

PATENT SPECIFICATION

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(54) WORM DRIVE

(71) We, FRANKE & HEIDECHE G.m.b.H., a German Body Corporate, trading as ROLLEI-WERKE FRANKE & HEIDECHE, of 196 Salzdahlumerstrasse, Braunschweig, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 The invention relates to a worm drive with a shaft rotatable in two bearings spaced longitudinally of the shaft, this shaft being equipped with a drive wheel for the shaft at a shaft end extending axially beyond one said bearing and having a worm gear mounted between the bearings, and a gear wheel rotatable about an axis spaced from and perpendicular to the shaft, this gear wheel meshing with the worm.

20 Worm drives of this kind are used in particular in gear units for slide changing mechanisms and magazine transport of a still picture projector.

25 In a known worm drive of this type, the drive wheel is extruded onto the shaft and following the successful insertion of the shaft into the bearings, the worm gear produced as a one-off part is mounted onto the shaft end. The plastic bearings are provided with axial bores in which the shaft is guided and safe-guarded against axial displacements by additional positioning means such as circlips etc.

35 In order to mount a worm drive of this kind, one end of the shaft carrying the drive wheel must be pushed through one of the bearings. Subsequently, the shaft must be grooved, the worm gear must be placed onto the shaft and caulked in the groove. Then the shaft is placed into the second bearing and safe-guarded against axial displacements by means of circlips. Subsequently, the gear wheel is slipped onto the prepared shaft and secured by means of a circlip.

45 Such a design and arrangement of the worm gear does not only entail a laborious mounting process, this considerably increasing the mounting time and costs, but also requires the worm gear to be produced as a one-off part and mounted onto the shaft in

an additional mounting operation following the mounting of the shaft, although it would be possible—since the drive wheel is also manufactured of plastic—to extrude this onto the shaft together with the worm gear in one single operation.

The present invention may improve a worm drive of the kind mentioned above in such a way that it would, on one hand, be possible to extrude worm gear and drive wheel onto the shaft before the mounting process and, on the other hand, to substantially simplify the mounting process in order to considerably reduce the mounting time.

The present invention is characterised by the bearings being provided at their side facing the gear wheel with an opening permitting a passing-through of the shaft into the bearings.

This measure allows the shaft, equipped with worm gear and drive wheel, to be slipped into the bearings whilst maintaining the axis of the shaft parallel to the axial direction of the bearings, and the gear wheel to be subsequently placed on its shaft in the known manner and to be secured by a retaining ring. A dropping-out of the shaft is prevented by the engagement of worm gear and gear wheel even if the shaft with its worm is spatially positioned above the gear wheel.

If, according to general practice, the bearings are manufactured of plastic, it is advantageous according to one refinement of the invention, to choose a width for the openings which is slightly smaller than the diameter of that part of the shaft disposed in the bearings. When the shaft is pressed into the bearings, this results in a certain snap effect of the bearings which results in an additional—but not necessarily required—retainment of the shaft.

In order to protect the shaft from axial displacement, the shaft diameter according to a further development of the invention has been reduced in that part engaged in the bearings in relation to the remaining shaft diameter, and the bearing bore has been adapted to the smaller shaft diameter. In this way, the shaft with one annular surface

abuts against the bearing side walls on both sides of the bearings, whereby an axial displacement of the shaft is prevented. The mounting of an additional retaining ring on the shaft to prevent this axial displacement is, therefore, superfluous this resulting in a further saving.

An embodiment of the invention is hereinafter particularly described with reference to the accompanying drawings, wherein:

Figure 1 shows the worm drive mounted on a plate,

Figure 2 shows an enlarged representation of the side elevation of a bearing with inserted shaft, and

Figure 3 shows an enlarged representation of an axial section through a bearing.

Two bearing supports 14 and 15 are bent away from a plate 1 at right angles and are provided with a U-shaped cutout 4. The two plastic bearings 2 and 3 are of an appropriate U-shaped design and are slipped into the cutout 4 of bearing supports 14 and 15 by means of a groove 5 extending around their outer periphery.

The U-shaped interior of the bearings 2, 3 is open as at 9, towards the axis 7 of a shaft extending perpendicularly to the plate 1 to support gear wheel 8. The width of each opening 9 is such that a shaft 10 may be inserted through these openings into the U-shaped interior of the two bearings 2 and 3.

In those parts which engage in the two bearings 2 and 3, the shaft is provided with an annular groove 11 defining a reduced diameter section 6 of the shaft 10. A worm 12 is mounted between these grooves and a drive wheel 13 is fixed to one shaft end 14 extending axially beyond the bearing 3. Worm gear 12 and drive wheel 13 are extruded onto the shaft. In order to mount the worm gear on the plate 1, the prepared shaft 10—i.e. the one with annular grooves 11, worm gear and drive wheel 13, is placed with its reduced diameter section 6 into the bearings 2 and 3; subsequently, the gear wheel 8 is placed on the shaft 7 and secured against

dropping off by means of a circlip 15. This completes the mounting of the worm drive in the shortest possible time.

In addition, the opening 9 may be slightly narrowed, i.e. slightly smaller than the diameter of the section 6 in the bearing; this causes the shaft 10 to be pressed into the bore against the spring action of the walls of the openings in the bearings 2 and 3 and to be additionally retained in the bearing by the elastic spring-back resilience of the opening walls.

WHAT WE CLAIM IS:—

1. Worm drive with a shaft rotatable in two bearings spaced longitudinally of the shaft, this shaft being equipped with a drive wheel for the shaft at a shaft end extending axially beyond one said bearing and having a worm gear mounted between the bearings, and a gear wheel rotatable about an axis spaced from and perpendicular to the shaft, this gear wheel meshing with the worm, characterised by the bearings being provided at their side facing the gear wheel with an opening permitting a passing-through of the shaft into the bearings.

2. Worm drive according to Claim 1, with plastic bearings, characterised by the width of each opening being smaller than the diameter of that part of the shaft disposed in the bearings.

3. Worm drive according to claims 1 or 2, characterised by the shaft being provided with an annular groove in that part engaged in the bearings.

4. A worm drive, substantially as described herein with reference to and as illustrated by the accompanying drawings.

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