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(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): **HAYAKAWA, Hiroshi** [JP/JP]; 42-2 Fukasaku Minuma-ku, Saitamai-shi, Saitama (JP).

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

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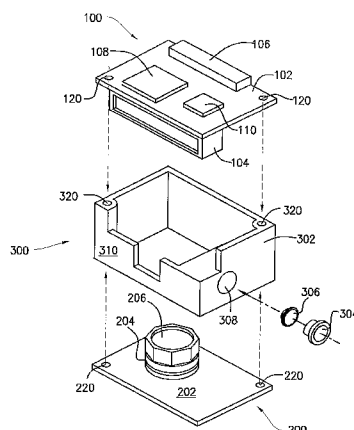
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(54) Title: SCANNER WITH MODULE PARTS



(57) Abstract: A modular barcode scanner for identifying various types of barcodes or the like is provided. The scanner has a housing that has a light source mounted therein and a plurality of walls with one wall at least partially disposed to allow a light path originating from the light source to pass out of the housing to reach the bar codes. The scanner further has a top module mounted on the top of the housing comprising a flat member having light receiving and processing optics as well as subsequent electronic processing devices mounted thereon; and a bottom module mounted on the bottom of the housing having an inner surface with a rotating mirror mounted thereon for directing the light path.



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SCANNER WITH MODULAR PARTS

BACKGROUND OF THE INVENTION

Field of the Invention

5 The present invention generally relates to scanners, more particularly, relates to a scanner with modular sections.

Description of the Related Art

10 Scanners are known. Scanning symbols having data identifying characteristics such as barcodes are also known. The use of discrete components limits further miniaturization of the barcode scanner. Further, improper alignment of the discrete components can render the scanner inoperative. Thus, the discrete components must be carefully aligned during assembly, making the scanner complex and costly to construct and assemble.

15 United States Patent 6,729,545 to Li et al. discloses an integrated scanner for scanning a barcode omnidirectionally with the scanner being formed on a common substrate. The scanner may include a mirror assembly or scan module, a laser diode, and a detector, mounted on a single substrate or several connected substrates. Lenses can be used to focus a laser beam from the laser diode as well as expand a laser beam deflected by the micro-machined mirror. However, in practical applications, for ordinary scanners an easier or more efficient way of forming a scanner is required.

20 Japanese published patent having Publication Number 2002-304593 to Keyence Corp describes an optical information reader which is miniaturized by reducing wasteful space unnecessary when using the optical information reader and improving the arrangement density of components constituting each part of the optical reader.

25 Referring to Fig. 1, the Japanese published patent device is shown. The device has a freely insertable and removable frame 27 to be fit and fixed in the casing 28. A device main body 25 obtained by mounting signal processing circuit parts such as a laser beam emitting part 1, a light receiving part 2, and analog and digital signal processing parts 3 and 4 on bendable circuit substrates 21a-21e and bending the substrates, are mounted and fixed to the frame body 27, and housed in the casing 28.

As can be seen, discrete components are used in prior art devices, which need assembling in an elaborate and inefficient manner. Therefore, it is desirable to have a scanner having modular portions free of discrete components and be assemble in a simple and efficient manner. It is further desired to have the scanner with low cost and compact form.

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SUMMARY OF THE INVENTION

The present invention generally provides a modular apparatus with modular parts for identifying symbols having data identifying characteristics.

The present invention provides a scanner that is efficiently assembled and adjusted.

10 The present invention provides a scanner that is of low cost and compact in form.

A modular apparatus for identifying symbols having data identifying characteristics is provided. The apparatus has a housing that has a light source mounted therein and a plurality of walls with one wall at least partially disposed to allow a light path originating from the light source to pass out of the housing to reach the identifying symbols. The scanner further
15 has a top module mounted on the top of the housing comprising a flat member having light receiving and processing optics as well as subsequent electronic processing devices mounted thereon; and a bottom module mounted on the bottom of the housing having an inner surface with a rotating mirror mounted thereon for directing the light path.

A modular barcode scanner for identifying various types of barcodes or the like is
20 provided. The scanner has a housing that has a light source mounted therein and a plurality of walls with one wall at least partially disposed to allow a light path originating from the light source to pass out of the housing to reach the bar codes. The scanner further has a top module mounted on the top of the housing comprising a flat member having light receiving and processing optics as well as subsequent electronic processing devices mounted thereon;
25 and a bottom module mounted on the bottom of the housing having an inner surface with a rotating mirror mounted thereon for directing the light path.

BRIEF DESCRIPTION OF THE DRAWINGS

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 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 scanner.

Fig. 2 depicts a compact scanner of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates to forming a scanner comprised of modules for identifying symbols having data identifying characteristics. The modules include a top module 100 and a bottom module 200, as well as a middle or center module 300. Top module 100 is provided as the mounting platform for light receiving optics 104 receiving light reflected from symbols such as a barcode (not shown) and transforming the reflected light into opto-electronic signal processors for further processing. An interface connector 106 is also mounted on a printed circuit board 102 for connecting with outside devices.

Interface connector 106 may also be used for power supply purposes for coupling to a power source (not shown). A digital ASIC (Application Specific Integrated Circuit) 108 and an analog ASIC 110 may also be mounted on printed circuit board 102. Digital ASIC 108 and analog ASIC 110 both are application-specific integrated circuit chips designed for the scanning application of the present invention.

Bottom module 200 has a bottom substrate having an inner surface 202 adapted to have a unidirectional motor 204 for driving a polygon mirror 206 coupled therewith. Polygon mirror 206 is disposed to rotate in relation to bottom substrate 202.

Center module 300 has a chassis or housing 302 that provide lateral support for both top module 100 and bottom module 200. Center module 300 multiple sided walls for

structure support, and also has lateral opening or notch on at least one wall such as wall 310. The notch is adapted to let light within housing 302 to reflect out of the housing 302. Center module 300 further has a cylindrical opening 308 formed on a lateral side thereof for positioning a light source such as a laser diode 304 therein may be positioned therein. Laser diode 304 generates a laser adapted to generate a light path toward polygon mirror 206 and be rotatively reflected by the polygon mirror 206. A focusing lens 306 may be interposed between polygon mirror 206 and the laser diode 304 in the light path.

Top module 100 and bottom module 200 each has openings 120 and 220 respectively disposed to receive a fastener (not shown) for rigidly affixing top module 100 and bottom module 200 onto center module 300. Center module 300 has corresponding receiving holes 320 for receiving the fastener.

The scanner of the present invention generates a light pattern including an omnidirectional light pattern for scanning barcodes. Light from the laser diode 304 may first be reflected off of at least one mirror (not shown). The mirror(s) will guide the laser light to the rotating polygon mirror 206. Polygon mirror 206 acts as a diffraction grating, causing the laser light to change its course again. As time elapses, the degree that polygon mirror 206 changes the course of the light increases and then decreases, in a cyclical manner. This continuous course change is what allows the laser light to eventually move across the entirety of a barcode (not shown) without moving the barcode itself. The laser light may reflect off of another series of mirrors (not shown) before striking the barcode subjected to scanning. At this point the light strikes the barcode, and reflects off the same. When the laser reflects off the barcode, the light is dispersed, and not focused as the laser light was. The dispersed light may return along the same path that the laser light traveled, until it reaches light receiving optics 104. Light receiving optics 104 receives the dispersed light, and sends a digital signal to the readout circuitry such as digital ASIC 108 and analog ASIC 110 with the signal strength based on the intensity of the light received. The readout circuitry then processes this signal. After the laser has reflected off each line of the barcode, and the resultant signal processed by the readout circuitry, the barcode is considered to be scanned.

As can be seen, center module 300 is preferably formed out of a single piece with simple geometry. Top module 100 and bottom module 200 have even simpler geometry in that both are structurally formed out of a flat board-like piece or member, i.e., print circuit

board 102 and bottom substrate 202. All three modules can be easily manufactured in compact form and at low cost. In addition, center module 300 preferably has no electronic components or circuitry thereon.

5 In the bottom module 200, except for the motor 204, no other electronic parts are preferably mounted thereon. The controlling of motor 204, which is typically a unidirectional motor, may be easily controlled within bottom module 200 or by a controller mounted on top module 100 in that a controlling path therefore may be easily achieved.

10 In addition, just simple and easy steps are required to assemble the modules together. In the preferred embodiment, top module 100 and bottom module 200 are simply assembled onto center module 300 by aligning the same using the preformed openings. In other words, the openings 120 on top module 100, the openings 220 on bottom module 200, and the openings 320 on center module 300 are all preformed for simple and easy assembly without elaborate tools or processes.

15 In an alternative embodiment, center module 300 is not needed because it would be possible to achieve the teachings of the present invention without the box shaped support of module 300. For example supporting pillars member can be placed at the four corners connecting module 100 with module 200 for example on their respective four corners. In this alternative embodiment, parts such as focusing lens 306 and laser diode 304 can be suitably mounted either on module 100, or module 200.

20 While the foregoing is directed to 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.

WHAT IS CLAIMED IS:

1. A modular apparatus for identifying symbols having data identifying characteristics comprising:
 - a housing having a light source mounted therein and a plurality of multiple sided
 - 5 walls with one wall at least partially disposed to allow a light path originating from said light source passing out of said housing to reach said identifying symbols;
 - a top module mounted on the top of said housing comprising a flat member having light receiving and processing optics as well as subsequent electronic processing devices mounted thereon; and
 - 10 a bottom module mounted on the bottom of said housing having an inner surface with a rotating mirror mounted thereon for directing said light path, wherein said top module, said bottom module, and said housing may be fit together.
2. The modular apparatus of claim 1, further comprising at least one fastener means for
- 15 affixing said top module or said bottom module onto said housing.
3. The modular apparatus of claim 1, wherein said bottom module further comprising a motor for driving said rotating mirror.
- 20 4. The modular apparatus of claim 1, wherein said rotating mirror is a polygon mirror.
5. The modular apparatus of claim 1, wherein said light source is laser.
6. The modular apparatus of claim 1, wherein said flat member is a circuit board.
- 25 7. The modular apparatus of claim 1, wherein said bottom module comprising substantially all optical and electronic signal processing devices for the modular apparatus.
8. A modular barcode scanner for identifying various types of barcodes or the like,
- 30 comprising:

a housing having a light source mounted therein and a plurality of multiple sided walls with one wall at least partially disposed to allow a light path originating from said light source passing out of said housing to reach anyone of said types of barcodes;

5 a top module mounted on the top of said housing comprising a flat member having light receiving and processing optics as well as subsequent electronic processing devices mounted thereon; and

a bottom module mounted on the bottom of said housing having an inner surface with a rotating mirror mounted thereon for directing said light path.

10 9. The modular barcode scanner of claim 8, further comprising at least one fastener means for affixing said top module or said bottom module onto said housing.

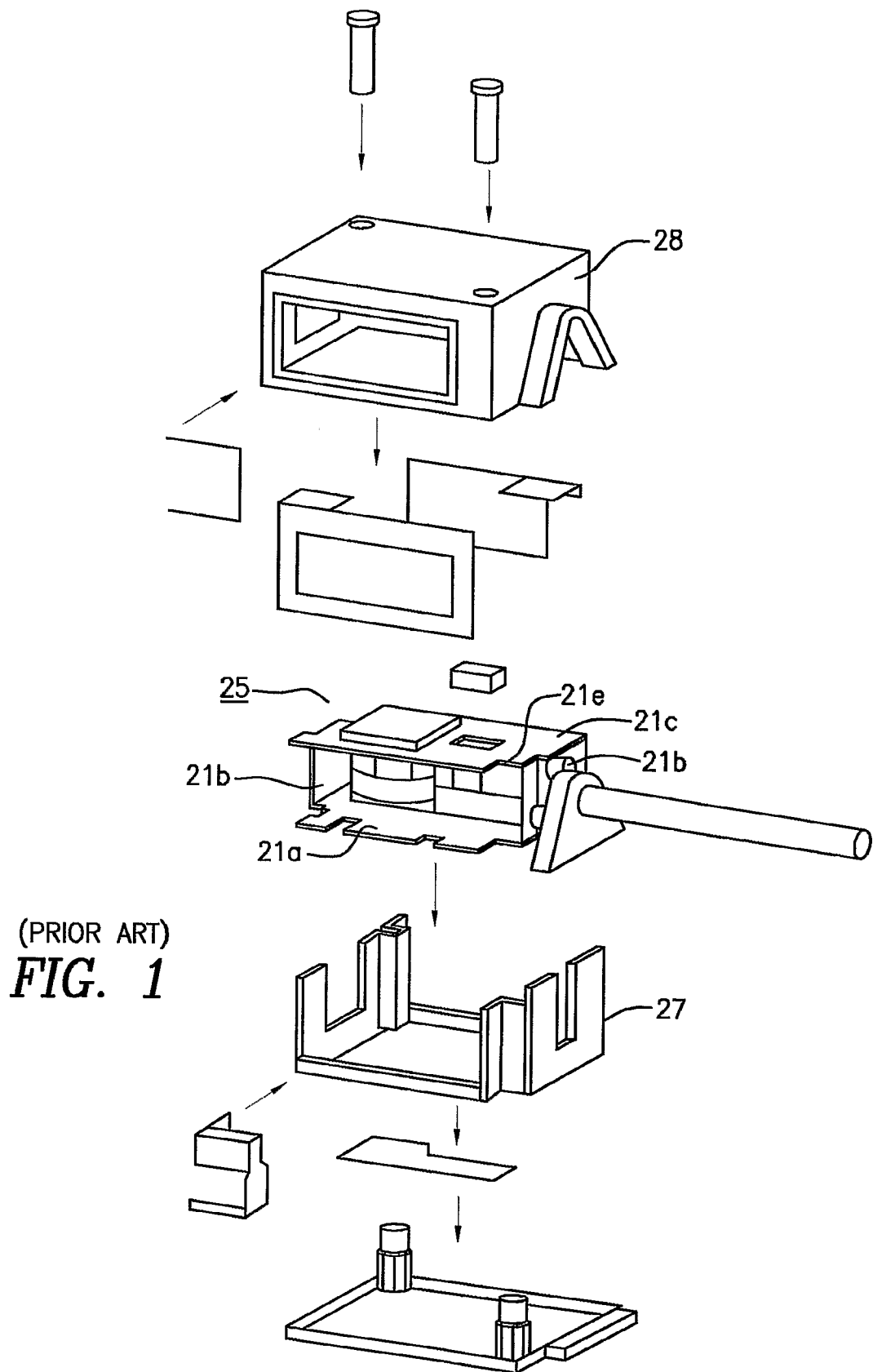
10. The modular barcode scanner of claim 8, wherein said bottom module further comprising a motor for driving said rotating mirror.

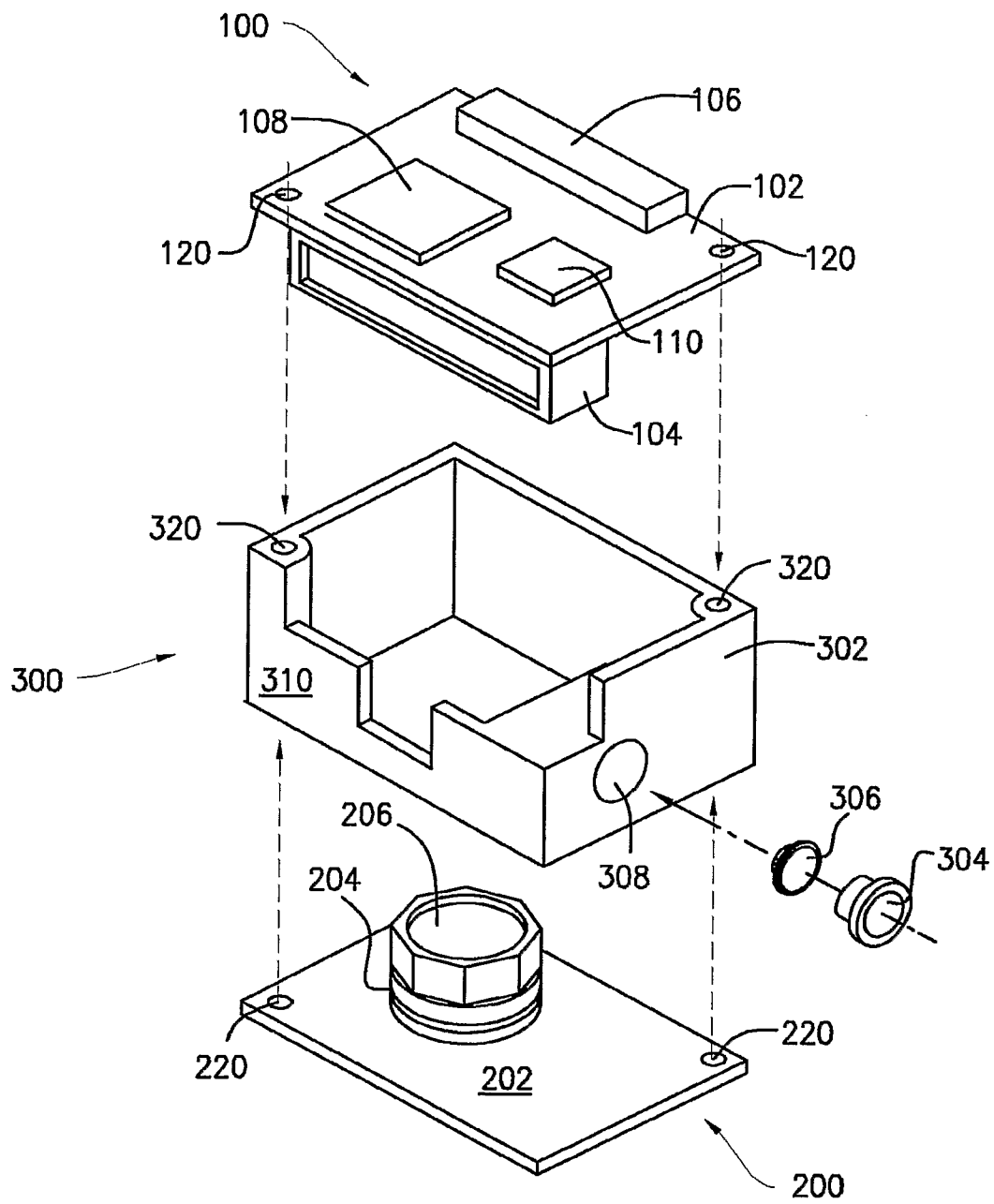
15 11. The modular barcode scanner of claim 8, wherein said rotating mirror is a polygon mirror.

12. The modular barcode scanner of claim 8, wherein said light source is laser.

20 13. The modular barcode scanner of claim 8, wherein said flat member is a circuit board.

14. The modular barcode scanner of claim 8, wherein said bottom module comprising substantially all optical and electronic signal processing devices for the modular barcode
25 scanner.



**FIG. 2**