

OFF-AXIS OPTICAL PICKUP MECHANISM FOR OPTICAL STORAGE DRIVES

FIELD OF THE INVENTION

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The present invention relates generally to the field of optical storage drives, and particularly to an optical pickup mechanism for optical storage drives.

10 BACKGROUND OF THE INVENTION

Optical storage drives such as CD-ROM and DVD drives are well known in the art. An important element in such drives is the optical pickup unit (OPU). Typically, the OPU comprises laser light emitting diode, light
15 detector, optical lens, and a voice coil. The voice coil is used to position the lens for proper focusing and tracking during a read/write operation. To be able to access different data tracks in an optical storage device, e.g., CD-ROM, the entire OPU has to move radially to the storage device on a linear sliding rail system. The OPU and the mechanism for positioning the OPU
20 shall collectively be referred to as an optical pickup mechanism.

Although this current configuration where the entire OPU moves on a linear sliding rail system has been used successfully for many years, it has its limitations, particularly in light of the current shorter data access time requirement. The OPU is a relatively bulky device which slows down the
25 movement of the entire mechanism, and consequently, the time it takes to move from one track to a different track is increased. Although attempts have been made to increase the mobility of the OPU by applying more

powerful motors, this has led to increased vibration, particularly in the voice coil which is most susceptible. Hence, the time saved from increased acceleration is offset by the time it takes to stabilize the unit before the accessed data can be read or written.

5 To have a reliable optical pickup mechanism, the mechanism must be capable of high acceleration without incurring vibrational problems. Since such a mechanism would greatly shorten the data access time of the current optical storage drives, it is easy to why such a mechanism would be highly desirable and useful in the optical storage drive industry.

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OBJECT OF THE INVENTION

 It is therefore an object of the present invention to provide an optical pickup mechanism which would mechanically facilitate a fast data track
15 access in a optical storage drive.

 It is another object of the present invention to provide an optical pickup mechanism which would minimize induced vibration during high acceleration.

 It is yet another object of the present invention to provide an optical
20 pickup mechanism which is simpler in design, relatively inexpensive to manufacture, and is reliable.

SUMMARY OF THE INVENTION

25 The present invention basically comprises an optical pickup unit (OPU) connected to an optical pipe. To protect against dust and to provide

structural stability for the mechanism, a baffle surrounds the OPU and a cover is placed on top of the baffle. To be able to rotate the optical pipe, a first gear is attached to the pipe. The first gear is meshed with a second gear which is connected to a motor.

5 The optical pipe comprises a hollow tube having a channel. The tube is bent at an angle in two places (here at 90 degrees) though it can be bent at fewer or more places or at a different angle depending on how one wants to direct the light beam. At each of the bent corners, a reflective mirror, is placed to direct the light to the lens element. The pipe should preferably be
10 made of light and durable material to reduce its overall moment of inertia.

 The OPU is a standard item currently available. The eye of the OPU for emanating and receiving light beams is placed directly under the opening of the hollow tube such that any light emanating from the OPU directed to the lens element via the mirrors, and any light reflected back into
15 the lens element is directed back to the OPU eye.

 The optical pipe can rotate controllably via the first and second gears and the motor. To be able to access all the tracks on an optical storage device, the pipe should be situated adjacent to the storage device such that the end of the pipe with the lens element of cuts across every track as the
20 pipe is rotated through its full range of motion. By combining the rotational movement of the storage device and the spinning action of the optical pipe, any segment of data from the storage device can be uniquely accessed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective diagram illustrating the present off-axis optical pickup mechanism.

FIG. 2 is a perspective diagram illustrating individual elements
5 comprising the present off-axis optical pickup mechanism.

FIG. 3 is a cross-sectional view of the optical pipe of the present off-axis optical pickup mechanism.

10 DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 illustrates the preferred embodiment of the present optical pickup mechanism 1. As can be better seen in FIG. 2, the present invention basically comprises an optical pickup unit (OPU) 2 connected to an optical
15 pipe 4. To protect against dust and to provide structural stability for the mechanism, a baffle 6 surrounds the OPU and a cover 8 is placed on top of the baffle 6. The present invention, however, may still function without the baffle 6 and the cover 8 in place so long as the optical pipe 4 is properly engaged with the OPU. To be able to rotate the optical pipe 4, a first gear
20 10 is attached to the pipe 4. The first gear 10 is meshed with the second gear 12 which is connected to a motor 14.

In referring to FIG. 3, the optical pipe 4 comprises a hollow tube 18 having a channel 17. The tube is bent at an angle in two places (here 90 degrees), 18a and 18b, though it can be bent at fewer or more places or at a
25 different angle depending on how one wants to direct the light beam. At each of the bent corners 18a and 18b, a reflective mirror, 20a and 20b, is

placed to direct the light to the lens element 22. The pipe 4 should preferably be made of light and durable material to reduce its overall moment of inertia. Although mirrors are used in this preferred embodiment, it should be appreciated other means for deflecting light other than mirrors are possible, and, thus, they are contemplated within the scope of this present invention.

The OPU 2 is a standard item currently available. The eye 16 of the OPU for emanating and receiving light beams is placed directly under the opening 24 of the hollow tube 18 such that any light emanating from the OPU 2 directed to the lens element 22 via the mirrors 20a and 20b, and any light reflected back into the lens element 22 is directed back to the OPU eye 16.

The optical pipe 4 can rotate controllably via the gears 10 and 12 and the motor 14. Other means for controllably rotating the optical pipe 4 are clearly available. To be able to access all the tracks on an optical storage device, the pipe 4 should be situated adjacent to the storage device 26, as shown in FIG. 1, such that the end of the pipe 4 with the lens element 22 of cuts across every track as the pipe 4 is rotated through its full range of motion. By combining the rotational movement of the storage device 26 and the spinning action of the optical pipe 4, any segment of data from the storage device 26 can be uniquely accessed.

The advantages of the present mechanism over the previous designs are many. Particularly, the present mechanism is able to reduce the time to access a new track because the optical pipe 4 can be accelerated at a high rate due to its low moment of inertia. Unlike the previous design where the entire optical pickup unit had to move, here, only the pipe 4, and not the

entire OPU, moves. This configuration, moreover, eliminates the vibrational problem associated with the previous design because the element which is most susceptible to induced vibration, the OPU, remains stationary. Finally, the present design is much simpler and relatively inexpensive to manufacture because it does not require a complex rail system, but simply rotates on a single axis.

The present invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The presently disclosed embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims and all changes which come within the meaning and range of equivalency of the claims are, therefore, to be embraced therein.

CLAIMS**We Claim:**

- 1 1. An off-axis optical pickup mechanism for accessing data tracks of an
2 optical storage device in an optical storage drive comprising:
3 an optical pickup unit, said optical pickup unit having an eye for
4 emanating and receiving a light beam;
5 an optical pipe having a channel for directing the light beam, said
6 channel having a lens element at one end and an opening at second end,
7 said optical pipe rotatably positioned over said optical pickup unit such that
8 said opening can receive the light beam from said eye of the optical pickup
9 unit; and
10 a mechanism for controllably rotating and positioning said optical
11 pipe such that said lens element can be placed in position to access said
12 data tracks of said optical storage device.
- 1 2. The off-axis optical pickup mechanism as recited in Claim 1 further
2 comprising a baffle and cover.
- 1 3. The off-axis optical pickup mechanism as recited in Claim 1 wherein
2 said mechanism for controllably rotating and positioning said optical pipe
3 comprises a first gear attached to said optical pipe, a second gear meshed
4 with said first gear, and a motor attached to said second gear.
- 1 4. The off-axis optical pickup mechanism as recited in Claim 1 wherein
2 said optical pipe is bent at two locations at 90 degrees, said optical pipe
3 having a mirror at each of the bent locations to deflect the light beam.