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DescriptionDrive device for a stop barrier

The invention refers to a drive device for a stop barrier or similar stop or closure device as described for example in EP 0 290 957 B1, 0 438 364 B1, DE 32 31 720 C1 or DE 83 00 704 U1.

5 The invention therefore assumes such a device with a drive unit that has a drive motor and attached to the drive motor an at least single-stage step-down worm and/or spur gear with a hinged connection to a pivoting crank on a primary shaft that can be swivelled on bearing points on both sides, preferably around a horizontal axis, the primary shaft having a fixing device for the stop or closure element or barrier tree or
10 pole, which as a rule has to be swivelled around an angle of 90 degrees, and abutments for its compensation springs, which act on its spring crank.

In the above-mentioned drive device and also in drive devices described in other publications, the fixed components and the moving drive and gear elements consist of
15 a large number of individual parts. This diversity of parts is felt to be a disadvantage, because the different implementation versions have to be taken into consideration when ordering parts, and because there is a considerable amount of work involved in installing and adjusting the numerous individual parts.

20 One very great disadvantage is seen in the fact that depending on the local situation at the installation site, widely differing construction dimensions, different motor powers and different constructions, for example right-hand or left-hand barrier arrangements, are necessary. This diversity of construction types and parts results in having to keep a wide range of individual components in stock for the production and installation
25 stages, causing considerable costs for purchasing and stock-keeping. In addition, more high costs are necessary for the provision of spare parts, and it is necessary to maintain an extensive customer service facility with a knowledge of the features of the



numerous types and versions and the possible sources malfunctioning that can occur depending on type of construction or operation.

5 The task of the invention is derived from these circumstances, in that a design of such a drive device must be created that is composed of a considerably smaller number of individual components and which above all can always be used uniformly in the same design and construction for different drive powers and barrier lengths and weights and for right-handed and left-handed barrier tree or pole arrangements.

10 The solution to this task is achieved by constructing a single-part and single-piece drive casing with flat securing flange strips that are open on all sides, which also has a receiving flange for mounting the drive motor, which can be dismantled and removed and whose motor shaft is inserted into a gear box that can be closed by means of a lid and containing a step-down gear to whose output shaft an output crank is fixed with a
15 hinged connection to the pivoting crank of the primary shaft by means of a swivelling arm, the pivoting crank being supported on both sides by two bearing blocks moulded onto the single-piece drive casing and extending out on one side at least in the area of one bearing point and equipped with a fixing device for the barrier or closing element or barrier tree or pole.

20 Construction of this single-part and single-piece drive casing with the claimed features enables a compact assembly unit of the drive device to be created consisting of the drive motor, the encased step-down gear, a lever mechanism with an output crank, a hinged joint to the pivoting crank, and with bearings for the primary shaft for the
25 barrier or closing element or barrier tree or pole.

This assembly unit has flat securing flange strips, open on all sides, running all round, so that it can be mounted or anchored to any design of substructure or other holding constructions.

30 The single-part drive casing provides considerable technical advantages in manufacturing through the possibility of manufacturing it as a complete injection-moulded part, through mechanical processing in a single machine set-up, through compliance with tight distance tolerances, and by obviating the necessity for costly



reclamping and adjustment. The markedly lower number of individual parts to be assembled also results in further savings in technical cost.

5 The spatial inclusion of a receiving flange to fix the drive motor to in conjunction with the gear box for the step-down gear is particularly advantageous. Through mechanical processing of both devices in a single set-up, the tightest of tolerance values can be complied with in a very short machining time.

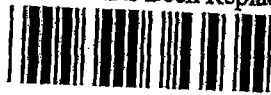
10 The receiving flange for fixing the drive motor can be designed as a circular cylindrical pipe socket, arranged in transverse direction to the primary shaft, with the stator casing of the electric motor installed in the pipe socket. As a variation of this, it is also advantageous for the receiving flange to be shaped as a short pipe socket piece with a circular centering shoulder on which the drive motor stator casing is positioned to fit and screwed.

15 This type of construction is a simple way of enabling different versions of motors, according to power, voltage and motor type, with their different dynamics, to be installed. For simple multi-storey car-park barriers with movement times of between 2 and 3 s, an inexpensive asynchronous motor is sufficient, while if the requirement is
20 for fast movement of 0.5 s, a highly dynamic, electronically controlled synchronous motor can be installed.

With solar power, direct current motors are also an option.

25 A gear box for the step-down gear is also included in the single-part drive casing. This gear box is equipped with an entry socket for the motor shaft, the counter gears and the associated bearing point for at least one gear stage and an exit socket for the gear output shaft, which is over-mounted and has an output crank. Due to the gear box and the receiving flange for the drive motor being mechanically processed in a single set-
30 up, precise meshing of the gear wheel mounted on the motor shaft and the first step-down stage gear wheel mounted in the gear box is ensured.

The gear box, which can be closed by means of a gear lid, is provided with the bearing points for the teeth of the step-down gear, by means of which the gear stages are



formed. Preferably, two or three gear stages are provided, whose final stage gear output shaft has an external output crank.

5 The step-down gear is preferably formed from one worm and two spur gear stages forming a modular system, where the transmission provided by the worm and spur gear stages allows variable combinations of gear ratios within broadly set limits by means of exchanging pairs of wheels.

10 The possibility of selecting the type of motor combined with selectable gear ratios allows a very wide range of options for adjustment to different conditions in which barriers or similar closing systems are used.

15 The output crank located outside the gear box has a hinged swivelling arm connection to the pivoting crank, and the latter is located on the primary shaft for the barrier or other closing device. The primary shaft is borne on both sides by bearing blocks, which are moulded onto on the drive casing. The barrier tree or pole or other closing device is connected to the primary shaft, which is open on one side, by means of a fixing device.

20 According to one essential feature, this primary shaft is designed as a sleeve shaft in which the working shaft can be locked against rotating; the working shaft is connected to the fixing device for the barrier or closing element, or barrier tree or pole, and after being unlocked it can be pulled out on one side and re-inserted on the opposite side, so that the fixing device with the barrier or similar closing element can be positioned on
25 either the left or the right side as required, without anything on the drive device having to be modified. This achieves advantages in manufacturing and logistics through a smaller number of different versions; users can also change sides themselves while retaining the adjustments made to the pre-set limit switch and transmitter for correct functioning.

30 In this connection, it is also very advantageous that the output crank on the gear output shaft and above all the pivoting crank on the primary shaft are fixed by clamping force. The cranks are clamped firm to the primary shaft as a divided ring flange by screw joints, and can be released. A securing element that can be removed after the



screws have been loosened and replaced after the working shaft has changed sides and again secured by tightening the screws is used to lock the working shaft in place.

5 The fixing device for a barrier tree or pole or other closing device consists of an appropriately shaped connecting piece for the barrier tree or pole or similar closing device which is adapted to the working shaft by means of an interlocking adapter piece and adapted to the adapter piece by means of a wedge profile. The separation of adapter piece and connecting piece allows universal adaptability of various different versions and materials of a barrier tree or pole (cross-section profile / wood, metal,
10 plastic).

With overloading or impact forces – for example on the barrier tree or pole due to falling trees or people sitting on it – massive overload forces are buffered by a limit stop, which in its lowest position limits the final position of the pivoting crank, thus
15 preventing the overload forces from being transmitted to the gear.

As a rule, in the known drive devices for stop barriers or similar stop and closing devices, compensating devices are necessary in order to compensate for imbalances due to gravity. Spring compensation arrangements are common. Within the framework
20 of the invention, a spring compensation mechanism is proposed in which between 1 and 6 draw springs can be suspended from two spaced spring cross arms, so that the spring compensation force can be dimensioned according to the extent of the compensation requirement due to gravity. Precise adjustment is also made possible by attaching the draw springs on adjustable threaded anchor rods.

25 Compared with the current state of technology, the drive device according to the invention combines several complementary features to produce a very progressive new technological solution. This makes it possible to create easily adaptable stop barriers or similar stop or closing devices for a wide variety of different installation situations
30 by means of a modular conception, at a considerably reduced technical cost achieved by restriction to a smaller number of components.

The essential features of the invention are described and explained in greater detail using the examples of implementation shown in drawings. These show:



- Fig. 1 A perspective view of a basic form of the drive casing in a first version;
- Fig. 2 The basic form acc. to Fig. 1 from a different perspective view;
- 5 Fig. 3 A perspective view of a second version of the basic form acc. to Fig. 2;
- Fig. 4 A side view of the basic form acc. to Fig. 1;
- 10 Fig. 5 A further version of the basic form acc. to Fig. 4;
- Fig. 6 A side view of the gear lid;
- Fig. 7 A cross-section of the gear lid;
- 15 Fig. 8 The gear lid from the inside;
- Fig. 9 A schematic representation of the drive kinematics;
- 20 Fig. 10 A partial view of the drive gear;
- Fig. 11 A side view of the drive gear.

25 Figure 1 shows a basic form of the single-part and single-piece drive casing G. It essentially consists of a rectangular basic frame 1, which has flat securing flange strips 2 surrounding it on all sides; these have a number of spaced drill-holes sunk in drill-hole reinforcements 4. Two bearing blocks 6 are moulded on opposite one another by means of reinforcing ribs 5 to bear the primary shaft. The rectangular basic frame 1 is also provided with reinforcing ribs 8 at the edge zones, and the edge zones R are

30 connected to one another and stiffened against torsion by means of further continuous reinforcing ribs 8, with free openings A, B and C present between the reinforcing ribs.

In opening C, a gear box 9, whose flat casing opening is closed by a gear lid 10 – see Fig. 7 - is moulded perpendicularly onto the plane of basic frame 1. In addition, a stop



buffer 12 can also be seen on a rib reinforcement 11 in the area of opening C; this serves to restrict the pivot movement of output crank 31, which is fixed to the gear output shaft 30 which protrudes from an exit socket (21b) with bearing point 13 in the gear lid 10.

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From Fig. 2 it can be seen that the gear box 9 is moulded onto the basic frame 1 by means of reinforcing ribs 15 and 16 (Fig. 1), and that on the underside of the gear box the receiving flange 14 for fixing the drive motor 17, which can be dismantled and removed, is also attached to the gear box 9 as a single piece.

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Fig. 3 shows the drive casing according to Fig. 2 with a framework arranged on it consisting of two side bars 50 and a cross bar 51 for suspending the compensation springs 48 shown in Fig. 11. The framework can be attached to drive casing G as a single piece, e.g. as a single injection-moulded part, or it can be fixed to it by means of a plug or screw joint.

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Figs. 4 and 5 show the single-piece construction of the drive casing G with the gear box 9 and the receiving flange 14 for fixing the drive motor 17. The flat outer surface 22 of the gear box 9 is used to screw on the gear lid 10 – see Figs. 6 to 8. As can be seen from Figs. 4, 5 and 6 to 8, the gear box 9 has an entry socket 18 for insertion of the motor shaft, on which a worm, not shown here, is mounted in the design example. The bearing points 19 in gear box 9 in the gear lid 10 are provided for the first countershaft, not shown here, with the worm wheel and the first pinion gear. Bearing points 20 and 20a are used to mount the rolling bearing for the second countershaft with a cogwheel and another pinion gear, and bearing points 21 and 21a bear the rolling bearing for the gear output shaft which carries a spur gear in gear box 9 and extends to the outside through exit socket 21b and is there fitted with the output crank. The gear lid 10 also has a shoulder 23, which bears a stop buffer 24, which serves to restrict the movement of the output crank 31.

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Figs. 9 to 11 show the drive kinematics of the device of the design example described. In Fig. 9, the motor shaft designated 36 on which worm 32 is mounted, and belonging to drive motor 17, can be seen. This meshes with the worm gear 34, which is connected by worm gear shaft 39 to pinion gear I 35. This in turn meshes with spur



gear I 26, which is mounted on countershaft 27 together with pinion gear II 28. This drives spur gear II, which is mounted on the gear output shaft 30, thus also driving the output crank 31. The torque is transmitted via swivelling arm 37 to the pivoting crank 38, which is connected to the primary shaft 46. This is constructed as a sleeve shaft
5 holding the working shaft 44, which has an anti-rotation connection to it, and can be removed. The fixing device 40 for the barrier tree or pole 41 is mounted on the working shaft 44. The spring crank 45, to which the top spring cross arm 42 is fixed, which is used to attach the compensation springs 48, can be seen as an extension of the pivoting crank 38.

10 Fig. 10 also shows these kinematics, as a partial view in which the gear box 9 with the gear lid 10 is shown in a vertical section. It can also be seen how the worm gear shaft 39, which is not represented in greater detail, and the countershaft 27, which is also not represented in greater detail, are borne by the corresponding bearing points 19, 19a
15 and 20, 20a by means of rolling bearings. The gear output shaft 30 is borne by bearing points 21, 21a. (Figs. 6 to 8).

In Fig. 11, the gear parts have the same reference numbers. In addition, it can also be seen that as a variation on the version according to Figs. 2 to 5, the receiving flange 14
20 — see patent claim 4 — is formed as a short pipe socket piece N to which the casing of the drive motor 17 centered and attached. Further, the spring crank 45 with the top spring cross arm 42, to which the compensation springs 48 are attached, can also be seen. To adjust the spring force, screw joints 43 allowing longitudinal adjustment, which are fixed to the spring cross arm 42 and connected to the spring ends, are used;
25 such screw joints can also be located on the lower spring cross arm 54, which is connected to the cross bar 51 or mounted in a drill hole 53. The number 52 designates a fixing attachment for the compensation spring 48.

Patent Claims

- 5 1. Drive device for a stop barrier or a similar stop or closure device with a drive unit which has a drive motor (17) and attached to that an at least single-stage step-down worm gear and/or spur gear with a hinged joint to a pivoting crank (38) on a primary shaft (46) that can be swivelled on bearing points on both sides, preferably around a horizontal axis, which has fixing device (40) for the barrier or closure
- 10 element or barrier tree or pole (41), which as a rule has to be swung through about 90 degrees, and abutments for the compensation springs (48) that act on their spring crank (45).
- characterized by
- 15 a) a single-part, single-piece drive casing (G) with flat securing flange strips (2), open on all sides, which further
- b) has a receiving flange (14) for mounting the drive motor (17), which can be
- 20 dismantled and removed, whose motor shaft (36)
- c) enters a gear box (9) which can be closed by a gear lid (10) and which contains a step-down gear
- 25 d) to whose gear output shaft (30) an output crank (31) is fixed, which
- e) by means of a swivelling arm (37) has a hinged connection to the pivoting crank (38) of the primary shaft (46), which
- 30 f) is borne by two bearing blocks (6) moulded onto the single-piece drive casing (G) and
- g) protrudes on one side at least in the area of one bearing point and is fitted with the fixing device (40) for the barrier or closure element or the barrier tree or pole (41).

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2. Drive device for a stop barrier or a similar stop or closure device with a drive unit which has a drive motor (17) and attached to that an at least single-stage step-down gear, worm gear and/or spur gear with a hinged connection to a pivoting crank (38) on a primary shaft (46) that can be swivelled on bearing points on both sides, preferably around a horizontal axis, which has fixing device (40) for the barrier or closure element or barrier tree or pole (41), which as a rule has to be swung through about 90 degrees, and abutments for the compensation springs (48) that act on their spring crank (45).

characterised by

- a) a single-part, single-piece drive casing (G) with flat securing flange strips (2), open on all sides, which further
- b) has a receiving flange (14) for mounting the drive motor (17), which can be dismantled and removed, and whose motor shaft (36)
- c) enters a gear box (9) which can be closed by a gear lid (10) and contains a step-down gear
- d) to whose gear output shaft (30) an output crank (31) is fixed, which
- e) by means of a swivelling arm (37) has a hinged connection to the pivoting crank (38) of the primary shaft (46), which
- f) is borne by two bearing blocks (6) moulded onto the single-piece drive casing (G) and
- g) protrudes on one side at least in the area of one bearing point and is fitted with the fixing device (40) for the barrier or closure element or the barrier tree or pole (41),
- h) two rod-shaped side bars (5) moulded onto the drive casing (G) on both sides and connected in transverse direction by a cross bar (51) and on which a lower spring cross arm (54) for the compensation springs (48) is located.





3. Drive device according to claims 1 or 2 characterized in that the receiving flange (14) used for fixing the drive motor (17) is shaped as a circular cylindrical pipe socket aligned transversely to the axis of the primary shaft (46).

5 4. Drive device according to claim 3 characterized in that the drive motor is inserted with its stator casing into the pipe socket of the receiving flange (14).

10 5. Drive device according to claim 3 characterized in that the pipe socket of the receiving flange (14) is shaped as a short pipe socket piece N and has a circular centering shoulder (47) to carry the drive motor stator housing (17).

15 6. Drive device according to claims 1 or 2 characterized in that the gear box (9) is fitted with an entry socket (18) for the motor shaft (36), the counter gears and associated bearing points for at least one gear stage, and the gear lid (10) is fitted with an exit socket (21b) for the over-mounted gear output shaft (30), which has an output crank (31).

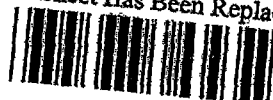
20 7. Drive device according to claims 1 or 2 characterized in that that a working shaft (44) that is fixed against rotation to the pivoting crank (38), but which can be removed and which can be shifted in an axial direction, is located in the primary shaft (46), which is shaped as a sleeve shaft and also connected to the pivoting crank (38), and that the fixing device (40) for the for the barrier or closure element or barrier tree or pole (41) is locked against rotation to the working shaft (44).

25 8. Drive device according to claim 6 characterized in that the output crank (31) on the gear output shaft (30) is fixed by clamping action.

30 9. Drive device according to claim 7 characterized in that the pivoting crank (38) on he primary shaft (46) is fixed by clamping action.

10. Drive device according to claims 1 or 2 characterized in that for the compensation springs (48) an upper spring cross arm (42) has a hinged connection to a spring crank (45) mounted on the primary shaft (46).

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11. Drive device according to claims 1 or 2 characterized in that for the compensation springs (48) a lower spring cross arm (53, 54) is mounted on a framework (49) on the drive casing (G).

5 12. Drive device according to claims 1 or 2 characterized in that the step-down gear in the gear box (9) consists of a first gear stage with the worm gear (32) located on the motor shaft (36) and the worm wheel (34), and that the second gear stage is made of the first pinion gear I (35) and a first spur gear (26), and that the third gear stage comprises a second pinion gear II (28) and a second spur gear II (29), which is located
10 on the gear output shaft (30) to which the output crank (31) is firmly clamped.

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