

[54] **FAULT TOLERANT COMPUTER BACKUP SYSTEM**

[75] Inventors: **James A. Horton, Bethlehem; Stephen M. Getz, Pittsburgh, both of Pa.**

[73] Assignee: **Vortex Systems, Inc., Pittsburgh, Pa.**

[21] Appl. No.: **300,469**

[22] Filed: **Jan. 23, 1989**

[51] Int. Cl.<sup>5</sup> ..... **G06F 11/16**

[52] U.S. Cl. .... **395/575; 364/256.3; 364/268.5; 364/269.2; 364/285.1; 364/DIG. 1; 371/10.1**

[58] Field of Search ..... **364/200, 232.1, 256.3, 364/256.4, 256.6, 268.5, 269.2, 285.1; 371/10.1**

4,639,856	1/1987	Hrustich et al.	364/200
4,648,031	3/1987	Jenner	364/200
4,652,940	3/1987	Sumiyoshi	360/5
4,654,819	3/1987	Stiffler et al.	364/900
4,654,857	3/1987	Samson et al.	371/9.1
4,674,038	6/1987	Brelsford et al.	364/200
4,703,421	10/1987	Abrant et al.	364/200
4,703,481	10/1987	Fremont	371/12
4,713,811	12/1987	Frey	371/8.2
4,727,516	2/1988	Yoshida et al.	365/200
4,736,339	4/1988	Crabbe, Jr.	364/200
4,750,177	6/1988	Hendrie et al.	371/32
4,754,397	6/1988	Varaiya et al.	364/200
4,878,167	10/1989	Kapulka et al.	364/200

*Primary Examiner*—Charles E. Atkinson  
*Attorney, Agent, or Firm*—Buchanan Ingersoll; Lynn J. Alstadt

[56] **References Cited**  
**U.S. PATENT DOCUMENTS**

3,444,528	11/1966	Lovell et al.	340/172.5
3,533,082	10/1970	Schnabel et al.	364/200
4,141,066	2/1979	Keiles	364/119
4,156,907	5/1979	Rawlings et al.	364/200
4,164,017	8/1979	Randell et al.	364/200
4,191,996	3/1980	Chesley	371/9.1
4,351,023	9/1982	Richer	364/187
4,378,588	3/1983	Katzmann et al.	364/200
4,403,303	9/1983	Howes et al.	364/900
4,453,215	6/1984	Reid	364/200
4,459,658	7/1984	Gabbe et al.	364/200
4,479,214	10/1984	Ryan	371/2.2
4,483,001	11/1984	Ryan	371/2.2
4,484,275	11/1984	Katzman et al.	364/200
4,486,826	12/1984	Wolff et al.	364/200
4,498,145	2/1985	Baker et al.	364/900
4,507,751	3/1985	Gawlick et al.	364/900
4,521,847	6/1985	Ziehm et al.	364/184
4,581,701	4/1986	Hess et al.	364/187
4,607,365	8/1986	Greig et al.	371/16.2
4,608,688	8/1986	Hansen et al.	371/11

[57] **ABSTRACT**

A method and apparatus for storing and retrieving any prior state of a computer system is provided. Upon installation of the system, a base image corresponding to the initial state of the computer system is established and stored on a storage device. The system monitors changes to the state of the host and subsequently stores at least some of these changes on the storage device. These changes are then mapped by location of the stored changes in an address table to enable subsequent retrieval of any selected changes. When the address table becomes full, at least one differential image of the state of the system is subsequently created by compiling all changes to the base image which occurred between creation of the base image and the selected time. A virtual image may thus be created of data stored on the storage device, as such data existed at a predetermined prior point in time, from which data and files may be retrieved and written to the host disk.

**19 Claims, 13 Drawing Sheets**

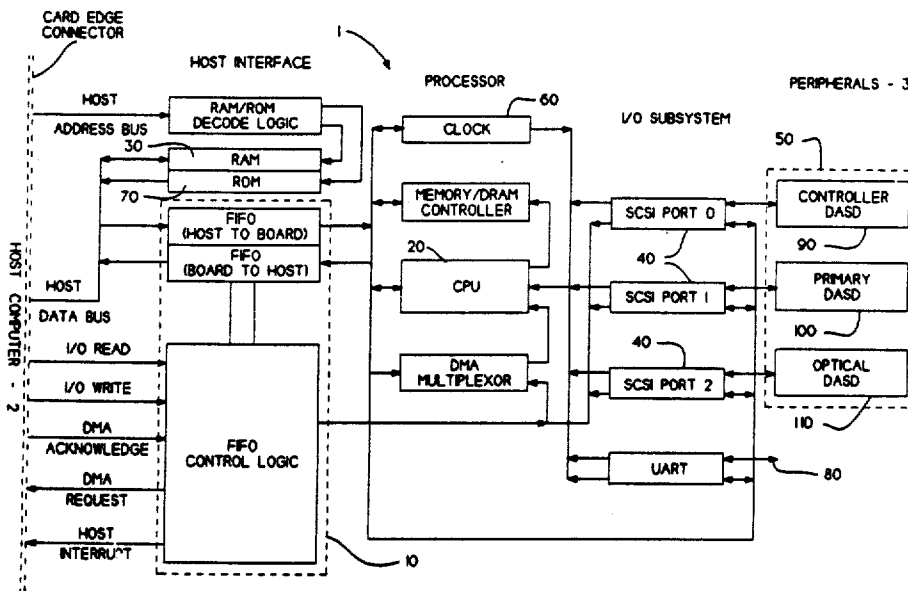
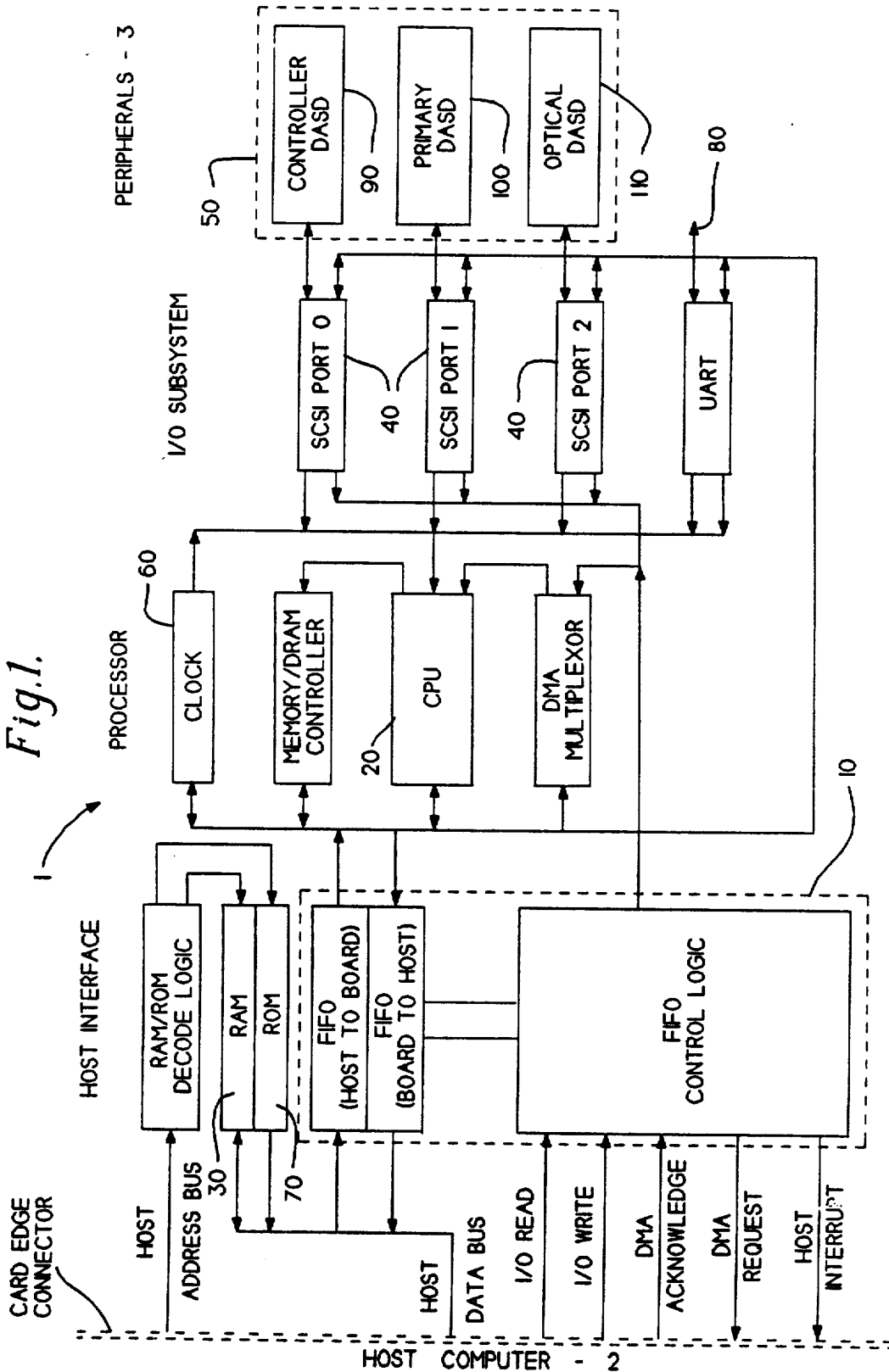


Fig. 1.



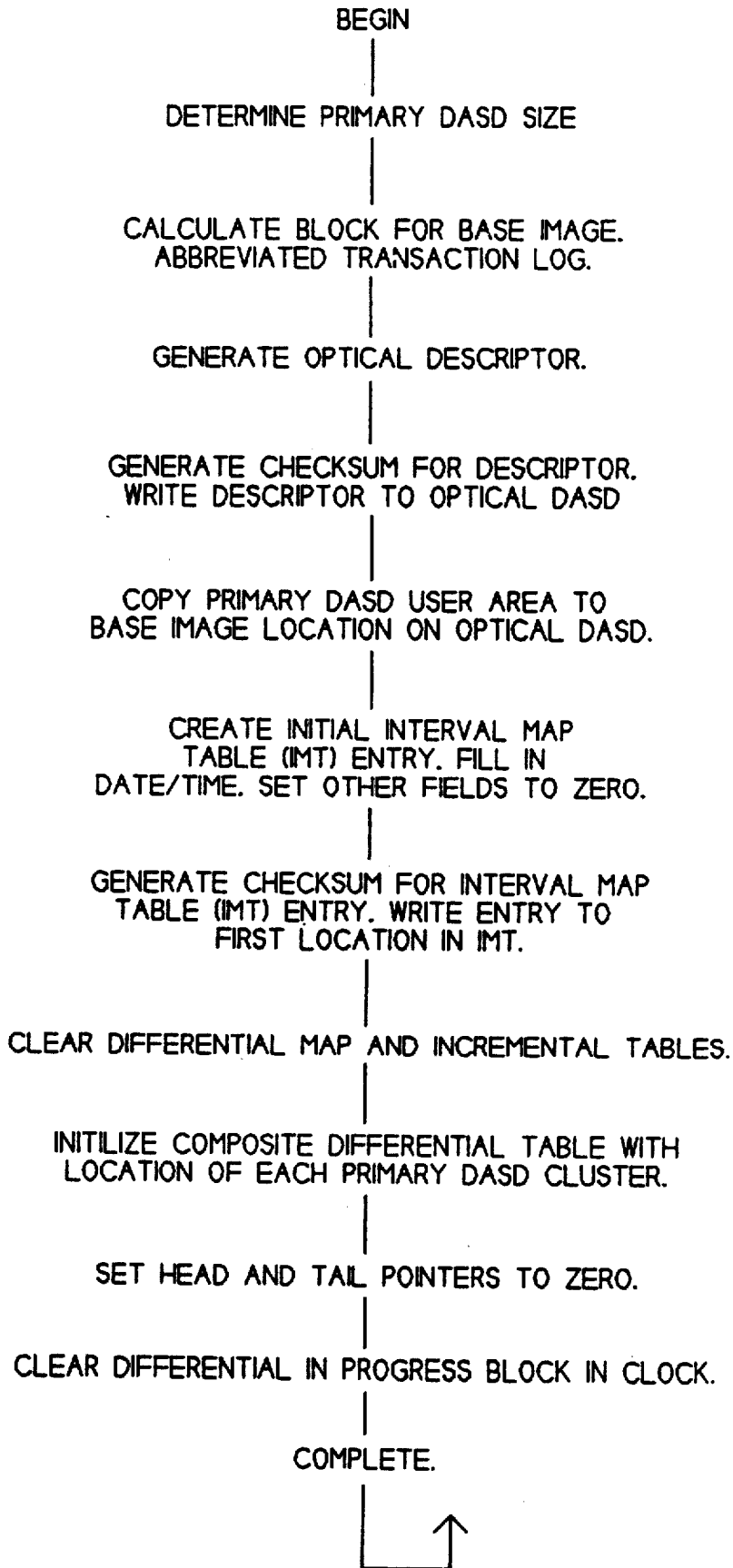
*Fig.2.*

Fig. 3.

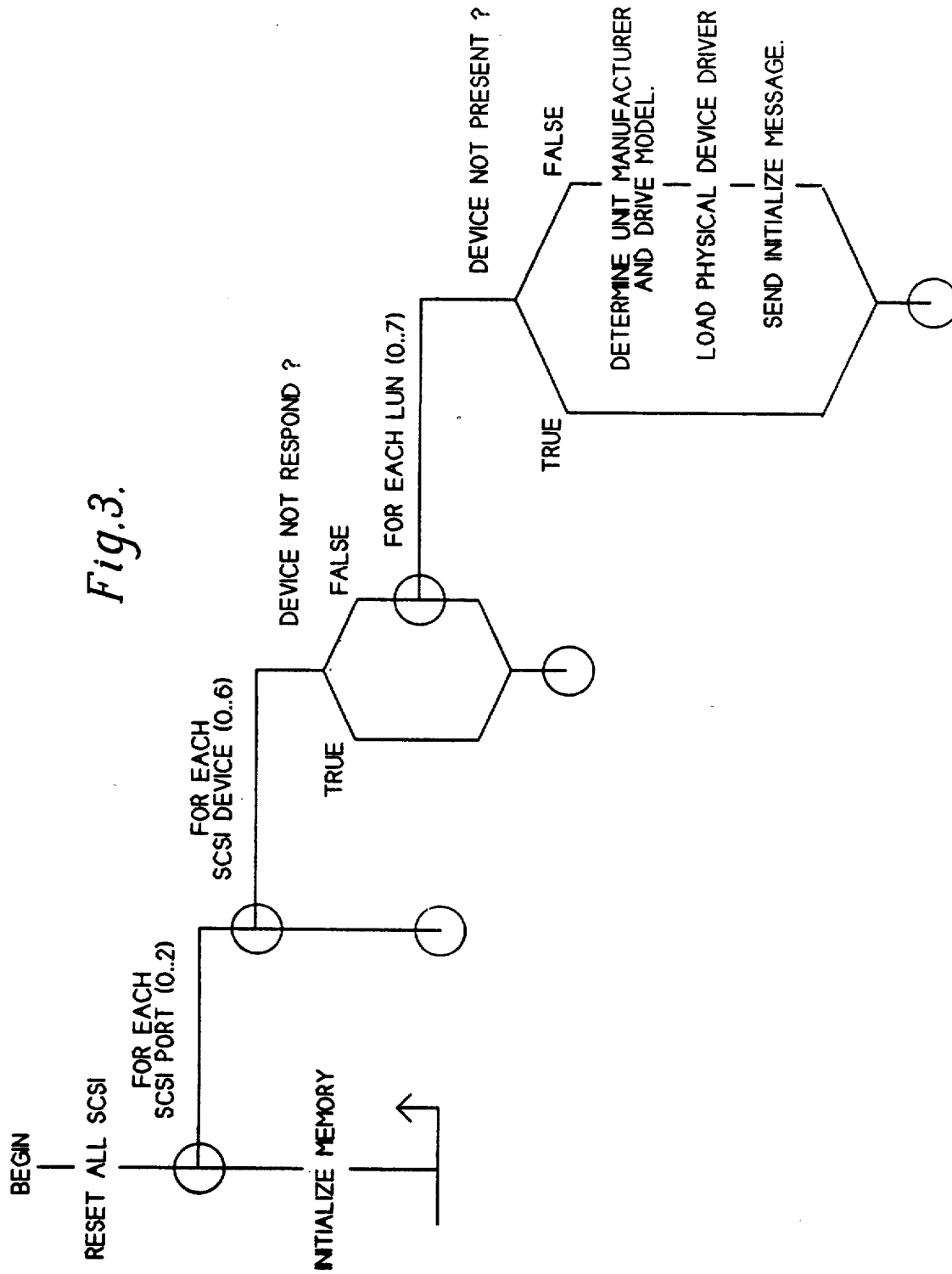
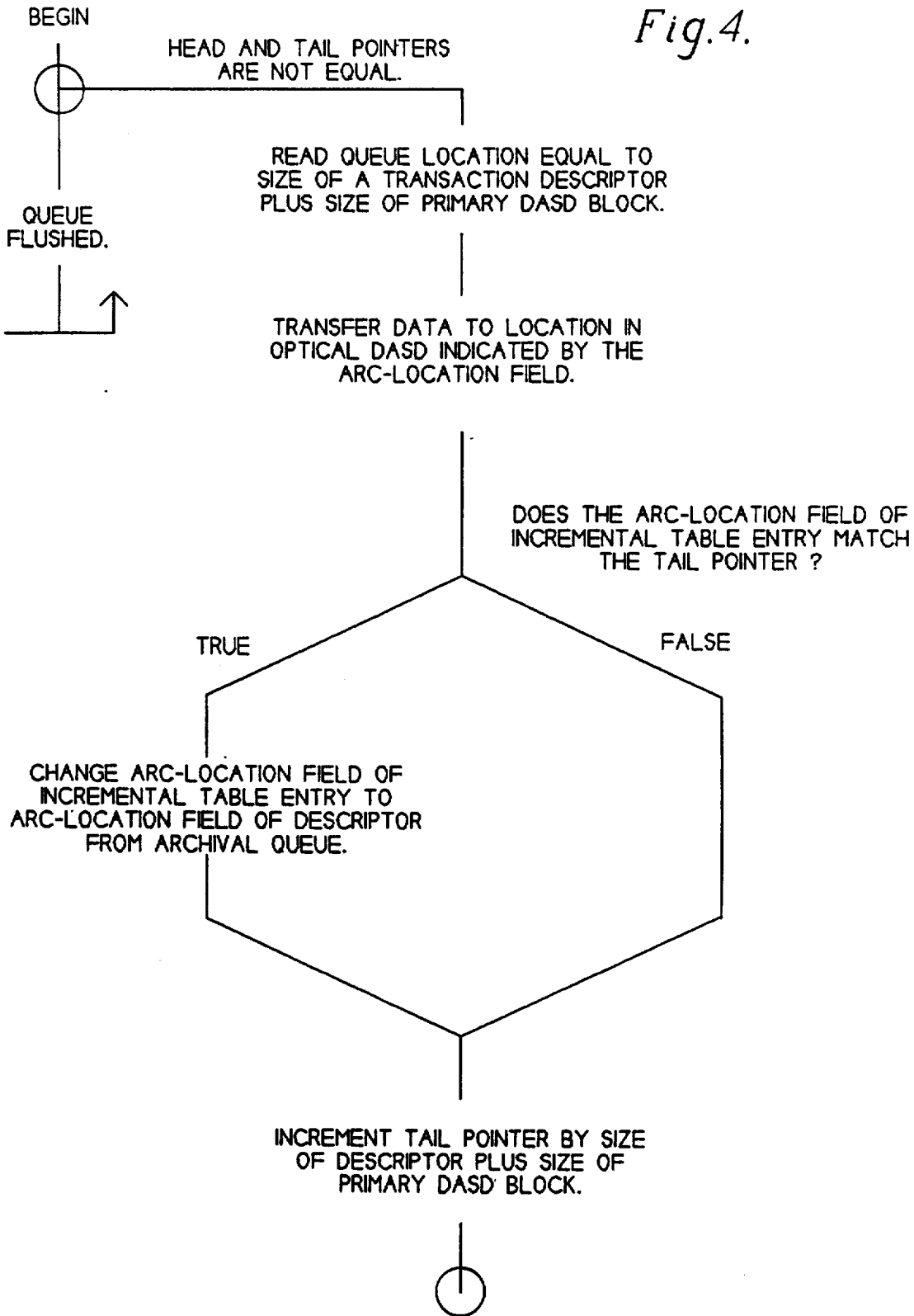


Fig. 4.



# Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

## Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

## Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

## Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

## API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

## LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

## FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

## E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.