

- [54] ADAPTIVE MISPOSITION CORRECTING METHOD AND APPARATUS FOR MAGNETIC DISK SERVO SYSTEM
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- [73] Assignee: Digital Equipment Corporation, Maynard, Mass.
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- [52] U.S. Cl. .... 360/77
- [58] Field of Search ..... 360/75, 77, 78; 369/43; 318/594, 600, 632

IBM TDB, vol. 23, No. 2, Track Locating and Following Apparatus for a Flexible Disk File by Jahnke. Electronics, vol. 55, No. 8, Apr. 21, 1982, D. Sutton, "Winchester Cartridge Challenges Other Backup Systems", pp. 112-116.

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[57] ABSTRACT

A misposition correction system for correcting misposition errors due to spindle runout and other slowly varying errors in a servo positioning system of a magnetic disk storage device. The system includes means for dynamically measuring misposition error with respect to a data track centerline using an anti-aliasing analog filter, means for digitizing the measured analog signal and for removing selected harmonics of the fundamental-frequency of the resulting cyclic error signal, means for transforming the digitized error signal by a matched digital filter whose transfer function contains independently adjustable DC gain, fundamental-frequency gain, and phase lead components thereby to generate a misposition error correction signal that matches the electrical and mechanical response characteristics of the servo system. Further, the system includes means to iteratively refine the correction signal by re-applying it to the servo controller when measuring misposition errors with respect to the data track centerline. The system stores separate misposition correction signals for each transducer on the disk so that one of several correction signals can be selected depending on which transducer in the device is selected. The system further includes means for generating a bias force correction signal to correct for non-linear position errors resulting from variations in bias forces acting on the transducer carriage over its range of radial displacement.

[56] References Cited

U.S. PATENT DOCUMENTS

3,404,392	10/1968	Sordello	360/77
3,881,184	5/1975	Koepcke et al.	360/78
3,994,016	11/1976	Moghadam	360/77
4,087,842	5/1978	Manly	360/77
4,135,217	1/1979	Jacques et al.	360/77
4,136,365	1/1979	Chick et al.	360/78
4,208,679	6/1980	Hertrich	360/77
4,371,960	2/1983	Kroiss	360/77
4,419,701	12/1983	Harrison et al.	360/77

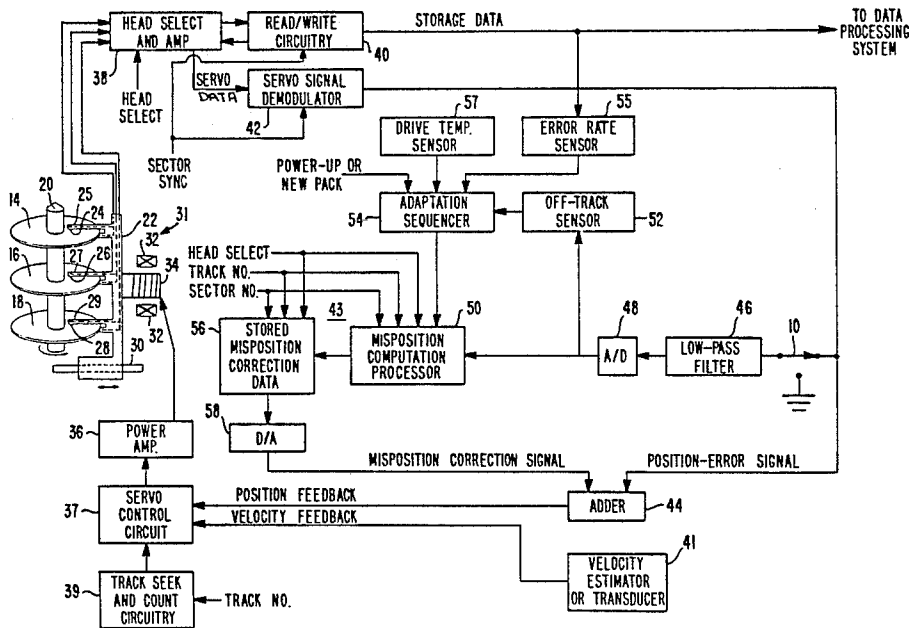
FOREIGN PATENT DOCUMENTS

0009087 4/1980 European Pat. Off.

OTHER PUBLICATIONS

Patent Abstracts of Japan, V. 3, No. 40, Apr. 6, 1979, p. 152E102 & JP.A-54-19718, "Locating System of High Accuracy".  
 Patent Abstracts of Japan, V. 4, No. 18, Feb. 13, 1980, p. 75E171 & JP.A-54-158206, "Servo-Information Recorder of Magnetic Disc Memory".  
 IBM TDB, vol. 19, No. 6, *Self-Calibrating Disk Storage Apparatus* by Griffiths et al.

19 Claims, 10 Drawing Figures



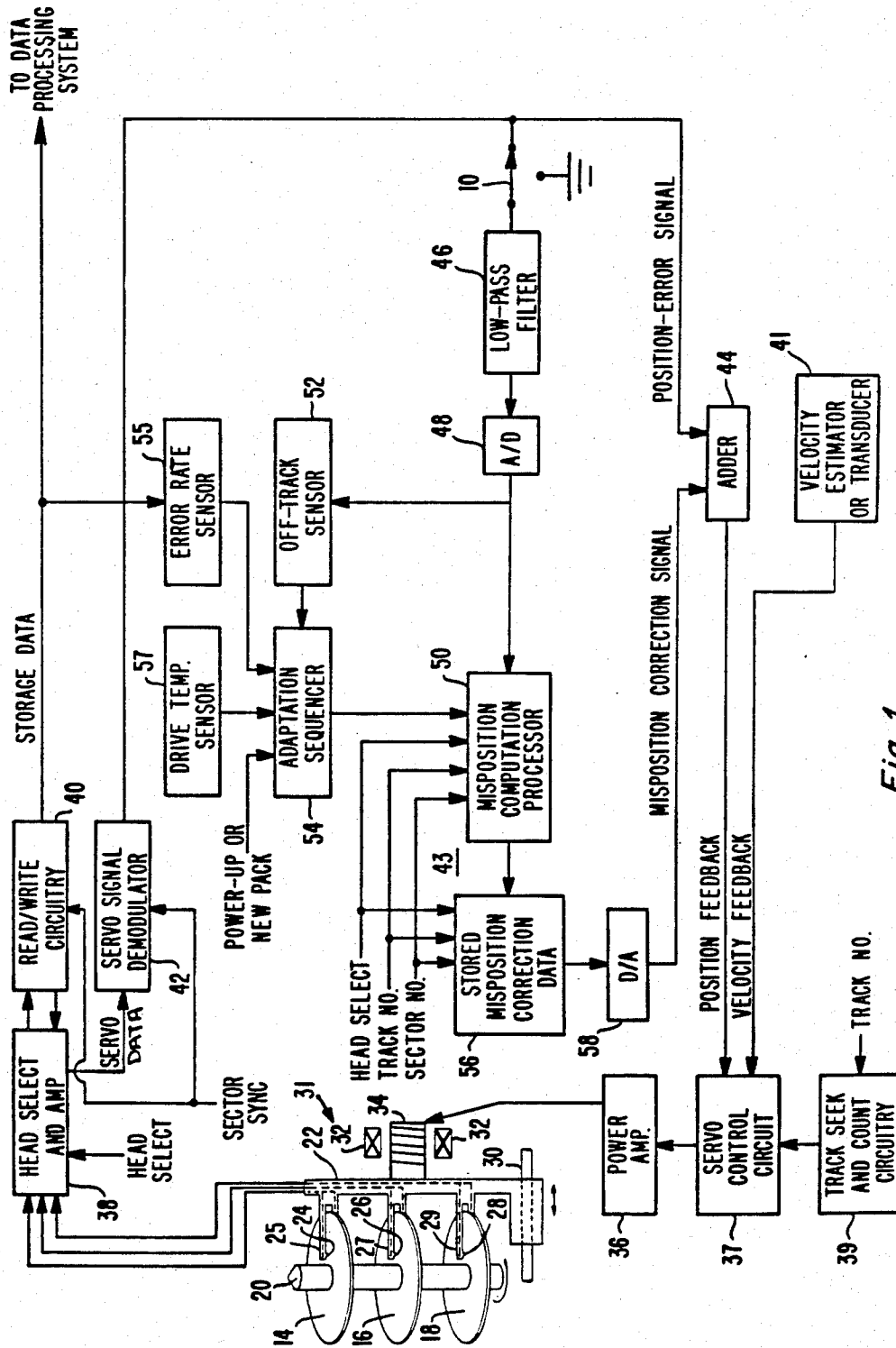


Fig. 1

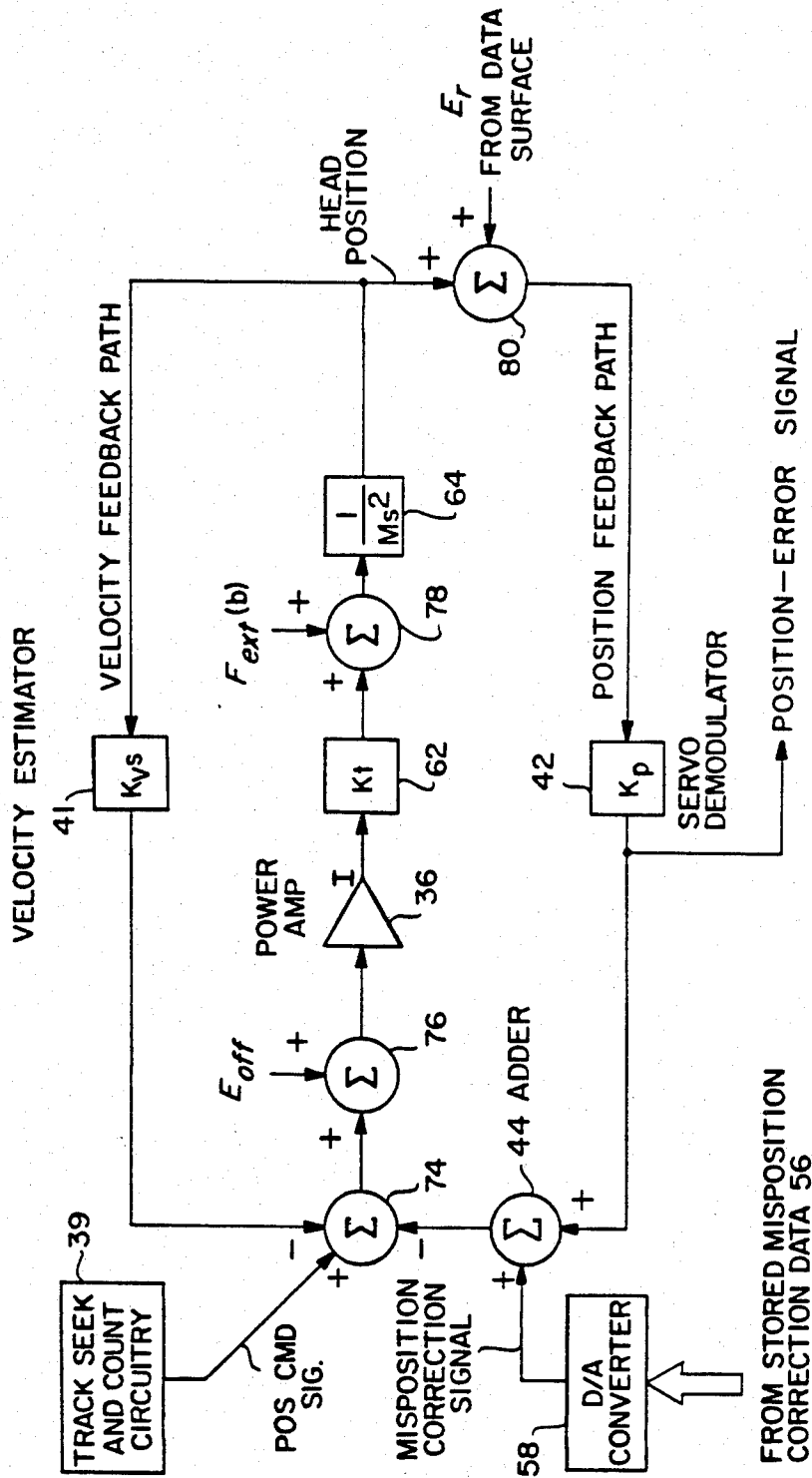


Fig. 2

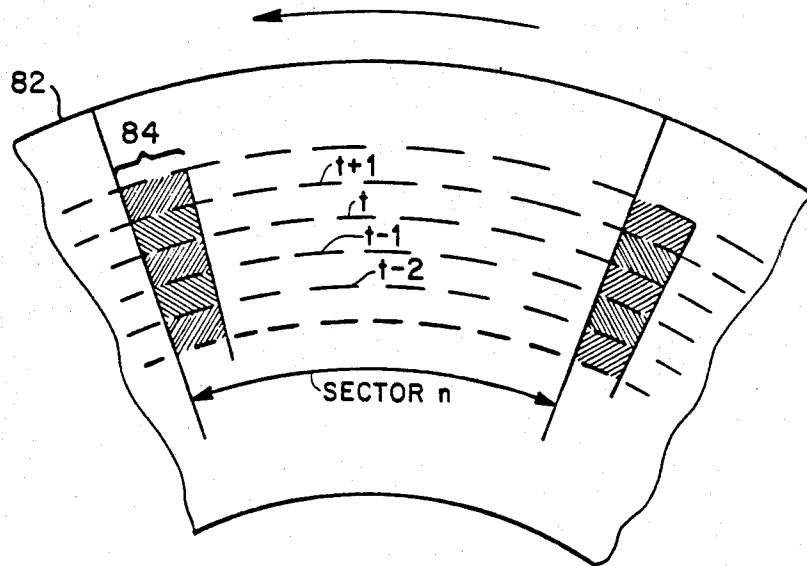


Fig. 3

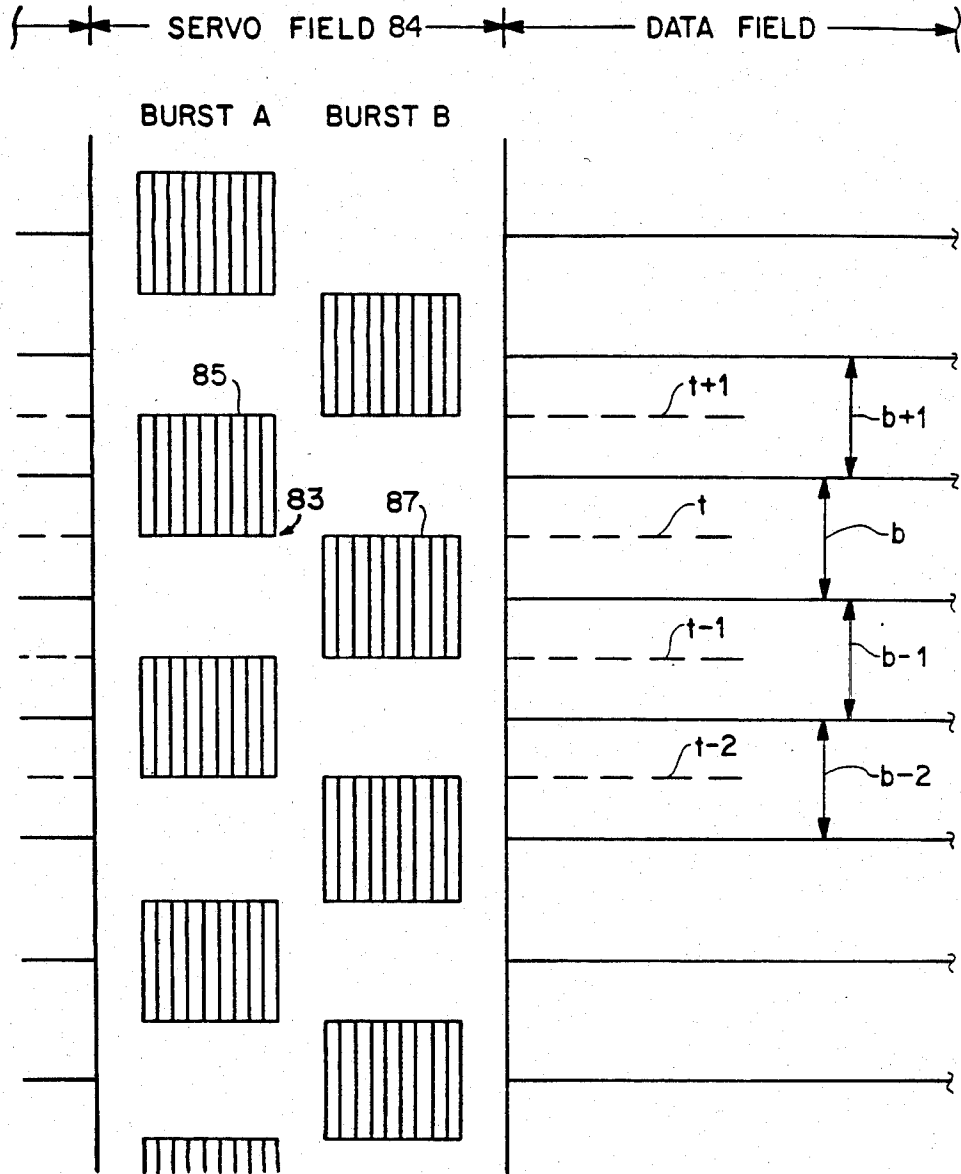


Fig. 4

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