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(54) Benævnelse: **DRIVANORDNING TIL ET DØRBLAD**

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Drive assembly for a swinging wing

The invention relates to a drive arrangement for a swivel door leaf according to the preamble of patent Claim 1.

A drive arrangement for a swivel door leaf is known from DE 103 01 016 A1. The swivel door leaf is opened by means of an electric drive motor and is closed by means of a spring-loaded drive with a helical compression spring, wherein the helical compression spring is tensioned during the opening movement by the drive motor and the spring-loaded drive is thus loaded. Thus, the drive operates in the so-called normal operation, in which the swivel door leaf can still be moved reliably after its release even during a power failure by the expanding compression spring into its closed position. This function is of fundamental importance particularly for the so-called fire doors, which should be reliably closed in case of fire, in order to prevent the spread of the fire. The compression spring and the drive motor are constantly in operative connection in the case of this known design via a gear drive, so that further interactions can be achieved. For example, in the case of the expansion of the compression spring the drive motor can be rotated by its belt drive in order to act as an attenuator. In the case of gears without self-locking the electric motor can even be operated as a generator, in order to homogenize the closing process of the rotating door otherwise initiated abruptly by the spring force or to attenuate it by braking.

Furthermore, a drive arrangement of a similar type is known from DE 199 49 744 A1, in which the swivel door leaf can be closed by means of a drive motor and after release of the swivel door leaf can be opened by means of a spring-loaded drive. This arrangement is intended for so-called escape doors, which, for example, in case of an emergency are supposed to swing into their opened position despite a power failure after release of the swivel door leaf by the force of the spring-loaded drive and thus immediately release the escape route.

None of the two described drive arrangements is suitable for the respective other application, so that until now a large variety of drive arrangements had to be available.

Other arrangements of the type in question or of a similar type are also shown in documents DE 195 00 945 A1, DE 32 09 608 A1 and US 2005 144 847 A1, wherein also here during motor operation a single direction of rotation of the gearbox elements, for example, toothed wheels, exists, and in the case of spring-loaded movement an opposite direction of rotation of the gearbox elements.

The problem addressed by the invention is to indicate a drive arrangement for a swivel door leaf according to the preamble of patent Claim 1, which makes possible a universal applicability of the drive arrangement.

This problem is solved according to the invention by the features of patent Claim 1.

Advantageous embodiments and further developments of the invention are indicated in the dependent claims.

The basic idea of the invention is based on the consideration, that a uniform rotary drive of the swivel door leaf in the opening and closing direction is possible in a simple manner, if the drive shaft of the drive motor can be moved in both directions of rotation, in that the drive arrangement for the reversal of the direction of rotation can include a gearbox, which can cause a switchover between normal- and inverse operation. In the same way, the drive shaft can be driven in each case in both directions of rotation by the spring-loaded drive.

A substantial advantage of the drive arrangement according to the present invention therefore consists in that it can optionally be used without significant changes in the case of a fire door or an escape door.

Through this the drive arrangement can also be used with little retrofitting costs for a semi- or fully automatically operated swivel door leaf. The emergency operation possibility via the spring-loaded drive can be ensured in this connection in a selectable direction of rotation of the swivel door leaf, wherein the spring-loaded drive can continue to be loaded by the drive motor, which moves the swivel door leaf in the opposite direction.

The switching over can thereby can be carried out manually or be controlled automatically depending on the further requirements.

In order for the spring-loaded drive to be able to load independent of the position of the output shaft, the drive arrangement can be provided with an idling function for loading the spring-loaded drive decoupled from the position of the output shaft.

An advantageous embodiment of the invention is depicted in the drawings and is described below.

Fig. 1 shows a frontal view of a closed rotating door with a drive arrangement for the swivel door leaf;

Fig. 2 shows a schematic horizontal cut through a housing of the drive arrangement.

A drive arrangement 1 visible in Figure 1 is supposed to be able to drive a swivel door leaf 2 swiveling via strap hinges 3 on the associated door frame 4 about a vertical axis between its opened and its closed position. For this purpose, above the door opening on the door frame 4 a housing 5 is fastened, from the underside of which in the end area on the hinge side a coupling area, for example, a square of a drive shaft 6 is sticking out. The coupling area of the drive shaft 6 pushes through a parallel-epiped slide arm 7 and is connected via a drive-type fastening torque-proof with the slide arm 7, whereby it is guided in a horizontal plane located underneath the housing 5 and above the swivel door leaf 2 in an oscillating manner. On the free end area of the slide arm 7 a slider is arranged, which engages from above into the slide rail 8 with a U- shaped cross section. The straight slide rail 8 is fastened for its part under the longitudinal covering for the housing 5 close to the upper edge of the door on the broadside of the swivel door leaf 2. After releasing the swivel door leaf 2 on the lock side provided with a door handle, the swivel door leaf 2 can thus be rotated by rotating the drive shaft 6 counter-clockwise from its shown closed position to its opened position, since the slider on the end of the slide arm 7 acting as a crank handle is moved on a corresponding circular path and slides along in the slide rail 8 in compensation for the different swivel lengths of the lever arm 7 and the swivel door leaf 2. Through a corresponding clockwise turning back of the drive shaft 6 the swivel door leaf 2 can be closed again and is then located again in the shown position.

In the depiction according to Figure 2 the drive mechanism is schematically represented, by which the drive shaft 6 can be rotated to open and close the swivel door leaf 2.

An electric drive motor 9 is located in the housing 5 on the end opposite the drive shaft 6, which drive motor can be in particular a gear motor. A drive worm 11, the screw channel of which meshes with the teeth of a worm wheel 12, can be rotated by the motor shaft 10, which runs axially parallel to the center longitudinal axis of the housing 5. The worm wheel 12 is in tooth engagement with further toothed wheels 13 and 14, wherein the toothed wheel 14 engages in a gear device not shown in detail. By means of the gear device 19, the rotary coupling of the toothed wheel 14 with the drive shaft 6 can be brought about. On the other hand, a decoupling of toothed wheel 14 and drive shaft 6 can also be carried out via a free wheel, which is not visible. In addition, the gear device 19 includes a switchover device similar to a mechanical gearbox, by which the direction of rotation of the drive shaft 6 can be reversed in spite of the toothed wheel 14 having the same direction of rotation.

On the side next to the gear device 19 a cylindrical tube sleeve 16 is located in the housing 5. In the hollow chamber of the tube sleeve 16, a helical compression spring 17 is located, the winding diameter of which is a little less than the inside diameter of the tube sleeve 16 itself. One end of the spring winding is supported on an annular end face of the tube sleeve 16, while on the opposite end of the spring winding a spring plate 18 is supported. Between the annular end face of the tube sleeve 16 and the spring plate 18 a helical compression spring 17 is held by means of a power transmission element 15 in a substantially expanded position, in which it extends over the largest part of the tube length. The power transmission element 15 consists of a wire rope or a flexible strip, which twines around a drum or the like connected torque-proof with the toothed wheel 13, on which drum its one end is fastened. Proceeding from the end partially encompassed by the drum the power transmission element 15 extends through the open end of the tube sleeve 16 into its hollow chamber, pushes the spring winding of the helical compression spring 17 through lengthwise and then the spring plate 18, on which the power transmission element 15 is fastened by means of a nipple or the like with the other end.

The drive arrangement 1 shown is in normal operation, in which the swivel door leaf 2 can be opened by motor and can be closed by spring force. By connecting the drive motor 9, the worm gear and the toothed wheels 13 and 14 as well as the transmission means of the gear device 19 are accordingly rotated, whereby the drive shaft 6 is accordingly rotated counter-clockwise. As was already explained, the swivel door leaf 2 is thereby pressed by means of the slide arm 7 interacting with the slide rail 8 into its open position. Due to the teeth engagement of worm wheel 12 and toothed wheel 13 the winding drum of the toothed wheel 13 was also thereby rotated counterclockwise, wherein the spring plate 18 is moved by power transmission element 15 under compression of the helical compression spring 17 towards the annular end face of the tube sleeve 16. The spring storage drive is thus loaded and can be used to close the rotating door 2.

From the normal mounting of the drive arrangement 1, the latter in the case of swivel door leaf 2 in the closed position and in the case of the helical compression spring 17 relaxed up to residual force can be switched over to inverse operation as follows.

The gear device 19 is switched into free wheel position, after which the drive shaft 6 is decoupled from the gear device 19 and thus is not rotated. The drive motor 9 tensions the helical compression spring 17 via the toothed wheels 12 and 13 and moves into the open

position of the swivel door leaf 2. Now the gear device 19 is switched to inverse operation, wherein the spring tension is maintained by energization of the drive motor 9. Drive shaft 6 and helical compression spring 17 are coupled with each other again.

In the case of a corresponding control signal the swivel door leaf 2 is now opened by the force of the expanding helical compression spring 17 and closed via the drive motor 9.

From the normal mounting of the drive arrangement 1, the latter in the case of swivel door leaf 2 in the open position and in the case of the fully tensioned helical compression spring 17 can be switched over to inverse operation as follows.

The gear device 19 is switched into free wheel position, wherein the drive shaft 6 is decoupled from the gear device 19. Also here the spring pre-loading of the helical compression spring 17 is maintained by energization of the drive motor 9. Then the swivel door leaf 2 is moved into its closed position by the drive motor 9 and the helical compression spring 17 is thereby relaxed. Now the gear device 19 is switched over to inverse operation, after which the drive shaft 6, gear device 19 and helical compression spring 17 are coupled with each other again.

In the case of a control signal, the swivel door leaf 2 is now closed by the drive motor 9 and is opened again by the spring storage drive.

In the case of inverse mounting of the drive arrangement 1 and closed swivel door leaf 2 as well as tensioned helical compression spring 17 the switchover to the normal mode can occur as follows.

The gear device 19 is switched into free wheel position, wherein the drive shaft 6 is decoupled from the gear device 19. The pre-tensioning of the helical compression spring 17 is again maintained by motor energization. The swivel door leaf 2 is moved into its open position by drive motor 9 and the helical compression spring 17 is thereby relaxed via the gear device 19. By switching over the gear device 19 to the inverse mode gear device 19, drive shaft 6 and helical compression spring 17 are coupled with each other again.

In the case of a control signal the swivel door leaf 2 is thus opened by spring force of the helical compression spring 17 and closed again by the drive motor 9.

In the case of inverse mounting of the drive arrangement 1 and opened swivel door leaf 2 as well as relaxed helical compression spring 17 the switchover into the normal mode can occur as follows.

The gear device 19 is initially switched into free wheel position, wherein the drive shaft 6 is decoupled from the gear device 19. The swivel door leaf 2 is moved via the drive motor 9 into the closed position, wherein the helical compression spring 17 is tensioned via the gear movement. Then the gear device 19 is switched over to inverse operation, wherein the spring pre-loading of the helical compression spring 17 is maintained by motor energization. After the switchover process gear device 19, drive shaft 6 and helical compression spring 17 are coupled with each other again. In the case of a control signal the swivel door leaf 2 is thus closed by means of the drive motor 9 and can be opened again by spring force of the helical compression spring 17.

**List of reference signs**

| | |
|---|---|
| 1 | drive arrangement |
| 2 | swivel door leaf |
| 3 | strap hinge |
| 4 | door frame |
| 5 | housing |
| 6 | drive shaft |
| 7 | slide arm |
| 8 | slide rail |
| 9 | drive motor |
| 10 | motor shaft |
| 11 | drive worm |
| 12 | worm wheel |
| 13 | toothed wheel |
| 14 | toothed wheel |
| 15 | power transmission element |
| 16 | tube sleeve |
| 17 | helical compression spring |
| 18 | spring plate |
| 19 | gear device |

# DRIVANORDNING TIL ET DØRBLAD

## PATENTKRAV

1. Drivanordning (1) til et dørblad (2),
der omfatter en drivaksel (6), som er motordrevet i åbningsretningen og i lukkeretningen med reversering af rotationsretningen,
hvor drivakslen (6) kan bevæges, ved mellemkobling af en gearmekanisme, i én rotationsretning ved hjælp en drivmotor (9) og i den modsatte rotationsretning ved hjælp af et fjederbelastet drev,
ved at drivmotorens (9) drivaksel (10) er rotationsfast koblet sammen med drivakslen (6) via en drivsnegl (11), et sneglhjul (12) og mindst ét yderligere tandhjul (14), således at rotationsretningen for det i det mindste ene tandhjul (14) under motordriften altid er den samme, og ved at det fjederbelastede drev er rotationsfast koblet sammen med drivakslen (6) via det i det mindste ene yderligere tandhjul (14), således at rotationsretningen for det i det mindste ene tandhjul (14), der resulterer fra det fjederbelastede drev, altid er den samme, kendetegnet ved, at dørbladets (2) drivaksel (6) kan drives valgfrit i begge rotationsretninger via en drivmotor (9) og det fjederbelastede drev på en sådan måde, at drivanordningen (1) kan skiftes mellem normal og reverseret drift via omskiftning af en styremekanisme i gearanordningen (19), således at drivakslens (6) rotationsretning reverseres på trods af, at nævnte tandhjul (14) har samme rotationsretning.

2. Drivanordning ifølge krav 1, kendetegnet ved, at dørbladets (2) drivaksel (6) kan drives i begge rotationsretninger af det fjederbelastede drev.

3. Drivanordning ifølge krav 1 eller 2, kendetegnet ved, at drivanordningen kan omskiftes mellem normal drift, hvor dørbladet (2) åbnes ved hjælp af drivmotoren (9) og lukkes ved hjælp af det fjederbelastede drev (skruetrykfjeder (17)), og reverseret drift, hvor dørbladet (2) lukkes ved hjælp af drivmotoren (9) og åbnes ved hjælp af det fjederbelastede drev.

4. Drivanordning ifølge krav 3, kendetegnet ved, at drivanordningen (1) indbefatter en frihjulsfunktion til udkoblet opladning af det fjederbelastede drev via drivmotoren (9).

5. Drivanordning ifølge krav 3, kendetegnet ved, at omskiftningsprocessen mellem normal og reverseret drift kan styres via manuel aktivering.

6. Drivanordning ifølge krav 3, kendetegnet ved, at omskiftningsprocessen mellem normal og reverseret drift kan styres automatisk.

Fig. 1

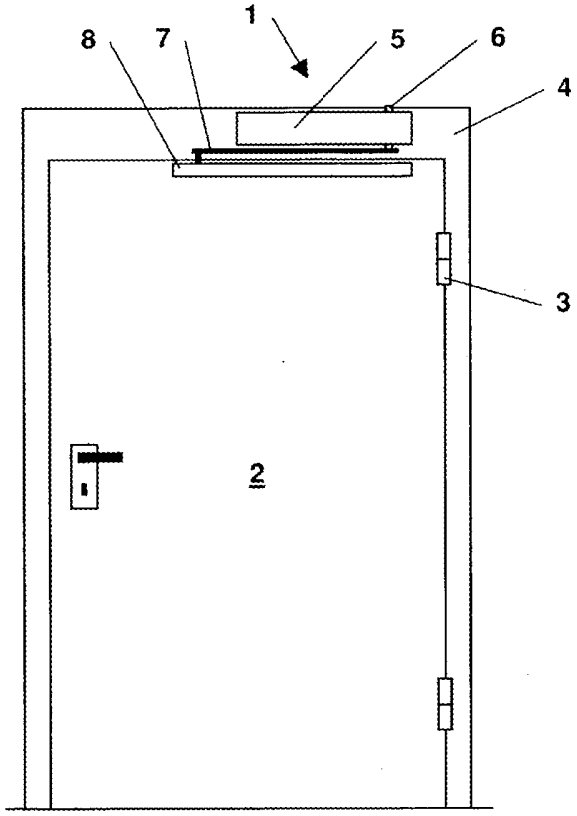



Fig. 2

