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CRASH STOP AND ZERO TRACK INDICATOR FOR DISC RECORDING APPARATUS

This invention relates to a crash stop and zero track indicator for disc recording apparatus to provide for identifying of the initial track (zero track) and for limiting the travel of the heads across the disc to prevent mechanical crashes.

Disc drive apparatus utilize disc recording of information on concentric circular tracks. Tracks are written and read by magnetic heads which cooperate with the surface of the disc. Various methods have been used to position the heads including head screw drives and the band drives. Band drives are shown and described in U.S. Patents 3,881,189, 4,161,004 and 4,170,146 among others. These drives convert rotary motion of a stepper motor to linear motion of the read-write heads which are mounted on a carriage and move radially across the recording disc to form adjacent circular tracks. A new concentric circular track is formed at each step of the stepper motor. The spacing of the tracks is dependent upon the amount of rotation that the motor shaft undergoes with each step and diameter of the pulley upon which the band is wound.

During writing and reading there is a need for identifying the tracks. Generally the tracks are counted and indexed from an initial position. In the art this has been the initial outertrack which is referred to as "track zero".

Thus, the head positioning apparatus must provide a signal representative of this position.

Such apparatus usually includes so called crash stops. These stops provide a mechanical fixed stop which prevents movement of the carriage past its end point which might physically damage the equipment. This is necessary in the event that the electrical controls fail and attempt to drive the carriage past its safe limits.

In the prior art the track zero stop and the forward stop have been independently adjustable. The adjustment of the track zero and crash stops during manufacture of a disc drive has been tedious and time consuming.

It is an object of the present invention to provide a crash stop and zero track indicator for a disc recording apparatus in which the zero position and crash stops are mutually fixed and non-adjustable

According to the present invention there is provided a crash stop and zero track indicator assembly for a recording apparatus of the type including a drive motor having a drive shaft coupled to a linear drive to move magnetic heads of the recording apparatus, the assembly comprising a stationary switch and stop assembly mounted, in use, on the housing of said drive motor; and a moving crash stop and zero track indicator mounted, in use, on said drive shaft for rotation therewith; the moving crash stop and zero track indicator including a pair of stops which are fixed relative to one another and are not independently adjustable and are arranged to strike the stop assembly in both directions of rotation of the shaft to limit the shaft rotation, and thereby said head movement, and to activate said switch to indicate zero track in one direction of rotation.
The foregoing and other objects will be more clearly understood from the following description taken in connection with the accompanying drawing, of which:

Figure 1 is a sectional view taken along the line 1-1 of

Figure 2 showing a carriage drive mechanism embodying the invention.

Figure 2 is a plan view of a carriage drive including drive motor.

Figure 3 is an end view of the motor showing the moving crash stop and zero track indicator and the switch and stop assembly.

Figure 4 is a side elevational view of the crash stop and zero track interrupter.

Figures 1 and 2 show a head actuator assembly employing a crash stop and zero track indicator assembly embodying the invention. The actuator can be used in connection with a conventional disc drive preferably with a disc drive of the type shown and described in U.S. Patent Registration No. 4,323,939, dated April 6, 1982, entitled HARD FIXED DISC DRIVE ASSEMBLY AND READ-WRITE HEAD ACTUATOR and assigned to the same assignee. The actuator is seen to comprise a stepper motor 11 having a drive shaft 12, a hollow pulley 13 is carried at one end of the drive shaft 12 and is adapted to receive a drive band 14. The band includes an inner portion secured by a screw 16 to one end of a carriage 17 and a pair of outer portions secured by screws 18 to the other end of the carriage. Preferably the drive band includes a U-shaped spring portion 21 to maintain predetermined tension upon the band. The center portion of the band where the center and outer portions merge is suitably secured to the pulley 13.

Rotation of the pulley clockwise or counterclockwise winds and unwinds band portions onto the shaft to move the carriage. The carriage includes spaced bearings 23, 24 and 26 disposed in a triangular configuration. Two of the bearings 23 and 24 are adapted to ride along a fixed way or track 27 while the other bearing 26 is adapted to ride along a floating track 29. The track 29 is supported by

a spring 31 or other resilient means whereby to urge the track 29 against the bearing 26 to maintain the bearings 23 and 24 in intimate contact with the fixed trackway. This provides a self-aligning no backlash arrangement with minimum wear and increased bearing life, the carriage guide is described in more detail in our United States Patent Registration No. 4,323,939, dated April 6, 1982, assigned to the same assignee.

The carriage 17 is relatively light and serves to mount an E-shaped or other suitable mount 32 for a plurality of magnetic heads 33 which are adapted to cooperate with one or more discs associated therewith. By controlling the stepper motor 11 the carriage moves linearly along the track 27 to move the heads radially in and out along the surface of the associated disc to read and write information on the disc surface.

The other end of the shaft 12 carries the moving crash stop and zero track indicator The crash stop includes a split collar 41 adapted to be mounted upon the shaft end 42 of the stepper motor. The collar is secured to the shaft by means of a screw 49. The moving crash stop and zero track indicator comprises a pair of outwardly extending arms 46 and 47 formed of sheet metal or the like and welded or otherwise secured to the collar 41. The outer ends of the arms are bent at 90° to form a stop and a combined stop and zero track indicator. A stationary crash stop and zero track switch assembly 48 is mounted on the motor housing and includes a photoelectric sensor comprising a light source such as a photodiode 51 spaces from a transduceer 52. The light from the photodiode is interrupted by the zero track indicator as the motor rotates clockwise as shown in the figure and strikes the stop 53. This establishes the zero position of the head actuator assembly and provides a zero signal to the associated electrical circuits. In its other direction of rotation, the other arm 47 of the moving crash stop strikes the

the fixed housing 53 of the photoelectric sensor and physically stops rotation. It is seen that there is no requirement for any adjustments since the total rotational movement in the two directions of travel is predetermined by the spacing or angle of the crash stop arms 46 and 47. Thus the total rotation is preset and predetermined. This of course fixes or determines the travel of the carriage and heads.

There has been provided a simple inexpensive means providing zero track information and providing physical stops for each direction of rotation and a zero track signal.

CLAIMS:

1. A crash stop and zero track indicator assembly for a recording apparatus of the type including a drive motor having a drive shaft coupled to a linear drive to move magnetic heads of the recording apparatus, the assembly comprising a stationary switch and stop assembly mounted, in use, on the housing of said drive motor; and a moving crash stop and zero track indicator mounted, in use, on said drive shaft for rotation therewith; the moving crash stop and zero track indicator including a pair of stops which are fixed relative to one another and are not independently adjustable and are arranged to strike the stop assembly in both directions of rotation of the shaft to limit the shaft rotation, and thereby said head movement, and to activate said switch to indicate zero track in one direction of rotation.

2. A crash stop and zero track indicator assembly as claimed in Claim 1 wherein said moving crash stop and zero track indicator comprises a collar, mountable on said drive shaft, with spaced radially outwardly extending arms arranged whereby the outer ends of said arms engage said stationary switch and stop assembly.

3. A crash stop and zero track indicator

assembly substantially as herein described with reference to the accompanying drawings.

4. A recording apparatus including a crash stop and zero track indicator assembly as claimed in any preceding claim.

5. A drive motor including a crash stop and zero track indicator assembly as claimed in any one of Claims 1 to 3.

6. A recording apparatus including a crash stop and zero track indicator assembly substantially as herein described with reference to the accompanying drawings.

7. A drive motor including a crash stop and zero track indicator assembly substantially as herein described with reference to the accompanying drawings.