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CLERK U.S. DISTRICT COURT
CENTRAL DIST. OF CALIF.
SANTA ANA
BY

IN THE UNITED STATES DISTRICT COURT

FOR THE CENTRAL DISTRICT OF CALIFORNIA

SOUTHERN DIVISION

ADVANCED OPTICAL TRACKING, LLC, Plaintiff, v. DELKIN DEVICES, INC., Defendant.	**SACV13-01418 JVS (DFMx)** Civil Case No. **COMPLAINT FOR PATENT INFRINGEMENT** **JURY TRIAL DEMANDED**

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Advanced Optical Tracking, LLC, a Delaware limited liability company, by way of its Complaint for Patent Infringement ("Complaint") against Defendant Delkin Devices, Inc. ("Delkin"), a California corporation, hereby alleges as follows:

JURISDICTION AND VENUE

1. This is a civil action for patent infringement arising under the patent laws of the United States, 35 U.S.C. § 1 *et seq*. This Court has subject matter jurisdiction over such Federal Question claims pursuant to 28 U.S.C. §§ 1331 and 1338(a).

2. Venue is proper in this Judicial District under 28 U.S.C. §§ 1391 and 1400(b).

3. On information and belief, Delkin is subject to the jurisdiction of this Court by reason of its acts of patent infringement which have been committed in this Judicial District, and by virtue of its regularly conducted and systematic business contacts in this State. As such, Delkin has purposefully availed itself of the privilege of conducting business within this Judicial District; has established sufficient minimum contacts with this Judicial District such that it should reasonably and fairly anticipate being haled into court in this Judicial District, has purposefully directed activities at residents of this State, and at least a portion of the patent infringement claims alleged herein arise out of or are related to one or more of the foregoing activities.

THE PARTIES

4. Plaintiff Advanced Optical Tracking, LLC ("AOT") is a Delaware limited liability company with a place of business at 1220 N. Market Street, Suite 806, Wilmington, Delaware 19801.

5. Upon information and belief, Defendant Delkin is a corporation organized under the laws of California with its principal place of business at 13350 Kirkham Way, Poway, CA 92064-7117.

THE PATENT-IN-SUIT

6. On January 24, 2006, U.S. Patent No. 6,990,058 (the "'058 Patent"), entitled "Structure and Method for Storing Data on Optical Disks," was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the '058 Patent is attached as Exhibit A to this Complaint.

7. AOT is the assignee and owner of the right, title and interest in and to the '058 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it.

COUNT I – INFRINGEMENT OF U.S. PATENT NO. 6,990,058

8. The allegations set forth in the foregoing paragraphs 1 through 7 are hereby realleged and incorporated herein by reference.

9. In violation of 35 U.S.C. § 271, Delkin has directly infringed and continues to directly infringe, both literally and under the doctrine of equivalents, the '058 Patent by making, using, selling and offering for sale in the United States, including in this Judicial District, and importing into the United States, products that practice the subject matter claimed in one or more claims of the '058 Patent (the "'058 Accused Products"), including but not limited to claim 1, without the authority of AOT. The '058 Accused Products include, without limitation, Blu-Ray Recordable (BD-R) discs, including but not limited to Delkin-branded Blu-ray BD-R discs.

10. AOT provided actual notice to Delkin of its infringement of the '058 Patent in a letter sent by certified mail on September 19, 2012. In that letter, Plaintiff informed Delkin that Delkin was infringing the '058 Patent through the manufacture, use, sale, and offer to sell BD-R discs. AOT's letter also informed Delkin that Delkin was acting to induce its suppliers, resellers, and distributors to manufacture, use, sell, and offer to sell BD-R discs by entering into, performing, and requiring performance under manufacturing, supply, and distribution agreements for such products.

11. Delkin has had actual knowledge of the '058 Patent and its infringement of that patent since at least the date that Delkin received the September 19, 2012 letter.

12. Upon information and belief, Delkin has induced and continues to induce others to infringe at least claim 1 of the '058 Patent under 35 U.S.C. § 271(b) by, among other things, and with specific intent or willful blindness, actively aiding and abetting others to infringe, including, but not limited to, Delkin's suppliers, distributors, and resellers of '058 Accused Products whose making, using, selling and offering for sale in the United States, and importing into the United States the '058 Accused Products constitutes direct infringement of at least claim 1 of the '058 Patent. In particular, Delkin's actions that aid and abet

others to infringe include entering into, performing, and requiring performance under manufacturing, supply, and distribution agreements for the '058 Accused Products. On information and belief, Delkin has engaged in such actions with specific intent to cause infringement or with willful blindness to the resulting infringement because Delkin has had actual knowledge of the '058 Patent and that its acts were inducing others to infringe the '058 Patent since at least the date it received the notice letter from AOT notifying Delkin that the '058 Accused Products infringed the '058 Patent.

13. AOT has been harmed by Delkin's infringing activities.

14. AOT notified Delkin of its infringement of the '058 Patent including an identification of the particular infringing products, but Delkin thereafter continued to infringe the patent by continuing the activities described in Paragraph 9-12. On information and belief, Delkin has not obtained an opinion of counsel regarding the claims of '058 Patent. Delkin's continued infringement has therefore been in reckless disregard of AOT's patent rights. On information and belief, Delkin's infringement has been and continues to be willful.

PRAYER FOR RELIEF

WHEREFORE, AOT prays for judgment as follows:

a. An adjudication that Delkin has infringed the '058 Patent;

b. An award of damages to be paid by Delkin adequate to compensate AOT for Delkin's past infringement of the '058 Patent, and any continuing or future infringement through the date such judgment is entered, including interest, costs, expenses and an accounting of all infringing acts including, but not limited to, those acts not presented at trial;

c. An order that Delkin pay an ongoing royalty in an amount to be determined for any continued infringement after the date judgment is entered;

d. An award of treble damages under 35 U.S.C. § 284;

e. A declaration finding this to be an exceptional case, and awarding AOT attorney fees under 35 U.S.C. §285; and

f. For such further relief at law and in equity as the Court may deem just and proper.

DATED: September 12, 2013

H. H. Kewalramani

Attorneys for Plaintiff
ADVANCED OPTICAL TRACKING, LLC

EXHIBIT A

(12) **United States Patent**
Pleiss et al.

(10) **Patent No.: US 6,990,058 B1**
(45) **Date of Patent: Jan. 24, 2006**

(54) **STRUCTURE AND METHOD FOR STORING DATA ON OPTICAL DISKS**

(75) Inventors: **Curtis M. Pleiss**, Longmont, CO (US); **Stanton M. Keeler**, Longmont, CO (US)

(73) Assignee: **DPHI Acquisitions, Inc.**, Boulder, CO (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/542,681**

(22) Filed: **Apr. 3, 2000**

(51) **Int. Cl.**
G11B 7/24 (2006.01)

(52) **U.S. Cl.** **369/275.4**

(58) **Field of Classification Search** 369/275.1, 369/59.25, 47.35, 47.28, 275.3, 44.11, 111, 369/275.4, 44.26, 47.27, 47.22, 13.53, 13.54, 369/44.13
See application file for complete search history.

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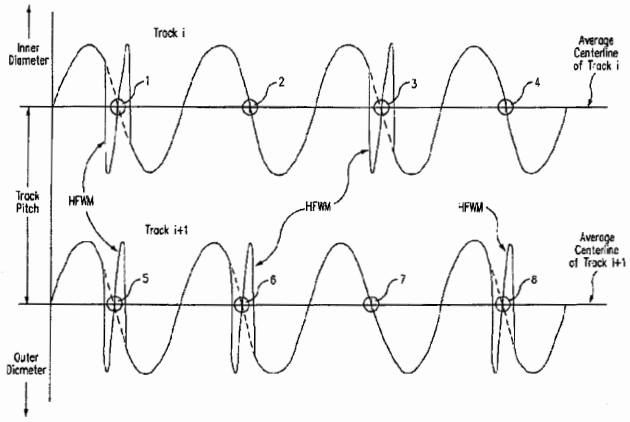
Primary Examiner—Thang V. Tran
(74) *Attorney, Agent, or Firm*—Jonathan Hallman; MacPherson Kwok Chen & Heid

(57) **ABSTRACT**

During manufacturing of optical disks, mastering equipment inserts marks ("high frequency wobble marks" or "HFWMs") into the wobble of the groove on optical disks to store data. The presence of a HFWM at a zero crossing of the wobble indicates an active bit and the absence of the HFWM indicates an inactive bit. The zero crossing is, for example, a negative zero crossing. A matched filter is used to detect the shape of the HFWMs. If a HFWM is detected during a wobble cycle, an active bit is saved in a register or a memory. If a HFWM is not detected during a wobble cycle, an inactive bit is saved in a register or a memory. The active and inactive bits may be coded bits that must be decoded to data bits. The data bits include information such as a synchronization mark, a sector identification data, and an error detection code.

11 Claims, 7 Drawing Sheets



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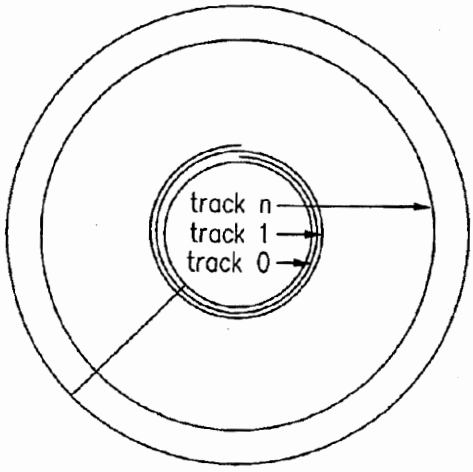

FIG. 1
(PRIOR ART)

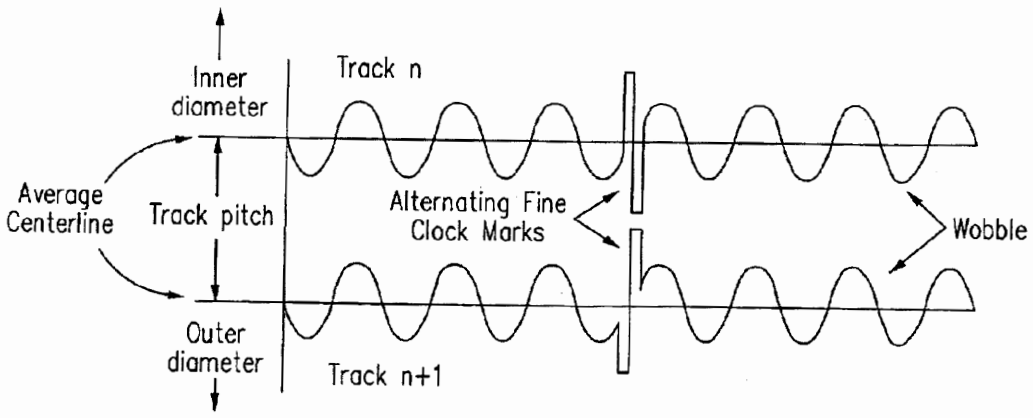

FIG. 2
(PRIOR ART)

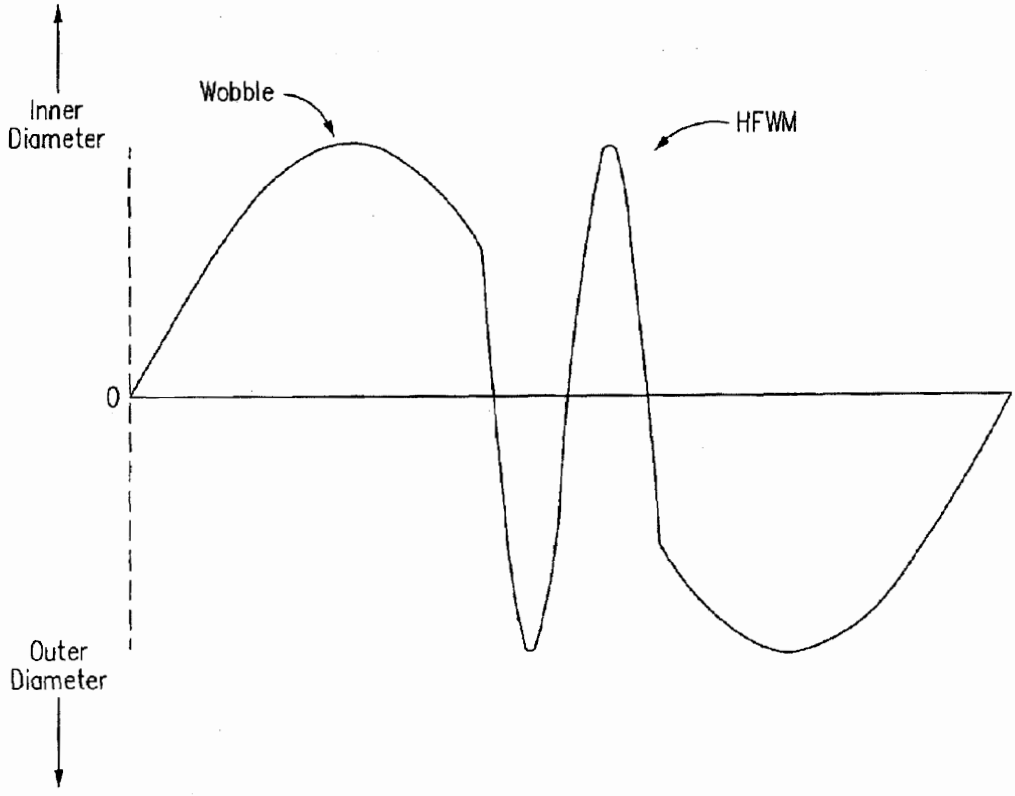

FIG. 3

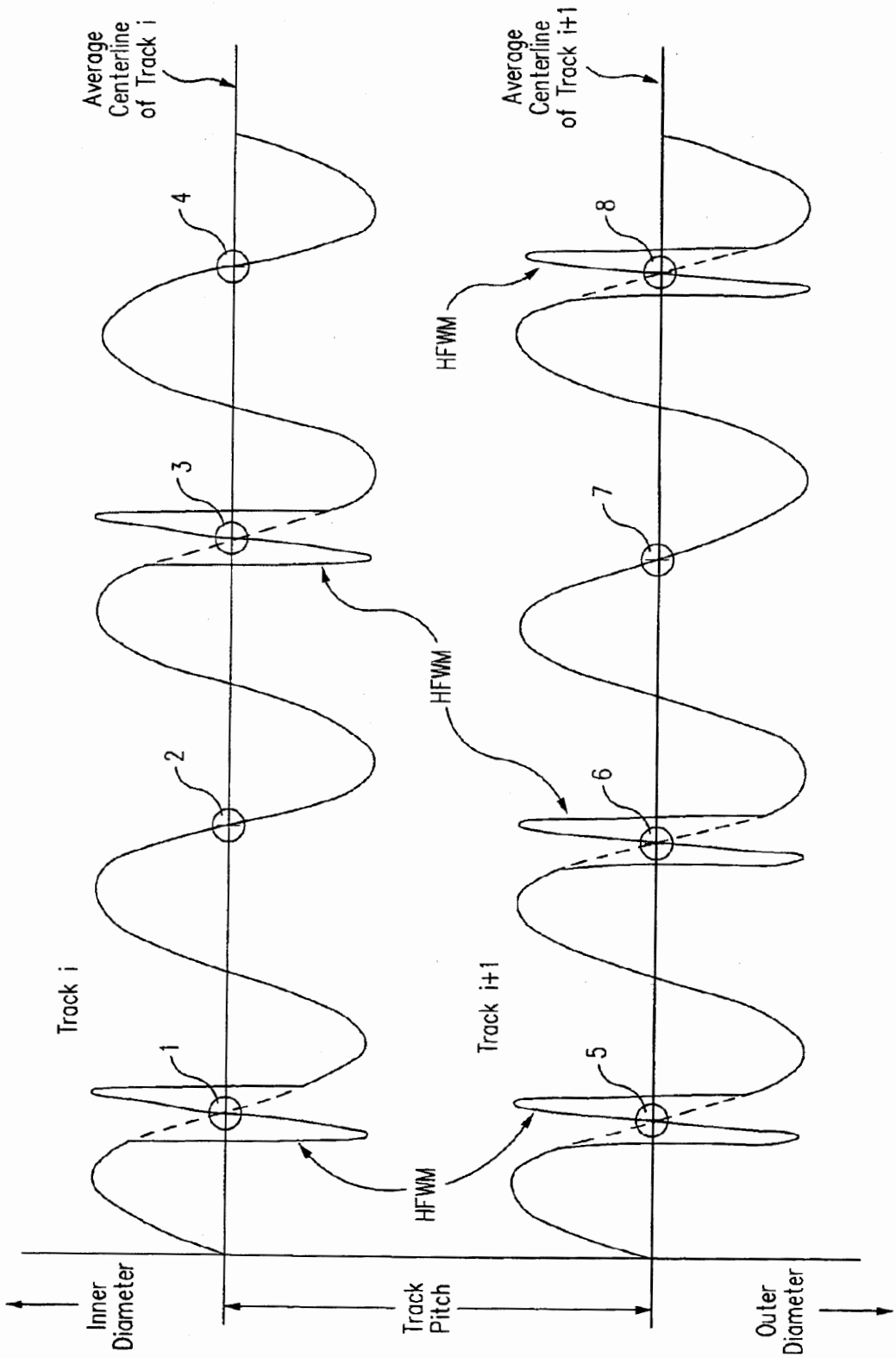
Average Centerline of Track i
Average Centerline of Track i+1
Track i
Track i+1
HFWM
HFWM
HFWM
1
2
3
4
5
6
7
8
Inner Diameter
Track Pitch
Outer Diameter

FIG. 4

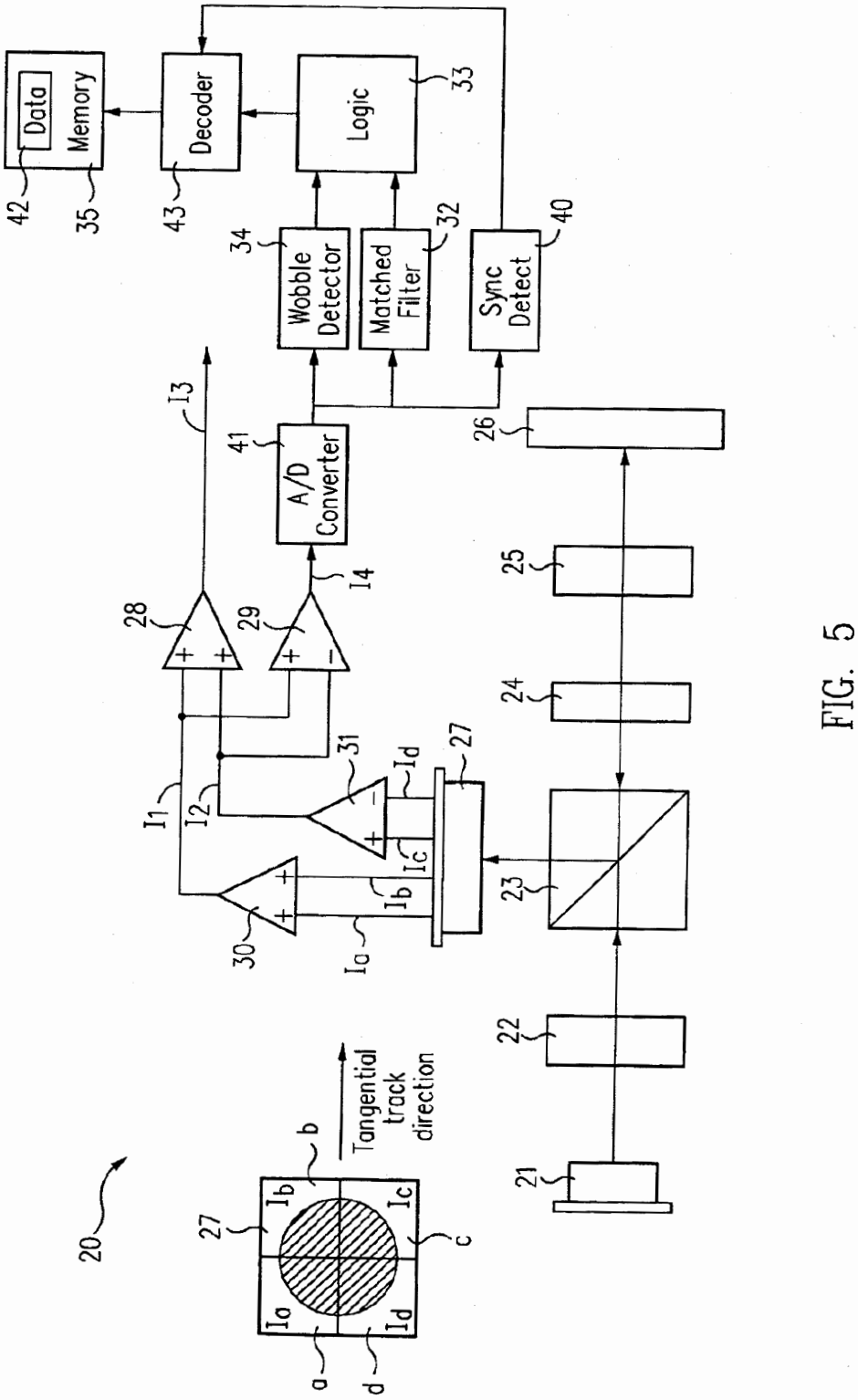
Data Memory
Decoder
Logic
Wobble Detector
Matched Filter
Sync Detect
A/D Converter
Tangential track direction
20
21
22
23
24
25
26
27
28
29
30
31
33
34
35
40
41
42
43
I1
I2
Ia
Ib
Ic
Id
a
b
c
d

FIG. 5

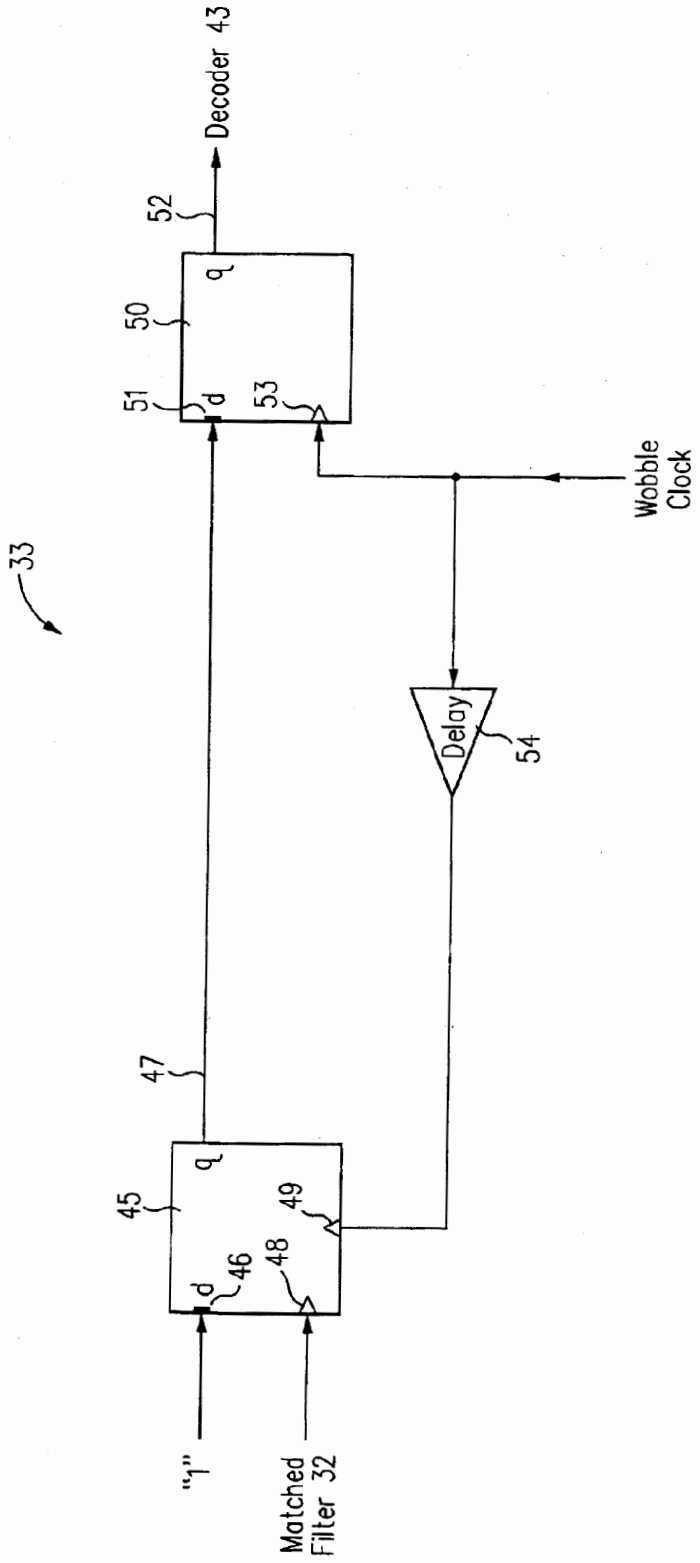
Decoder 43
52
50
51
d
q
53
Wobble Clock
33
Delay
54
47
45
49
46
48
"1"
Matched Filter 32

FIG. 6

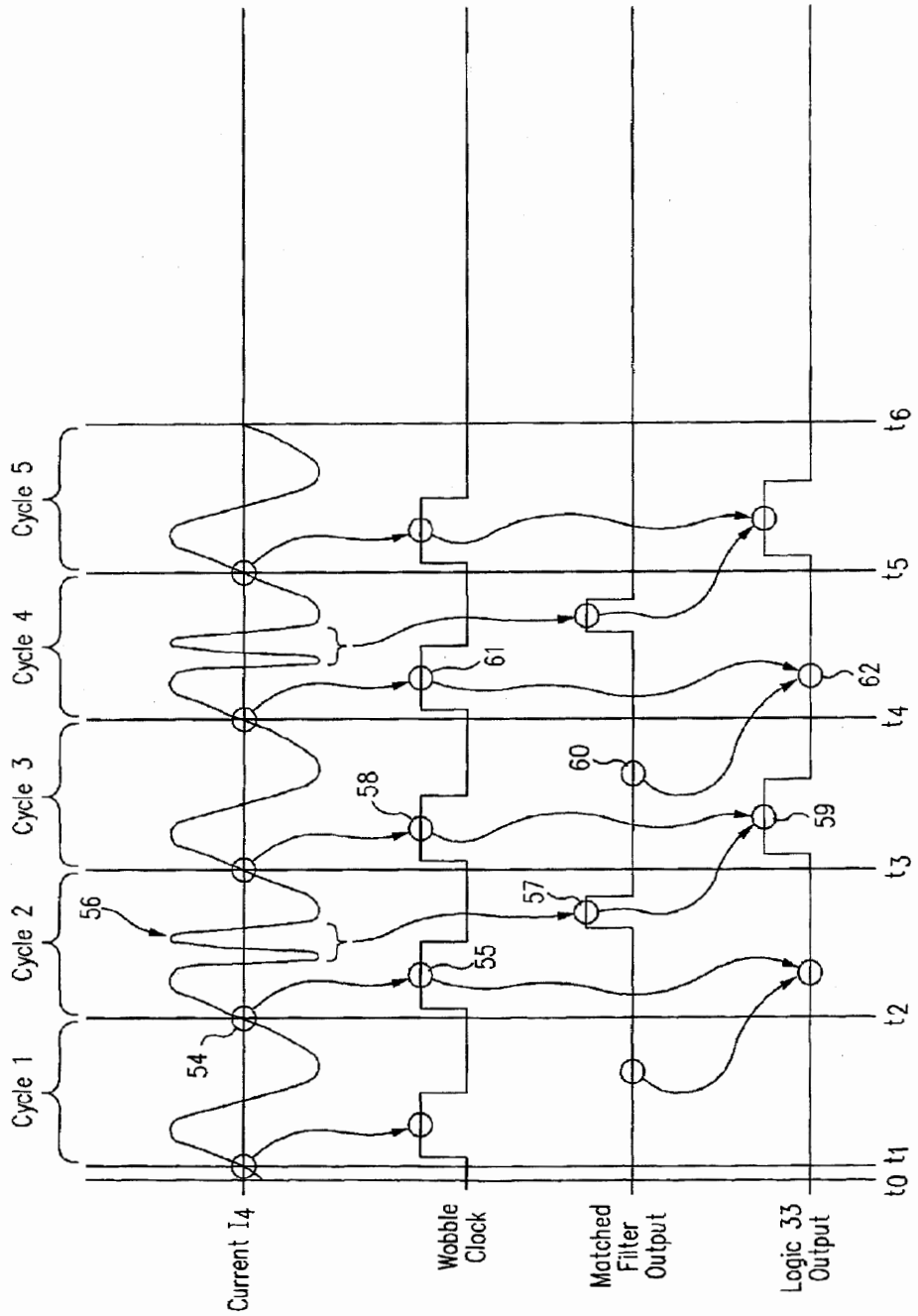
Cycle 1
Cycle 2
Cycle 3
Cycle 4
Cycle 5
t0 t1
t2
t3
t4
t5
t6
54
55
56
57
58
59
60
61
62
Current I4
Wobble Clock
Matched Filter Output
Logic 33 Output

FIG. 7

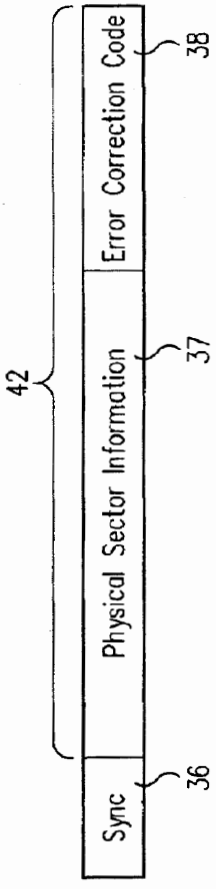
42
Sync
36
Physical Sector Information
37
Error Correction Code
38

FIG. 8

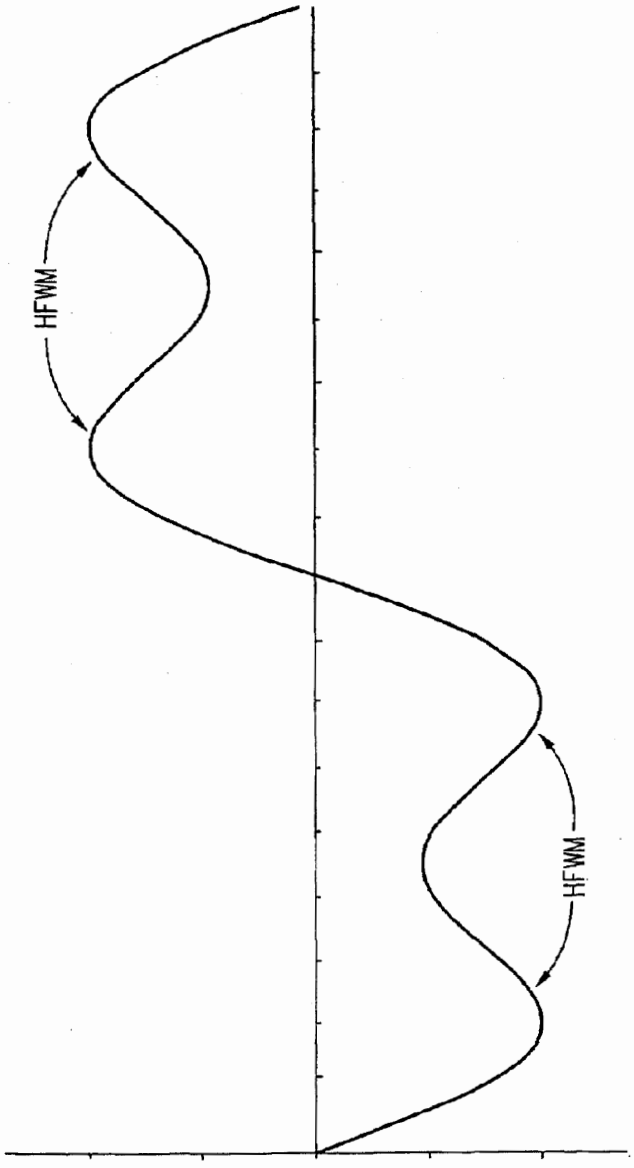
HFWM
HFWM

FIG. 9

STRUCTURE AND METHOD FOR STORING DATA ON OPTICAL DISKS

BACKGROUND

1. Field of the Invention

The present invention relates to a method to store data on writeable optical disks, and more particularly to the use of marks in the wobble of the groove to store data.

2. Description of Related Art

FIG. **1** illustrates a writable optical disk that has tracks formed from a single spiral groove. The writable optical disk is, for example, a record-able CD or DVD. The spiral groove increases in diameter linearly with increasing radius in a mathematical phenomenon known as the Archimedes Spiral. The interval between turns of the spiral groove is called the track pitch and this is nominally constant for most optical disks. The groove is divided into tracks that each form a 360-degree turn of the groove. The tracks are further divided into sectors, which are the smallest units that an optical drive (including reader and writer) accesses. The optical drive keeps track of where data is stored by the data's sector number.

To determine the linear velocity of the tracks, the tracks in the writable area contain a deviation from the averaged centerline of the groove called "wobble." FIG. **2** illustrates the wobble. Optical drives measure the number of cycles during a unit of time (frequency) to determine the linear velocity of the track. Optical drives match the clocks used to write data into the tracks ("write speed") with the linear velocity of the tracks so that the written bits of data are equally spaced apart. For further details, see for example U.S. Pat. No. 4,972,401 issued to Carasso et al.

Writable optical disks must have a reliable method for reading radial and rotational positions of the tracks so that optical drives can read from and write to the appropriate locations in the tracks. Radial and rotational information may be communicated through prewritten data in the tracks called pre-embossed headers. In this addressing scheme, the mastering equipment creates the optical disks with radial and rotational information written in the groove during the manufacturing of the optical disks. This addressing scheme displaces some storage area that can be otherwise used to store user data in order to store radial and rotational information. For further details, see for example Standard ECMA-272 from ECMA located at 114 Rue du Rhône —CH-1204 Geneva Switzerland ("ECMA"), which is hereby incorporated by reference.

Radial and rotational information may also be communicated by modulating the frequency of the wobble. The wobble frequency is modulated between a first frequency and a second frequency to communicate an active or inactive bit (e.g., a "1" or a "0" bit). This addressing scheme is inefficient because multiple wobble cycles are required to convey an active or inactive bit. As FIG. **2** illustrates, the wobble may include periodic occurrences of square waves called "Alternating Fine Clock Marks" ("AFCMs") that provides timing information. Each AFCM has an amplitude 3.5 to 7 times greater than the amplitude of the wobble. Each AFCM is inverted from the AFCM in the adjacent tracks. The AFCMs are spaced equally apart around the tracks to provide timing information. For further details, see for example Standard ECMA-274 from ECMA, which is hereby incorporated by reference.

Radial and rotational information may further be communicated through a series of pits ("land pre-pits") on the land areas between the tracks. Land pre-pits create cross talk into the data because optical drives detect the land pre-pits in the land areas between the tracks. Closely aligned land pre-pits in adjacent tracks also create cancellation problems as their presence cancels their detection by optical drives. Land pre-pits further require a 2-beam mastering system that can generate the groove and the land pre-pits simultaneously during the mastering of the optical disks. For further details, see for example Standard ECMA-279 from ECMA, which is hereby incorporated by reference.

A master optical disk is formed by coating a glass substrate with a photoresist, exposing the photoresist to a laser beam recorder, developing the photoresist, removing the photoresist, and coating the remaining material with a thin seed-layer of metal to form the master optical disk. These steps are known as "mastering". A stamper is made by electroplating nickel onto the master and removing the nickel from the master to form the stamper. These steps are known as "electroforming". Optical disks are produced from the stamper by placing the stamper in a mold cavity of an injection molding press and injecting molten plastic into the mold. The resulting molded disks have an imprint of the stamper. These steps are known as "molding". The molded disks are then coated with a variety of thin films (e.g., reflective layers, active layers, overcoats) depending on their type. The molded disks can be coated by a variety of methods, such as sputtering, spin coating, and chemical vapor deposition (CVD). Manufacturers of optical disks include Ritek of Taiwan, Sony of Japan, Matsushita of Japan, and Imation of Oakdale, Minn.

SUMMARY

Marks ("high frequency wobble marks" or "HFWMs") in the wobble of the groove on an optical disk are used to store data. The presence of a HFWM at a negative zero crossing of the wobble indicates an active bit while the absence of a HFWM at a negative zero crossing of the wobble indicates an inactive bit. Alternatively, the presence of a HFWM at a positive zero crossing of the wobble indicates an active bit while the absence of a HFWM at a positive zero crossing of the wobble indicates an inactive bit. A matched filter outputs an active signal to a decoder logic when the matched filter detects the shape of a HFWM. The decoder logic records an active bit when it receives an active signal from the matched filter. If the logic device does not receive an active signal from the matched filter within a wobble cycle, the logic device records an inactive bit. The stored bits include information such as a synchronization mark used for timing, physical sector information including a physical sector address, and an error correction code for correcting misread of the physical sector information.

Other aspects and advantages of the present invention will become apparent from the following detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. **1** and **2** illustrate a groove in a prior art optical disk.

FIG. **3** illustrates a high frequency wobble mark in accordance to one embodiment of the present invention.

FIG. **4** illustrates high frequency wobble marks in adjacent tracks.

FIG. **5** is a block diagram illustrating an optical drive that detects the high frequency wobble marks of FIG. **2**.

FIG. **6** illustrates a schematic of logic **33** of FIG. **5**.

FIG. **7** illustrates a timing diagram of matched filter **32**, logic **33**, and wobble detector **34** of FIG. **5**.

FIG. **8** illustrates the data stored by high frequency wobble marks of FIG. **2**.

FIG. **9** illustrates high frequency wobble marks in accordance to one embodiment of the present invention.

Use of the same reference symbols in different drawings indicates similar or identical items.

DETAILED DESCRIPTION

In accordance with one aspect of the invention, the presence of a mark in a wobble cycle ("high frequency wobble mark" or "HFWM") indicates an active bit (e.g., a "1" bit") and the absence of a HFWM indicates an inactive bit (e.g., a "0" bit). The active and inactive bits ("HFWM bits") are decoded to generate data bits. During the manufacturing of an optical disk, a conventional mastering equipment inserts the HFWMs in the wobble of the tracks to save data such a synchronization mark, physical sector information, and an error correction code. The conventional mastering equipment can make a conventional disk stamper from the above-described optical disk and use the conventional disk stamper to make optical disks in large quantity. The optical disk includes, for example, a small optical disk 32 mm in diameter. Optical drives read the synchronization mark and the physical sector information from optical disks to determine the appropriate sectors for read and write operations. Optical drives read the error correction code to detect and correct errors from the reading of the physical sector information.

In one embodiment illustrated in FIG. **3**, HFWMs have a sinusoidal shape with an amplitude equal to the amplitude of the wobble. The amplitude is, for example, 20 nanometers from peak to peak. Each sector of the optical disk includes, for example, 248 wobble cycles. Thus, 248 HFWM bits may be inserted into the wobble cycles.

In one implementation illustrated in FIG. **4**, the mastering equipment inserts HFWMs at points on the optical disk where the wobble would cross the centerline of the tracks from a region closer to the inner diameter to a region closer to the outer diameter ("negative zero crossings"). In FIG. **4**, the would-be paths of the wobble without the HFWMs are illustrated as dashed lines. The negative zero crossings are labeled as crossings 1 through 4 for track i and crossings 5 to 8 for track i+n. In this implementation, the absence of HFWMs at negative zero crossings indicate inactive HFWM bits. In this implementation, optical drives detect the positive zero crossings of the wobble to determine wobble cycles, the wobble frequencies, and the linearly velocities of the tracks.

In another implementation, the mastering equipment inserts HFWMs at points on the optical disk where the wobble would cross the centerline of the tracks from a region closer to the outer diameter to a region closer to the inner diameter ("positive zero crossings"). In this implementation, the absence of HFWMs at positive zero crossings indicate inactive HFWM bits. In this implementation, optical drives detect the negative zero crossings of the wobble to determine the wobble cycles, wobble frequencies, and the linear velocities of the tracks.

The HFWMs may have a frequency, for example, three to five times the frequency of the wobble. It is preferred to choose a frequency that is far from the frequencies of the data so there is less cross talk between HFWM detection and data detection. The HFWMs cannot have the same frequency as the wobble because optical drives will not be able to detect the zero crossings of the wobble to determine the wobble cycles, the wobble frequencies, and the linear velocities of the tracks. The HFWMs cannot have a frequency that is too large because the mastering equipment may not have the precision to generate the shape of such HFWMs. The frequency limit of the mastering equipment is, for example, 10^6 Hz. Furthermore, optical drives may not have the precision to detect such HFWMs.

In one implementation, each HFWM is in phase with the HFWMs in adjacent tracks. Since the amplitude of the HFWMs is no greater than the amplitude of the wobble, the cross talk between HFWMs in adjacent tracks is no greater than the cross talk between the wobbles of the tracks. Using HFWMs that are in phase allows simpler manufacturing processes as compared to using marks that are not in phase with adjacent marks.

FIG. **5** illustrates a schematic diagram of an optical drive **20**. Optical drive **20** includes a laser diode **21** that emits concentrated light that passes through a collimator lens **22**, a polarizing beam splitter **23**, a quarter-wave plate **24**, and an objective lens **25**. The light is reflected off an optical disk **26** and, with its polarization changed by passing twice through quarter-wave plate **24**, is deflected by polarizing beam splitter **23** to a photo detector **27**. Laser diode **21**, collimator lens **22**, polarizing beam splitter **23**, quarter-waveplate **24**, objective lens **25**, and photo detector **27** are collectively called an optical pickup unit (OPU).

FIG. **5** also provides a top view of the photo detector **27**. Photo detector **27** outputs, for example, currents Ia, Ib, Ic, and Id according to the intensity of the light that is detected in each of four quadrants a, b, c, and d of photo detector **27**. The intensity of the light varies due to the wobble of the track. For example, as optical disk **26** spins and a peak of the wobble passes through quadrants a and b, the sum of currents Ia and Ib (i.e., current **I1**) reaches a maximum as light is reflected into quadrants a and b. Similarly, when a valley of the wobble passes through quadrants c and d, the sum of currents Ic and Id (i.e., current **I2**) reaches a maximum as light is reflected into quadrant c and d. The maximum of current I1 is 180 degrees out of phase with the maximum of current **I2**. Of course, a photo detector with a different number of elements and output currents may be used.

A direct current coupled amplifier **30** adds currents Ia and Ib and outputs current **I1**. A direct current coupled amplifier **31** adds the currents Ic and Id and outputs current **I2**. A direct current coupled amplifier **28** adds currents **I1** and **I2** and outputs a current **I3**, which represents the data that is stored on a track. A direct current coupled amplifier **29** subtracts current **I2** from current **I1** and outputs a current **I4**, which represents the wobble of the track. The output of direct current coupled amplifier **29** is coupled to an analog-to-digital converter **41**. Analog-to-digital converter **41** converts the amplitude of current **I4** to discrete values at a specified interval, thereby creating a stream of digital values. Analog-to-digital converter **41** passes these values to a matched filter **32**, a wobble detector **34**, and a synchronization detector **40**.

Matched filter **32** processes the stream of digital values to look for a HFWM mark. When matched filter **32** finds a HFWM mark, matched filter **32** outputs an active signal (e.g., a pulse) to a logic **33** (described later) for conversion to a HFWM bit. Matched filter **32** is known to one skilled in the art and is for example described in "Digital and Analog Communication Systems" by Leon W. Couch II, 1990, p. 497 to 508.

Wobble detector **34** processes the stream of digital values to extract the wobble frequency. Wobble detector **34** phase locks to the wobble frequency and generates a square wave clock signal. Wobble detector **34** passes this clock signal to

logic **33**, which uses the clock signal and the signals from matched filter **32** to extract the HFWM bits (described later). A decoder **43** also uses this clock signal to divide the HFWM bits into frames of encoded bits that decoder **43** decodes to data bits according to the coding scheme described below in reference to Tables 1 and 2.

Synchronization detector **40** processes the input digital stream to look for the synchronization pattern that is encoded at the start of each information field (described later). When synchronization detector **40** finds the synchronization pattern, it outputs an active signal (e.g., a pulse) to decoder **43**, indicating to decoder **43** to start decoding the HFWM bits to data bits, build the resulting data bits into data bytes **42**, and store data bytes **42** in a memory **35** for later use by a system microprocessor.

FIG. **6** illustrates one embodiment of logic **33**. Logic **33** includes a D flip-flop **45** that has its data input terminal **46** coupled to an active signal (e.g., a "1") and its clock input terminal **48** coupled to the output line of matched filter **32**. Thus, each time matched filter **32** detects a HFWM and outputs an active signal, D flip-flop **45** outputs an active signal onto its output line **47**.

D flip-flop **45** also has a reset input terminal **49** coupled to the wobble clock signal from wobble detector **34**, which is delayed by a buffer **54**. Thus, a delayed active wobble clock signal resets D flip-flop **45**. Once reset, D flip-flop **45** outputs an inactive signal (e.g., a "0") until it receives another active signal at its clock input terminal **48** from matched filter **32**.

Output line **47** of D flip-flop **45** is coupled to a data input terminal **51** of a D flip-flop **50**. On receipt of an active wobble clock signal from wobble detector **34** on clock input terminal **53**, D flip-flop **50** outputs the data it receives on terminal **51** from D flip-flop **45** to an output line **52** to decoder **43**. Decoder **43** decodes the data it receives from D flip-flop **50** to data bits.

FIG. **7** illustrates a timing diagram highlighting the operations of matched filter **32**, wobble detector **34**, and logic **33**. Current I4 represents the wobble of the groove. As FIG. **7** illustrates, the wobble goes through cycles 1 to 5 respectively from t1 to t2, t2 to t3, t3 to t4, t4 to t5, and t5 to t6. Each time wobble detector **34** detects a rising edge in the wobble, wobble detector **34** generates an active wobble clock signal. For example in cycle 2, wobble detector **34** outputs an active wobble clock signal **55** in response to a rising edge **54**.

Each time matched filter **32** detects a HFWM mark in the wobble, matched filter **32** outputs an active signal. For example in cycle 2, matched filter **32** outputs an active signal **57** when it detects HFWM **56**. Each time logic **33** receives an active wobble clock signal, logic **33** outputs an active signal if it has received an active signal from matched filter **32** in the last wobble cycle. For example in cycle 2, D flip-flop **45** of logic **33** (FIG. **6**) receives an active signal **57** at clock terminal **48** and thus outputs an active signal on line **47** to terminal **51** of D flip-flop **50**. D flip-flop **45** continues to output the active signal on line **47** until it is reset. In cycle 3, D flip-flop **50** outputs an active signal **59** because it receives wobble clock signal **58** at clock terminal **53** and the active signal from line **47** at data terminal **51**. A delayed wobbled clock signal **58** resets D flip-flop **45**. After being reset in cycle 3, D flip-flop **45** receives an inactive signal **60** from matched filter **32** at clock terminal **48** and thus outputs an inactive signal on line **47** to terminal **51** of D flip-flop **50**. In cycle 4, D flip-flop **50** outputs an inactive signal **62** because it receives wobble clock signal **61** at clock terminal **53** and an inactive signal from D flip-flop **45** at data terminal **51**.

FIG. **8** illustrates the information stored as HFWM bits. This information includes a synchronization mark **36**, physical sector information **37**, and a conventional error correction code **38**, collectively known as an information field. Physical sector information **37** includes a unique physical sector address. Physical sector information **37** is, for example, 4 bytes. Error correction code **38** is, for example, 2 bytes. The error correction code is, for example, ID error detection code ("IED") well understood by one skilled in the art and described in Section 13.1.2 of Standard ECMA-274.

The system microprocessor that controls optical drive **20** reads data bytes **42** in memory **35** to read physical sector information **37**. The system microprocessor uses the detection of synchronization mark **36** and the read of physical sector information **37** to read from and write to the appropriate sectors on optical disk **26**. The system microprocessor uses the error correction code to detect and correct errors from the read of the physical sector address. Alternatively, a hardware instead of the system microprocessor can be used to detect and correct errors in physical sector information **37**.

In one implementation, a data bit is encoded in two consecutive HFWM bits (e.g., a 2-bit frame of HFWM bits) in accordance with Table 1.

TABLE 1

HFWM Bits	Data Bit
10	0
01	1

In this implementation, a synchronization mark is identified by the following sequence of HFWM bits: 00001111.

In another implementation, mastering equipment uses an encoding scheme to change each 4 data bits to 15 code bits (e.g., a 15 bit frame of HFWM bits) where the 15 code bits are selected from a maximum length binary sequence (MLBS) generated from a four bit primary polynomial of "1001". MLBS is known to one skilled in the art and is for example described in "Error-Correcting Codes" by Peterson et al., 1991, p. 222 to 223. By using 15 code bits selected from a MLBS, the chances of reading error are reduced as the 15 code bits are distinctly different from one and another. Table 2 illustrates frames of code bits generated from the MLBS and the data bits they represent. A negative sign before the code name designates a frame of code bits generated by inverting the frame of code bits of a corresponding positive code name.

TABLE 2

Data Bit Values	Code Bits	Code Name
0000	010110010001111	V0
0001	110101100100011	V2
0010	111101011001000	V4
0011	001111010110010	V6
0100	100011110101100	V8
0101	001000111101011	V10
0110	110010001111010	V12
0111	101100100011110	V14
1000	101001101110000	-V0
1001	001010011011100	-V2
1010	000010100110111	-V4
1011	110000101001101	-V6
1100	011100001010011	-V8

TABLE 2-continued

Data Bit Values	Code Bits	Code Name
1101	110111000010100	-V10
1110	001101110000101	-V12
1111	010011011100001	-V14

During manufacturing of optical disks, the mastering equipment uses code bits from Table 2 to encode HFWM bits for identification data **37** and error correction code **38** in the wobble. In one implementation, a 63 bit MLBS is generated from a six bit primary polynomial of "100001". This 63 bit MLBS is used as synchronization mark **36**. The 63 bit MLBS is, for example, "010101100110-111011010010011100010111100101000110000100000111-111". By using a different MLBS for synchronization mark **36**, the encoded identification data **37** and error correction code **38** are less likely to be read as synchronization mark **36**. One skilled in the art will recognize that other MLBS may be used. Furthermore, other encoding schemes may be used to decrease the chances of reading error.

In one implementation illustrated in FIG. **9**, multiple HFWMs are inserted into a single wobble cycle. For example, three HFWMs are inserted into a single wobble cycle. In this implementation, matched filter **32** is programmed to detect (match) the shape of the three HFWMs and output an active signal.

Although the invention has been described with reference to particular embodiments, the description is only an example of the invention's application and should not be taken as a limitation. In particular, other waveforms of HFWMs can be used. In addition, other types of encoding schemes may be used to encode the data. Various other adaptations and combinations of features of the embodiments disclosed are within the scope of the invention as defined by the following claims.

We claim:

1. A spiral groove in an optical disk comprising:

a wobble, the wobble being a sinusoidal deviation from the centerline of the groove; and

a first plurality of sinusoidal marks located at zero crossings of the wobble, each sinusoidal mark being formed from a sinusoidal deviation of the groove;

wherein the presence of one of the first plurality of sinusoidal marks at one of the zero crossings represents an active bit and the absence of one of the first plurality of sinusoidal marks at one of the zero crossings represents an inactive bit, a plurality of the active bits and the inactive bits encoded to form an information field including at least address information.

2. The groove of claim **1**, wherein the first plurality of sinusoidal marks has the same amplitude as the wobble.

3. The groove of claim **1**, wherein the first plurality of sinusoidal marks has a frequency greater than the frequency of the wobble.

4. The groove of claim **3**, wherein the first plurality of sinusoidal marks has a frequency 3 to 5 times the frequency of the wobble.

5. The groove of claim **1**, further comprising a second plurality of sinusoidal marks located at zero crossings of the wobble having a different phase than the first plurality of sinusoidal marks.

6. The groove of claim **1**, further comprising a second plurality of sinusoidal marks located at zero crossings of the wobble having the same phase as the first plurality of sinusoidal marks.

7. The groove of claim **6**, wherein first plurality of sinusoidal marks and the second plurality of sinusoidal marks are adjacent to each other such that they are aligned in a radial direction.

8. The groove of claim **1**, wherein the zero crossings are negative zero crossings.

9. The groove of claim **1**, wherein the zero crossings are positive zero crossings.

10. The groove of claim **1**, further comprising more than one sinusoidal mark in a single cycle of the wobble.

11. The groove of claim **1**, wherein the address information includes at least a synchronization mark, a sector information, and an error correction code.

* * * * *

UNITED STATES DISTRICT COURT, CENTRAL DISTRICT OF CALIFORNIA
CIVIL COVER SHEET

I (a) PLAINTIFFS (Check box if you are representing yourself ☐)

ADVANCED OPTICAL TRACKING, LLC

DEFENDANTS

DELKIN DEVICES, INC.

(b) Attorneys (Firm Name, Address and Telephone Number. If you are representing yourself, provide same.)

H. H. (Shashi) Kewalramani
LEE, JORGENSEN, PYLE & KEWALRAMANI, PC
440 W 1st Street, Suite 205, Tustin, CA 92780 (714) 252-6611

Attorneys (If Known)

II. BASIS OF JURISDICTION (Place an X in one box only.)

☐ 1 U.S. Government Plaintiff
☑ 3 Federal Question (U.S. Government Not a Party)
☐ 2 U.S. Government Defendant
☐ 4 Diversity (Indicate Citizenship of Parties in Item III)

III. CITIZENSHIP OF PRINCIPAL PARTIES - For Diversity Cases Only
(Place an X in one box for plaintiff and one for defendant.)

	PTF	DEF		PTF	DEF
Citizen of This State	☐ 1	☐ 1	Incorporated or Principal Place of Business in this State	☐ 4	☐ 4
Citizen of Another State	☐ 2	☐ 2	Incorporated and Principal Place of Business in Another State	☐ 5	☐ 5
Citizen or Subject of a Foreign Country	☐ 3	☐ 3	Foreign Nation	☐ 6	☐ 6

IV. ORIGIN (Place an X in one box only.)

☑ 1 Original Proceeding ☐ 2 Removed from State Court ☐ 3 Remanded from Appellate Court ☐ 4 Reinstated or Reopened ☐ 5 Transferred from another district (specify): ☐ 6 Multi-District Litigation ☐ 7 Appeal to District Judge from Magistrate Judge

V. REQUESTED IN COMPLAINT: **JURY DEMAND:** ☑ Yes ☐ No (Check 'Yes' only if demanded in complaint.)

CLASS ACTION under F.R.C.P. 23: ☐ Yes ☐ No ☐ **MONEY DEMANDED IN COMPLAINT: $**_____

VI. CAUSE OF ACTION (Cite the U.S. Civil Statute under which you are filing and write a brief statement of cause. Do not cite jurisdictional statutes unless diversity.)

35 U.S.C. §§ 1, et seq. - Patent Infringement

VII. NATURE OF SUIT (Place an X in one box only.)

OTHER STATUTES
☐ 400 State Reapportionment
☐ 410 Antitrust
☐ 430 Banks and Banking
☐ 450 Commerce/ICC Rates/etc.
☐ 460 Deportation
☐ 470 Racketeer Influenced and Corrupt Organizations
☐ 480 Consumer Credit
☐ 490 Cable/Sat TV
☐ 810 Selective Service
☐ 850 Securities/Commodities/ Exchange
☐ 875 Customer Challenge 12 USC 3410
☐ 890 Other Statutory Actions
☐ 891 Agricultural Act
☐ 892 Economic Stabilization Act
☐ 893 Environmental Matters
☐ 894 Energy Allocation Act
☐ 895 Freedom of Info. Act
☐ 900 Appeal of Fee Determination Under Equal Access to Justice
☐ 950 Constitutionality of State Statutes

CONTRACT
☐ 110 Insurance
☐ 120 Marine
☐ 130 Miller Act
☐ 140 Negotiable Instrument
☐ 150 Recovery of Overpayment & Enforcement of Judgment
☐ 151 Medicare Act
☐ 152 Recovery of Defaulted Student Loan (Excl. Veterans)
☐ 153 Recovery of Overpayment of Veteran's Benefits
☐ 160 Stockholders' Suits
☐ 190 Other Contract
☐ 195 Contract Product Liability
☐ 196 Franchise

REAL PROPERTY
☐ 210 Land Condemnation
☐ 220 Foreclosure
☐ 230 Rent Lease & Ejectment
☐ 240 Torts to Land
☐ 245 Tort Product Liability
☐ 290 All Other Real Property

TORTS
PERSONAL INJURY
☐ 310 Airplane
☐ 315 Airplane Product Liability
☐ 320 Assault, Libel & Slander
☐ 330 Fed. Employers' Liability
☐ 340 Marine
☐ 345 Marine Product Liability
☐ 350 Motor Vehicle
☐ 355 Motor Vehicle Product Liability
☐ 360 Other Personal Injury
☐ 362 Personal Injury-Med Malpractice
☐ 365 Personal Injury-Product Liability
☐ 368 Asbestos Personal Injury Product Liability

IMMIGRATION
☐ 462 Naturalization Application
☐ 463 Habeas Corpus-Alien Detainee
☐ 465 Other Immigration Actions

TORTS
PERSONAL PROPERTY
☐ 370 Other Fraud
☐ 371 Truth in Lending
☐ 380 Other Personal Property Damage
☐ 385 Property Damage Product Liability

BANKRUPTCY
☐ 422 Appeal 28 USC 158
☐ 423 Withdrawal 28 USC 157

CIVIL RIGHTS
☐ 441 Voting
☐ 442 Employment
☐ 443 Housing/Accommodations
☐ 444 Welfare
☐ 445 American with Disabilities - Employment
☐ 446 American with Disabilities - Other
☐ 440 Other Civil Rights

PRISONER PETITIONS
☐ 510 Motions to Vacate Sentence Habeas Corpus
☐ 530 General
☐ 535 Death Penalty
☐ 540 Mandamus/ Other
☐ 550 Civil Rights
☐ 555 Prison Condition

FORFEITURE / PENALTY
☐ 610 Agriculture
☐ 620 Other Food & Drug
☐ 625 Drug Related Seizure of Property 21 USC 881
☐ 630 Liquor Laws
☐ 640 R.R. & Truck
☐ 650 Airline Regs
☐ 660 Occupational Safety /Health
☐ 690 Other

LABOR
☐ 710 Fair Labor Standards Act
☐ 720 Labor/Mgmt. Relations
☐ 730 Labor/Mgmt. Reporting & Disclosure Act
☐ 740 Railway Labor Act
☐ 790 Other Labor Litigation
☐ 791 Empl. Ret. Inc. Security Act

PROPERTY RIGHTS
☐ 820 Copyrights
☑ 830 Patent
☐ 840 Trademark

SOCIAL SECURITY
☐ 861 HIA (1395ff)
☐ 862 Black Lung (923)
☐ 863 DIWC/DIWW (405(g))
☐ 864 SSID Title XVI
☐ 865 RSI (405(g))

FEDERAL TAX SUITS
☐ 870 Taxes (U.S. Plaintiff or Defendant)
☐ 871 IRS-Third Party 26 USC 7609

FOR OFFICE USE ONLY: Case Number: **SACV13-01418 JVS (DFMx)**

AFTER COMPLETING THE FRONT SIDE OF FORM CV-71, COMPLETE THE INFORMATION REQUESTED BELOW.

UNITED STATES DISTRICT COURT, CENTRAL DISTRICT OF CALIFORNIA
CIVIL COVER SHEET

VIII(a). IDENTICAL CASES: Has this action been previously filed in this court and dismissed, remanded or closed? ☑ No ☐ Yes
If yes, list case number(s): _____

VIII(b). RELATED CASES: Have any cases been previously filed in this court that are related to the present case? ☐ No ☑ Yes
If yes, list case number(s): cases being filed by the plaintiff concurrently on this date

Civil cases are deemed related if a previously filed case and the present case:
(Check all boxes that apply) ☑ A. Arise from the same or closely related transactions, happenings, or events; or
☑ B. Call for determination of the same or substantially related or similar questions of law and fact; or
☑ C. For other reasons would entail substantial duplication of labor if heard by different judges; or
☑ D. Involve the same patent, trademark or copyright, and one of the factors identified above in a, b or c also is present.

IX. VENUE: (When completing the following information, use an additional sheet if necessary.)

(a) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which **EACH** named plaintiff resides.
☐ Check here if the government, its agencies or employees is a named plaintiff. If this box is checked, go to item (b).

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
	Delaware

(b) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which **EACH** named defendant resides.
☐ Check here if the government, its agencies or employees is a named defendant. If this box is checked, go to item (c).

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
	San Diego

(c) List the County in this District; California County outside of this District; State if other than California; or Foreign Country, in which **EACH** claim arose.
Note: In land condemnation cases, use the location of the tract of land involved.

County in this District:*	California County outside of this District; State, if other than California; or Foreign Country
Orange	

*** Los Angeles, Orange, San Bernardino, Riverside, Ventura, Santa Barbara, or San Luis Obispo Counties**
Note: In land condemnation cases, use the location of the tract of land involved

X. SIGNATURE OF ATTORNEY (OR PRO PER): _____ **Date** September 12, 2013

Notice to Counsel/Parties: The CV-71 (JS-44) Civil Cover Sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law. This form, approved by the Judicial Conference of the United States in September 1974, is required pursuant to Local Rule 3-1 is not filed but is used by the Clerk of the Court for the purpose of statistics, venue and initiating the civil docket sheet. (For more detailed instructions, see separate instructions sheet.)

Key to Statistical codes relating to Social Security Cases:

Nature of Suit Code	Abbreviation	Substantive Statement of Cause of Action
861	HIA	All claims for health insurance benefits (Medicare) under Title 18, Part A, of the Social Security Act, as amended. Also, include claims by hospitals, skilled nursing facilities, etc., for certification as providers of services under the program. (42 U.S.C. 1935FF(b))
862	BL	All claims for "Black Lung" benefits under Title 4, Part B, of the Federal Coal Mine Health and Safety Act of 1969. (30 U.S.C. 923)
863	DIWC	All claims filed by insured workers for disability insurance benefits under Title 2 of the Social Security Act, as amended; plus all claims filed for child's insurance benefits based on disability. (42 U.S.C. 405(g))
863	DIWW	All claims filed for widows or widowers insurance benefits based on disability under Title 2 of the Social Security Act, as amended. (42 U.S.C. 405(g))
864	SSID	All claims for supplemental security income payments based upon disability filed under Title 16 of the Social Security Act, as amended.
865	RSI	All claims for retirement (old age) and survivors benefits under Title 2 of the Social Security Act, as amended. (42 U.S.C. (g))

AO 440 (Rev. 12/09) Summons in a Civil Action

UNITED STATES DISTRICT COURT

for the

Central District of California

Advanced Optical Tracking, LLC

Plaintiff

v.

Delkin Devices, Inc.

Defendant

Civil Action No. **SACV13-01418 JVS (DFMx)**

SUMMONS IN A CIVIL ACTION

To: *(Defendant's name and address)* Delkin Devices, Inc.
c/o Martin J. Wood
13350 Kirkham Way
Poway, CA 92064

A lawsuit has been filed against you.

Within 21 days after service of this summons on you (not counting the day you received it) — or 60 days if you are the United States or a United States agency, or an officer or employee of the United States described in Fed. R. Civ. P. 12 (a)(2) or (3) — you must serve on the plaintiff an answer to the attached complaint or a motion under Rule 12 of the Federal Rules of Civil Procedure. The answer or motion must be served on the plaintiff or plaintiff's attorney, whose name and address are:

H. H. Kewalramani
LEE, JORGENSEN, PYLE & KEWALRAMANI, PC
440 W. 1st Street
Suite 205
Tustin, California 92780

If you fail to respond, judgment by default will be entered against you for the relief demanded in the complaint. You also must file your answer or motion with the court.

CLERK OF COURT

Date: 9-12-13

A. Gonzalez
Signature of Clerk or Deputy Clerk
Adrianna Gonzalez

1225

Civil Action No.

PROOF OF SERVICE

(This section should not be filed with the court unless required by Fed. R. Civ. P. 4 (l))

This summons for *(name of individual and title, if any)* _____

was received by me on *(date)* _____ .

❒ I personally served the summons on the individual at *(place)* _____

_____ on *(date)* _____ ; or

❒ I left the summons at the individual's residence or usual place of abode with *(name)* _____

_____ , a person of suitable age and discretion who resides there,

on *(date)* _____ , and mailed a copy to the individual's last known address; or

❒ I served the summons on *(name of individual)* _____ , who is

designated by law to accept service of process on behalf of *(name of organization)* _____

_____ on *(date)* _____ ; or

❒ I returned the summons unexecuted because _____ ; or

❒ Other *(specify):*

My fees are $ _____ for travel and $ _____ for services, for a total of $ 0.00 .

I declare under penalty of perjury that this information is true.

Date: _____

_____

Server's signature

_____

Printed name and title

_____

Server's address

Additional information regarding attempted service, etc:

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

NOTICE OF ASSIGNMENT TO UNITED STATES JUDGES

This case has been assigned to District Judge James V. Selna and the assigned Magistrate Judge is Douglas F. McCormick .

The case number on all documents filed with the Court should read as follows:

SACV13-01418 JVS (DFMx)

Pursuant to General Order 05-07 of the United States District Court for the Central District of California, the Magistrate Judge has been designated to hear discovery related motions.

All discovery related motions should be noticed on the calendar of the Magistrate Judge.

Clerk, U. S. District Court

September 12, 2013
Date

By A. Gonzalez
Deputy Clerk

NOTICE TO COUNSEL

A copy of this notice must be served with the summons and complaint on all defendants (if a removal action is filed, a copy of this notice must be served on all plaintiffs).

Subsequent documents must be filed at the following location:

☐ Western Division
312 N. Spring Street, G-8
Los Angeles, CA 90012

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