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- (73) Patenthaver: **GEZE GmbH, Reinhold-Vöster-Straße 21-29, 71229 Leonberg, Tyskland**
- (72) Opfinder: **HUCKER, Matthias, Lorenzstr. 20, 76359 Marxzell, Tyskland**
Hahn, Erhard, In den Vogelgarten 8, 71379 Leutenbach, Tyskland
Katz, Eugen, Wacholderweg 1, 71139 Ehningen, Tyskland
HÄGELE, Volker, Stettiner Str. 40, 73614 Schorndorf, Tyskland
FISCHER, Manuel, Zeppelinstrasse 2, 71106 Magstadt, Tyskland
- (74) Fuldmægtig i Danmark: **Dennemeyer & Associates S.A, P.O. Box 700425, DE-81304 Munich, Tyskland**
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ELECTROMECHANICAL DRIVE FOR ACTUATING A MOVEABLE WING AND CORRESPONDING DOOR

The invention relates to an electromechanical drive for actuating a movable wing of the type specified in the precharacterizing clause of claim 1.

Electromechanical door drives are known from the prior art which are also used as hold-open devices in hold-open systems on fire doors. Corresponding drives or at least drives of similar type are known, for example, from DE 10 2005 028007 A1, US 2006/125436 A1, US 2013/300321 A1, WO 2011/013585 A1 and DE 10 2005 049488 B3. If the power supply fails or in the event of an alarm, the open door of a hold-open system must close using mechanically stored energy that was previously generated when the door was opened. There are different requirements for the behaviour of such a door. If the door is opened manually when the drive is de-energized, the person passing through must generate the energy that is used to subsequently close the door. This means that when the door is opened manually, the mechanical energy storage unit is charged with potential energy, which closes the released wing again. The mechanical energy storage unit is designed as a spring, for example, which is tensioned when the door is opened manually. Then the potential energy in the spring closes the door when the person passing through lets go of the wing. The closing moment of the wing is determined by the current spring tension and the various gear ratios in the system. So that the wing does not slam into the closed position without braking, a braking device is used that damps the closing movement of the wing. However, this braking device is only allowed to brake the wing in the closing direction; opening of the door must not be additionally impeded by this braking device since the person passing through has to generate the energy to charge the mechanical energy storage unit when opening the door.

When the drive opens the door, an electric motor, for example, uses electrical energy to accelerate the wing. If the electrical power supply fails when the door is opened or if an alarm occurs, there is the risk, especially with a high wing speed or with so-called free-swing doors, in which the spring is kept tensioned and released in the event of a grid failure or alarm, of the wing slamming into the open position without braking or injuring a person behind the wing. This means that the braking device must immediately stop the opening movement of the wing and damp the subsequent closing movement of the wing. However, the braking device should only stop the wing movement immediately during opening if a grid failure or alarm occurs when the door is being opened automatically. If,

on the other hand, the door is opened manually, the manual opening of the door should not be hindered by the braking device.

In addition, it is known from the prior art to use the electric motor of the drive itself to brake the wing. This is usually solved in such a way that the motor winding is short-circuited in the de-energized state via a switching element in the form of a diode. If the electric motor, designed as a permanently magnetically excited direct current motor, rotates, a voltage is induced. The current flowing via the short circuit results in a braking torque. Because of the diode in the short circuit, this braking torque only acts on one side; the closing speed can be increased with additional diodes in series.

In another known technical solution, an oscillator triggers a triac as long as the voltage supply is available. After a grid failure or an alarm, the triac is no longer triggered. The triac remains conductive as long as it is triggered. It then remains conductive if a current flows through it. As soon as no more current flows, the triac blocks and only becomes conductive again if it is triggered again by the supply voltage that is again available. If this triac is introduced into the motor short-circuit, braking will only take place if a grid failure or alarm occurs during automatic opening. Later manual opening of the door is no longer impeded.

These known technical solutions have the disadvantage that the diode or the triac must be installed to match the direction of rotation of the door. For this purpose, jumpers are usually used, which must be correctly and manually set before the door is put into operation. The braking force in closing the door must also be set manually according to the size of the mechanical energy storage unit, for example by setting jumpers to obtain the desired closing time. In addition, the motor current flows via an end stop switch such that the door slams shut without braking in the event of a line break.

DE 10 2005 028 007 B4 discloses a drive for actuating a movable door wing with a braking device of the type in question. The braking device by which the movement of the door wing can be braked comprises an electric motor operated as a generator, the motor shaft of which electric motor can be rotated by a movement of the door wing, and a motion-dependent motor voltage is generated at the motor terminals of the electric motor and is applied to a brake circuit, the brake circuit having at least one switching element designed as a field-effect transistor (FET), via which the motor terminals can be short-circuited. A drain-source path of the field-effect transistor is arranged in the brake circuit and a voltage between the gate and source of the field-effect transistor is set via a potentiometer which is arranged in parallel with the drain-source path of the field-effect transistor. A voltage tap of the potentiometer is connected to the gate terminal of the field-

effect transistor. The field-effect transistor is thus operated as a voltage-dependent load resistor for the electric motor, such that the braking force of the braking device is dependent on the output voltage of the electric motor operated as a generator.

The invention addresses the problem of specifying an improved electromechanical drive for actuating a movable wing and a corresponding door which enable improved braking of the movable wing in the event of a grid failure or an alarm.

This problem is solved by the features of the electromechanical drive for actuating a movable wing according to claim 1.

Advantageous embodiments and developments of the invention are specified in the remaining claims.

The electromechanical drive according to the invention for actuating a movable wing comprises an electric motor, the motor shaft of which is operatively connected to the wing in the mounted state of the drive via a force transmission apparatus such that a movement of the motor shaft brings about a movement of the wing, a mechanical energy storage unit that is charged through an opening movement of the wing and is discharged through a closing movement of the movable wing, and a braking device by way of which the movement of the wing is able to be braked by virtue of the electric motor being able to be operated as a generator. The movement of the wing here gives rise, at the motor terminals of the electric motor operated as a generator, to a motion-dependent output voltage that is applied to a brake circuit, wherein the brake circuit has at least one switching element by way of which the motor terminals are able to be short-circuited. According to the invention, in an emergency mode, the output voltage of the electric motor operated as a generator is applied to a charging circuit that stores electrical energy in a capacitor for supplying energy to emergency control electronics.

In addition, a door with at least one movable wing and an electromechanical drive according to the invention for actuating the movable wing is proposed.

Embodiments of the electromechanical drive according to the invention advantageously enable automatic damping of the movement of the movable wing without an external energy source in an emergency mode in the event of a grid failure and in the event of an alarm, such as a fire alarm for example. The parameters and/or limit values for damping the movement of the wing can be automatically specified and set by a higher-level controller during normal mode. In addition, in embodiments of the invention, the motor current does not flow via the end stop switch, such that the braking device also functions in the event of a line break to the end stop switch.

In an advantageous embodiment of the drive according to the invention, a motor relay

can activate the emergency mode via at least one relay contact in the event of a grid failure and/or in the event of an alarm. The at least one relay contact can connect the motor terminals to main control electronics in normal mode and to the emergency control electronics, which can comprise the charging circuit, in emergency mode. This advantageously enables simple and safe activation of the emergency mode and thus a reliable energy supply to the emergency control electronics.

In the embodiment of the drive according to the invention, a first evaluation and control unit of the emergency control electronics sets an effective braking force for damping the movement of the wing in emergency mode via the switching element designed as a field-effect transistor. The first evaluation and control unit performs pulse-width modulation on the motor current via the field-effect transistor. In addition, a second evaluation and control unit of the main control electronics can communicate with the first evaluation and control unit of the emergency control electronics in normal mode via appropriate communication connections and output information about the current operating state of the electromechanical drive to the first evaluation and control unit. The first evaluation and control unit and the second evaluation and control unit are preferably designed as microcontrollers.

The pulse-width modulation of the motor current advantageously enables a closing time to be specified, which can be kept constant, for example, by regulating the closing speed as a function of the opening angle of the wing. The desired closing time can advantageously be specified and set independently of temperature, aging and friction. In addition, embodiments of the electromechanical drive according to the invention allow the implementation of further parameterizable and electronically adjustable functions, such as for example an end stop function, which can specify varying starting points for the end stop and the final speed of the wing according to certain parameters. Furthermore, an opening damping function can be implemented which damps the opening speed of the wing when certain operating states of the drive are present and/or from a certain opening angle. Furthermore, additional functions such as cycle counters and the storage of maintenance data can be easily implemented. In addition, the electromechanical drive according to the invention does not contain any easily combustible substances such as damper oil.

In a preferred embodiment of the electromechanical drive according to the invention, the first evaluation and control unit can set the damping of the movement of the wing on the basis of the current operating state of the electromechanical drive and/or of a current direction of movement and/or a current speed and/or a current opening angle of the wing.

The first evaluation and control unit can, for example, determine a current direction of movement and speed of the wing from the motor voltage via at least one measurement circuit. The polarity of the motor voltage can provide information about the direction of movement of the wing, and the level of the motor voltage can provide information for determining the speed of the wing. At least one first measurement circuit can identify an opening movement of the wing and output a measured variable for determining the opening speed of the wing to the first evaluation and control unit. At least one second measurement circuit can identify a closing movement of the wing and output a measured variable for determining the closing speed of the wing to the first evaluation and control unit. At least one third measurement circuit can comprise a position sensor which can output a measured variable for determining a current opening angle and/or a current speed of the wing to the first evaluation and control unit.

In a further advantageous embodiment of the drive according to the invention, the first evaluation and control unit can damp an automatic opening movement of the wing with a maximum braking force for a predefined first duration, and, after the predefined first duration has elapsed, limit the further opening movement of the wing to a maximum opening speed if the emergency mode occurs during the automatic opening movement of the wing. In addition, the first evaluation and control unit can limit a manual opening movement of the wing to a maximum opening speed if the emergency mode occurs during the manual opening movement. This can advantageously reduce the risk of the wing slamming into the open position without braking or injuring a person behind the wing.

In a further advantageous embodiment of the drive according to the invention, the first evaluation and control unit can limit the closing movement of the wing to a maximum closing speed if the emergency mode occurs during the closing movement. Furthermore, the evaluation and control unit can end the damping of the closing movement of the wing when the wing has achieved at least one predefined end stop condition. For example, an end stop speed and/or an end stop position can be predefined as end stop condition. In this way, it can be advantageously ensured that the movable wing reaches the end stop position and the door is completely closed.

In a further advantageous embodiment of the drive according to the invention, the second evaluation and control unit can output parameters and/or limit values for damping the movement of the wing to the first evaluation and control unit. The first evaluation and control unit can store the parameters and/or limit values for damping the movement of the wing in a non-volatile memory.

In a further advantageous embodiment of the drive according to the invention, the

evaluation and control unit can increment a counter in the non-volatile memory with each opening cycle of the wing and thus count the opening cycles of the wing. In addition, maintenance data can be stored in the non-volatile memory.

In the following, exemplary embodiments of the invention are explained in more detail with reference to the drawings.

In the drawings:

Figure 1 shows a schematic block diagram of an exemplary embodiment of a door according to the invention with an exemplary embodiment of an electromechanical drive according to the invention for actuating a movable wing;

Figure 2 shows a schematic block diagram of evaluation and control electronics for the electromechanical drive according to the invention for actuating a movable wing from figure 1; and

Figure 3 shows a schematic block diagram of emergency control electronics for the evaluation and control electronics from figure 2.

As can be seen from figures 1 to 3, an electromechanical drive 1 for actuating a movable wing 5 has a housing 3 in the exemplary embodiment shown, in which the following are arranged: evaluation and control electronics 2, an electric motor 22, the motor shaft 24 of which is operatively connected to the wing 5 via a force transmission apparatus such that a movement of the motor shaft 24 causes a movement of the wing 5, a mechanical energy storage unit 28, which is charged by an opening movement of the wing 5 and discharged by a closing movement of the movable wing 5, and a braking device 20, by which the movement of the wing 5 can be braked by operating the electric motor 22 as a generator. The movement of the wing 5 at motor terminals K1, K2 of the electric motor 22 operated as a generator produces a motion-dependent output voltage U_A which is applied to a brake circuit 18. The brake circuit 18 has at least one switching element designed as a field-effect transistor FET, via which the motor terminals K1, K2 can be short-circuited. The mechanical energy storage unit 28 is preferably designed as a spring and is charged with potential energy by manual opening of the wing 5, which closes the released wing 5 again. According to the invention, in an emergency mode, the output voltage U_A of the electric motor 22 operated as a generator is applied to a charging circuit 12, which stores electrical energy in a capacitor C for supplying energy to emergency control electronics 10.

As can also be seen from figure 1, in the exemplary embodiment shown, the housing 3 is

mounted fixed to the wing on the upper left-hand edge region of the movable wing 5. The motor shaft 24 of the electric motor 22 is coupled via a transmission 26 to an output shaft 27 which is coupled to a sliding arm 7. The sliding arm 7 has a sliding block 7.1 at its free end, which is guided in a sliding rail 9 that is mounted fixed to the panel. The electric motor 22 is preferably designed as a permanently magnetically excited direct current motor.

As can also be seen from figure 2, the evaluation and control electronics 2 comprise, in addition to the emergency control electronics 10 with a first evaluation and control unit 11, main control electronics 30 with a second evaluation and control unit 32 and a motor relay 34, which is connected to an operating voltage U_B via a further switching element S1 designed as a normally closed contact. A flyback diode D_F is connected electrically in parallel with the motor relay 34. The motor relay 34 activates the emergency mode in the event of a grid failure and/or in the event of an alarm, such as a fire alarm, via at least one relay contact 34.1. In the exemplary embodiment shown, a relay contact 34.1 connects a first motor terminal K1 to the main control electronics 30 in normal mode and to the emergency control electronics 10, comprising the charging circuit 12, in emergency mode. In the exemplary embodiment shown, a second motor terminal K2 is connected both to the emergency control electronics 10 and to the main control electronics 30. Alternatively, a second relay contact (not shown) of the motor relay 34 can connect the second motor terminal K2 to the main control electronics 30 in normal mode and to the emergency control electronics 10 in emergency mode. In the exemplary embodiment shown, the two evaluation and control units 11, 32 are each designed as microcontrollers. In normal mode, the motor relay 34 is energized by the applied operating voltage U_B , such that the relay contact 34.1 connects the first motor terminal K1 to the main control electronics 30. The electromechanical drive 1 moves the wing 5 and opens the corresponding door in that the second evaluation and control unit 32 accelerates the electric motor 22 by applying an input voltage U_E to the motor terminals K1, K2. Thus, the wing 5 is moved by means of electrical energy. If the wing 5 is moved manually to open the door, the person passing through must generate the energy that is stored as potential energy in the mechanical energy storage unit 28. If the person passing through lets go of the wing 5, the stored energy closes the door. So that the wing 5 does not slam into the closed position without braking, the main control electronics 30 can use the braking device 20 in order to damp the closing movement of the wing 5. The switching element S1 can, for example, be designed as an electronic switch, for example as a field-effect transistor, controlled by the second evaluation and control unit 32. As a result, the main

control electronics 30 can use the components of the emergency control electronics 10 to damp the movement of the movable wing 5 even during normal mode. The second evaluation and control unit 32 can thus disconnect the motor relay 34 from the operating voltage by opening the switching element S1. As a result, the relay contact 34.1 changes to the de-energized switching state shown and connects the motor terminals K1, K2 to the emergency electronics 10 so that the first evaluation and control unit 11 can dampen the movement of the movable wing 5 via the brake circuit 18.

As can also be seen from figures 2 and 3, the emergency control electronics 10 include the charging circuit 12 to which the output voltage U_A is applied and which stores electrical energy in the capacitor C for supplying energy to the emergency control electronics 10. Depending on the polarity of the output voltage U_A , this is applied to the storage capacitor C via a first diode D1 or via a second diode D2. A Zener diode D_Z limits the maximum voltage. In addition, the emergency control electronics 10 in the exemplary embodiment shown includes a first measurement circuit 14A with a third diode D3 and a voltage divider, which has a first ohmic resistor R1 and a second ohmic resistor R2. The first measurement circuit 14A identifies an opening movement of the wing 5 on the basis of the polarity of the third diode D3 and outputs a measured variable for determining the opening speed of the wing 5 to the first evaluation and control unit 11 at the tap between the first and second ohmic resistors R1, R2. Furthermore, in the exemplary embodiment shown, the emergency control electronics 10 include a second measurement circuit 14B with a fourth diode D4 and a further voltage divider which has a third ohmic resistor R3 and a fourth ohmic resistor R4. The second measurement circuit 14B identifies a closing movement of the wing 5 on the basis of the polarity of the fourth diode D4 and outputs a measured variable for determining the closing speed of the wing 5 to the first evaluation and control unit 11 at the tap between the third and fourth ohmic resistors R3, R4. A third measurement circuit 16 of the emergency control electronics 10 comprises a position sensor R_P , which outputs a measured variable for determining a current opening angle and/or a current speed of the wing 5 to the first evaluation and control unit 11. The position sensor R_P can be designed, for example, as a foil potentiometer, to which a protective resistor R5 can be connected in series to limit current. The first evaluation and control unit 11 can thus determine a current direction of movement and speed of the wing 5 from the output voltage U_A via the measurement circuits 14A, 14B. The first evaluation and control unit 11 can determine the absolute opening angle or the speed of the wing 5 via the third measurement circuit 16.

As can also be seen from figures 2 and 3, the brake circuit 18 comprises the field-effect

transistor FET, a gate resistor R6, via which the gate of the field-effect transistor FET is electrically connected to the first evaluation and control unit 11, and a bridge rectifier circuit BG with four diodes D5, D6, D7, D8, which has the effect that the polarity of the voltage applied to the drain-source path of the field-effect transistor FET remains the same regardless of the polarity of the output voltage U_A of the electric motor 22 operated as a generator. The first evaluation and control unit 11 then controls the short circuit at the motor terminals K1, K2 via the field-effect transistor FET according to the following principle:

When the emergency mode is activated, the motor terminals K1, K2 are open and electrical energy is charged into the capacitor C of the charging circuit 12. The energy stored in the capacitor C is used to supply the emergency control electronics 10 with energy. In addition, while the motor terminals K1, K2 are open, the first evaluation and control unit 11 determines the angular speed of the electric motor 22, i.e. the speed of the wing 5, via the first or second measurement circuit 14A, 14B. In addition, the evaluation and control unit 11 can determine the position or the speed of the wing 5 via the third measurement circuit 16.

To damp the movement of the wing 4, the first evaluation and control unit 11 short-circuits the motor terminals K1, K2 briefly via the field-effect transistor FET. During the short circuit, the angular speed of the electric motor 22 is damped. Owing to the pulse-width modulation of the short-circuit current I_A , the first evaluation and control unit 11 adjusts the damping of the speed and thus the braking force in emergency mode and ensures that its energy supply is recharged. In emergency mode, the first evaluation and control unit 11 adjusts the damping of the movement of the wing 5 according to the current operating state of the electromechanical drive 1 and/or a current direction of movement and/or a current speed and/or a current opening angle of the wing 5. Furthermore, in emergency mode, the first evaluation and control unit 11 ensures the desired closing time of, for example, 5 seconds by regulating the closing speed as a function of the opening angle of the wing 5. The closing time is therefore independent of temperature, aging and friction. This means that the first evaluation and control unit 11 adjusts the damping of the movement of the wing 5 according to a current operating state of the electric drive 1 and/or a current direction of movement and/or a current speed and/or a current opening angle of the wing 5.

The first evaluation and control unit 11 damps an automatic opening movement of the wing 5 for a predefined first duration of, for example, approximately 3 seconds with a maximum braking force if the emergency mode occurs during the automatic opening

movement of the wing 5. After the predefined first duration of approximately 3 seconds has elapsed, the first evaluation and control unit 1 limits the further opening movement of the wing 5 to a maximum opening speed. If the emergency mode occurs during the manual opening movement, the first evaluation and control unit 11 limits a manual opening movement of the wing 5 to a maximum opening speed. This can advantageously reduce the risk of the wing 5 slamming into the open position without braking or injuring a person behind the wing.

If the emergency mode occurs during the closing movement of the wing 5, the first evaluation and control unit 11 limits the closing movement of the wing 5 to a maximum closing speed. The first evaluation and control unit 11 ends damping of the closing movement of the wing 5 when the wing 5 has reached at least one predefined end stop condition. For example, an end stop speed and/or an end stop position can be predefined as the end stop condition.

The second evaluation and control unit 32 of the main control electronics 30 communicates with the first evaluation and control unit 11 of the emergency control electronics 10 in normal mode via corresponding communication connections and outputs information about the current operating state of the electromechanical drive 1 to the first evaluation and control unit 11. In addition, the second evaluation and control unit 32 can output parameters and/or limit values to the first evaluation and control unit 11 to damp the movement of the wing 5. In the exemplary embodiment shown, the first evaluation and control unit 11 stores the parameters and/or limit values for damping the movement of the wing 5 in a non-volatile memory 19. In addition, the first evaluation and control unit 11 increments a counter in the non-volatile memory 19 with each opening cycle of the wing 5. In addition, if necessary, maintenance data can be written to the non-volatile data memory 19 and read from it. This also applies to the cycle counter reading in the data memory 19.

Embodiments of the electromechanical drive 1 according to the invention can preferably be used for fire doors.

List of reference signs

1	Electromechanical drive
2	Evaluation and control electronics
3	Housing
5	Wing
7	Sliding arm

7.1	Sliding block
9	Sliding rail
10	Emergency control electronics
11	Evaluation and control unit (microcontroller)
12	Charging circuit (power supply)
14A	First measurement circuit (speed measurement)
14B	Second measurement circuit (speed measurement)
16	Third measurement circuit (position determination)
18	Brake circuit (pulse-width modulation)
19	Non-volatile memory
20	Braking device
22	Electric motor
24	Motor shaft
26	Transmission
27	Output shaft
28	Mechanical energy storage unit
30	Main control electronics
32	Evaluation and control unit (microcontroller)
34	Motor relay
34.1	Relay contact
D1 to D8	Diode
R1 to R6	Ohmic resistor
R _P	Potentiometer
C	Electrical energy storage unit
D _Z	Zener diode
FET	Field-effect transistor
BG	Bridge rectifier
K1, K2	Motor terminal
U _A	Output voltage
U _E	Input voltage
I _A	Motor current
D _F	Flyback diode
S1	Switching element

ELEKTROMEKANISK DREV TIL AKTIVERING AF EN BEVÆGELIG DØRFLØJ OG KORRESPONDERENDE DØR

Patentkrav

1. Elektromekanisk drev (1), som omfatter en elmotor (22) til aktivering af en bevægelig dørføj (5) med elmotoren (22), hvis motoraksel (24) i drevets (1) monterede tilstand står i operativ forbindelse med dørføjen (5) via en kraftoverføringsanordning, således at en bevægelse af motorakslen (24) forårsager en bevægelse af dørføjen (5), et mekanisk energilager, der oplades via dørføjens (5) åbningsbevægelse og aflades via den bevægelige dørføjs (5) lukkebevægelse, og en bremseanordning (20), ved hjælp af hvilken dørføjens bevægelse (5) kan bremses, idet elmotoren (22) kan drives som generator, hvor der via dørføjens (5) bevægelse på motorklemmer (K1, K2) på elmotoren (22), der drives som generator, opstår en bevægelsesafhængig udgangsspænding (UA), som påtrykkes et bremsekredsløb (18), hvor bremsekredsløbet (18) har mindst ét koblingselement (FET), via hvilket motorklemmerne (K1, K2) kan kortsluttes, kendetegnet ved, at udgangsspændingen (UA) fra elmotoren (22), der drives som generator, i en nøddrift påtrykkes et ladekredsløb (12), der lagrer elektrisk energi i en kondensator (C) med henblik på energiforsyning af en nødstyringselektronik (10), hvor en første evaluerings- og styreenhed (11) i nødstyringselektronikken (10) desuden indstiller en effektiv bremsekraft til dæmpning af dørføjens (5) bevægelse via koblingselementet, der er udført som felteffekttransistor (FET), og hvor den første evaluerings- og styreenhed (11) via felteffekttransistoren (FET) udfører en pulsbreddemodulation af motorstrømmen (I_A).
2. Drev ifølge krav 1, kendetegnet ved, at et motorrelæ (34), via mindst én relækontakt (34.1), aktiverer nøddriften i tilfælde af strømsvigt og/eller i tilfælde af en alarm.
3. Drev ifølge krav 2, kendetegnet ved, at den mindst ene relækontakt (34.1) i normal drift forbinder motorklemmerne (K1,

- K2) med en hovedstyringselektronik (30) og i nøddrift med nødstyringselektronikken (10), som omfatter ladekredsløbet (12).
4. Drev ifølge et af kravene 1 til 3, kendetegnet ved, at en anden evaluerings- og styreenhed (32) i hovedstyringselektronikken (30) i normal drift kommunikerer med den første evaluerings- og styreenhed (11) i nødstyringselektronikken (10) via tilsvarende kommunikationsforbindelser og udlæser information om den aktuelle driftstilstand for det elektromekaniske drev (1) til den første evaluerings- og styreenhed (11).
 5. Drev ifølge et af kravene 1 til 4, kendetegnet ved, at den første evaluerings- og styreenhed (11) indstiller dæmpningen af dørløjens (5) bevægelse afhængigt af den aktuelle driftstilstand for det elektromekaniske drev (1) og/eller af en aktuel bevægelsesretning og/eller af en aktuel hastighed og/eller af en aktuel åbningsvinkel af dørløjen (5).
 6. Drev ifølge krav 5, kendetegnet ved, at den første evaluerings- og styreenhed (11) ud fra udgangsspændingen (UA) bestemmer en aktuel bevægelsesretning og hastighed for dørløjen (5) via mindst ét målekredsløb (14A, 14B).
 7. Drev ifølge krav 6, kendetegnet ved, at mindst ét første målekredsløb (14A) detekterer en åbningsbevægelse af dørløjen (5) og udlæser en målestørrelse til den første evaluerings- og styreenhed (11) til bestemmelse af dørløjens (5) åbningshastighed.
 8. Drev ifølge krav 6 eller 7, kendetegnet ved, at mindst ét andet målekredsløb (14A) detekterer en lukkebevægelse af dørløjen (5) og udlæser en målestørrelse til den første evaluerings- og styreenhed (11) til bestemmelse af dørløjens (5) lukkehastighed.

9. Drev ifølge et af kravene 5 til 8,
kendetegnet ved,
at mindst ét tredje målekredsløb (16) omfatter en positionssensor (R_P), der udlæser en målestørrelse til den første evaluerings- og styreenhed (11) til bestemmelse af en aktuel åbningsvinkel og/eller en aktuel hastighed af dørløjen (5).

10. Drev ifølge et af kravene 1 til 9,
kendetegnet ved,
at den første evaluerings- og styreenhed (11) dæmper en automatisk åbningsbevægelse af dørløjen (5) i en forudbestemt første periode med en maksimal bremsekraft og efter udløb af den forudbestemte første periode begrænser dørløjens (5) yderligere åbningsbevægelse til en maksimal åbningshastighed, hvis der indtræder nøddrift i løbet af dørløjens (5) automatiske åbningsbevægelse.

11. Drev ifølge et af kravene 1 til 10,
kendetegnet ved,
at den første evaluerings- og styreenhed (11) begrænser en manuel åbningsbevægelse af dørløjen (5) til en maksimal åbningshastighed, hvis der indtræder nøddrift i løbet af den manuelle åbningsbevægelse.

12. Drev ifølge et af kravene 1 til 11,
kendetegnet ved,
at den første evaluerings- og styreenhed (11) begrænser dørløjens (5) lukkebevægelse til en maksimal lukkehastighed, hvis der indtræder nøddrift i løbet af lukkebevægelsen.

13. Drev ifølge krav 12,
kendetegnet ved,
at evaluerings- og styreenheden (11) afslutter dæmpningen af dørløjens (5) lukkebevægelse, når dørløjen (5) har nået mindst én forudbestemt endestopbetingelse.

14. Drev ifølge krav 13,

- kendetegnet ved,
at en endestophastighed og/eller en endestopposition er specificeret som endestopbetingelse.
15. Drev ifølge et af kravene 4 til 14,
kendetegnet ved,
at den anden evaluerings- og styreenhed (32) udlæser parametre og/eller grænseværdier til dæmpning af dørfløjens (5) bevægelse til den første evaluerings- og styreenhed (11).
16. Drev ifølge krav 15,
kendetegnet ved,
at den første evaluerings- og styreenhed (11) udlæser parametrene og/eller grænseværdierne til dæmpning af dørfløjens (5) bevægelse i en ikke-flygtig hukommelse (19).
17. Drev ifølge krav 15 eller 16,
kendetegnet ved,
at den første evaluerings- og styreenhed (11) forøger en tæller i den ikke-flygtige hukommelse (19) med hver åbningscyklus for dørfløjen (5).
18. Dør med mindst én bevægelig dørfløj (5) og ét elektromekanisk drev (1) til aktivering af den bevægelige dørfløj (5),
kendetegnet ved,
at det elektromekaniske drev (1) er udført ifølge mindst et af kravene 1 til 17.

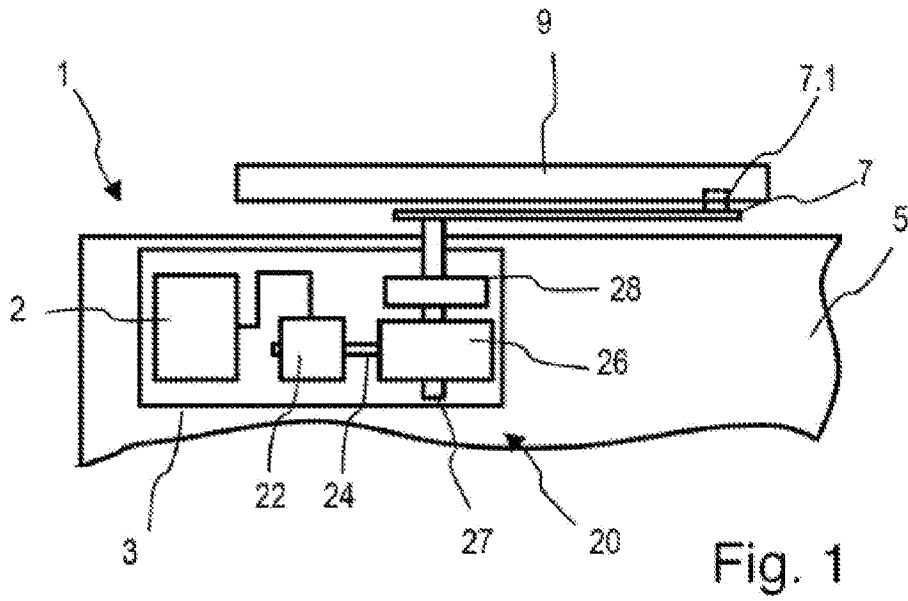


Fig. 1

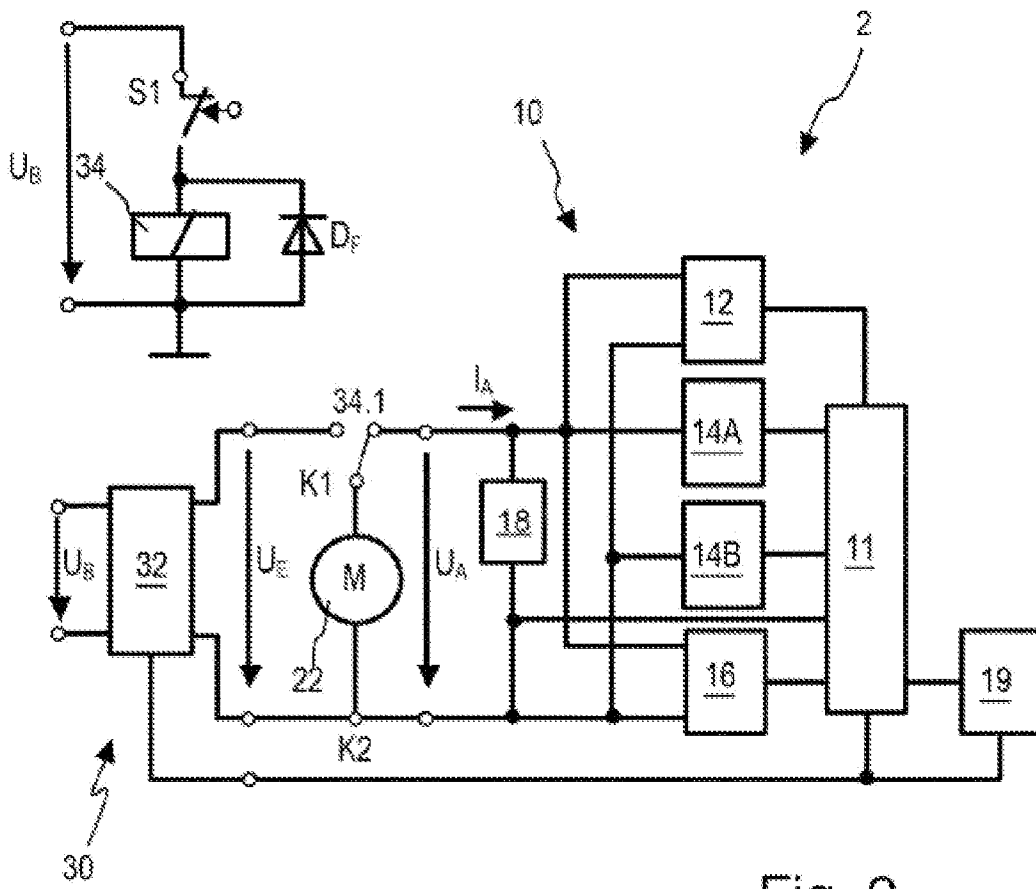


Fig. 2

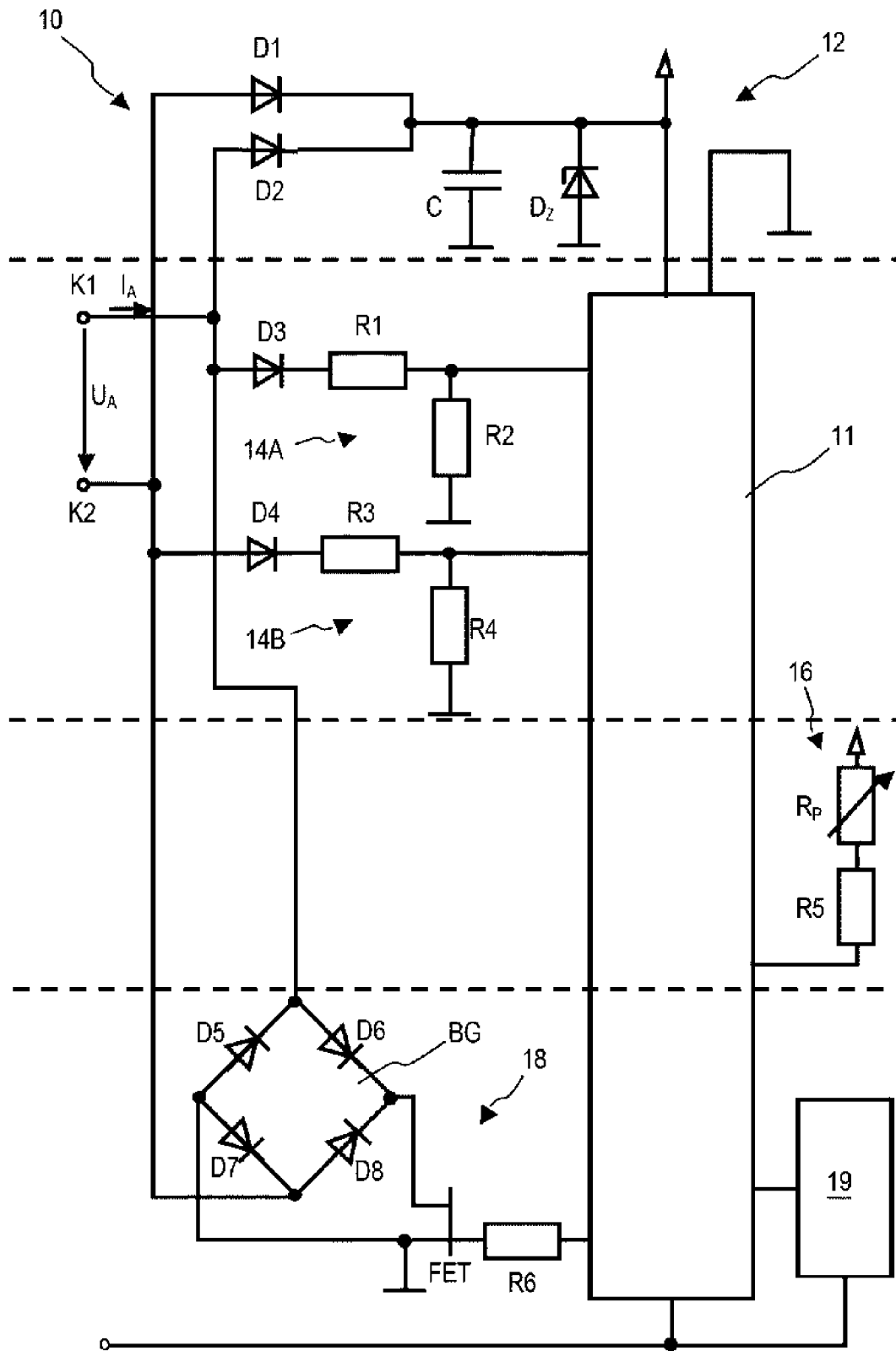


Fig. 3