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(54) Power drive mechanism

(57) A power drive mechanism has an electro-motor, with a flat casing, which is energised by a permanent magnet (20) and drives, by way of a worm (6) with worm gear (7) mounted on a motor shaft (5) end extended into an adjacent gearbox and also by means of a cable drum (8), a closed cable-rope loop. To provide an especially simple and compact construction the motor stator part consists essentially of an axially extending frame (3) which is magnetically non-conductive, serving the purpose of at least the mounting or support respectively of the rotor (4) and at least of the permanent magnet (20) with pole sheets (1, 2) shaped as halves of the flat motor casing which are closely spaced from the motor peripheral region, and the worm gear (7) and cable drum (8) are pivoted in the gear box on a common axis. An advantageous use is in the motorised opening and closing of windows, doors and sliding roofs in motor vehicles or the like.

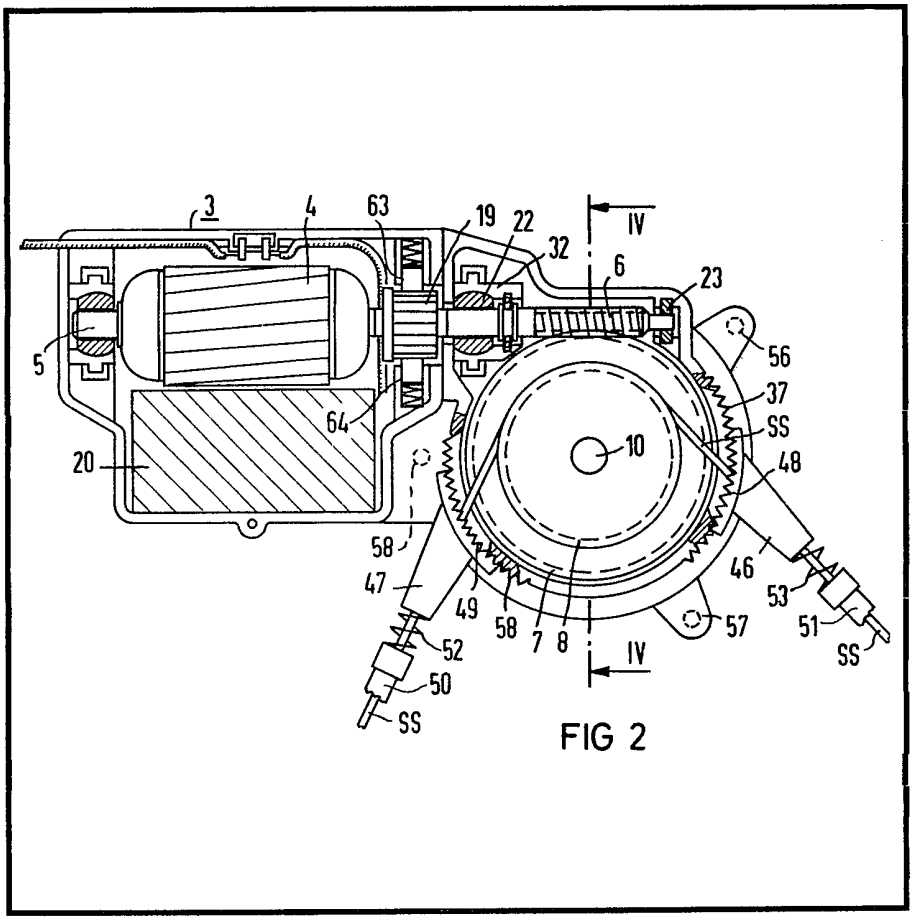

FIG 2

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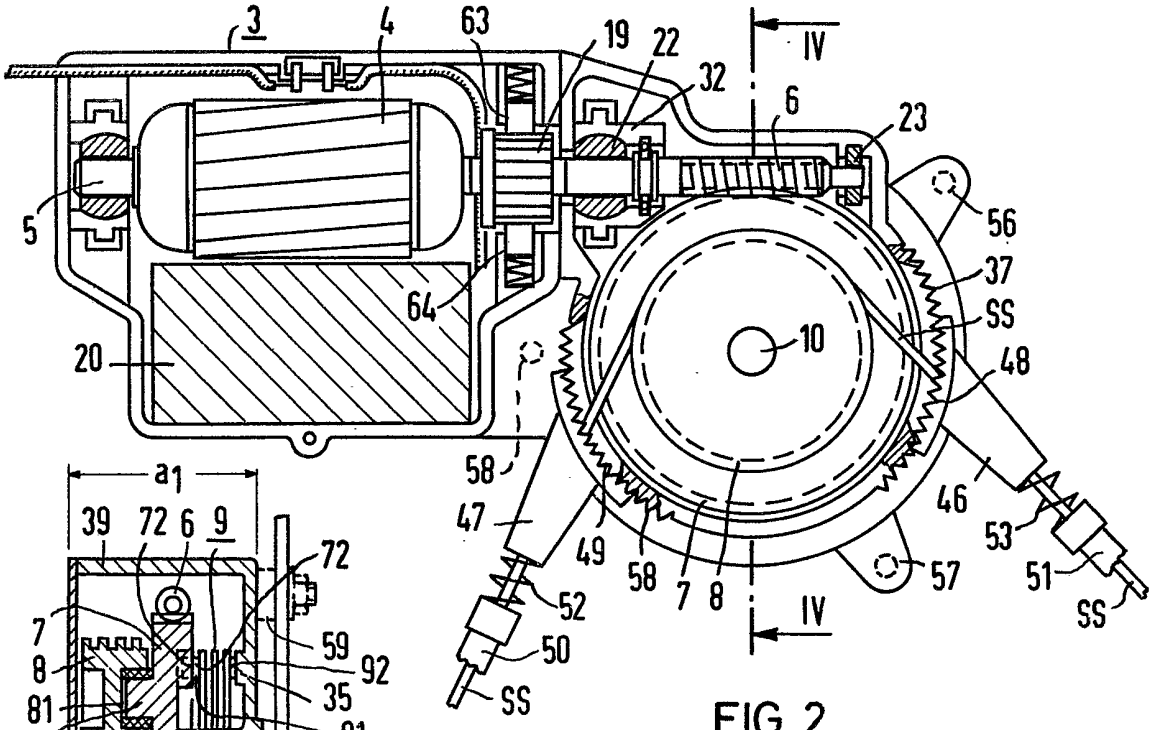

FIG 2

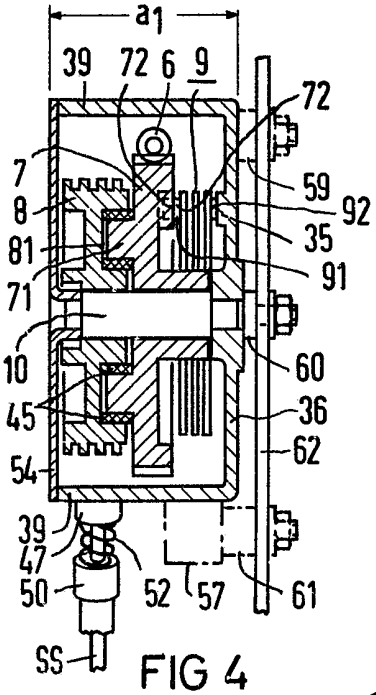

FIG 4

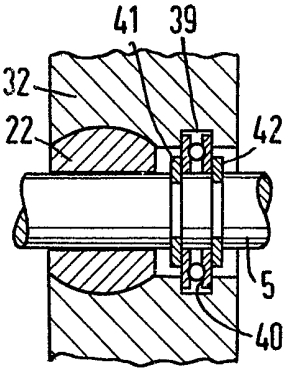

FIG 3

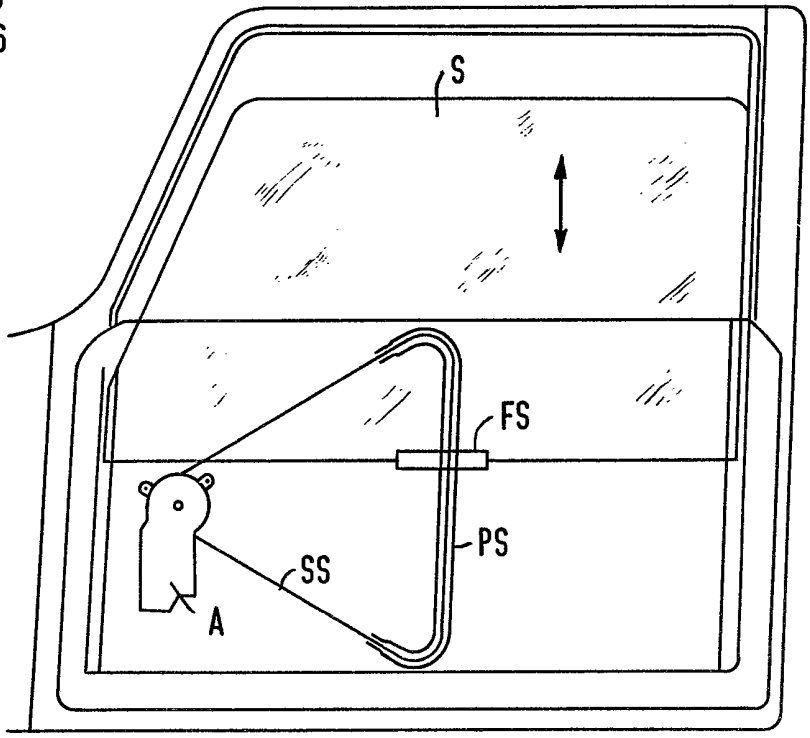

FIG 1

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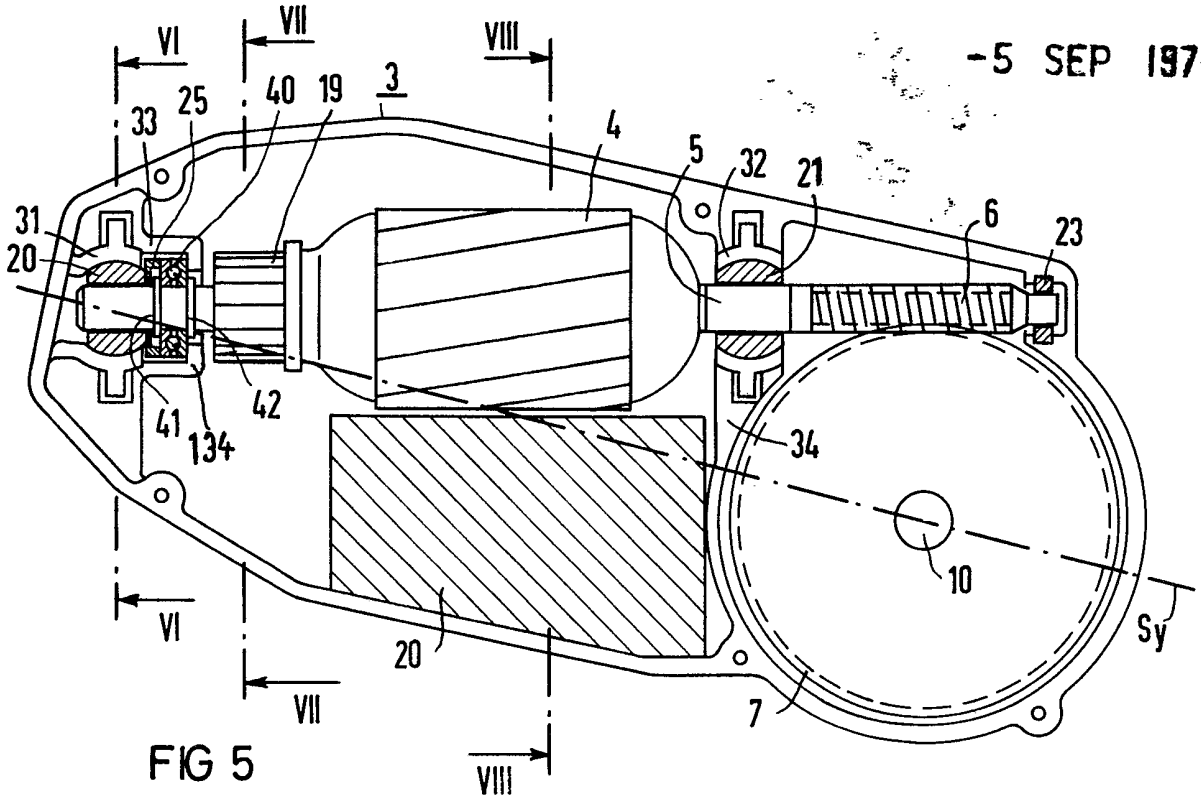

FIG 5

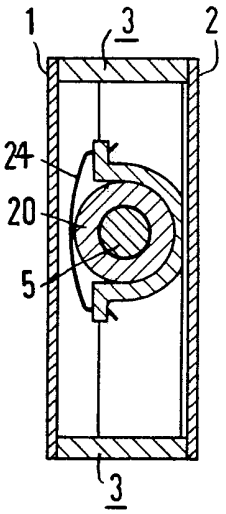

FIG 6

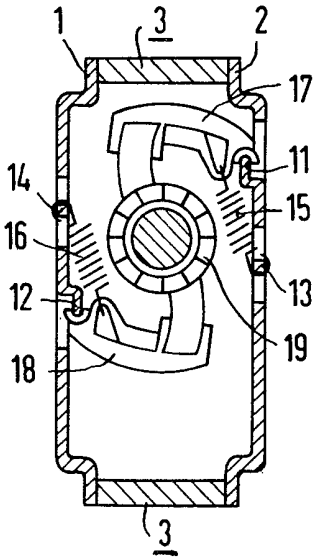

FIG 7

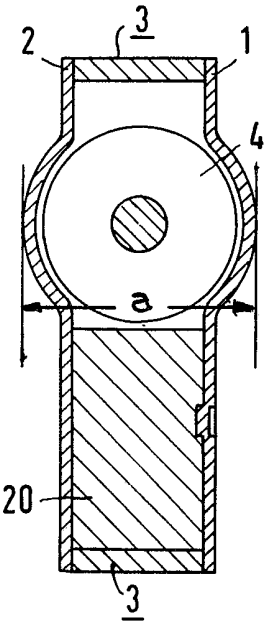

FIG 8

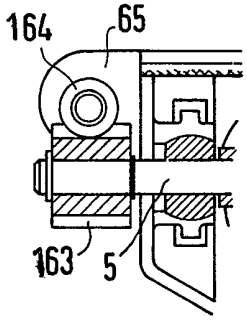

FIG 9

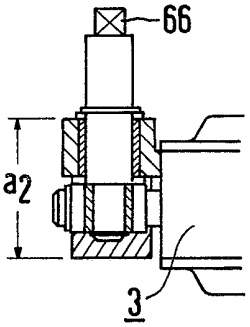

FIG 10

SPECIFICATION

Power drive mechanism

The invention relates to a power drive mechanism for opening and closing a movable part such as a window, door, sliding roof in a motor vehicle or similar.

It is known (German Auslegeschrift 17 08 310) in cable-rope window raising mechanisms operated by motor, to transfer the power from the off-drive shaft of the electromotor onto a worm gear by way of a worm. Worm and worm gear are accommodated thereby in a gear box. The shaft of the worm gear projects out of an opening of this gear box and forms at the same time the axis of a crank bolt on which a small cog wheel is mounted which engages with a large cog wheel bearing the cable drum. In window-raising mechanisms driven by motor according to the prior art the motor is screwed laterally onto this intermediate gear unit.

In a previously proposed driving motor for a mechanism for opening and closing windows, in particular in motor vehicles with direct-current motor with subsequently connected gear unit, energised by permanent magnet and arranged in flat casing which closes tightly towards the outside, a u-shaped return contact stirrup is provided for the purpose of magnetic return contact which abuts on the front end with its free limb ends the one side of a supplementary return-contact sheet, on the other side of which a gear box made of cast aluminium is connected. A thermo-plastic cover is inverted over the return-contact stirrup and the outer edge of the return-contact sheet for sealing off the motor part. The motor shaft, extended through an opening of the return-contact sheet into the gear box and provided there with a worm gear, is received there by sintered iron hemispherical bearings, which on the one side are mounted on the yoke curvature connecting the limbs of the return-contact stirrup and on the other side directly abutting the gear box.

The present invention aims to produce, with simple means of assembly and manufacture, a power drive mechanism for opening and closing a movable part, such as a motor vehicle door window, the mechanism being highly efficient and at the same time very compact.

According to the invention there is provided a power drive mechanism for opening and closing a movable part such as a window, door, sliding roof in a motor vehicle or similar, the mechanism comprising an electric motor of which the stator part comprises a magnetically non-conductive frame supporting, at least, the motor rotor and a stator permanent magnet provided with magnetic pole sheets which are secured on the frame one on each side of the rotor, so as to constitute together with said frame a motor casing, and are shaped so that their internal surfaces are closely spaced from the peripheral region of the rotor, the motor shaft extending into a gearbox casing disposed adjacent the magnetically non-conductive frame and housing a cable drum for winding a closed cable loop to open and close said movable part, the cable drum being in coaxial driving connection with a gear, in the gearbox casing, meshed with a worm on the motor shaft extension, the common axis of the cable drum and gear being arranged parallel to the direction of spacing between the pole sheets and the overall thickness of the gearbox casing in the direction of the cable drum axis being not greater than the maximum corresponding thickness of the motor casing.

A constructional simplification can be achieved advantageously in that the magnetically non-conductive frame is constructed as an integrated motor-gear-unit so that the gearbox casing forms a part of the magnetically non-conductive frame. First of all the motor and gear parts can be fitted during assembly onto this frame which extends into the motor as well as the adjacent gearbox for the worm and meshing gear and the entire integrated motor-gear-unit be completed by fitting the motor casing parts tightly on both sides, whereby the casing parts are also used at the same time as pole sheets. In order to prevent dirtying of the motor parts through oil lubrication agents of the worm drive parts in the integrated motor-gear-unit, a partition can also be pre-formed as a unitary part of the frame which separates the gear unit section from the motor section. It is possible for the frame to be constructed in one piece as a sprayed die casting of synthetic material.

Half-open bearing boxes can also be preformed in unitary fashion on the frame, and bearings for supporting the motor shaft, positioned in these boxes and fixed thereby in an axial manner, can be each secured radially in the respective bearing seat. The radial securement can be provided in each case by a clamping spring clamped over the opening of the bearing box onto said frame. In a development the mounting on the motor shaft in at least the bearing box remote from the worm is provided by a part-spherical bearing to absorb radial forces and an axial pressure bearing, the part-spherical bearing being radially secured by means of said clamping spring. Alternatively, the radial securement is provided in each case by an additional half-open bearing box which is securely screwed-on.

The compact structural form of the pwoer drive mechanism can be even further improved advantageously in that only a single permanent magnet is provided, this magnet being disposed in a space limited along two adjoining sides essentially by the motor rotor and by the gear and cable drum, respectively, so that only the *per se* "shielded angle"

between worm gear and cabledown on the one hand and motor rotor on the other hand is used for the permanent magnet. A magnetic short circuit of the pole sheets at their edges remote from the single permanent magnet is prevented by the frame, on which the pole sheets fit tightly in this area.

In accordance with another preferred feature, mechanical means are provided in the gearbox casing on the common axis of the gear and cable drum for limiting the angle of rotation of the gear, for the purpose of an additional contraction of the structural parts to a compact integrated drive on the common fixed axis of the worm gear and cable drum. The greatest saving of space is achieved thereby by pivoting the mechanical means on the said common axis on that side of the worm gear facing away from the cable drum, the mechanical means being inserted if necessary even as far as into the gear rim of the worm gear which is formed in a hollow manner on this side.

The mutual rotationally locked connection between worm gear and cable drum can take place for example by means of mutual riveting or even by manufacturing both structural parts in one piece. However, in order to achieve a uniform motion and a cushioned end stop, the worm gear and the cable drum can be arranged in coaxial driving connection advantageously as single structural parts by way of flexible means. Flexible means of this kind can in particular be elastic buffers of rubber or synthetic material.

As in the power drive mechanism no separate intermediate gear unit means subsequently connected to the worm gear are necessary, it is provided advantageously for a further simplification and achievement of a high degree of compactness that fittings for the attachment of cable-guide tubes for the cable loop are also pre-formed on the gear box casing. An arrangement of this kind is recommended in particular when the gear box or the halves of the gear box respectively fitting the integrated frame are produced as sprayed die casting.

In order to be able to adapt or modify the angle at which the two cable lengths of the cable loop extend away from the cable drum independently of the particular shape and construction of various motor vehicle doors in each case according to a different motor vehicle model for the purpose of an extensive standardisation of the power drive mechanism, fittings for attachment of cable-guide tubes are constructed as separate components from the gearbox casing and attached thereto by means enabling said fittings to be attached at different selected angles about the cable drum axis.

Mounting lugs can be pre-formed on the integrated motor-gear-drive unit, for mounting the motor-gear-drive unit on a support part of a motor vehicle. For example these mounting lugs are pre-formed on a back face and/or side wall of the frame which is formed in a cup-shaped manner in the region of the gearbox section. Alternatively, mounting lugs may be pre-formed on the gearbox casing for mounting the power drive mechanism on a support part of a motor vehicle. In each case further mounting lugs may be pre-formed on a gearbox cover which closes the gearbox casing, and rubber buffers positioned on the mounting lugs so as to be between the mounting lugs and a support part of a motor vehicle when the power drive mechanism is mounted on said support part.

In a preferred arrangement means are provided to enable a manually-operated device to be coupled directly or indirectly from the outside of the power drive mechanism to one end of the motor shaft. In one construction, the end of the motor shaft remote from the gearbox extends out of the motor casing and the coupling enabling means comprise a worm on the shaft extension remote from the gearbox, a spur gear adapted so that the manually operated device can be coupled thereonto directly or indirectly, and means to enable the worm to be brought into mesh with the spur gear. Suitably, the spur gear is mounted on a lug pre-formed on said frame.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made by way of example to the accompanying drawings in which:—

Figure 1 shows a general side view of a power drive mechanism mounted in a motor vehicle door, for raising and lowering the door window,

Figure 2 is a longitudinal section through the power drive mechanism,

Figure 3 shows a detailed fragment view of Fig. 2, a thrust bearing between a motor and worm drive included in the drive mechanism,

Figure 4 is a sectional view taken along the line IV–IV in Fig. 2.

Figure 5 shows a view, corresponding to Fig. 2, of a second embodiment,

Figures 6 to 8 are sectional views taken on the lines VI–VI, VII–VII and VIII–VIII respectively in Fig. 5,

Figure 9 shows a connecting drive which can be incorporated into the Fig. 2 embodiment for manual operation of the power drive mechanism in the event of motor drive failure, and

Figure 10 is a top view onto the connecting drive.

Fig. 1 shows the basic arrangement of a power drive mechanism used in a window-raising mechanism driven by electro-motor mounted inside a motor vehicle door. A compact drive unit A comprises a direct-current motor energised by permanent magnet and of flat constructional type with integrated gear

unit with cable drum driven in the same casing. A cable loop SS, closed in itself, passes from the cable drum driven by way of the rotating electro-motor and an interposed worm drive. The cable loop SS is guided through a profiled rail PS in its right-hand part. Depending on the direction of rotation of the cable drum a guide block FS is moved up or down along an upright straight section of a profiled rail PS, the pane S of the motor vehicle door being attached to this guide block at its lower edge. The entire window raising mechanism driven by electro-motor is supported in the door in a manner not shown in greater detail here in that on the one hand the drive unit A and on the other hand the profiled rail PS are attached to bearing, fixed parts of the motor vehicle door.

In accordance with the longitudinal sectional views according to Fig. 2 and Fig. 5, the motor rotor (4) and the worm gear (7) are mounted in a die cast or sprayed die cast frame 3 which is magnetically non-conductive and manufactured for example from aluminium, zinc or synthetic material and which extends as integrated structural part over both the motor and the gear part as bearing structural part. A single permanent magnet 20 is disposed in the area limited towards the upper side essentially by the motor rotor 4 on the one hand and towards the right-hand side by the worm gear 7 and the cable drum 8 on the other hand. Two casing halves, separable in the direction away from the motor axis, are constructed as axially extending pole sheets 1, 2 (see Figs. 6 and 8 which essentially apply in the case of the Figs. 1 to 4 embodiment) at least in the area of the motor rotor 4 and are placed on the frame 3 as a tightly closing, flat casing. As can be seen in particular from Fig. 8, the pole sheets 1, 2 closely abut the single permanent magnet 20 at their longitudinal edges, are matched in the area of the motor rotor 4 as pole surfaces to the curvature of the motor rotor 4 so as to be closely spaced from the peripheral region of the rotor, and are attached at their upper edges remote from the permanent magnet 20 to the magnetically non-conductive frame 3 in such a manner that a magnetic short circuit is prevented in this area. The permanent magnet 20 does not require a curved fitting as it is magnetised perpendicular to the direction of the motor axis and does not itself form a direct pole shoe. The shaft 5 of the motor rotor 4 extended to the right terminates in a worm 6 which meshes with the worm gear 7 pivoted on fixed axis 10 in the gear box part.

As can be seen in particular from Fig. 4, the cable drum 8, which is in locked connection with the worm gear 7, is pivoted coaxially to the worm gear 7 on its one (left) side on the fixed axis 10. Axially projected pins 71 are pre-formed on the periphery of the worm-gear 7, said pins engaging in corresponding bores 81 in the cable drum 8. The pins 71 are covered with a rubber buffer before the worm gear 7 and cable drum 8 are put together in order to achieve a smooth motion and in particular to guarantee a cushioned end stop.

Several disks, pivoted on the fixed axis 10, are arranged on the side of the worm gear 7 facing away from the cable drum 8 as mechanical means for limiting the angle of rotation of the worm gear 7. This set of disks 9 has already been suggested in its technical function for limiting the angle of rotation for the worm and the cable drum and consequently as stroke limiter for the window in German patent application P 27 48 877.3–23. To achieve this limitation in the angle of rotation, the worm gear 7 is provided with an impact edge 72 which co-operates with an external impact edge 91 of the set of disks 9, while the frame 3 which is widened in a cup-shaped manner in the area of the worm drive on its back face to a closed casing wall 36 has an impact edge 35 which co-operates with an outer edge 92 on the facing side of the set of disks 9. The individual disks of the set of disks 9 are connected together by means of additional stops not shown here in greater detail which have the purpose that each individual dual disk takes up respectively the next one following it after rotating by almost 360°.

As can be seen from Fig. 4 the integrated frame is widened in the area of the worm drive to a cup-shaped casing with a back face 36 and a cylindrical side wall 39 which is sealed off by a separate gear cover 54, which lies against the corresponding pole sheet 1 in a tightly closed manner in the axial direction. Two fittings 46, 47 are placed on the periphery of the side wall 39, through which fittings the cable ends of the closed cable loop SS are guided and on which the cable guide tubes 50, 51 of the cable loop SS are supported. This takes place with the interposition of equalizer springs 52, 53 as are described in German patent application P 26 16 331.5. The effect of the equalizer springs 52, 53 is that the cable loop SS always remains free from play. The fittings 46, 47 can be produced in one piece with the gear box casing.

In the present case, however, according to the development shown in Figs. 2 and 4, the fittings 46, 47, are constructed as separate structural parts and can be placed on the gear box part 36, 39 at different angles to the cable drum 8 or to the side wall 39 respectively. To this purpose the contact surfaces of the fittings 46, 47 are shaped to the curvature of the wall 39 in an advantageous manner on the periphery of the wall 39 by way of the prescribed attachment area of the fittings 46, 47, and the wall 39 is provided in a way not shown here in greater detail with corresponding openings for guiding out the cable

loop SS at the respective angles. In order to fix the fittings 46, 47 in their respective angular positions on the casing wall 39 of the gear box part of the frame 3, the latter is provided with a grooving in the form of a saw-tooth grooving 37 or 38 respectively into which the fittings 46, 47 with a corresponding saw-tooth grooving 48, 49 engage and are cable to be pressed in for attaching purposes.

A particularly simple mode of attaching the entire drive unit A (Fig. 1) to the bearing part inside the vehicle door is provided by means of mounting lugs 56, 57, 58 pre-formed in particular in the area of the gear-box parts 36, 39 for attaching the motor-gear-drive-unit onto a motor vehicle part 62 (Fig. 4) bearing this. Thereby it is possible to obtain stable attachment with at the same time low production costs in that the mounting lugs 56, 57, 58 are also preformed on the back face 36 and/or side wall 39 of the frame 3 which is formed in a cup-shaped manner in the ara of the gear box part 36, 39. If on the contrary mounting lugs are also pre-formed on the gear cover 54 sealing off the gear box part 36, 39 of the frame 3, this gear cover must indeed be strengthened if necessary in its function as bearing structural part. However, there is then the advantage that with different points of attachment depending on different types of motor vehicle doors, a corresponding adaptation is only required in respect of the gear cover, as opposed to which the entire remaining motor-drive unit can remain unaltered as a universal structural part. As a noise-suppressing attachment, rubber buffers 59, 60, 61 are placed in an advantageous manner respectively between the mounting lugs 56, 57, 58 and the bearing part of the motor vehicle 62.

The rotor 4 is supported on both sides with its shaft by way of hemispherical bearings 21, 22, in half-open bearing boxes 31, 32 which are also cast onto the frame 3 in one piece. By placing the hemispherical bearings into the half-open bearing boxed the motor rotor 4 is already able to be fixed axially in the assembly. The radial fixing can—as can be seen in particular from Fig. 6—take place by means of a clamping spring 24 which can be clamped over the half-open bearing box 31 on the frame 3 or—as for the right-hand hemispherical bearing 22 according to Fig. 2 provided near the worm drive—can take place in that an additional half-open bearing box is screwed onto the frame cast integrally with the bearing box 32 in one piece.

Advantageously, it is provided for the absorption of the axial pressure forces working on the motor rotor 4 that in addition to the hemispherical bearing 22 (Fig. 2) or 21 respectively (Fig. 5) which absorbs radial forces, an axial pressure bearing 40 (Fig. 3) is supported axially by means of expanding rings 41, 42 engaging respectively on both sides in grooves of the shaft 5. The axial pressures working in the one or the other axial direction are transferred in the case of the support according to Fig. 3 from the expanding rings 41 or 42 respectively via the axial pressure bearing 40 suported in an annular T-section slot 39 in the frame 3 and in the case of the embodiment according to Fig. 5 via a supporting disk 25 overlapping the expanding ring 41 onto the hemispherical bearing 21 and via a shoulder 134 pre-formed on the half-open bearing box onto the integrated frame 3.

According to Fig. 2 cylindrical brush holders 63, 64 are provided for supplying current to the commutator 19 which are also moulded into the frame 3 near a partition 34 between motor part and gear unit part cast onto the frame 3 in one piece as hollows with cross-section adapted to the brush to be inserted. In the embodiment according to Fig. 5 the commutator 19 and correspondingly the brush holders are provided on the end of the motor rotor 4 facing away from the worm drive as compared with the embodiment according to Fig. 2. A further difference is that hammer brush holders and not cylindrical brush holders are provided in Fig. 5 as current supply to the commutator 19. As can be seen in particular from Fig. 7 tongues 11, 12 are punched out of the respective pole sheets in one piece from the two pole sheets 1, 2 and bent inwardly for the simple suspension of the hammer brush holders provided for in Fig. 5, the hammer brush holders 17, 18 being suspended with corresponding abutment on these tongues in the manner of a knife-edge bearing and are pressed against the commutator 19 each by a spring 15, 16. Additional tongues 13, 14 likewise bent out of the sheets 1, 2 inwardly in one piece serve to be able to suspend the springs 15, 16 with their ends turned away respectively from the brush holders 17, 18 on the motor casing. Both pole sheets 1, 2 and the gear cover 54 covering the cup-shaped gear box part 36, 39 can be screwed for example with screws closing tightly onto the frame 3. Finally, the sealing of the openings in the pole sheets 1, 2 formed by the bent-out tongues 11 to 14 can for example take place in a simple manner following the entire assembly procedure by externally attaching self-adhesive film or by applying another sealing compound. The motor-gear-drive unit shown in Fig. 5 differs from the one according to Fig. 2 also in that through the assymetrical structural arrangement of the single permanent magnet 20 a drive is achieved which is essentially symmetrical about the indicated axis Sy and consequently can be used for insertion into a right or left motor vehicle door. In order to put the motor-gear-drive unit into operation in spite of a possible fault in the electrical system and thus for example in order to be able to open the vehicle window, a manually operated de-

vice (hand crank) can be coupled directly or indirectly from the outside to one end of the shaft 5 of the motor rotor 4. For this purpose for example one or the other end of the shaft 5 could be provided on the front end with a profiled opening or groove respectively, into which a hand crank with corresponding profile can be inserted directly or with the interposition of a flexible shaft and with the help of which the motor shaft and consequently the cable rope can be put into operation even though the motor drive has failed.

In one arrangement (not shown in Figs. 9, 10) the end of the shaft 5 of the motor rotor 4 remote from the gear box is brought out of the motor casing and is securely connected to a worm 63. In an inoperative condition of the manual drive, the worm 163 is out of mesh with a spur gear 164 onto which the hand crank can be coupled directly or indirectly. However, in the operative position, these two gears are brought into mesh. In the exemplary embodiment according to Figs. 9, 10 the worm 163 is placed onto the extended end of the shaft 5 and is attached to this. The spur gear 164 meshing with the twom 163 is mounted advantageously in a lug 65 preformed on the front end on the frame 3. As can be seen in Fig. 10, the spur gear 164 projects with a shaft stub with profiled end 66 out of the lug 65 at a right-angle to the vertical plane surface extending through the longitudinal axis of the motor-drive-unit, in such a manner that in the case of the cable-rope raising mechanism driven by electromotor built into the vehicle door of the flush constructional type without enlarging the overall thickness of the motor-drive unit, a hand crank with corresponding counter profiling can be placed on the profiling 66 of the spur gear 65 for example projecting into a trough-like depression in the inner lining of the vehicle door.

The worm and spur gear can be arranged for example securely together and thus are permanently in locked connection or are brought into locked connection against a spring pressure only in the case of the manually-operated device being operated. Further, by interposing a flexible shaft the coupling point of the hand crank can be set in the most advantageous position according to use independently from the most favourable arrangement according to assembly and manufacture of the motor-gear drive unit inside the vehicle door.

Of course, in all these arrangements, the gear ratio between the meshing worm and worm gear is such that drive can be transmitted from the worm gear to the worm, as is required when operating the window from the manually-operated device.

As can be seen in particular from a comparison of Fig. 7 with Fig. 4 and Fig. 10, it is achieved with the cable-rope raising mechanism disclosed herein that the overall thickness a_1 or a_2 of the entire gear unit, including cable drum and rotation limiting means and the coupling of the manually-operated device respectively, is not greater than the overall thickness a of the electro-motor, the size of which does not exceed 40 mm in a practical embodiment satisfying all requirements of a simple cable-rope raising mechanism. In this way the requirement is fulfilled through the cable-rope raising mechanism disclosed herein to accommodate the drive unit of an electromotive window raising mechanism as a compact unit able to be produced in a simple manner in the space of a vehicle door for which the tendency in design is to become continually narrower.

With the powser drive mechanism described hereinabove, a compact, efficient drive of flat constructional type is achieved through the strong magnetic force existing in the cable-rope raising mechanism without increasing the overall thickness of the direct-current motor which is energised by permanent magnet with correspondingly great off-drive momentum with the abolishing of a separate intermediate gear unit between the worm and cable drum through the direct coupling of the cable drum onto the worm gear on the common fixed axis, this drive guaranteeing, by means of the mounting and support of essential structural parts in the frame which is independent from the casing halves which seal outwardly and are to be attached subseqnently, a very low level of noise with simple manufacture. A cable-rope raising mechanism of this kind is in particular applicable where for example the space available for mounting a window raising mechanism in motor vehicle doors is narrowed down increasingly in that the gaps between the side walls of the doors are filled with foam in order to obtain as large a safety zone as possible.

CLAIMS

1. A power drive mechanism for opening and closing a movable part such as a window, door, sliding roof in a motor vehicle or similar, the mechanism comprising an electric motor of which the stator part comprises a magnetically non-conductive frame supporting, at least, the motor rotor and a stator permanent magnet provided with magnetic pole sheets which are secured on the frame one on each side of the rotor, so as to constitute together with said frame a motor casing, and are shaped so that their internal surfaces are closely spaced from the peripheral region of the rotor, the motor shaft extending into a gearbox casing disposed adjacent the magnetically non-conductive frame and housing a cable drum for winding a closed cable loop to open and close said movable part, the cable drum being in coaxial driving connection with a gear, in the gearbox casing, meshed with a

worm on the motor shaft extension, the common axis of the cable drum and gear being arranged parallel to the direction of spacing between the pole sheets and the overall thickness of the gearbox casing in the direction of the cable drum axis being not greater than the maximum corresponding thickness of the motor casing.

2. A power drive mechanism according to claim 1, wherein the magnetically non-conductive frame is constructed as an integrated motor-gear-unit, so that the gearbox casing forms a part of the magnetically non-conductive frame.

3. A power drive mechanism according to claim 2, wherein a partition is also pre-formed as a unitary part of the frame which separates the gear unit section from the motor section.

4. A power drive mechanism according to any one of claims 1 to 3, wherein the frame is constructed in one piece as a sprayed die casting of synthetic material.

5. A power drive mechanism according to any one of claims 1 to 4, wherein half-open bearing boxes are also pre-formed in unitary fashion on the frame, and bearings for supporting the motor shaft, positioned in these boxes and fixed thereby in an axial manner are each secured radially in the respective bearing seat.

6. A power drive mechanism according to claim 5, wherein the radial securement is provided in each case by a clamping spring clamped over the opening of the bearing box onto said frame.

7. A power driven mechanism according to claim 5, wherein the radial securement is provided in each case by an additional half-open bearing box which is securely screwed-on.

8. A power drive mechanism according to claim 6, wherein the mounting on the motor shaft in at least the bearing box remote from the worm is provided by a part-spherical bearing to absorb radial forces and an axial pressure bearing, the part-spherical bearing being radially secured by means of said clamping spring.

9. A power drive mechanism according to any preceding claim, wherein only a single permanent magnet is provided, this magnet being disposed in a space limited along two adjoining sides essentially by the motor rotor and by the gear and cable drum, respectively.

10. A power drive mechanism according to any one of claims 1 to 9, wherein mechanical means are provided in the gearbox casing on the common axis of the gear and cable drum for limiting the angle of rotation of the gear.

11. A power drive mechanism according to any one of claims 1 to 10, wherein said mechanical means are pivoted on said common axis on that side of the worm gear facing away from the cable drum.

12 A power drive mechanism according to any one of the claims 1 to 11, wherein the gear and the cable drum are arranged in coaxial driving connection by way of flexible means.

13. A power drive mechanism according to claim 12, wherein the flexible means are elastic buffers of rubber or synthetic material.

14. A power drive mechanism according to any one of the claims 1 to 13, wherein fittings for the attachment of cable-guide tubes are also pre-formed on the gearbox casing.

15. A power drive mechanism according to any one of claims 1 to 13, wherein fittings for attachment of cable-guide tubes are constructed as separate components from the gearbox casing and attached thereto by means enabling said fittings to be attached at different selected angles about the cable drum axis.

16. A power drive mechanism driven according to claim 2 or any dependent claim thereof as appended thereto, wherein mounting lugs are pre-formed on the integrated motor-gear-drive unit, for mounting the motor-gear-drive unit on a support part of a motor vehicle.

17. A power drive mechanism according to any preceding claim, wherein mounting lugs are pre-formed on the gearbox casing for mounting the power drive mechanism on a support part of a motor vehicle.

18. A power drive mechanism according to claim 16, wherein the mounting lugs are pre-formed on a back face and/or side wall of the frame which is formed in a cup-shaped manner in the region of the gearbox section.

19. A power drive mechanism according to any one of claims 16 to 18, wherein further mounting lugs are preformed on a gearbox cover which closes the gearbox casing.

20. A power driven mechanism according to any one of claims 16 to 19, wherein rubber buffers are positioned on the mounting lugs so as to be between the mounting lugs and a support part of a motor vehicle when the power drive mechanism is mounted on said support part.

21. A power drive mechanism according to any one of claims 1 to 20, wherein means are provided to enable a manually-operated device to be coupled directly or indirectly from the outside of the power drive mechanism to one end of the motor shaft.

22. A power drive mechanism according to claim 21, wherein the end of the motor shaft remote from the gearbox extends out of the motor casing and the coupling enabling means comprise a worm on the shaft extension remote from the gearbox, a spur gear adapted so that the manually operated device can be coupled thereonto directly or indirectly, and means to enable the worm to be

brought into mesh with the spur gear.

23. A power drive mechanism according to claim 22, wherein the spur gear is mounted on a lug pre-formed on said frame.

24. A power drive mechanism substantially as hereinbefore described with reference to Figs. 1 to 4, 9 and 10, or to Figs. 5 to 8 of the accompanying drawings.

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