INFORMATION-STORAGE DISK DRIVE ASSEMBLIES

The invention concerns an information storage-disk drive assembly comprising an exchangeable information-storage disk and a motor having a rotor directly driving the information-storage disk.

According to the invention, there is provided an information-storage disk drive assembly comprising an exchangeable information-storage disk and a motor whose rotor directly drives said disk, wherein the motor is a collectorless D.C. motor comprising an internal stator and an external permanent-magnet rotor, the rotor shaft has an end which projects axially from the motor and the rotor includes a carrier member connected to said rotor shaft, said carrier member having a support ridge of ferromagnetic material through which the flux of a flat permanently magnetic holding magnet passes to support and hold the information-storage disk in place against said support ridge, the face of the flat holding magnet which faces towards the information-storage disk being axially recessed relative to the support ridge by a predetermined distance.

Preferably, the carrier member is shaped to form a rotor housing for the rotor. The rotor suitably includes a rotor housing having a larger-diameter portion surrounding the rotor magnet arrangement and at the end of the rotor housing remote from the carrier member a smaller diameter portion which accommodates at least one roller bearing unit.

In one preferred embodiment of the invention, the support ridge has an inclined flank portion, while in another preferred embodiment the support ridge has a flank portion which evidences having undergone material removal by lathe turning such as to reduce the breadth of the support ridge.

It also is preferred that:

the stator comprises a carrier structure accommodating at least one roller bearing unit, the carrier structure being provided with a mounting portion for mounting the motor as a whole;

the stator furthermore comprises a packet of stator plates radially outwards of the carrier structure;

the rotor includes a rotor shaft journalled within the roller bearing unit accommodated in the carrier structure and comprising a rotor housing; and

an electromagnetic braking arrangement is located in the interior of the rotor housing and supported on the carrier structure.

Suitably the electromagnetic braking arrangement is operative for braking the rotor by engaging the interior of the rotor housing. The interior side of

the rotor housing may be provided with a friction layer which is engaged by the electromagnetic braking arrangement when the latter is operative.

Alternatively, the rotor housing may have a radially extending wall portion, the electromagnetic braking arrangement being mounted to brake the rotor by engaging the interior side of the rotor housing at the radially extending wall portion thereof.

The electromagnetic braking arrangement may comprise a stator part which includes an energizing coil, the stator part inclusive of the energizing coil being mounted on the carrier structure. The electromagnetic braking arrangement may furthermore including an armature part, the carrier structure and the armature part of the electromagnetic braking arrangement having interengaging portions which secure the armature part against rotation when the rotor housing rotates. Said interengaging portions suitably comprise a portion of the carrier structure provided with an axially extending recess and a portion on the armature part which extends into the recess.

The permanent-magnet rotor may include a rotor magnet arrangement which extends into the vicinity of the electromagnetic braking arrangement, and may further include a magnetic-field-responsive sensing element mounted on the braking arrangement for

sensing the rotor magnet arrangement. The electromagnetic braking arrangement also may include an element having a portion which extends towards the rotor magnet arrangement, the sensing element comprising a sensing coil arranged on said portion.

The invention is illustrated in the following description of specific embodiments when considered in conjunction with the Figures. In the drawings:-

FIG. 1 depicts a first embodiment of the inventive information-storage disk drive assembly;

FIG. 2 depicts a second embodiment;

FIGS. 3 and 4 depict detail "M" of FIG. 2, depicting two variants therefor, on a scale about five times greater than that of FIG. 2;

FIG. 5 is a plot of magnetic holding force, referred to in connection with the description of FIGS. 1-4;

FIG. 6 is a section taken along line XII-XII of FIG. 7;

FIG. 7 is a plan view which depicts a flux conducting element generally congruent with the stator plate packet of the embodiment of FIG 2 and provided on the axial end face of said packet;

FIG. 8 depicts an electrically conductive spring maintaining the rotor shaft of the embodiments of FIGS

1 and 2 at the same potential as the respective carrier structure thereof;

FIG. 9 is a plan view, seen from above, of the motor of FIG. 2, depicted at a typical true scale; and

FIG. 10 depicts a motor incorporating a built-in frictional braking arrangement, which arrangement can be incorporated into the embodiments of FIGS 1 and 2;

In the various Figures, components which are identical or equivalent are denoted by the same reference numerals and usually described only once.

Referring to FIG. 1, an information-storage disc drive assembly of the invention comprises a collectorless D.C. motor 103 having a carrier tube 11 with a mounting flange 12. Two roller bearings 14, 15 (preferably ball bearings) mount a drive shaft 16 and are located within the carrier tube 11 held spaced from each other by a radially inward annular projection 13 of the carrier tube. The inner ring of the upper roller bearing 14 is fixedly connected to shaft 16, e.g. by cementing. The axial distance between the median planes of the two roller bearings corresponds approximately to the diameter of shaft 16. Secured to the upper end of shaft 16 is a somewhat pan-shaped rotor housing 180 of magnetically conductive material, in whose downwardly extending peripheral wall 190 is inserted a four-pole, radially magnetized rubber magnet

29. A plot of the radial magnetization of magnet 29 versus circumferentially successive locations thereon has a trapezoid-wave shape such that the polarity transitions proceeding from one individual pole to the next are very narrow in angular extent; cf. Federal Republic of Germany Patent DBP 23 46 380, the disclosure of which is incorporated herein by reference. In the upper, flat part 123 of rotor housing 180 there is provided a turned out (i.e., machined out) recess 124 which is coaxial with shaft 16 and accommodates an axially magnetized ring 125, e.g., made of rubber-magnetic material. This housing part 123 furthermore has at its center an axial extension 126 which, as can be seen, serves for centering an information-storage disk 127 (indicated in dash-dot lines), disk 127 being positively held in position by the magnetic pull of ring 125. Between the hub of rotor housing 180 and the inner ring of the upper ball bearing 14 there is accommodated a compensation washer or shim 60 which serves during assembly for establishing exactly the correct axial height for the rotor housing 180.

The stator plate packet 34 of the motor is located exteriorly of the carrier tube 11 and has four salient poles (cf. FIG. 7). The four salient poles are defined, and separated from one another, by four

equiangularly spaced cut-outs 132 in the stator plate packet 34, only one such cut-out 132 being visible in the sectional view of FIG. 1, at the right side thereof. The four cut-outs 132 accommodate a winding 38. Cast annular insulating members 134, 135 are provided to insulate the winding 38 from the stator plate packet 34. The circumferential course of the air gap may correspond to that disclosed in Federal Republic of Germany Patent DBP 23 46 380, the disclosure of which is incorporated herein by reference.

In this embodiment, the radial flange 12 of the carrier tube 11 is located beneath the stator plate packet 34. The upper face of flange 12 has, over a limited angular sector thereof, a recess 137 which accommodates a circle-sector-shaped circuit board or plate 138. Circuit board 138 carries, as shown, a galvanometric sensor 139 which is electrically connected to the two conductors of the stator winding 38, to which latter are connected connecting conductors 142, 143 which exit the motor through an aperture 144 of flange 12, as shown. The sensor may be used for generation of an RPM signal, a rotor-position signal, etc.

Shaft 16 has at its lower end an annular groove 145 which accommodates a circlip 146, the latter being

spaced by a dish spring 147 and a shim disk 148 from the inner ring of bearing 15, the latter being shiftable on the shaft 16, so that the two ball bearings 14, 15 are held pressed together by spring force but spaced from each other by the radially inward projection 13 of the carrier tube. The radial inward projection 13 has an annular groove 17 (see FIG 10) in which is fixedly arranged a spring 18 (see FIG 8) which extends out therefrom spirally in turns of decreasing radius, the spring 18 having a free end 19 which bears against the periphery of shaft 16 for relative sliding movement. In this fashion the spring 18 serves to electrically conductively connect shaft 16 to carrier tube 11 and maintain the former at the potential of the latter to prevent undesired build-up of electrostatic charge on shaft 16. Spring 18 can, for example, be made of beryllium bronze. Its use is of great advantage in the illustrated construction but is of similar advantage in motors of other types. Instead of the free end 19 of spring 18 bearing directly against shaft 16, spring end 19 could be provided with a rolling metallic element, although this would, of course, be more costly.

FIG. 2 depicts a second embodiment of the invention, having a motor 104 in which the mounting flange 12 is provided at the upper end of the motor,

whereas the rotor housing 181 is located below the mounting flange and is secured to the lower end of drive shaft 16. Located at the top of shaft 16 is a pan-shaped carrier member 150 having a recess 124 which accommodates an axially magnetized magnet ring 125. Carrier member 150 is positioned at a predetermined axial distance from the inner ring of the upper bearing 14 by means of a shim ring 60, the inner ring of bearing 14 being fixedly cemented to shaft 16, whereas the inner ring of lower bearing 15 is shiftable relative to shaft 16. Carrier member 150 accepts, as shown, an information-carrier disk 127. The face of magnet ring 125 facing the disk 127 is located lower, by an axial distance n, than the annular disk-bearing surface 71 (see FIGS 3 and 4) of the carrier member 150. (It is to be noted that the same is true in the construction of FIG. 1, already described, where the magnet ring 125 is accommodated in a recess 124 on the upper face of rotor housing 18. Accordingly, in FIGS. 3 and 4 described below, where reference numeral 150 of FIG. 2 is indicated there is also indicated, therebelow in parentheses, reference numeral 180 of FIG. 1).

In FIG. 2, rotor housing 181 has an axial extension 182 which accommodates the lower end of carrier tube 11 and which is secured to the lower end of shaft 16. Located intermediate lower bearing 15

and the bottom of the rotor housing are a dish spring 47 and a shim ring 97. Dish spring 47 loads bearing 15 with a predetermined force and thereby holds bearings 14, 15 pressed together to an extent such as to ensure quiet running of the rotor.

In this embodiment the axial length of the stator plate packet 34 amounts to less than 50% of that of the rotor magnet 29. Accordingly, there is provided at the bottom face of the stator plate packet 34 a skirted-rim annular member 35 having at its periphery an axially extending skirt 35'. Member 35 is shown in plan view in FIG. 7. The peripheral outline of member 35, clearly visible in FIG. 7, is substantially identical to and coincident with that of the stator plate packet 34; likewise, four equiangularly spaced cut-outs in member 35, apparent in FIG. 7, are identical to and coincident with four such cut-outs in the stator plate packet 34, formed to define four salient stator poles. As shown in FIG. 2, the axially extending skirt 35' of member 35 serves to lengthen the effective air gap 32, so that the latter extends over substantially the full axial length of rotor magnet 29. Thus, it is possible to increase the torque of motor 104, by air-gap-length increase, without increasing the total axial length of the stator of the motor.

In the motor of FIG. 2, the underside of the mounting flange 12 has a recess 155, whose outline has the shape of a sector of a circle, as clearly seen in FIG. 9. Recess 155 accommodates a circuit plate 156 on which are secured connection terminals 158 for the stator winding 38, and connection terminals for a Hall-IC 159. The Hall-IC 159 is not visible in the section of FIG. 2, but extends into a margial cut-out of the stator plate packet 34. In the construction of FIG. 2, the peripheral outline of the stator plate packet 34, which determines the variation in the radial air-gap length as one proceeds circumferentially, serves to generate a reluctance torque such as discussed earlier.

FIG. 9 depicts the motor of FIG. 2 at a typical true scale. The type of motor involved is a high-precision miniature motor having typically a power consumption of a few watts.

As shown in FIG. 2, the lower end 55 of shaft 16 is spherically rounded. During operation of the motor a (non-illustrated) spring contact bears against the rounded end 55 and serves to conduct away from shaft 16 electrostatic charge which might otherwise accumulate thereon.

The pan-shaped carrier member 150 of FIG. 2 (or the corresponding upper portion of rotor housing 180

in FIG. 1) is, in the simplest case, a deep-drawn part. The magnetic holding force MF exerted upon an information-storage disk 127 laid upon the pan-shaped member 125 (or 180) depends upon the annular crosssectional surface area of the ring-shaped surface 71 upon which the disk 127 rests. Assuming the magnetic flux be constant, the magnetic holding force MF decreases with decreasing cross-sectional surface area of ring-shaped surface 71. If greater mechanical stability is required for the carrier member 150 (or 180), then it may be necessary to employ a lathe-turned member (similar to FIG. 1) or a deep-drawn member provided with auxiliary stamped portions 74 to increase rigidity. To optimize the magnetic holding force MF exerted upon an information-storage disk 127, the annular disk-bearing ridge 71 (see FIG. 3) of the pan-shaped carrier 150 is provided with an incline machined by turning; preferably the incline slopes radially inwards as shown in FIG. 3. The radial breadth b of this annular ridge as well as the inclination angle determine the magnitude of the magnetic holding force MF, and also determine how quickly the holding force exerted upon the disk 127 collapses as the disk is removed from the diskbearing surface 71. FIG. 5 depicts, for four different values of radial breadth b, the collapse of

the magnetic holding force MF, as the distance h between the disk 127 and the disk-bearing surface 71 increases when the disk is lifted off surface 71. In FIG. 5, it is assumed that, in all four cases illustrated, no magnetic saturation is present at the disk-supporting surface 71, or more precisely at the surface through which pass the flux lines which are responsible for the holding force MF. However, the assumption that magnetic saturation is not present requires certain comments. In the mass-production of magnets, when the magnetic behaviour exhibits a relatively wide tolerance range, there will be considerable differences in the magnitude of the holding force from one produced magnet to the next. Assume that the value of b is selected for the case of a magnet having a relatively low coercive force (remanent induction), i.e., at the low end of the tolerance range; accordingly, to ensure that such a magnet will provide a sufficient holding force, the value of b will be chosen relatively low, generally such that magnetic saturation will be approached but not quite reached. Now, if the same value of b were to be chosen in the case of another such magnet, whose coercive force however is at the high end of the tolerance range, such magnet will tend to produce saturation at the disk-bearing surface 71. Thus, with

this form of the disk-bearing surface 71 it becomes possible at least in part to compensate for the tolerance range of the mass-produced magnets to be employed.

As the surface 71 will in general be produced within a very narrow tolerance range as to its axial height, and therefore in the assembled condition of the motor must be yet again machined down, the contour shown in FIG. 4 for the disk-bearing surface 71 is more advantageous, because then by means of the supplemental machining the ridge 71 is machined down by an amount Δh and nevertheless, if formed as in FIG. 4, does not undergo a change of cross-sectional area.

If one desires a gradual collapse of the magnetic holding force MF with increasing distance h of the information-storage disk 127 from the carrier member 150, then the angle α must be made small; this is not compatible with the contour for ridge 71 shown in FIG. 4. If in the FIG. 4 case one selects the radial breadth b such that the disk-bearing ridge 71 actually saturates upon disk engagement, then this would result in a gradual collapse of the magnetic holding force MF upon disk removal, because then, as the disk 127 is removed a small distance h from the ridge 72, the magnetic flux in the ridge air gap will not immediately decrease in any drastic way, because there must first

occur the return trip along the magnetic saturation curve of the material.

These properties of the ridge contour for the pan-shaped carrier member 150 which accommodates magnet 125 in FIG. 2 of course apply likewise to the construction of FIG. 1. Indeed, more generally, these are applicable no matter what type of drive motor is employed, when a drive for an exchangeable information-storage disk is provided with a ring magnet 125 for holding the exchangeable disks in place on a ferromagnetic carrier.

FIG. 6 and 7 depict, on an enlarged scale, one of the skirted-rim members 35 discussed above, FIG. 6 being a section taken along line XII-XII of FIG. 7. As shown in FIG. 7, in correspondence to the cooperating stator plate packet, the skirted-rim member 35 has four equiangularly spaced cut-outs which define and separate four T-arms to form four salient poles. As shown in FIG. 4, the marginal skirt 35' has an axial height H. In FIG. 7, arrow 75 indicates the direction of rotor rotation. The leading ends, as considered with regard to such direction, of the four T-arms have the initial portions of their marginal skirt 35' absent. These leading-end cut-outs A from the skirt 35' are best visualized from FIG. 6, where the removed material of the cut-out A is shown hatched by dash-dot lines. As

indicated in FIG. 7, along an initial angular span E, the skirt 35' is entirely absent. Along the subsequent angular span F, the skirt 35' commences to reappear and return to its full axial height, the transition to its full height being, for example, a straight incline of angle gamma as shown in FIG. 6, a stepped transition, or a transition along a curve. Along the entire subsequent angular span G the skirt 35' then runs substantially constant at its full axial height H. Preferably, the surface area of each cut-out A is 10-30% of the maximum surface area of the respective skirt segment 35', and the angular extent of sector E is about 8-15% and of sector F 5-20% of the angular extent of one of the four skirt segments 35'. These cut-outs A serve mainly to increase the auxiliary reluctance torque of the motor, to thereby improve and make more reliable the start-up action of the motor.

It will be noted from FIG. 7 that the peripheral outline of the skirted-rim member 35 is here non-cylindrical. A concentric circle is shown in dash-dot line for reference. As can be seen, the leading-end radius of each of the four T-arms is initially less than the maximum radius, increasing gradually thereto.

It is emphasised that the reluctance-torque effect produced by the cut-outs A can be employed

likewise in the case where the outer periphery of the stator plate packet (and the corresponding outer periphery of such skirted-rim members) forms a constant-radial-breadth cylindrical air gap with the inner periphery of the rotor magnet arrangement. In such event, however, the cut-outs should generally be somewhat larger. Thus, if in FIG. 7 the member 35 (and likewise the stator plate packet) is of circular outline, the surface area of each cut-out A should be more of the order of 30-70% of the maximum surface of the associated skirt segment 35'.

FIG. 10 depicts a motor 102 provided with a built-in frictional braking arrangement 82, which braking arrangement can be incorporated in the motor of an information-storage disk drive assembly of the embodiments of FIGS 1 and 2.

Secured to the upper end of shaft 16 is a hub member 22 which serves to accept and transmit rotation to a non-illustrated information-storage disk, such disk having a central aperture of a diameter corresponding to the external diameter of the hub member 22.

Hub member 22 has an inwardly extending axial collar 23 which forms the inner part of a magnetic-fluid seal, the outer part of which is formed by a ring magnet 24. Ring magnet 24 is fixedly

inserted in the carrier tube 11. The magnetic sealing fluid is located between magnetic ring 24 and the collar portion 23.

The magnet ring 29 is located within the outer peripheral wall 28 of the rotor housing 26.

The stator arrangement 33 has both axial end faces thereof fitted with skirt rimmed elements 35,36 such as shown in FIG 7. The skirts 35'36' of said elements form extensions of the air gap 32 and axial end faces of said elements are provided with a layer 37 of insulating material upon which the stator winding 38 is wound.

The rotor housing 26 is secured on a bushing 45 by upsetting the lower end of the latter, and the bushing 45 is secured to the shaft 16 by a cement connection 96.

The inner ring of a roller bearing 15 is shiftable with respect to the shaft, and there is provided between this inner ring and the bushing 45 an axial length compensation washer 97 and a dish spring 47, the latter being set to a predetermined level of stress causing the roller bearings 14 and 15 to be pressed together with a force such as to assure quiet running of the rotor.

A built-in frictional braking arrangement 82 is secured to the lower section of the carrier tube 11 by

means of a cement connection 81. The braking arrangement 82 includes an annular channel-like stator 83 of magnetically conductive material, whose open channel faces down and at its lower rim terminates in a radially outwardly extending flange portion 84 which extends normal to shaft 16. Accommodated within the channel-like stator are an annular coil 85 and a helical compression spring 86. The aforementioned cement connection 81 is located between the carrier tube 11 and the cylindrical, radially inward portion 87 of the stator 83; this location for the cement connection facilitates exact setting of the height of the stator 83 during assembly. Also facilitating assembly is the provision, on the cylindrical portion 87, of a radially inwardly bent segment 88 which is received in a longitudinal groove 89 in the lower periphery of the carrier tube 11.

As shown at the left in FIG. 10, a segment 62 of the axially extending outer cylindrical wall of stator 83 is bent radially outwardly towards the rotor magnet 29. Wound on this bent out tab 62 is a sensor coil 63 which is electrically connected via conductors 64 to a circuit board 43, to which by means of non-illustrated conductors the annular coil 85 of the braking arrangement 82 is likewise electrically connected. The sensor coil 63 may be used to produce an RPM signal, a

rotor-position signal, etc. The circuit board 43 is carried by an annular magnetic shielding plate 42 of magnetically conductive material and is connected to a cable 46.

The brake 82 comprises a movable armature 65 which includes an annular member having a radially inner cylindrical portion 66 and, extending radially outwards from the lower edge thereof, an annular flange portion 68. Portion 66 engages and is guided by the radially inner cylindrical wall 87 of the annular channel-like brake stator 83. To prevent improper rotation of armature 66, 68, portion 66 thereof has a radially inwardly bent section 67 which extends into the aforementioned longitudinal groove 89. When the braking arrangement 82 is operative, the underside of the radial flange 68 bears down on and frictionally engages an annular friction layer 69 provided on the interior face of the bottom of rotor housing 26.

When brake 82 is not energized, compression spring 86 presses the brake armature 65 downwards against the friction layer 69. In contrast, when annular coil 85 is energized, it pulls armature 65 upwards against the force of spring 86 and disengages the brake 82. In this way, when the motor is disconnected from power the rotor is inherently very quickly braked to a stop, so that reading and writing

heads for the information-storage disk driven by the motor will not become damaged.

A comparison with FIG. 4 of Federal Republic of Germany Offenlegungsschrift DE-OS 31 44 629 will make clear that the technique here described could be used in the construction of that publication, to provide that motor with a built-in braking system without increasing its size. The disclosure of that publication is incorporated herein by reference. Thus, with the present feature of this invention one can achieve a very compact motor construction, as may be seen in present FIG. 10 from the "1 cm" indication of scale.

While the invention has been illustrated and described as embodied in particular embodiments of a D.C. collectorless external-rotor motor unit used for direct drive of an information-storage disk, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in anyway from the scope of the present invention as defined in the following Claims.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications that, from the viewpoint of prior art, fairly constitute essential

characteristics of the generic or specific aspects of this invention.

We have disclosed and claimed in our co-pending Patent Application No. 8320254 (Publication No. 2127231) a drive arrangement for signal-processing devices, especially storage-disk devices, of the type including a motor whose rotor is used for direct drive,

the arrangement comprising:

a collectorless D.C. motor comprising an internal stator and an external permanent-magnet rotor,

the stator comprising a carrier structure accommodating at least one roller bearing unit, the carrier structure being provided with a mounting portion for mounting the motor as a whole,

the stator further comprising a packet of stator plates radially outwards of the carrier structure,

a rotor shaft journalled within the roller bearing unit accommodated in the carrier structure, and

an electrically conductive element mounted on the carrier structure in electrically conductive engagement with the latter, the electrically conductive element bearing against the rotor shaft.

We have also disclosed and claimed in our co-pending Patent Application No. 8601006 (Publication

No. 2169149), a drive arrangement for signal-process devices, especially storage-disk devices, of the type including a motor whose rotor is used for direct-drive, the arrangement comprising

a collectorless D.C. motor including an internal stator and an external permanent-magnet rotor,

the stator comprising a carrier structure accommodating at least one roller bearing unit, the carrier structure being provided with a mounting portion for mounting the motor as a whole,

the rotor including a rotor shaft journalled within the roller bearing unit accommodated in the carrier structure,

the rotor comprising a rotor magnet arrangement which is of predetermined axial length and has a general inner periphery,

the stator furthermore comprising a packet of stator plates radially outwards of the carrier structure, the stator plate packet having two opposite axial end faces,

the stator plate packet having cut-outs forming salient poles and being provided with a stator winding,

the axial length of the stator plate packet being substantially smaller than the axial length of the rotor magnet arrangement,

the stator plate packet being provided at at least one of its axial end faces with at least one flux-conducting element having an overall peripheral outline which as viewed axially of the rotor is substantially the same as the peripheral outline of the stator plate packet,

the flux-conducting element having a peripheral skirt portion which extends generally parallel to the general inner periphery of the rotor magnet arrangement and is of substantially constant axial length along at least part of its circumferential extent,

the skirt portion forming with the rotor magnet arrangement a useful air gap which is a continuation of the air gap formed between the outer periphery of the stator plate packet and the inner periphery of the rotor magnet arrangement.

CLAIMS

1. An information-storage disk drive assembly comprising an exchangeable information-storage disk and a motor whose rotor directly drives said disk, wherein the motor is a collectorless D.C. motor comprising an internal stator and an external permanent-magnet rotor, the rotor shaft has an end which projects axially from the motor and the rotor includes a carrier member connected to said rotor shaft, said carrier member having a support ridge of ferromagnetic material through which the flux of a flat permanently magnetic holding magnet passes to support and hold the information-storage disk in place against said support ridge, the face of the flat holding magnet which faces towards the information-storage disk being axially recessed relative to the support ridge by a predetermined distance.

2. A drive assembly as defined in Claim 1, the carrier member being shaped to form a rotor housing for the rotor.

3. A drive assembly as defined in Claim 1, the rotor including a rotor housing having a larger-diameter portion surrounding the rotor magnet arrangement and at the end of the rotor housing remote from the carrier member a smaller-diameter portion which accommodates at least one roller bearing unit.

4. A drive assembly as defined in Claim 1, the support ridge having an inclined flank portion.

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5. A drive assembly as defined in Claim 1, the support ridge having a flank portion which evidences having undergone material removal by lathe turning such as to reduce the breadth of the support ridge.

6. A drive assembly as claimed in any one of the preceding claims wherein:

the stator comprises a carrier structure accommodating at least one roller bearing unit, the carrier structure being provided with a mounting portion for mounting the motor as a whole;

the stator furthermore comprises a packet of stator plates radially outwards of the carrier structure;

the rotor includes a rotor shaft journalled within the roller bearing unit accommodated in the carrier structure and comprising a rotor housing; and

an electromagnetic braking arrangement is located in the interior of the rotor housing and supported on the carrier structure.

7. A drive assembly as defined in Claim 6, the rotor housing having an exterior side and an interior side, the electromagnetic braking arrangement being operative

for braking the rotor by engaging the interior side of the rotor housing.

8. A drive assembly as defined in Claim 7, the rotor housing having a radially extending wall portion, the electromagnetic braking arrangement being mounted to brake the rotor by engaging the interior side of the rotor housing at the radially extending wall portion thereof.

9. A drive assembly as defined in Claim 6, the electromagnetic braking arrangement comprising a stator part which includes an energizing coil, the stator part inclusive of the energizing coil being mounted on the carrier structure.

10. A drive assembly as defined in Claim 8, the electromagnetic braking arrangement furthermore including an armature part, the carrier structure and the armature part of the electromagnetic braking arrangement having interengaging portions which secure the armature part against rotation when the rotor housing rotates.

11. A drive assembly as defined in Claim 10, the interengaging portions comprising a portion of the carrier structure provided with an axially extending recess and a portion on the armature part which extends into the recess.

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12. A drive assembly as defined in Claim 7, the interior side of the rotor housing being provided with a friction layer which is engaged by the electromagnetic braking arrangement when the latter is operative.

13. A drive assembly as defined in Claim 6, the permanent-magnet rotor including a rotor magnet arrangement which extends into the vicinity of the electromagnetic braking arrangement, and further including a magnetic-field-responsive sensing element mounted on the braking arrangement for sensing the rotor magnet arrangement.

14. A drive assembly as defined in Claim 13, the electromagnetic braking arrangement including an element having a portion which extends towards the rotor magnet arrangement, the sensing element comprising a sensing coil arranged on said portion.

15. A drive assembly as defined in Claim 1 and substantially as shown in the accompanying Figures and described herein.

16. A drive assembly as defined in Claim 6 and substantially as shown in Figure 10 and described herein.

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