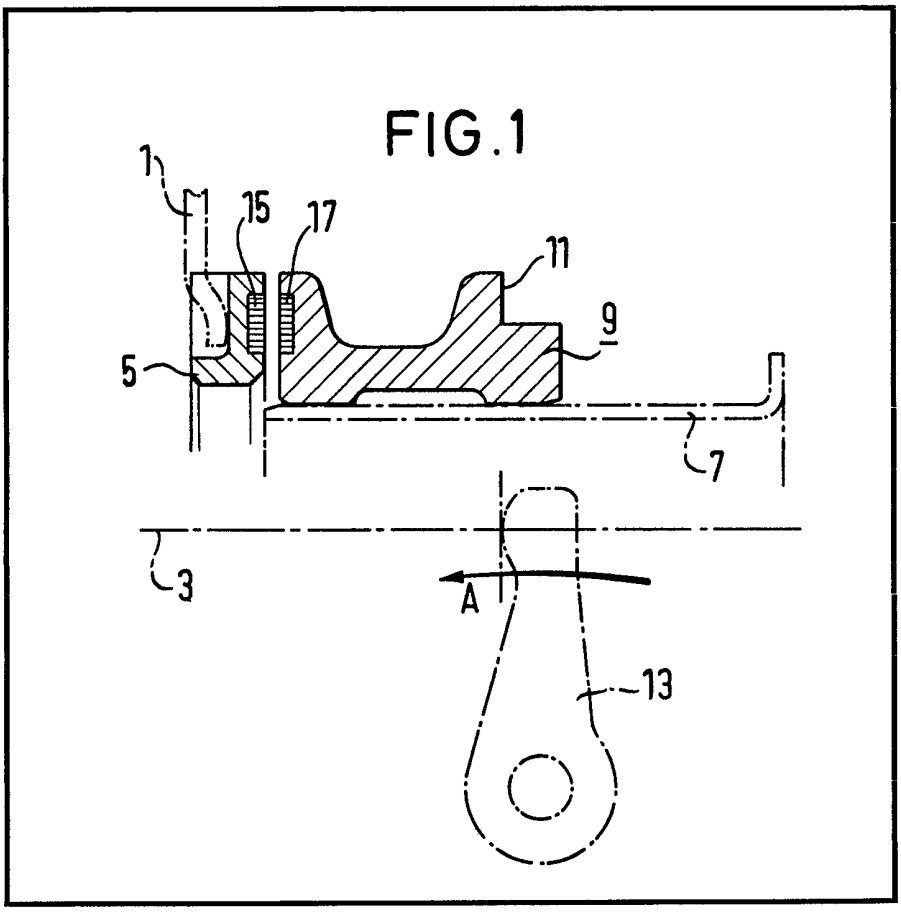
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(54) Clutch release device

(57) A clutch release device is provided in which contact-free displacement of a rotating displaceably mounted member along the axis of rotatio thereof can take place. A rotating member (5) which engages diaphragm string tongues (1) is axially displaced upon axial movement of a non-rotatable member (9) by a release fork (13), the displacing force being provided by mutual repulsion of magnets (15, 17) on the members (5, 9) which also limits the approach of the two members towards each other. In this manner wear between rotary parts is obviated and noise is reduced. In another embodiment, energisation of an electromagnet on the non-rotatable member attracts a soft iron rotatable member bur axial displacement of the latter member is limited by a stop co-operating with the diaphram spring tongues engaged with the rotatable member.



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FIG.1

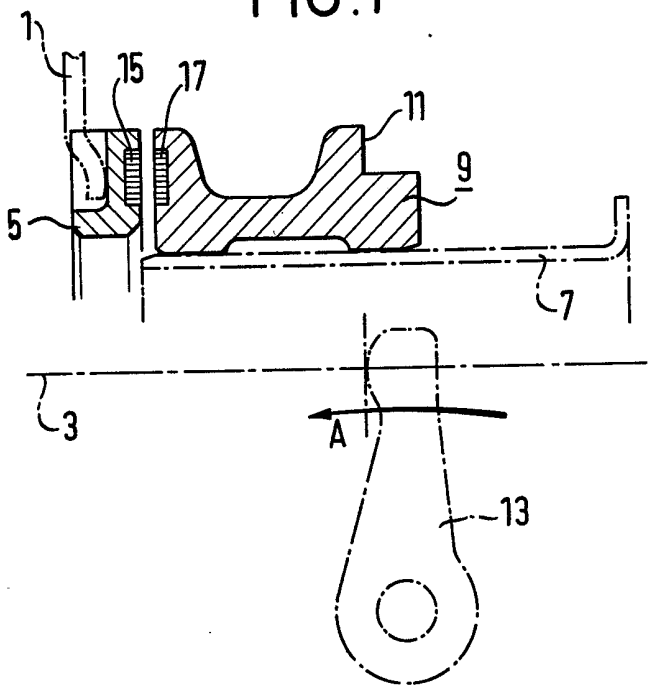


FIG.2

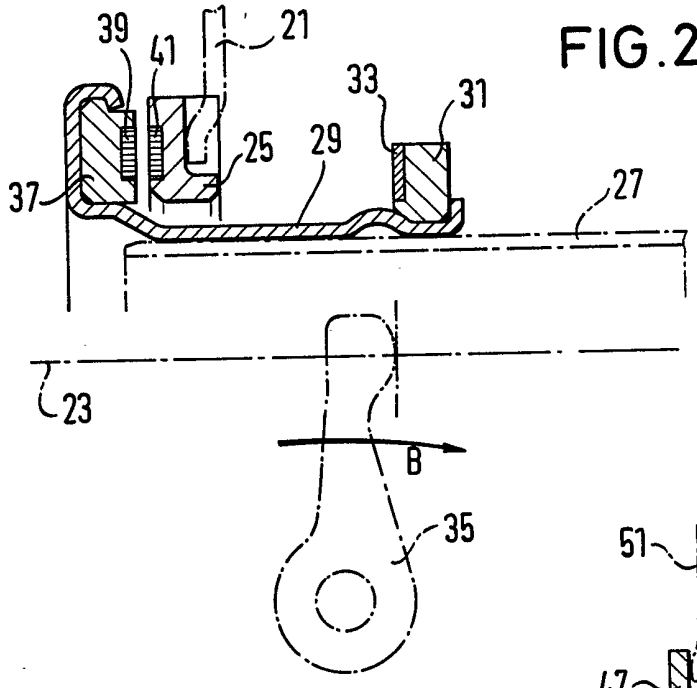
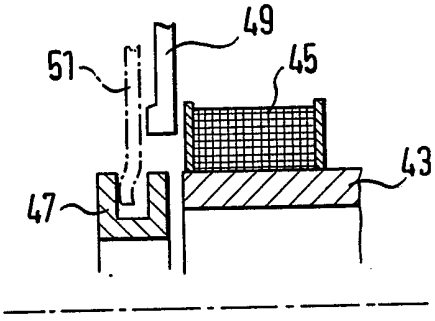


FIG.3



SPECIFICATION

Clutch release device

The invention relates to a device for the contact-free displacement of a rotating, displaceably mounted member along the axis of rotation thereof.

Clutch release mechanisms of known motor vehicle friction clutches usually comprise an antifriction bearing for reducing the friction arising between the revolving parts of the clutch and the non-revolving parts of the clutch release mechanism. In order to reduce the wear and the noise formation to a minimum, there are used radially displaceable, self-centring antifriction bearings.

Hwoever, it is impossible to avoid any wear at all between the revolving and the non-revolving parts, and the noise formation also often leaves much to be desired.

It is the object of the invention to indicate a device which is intended for the contact-free displacement of a rotating, displaceably mounted member and which is suitable, in particular, for the clutch release mechanism of a motor vehicle friction clutch. According to the invention, this problem is solved in that the rotating member of a member which is non-rotatably arranged adjacent thereto, in the direction of the axis of rotation, comprises at least one magnet which exerts a displacing force on the respective other member and in that a means, which limits the approach of the two members towards each other, engages at least in the axially displaceable member. In this way, the rotating member can be axially displaced in a contact-free manner so that the device operates in a manner that is entirely free from wear and noise.

In a first constructional form, provision is made for the rotatijng member to be mounted on a carrier, which also rotates, so as to be secured against rotation but so as to be axially displaceable, and for the magnet of one member to exert a pull on the other member, and for a stop, which is held on the carrier, to be provided for limiting the approach of the two members towards each other. The carrier may be the friction clutch housing or the like. The stop on the carrier prevents the magnet, which is designed as an electromagnet, from pulling the rotating member to such an extend that it comes into contact with the other member. The electromagnet may be attached to the other member, which is expediently stationary. The clutch can thus be electrically operated. The member to be pulled by the electromagnet may comprise a soft-iron armature or possibly a permanent magnet which is poled in the same sense.

In another preferred constructional form, wherein the rotating member is also mounted on a rotating carrier so as to be secured against rotation but so as to be axially displaceable, provision is made for both members to carry at least one magnet and for the magnets to be carried in the magnetic field of the respective other magnet and to be oppositely poled, so as to limit the approach of the members towards each other. This constructional form has the advantage that the repulsive forces increase as the distance between the magnets is reduced so that any contact of the members is reliably avoided.

Although, in the last-mentioned constructional form, too, at least one of the two magnets may be designed as an electromagnet that is fed by direct current, preference is given to constructional forms wherein both magnets are designed as permanent magnets. If clutch release mechanisms are involved, both members are in this case mounted so as to be axially displaceable in order to transmit the disengageing forces from a setting element to the clutch operating parts, for example a co-rotating release ring which acts on diaphragm spring tongues of the clutch. In constructional forms wherein oppositely poled magnets are used, all magnets are preferably designed as permanent magnets. Last not least, this has the advantage that the repulsive magnetic forces bias the two members to their position of rest to that no rattling noises can arise. The magnets may be provided, for example, on surfaces of the members which are directed axially towards one another.

In all constructional forms, there may be provided. In addition to the permanent magnets and the electromagnets, soft-iron yokes or pole shoes which bunch the magnetic flux or close it in the back-circuit.

Some exemplified embodiments of the invention will hereinafter be explained in more detail with reference to drawings, in which:—

Figure 1 shows a schematic diagram of a release device for a pressed friction clutch,

Figure 2 shows a schematic diagram of a release device of a drawn further clutch, and

Figure 3 shows a further embodiment.

Fig. 1 shows a release ring 5, which rotates, together with diaphragm spring tongues 1, about an axis of rotation 3, of a motor vehicle friction clutch of conventional type which has been biased to its engaged position by a diaphragm spring not shown and which is disengaged when the release ring 5 is moved to the left in Fig. 1 by means of a sliding sleeve 9 which is mounted on a guide tube 7, located at the gearbox end, so as to be secured against rotation but so as to be displaceable. A clutch release fork 13, which can be swivelled, for declutching the clutch, in the direction of an arrow A by means of the clutch pedal of the motor vehicle, engages in a shoulder 11 of the sliding sleeve 9, which shoulder is directed axially opposite to the declutching direction.

In axially facing faces of the release ring 5 and the sliding sleeve 9 respectively, there are

arranged permanent magnets 15, 17 which are ring-shaped and are concentric with the axis of rotation 3. The permanent magnets 15, 17 are poled in opposite senses so that they repel each other. If the sliding sleeve 9 is shifted to the left in Fig. 1 by means of the release fork 13, then the repulsive forces in the permanent magnets 15, 17 also move the release ring 5 to the left, without the release ring 5 coming however into contact with the sliding sleeve 9. The rotating release ring 5 and the non-rotating sliding sleeve 9 are thus not subjected to any wear. Furthermore, centring errors are no longer of any importance and the noises arising in hitherto usual anti-friction bearing are also avoided. It is possible to use single permanent magnets, which are distributed over the circumference of the release ring 5 and the sliding sleeve 9 respectively, instead of ring-shaped permanent magnets.

Fig. 2 shows release members of a drawn vehicle friction clutch where, in contrast to the clutch shown in Fig. 1, the diaphragm spring tongues or clutch fingers 21 can be drawn away from the clutch disc of the friction clutch, which is not shown in Fig. 2, through a release ring 25 which co-rotates with the diaphragm spring tongues 21 about an axis of rotation 23. The clutch actuation is again effected through a sliding sleeve 29 which is axially displaceable on a stationary guide tube 27 at the gearbox end but which does not rotate and which carries at one end a pressure ring 31, which is provided with an axial shoulder 33 which points opposite to the pull direction, for a release fork 35 which can be moved from the clutch pedal of the vehicle in the direction of an arrow B.

On the side of the release ring 25 that is remote from the pressure ring 31, the sliding sleeve 29 carries a ring 37 at a distance from the release ring 25. Ring-shaped permanent magnets 39, 41 are inserted, coaxially with the axis of rotation 23, in the faces of the rings 25, 37 which are axially directed towards each other. The permanent magnets 39, 41 are poled in opposite senses so that they repel each other. In order to disengage the friction clutch, the release fork 35 is moved in the direction of the arrow B. During this process, the sliding sleeve 29 is displaced along the guide tube 27 to the right in Fig. 2, the release ring 25 also being shifted to the right on account of the repulsive forces in the permanent magnets 39, 41. The repulsive forces exerted by the permanent magnets 39, 41 are so great that the rings 25, 37 do not come into contact with each other during the disengagement of the clutch.

Instead of the permanent magnets shown in Figs. 1 and 2, there may be provided oppositely poled electromagnets.

In the constructional forms illustrated above, there were transmitted for the operation of the clutch repulsive magnetic forces between a mechanically displaceable, non-rotating sliding sleeve and an axially displaceable rotating release ring. If a gradual engagement is not essential for the clutching process, there may be applied to a soft-iron tube 43 at the gearbox end a winding 45 which encloses the soft-iron tube 43 and which upon excitement pulls a release ring 47, which also consists of soft iron, into an end position which is determined by a stop 49, as shown in Fig. 3. In the exemplified embodiment shown in Fig. 3, the stop 49 engages in the motor vehicle friction clutch diaphragm spring tongues 51, which are pulled by the release ring 47, and limits the minimum distance between the rotating release ring 47 and the stationary soft-iron tube 43. The top 49 rotates with the release ring 47 and is secured, for example, to the clutch plate of the friction clutch.

CLAIMS

1. A device for the contact-free displacement of a rotating displaceably mounted member along the axis of rotation thereof, wherein the rotating member or a member which is non-rotatably arranged adjacent to this member in the direction of the axis of rotation comprises at least one magnet which exerts a displacing force on the respective other member and wherein there engages at least in the axially displaceable member a means which limits the approach of the two members towards each other.

2. A device as claimed in claim 1, whrein the rotating member is mounted on a likewise rotating carrier so as to be secured against rotation but so as to be axially displaceable, and wherein the magnet of one member is designed as an electromagnet and in its excited state exerts a pulling force on the other member, and wherein a stop, which is held on the carrier, is provided for limiting the approach of the two members towards each other.

3. A device as claimed in claim 1, wherein the rotating member is mounted on a likewise rotating carrier so as to be secured against rotation but so as to be axially displaceable, and wherein both members each carry at least one magnet, and wherein for limiting the approach of the members, the magnets, being oppositely poled, are arranged in the magnetic field of the respective other magnet.

4. A device as claimed in claim 3, wherein both members are mounted so as to be axially displaceable.

5. A device as claimed in claim 3, whrein the magnet of at least one of the members is an electromagnet.

6. A device as claimed in claim 3, wherein the magnet of at least one of the members is a permanent magnet.

7. A device as claimed in claim 6, wherein

all the magnets are designed as permanent magnets.

8. A device as claimed in claim 7, wherein the magnets are provided on faces of the members which point axially to one another.

9. A device as claimed in claim 8, wherein the permanent magnets are of ring shape and are arranged coaxially with the axis of rotation of the rotating member.

10. A device as claimed in claim 7, wherein the two members are parts of a clutch release mechanism of a motor vehicle friction clutch.

11. A device as claimed in claim 10, wherein one member is designed as a release ring which co-rotates with diaphragm spring tongues of the clutch and the other member is designed as a setting element which is guided on a stationary guide tube at the gearbox end and which is displaceable by means of a release fork.

12. A device for the contact-free displacement of a rotating displaceably mounted member along the axis of rotation thereof substantially as described herein with reference to the accompanying drawings.

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