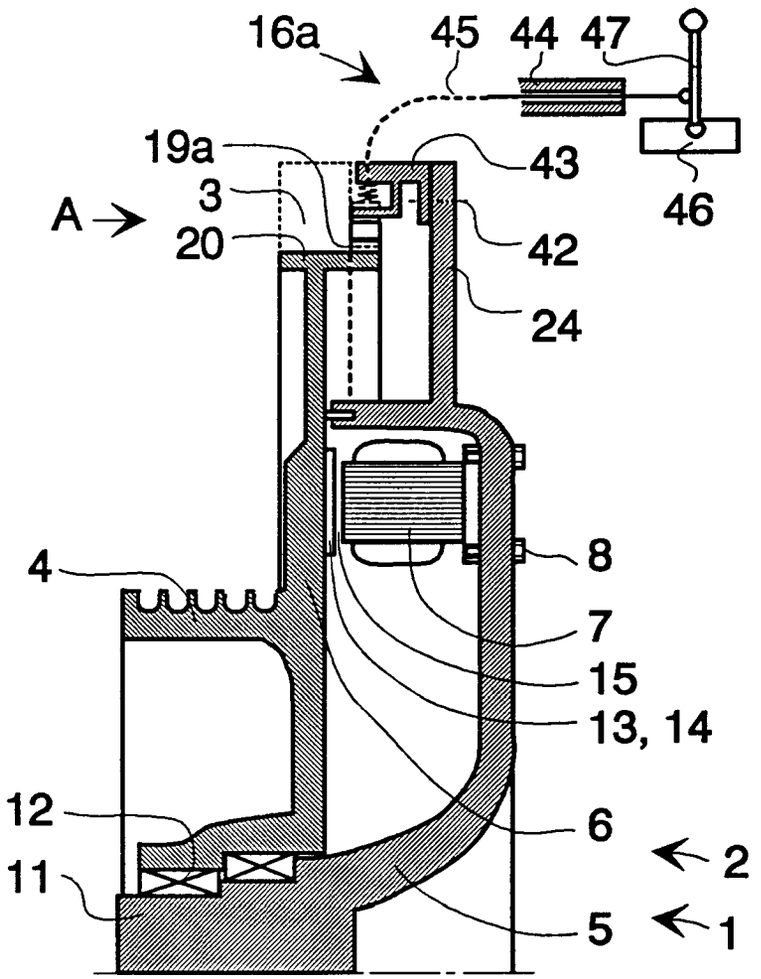

Fig. 2

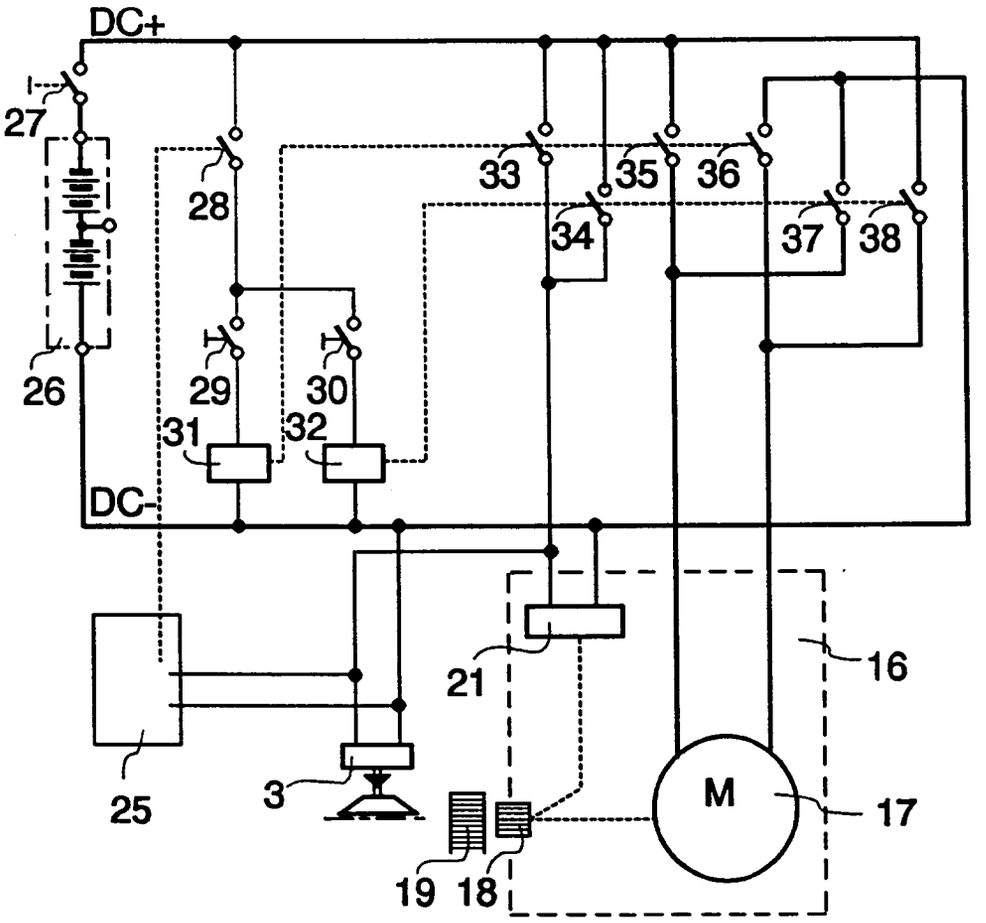
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Fig. 3

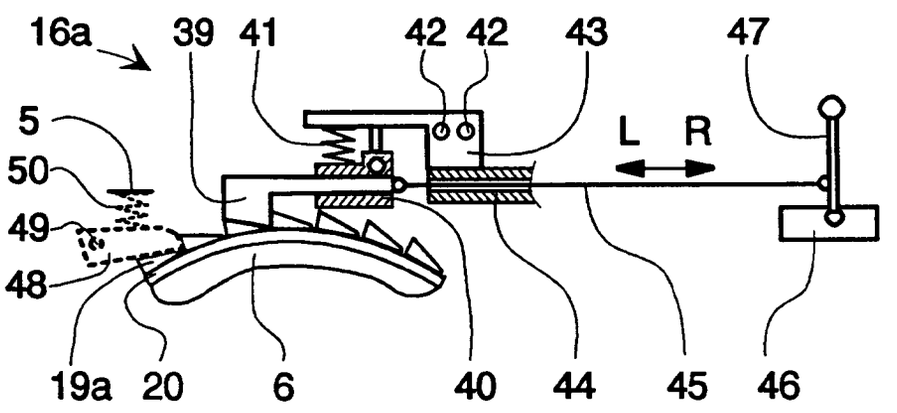
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Fig. 4