

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
26 July 2007 (26.07.2007)

PCT

(10) International Publication Number
WO 2007/084802 A2

(51) International Patent Classification:
G06K 7/10 (2006.01)

(21) International Application Number:
PCT/US2007/060138

(22) International Filing Date: 5 January 2007 (05.01.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11/336,679 20 January 2006 (20.01.2006) US

(71) Applicants (for all designated States except US): **OPTO-ELECTRONICS CO., LTD.** [JP/JP]; 5-3, Tsukagoshi 5-chome, Warabi, Saitama Pref., 335-0002 (JP). **OPTICON, INC.** [US/US]; 8 Olympic Drive, Orangeburg, NY 10962 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **SHIMURA, Noriaki** [JP/JP]; 1-104-5 Mitsufuji, Musashimurayama-shi, Tokyo (JP).

(74) Agent: **LERCH, Joseph, B.**; KAPLAN GILMAN GIBSON & DERNIER LLP, 900 Route 9 North, Woodbridge, NJ 07095 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

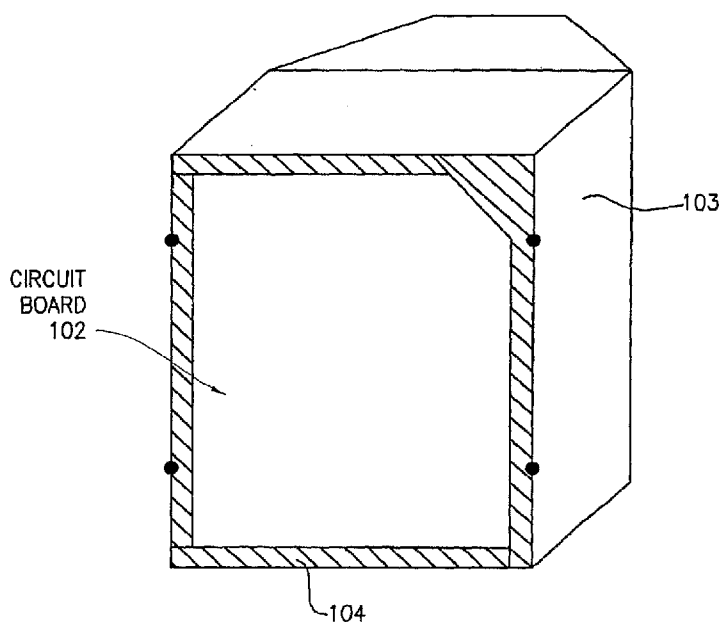
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: COMPACT SCAN ENGINE DISPOSED WITHIN A SCANNER HOUSING



(57) Abstract: A scanner with a compact scan engine having a light source for generating a light beam is provided, optionally with a polygon scan mirror as well. A seat with the compact scan engine attached thereto is utilized, and the scan engine is significantly smaller than the scanner housing.

WO 2007/084802 A2

COMPACT SCAN ENGINE DISPOSED WITHIN A SCANNER HOUSING

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention generally relates to compact scan engines, more particularly,
5 relates to a compact scan engine disposed within a scanner housing.

Description of the Related Art

Scan engines used for scanning symbols having data identifying characteristics such as barcodes are known. Typically, a scan engine comprises a circuit board that takes up most of the space within a housing. Often, the housing has to be designed to accommodate large circuit
10 boards and other components, even though a designer may wish to design the housing differently. An exemplary such prior art arrangement is shown in Figure 1, wherein a circuit board 102 is mounted upon a housing 103. Notably, the perimeter 104 of the circuit board is substantially the same size as the housing.

There is a need to have a compact scan engine with limited dimensional restrictions.

15

SUMMARY OF THE INVENTION

The present invention generally provides a compact scan engine with limited dimensional restrictions so as to be disposed within a housing of a scanner.

The present invention further provides a compact scan engine with limited dimensional
20 restrictions such that the relatively small compact scan engine with a housing can be positioned at various angles and orientations with respect to the housing.

The present invention still further provides a compact scan engine with limited dimensional restrictions such that the relatively small compact scan engine can be positioned to

suit a multiplicity of light paths and the compact scan engine can be positioned at an angle with respect to at least one surface of the scanner housing.

The present invention yet still further provides a compact scan engine with limited dimensional restrictions such that various requirements to place mirrors along some scan light
5 paths can be accommodated due to the various positioning of the compact scan engine.

A scanner with a compact scan engine having a light source for generating a scanning light beam is provided. The scanner also has a reflector mirror for directing light to a prescribed light path and for receiving light from said light path. An embodiment of the invention also provides a seat with the compact scan engine mounted thereon for orienting the light source on
10 the compact scan engine such that the light path can reach the polygon mirror. The size of the scan engine and mounting thereof within the housing permits a more compact housing and flexible design.

BRIEF DESCRIPTION OF THE DRAWINGS

15 So that the manner in which the above recited features, advantages and objects of the present invention are attained and can be understood in detail, a more particular description of the invention, briefly summarized above, may be had by reference to the embodiments thereof which are illustrated in the appended drawings.

It is to be noted, however, that the appended drawings illustrate only typical
20 embodiments of this invention and are therefore not to be considered limiting of its scope, for the invention may admit to other equally effective embodiments.

Fig. 1 depicts a prior art scan system with a scan engine.

Fig. 2 depicts a first perspective view of the present invention.

Fig. 3 depicts a second perspective view of the present invention.

25 Fig. 4 depicts a third perspective view of the present invention.

Fig. 5 shows the mounting of a scan engine on a housing in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

5 The present invention relates to a compact scan engine variously disposed within a scanner housing. Referring to Figs 2-5, a preferred embodiment of the present invention is described.

10 A compact scan engine 12 having a circuit board 12a and a light source (not shown) with its associated optic components is provided. Such a scan engine may be typical of what is available commercially, and may include an inner scan mirror that may optionally be capable of oscillation, optionally digital processing components, a light source, a collecting mirror, and potentially other functions as well. All the components, including the scan engine 12, may be mounted within the housing 30, which may be fabricated from plastic or similar materials.

15 Portion 14a as designated is preferably a flattened portion of reflecting mirror 14. Portion 14a is utilized to reflect the outgoing beam generated by the light source within scan engine 12. The remainder of mirror 14 is preferably utilized for collecting light reflected from the target.

20 An outgoing light beam, after reflecting off of portion 14a, traverses onto a rotating polygon mirror 16 shown in Figure 3, which is typically driven by an electro-magnetic driver 18 (Figure 4). Driver 18 has its non-moving parts rigidly affixed onto bracket 20, which is itself rigidly affixed onto interconnect 10. Housing 30 has receiving elements such as protrusion 22 or threaded holes (not shown) disposed to receive screws 24. In addition, driver 18 may be a unidirectional or bidirectional driver.

25 The light beam is then directed out of the housing after being reflected off of the polygon mirror 16. This produces a multidirectional pattern for scanning of symbols wherein the symbol

orientation with respect to the scanner is not fixed. Importantly, the housing 30 shown best in Figure 5 is significantly larger than the scan engine 12.

The reflected light from the scanned symbols travels back to be collected by mirror 14. Mirror 14 collects the light and focuses it on a photo-sensor contained within scan engine 12.

5 A seat 10a for suitably positioning of compact scan engine 12 is formed on interconnect 10. Seat 10a may be angularly oriented with respect to the housing 30. In other words, compact scan engine 12 can have an angle with respect to any surface of the housing due to its compact nature. Unlike prior art systems wherein the circuitry making up the scan engine is typically mounted on a circuit board substantially as large as the housing 30 itself, the scan engine 30 of
10 the present invention is significantly smaller than the housing 30. As a result, the scan engine 12 may be disposed at many different angles and orientations with respect to the housing.

Alternatively, the seat may be eliminated and the scan engine mounted directly on any portion of the housing or otherwise positioned to properly transmit the light beam out to the polygon mirror for scanning.

15 The perimeter of scanner 12 need not be equal to a perimeter of housing 30. Instead of mounting scanner 12 and/or its associated circuit board to the perimeter of housing 30, scanner 12 may instead be mounted to any angular seat 10a formed in housing 30. A preferred angle is approximately 45 degrees, and is shown best in Figure 5.

In the preferred embodiment, compact scan engine 12 is positioned such that angled
20 reflection mirror 14 serves as a reflector for reflecting light back and forth between compact scan engine 12 and polygon mirror 16. Other embodiments may desire a different light path. Therefore, compact scan engine 12 due to its compact nature can adjust accordingly. Moreover, seat 10a can be molded into the housing at a variety of angles.

Compact scan engine 12 may be affixed onto seat 10a by gluing, screws, snap-fit, etc.
25 Housing 30 may also have seats for mounting any of the other components such as mirror 14. Typically, the scan engine is less than 15% of the size of the housing itself. While the housing

has to accommodate the scanning polygon mirror in one preferred embodiment, the scan engine is not restricted by such a size requirement.

5 The light used in the present invention is preferably a laser diode, but can be other types and from other sources as well. Furthermore, the compact scan engine may include a scan engine housing; a light source within said scan engine housing; and a circuit board forming one side of said compact scan engine housing. In addition, the compact scan engine may also include an inner reflective mirror for reflecting light generated by the light source.

10 While the foregoing is directed to exemplary embodiments of the present invention, other and further embodiments of the invention may be devised without departing from the basic scope thereof, and the scope thereof is determined by the claims that follow. The invention in a preferred embodiment utilizes a scan engine having a perimeter less than half the size of the perimeter of the housing.

WHAT IS CLAIMED IS:

1. A scanner comprising:
 - a housing having sides, each side having a perimeter;
 - a scan engine having a light source for generating a light beam and associated optics for directing the light beam to a predetermined location within said housing;
 - a scanning mirror at said predetermined location for causing said light beam to be scanned across a symbol to be read; and
 - a seat with said housing on which said compact scan engine is mounted, said seat being substantially smaller than the perimeter of the housing on the side which said scan engine is mounted.
2. The scanner of claim 1, wherein the compact scan engine comprising
 - a scan engine housing;
 - a light source disposed within said scan engine housing; and
 - a circuit board forming one side of said compact scan engine housing.
3. The scanner of claim 2, wherein the scan engine comprises an inner mirror for reflecting light generated by said light source.
4. The scanner of claim 2 further wherein the seat is substantially equal in size with the scan engine.
5. The scanner of claim 1 wherein the seat is formed integrally with, and at an acute angle to, a surface of said housing.
6. A method of making a scanner comprising providing a housing having a seat, and mounting a scan engine to the seat, wherein the perimeter of the scan engine is substantially smaller than the perimeter of the housing, and wherein the scan engine is mounted at an acute angle with respect to the housing.

7. The method of claim 6 further comprising providing a polygon scanning mirror, a reflecting mirror, and an inner scan mirror, said inner scan mirror being oscillatable and disposed within said scan engine.
8. The method of claim 7 further comprising mounting a rotating polygon mirror within said housing.
9. A scanner comprising:
 - a housing having sides, each side having a perimeter;
 - a scan engine having a light source for generating a light beam and associated optics for directing the light beam to a predetermined location within said housing;
 - a scanning mirror at said predetermined location for causing said light beam to be scanned across a symbol to be read, said scan engine being disposed to direct a light beam at said scanning mirror, said scan engine having a perimeter less than half of that of the housing.
10. The scanner of claim 9 wherein the scan engine is formed with an internal mirror that is oscillatable.

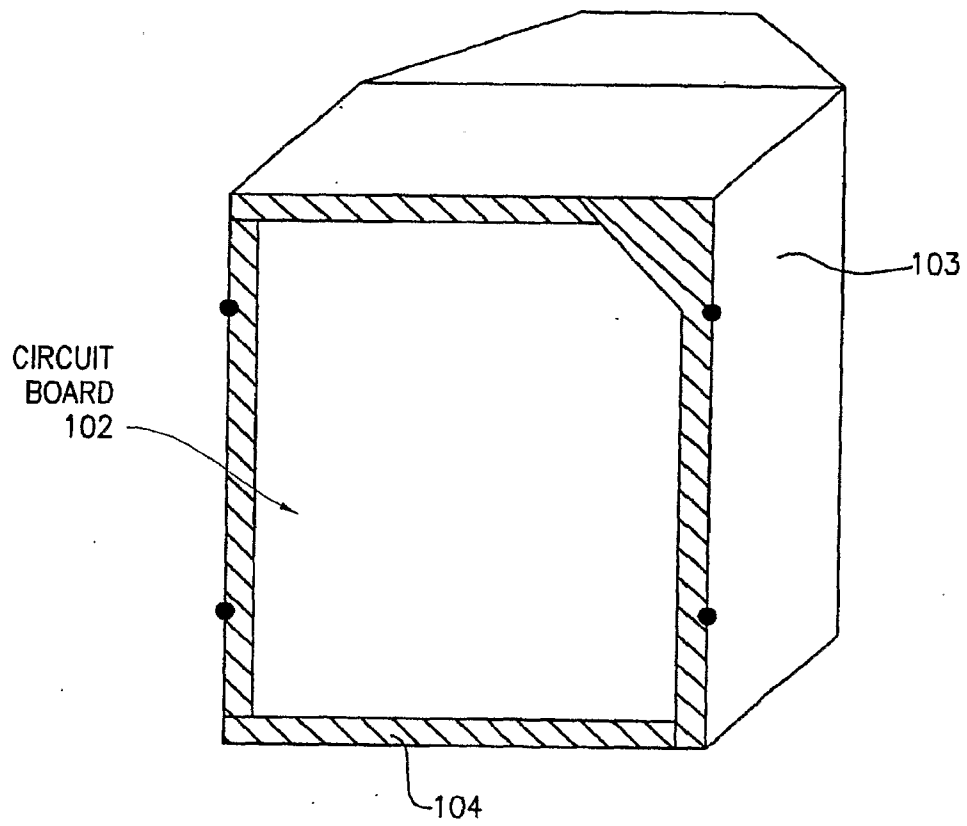


FIG. 1

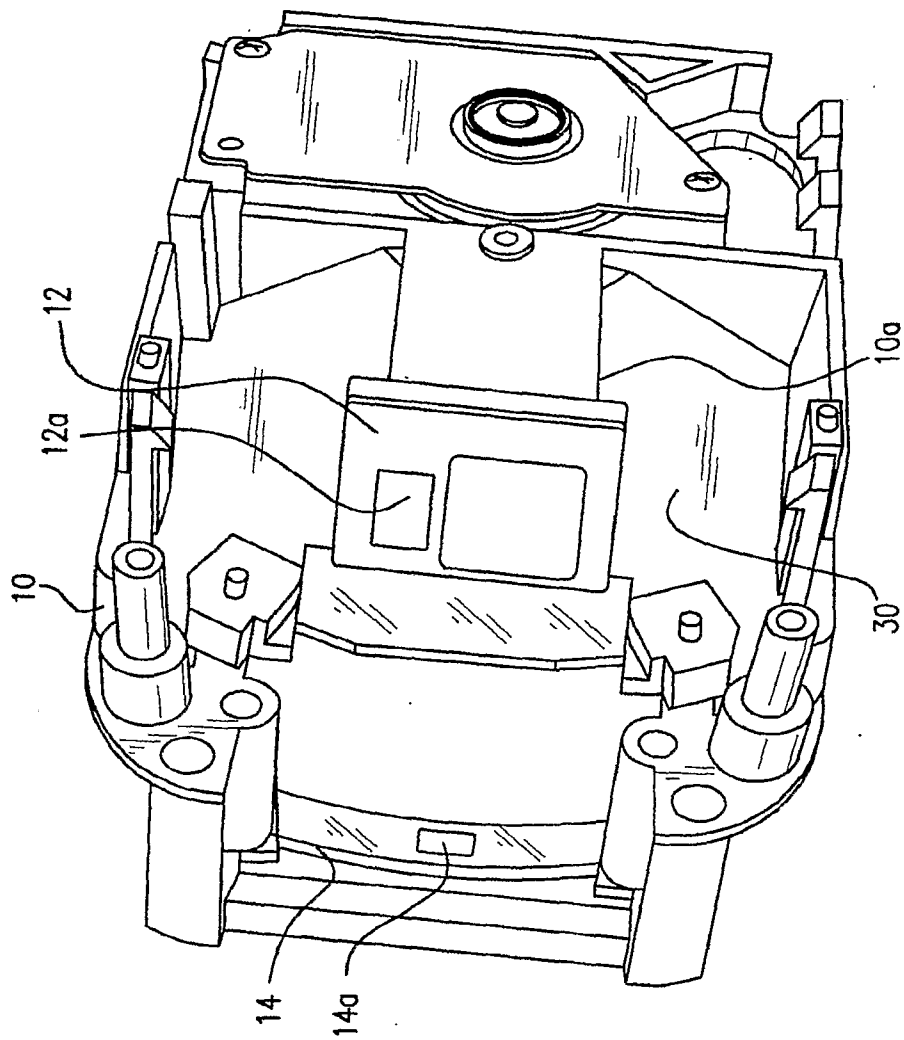


FIG. 2

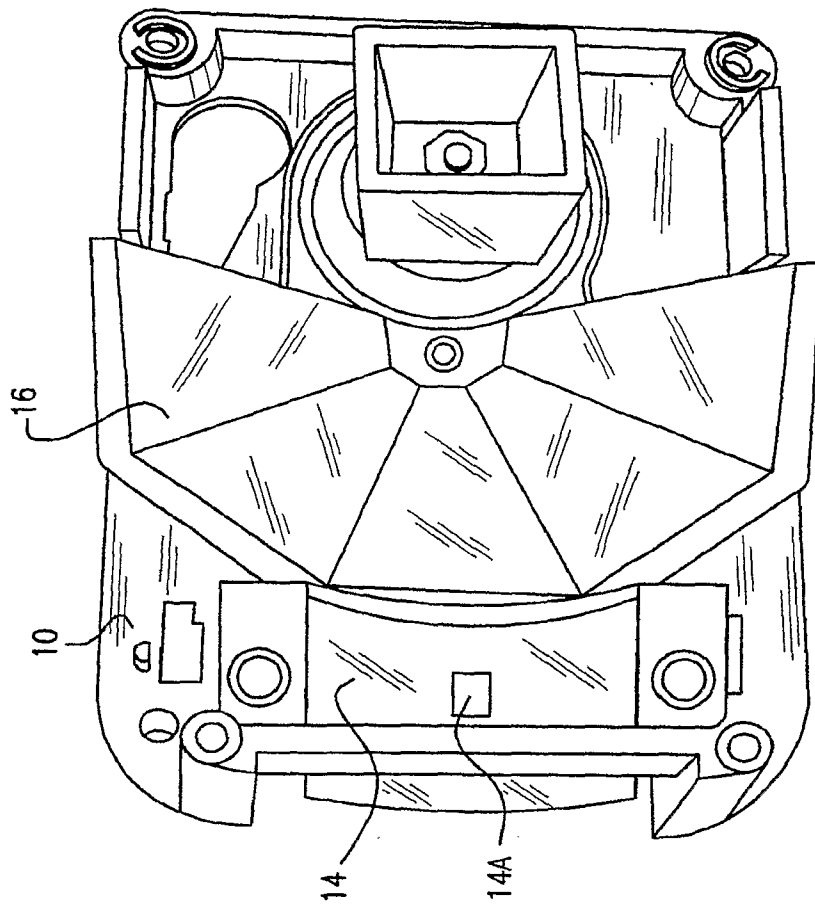


FIG. 3

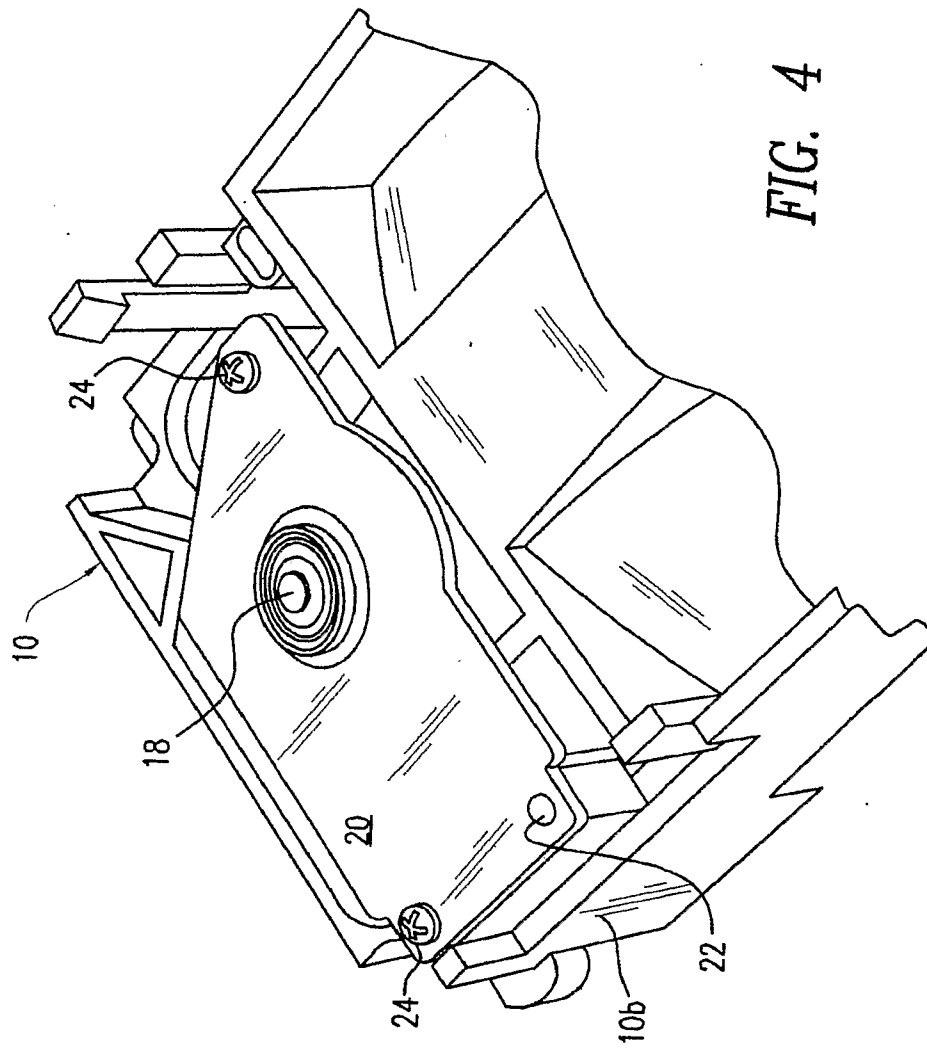


FIG. 4

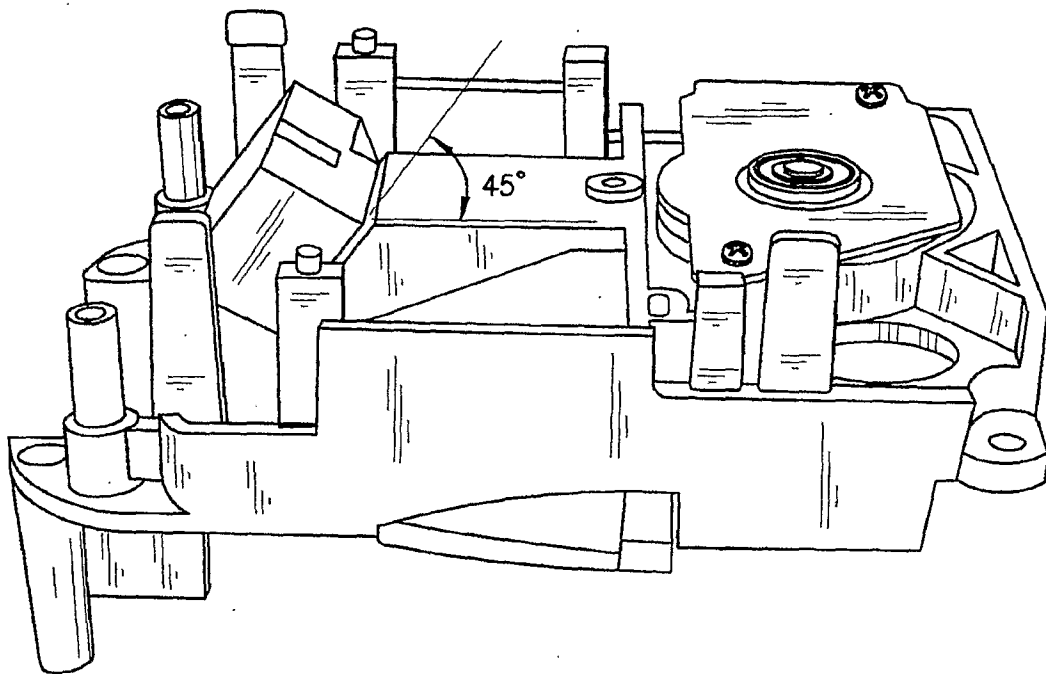


FIG. 5