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FOREIGN/PCT APPLICATIONS***
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ADDRESS

~~GIRMA WOLDE-NICHAEL~~
~~PATTERSON & KEOUGH~~
~~627 MARQUETTE AVENUE SOUTH~~
~~1200 RAND TOWER~~
~~MINNEAPOLIS MN 55402 1014~~

*4800 IDS Center
80 South 8th Street
Minneapolis, MN 55402-2100*

METHOD AND APPARATUS FOR IMPLEMENTING MAXIMUM TRANSITION RUN CODES

TITLE

U.S. DEPT. OF COMM./ PAT. & TM—PTO-436L (Rev.12-94)

PARTS OF APPLICATION FILED SEPARATELY

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JASON L.W. KOST
Assistant Examiner

CLAIMS ALLOWED

Total Claims	Print Claim
<i>21</i>	<i>1</i>

ISSUE FEE

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JEFFREY A. GAFFIN
SUPERVISORY PATENT EXAMINER
GROUP 2100

DRAWING

Sheets Drwg	Figs. Drwg	Print Fig.
<i>8/14</i>	<i>19</i>	<i>7</i>

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Jeffrey A. Gaffin
Primary Examiner
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SPECIFICATION

METHOD AND APPARATUS FOR IMPLEMENTING
MAXIMUM TRANSITION RUN CODES

RELATED APPLICATIONS

This application is a formal application of the Provisional Application filed on April 5, 1996, and assigned Serial No. 60/014,954.

specifically, the invention pertains to an improved coding technique involving data recovery channels utilizing sequence detection methods.

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BACKGROUND OF THE INVENTION

Channel codes, sometimes called modulation codes, are mappings of data bits into the symbols that are either transmitted in a communication system or recorded onto a medium in a storage device. The purpose of these codes is to prevent certain characteristics in the stream of symbols that make their recovery difficult. Runlength limited (RLL) codes are commonly used in magnetic recording. These codes impose a (d,k) constraint on the recorded data sequence. With the Non-Return-to-Zero (NRZ) recording format, where the binary "1" represents a positive level in the magnetization waveform and the binary "0" negative level in the same waveform, $d+1$ is the minimum number of consecutive like symbols and $k+1$ is the maximum number of consecutive like symbols in the binary sequence. With the Non-Return-to-Zero-Inversion (NRZI) recording format, where a magnetic transition is represented by 1 and no transition by 0, d and k are the minimum and maximum number of consecutive 0's between any two 1's, respectively as described in P.H. Siegel, "Recording codes for digital magnetic storage," *IEEE Transactions on Magnetics*, vol. MAG-21, no. 5, pp. 1344 - 1349, Sept. 1985. The d constraint is used to increase the minimum physical spacing between transitions. The k constraint guarantees that a change in the readback waveform will occur at regular intervals for the purpose of synchronizing a phase locked loop to the data. A (1,7) code is a common example of an RLL code; see U.S. Patent 4,337,458. Also popular is the (0,4/4) code, where $d=0$ and $k=4$ both for the data sequence and for the sequence that results if every other symbol is considered; see U.S. Patent 4,707,681. Additional constraints, such as a limitation on the total number of NRZI 1's in a codeword for the purpose of improving timing and gain control can be applied to these codes; see

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