

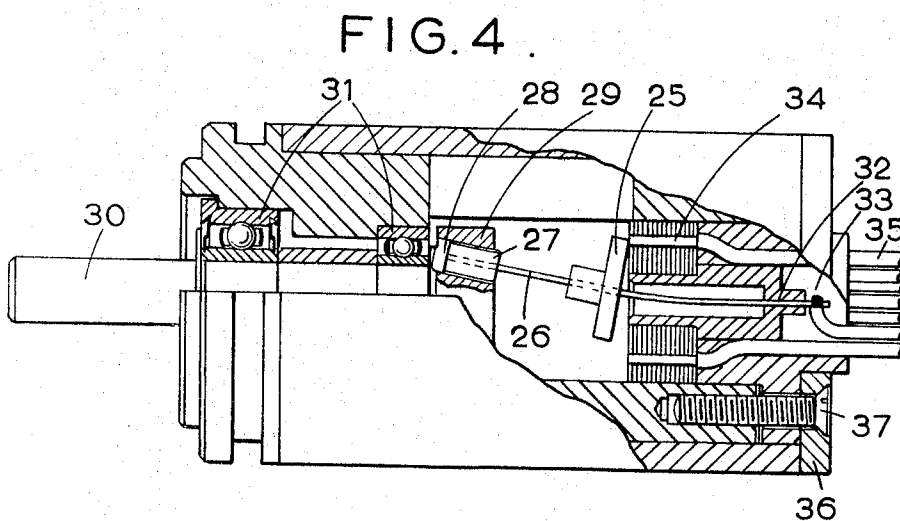
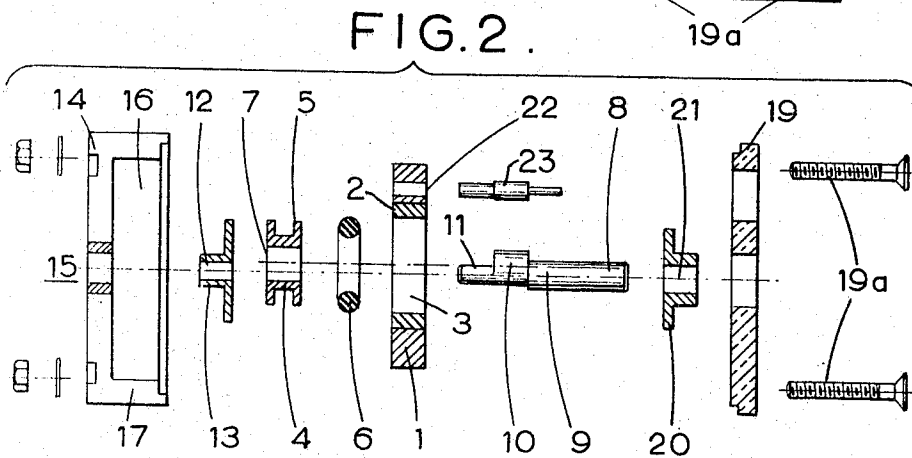
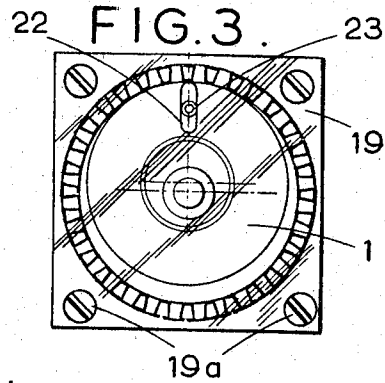
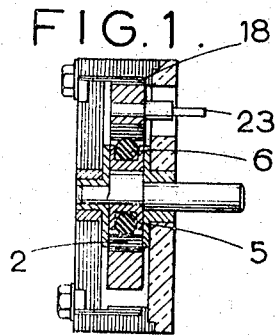
March 7, 1967

D. L. SPENCER

3,308,320

COMMUTATORS

Filed Feb. 28, 1964



INVENTOR

DENNIS LINCOLN SPENCER

BY

Stevens, Davis, Miller & Mosher

ATTORNEYS

1

2

3,308,320

COMMUTATORS

Dennis Lincoln Spencer, Earley, Reading, England, assignor to I.D.M. Electronics Ltd., Berkshire, England, a British company

Filed Feb. 28, 1964, Ser. No. 348,139

Claims priority, application Great Britain, Mar. 22, 1963, 11,510/63

9 Claims. (Cl. 310—219)

This invention relates to electrical commutators and particularly to an epicyclic rotary switching device wherein a rotary contact member arranged to be driven by any suitable means is caused sequentially to traverse a ring of stationary contacts forming a segmented commutator member.

Where the rotary contact member is arranged concentric with the ring of contact segments, it has been found that a wiping action occurs between the periphery of the rotary contact and the segments of the commutator; the wiping speed being determined by the speed of revolution of a driven shaft on which the rotary contact member is mounted and the diameter of the commutator.

An object of the present invention is to provide a rotary commutator switching device wherein the wiping speed is reduced to any required ratio of the speed of revolution of the driven shaft on which the rotary contact member is mounted.

It has been found that this object can be achieved by providing an eccentrically mounted rotary contact member whose rotation about its own axis is constrained, the relative dimensions of the circumferences of the rotary and stationary contact members being such as to reduce the wiping speed to a predetermined ratio of the speed of revolution of the shaft of the rotary contact member.

Thus, according to the present invention, there is provided an electrical commutator device comprising a stationary member formed with a plurality of spaced commutator segments and an eccentrically mounted rotary contact member biased into contact with and arranged to wipe over the commutator segments, means for constraining the rotation of the rotary contact member about its own axis and the relative dimensions of the circumferences of the rotary and stationary members being such as to reduce the wiping speed to a predetermined ratio of the speed of revolution of the shaft of the rotary contact member.

The constructional features of a preferred embodiment of an epicyclic rotary switching device according to the invention will now be described by way of example only with particular reference to the accompanying drawing wherein:

FIGURE 1 is a sectional elevation of the epicyclic rotary switching device;

FIGURE 2 is an exploded view of the components of the device;

FIGURE 3 is a plan view of the device according to the invention, and

FIGURE 4 is a sectional elevation of a modified switching device wherein the eccentric rotary contact member comprises a swash plate.

Referring to FIGURES 1, 2 and 3, the rotary contact member comprises an annulus 1 of electrically conductive material e.g. copper formed concentrically with an inner annulus 2 of electrically insulating material, the central aperture 3 of which is arranged to receive a spool-shaped member 4, between the flanges 5 of which is located a resilient ring 6, preferably of rubber and of a thickness such as to project beyond the peripheries of the flanges 5 of the spool 4 for a purpose hereinafter defined.

The spool-shaped member 4 is provided with a central

aperture 7 adapted to receive an eccentric portion of the driven shaft 8 on which the revoluble contact member is mounted, and the spool 4 is formed of any suitable material e.g. Phosphor bronze in order to serve as a bearing member for the shaft 8.

The driven shaft 8 comprises a major portion 9 adapted to be coupled to any suitable driving means such as to rotate the shaft at a predetermined speed e.g. 3000 r.p.m. The shaft also includes a minor portion 10 of reduced length but of larger cross-sectional area than the major portion 9, arranged eccentrically therewith and located intermediate the major portion 9 and a further portion 11 of reduced cross-sectional area arranged concentric with the major portion 9. The eccentric minor portion 10 is arranged to be located within the central aperture 7 in the spool-shaped bearing member 4 and the further shaft portion 11 of reduced cross-sectional area projects from the bearing member 4 and is arranged to be located within a central aperture 12 in a fixed bush 13 preferably of Phosphor bronze, formed in a base plate 14 housing the segmental commutator ring 15.

The base plate 14 is formed of electrically insulating material and is provided with an annular recess 16, the wall 17 of which is provided with a plurality of spaced commutator segments 18, preferably of copper, separated by the electrically insulating material of the base plate 14. The copper segments 18 extend through the insulating base plate 14 and allow current to be drawn off from the commutator.

A cover plate 19 shown in FIGURE 3 as of transparent material, is arranged to be bolted to the top surface of the base plate 14 by means of bolts 19a, and is provided with a central bush 20 preferably of Phosphor bronze, provided with a central aperture 21 through which the major portion 9 of the driven shaft 8 is arranged to project.

To restrain the rotational movement of the revoluble switch member 1 with respect to the commutator segments 18, a radial slot 22 is provided in the annular member 1 through which is arranged to project a terminal peg 23 located at right angles to the plane of the revoluble annular member 1 and parallel to the shaft 8 passing therethrough. The peg 23 is used as an electrical connection to the revoluble annular member 1 and the arrangement is such that when the revoluble annular member 1, base plate 14 and cover plate 19 are assembled with the earthed peg 23 projecting through the slot 22 in the annular member 1, rotation of the shaft 8 causes eccentric movement of the revoluble annular member 1. The resilient member 6 on the spool-shaped bearing member 4 will bias the eccentric revoluble annular member into contact with the segmented member 15. The peg 23, being constrained within the slot 22 in the cover plate 19, will describe a reciprocatory movement therein as the shaft 8 is rotated and prevent the rotational movement of the revoluble annular member, causing the speed that the latter wipes over the stationary segmental contacts 18 of the commutator 15, to be considerably reduced. The relative dimensions of the circumferences of the eccentric revoluble switch member 1 and the segmental commutator member 15 can be arranged to provide any predetermined reduction ratio in wiping speed. Thus if the speed of the shaft is 3000 r.p.m. a ratio of 10:1 will give a wiping speed equivalent to 300 r.p.m.

It will be appreciated that the invention is susceptible of considerable modification and is not to be deemed limited to the particular constructional features described by way of example only. For instance, any means, other than the resilient rubber ring may be used to bias the eccentric disc 1 into contact engagement with the seg-

3

ments 18 of the commutator 15 and the revoluble switch member 1 may be arranged externally of the segmental contacts 18 of the base member 14. Furthermore, it will be appreciated that the invention has extremely wide application wherever rotary commutator switches are required, and has particular application in connection with telemetry equipment.

In the embodiment illustrated in FIGURE 4, the eccentric rotary contact member comprises a swash plate 25 mounted on a cantilever spring 26. The "free" end of the cantilever spring 26 is located within a sleeve 27 fixedly located within a recess 28 formed in a radial extension 29 of the driven shaft 30 and is arranged to rotate with the shaft. The swash plate 25 and spring 26 are driven from shaft 30 via the eccentric bearing member 31 but the cantilever spring 26 and thus the swash plate 25, is constrained from rotation about its own axis by having the opposite end 32 of the spring anchored in the switch housing 33. The swash plate 25 is biased into contact engagement with the commutator segments 34 by means of the cantilever spring 26, the leads from the segments being shown at 35. The switch housing is sealed by means of cover plate 36 secured to the housing by screws 37. In this embodiment also the relative dimensions of the circumferences of the swash plate 25 and the stationary segmental contacts are arranged to provide any required reduction in wiping speed.

I claim:

1. An electrical commutator device comprising a stationary member formed with a plurality of spaced commutator segments and an eccentrically mounted revoluble contact member mounted on a driven shaft and biased into contact with and arranged to wipe over the commutator segments, means for constraining the rotation of the revoluble contact member about its own axis and the relative dimensions of the circumferences of the revoluble and stationary members being such as to reduce the wiping speed to a predetermined ratio of the speed of revolution of the shaft of the revoluble contact member.

2. An electrical commutator device as claimed in claim 1 wherein said revoluble contact member comprises a disc having an outer annulus of electrically conductive material and an inner annulus of electrically insulating material.

3. An electrical commutator device as claimed in claim 2 wherein said disc is provided with a central aperture arranged to receive a bearing member for the driven shaft, said bearing member being provided with resilient means extending beyond the periphery thereof such as to bias the disc into contact engagement with the segments of the stationary member.

4. An electrical commutator device as claimed in claim 3 wherein said driven shaft comprises a major portion

4

arranged to be coupled to driving means such as to rotate the shaft at a predetermined speed, a minor portion of reduced length but of larger cross sectional area than that of the major portion and arranged eccentrically therewith and located intermediate said major portion and a further portion of reduced cross sectional area arranged concentric with said major portion, said minor portion being located within a central aperture in the bearing member and said further portion projecting therefrom and being located in a bearing member formed in the stationary commutator member.

5. An electrical commutator device as claimed in claim 1 wherein said stationary member comprises a base plate formed of electrically insulating material and provided with an annular recess arranged to receive the revoluble contact member, the wall of said recess being provided with a plurality of spaced segments of electrically conducting material separated by the electrically insulating material of the base plate.

6. An electrical commutator device as claimed in claim 5 wherein said means for constraining the rotation of the revoluble contact member comprises said base plate having secured thereto a cover plate provided with a radial slot through which is arranged to project a terminal peg connected at right angles to the plane of the revoluble contact member and arranged parallel to the driven shaft passing therethrough, such that rotation of the shaft causes the peg to describe a reciprocatory motion within the slot to impede rotation of the revoluble contact member and reduce the wiping speed thereof with respect to the segmental contacts of the stationary member.

7. An electrical commutator device as claimed in claim 1 wherein said revoluble contact member comprises a swash plate mounted on a cantilever spring.

8. An electrical commutator device as claimed in claim 7, wherein the cantilever spring is fixed at one end thereof to the driven shaft to effect rotation of the spring and swash plate via an eccentric bearing and the other end of the cantilever spring is fixed to constrain the cantilever spring and revoluble contact member from rotating about their own axes.

9. An electrical commutator device as claimed in claim 7 wherein the swash plate is biased into contact engagement with the commutator segments of the stationary member by means of the cantilever spring.

References Cited by the Examiner

UNITED STATES PATENTS

Re. 22,549	9/1944	Plensler	310—82
2,318,503	5/1943	Leischner	310—219
2,984,757	5/1961	Popworth	310—90

MILTON O. HIRSHFIELD, *Primary Examiner.*

D. F. DUGGAN, *Assistant Examiner.*