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(54) **MOTOR/PUMP ASSEMBLY FOR USE IN A BRAKING DEVICE**

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ABSTRACT

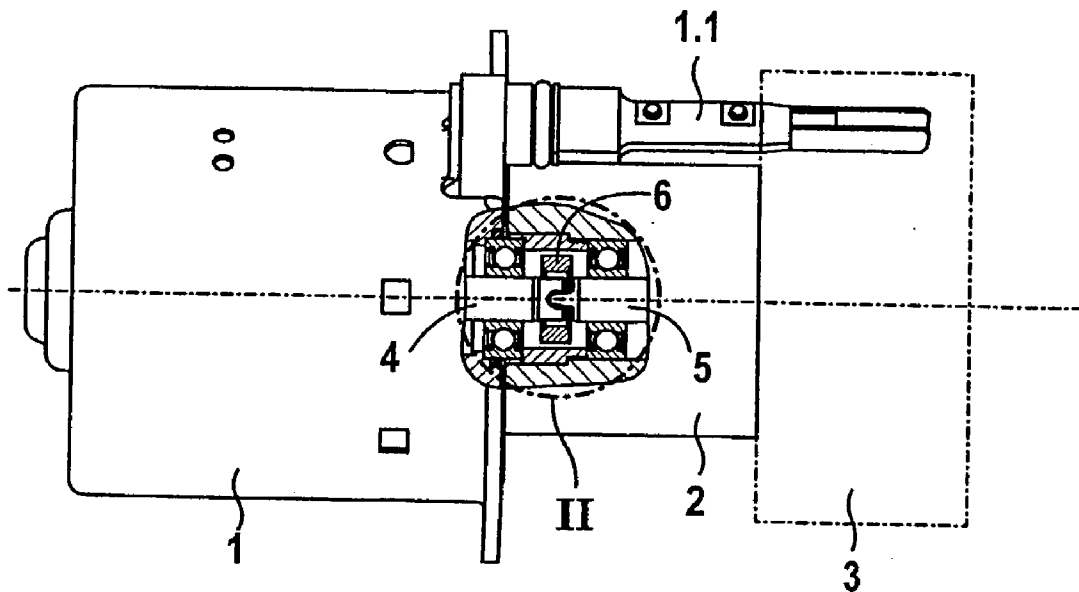
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A driven-side rotor shaft end of an electric motor is drive-connected to a drive-side pump shaft end of a pump via a coupling piece, in the manner of a cardan joint, in each case by means of the positive axial plug receptacle. The invention provides protection against torsional thrusts and axial vibrations, and a play-free drive by virtue of a conical design of the plug receptacle, at the same time with a mutual axial prestress of the rotor shaft end and pump shaft end.



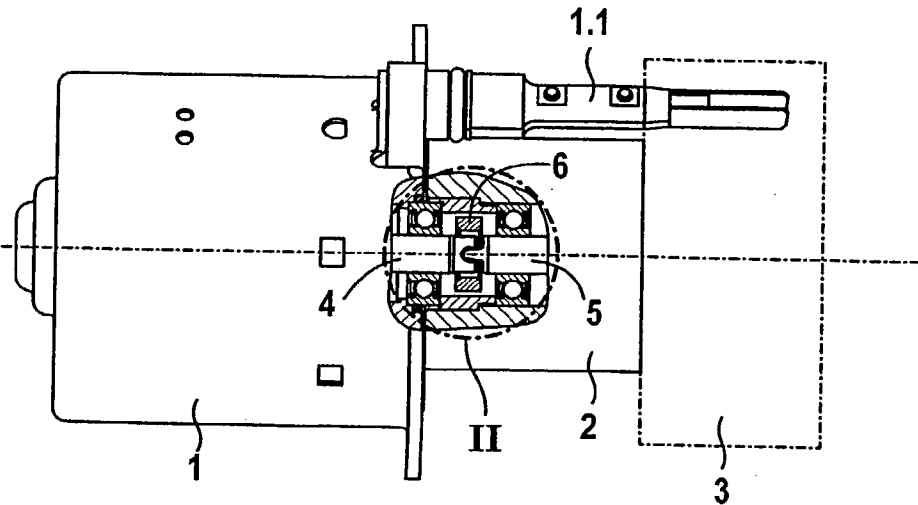


FIG 1

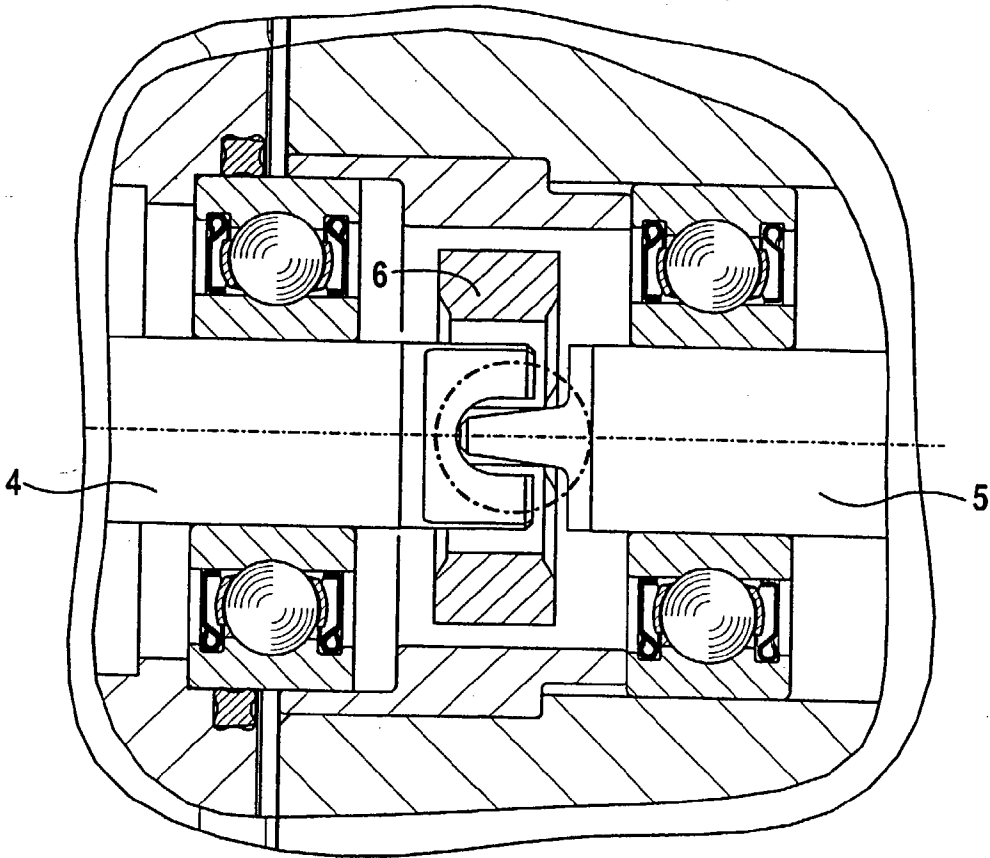


FIG 2

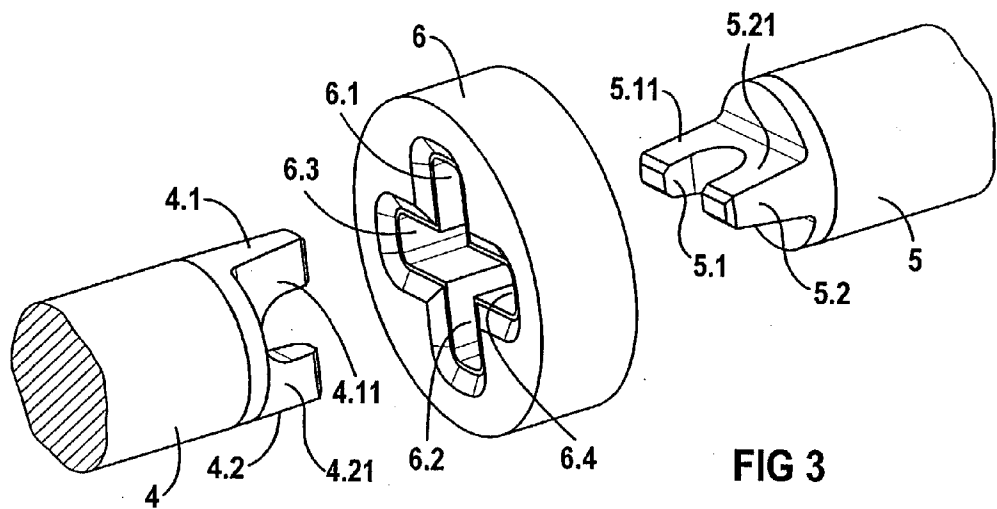


FIG 3

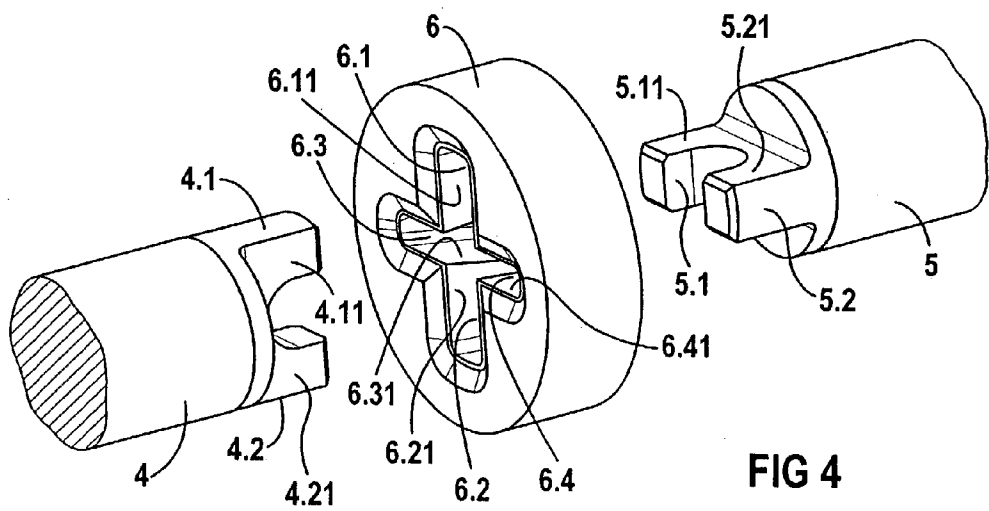


FIG 4

MOTOR/PUMP ASSEMBLY FOR USE IN A BRAKING DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation of European application number EP02004529.0 filed Feb. 27, 2002.

TECHNICAL FIELD

[0002] The invention relates to a motor/pump assembly, in particular to a motor vehicle braking device with the following features: A motor/pump assembly for use in a coupling device for protection against torsional thrusts and axial vibrations, said assembly comprising an electric motor having a driven-side rotor shaft, said shaft having an end; a pump having a drive-side pump shaft, said shaft having an end; and said rotor shaft end drive-connected via a joint to said pump shaft end, said joint including a coupling piece comprising an axially conical positive plug receptacle for plugging at least one shaft end to provide a play-free rotational take-up.

BACKGROUND OF THE INVENTION

[0003] Motor vehicle braking devices are known, e.g., see EP 0 645 875 B1. In a motor vehicle braking device, in particular for an ABS braking device, the pump is normally designed as a hydraulic pump; in this case, pump plungers are driven by the pump shaft via eccentrics. The pump shaft may be designed as a prolonged one-piece rotor shaft end of the electric motor or be coupled as an independent pump component with a pump shaft end to a corresponding rotor shaft end of the electric motor when the electric motor and pump are being assembled. For the intercoupling of the driven-side pump shaft end of the electric motor, on the one hand, to the drive-side pump shaft end of the pump, on the other hand, a coupling piece may be provided, which provides a drive connection in the manner of a cardan joint to the rotor shaft end and to the pump shaft end, in each case via a positive axial plug receptacle.

SUMMARY OF THE INVENTION

[0004] According to the object of the present invention, a drive connection protected against undesirable torsional vibrations and axial thrusts is avoided in the case of drive connections of this type in the manner of a cardan joint, with an axially mutual positive plug receptacle of the rotor shaft end and pump shaft end via a coupling piece.

[0005] This object is achieved, according to the invention, by means of a motor/pump assembly according to the following: an assembly for use in an antilock braking device to protect against torsional thrusts and axial vibrations, said assembly comprising an electric motor having a driven-side rotor shaft, said shaft having a plugged end; a pump having a drive-side pump shaft, said shaft having a plugged end; and a coupling device comprising a plug receptacle for receiving said plugged ends under mutual prestress to provide for play-free rotational take-up.

[0006] Advantageous embodiments of the invention are the subject matter of the description to follow.

[0007] Proceeding from the recognition that torsional vibrations and axial thrusts leading to premature damage are

based particularly on torque fluctuations of the pump and on a radial or axial tolerance play between those ends of the rotor shaft or pump shafts which are in positive take-up in the coupling piece, the conicity according to the invention, at the same time with slight mutual prestress of the rotor shaft end with respect to the pump shaft end, makes it possible by simple means to eliminate production-related slack between the parts to be driven in the coupling piece, and the freedom from play therefore ensured within the coupling piece makes it possible to avoid the torque fluctuations which occur as a result of movement and which penetrate via the coupling piece into the motor and lead within the latter, for example, to winding damage.

BRIEF DESCRIPTION OF THE FIGURES

[0008] The invention and further advantageous embodiments of the invention according to the features of the subclaims are explained in more detail below, by means of diagrammatic exemplary embodiments, in the drawing in which:

[0009] **FIG. 1** shows a fully mounted motor/pump assembly in an axial part-sectional diagram;

[0010] **FIG. 2** shows, in an enlarged detail from **FIG. 1**, the mutual rotational take-up connection, in the manner of a cardan joint, of the rotor shaft end of the electric motor, on the one hand, and of the pump shaft end of the pump, on the other hand, via a coupling piece;

[0011] **FIG. 3** shows, in a perspectively enlarged detail from **FIG. 2**, a plug receptacle in the manner of a cardan joint, with a conical design of the flat take-up webs of the rotor shaft end and of the pump shaft end and with a design of the matching take-up grooves of the coupling piece; and

[0012] **FIG. 4** shows, in a perspectively enlarged detail from **FIG. 2**, a plug receptacle in the manner of a cardan joint, with a conical design of the take-up grooves of the coupling piece and with a design of the flat take-up webs of the rotor shaft end and of the pump shaft end.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] **FIG. 1** shows a complete motor/pump assembly capable of being used, for example, for a motor vehicle antilock braking device in an axial part-sectional diagram. A pump **2** for a hydraulic brake fluid is flanged to an electric motor **1** on one end face and axially in alignment and the other end face of the pump **2** has mounted on it an electronic housing **3** which receives a connection unit, in particular an electric or electronic supply or control unit, not illustrated separately here, but known, for example, from EP 0 695 875 B1, and which is connected via a junction connection **1.1** to the control or supply connections of the electric motor **1**.

[0014] The electric motor **1** has a pump-side rotor shaft end **4** which can be coupled via a coupling piece **6** to a pump shaft end **5** of the pump **2**, for example when the electric motor **1** and the pump **2** are being assembled axially.

[0015] As may be gathered from the enlarged detail according to **FIG. 2** and particularly according to **FIGS. 3, 4**, the rotational take-up coupling between the rotor shaft end **4**, on the one hand, and the pump shaft end **5**, on the other hand, takes place in the manner of a cardan joint, in such a

way that the rotor shaft end **4** can be plugged with projecting flat take-up webs, in particular two-flat take-up webs' **4.1;4.2**, into corresponding take-up grooves, in particular two-flat take-up grooves **6.1;6.2**, of the coupling piece **6** and the pump shaft end **5** can be plugged with two-flat take-up webs **5.1;5.2** into matching take-up grooves, in particular two-flat take-up grooves **6.3;6.4**, of the coupling piece **6**, said two-flat take-up grooves being offset relative to one another, for example, at 90° with respect to the first-mentioned take-up grooves. Instead of the version illustrated in **FIGS. 3, 4** in the reverse design principle flat take-up webs may also be provided on the coupling piece and matching two-flat take-up grooves may be provided on the rotor shaft end and on the pump shaft end.

[0016] The rotor shaft end **4**, on the one hand, or the pump shaft end **5** can be plugged under slight mutual prestress into the positive plug receptacle of the coupling piece **6**.

[0017] According to the invention, as shown in **FIG. 3**, the two-flat take-up webs **4.1;4.2** and **5.1;5.2** have, on their take-up surfaces **4.11;4.21** and **5.11;5.21** taking effect during rotational take-up and coming to bear on the coupling piece **6**, a conical design such that, due to the mutual slight prestress, they come reliably into play-free bearing contact on the matching flat-running take-up surfaces of the take-up grooves **6.1-6.4**. The take-up surfaces are expediently provided with a corresponding conical design with respect to both directions of rotation.

[0018] **FIG. 4** shows basically the same solution principle as that according to **FIG. 3**, but, in this case, the conical design is provided on the take-up surfaces **6.11-6.41**, coming into take-up bearing contact, of the two-flat take-up grooves **6.1-6.4** of the coupling piece **6**, and the take-up surfaces of the two-flat take-up webs **4.1;4.2** and **5.1;5.2** of the rotor shaft end **4** and of the pump shaft end **5** have a flat-running design without any separate machining as regards conicity.

What is claimed is:

1. A motor/pump assembly for protection against torsional thrusts and axial vibrations, said assembly comprising:

an electric motor having a driven-side rotor shaft, said shaft having an end plugged with take-up webs;

a pump having a drive-side pump shaft, said shaft having an end plugged with take-up webs;

said rotor shaft plugged end connected to said pump shaft plugged end via an axial positive plug receptacle for receiving the plugged shaft ends, said receptacle including take-up grooves having conical take-up contact surfaces, wherein the connection provides a play-free rotational take-up.

2. The motor/pump assembly as claimed in claim 1, wherein the braking device is an antilock braking device.

3. A motor/pump assembly for use in a motor vehicle antilock braking device, said assembly comprising:

an electric motor having a driven-side rotor shaft, said shaft having an end plugged with take-up webs having conical contact surfaces;

a pump having a drive-side pump shaft, said shaft having an end plugged with take-up webs having conical contact surfaces; and

a coupling device having take-up grooves for receiving said take-up webs for connecting said plugged ends under mutual prestress.

4. The motor/pump assembly as claimed in claim 3, wherein the connection is play-free.

5. An assembly for use in an antilock braking device to protect against torsional thrusts and axial vibrations, said assembly comprising:

an electric motor having a driven-side rotor shaft, said shaft having a plugged end;

a pump having a drive-side pump shaft, said shaft having a plugged end;

a coupling device comprising a plug receptacle for receiving said plugged ends under mutual prestress to provide for play-free rotational take-up.

6. The motor/pump assembly as claimed in claim 5, wherein said plug receptacle comprises radially projecting axially running take-up webs.

7. The motor/pump assembly as claimed in claim 5, wherein said ends are plugged with radially projecting axially running take-up webs.

8. The motor/pump assembly as claimed in claim 6, wherein the take-up webs have a conical contact surface.

9. The motor/pump assembly of claim 7, wherein the take-up webs have a conical contact surface.

10. A motor/pump assembly for use in a motor vehicle braking device,

an electric motor;

an axially following pump driven by the latter;

a drive connection, in the manner of a cardan joint, between the motor and the pump via a coupling piece, in each case with a positive plug receptacle for a driven-side rotor shaft end of the motor and for a drive-side pump shaft end of the pump, and

an axially conical design of the plug receptacle and with a mutual axial prestress of the rotor shaft end and of the pump shaft end with the effect of a play-free rotational take-up.

11. The motor/pump assembly as claimed in claim 10,

the plug receptacle having two radially projecting axially running take-up webs on the rotor shaft end and on the pump shaft end, or on the coupling piece, and two mating take-up grooves on the coupling piece or on the shaft ends.

12. The motor/pump assembly as claimed in claim 11,

wherein the coupling piece comprises take-up webs and said webs include conical take-up surfaces.

13. The motor/pump assembly as claimed in claim 11,

wherein the shaft ends comprise take-up webs, said webs having conical take-up surfaces.

14. The motor/pump assembly as claimed in claim 10, wherein said assembly is adapted for use in a hydraulic pump drive of an ABS braking device for a motor vehicle.

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