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(54) Electrical window lifter drive

(57) An electrical window lifter drive comprises a drive housing (24), an electric motor (26) with a motor shaft (28) projecting into the drive housing, a worm wheel (34) mounted rotatably in the drive housing, penetrated by a bearing shaft (50) and meshing with a worm (30) mounted on the shaft (28) and a drive element (36) connected to the worm wheel (34) via a jaw coupling (38, 40), the bearing shaft (50) being mounted on both side of the worm wheel (34) on the drive housing (24). Bending of the bearing shaft (50) is thereby prevented. The drive may be attached to a cable window lifter or a rod window lifter.

FIG. 1

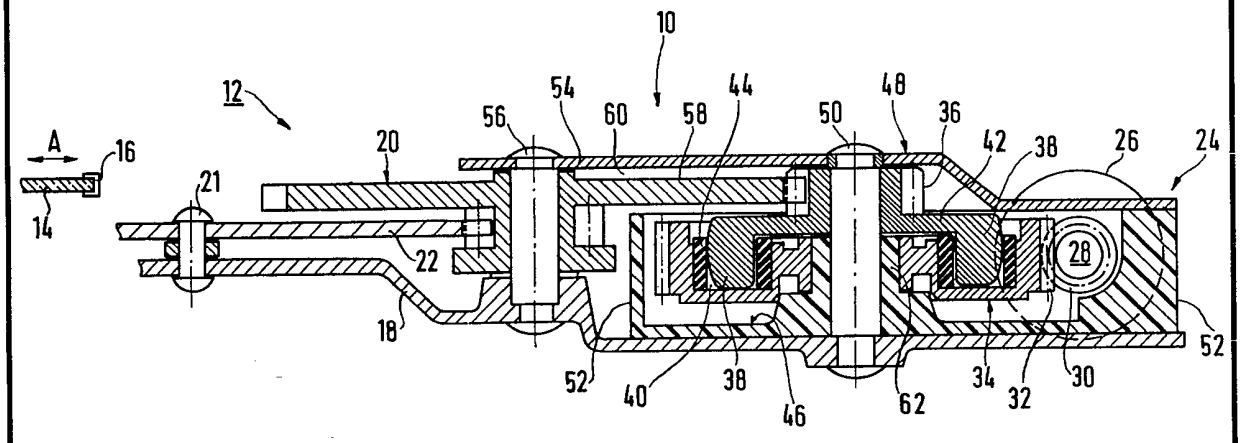

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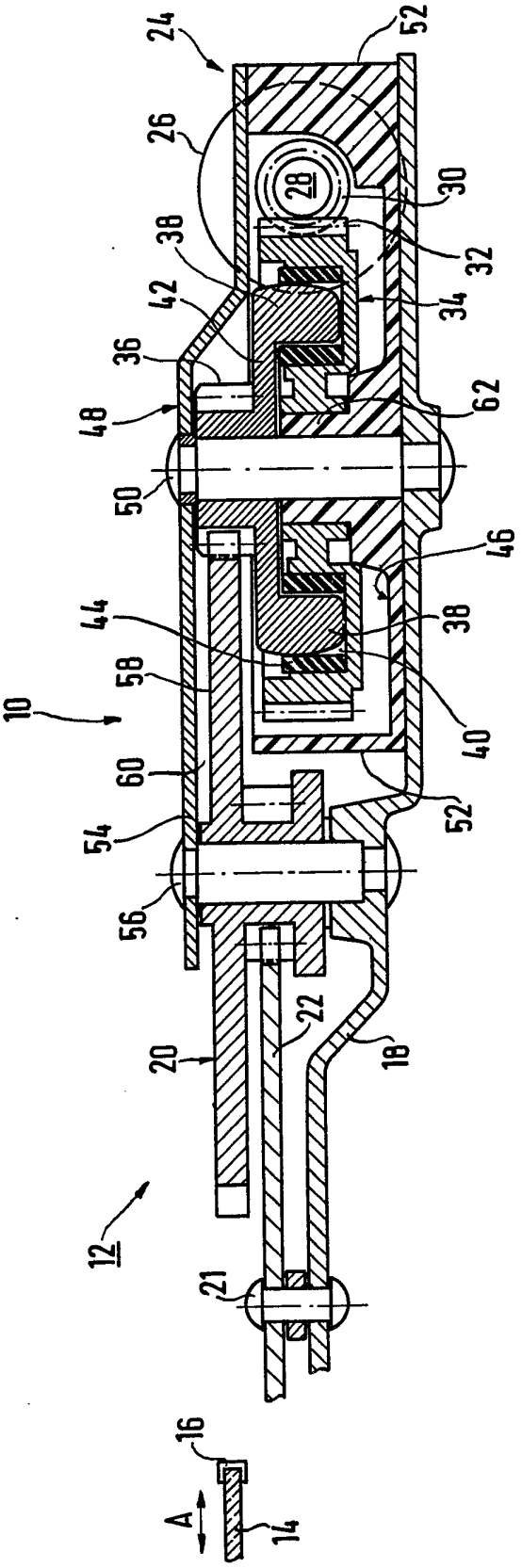
FIG. 1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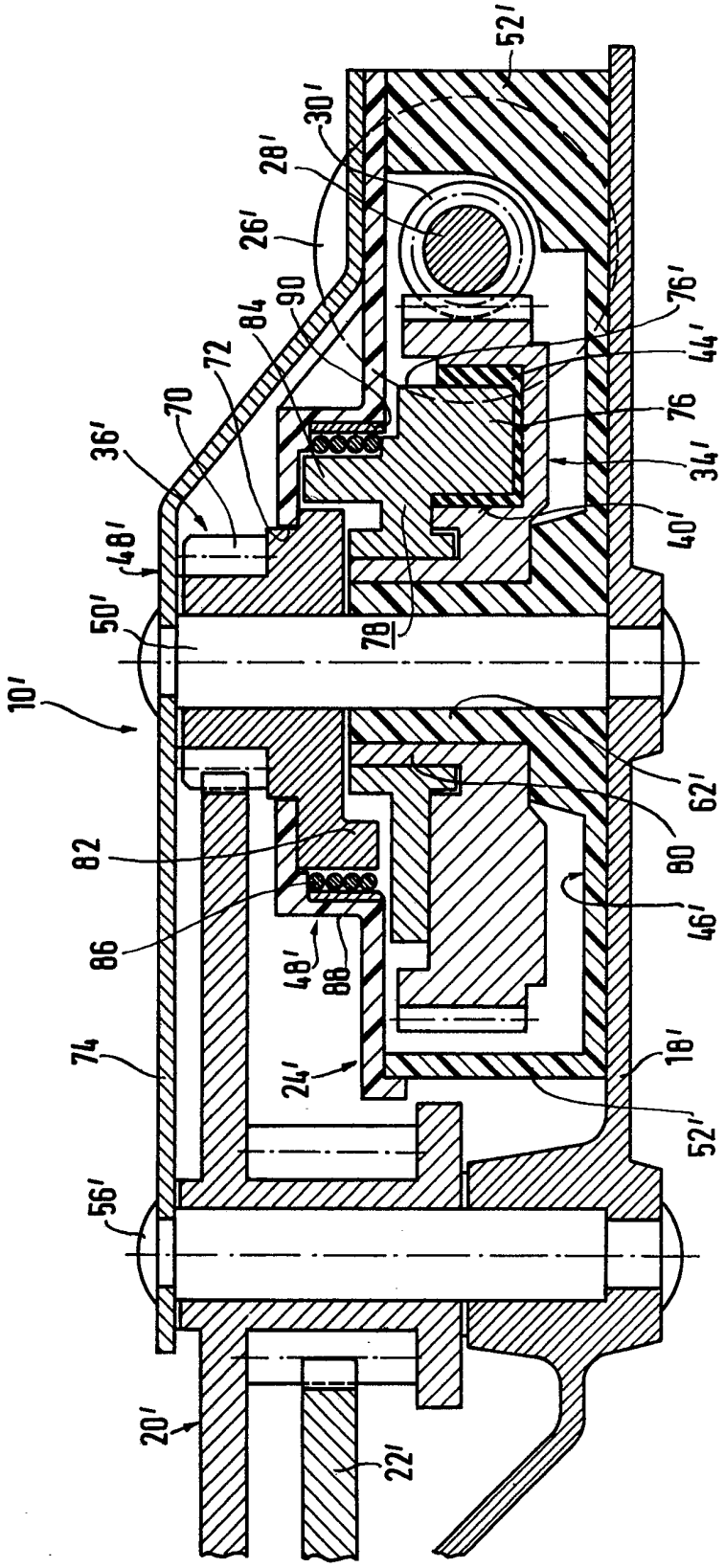
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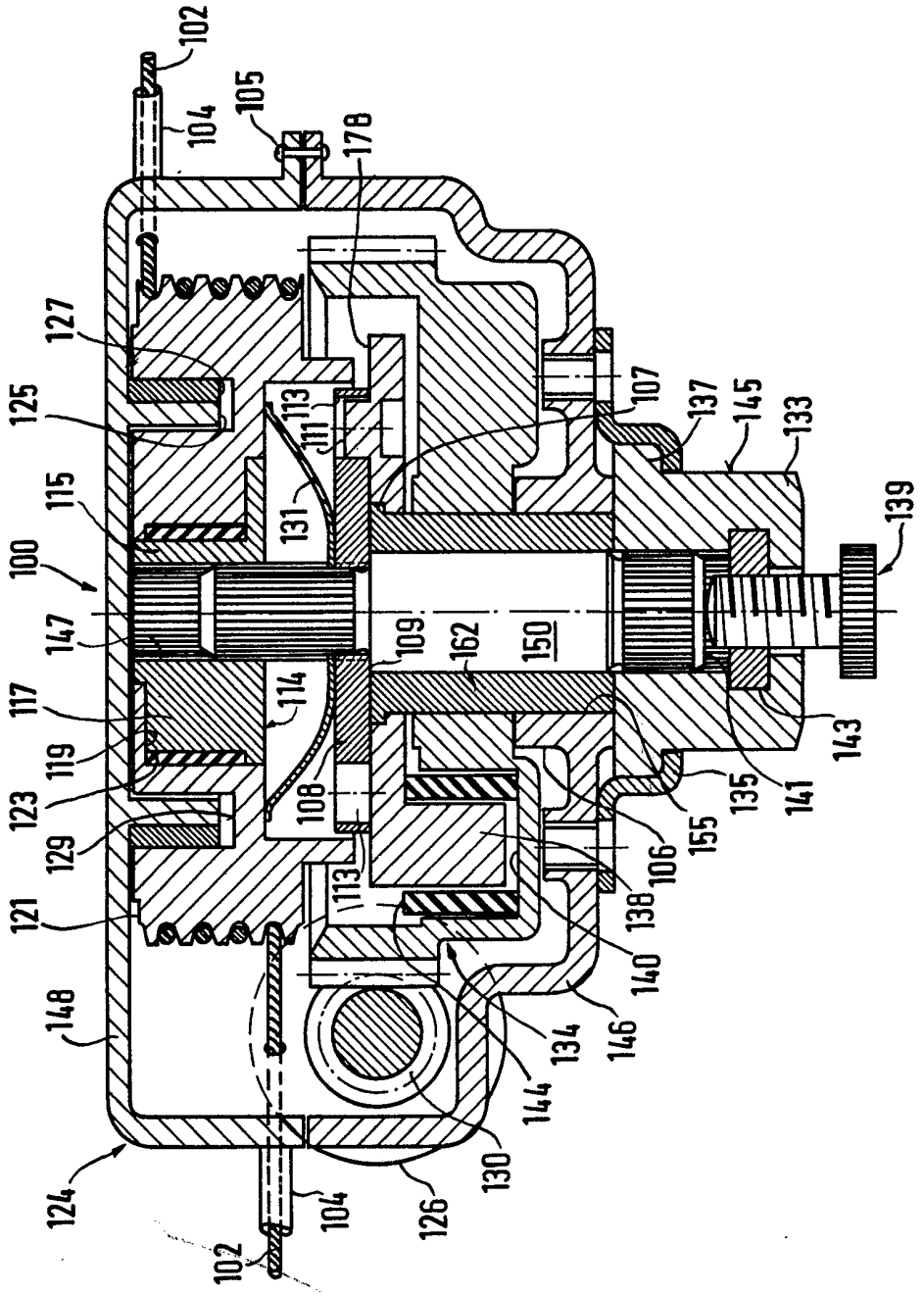
FIG. 2

FIG. 3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SPECIFICATION

Electrical window lifter drive for a cable or rod window lifter

This invention relates to an electrical window lifter drive for a cable or rod window lifter, especially for a motor vehicle, comprising a drive housing, and electric motor with a motor shaft projecting into the drive housing, a worm wheel which is mounted turnably in the drive housing and is penetrated by a bearing shaft and which meshes with a worm fastened to the motor shaft and a drive element which is connected via a jaw coupling to the worm wheel and which is designed as a cable drum for a drive cable of the cable window lifter or as a drive pinion for a lifting rod of the rod window lifter.

With a known window lifter drive of this type the bearing shaft is mounted only on one side on the drive housing. During the operation of the window lifter relatively large forces act upon the worm wheel, especially when the window lifter moves against a stop. These are applied to the bearing shaft by the worm wheel bending moments which lead to a strong loading of the sole bearing point of the bearing shaft on the drive housing; the result is increased wear and consequently a reduced lifetime of the window lifter drive.

The object of the invention is to provide an electrical window lifter of the above-mentioned type which works reliably and for longer periods of time.

According to the invention, there is provided electrical window lifter drive for a cable or rod window lifter, comprising a drive housing, an electric motor with a motor shaft projecting into the drive housing, a worm wheel which is mounted turnable in the drive housing and is penetrated by a bearing shaft and which meshes with a worm mounted on the motor shaft and a drive element which is connected to the worm wheel via a jaw coupling, the bearing shaft being mounted on both side of the worm wheel directly or indirectly on the drive housing.

Bending moments applied to the bearing shaft during operation are diverted to the drive housing without a larger loading of the bearing shaft and the bearing points of the bearing shaft on the drive housing. Bending of the bearing shaft is therefore practically excluded; the wear of the bearing points on the drive housing with a rotating bearing shaft is small. Owing to these favourable mechanical conditions, less expensive materials of smaller strength can be used. Whereas with the known window lifter drive a relatively long bearing bush projecting beyond the drive housing is used for the mounting of the bearing shaft, such a long bearing bush can be omitted in a drive according to the invention, whereby a correspondingly smaller overall height of the window lifter drive results in the region of the bearing shaft.

The assembly of the drive housing is facilitated if the bearing shaft is mounted on a housing bottom part connected rigidly to the electric motor and on a housing top part of the drive housing.

In a preferred embodiment, a loop-spring brake is provided which interacts with the jaw coupling and which is supported on an inner face of the drive housing and the jaw coupling is mounted on the bearing shaft. A reliably working brake is thus obtained since the bearing shaft hold the jaw coupling reliably especially under larger braking torques.

During the operation of rod window lifters, there occasionally arise extremely disturbing noises which lead to complaints from users of such window lifters. The cause of these noises are mechanical vibrations which are propagated through the entire rod window lifter and generate a correspondingly loud noise. In a preferred embodiment, it is proposed to attach the drive housing to a baseplate carrying the lifting rod and to make at least the part of the drive housing lying on the baseplate of a different material from that of the baseplate. The transmission of the vibration from the drive housing to the baseplate is thereby restricted and consequently the noise level is reduced. The baseplate can consist of metal or plastic and the part, lying on the baseplate, of the drive housing of plastic or metal respectively. In any case, a direct metallic connection between the drive motor and the lifting rod which conducts sound through solids especially well is thereby avoided.

An especially simply produced mounting for the bearing shaft and worm wheel may be achieved if the housing bottom part is provided with a circular collar which projects into the inside of the drive housing and is penetrated by the bearing shaft and on which the worm wheel is mounted turnably. A quickly assemblable, yet stable construction is obtained if that the bearing shaft is connected rigidly to the drive housing, for example by riveting, and the drive element is mounted on the bearing shaft.

The transmission of the torque from the worm wheel to the drive pinion may be effected advantageously via engaging dogs which are connected to the drive pinion so as to rotate therewith and engage in recesses of the worm wheel. There can then be provided in the recesses damping elements which, on the one hand, prevent the transmission of vibrations of higher frequency from the worm wheel to the drive pinion and, on the other hand, permit a turning of the drive pinion in relation to the worm wheel against spring tension to a certain extent. In this way, sudden loads are prevented from being transmitted from the motor to the lifting rod (switching on and off of the motor) and from the

lifting rod to the motor (moving against a stop).

A compact construction with substantial protection of the inside of the drive housing against contamination is achieved if the drive pinion is arranged within the drive housing and meshes with a gear wheel of the lifting rod mounted on the baseplate and entering the drive housing through a slot.

A stable mounting of said gear wheel is obtained if the gear wheel is mounted on a bolt, one end of which is fastened, for example riveted, to the baseplate and the other end of which is fastened, for example riveted, to a housing top part section projecting beyond the housing bottom part, the slot being made between this section and the housing bottom part.

A completely closed drive housing which is consequently protected against grease loss and penetrating water is obtained if the drive pinion passes through a bearing opening of the housing top part, a pinion toothing of the drive pinion being arranged outside the drive housing. A slot in the drive housing for the gear wheel then becomes superfluous. The transmission of the turning movement from the worm wheel to the drive pinion is effected via engaging dogs provided on the drive pinion within the drive housing as well as via a jaw part attached to the worm wheel and having mating jaws which interact via the loop-spring brake with the engaging dogs of the drive pinion.

If the jaw part is provided with further jaws which engage in recesses of the worm wheel, damping elements being provided in the recesses, an arrangement which is simple to assemble with vibration neutralisation is obtained.

In order also with the last-described arrangement with a closed drive housing to obtain a stable mounting of the gear wheel meshing with the pinion, it is proposed to mount this gear wheel on a bolt, one end of which is fastened, for example riveted, to the baseplate and the other end of which is fastened, for example riveted, to a cover plate attached to the drive housing.

The jaw coupling may be provided with first and second engaging dogs which engage in recesses of the worm wheel or of the drive element and damping elements may be provided in these recesses. In this way, the vibration neutralisation between the worm wheel and drive element is further improved and the maximum possible turning angle between the worm wheel and drive element is increased.

The stable construction of the drive housing with bearing shaft mounted at both ends enables a release device for disengaging the worm wheel and drive element to be provided within the drive housing. The release device is preferably actuated by axial displacement of the bearing shaft.

The release device has an especially simple construction if the jaw coupling arranged on the bearing shaft between the worm wheel and the drive element has a first and a second jaw part, on which the first or the second engaging dogs are provided respectively, and if there is provided between the two jaw parts a coupling element which normally connects the two jaw parts so that they rotate together but disengages them upon axial displacement of the bearing shaft. The torque transmission can be effected via the axially displaceable bearing shaft which is mounted turnably in the drive housing and which is connected to one of the jaw parts so as to rotate therewith and the coupling element, whereby the coupling element normally engaged with the other jaw part so as to rotate therewith can be taken up by the bearing shaft and disengaged from the other jaw part upon an axial displacement of the bearing shaft.

The production costs of the coupling element are low if the coupling element comprises a perforated disc in whose holes axial projections of the other jaw part engage. If the coupling element is biassed by a spring into its normal position, it automatically returns to the normal position when no more releasing force is applied.

The displaceability of the bearing shaft is achieved with simple means if the bearing shaft is connected to a release part so as to rotate therewith but to be relatively axially displaceable, the release part being mounted turnably on the drive housing and said bearing shaft terminates within the release part and a release screw terminating at the end face of the bearing shaft is screwed into the release part. Since the release part is connected so as to rotate with the bearing shaft which is connected, in turn, so as to rotate with the drive element, the window lifter can be actuated by turning of the release part even if the worm wheel and the drive element are disengaged. To facilitate this turning, the surface of the release part may be hexagonal.

If the drive element in the form of a cable drum is arranged within the housing and mounted on the housing top part, an easily assemblable window lifter drive immune to dirt is obtained for cable window lifters. If the bearing shaft is mounted, on the one hand, in a bearing bush of the housing bottom part and, on the other hand, in an axial opening in the cable drum or in the jaw part mounted centrally on the cable drum, a bending of the bearing shaft and a noticeable wear of the bearing shaft need not be feared even under high bending moments.

In order not to prejudice the displaceability of the bearing shaft in the axial opening, the cable drum may be mounted on a circular bearing collar which is constructed on the housing top part and engages into a comple-

mentary circular groove of the cable drum.

To reduce the production costs, the cable drum can be made of plastic in one piece with the spring elements or the damping elements. The desired elasticity can be adjusted due to the material thickness of the plastic part.

The invention is described hereinafter with reference to the drawings wherein:

Figure 1 is a section, partly cutaway, through a first embodiment of the window lifter drive according to the invention, for a rod window lifter;

Figure 2 is a section, partly cutaway, through a second embodiment of the window lifter drive, also for a rod window lifter;

Figure 3 is a section through a further embodiment of the window lifter drive, namely for a cable window lifter.

Fig. 1 illustrates partly cutaway a rod window lifter 12 with a window lifter drive 10. Suggested purely schematically is a window pane 14 which is provided along one edge with a U-shaped rail 16. The rod window lifter 12 engages the U-shaped rail 16 with rod members not shown in such a way that the window 14 can be moved to and fro in the direction of the double arrow A. If the rod window lifter 12 is installed in a door of a motor vehicle, it serves to open or close a motor vehicle window. The direction A is then vertical.

The window drive 10 is mounted on a baseplate 18 on which the parts of the lifting rod are mounted. Of these lifting rod parts there are illustrated a double gear wheel 20 and, cutaway, a gear segment 22 which are mounted respectively on a bearing bolt 56 and a double headed rivet 21.

A two-part drive housing 24 of the window lifter drive 10 is mounted on the baseplate 18. Fastened on the drive housing 24 is an electric motor 26 whose outline is indicated in Fig. 1. A motor shaft 28 of the electric motor 26 projects into the drive housing 24 and is shown in section in Fig. 2. Fastened rigidly to the motor shaft 28 is a worm 30 which meshes with the toothing 32 of a worm wheel 34. The axis, lying in the sectional plane, of the worm wheel 34 is perpendicular to the axis of the worm wheel 30 and the motor shaft 28.

When the electric motor 26 is switched on the motor shaft 28 turns and with it the worm 30 which, in turn, causes the worm wheel 34 to turn. The turning of the worm wheel 34 is transmitted to a drive pinion 36 which is mounted coaxially with the worm wheel 34 and with which the double gear wheel 20 engages. For the transmission of the turning movement from the worm wheel 34 to the drive pinion 36 the worm wheel 34 is provided with four recesses 40 open in an axial direction towards the drive pinion 36. There engage into these recesses 40 four engaging dogs 38 which are fastened to the ends of four arms 42 arranged in the form of a cross. The arms 42 are connected rigidly to the drive pinion 36. Upon a turning of the worm wheel 34 the engaging dogs 38 and consequently also the drive pinion 36 are rotated.

In order to make possible a certain turnability of the worm wheel 34 in relation to the drive pinion 36 against restoring force and to hamper the transmission of vibrations, the recesses 40 are each provided with a lining 44 of an elastic and damping material such as rubber. Instead of the lining or additionally thereto, there may be used spring elements which are loaded upon a turning of the worm wheel 34 in relation to the drive pinion 36.

The drive housing 24 which accommodates the motor shaft, the worm wheel 34 and the drive pinion 36 and shields them against contamination from outside consists of a housing bottom part 46 and a housing top part 48. Both parts 46 and 48 are held together by a bearing shaft 50, one end of which is riveted to the housing top part 48 and the other end of which is riveted to the baseplate 18. The baseplate 18 lies on the underside of the housing bottom part 46 (see Fig. 1). The housing bottom part 46 is provided with an approximately cylindrical, upwardly projecting housing wall 52 which is reinforced in the region of the electric motor 26 to increase the stability. In this region also the housing top part 48 is drawn down in a double bend towards the housing wall 52 in order to lie tightly against same.

Towards the double gear wheel 20 the housing top part 48 is provided with a section 54 which projects beyond the housing bottom part 46 as far as the bearing bolt 56 of the double gear wheel 20. The bearing bolt 56 is riveted fast to the section 54 with its one end. The other end of the bearing bolt 56 is riveted to the baseplate 18. As shown in Fig. 1, a large gear wheel 58 of the double gear wheel 20 enters the drive housing 24 through a slot 60 made between the housing wall 52 and housing top part 58 in order to mesh with the drive pinion 36.

The window lifter drive 10 shown in Fig. 1 is characterised by especial stability since both the bearing shaft 50 and the bearing bolt 56 are mounted at both ends, so that bending of the bearing shaft 50 or of the bearing bolt 56 in relation to the drive housing 24 and a baseplate 18 is practically excluded. The stability of the drive housing 24 in respect of shears is increased due to the fact that the bearing shaft 50 is guided within a circular collar 62 which is formed on the housing bottom part 46. To keep the overall height in the direction of the bearing shaft 50 small, only the drive pinion 36 is mounted turnably on the bearing shaft 50, whereas the worm wheel 34 is mounted on the cylindrical outer face of the collar 62.

The parts of the above-described window

lifter drive 10 can be made of metal or plastic. In order to supress as much as possible the transmission of mechanical vibrations from the electric motor 26 to the entire rod window lifter 12, plastic parts are combined with metal parts. Thus, the housing bottom part 46 is formed from plastic, while the baseplate 18 consists of metal (deep-drawn or cast). However, a baseplate 18 of plastic can also be used, the drive housing 24 then being made of metal (e.g. aluminium or die cast zinc).

Owing to its small overall height the window lifter drive 10 shown in Fig. 1 is especially suitable for installation in doors of motor vehicles.

Fig. 2 illustrates a further embodiment 10′ of a window lifter drive which differs from the embodiment 10 in Fig. 1 substantially in a built-in loop-spring brake as well as in a different design of the drive housing, as is explained hereinafter. Parts in Fig. 2 which correspond to parts in Fig. 1 are identified with the same reference numerals, but with ′.

In contrast to the window lifter drive 10 in Fig. 1, with the window lifter drive 10′ in Fig. 2 the drive housing 24′ is closed on all sides, since the housing top part 48′ touches the housing wall 52′ tightly all round. The housing inside is therefore safeguarded against contamination and the penetration of moisture; also, no lubricating grease can escape from the drive housing 24′. So that the double gear wheel 20′ can engage on the drive pinion 36′, said drive pinion projects upwardly with a pinion toothing 70 out of the drive housing 24′ (see Fig. 2). The drive pinion 36′ is mounted turnably in a bearing opening 72 in the housing top part 48′.

To strengthen the window lifter drive 10′, especially for the mounting at both ends of the bearing bolt 56′, there is provided a cover plate 74 which upwardly covers the drive pinion 36′ and partly the double gear wheel 20′ and which is riveted to the bearing shaft 50′ and the bearing bolt 56′. In the region of the motor shaft 28′ the cover plate 74 is drawn down in a double bend towards the housing top part 48′.

The worm wheel 34′ is formed analogously to the worm wheel 34 in Fig. 1. It is likewise provided with recesses 40′ into which jaws 76 of a jaw part 78 engage. Also, elastic linings 44′ are inserted respectively into the recesses 40′. In contrast to Fig. 1, only one recess 40′ is shown in section in Fig. 2.

The jaw part 78 is mounted turnably on a collar 80 of the worm wheel 34′, that is not directly on the bearing shaft 50′, in order to save overall height. There adjoins the jaw part 78 upwardly (see Fig. 2) the drive pinions 36′ which is mounted turnably on the bearing shaft 50′.

Downwardly projecting engaging dogs 82 are formed on the drive pinion 36′ within the drive housing 24′. Mating jaws 84 of the jaw part 78 project upwardly in the same region of space. The engaging dogs 82 and the mating jaws 84 are connected turnably via a loop-spring brake 86. The loop-spring brake 86 is arranged in a radial direction between a cylindrical housing section 88 of the housing top part 48′ and the jaws 82 and 84. In order to improve the frictional force lock between the loop-spring brake 86 and the housing top part 48 made of plastic, a metal friction sleeve 90 is pressed into the housing section 88. The loop-spring brake 86 is prestressed radially outwards against this friction sleeve 90.

The jaws 82 and 84 interact with the inwardly bent ends of the loop-spring brake 86 in such a way that upon a turning of the worm wheel 34′ caused by the electric motor 26′ loop-spring brake 86 is released and the drive pinion 36′ is taken up, whereas upon a turning of the drive pinion 36′ the loop-spring brake 86 blocks a further turning.

The loop-spring brake 86 proves necessary when the self-locking of the window lifter is not sufficient. This self-locking depends on the turning resistance of the electric motor 26 and 26′ and on the transmission ratio. With a double-thread and multiple-thread worm 30′ a loop-spring brake 86 is, as a rule, indicated, while with a single-thread worm 30 the window lifter drive 10 according to Fig. 1 can be used without a loop-spring brake.

Fig. 3 illustrates a window lifter drive 100 for a cable window lifter. With a cable window lifter an endless traction cable loop guided in a tube act as a drive. A window connected to the traction cable is moved by the traction cable. Fig. 3 illustrates cutaway a traction cable 102 as well as two guide tubes 104 leading away from the window lifter drive 100.

Structural parts of the window lifter 100 which correspond in their function to structural parts of the window lifter 10 in Fig. 1 are designed by the same reference numerals, but increased by the number 100.

The housing bottom part 146 lies tightly on the housing top part 148 and is connected firmly thereto via a double headed rivet 105. The electric motor 126 illustrated on the left hand side in Fig. 3 drives the worm wheel 134 via the worm 130. The worm wheel 134 is mounted turnably on a bearing sleeve 162. The bearing sleeve 162 is pressed into an opening 155, made with a reinforced margin 106, in the housing bottom part 146. Adjoining the worm wheel 134 upwardly (see Fig. 3) is a first jaw part 178 which is mounted turnably on the outer surface of the bearing sleeve 162. The first jaw part 178 is prevented by a collar 107 of the bearing shaft 150 from moving upwardly in an axial direction. The bearing shaft 150 is mounted axially displaceably within the bearing sleeve 162.

As with the window lifter drives 10 and 10', with the window lifter drive 100 the worm wheel 134 is designed with recesses 140 which are lined with an elastic and damping lining 144 and into which first engaging dogs 138 of the first jaw part 178 engage.

There adjoins the first jaw part 178 a perforated disc 108 which is mounted in a turn-proof manner on the bearing shaft 150 via a toothing. Upon an axial displacement of the bearing shaft 150 upwards the perforated disc 108 is lifted by a ledge 109 of the bearing shaft 150. If the perforated disc 108 is removed in this way far enough from the first jaw part 178, axial projections 111 of the first jaw part 178 are disengaged from complementary holes 113 of the perforated disc 108. In this case, the perforated disc 108 and the bearing shaft 150 connected thereto so as to rotate therewith are no longer taken up by the rotating worm wheel 134. The force lock between the electric motor 26 and the traction cable 102 is interrupted since the turning movement can be transmitted to the traction cable 102 only via the bearing shaft 150. The shaft 150 is connected via a toothing within an opening 147 of a second jaw part 114 to this part 115 so as to rotate therewith and axially displaceably; this jaw part 115 engages, in turn, with second engaging dogs 117 in recesses 119 of a cable drum 121. Several turns of the endless traction cable 102 are wound on this cable drum 121. A turning of the bearing shaft 150 results therefore in a turning of the cable drum 121 and consequently a longitudinal displacement of the cable 102.

The recesses 119 in the cable drum 191 are, like the recesses 140 in the worm wheel 134, provided with an elastic damping lining 123. The maximum turnability of the worm wheel 134 in relation to the cable drum 121 and the vibration damping are correspondingly large. Also large torques arising upon the braking of the electric motor 26 can therefore be compensated.

The cable drum 121 is mounted on a cylindrical-annular bearing bush 127 which engages in a circular groove 129 of the cable drum 121. The bearing bush 127 is fastened on a likewise circular bearing collar 127 of the housing top part 148.

The jaw part 115 is mounted strictly centrally, albeit turnably, in the cable drum 121. The end, upper in Fig. 3, of the shaft 150 is therefore mounted turnably on the housing top part 148 via the second jaw part 115 and the cable drum 121. At the other end the bearing shaft 150 is mounted turnably in the bearing sleeve 162 on the housing bottom part 146. The shaft 150 will therefore neither bend nor damage its bearings even under larger loads. The cable drum 121, also, is mounted mechanically stably, namely, as described, both on the housing top part 148 and on the bearing shaft 50.

Arranged in an axial direction between the cable drum 121 and the perforated disc 108 is a leaf spring 131 which biasses the perforated disc 108 downwardly. The leaf spring 131 therefore supports the movement of the bearing shaft 150 and of the perforated disc 108 downwards in its normal position in which the worm wheel 134 is coupled to the cable drum 121.

In order to enable the bearing shaft 150 to be moved upwardly for disengagement and subsequently turned independently of the electric motor 126 (to enable manual drive with electric motor 126 broken down), a release part 133 is mounted turnably on the housing bottom part 146, namely by means of a step-ring-shaped fastening 135 which, on the one hand, is screwed or riveted to the housing bottom part 146 and, on the other hand, grips behind a guide shoulder 137 of the release part 133. The bearing shaft 150 is connected via a toothing to the release part 133 so as to rotate therewith, but axially displaceably. There is screwed into the release part 133 from the bottom (see Fig. 3) a release screw 139 which terminates at the lower end face 141 of the bearing shaft 150. A thread part 143 is provided within the release part 133 to guide the release screw 139.

For the disengagement of the electric motor 126 and cable drum 121 the release screw 139 is screwed into the release part 133 until the simultaneously upwardly moved bearing shaft 150 separates the perforated disk 108 from the first jaw part 178. The window lifter can now be actuated due to the fact that the release part 133 is turned, since the cable drum 121 is connected so as to rotate with the release part 133 via the bearing shaft 150. To facilitate the manual turning of the release part 133, its surface 145 is designed as a hexagon.

To couple the electric motor 126 again to the cable drum 121, only the release screw 139 needs to be screwed again at least partly out of the release part 133. If the holes 133 of the perforated disc 108 and the corresponding axial projections 111 of the first jaw part 178 do not stand opposite one another, this is unimportant since upon the first actuation of the electric motor the first jaw part 178 rotates under the perforated disc 108 until the axial projections 111 snap into the holes 113.

The drive housing 124 can consist of metal (e.g. cast aluminium) or plastic. Metal or plastic can likewise be used as material for the worm wheel 134 and the cable drum 121.

CLAIMS

1. Electrical window lifter drive for a cable or rod window lifter, comprising a drive hous-

ing, an electric motor with a motor shaft projecting into the drive housing, a worm wheel which is mounted turnably in the drive housing and is penetrated by a bearing shaft and which meshes with a worm mounted on the motor shaft and a drive element which is connected to the worm wheel via a jaw coupling, the bearing shaft being mounted on both sides of the worm wheel directly or indirectly on the drive housing.

2. Electrical window lifter drive according to claim 1, wherein the bearing shaft is mounted on a housing bottom part connected rigidly to the electric motor and to a housing top part of the drive housing.

3. Electrical window lifter drive according to claim 1 or 2, further comprising a loop-spring brake which interacts with the jaw coupling and which is supported on an inner face of the drive housing, the jaw coupling being mounted on the bearing shaft.

4. Electrical window lifter drive according to one of claims 1 to 3, wherein the drive housing is attached to a baseplate carrying a lifting rod.

5. Electrical window lifter drive according to claim 4, wherein at least the part of the driving housing lying on the baseplate consists of a different material from that of the baseplate.

6. Electrical window lifter drive according to claim 5, wherein the baseplate consists of metal or of plastic and the part of the driving housing lying on the baseplate consists of plastic or of metal respectively.

7. Electrical window lifter drive according to any of claims 2 to 6, wherein the housing bottom part is provided with a collar which projects into the inside of the drive housing and is penetrated by the bearing shaft and on which the worm wheel is rotatably mounted.

8. Electrical window lifter drive according to any of the preceding claims, wherein the bearing shaft is connected rigidly to the drive housing and the drive element is rotatable mounted on the bearing shaft.

9. Electrical window lifter drive according to any of the preceding claims, wherein the drive element is a drive pinion for a lifting rod of a rod window lifter.

10. Electrical window lifter drive according to claim 9, wherein the drive pinion is connected to dogs so as to rotate therewith, the dogs engaging in recesses of the worm wheel.

11. Electrical window lifter drive according to claim 10, wherein damping elements are provided in the recesses.

12. Electrical window lifter drive according to any of claims 9 to 11 wherein the drive pinion is arranged within the drive housing and meshes with a gear wheel of the lifting rod which is mounted on the baseplate and enters the drive housing through a slot.

13. Electrical window lifter drive according to claim 12, wherein the gear wheel is mounted on a bolt, one end of which is fastened on the baseplate and the other end of which is fastened on a section of the housing top part projecting beyond the housing bottom part, the slot being made between said section and the housing bottom part.

14. Electrical window lifter drive according to any of claims 9 to 11, wherein the drive pinion passes through a bearing opening of the housing top part and has a pinion toothing outside the drive housing.

15. Electrical window lifter drive according to claim 14, when appendant to claim 3, wherein engaging dogs are provided on the drive pinion within the drive housing and comprising a jaw part attached to the worm wheel and having mating jaws which interact via the loop-spring brake with the engaging dogs of the drive pinion.

16. Electrical window lifter drive according to claim 15, wherein the jaw part is provided with further jaws which engage in recesses of the worm wheel.

17. Electrical window lifter drive according to claim 16, wherein damping elements are provided in the recesses.

18. Electrical window lifter drive according to any of claims 14 to 17, wherein a gear wheel meshing with the pinion is mounted on a bolt, one end of which is fastened to the baseplate and the other end of which is fastened to a cover plate attached to the drive housing.

19. Electrical window lifter drive according to claim 18, wherein the bearing shaft is connected rigidly to the cover plate.

20. Electrical window lifter drive according to any of the preceding claims, wherein the jaw coupling is provided with first and second engaging dogs which engage in recesses of the worm wheel or of the drive element and in that damping element are arranged in the recesses of the worm wheel and of the drive element.

21. Electrical window lifter drive according to any of the preceding claims, further comprising a release device within the drive housing for disengaging the worm wheel and drive element.

22. Electric window lifter drive according to claim 21, wherein the release device is actuable by axial displacement of the bearing shaft.

23. Electrical window lifter drive according to any of claims 20 to 22, wherein the jaw coupling arranged on the bearing shaft between the worm wheel at the drive element has a first and a second jaw part, on which the first and the second engaging dogs are respectively provided, and a coupling element is provided between the two jaw parts which normally connects the two jaw parts to one another so as to rotate together, but disengages them upon a displacement of the bear-

ing shaft.

24. Electrical window lifter drive according to claim 23, wherein the axially displaceable bearing shaft mounted turnably in the drive housing is connected to rotate with one of the jaw parts and the coupling element and the coupling element normally engaged with the other jaw part so as to rotate therewith can be taken up by the bearing shaft and disengaged from the other jaw part upon an axial displacement of the bearing shaft.

25. Electrical window lifter drive according to claim 24, wherein the coupling element comprises a perforated disc in whose holes axial projections of the other jaw part engage.

26. Electrical window lifter drive according to claim 24 or 25, wherein the coupling element is biassed into a normal position by a spring element.

27. Electrical window lifter drive according to any of claims 21 to 26, wherein the bearing shaft is connected to a release part so as to rotate therewith, but to be relatively axially displaceable, the release part being mounted turnably on the drive housing and said bearing shaft terminates within the release part and a release screw terminating at an end face of the bearing shaft is screwed into the release part.

28. Electrical window lifter drive according to claim 27, wherein the surface of the release part is hexagonal.

29. Electrical window lifter drive according to any of claims 21 to 28, wherein the drive element is a cable drum for a drive cable of a cable lifter.

30. Electrical window lifter drive according to claim 29, wherein the cable drum is arranged within the housing is mounted on the housing top part.

31. Electrical window lifter drive according to claim 29, or 30, wherein the bearing shaft is mounted, on the one hand, in a bearing bush of the housing bottom part and, on the other hand, in an axial opening in the cable drum or in the jaw part mounted centrally on the cable drum.

32. Electrical window lifter drive according to claim 30, wherein a circular bearing collar is provided on the housing top part which projects into the inside of the housing and which engages a complementary circular groove of the cable drum.

33. Electrical window lifter drive according to any of claims 29 to 32, wherein the cable drum is made of plastic in one piece with a spring element and/or damping elements arranged in recesses of the cable drum.

34. Electrical window lifter drive substantially as herein described with reference to any of the Figures of the accompanying drawings.

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