

Description

Freewheel device for a drive of a leaf of a door or window

The invention relates to a freewheel device for a drive of a leaf of a door or window according to the precharacterizing clause of Claim 1.

Freewheel devices make it possible to decouple a leaf of a door or window provided with a drive from the drive. This makes it possible to actuate the leaf freely, corresponding to a leaf on which no drive was arranged. Freewheel devices interact with a fixing device which blocks the energy store in the door closer. The blocking can be cancelled, as a result of which the leaf is guided into its closed position by the door closer. This is used in particular in fire-protection doors, in order to close the leaves in the event of a fire and therefore to retard or even to prevent the spread of fire.

DE 92 09 276 U1 discloses a top door closer having a sliding rail linkage for hidden installation in a door leaf or door frame, having a closer shaft that can be actuated in the closing direction by a spring arrangement and a damping piston operatively connected thereto, and also an actuating arm which is coupled at one end to the closer shaft, can be pivoted and grips a sliding rail let into a door frame or into a door leaf by means of a sliding piece arranged at the other end. In this case, the closer shaft has a lifting cam disc, the end of the closer shaft which does not emerge from the housing

being mounted in an axle mounting within the housing.

The door closer is suitable for installation in the door leaf or door frame, but does not have a freewheel device.

DE 198 40 766 A1 discloses a drive for a leaf of a door or window, having a drive housing, having a restoring device which is arranged in the drive housing and which, when the leaf is opened or closed, is loaded and is constructed as an energy store for the automatic closing of the leaf, having a damping device arranged in the drive housing to damp the closing and/or opening movement of the leaf, having an output element which is arranged in the drive housing and which interacts with the restoring device and/or damping device, having a force-transmitting linkage which, on one side, is supported in a rotating or sliding bearing and, on the other side, is connected to the output element. In this case, the force-transmitting linkage is mounted such that it can rotate freely on the output element or in the region of the output element, and a closing lever, connected firmly to the output element so as to rotate with it, can be fixed by a fixing device.

The installation space required for the freely rotatable linkage is disadvantageous. In addition, the device requires an additional electromagnetic fixing device to be arranged on the door frame. In the case of using doors closing on the left or right, as specified by DIN, the door closer has to be rotated in order to mount the linkage with the freewheel device at the respective opposite shaft end of the closer shaft, since the rotational

movement of the shaft in the opening direction is possible in only one direction in the case of toothed drive door closers.

5 DE 32 46 457 A1 shows a door closing device comprising a unit for producing a closing force, which is arranged in a housing and can be stressed when the respective door is pivoted out of the closed position, a drive shaft connected to this
10 unit and led out of the housing, a lever connected to the drive shaft via a freewheel clutch and intended to actuate the door to be closed, a unit for producing a closing force, and a barring arrangement which, at least in a predefined opening
15 angle range, can be blocked in the closing direction in each case at the end of the pivoting-open movement, which can be connected and/or disconnected as desired as a function of control signals. In this case, the freewheel clutch comprises a thread
20 rotation permitting a relative rotation between actuating lever and drive shaft over a predefined stroke, and a frictional stop which is provided at at least one end of the stroke and becomes effective with respect to the actuating lever, the retaining
25 force established between actuating lever and frictional stop being dimensioned to be lower than the retaining force of the barring arrangement blocking the unit for producing the closing force in the closing direction.

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The disadvantage in the case of this device is the installation space required for the freewheel clutch between the housing and the actuating lever. The frictional stop is difficult to adjust and, because
35 of possible wear, has to be readjusted more frequently.

The invention is based on the object of designing a freewheel device for the drive of a leaf which has a low installation height and is therefore suitable for integrated door closers. In this case, the drive can be used for doors closing on the left and right as specified by DIN.

The object is achieved by the features of Claim 1.

10 The subclaims form advantageous possible refinements of the invention.

Drives for the leaf of a door or a window can bear on the leaf or be integrated in the leaf or in a frame or blind frame. In this case, the drive has an energy store which, when the leaf is opened, stores the energy required for the closure. To this end, for example in the case of a drive for the leaf of a door which is mounted on or in the leaf, an actuating arm is arranged between the drive and a sliding rail mounted in or on the frame. The end on the drive side of the actuating arm in this case interacts with an output shaft from the drive, the other end of the actuating arm having a slider which is guided in the sliding rail.

When the leaf is opened, the output shaft of the drive is rotated by the actuating lever, as a result of which the closing spring in the drive is stressed and the energy is stored, in order subsequently to guide the leaf automatically into its closed position again. For this purpose, the rotational movement of the output shaft is converted into a linear movement, which stresses the spring. In this case, toothed pistons can be used which interact with a pinion fixed to the output shaft. The rotational movement of the pinion in this case

effects longitudinal displacement of the piston. Here, the piston divides the interior of the drive, which is filled with a hydraulic fluid, into two parts, it being possible for the behaviour of the drive to be adjusted or controlled by means of bypass ducts and by means of valves and restrictors. The disadvantage in this case is that drives of this type, considered from the closed position of the leaf, permit only one direction of rotation or displacement direction of the piston. In order to employ the drive for different opening directions of the leaf - to the left or right as specified by DIN - the drive has an output shaft which emerges on both sides of the drive, for which reason the drive can also be used for the other direction of rotation if it is mounted the other way round.

In the case of drives for integrated installation in a leaf or frame, inverse installation is not possible. Therefore, drives with a lifting cam disc are used which, if a symmetrical lifting cam plane disc is used, for example a heart-shaped cam, are equally suitable for both directions of rotation of the leaf. Supported on the lifting cam disc by rollers are a spring-loaded damping piston and a spring piston loaded by the closing spring. In this case, the damping piston divides the interior of the housing, which is filled with a hydraulic fluid, into two subregions. By means of bypass ducts provided with restricting valves and valves arranged in the damping piston, the movement of the damping piston and therefore the behaviour of the drive can be influenced.

In order to permit free movement of the leaf, a freewheel device is arranged on the drive. The advantage in this case is that only when the leaf is

first opened does the energy required for closure have to be supplied to the drive, it subsequently being possible for the leaf to be actuated like a leaf without a drive. For this purpose, the drive
5 has on the output shaft a freely rotatable holder for the actuating lever. Furthermore, underneath this holder there is arranged a driver disc which is firmly connected to the output shaft so as to rotate with it and which is of semicircular shape. In the
10 region around the holder, the actuating arm has two opposite holes, which can have threads and into which a driver can be inserted. As a result, the drive can be used both for doors attached on the left and for doors attached on the right. The
15 driver is constructed in such a way that, when it is inserted, it projects into the plane of the semicircular driver disc. In this case, the hole into which the driver is inserted must be chosen in accordance with the direction of rotation of the
20 leaf, in order that the said driver comes into contact with the driver disc when the leaf is closed. When the actuating arm is pivoted about the output shaft as a result of opening the leaf, the driver disc firmly arranged on the output shaft so
25 as to rotate with it is also rotated by the driver. The spring piston and the damping piston are displaced by the lifting cam disc, the energy is stored in the closing spring and the hydraulic fluid flows from one side of the damping piston to the
30 other side. If the leaf is released, the energy stored in the closing spring has the effect that the spring piston rotates back the lifting cam disc arranged on the output shaft, as a result of which the damping piston is likewise displaced back and
35 the hydraulic fluid flows back again.

If, by means of a valve position, hydraulic fluid is permitted to flow only in the direction required for the opening operation and is barred in the opposite direction, the damping piston prevents the lifting
5 cam disc rotating back, so that the output shaft likewise cannot rotate back.

If the leaf is guided out of this position in the closed direction, the driver arranged on the
10 actuating lever that can rotate freely on the output shaft is guided out of its contact with the semicircular driver disc, and the leaf can then be moved freely.

15 The valve can be actuated electromagnetically, and the hydraulic fluid can be released again to flow back. This can be done, for example on a fire protection door, by means of a smoke detector system. After the valve has been released, the
20 energy stored in the closing spring can rotate the output shaft with the driver disc back via the spring piston and the lifting cam disc. If the driver disc comes into contact with the driver of the actuating arm, the rotational movement is
25 transmitted to the latter, as a result of which the leaf is guided into its closed position.

In the following text, exemplary embodiments in the drawing will be explained in more detail using the
30 figures, in which:

Fig. 1 shows a detail of a leaf of a door with associated frame and with a part section of the installed situation of an integrated door drive;

35 Fig. 2 shows a sectional illustration of a lifting cam door closer with freewheel device for integrated installation;

Fig. 3a shows the plan view of a drive which can be integrated with freewheel device and with an actuating arm mounted for DIN right-hand doors;

5 Fig.3b shows the plan view of a drive which can be integrated with freewheel device and with an actuating arm mounted for DIN left-hand doors.

10 Figures 1 and 2 illustrate a drive 3 integrated in a leaf 1 of a door, together with an associated frame 2. Installed in the frame 2 is the sliding rail 6, in which the slider 5 is guided. The slider 5 is arranged such that it can rotate at one end of an
15 actuating arm 4, the other end of the actuating arm 4 being firmly connected to a holder 14 of the drive 3 so as to rotate with it, and interacting with the driver disc 13 of the drive 3. The drive 3 can also be integrated in the frame 2 and the sliding rail 4
20 in the leaf 1.

The drive 3 has a housing 7, in which a spring-loaded damping piston 8 and a spring piston 9 are arranged. A closing spring 10 acts on the spring
25 piston 9 as an energy store which can be prestressed via a closing force adjustment 15 in order to adapt the drive 3 to different leaves 1.

The damping piston 8 divides the interior of the
30 housing, which is filled with hydraulic oil, into two regions in front of and behind the damping piston 8. By means of valves in the piston and by means of bypass ducts in the housing, which are provided with restricting valves, the behaviour of
35 the drive 3 can be influenced. The opening damping, closing damping, the end stop and fixing of the leaf 1 can therefore be carried out. The adjustments can

be made manually or else electromagnetically or by electric motor.

5 Arranged between the damping piston 8 and the spring piston 9 is an output shaft 11, which is mounted in the housing 7 such that it can rotate. A lifting cam disc 12 is arranged on the output shaft 11, firmly connected to the latter so as to rotate with it. The lifting cam disc 12 is symmetrical, for example a
10 heart-shaped cam, in order to be able to use the drive both for the installation of DIN left-hand and right-hand leaves 1. The output shaft 11 has, at its shaft end emerging from the housing 7 of the drive 3, a driver disc 13 firmly connected to it so
15 as to rotate with it, and a holder 14 arranged such that it can rotate freely for the actuating arm 4. The driver disc 13 with the holder 14 is illustrated in Fig. 4.

20 The driver disc 13 is cut out in a semicircular shape and has two depressions, in which a driver 16 which can be fixed to the actuating arm 4 can engage.

25 As can be seen from Figures 3a and 3b, the actuating arm can be placed on the holder 14 and screwed to it, it being possible for the actuating arm 4 to rotate freely without the closer shaft 11 also being rotated. The actuating arm 4 comprises two holes
30 18, which can have a thread.

As a result of inserting a driver 16 into one of the holes 18 in such a way that the driver 16 reaches into the plane of the driver disc 13, the driver 16
35 comes into form-fitting contact with one of the depressions of the driver disc 13 during rotational movement of the actuating lever 4, as a result of

which the said driver disc 13 is also moved. Depending on the use of the drive 3 for a DIN left-hand or DIN right-hand door, the direction of rotation is different when the leaf 1 is opened, as
5 illustrated by the arrow A in Figures 3a and 3b. The driver 16 therefore has to be inserted into the appropriate hole 18 in each case in order that the driver disc 13 is carried along when the leaf is opened, and therefore the output shaft 11 is
10 rotated.

The damping piston 8 and the spring piston 9 in each case have, at their end facing the output shaft 11, in each case a rotatably mounted roller 17, which
15 roll on the lifting cam disc 12 of the output shaft 11. If the output shaft 11 is rotated as a result of opening the leaf 1 and the resulting movement of the actuating arm 4 via the driver 16 and the driver disc 13, the damping piston 8 and the spring piston
20 9 are displaced by the lifting cam disc 12. The rotational movement of the output shaft 11 is converted into a linear movement. In the process, the spring piston 9 is moved in such a way that the closing spring 10 is stressed by being compressed,
25 and therefore stores the energy required for the closure of the leaf. The spring-loaded damping piston 8 is likewise displaced, it being possible for the hydraulic oil to flow from one piston side to the other piston side through bypass ducts.

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By means of a valve, the hydraulic fluid can be prevented from flowing back, as a result of which the damping piston 8 can be displaced when the leaf 1 is opened, but cannot move back again. This
35 therefore means that the lifting cam disc 12 is not rotated back by the force of the closing spring 10 when the leaf 1 is closed, but further opening of

the leaf 1 and therefore further stressing of the closing spring 10 and displacement of the damping piston 8 is possible. As a result, the output shaft 11 with the driver disc 13 fixed to it is blocked in the closing direction.

If the leaf 1 is guided in the direction of its closed position with the valve closed and therefore the driver disc 13 blocked, the driver 16 of the actuating arm 4 is released from its contact in the depression of the driver disc 13, since the actuating arm 4 is arranged on the freely rotatable holder 14. The leaf 1 can then be moved freely, decoupled from the drive 3, corresponding to a leaf 1 on which no drive 3 is arranged.

If the fixing of the drive 3 is cancelled by the valve being opened, the damping piston 8 can be displaced back again, and the output shaft 11 with the driver disc 13 rotates back. Depending on the instantaneous position of the leaf 1, the driver disc 13 comes into contact with the driver 16, and the rotational movement of the output shaft 11 is transmitted to the actuating arm 4, by which means the leaf 1 is guided into its closed position. This is advantageous in particular in the case of fire protection doors which have to be closed in the event of danger, it not being necessary in normal operation for the door always to be opened counter to the closing force of the drive 3.

List of reference symbols

- 1 Leaf
- 2 Frame
- 3 Drive
- 4 Actuating arm
- 5 Slider
- 6 Sliding rail
- 7 Housing
- 8 Damping piston
- 9 Spring piston
- 10 Closing spring
- 11 Output shaft
- 12 Lifting cam disc
- 13 Driver disc
- 14 Holder
- 15 Closing force adjustment
- 16 Driver
- 17 Roller
- 18 Hole

Patent claims

1. Freewheel device for a drive of a leaf of a door or window,
5 the drive being integrated in the leaf or in the frame, and the drive having an actuating arm which is arranged on an output shaft of the drive and which is pivoted when the leaf is actuated, and the actuating arm being arranged
10 on the output shaft such that it can rotate freely and having a driver which interacts with a driver disc firmly arranged on the output shaft so as to rotate with it, characterized in that,
15 in the region around the output shaft (11), the actuating arm (4) has mutually opposite holes (18) for the insertion of the driver (16), it being possible for the driver (16) to be inserted into one of the holes (18) in order to
20 define the actuating direction of the drive (3) as desired.
2. Freewheel device for a drive according to Claim 1, characterized in that the driver disc (13)
25 is of semicircular shape for the symmetrical use of the drive (3) on left-hand and right-hand leaves (1).
3. Freewheel device for a drive according to Claim 2, characterized in that the driver (16)
30 interacts with the driver disc (13) in such a way that the actuating arm (4) comes into contact with the driver disc (13) as a function of the direction of rotation.
- 35 4. Freewheel device for a drive according to Claim 1, characterized in that the driver disc (13) has depressions in which the driver (16) can engage with a form fit.

5. Freewheel device for a drive according to Claim 1, characterized in that the drive (3) has a fixing device which fixes the output shaft (11).
6. Freewheel device for a drive according to Claim 5, characterized in that, when the output shaft (11) is fixed, the actuating arm (4) can be released from the movement of the leaf (1) when the latter is pivoted in the closing direction.
7. Freewheel device for a drive according to Claim 5, characterized in that the fixing device can be controlled electrically.
8. Freewheel device for a drive according to Claim 5, characterized in that the fixing device uses valves to influence the bypass ducts of a hydraulic damping piston (8) which interacts with the output shaft (11) and belongs to the drive (3), in such a way that the output shaft (11) cannot pivot the actuating lever in the closing direction of the leaf (1).
9. Freewheel device for a drive according to Claim 5, characterized in that the fixing device uses valves to influence the bypass ducts of a hydraulic damping piston (8) which interacts with the output shaft (11) and belongs to the drive (3), in such a way that the actuating arm (4) can pivot the output shaft (11) when the leaf (1) is pivoted in the opening direction.