The invention relates to a device for eliminating the axial and radial play of a rotating axle upon which rests a disc and which is carried by a fixedly arranged attachment part, wherein materials between which a magnetic force is effective are selected for the disc and the attachment part.

In electric motors which turn the disc in CD players for example, the axial play of the motor axle is eliminated by a magnetic coupling force in the axial direction. The magnetic coupling force is produced for example by means of a disc shaped magnet which is located on the motor axle and a fixedly arranged flange of ferro-magnetic material.

It is however also possible to provide a metal disc on the motor axle and to attach the magnets to the housing. In order to achieve a greater magnetic force of attraction, a magnet may be arranged both on the motor axle and on the housing.

However, in addition to the axial play, the play in the radial direction, the radial play of the motor axle, should also be eliminated. It is known for example, to suppress the radial play by means of a helical coil spring. The combination of the two solutions - elimination of the axial play by magnetic coupling force and of the radial play by means of a helical coil spring - has the disadvantage that, in addition to a magnet, a spring is also needed which is subject to wear, causes additional friction and, under unfavourable circumstances, can even lead to seizure of the motor axle. Moreover, the outlay required for the mounting of the magnets and, in particular, of the helical coil spring is relatively high.

A disc drive having an axle upon which the [recorded] disc is located on a turn-table is described in US-PS 4 730 299. The axle rests on a disc upon which there is arranged a ring magnet through whose central hole the axle projects. The ring magnet is surrounded by a ring-shaped yoke. A turn-table, on whose lower side facing the ring magnet there is arranged a disc which is matched to the cross section of the ring magnet, is placed on the axle.

A magnetic force, which reduces the axial play, is effective in the axial direction between the ring magnet and the disc. A magnetic force, which reduces the radial play, is also effective between the disc and the ring magnet in the radial direction.

Likewise, an attractive force is effective on the disc radially opposite to the one side of the yoke, but, in exactly the opposite direction. It is a fact that the magnetic force which

emanates from the one side of the yoke onto the disc as a result of the lack of symmetry - the distance between the one side of the yoke and the disc is selected to be smaller than the distance between the other side of the yoke and the disc - is smaller than the attractive force between the other side of the yoke and the disc.

However, if, as a result of an external jolt, the turn-table is now deflected towards the other side of the yoke, the distance between the disc and the one side of the yoke is increased whilst that between the other side of the yoke and the disc is decreased. This has the result that the magnetic force between the one side of the yoke and the disc, the restoring force, decreases, whilst the force between the disc and the other side of the yoke increases, which is thus effective in the direction of the deflecting force. Consequently, because the restoring force decreases during a deflection, while the deflecting force on the other hand actually increases, the radial play is not reduced but rather, is actually increased when external jolts occur.

Thus, for a motor in which the play of the motor axle in the axial direction is eliminated by a magnetic coupling force, it is the object of the invention to also eliminate the radial play, using means which are as simple as possible, for the case that the motor is subjected to external shocks.

This object is achieved by the invention in that, a curved part which is matched to the curve of the disc is provided on a part of the attachment part, which curved part is arranged adjacent to the projection area of the disc upon the attachment part and projects up to the level of the disc, and that a magnetic force is effective between the curved part and the disc.

There is shown in:

Figure 1 a first embodiment of the invention in a side view

Figure 2 the first embodiment of the invention in a top view

Figure 3 a second embodiment of the invention in a side view

Figure 4 the second embodiment of the invention in a top view.

The invention will now be described and explained on the basis of the first embodiment shown in Figures 1 and 2.

In Figure 1, a motor M for driving the disc of a CD player is attached to a flange F of ferro-magnetic material which is placed in a housing G. A ring magnet RM, through whose opening the motor axle projects but which does not however touch the ring magnet RM, is arranged in the flange F. A disc S of ferro-magnetic material, above which the supporting turn-table T for a (CD) disc is arranged, rests on the motor axle A. A curved part K is provided on the flange F adjacent to the disc S.

Because a magnetic force of attraction is effective in the axial direction between the ring magnet RM and the disc S, the axial play of the motor axle A is eliminated. However, because a magnetic force of attraction is also effective in the radial direction between the curved part K and the disc S, the radial play of the motor axle A is likewise eliminated without a spring or further magnets being required for this purpose.

It is also possible to provide a ring magnet on the motor axle instead of the disc.

The invention is particularly easy and cheap to produce because the components provided for eliminating the axial play - the disc S, the ring magnet RM and also the flange F - also eliminate the radial play of the motor axle A by the simple measure of providing a curved part K on the flange F adjacent to the disc S.

In the top view illustrated in Figure 2, the curved part K arranged adjacent to the disc S and the motor axle A can be seen.

The second embodiment of the invention depicted in Figures 3 and 4 will now be described and explained.

In Figure 3, the motor M for the disc drive of a CD player is attached to a metal plate P. A ring magnet RM, above which the supporting turn-table T for the [CD] disc is arranged, rests on the motor axle A. A curved part K, which may for example be stamped out of the metal plate P, is arranged on the metal plate P adjacent to the disc S. Because a magnetic force of attraction is effective between the ring magnet RM resting on the motor axle A and the metal plate P to which the motor M is attached, the axial play of the motor axle A is eliminated.

Because of the curved part K stamped out from the metal plate which is arranged adjacent to the ring magnet RM, a magnetic force of attraction is also effective in the radial direction so that the radial play of the motor axle A is also eliminated.

Just as for the first embodiment, the components required for the elimination of the axial play of the motor axle A - the ring magnet RM resting on the motor axle A and the metal plate P to which the motor is attached - also serve for the elimination of the radial play.

Due to the simple measure of stamping a lug or a curved part from the metal plate P in such a way that it is arranged adjacent to the ring magnet RM, the radial play of the motor axle A is also eliminated in addition to the axial play.

The invention is suitable for eliminating the axial and radial play of an axle. The invention can be used particularly advantageously for the elimination of the radial and axial play in a motor for the disc drive in a recording and/or reproduction apparatus. As examples, CD players, video disc players, DRAW disc players and magneto-optic apparatus are mentioned.

Claims

1. Device for eliminating the axial and radial play of an axle (A) upon which rests a disc (S, RM) and which is carried by a fixedly arranged attachment part (F, P), wherein materials between which a magnetic force is effective are selected for the disc (S, RM) and the attachment part (F, P), characterised in that, a curved part (K) which is matched to the curve of the disc (S, RM) is provided on a part of the attachment part (F, P), which curved part (K) is arranged adjacent to the projection area of the disc (S, RM) upon the attachment part (F, P), and that a magnetic force is effective between the curved part (K) and the disc (S, RM).

2. Device in accordance with Claim 1, characterised in that, the curved part (K) projects up to the level of the disc.

3. Device in accordance with Claim 1 or 2, characterised in that, the attachment part is a flange (F), that a mounting (M) for the axle (A) is attached to the flange (F), that the flange (F) is attached to a housing (G), that a ring magnet (RM), through whose opening the axle (A) is guided, is located in the flange (F), and that the curved part (K) is provided on the flange (F) adjacent to the disc (S).

4. Device in accordance with Claim 3, characterised in that, the flange (F) and the curved part (K) are produced from one piece of metal.

5. Device in accordance with Claim 1 or 2, characterised in that, a ring magnet (RM) is located on the axle (A), that the attachment part is a plate (P), that a mounting (M) for the axle (A) is attached to the plate (P), and that the curved part (K) is arranged on the plate (P) adjacent to the ring magnet (RM).

6. Device in accordance with Claim 5, characterised in that, the plate (P) and the curved part (K) are produced from ferromagnetic material.

7. Device in accordance with Claim 5 or 6, characterised in that, the curved part (K) is formed by stamping from the plate (P).

8. Device in accordance with Claim 1, 2, 3, 4, 5, 6 or 7, characterised in that, the axle (A) is the axle of a motor (M) of the disc drive for a recording and/or reproduction apparatus.