SPECIFICATION

Electrical machine

The present invention concerns electrical machines, and especially drive motors for signal-processing equipment mainly adapted for slow-operation, such as tape recorders and the like.

Drive motors of the type in question are disclosed in U.S. Patent 3,845,339 and in U.K. Patent application No. 30396/76. In addition to requirements concerning simple construction and axial compactness, when such motors are rpm-regulated there arises a further problem, involving the need to suppress the effect upon the motor's rpm-regulating circuit of external interference coming from outside the motor, e.g. coming from electronic components of the apparatus driven by the motor, coming from closely located transformers, and so forth. In order to generate the actual-rpm signal needed for negative-feedback regulation of rpm, use is conventionally made of a tachometer generator. The shielding required for the latter, in order to shield it from the interference emanating from neighbouring components and from the drive motor itself, generally requires a considerable amount of expense.

If the machine has rotating windings connected to slip rings or commutators on which ride stationary brushes, then it is known to mount round or polygonal brushes slidably in stationary brush holders which surround the brushes like a sleeve. The brushes can also be connected to swingably arranged brush holders. In either case, the brushes bear resiliently upon the travelling surface of the slip ring or commutator. Common to these known constructions is the considerable expense needed for production and mounting of the brush holders, which can significantly add to the total cost of the motor, especially when small and miniature motors are involved.

For machines used to drive phonographs, tape recorders, and the like, and especially where the machine is used for direct-drive, i.e. where the rotor shaft directly drives the turntable or in itself constitutes the capstan, there is frequently encountered the problem of electrostatic charge as between the motor housing and the rotor shaft. To deal with such electrostatic charging, it is usual to insulate the rotor shaft from the housing by means of an oil film.

According to a first aspect of the present invention, there is provided an electrical drive motor for signal-processing equipment comprising a stator and a rotor constituting said drive motor and an rpm-signal generating means arranged coaxially therewith within a common, generally cylindrical housing having a wall made of soft magnetic material and serving as part of the magnetic circuit of the drive motor, said stator and rotor forming between them a cylindrical radial air gap, the rpm-signal generating means including a rotor disc of soft magnetic material supported for rotation with said motor rotor and formed with a plurality of teeth on its circumference, a stationary ring of permanent magnetic material surrounding the periphery of said rotor disc and defining a number of circumferentially arranged permanent magnetic pole pairs corresponding to the number of teeth of said rotor disc, and a stationary annular inductive coil arranged in a plane perpendicular to the axis of rotation of said rotor, the rpm-signal generating means being located in said housing at one axial end thereof adjacent said wall of the housing, whereby said wall shields the rpm-signal generating means at least from electromagnetic interference originating from the exterior of the housing.

Preferably, said wall is the end wall of a generally cylindrical housing and carries a significant part of the useful magnetic flux of the drive motor, said rpm-signal generating means being of very short axial length and being of only slightly smaller radius than said end wall.

In a preferred embodiment of the invention, the housing of the motor has an, at least approximately, rectangular configuration when viewed in longitudinal cross-section, the coaxial rpm-signal generating means is of very short length measured in the axial direction, and has a radius only a little smaller than that of the motor housing. The rpm-signal generating means is arranged at one axial end of the motor housing, interiorly of the motor housing, and is located just inward of a wall which is magnetically conducting and which carries at least a part of the useful magnetic flux of the motor.

The structural integration of the motor proper and its rpm-signal generating means according to the invention makes for a drive which is particularly compact in the axial direction and relatively inexpensively produced and assembled. The aforementioned wall of the motor housing, which carries at least part of the useful motor flux, is necessarily relatively thick. Because the rpm-signal generating means is located interiorly of this wall, which is anyway a necessary structural component of the motor, the wall additionally serves to provide effective shielding of the rpm-signal generating means.

If the drive motor is a commutator motor, then preferably the brush structure is arranged on one axial side of the motor winding, with the rpm-signal generating means located on the opposite axial side of the motor winding. A particularly simple and compact structure may be achieved by forming within the brushes themselves at least one guide element for longitudinal guidance of the brushes, thereby making possible a brush holder structure which is of simple construction, easy to produce and easy to install.

The rpm-signal generating means is preferably located very closely axially adjacent to the motor winding, between the latter and the axial end plate of the motor housing. Advantageously, the rpm-signal generating means is designed as disclosed in U.K. patent application No. 303973/76 referred to above and to which reference may be had for details.

To minimise the effect upon the rpm-signal generating means of interference emanating from

the motor itself, the rpm-signal generating means has the form of a tachometer generator including an induction coil oriented perpendicular to the motor shaft, and the magnetic flux of the motor being preferably conducted, in the region of such induction coil, in a direction parallel to the longitudinal axis of the induction coil.

To prevent the development of electrostatic charge between the motor housing and motor shaft, there can be provided at least one electrical contact element which presses resiliently against the rotor shaft and is conductively connected with the motor housing.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be better understood from the following description of specific embodiments when read in connection with the accompany drawings.

Figure 1 is a longitudinal section through a first embodiment of a drive motor according to the invention;

Figure 2 is an axial view of the brush arrangement of the drive motor of Figure 1, the brush arrangement being located at the base of the cup-shaped part of the motor housing;

Figure 3 is a section taken along line III-III of Figure 2;

Figure 4 is a longitudinal section through a second form of drive motor according to the invention;

Figure 5 is an axial view of the brush arrangement of the motor of Figure 4;

Figure 6 is a section taken along line VI-VI of Figure 5;

Figure 7 is an axial section through the flat axial end plate of the housing of a drive motor similar to that shown in Figure 4, provided with a tachometer generator riveted on to the end plate;

Figure 8 is a cross-section through a brush of the type provided in Figures 2, 3, 5 and 6 on an enlarged scale;

Figure 9 and 10 are views similar to Figure 8 of other brush configurations;

Figures 11-13 are cross-sections corresponding to Figures 8-10 through brushes provided with internal guide means;

Figure 14 is an axial view of a further modified brush arrangement;

Figure 15 is an axial section through the rotor shaft bearing flange used in Figure 7;

Figure 16 depicts the end-support plate used in Figure 7 for bearing the axial end of the rotor shaft; and

Figure 17 is an axial view of the bearing flange shown in Figure 15.

The drive motor depicted in Figures 1-3 comprises a stack of rotor laminations 1, a rotor winding 23, and permanent-magnet stator magnets 4. The drive motor is a slip ring motor, with a cylindrical (radial) air gap. The motor and its associated tachometer generator are housed in a motor housing which comprises a deep-drawn cup-shaped housing part 2 of soft magnetic material, the open end which is closed off by an axial end plate 3, likewise made of soft magnetic material. The stack of rotor laminations 1 and the rotor winding 23 are mounted on a shaft 15 which is journalled in flanged journals 19, 33 of which one is mounted in end plate 3 and the other in the base of the cup-shaped housing part 2.

The tachometer generator comprises a thin ferromagnetic rotor disc 6 which is provided with a circumferential series of teeth. The rotor disc 6 is rigidly connected to shaft 15, through the intermediary of a peferably non-ferromagnetic carrier member 7. Connected to the rotor disc 6 in an annular soft iron member 8 having an axial length several times that of the rotor disc 6. At the region 9 of the cup-shaped part 2, the inner periphery of housing part 2 is machined out to have a larger internal diameter. Extending into region 9 is the radially outermost part of a cap-shaped soft-iron drawn member 12. In the region of the open end of cap-shaped member 12, i.e. the end which faces towards motor winding 23, the inner periphery of member 12 is lined with a magnetic strip 11. Magnetic strip 11 comprises 200 pairs of oppositely polarized magnetised sectors, i.e. 200 pole pairs, the magnetic polarity of the successive magnetised sectors alternating as one proceeds along the length of strip 11, i.e. proceeding circumferentialy of the motor. The number of teeth on rotor disc 6 corresponds to the number of pole pairs of magnetic strip 11. Arranged at the bottom of drawn soft-iron member 12 is an annular coil 22, from which shielded connecting conductors *b* extend out to the exterior of the motor. The drawn soft-iron member 12 is connected to the axial end ple 3 of the housing via thermoplastic spacing members 14. Spacing members 14 have heads 13 which extend through openings in plate 3 and member 12 and terminate in flanges extending radially outward beyond the rims of such openings, for secure mounting.

In Figures 1 and 3, the rotor shaft 15 is vertical and is supported on an end-support plate 16, the latter being held in a carrier 17 riveted to the motor-housing end plate 3. The rotary part 6,7,8 of the tachometer generator is held in place axially on rotor shaft 15, between an end disc 21 of the rotor winding and a disc 20 which is a push fit on the rotor shaft.

The commutator 30 of the motor cooperates with a brush arrangement 40 provided in a space 10 on the side of the rotor 1, 23 facing away from the tachometer generator. The anti-interference condensers associated with the commutator are shown at 31.

As shown in detail in Figures 2, 3 and 8, the brush arrangement 40 comprises brushes 41, 42, which are held in the cut-outs 27 of U-shaped guide members 43 and guided thereon by means of lateral grooves 26 which extend in the longitudinal direction of brushes and engage over the edges of the cut-outs in the guide members. The guide members 43 an advantageously be stamped sheet-metal components, made for example of brass. The dimensions of the cut-outs 27 and the thickness of the guide members 43 are so matched relative to the rectangular grooves 26 of the brushes 41, 42, that the brushes

are moveable towards the commutator 30 with very little axial and radial play.

The guide members 43 are in turn held by an annular brush carrier 46. Brush carrier 46 comprises shaped elements 45, each of which engages a respective guide member 43 on both sides. The brush carrier 46 is preferably a vibration-damping synthetic plastic member. Secured on the brush carrier 46 are two groups 47, 48 of three pins each. In each group of three pins 47, 48, one end of a respective torsion spring 57 or 58 is braced against a selected one of the three pins. The middle part of each torsion spring is slung around a respective pin 59 or 60 secured to the brush carrier 46. The other end of each torsion spring bears against the radially outermost end face of a respective one of the brushes 41, 42, as a result of which the brushes are spring biased in the direction towards commutator 30 with an adjustable amount of spring force. The base part 51 of the brush carrier 46 is connected with the base of the cup-shaped housing part 2 by means of pins 53 which project upwards past the brush carrier. The pins 53 are heated and then peened over to secure brush carrier 46 to cup-shaped housing part 2. An oil-flinging disc 5 is secured to shaft 15 above the commutator 30, to prevent oil from reaching it when oil is applied to lubricate the bearing 33.

The supply of current to the brushes 41, 42 is implemented via connecting cables 55, 56 which latter are held free from tension in a thermoplastically formed projection 49 of the brush carrier 46, and additionally via contact strips 28 extending out from the brushes. The cables 55, 56 and the contact strips 28 are conductively connected to one another via connecting lugs 25.

The tachometer generator is effectively shielded by motor housing 2,3 against electromagnetic interference. Because the brush arrangement 40 is located at the side of the motor opposite the tachometer generator, and because the magnetic flux of the motor in the region of the induction coil 22 of the tachometer generator extends parallel to the axis of coil 22, the effect of electromagnetic interference emanating from the motor proper is kept minimal. Contributing to this shielding effect is the fact that carrier member 7 is made of non-ferromagnetic material. The structure as a whole has only a short axial length. Structural complexity, and accordingly cost, are kept quite low.

The embodiment depicted in Figures 4-6 is even more compact axially. Contributing to this is the fact that the stationary flux guide member 78 of the tachometer generator is located immediately adjacent to the motor housing and plate 3 and is riveted thereto. The toothed rotor disc 79 of the tachometer generator is connected to a soft ferromagnetic member 76 whose circumferential surface, together with the radially inward leg of the U-shaped flux guide member 78 as seen in cross-section, bounds a cylindrical air gap 77 which is coaxial with the motor axis.

An annular spring 73 is seated in an annular recess 72 of the rotor shaft 15. The soft magnetic member 76 is provided with an axial recess 75. Recess 75 accommodates a spring washer 71, which is braced against the spring 73 and against the bottom of the axial recess 75. As a result, the spring washer 71 holds the rotating part 76, 79 of the tachometer generator supported against the end plate 21 and the motor winding 23.

In other respects, the construction and operation of the tachometer generator correspond to those of the embodiment depicted in Figures 1-3.

The brush arrangement 80 at the other axial end of the motor winding likewise for the most part resembles the brush arrangement 40 of the first embodiment. The guide members 43 and the springs 57, 58 are held by thin stamped-out sheet-metal members 95 which are pushed onto pins 96 of the brush carrier 46 as well as onto pins 59, 60. In the region of the pins 96, the stamped-out sheet-metal members 95 are provided with openings 97 having a diameter somewhat smaller than the diameter of the pins. A plurality of slits 98 extend radially out from each of these openings 97. When the stamped-out sheet-metal members 95 are pushed into place, the slits 98 allow the openings 97 to open up to the diameter of the pins 96, as a result of which the members 95 are fixedly clamped on the pins 96. The connecting cables are fed out through a labyrinth guide structure 91, 92, 93 provided on the brush carrier 46, for tension-relief, from the exterior of the motor cannot be communicated to the interior of the motor.

In order to decrease the axial length of the construction still further, the anti-interference condensors 31 are inserted into recesses in the stack of rotor plates from the upper axial end of the stack 1, as viewed in Figure 4. They have diameters slightly larger than the width of these recesses or grooves in order to secure them in position. The first terminal conductors of these anti-interference condensers are conductively connected to respective projections 61 of the commutator segments, whereas the respective second terminal conductors (non-illustrated) of these condensors are conductively connected to an electrically conductive ring 63, which latter is inserted into the upper end plate 24 of the rotor.

If desired the guide members 43 can also be made of insulating material, for example plastics-impregnated fabric; or they can constitute the circuit boards or support members for printed circuitry which, if desired, can include anti-interference components or other circuit elements.

Other forms of brush guide structures are possible, such as round, polygonal, pin or bolt-shaped, which engage into or on the guide elements of the brushes or have the form of springy bent-wire members. For example, Figure 9 depicts a brush cross-section in which the guide elements of the brush have the form of two longitudinal ribs 29, whereas in Figure 10 the guide elements of the brush have the form of two longitudinally extending recesses 32 located on opposite sides of the brush. In the latter case, the brush can for example be engaged on its top face by a leaf-spring type element so as to be pressed thereby against a stationary guide structure complementary to the recesses 32, to give the requisite sliding guidance of the brush.

If the currents flowing through the brushes are

only relatively small and the surface area of the brushes across which such current flows is relatively large, i.e. if the area of surface contact between such brushes and the electrically conductive guide members and/or electrically conductive leaf-spring type members is relatively large, then one can dispense with the contact strips 28.

With smaller electric machines, the lifetime of the brushes is matched to the expected lifetime of the machine. However, if brush replacement is to be made possible, then the guide members 43 are advantageously designed of two-part construction, so that the brushes may be inserted from the side thereof facing away from the commutator 30.

The use of polyamide for the brush carrier 46 reduces the generation of noise, due to its good vibration-damping properties. Alternatively, or in addition thereto, a vibration-damping assembly may be provided for the guide structures for the brushes e.g. by appropriately shaping the elements 45 and/or the holding parts 95.

Whereas in Figures 8-10 the guide elements (recesses or projections) of the brushes are provided on the exterior of the brushes, in Figures 11-13, the brushes are provided with interior guide elements 34, 35, 36 in the form of blind or throughgoing bores extending in the direction in which the brushes are to be slidable. In each of these cases, these interior guide elements are advantageously formed at the time the material for the brush is being moulded into shape. In the embodiments shown in Figures 12 and 13, the guide elements have the form of a rectangular opening or of two parallel openings, and additionally serve to ensure that the surface of the brush contacting the commutator is prevented from turning. As a result, the means mounting the brushes in place can be kept especially simple.

According to another concept of the invention the discrete guide members such as 43 in figures 2 and 5 can be dispensed with, and instead the brush carrier can itself be a one-piece member of insulating material of a shape complementary to the form of the guide elements (recesses, projections and/or internal bores) of the brushes, so as to itself serve to establish the requisite sliding guidance for the brushes. Such an embodiment is depicted in figure 14. Here, the brush carrier 103 is designed as a carrier for printed circuitry. The circuit components on brush carrier 103 are not shown, except for the conductive paths 104, 105 which connect the connecting cables 106, 107 to the brushes 108, 109 via contact strips 120. 121. The two brushes shown in Figure 14 are differently held and guided. Brush 108 corresponds to the brush shown in Figure 8. Its guide elements 26 slide along the edges 110, 111 of a stamped cut-out in the brush carrier, in which extends a spring mounting element 112. Mounted on the latter is a helical compression spring 113 which presses the brush 108 towards the commutator. The brush 109 corresponds to that shown in Figure 12 and has an interior rectangular guide element 35, into which a brush guide projection 114 extends, the latter additionally serving as a mounting for a helical compression spring 115. The edges 116, 177 of the stamped cut-out smoothly adjoin the side faces of the brush 109 and thereby advantageously contribute to the guidance of the brush 109.

In the embodiments shown in Figures 1 and 4 the annular coil 22, preferably made of baked lacquer wire, is provided in direct contact with the bottom of the flux guide structure 12 or 78, preferably cemented to the latter. In contrast, in the embodiment of Figure 7, the annular coil 22 is supported on a coil former 64 which, in turn, is connected to the flux guide member 78. The coil former 64 structurally stabilises the coil 22 and facilitates its installation during assembly.

In the structure of Figure 7, and as most clearly shown in Figures 15-17, the axial end support 65, made of electrically conductive material, has a central projecting portion 66 into which is inserted an electrically conductive spring disc 67. The thin spring disc is conductively connected to the axial end support 65 by a weld indicated at 68. The spring disc 67 is of mirror-symmetrical configuration and comprises two upwardly bent contact arms 69. Inserted into recess 66 of axial end support 65, above the spring disc 67, is a plate-shaped axial end bearing member 70. The longer dimension of member 70 matches the inner diameter of the projecting portion 66, whereas the sides of the axial end bearing member 70 are flattened off as indicated at 81, to permit the contact arms 69 to extend upwards through the spaces between the flattened-off sides 81 and the inner wall of the axial end support member 65. The axial end bearing member 70 is preferably made of low friction synthetic plastics. It forms an axial bearing for the shaft 15 whose convex axial end 82 rests upon the axial end bearing member 70 (Figure 4). The contact arms 69 press against the convex end face 82 of rotor shaft 15 at locations near the axis of rotation of the latter. Accordingly, the rotor shaft 15 and the motor housing 2,3 are conductively connected to each other, via the axial end support member 65, the electrically conductive rivets 83 and the motor housing end plate 3. This effective prevents the build-up of electrostatic fields as between the motor shaft 15 and the motor housing 2,3. Even if the lubricating oil in the region of the bearings 19, 33 establishes electrical insulation as between the shaft 15 and the motor housing 2,3, this oil film is penetrated by the thin contact arms 69. Built up electrostatic charge is accordingly conducted away and dissipated. Because the contact arms 69 engage the shaft at locations near to the axis of rotation thereof, the braking moment exerted upon shaft 15 by the contact arms 69 is negligibly small. The wear experienced by the contact arms 69 is minimal.

Instead of the spring disc 67 with its contact arms 69, use can be made for example of a thin wire welded to the axial end support member 65. The spring disc 67, however, makes for easier assembly. Because two contact arms 69 are provided, conductive connection between the motor shaft and motor housing is assured, even if one of the contact arms loses contact with the motor shaft, e.g. due to faulty assembly or during installation of the drive motor. It will be understood that, alternatively, the motor

housing end plate 3 and the axial end support member 65 can be portions of a single piece of material. The convex end face 82 of the motor shaft 15 could instead be made concave and a ball bearing or the like inserted therein.

The drive motors described above can for example be designed as five-strand commutator motors for upright installation, in order for example to directly drive a phonograph turntable. If the motor is to be used to drive a tape machine, the motor shaft 15 can itself constitute the capstan of the tape machine.

It will be understood that the features described above, separately or in combination may also find application in constructions differing from the types described above.

While the invention has been illustrated and described as embodied in drive motors of particular type provided with rpm-signal generating means of particular type it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the scope of the present invention, as claimed in the following claims.

CLAIMS

1. An electrical drive motor for signal-processing equipment comprising a stator and a rotor constituting said drive motor and an rpm-signal generating means arranged coaxially therewith within a common, generally cylindrical housing having a wall made of soft magnetic material and serving as part of the magnetic circuit of the drive motor, said stator and rotor forming between them a cylindrical radial air gap, the rpm-signal generating means including a rotor disc of soft magnetic material supported for rotation with said motor rotor and formed with a plurality of teeth on its circumference, a stationary ring of permanent magnetic material surrounding the periphery of said rotor disc and defining a number of circumferentially arranged permanent magnetic pole pairs corresponding to the number of teeth of said rotor disc, and a stationary annular inductive coil arranged in a plane perpendicular to the axis of rotation of said rotor, the rpm-signal generating means being located in said housing at one axial end thereof adjacent said wall of the housing, whereby said wall shields the rpm-signal generating means at least from electromagnetic interference originating from the exterior of the housing.

2. A drive motor as claimed in Claim 1 wherein said housing is stationary.

3. A drive motor as claimed in Claim 1 or Claim 2 wherein said housing is of generally rectangular longitudinal cross-sectional configuration.

4. A drive motor as claimed in any one of Claims 1 to 3 wherein the said rotor disc has a diameter slightly smaller than the diameter of said housing.

5. A drive motor as claimed in any one of Claims 1 to 4 wherein said annular inductive coil has generally the same diameter as said rotor disc.

6. A drive motor as claimed in any one of Claims 1 to 5 wherein a ring-shaped first magnetic flux-conducting member is positioned axially adjacent said rotor disc.

7. A drive motor as claimed in Claim 6 wherein said first magnetic flux-conducting member is connected to said rotor disc for common rotation therewith.

8. A drive motor as claimed in Claim 6 or Claim 7 wherein said first magnetic flux-conducting member has an axial length several times that of said rotor disc.

9. A drive motor as claimed in any one of Claims 1 to 8 wherein said rpm-signal generating means comprises a magnetic flux conducting member (hereinafter referred to as a second magnetic flux-conducting member) comprising an axially extending cylindrical wall and a radially extending circular base, the axial length of the former being a multiple of the axial thickness of the latter.

10. A drive motor as claimed in Claim 6 being a drive motor as claimed in Claim 9, wherein said second magnetic flux-conducting member is cup-shaped and extends around the periphery of said first magnetic flux-conducting member to form a cylindrical air gap between said first and second flux-conducting members.

11. A drive motor as claimed in Claim 9 or Claim 10 wherein said second flux-conducting member carries said stationary ring of permanent magnetic material and said inductive coil.

12. A drive motor as claimed in any one of Claims 1 to 11 the motor being a commutator motor having a wound rotor, and comprising a brush arrangement, the brush arrangement and the rpm-signal generating means being located on axially opposite sides of the wound rotor of the motor.

13. A drive motor as claimed in any one of Claims 1 to 12, in which said housing comprises a deep-drawn cup-shaped housing part having a base and an open end and an axial end plate closing the axial end of the cup-shaped housing part.

14. A drive motor as claimed in Claim 13 comprising permanent magnet stator magnets secured to the interior of the cup-shaped housing part.

15. A drive motor as claimed in Claim 13 or Claim 14 having a wound rotor, wherein the rpm-signal generating means is located intermediate the latter and the axial end plate.

16. A drive motor as claimed in any one of Claims 1 to 15 wherein the number of teeth of said rotor disc and the number of magnetic pole pairs of said stationary ring of permanent magnetic material is such as to produce pulses of the order of one hundred or more per rotation of the rotor.

17. A drive motor as claimed in any one of Claims 1 to 16 the rotor comprising a stack of rotor laminations said stack having recesses, and anti-interference circuit components accommodated within said recesses.

18. A drive motor as claimed in any one of the preceding Claims, wherein the rpm-signal generating means has a very short axial length and a radius only slightly smaller than the radius of the motor housing.

19. A drive motor substantially as hereinbefore

housing end plate 3 and the axial end support member 65 can be portions of a single piece of material. The convex end face 82 of the motor shaft 15 could instead be made concave and a ball bearing or the like inserted therein.

The drive motors described above can for example be designed as five-strand commutator motors for upright installation, in order for example to directly drive a phonograph turntable. If the motor is to be used to drive a tape machine, the motor shaft 15 can itself constitute the capstan of the tape machine.

It will be understood that the features described above, separately or in combination may also find application in constructions differing from the types described above.

While the invention has been illustrated and described as embodied in drive motors of particular type provided with rpm-signal generating means of particular type it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the scope of the present invention, as claimed in the following claims.

CLAIMS

1. An electrical drive motor for signal-processing equipment comprising a stator and a rotor constituting said drive motor and an rpm-signal generating means arranged coaxially therewith within a common, generally cylindrical housing having a wall made of soft magnetic material and serving as part of the magnetic circuit of the drive motor, said stator and rotor forming between them a cylindrical radial air gap, the rpm-signal generating means including a rotor disc of soft magnetic material supported for rotation with said motor rotor and formed with a plurality of teeth on its circumference, a stationary ring of permanent magnetic material surrounding the periphery of said rotor disc and defining a number of circumferentially arranged permanent magnetic pole pairs corresponding to the number of teeth of said rotor disc, and a stationary annular inductive coil arranged in a plane perpendicular to the axis of rotation of said rotor, the rpm-signal generating means being located in said housing at one axial end thereof adjacent said wall of the housing, whereby said wall shields the rpm-signal generating means at least from electromagnetic interference originating from the exterior of the housing.

2. A drive motor as claimed in Claim 1 wherein said housing is stationary.

3. A drive motor as claimed in Claim 1 or Claim 2 wherein said housing is of generally rectangular longitudinal cross-sectional configuration.

4. A drive motor as claimed in any one of Claims 1 to 3 wherein the said rotor disc has a diameter slightly smaller than the diameter of said housing.

5. A drive motor as claimed in any one of Claims 1 to 4 wherein said annular inductive coil has generally the same diameter as said rotor disc.

6. A drive motor as claimed in any one of Claims 1 to 5 wherein a ring-shaped first magnetic flux-conducting member is positioned axially adjacent said rotor disc.

7. A drive motor as claimed in Claim 6 wherein said first magnetic flux-conducting member is connected to said rotor disc for common rotation therewith.

8. A drive motor as claimed in Claim 6 or Claim 7 wherein said first magnetic flux-conducting member has an axial length several times that of said rotor disc.

9. A drive motor as claimed in any one of Claims 1 to 8 wherein said rpm-signal generating means comprises a magnetic flux conducting member (hereinafter referred to as a second magnetic flux-conducting member) comprising an axially extending cylindrical wall and a radially extending circular base, the axial length of the former being a multiple of the axial thickness of the latter.

10. A drive motor as claimed in Claim 6 being a drive motor as claimed in Claim 9, wherein said second magnetic flux-conducting member is cup-shaped and extends around the periphery of said first magnetic flux-conducting member to form a cylindrical air gap between said first and second flux-conducting members.

11. A drive motor as claimed in Claim 9 or Claim 10 wherein said second flux-conducting member carries said stationary ring of permanent magnetic material and said inductive coil.

12. A drive motor as claimed in any one of Claims 1 to 11 the motor being a commutator motor having a wound rotor, and comprising a brush arrangement, the brush arrangement and the rpm-signal generating means being located on axially opposite sides of the wound rotor of the motor.

13. A drive motor as claimed in any one of Claims 1 to 12, in which said housing comprises a deep-drawn cup-shaped housing part having a base and an open end and an axial end plate closing the axial end of the cup-shaped housing part.

14. A drive motor as claimed in Claim 13 comprising permanent magnet stator magnets secured to the interior of the cup-shaped housing part.

15. A drive motor as claimed in Claim 13 or Claim 14 having a wound rotor, wherein the rpm-signal generating means is located intermediate the latter and the axial end plate.

16. A drive motor as claimed in any one of Claims 1 to 15 wherein the number of teeth of said rotor disc and the number of magnetic pole pairs of said stationary ring of permanent magnetic material is such as to produce pulses of the order of one hundred or more per rotation of the rotor.

17. A drive motor as claimed in any one of Claims 1 to 16 the rotor comprising a stack of rotor laminations said stack having recesses, and anti-interference circuit components accommodated within said recesses.

18. A drive motor as claimed in any one of the preceding Claims, wherein the rpm-signal generating means has a very short axial length and a radius only slightly smaller than the radius of the motor housing.

19. A drive motor substantially as hereinbefore

described with reference to, and as illustrated by Figures 1, 2 and 3, 4 to 7 and 15 to 17 together with any of Figures 8 to 14 of the accompanying drawings.

Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon, Surrey, 1983.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

