US010414183B2

(12) **United States Patent**
Zeleny

(10) **Patent No.: US 10,414,183 B2**
(45) **Date of Patent: Sep. 17, 2019**

(54) **FREE AXIS OR FREE-ROLLING PRINTER**

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(72) Inventor: **Joseph L. Zeleny**, Sacramento, CA (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.: **15/689,243**

(22) Filed: **Aug. 29, 2017**

(65) **Prior Publication Data**

US 2018/0056686 A1 Mar. 1, 2018

Related U.S. Application Data

(60) Provisional application No. 62/380,668, filed on Aug. 29, 2016.

(51) **Int. Cl.**

B41J 29/393	(2006.01)
B41J 25/00	(2006.01)
B41J 29/02	(2006.01)
B41J 29/70	(2006.01)
B41J 29/13	(2006.01)
B41J 2/175	(2006.01)
B41J 3/36	(2006.01)
B41J 29/38	(2006.01)
B41J 3/407	(2006.01)

(52) **U.S. Cl.**

CPC ***B41J 29/393*** (2013.01); ***B41J 2/175*** (2013.01); ***B41J 2/1752*** (2013.01); ***B41J 2/17546*** (2013.01); ***B41J 2/17553*** (2013.01); ***B41J 3/36*** (2013.01); ***B41J 25/006*** (2013.01); ***B41J 29/02*** (2013.01); ***B41J 29/023*** (2013.01); ***B41J 29/13*** (2013.01); ***B41J 29/38*** (2013.01); ***B41J 29/70*** (2013.01); *B41J 3/407* (2013.01)

(58) **Field of Classification Search**

None

See application file for complete search history.

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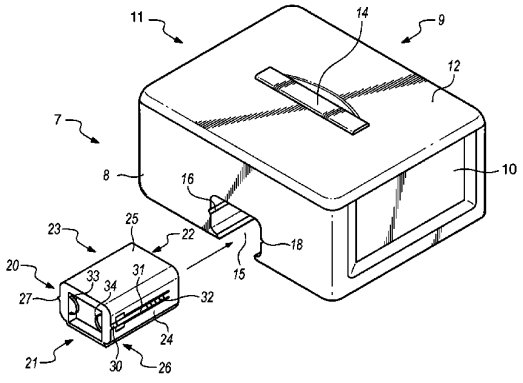
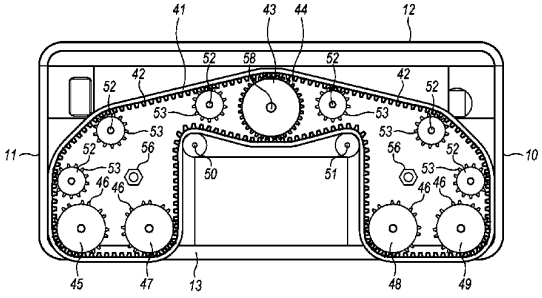
(57) **ABSTRACT**

Free axis or free-rolling printer is a self-propelled printer capable of printing on any stationary flat horizontal surface by moving itself around the stationary flat horizontal surface while ejecting the ink or colorants onto the stationary flat horizontal surface to create the clear image on the stationary flat horizontal surface. Free axis or free-rolling printer has at least one print media socket that is capable of accepting a plurality of interchangeable print media cartridges. Free axis or free-rolling printer has an X-axis tread system with a servomotor. Free axis or free-rolling printer has a retractable Y-axis tread system with a drive servomotor, a gantry servomotor, and a gantry assembly to lift and lower the Y-axis tread system. Free axis or free-rolling printer has a main circuit board with electrical continuity with a power source, the X-axis tread system servomotor, the Y-axis tread system drive servomotor, and the Y-axis gantry servomotor.

1 Claim, 12 Drawing Sheets





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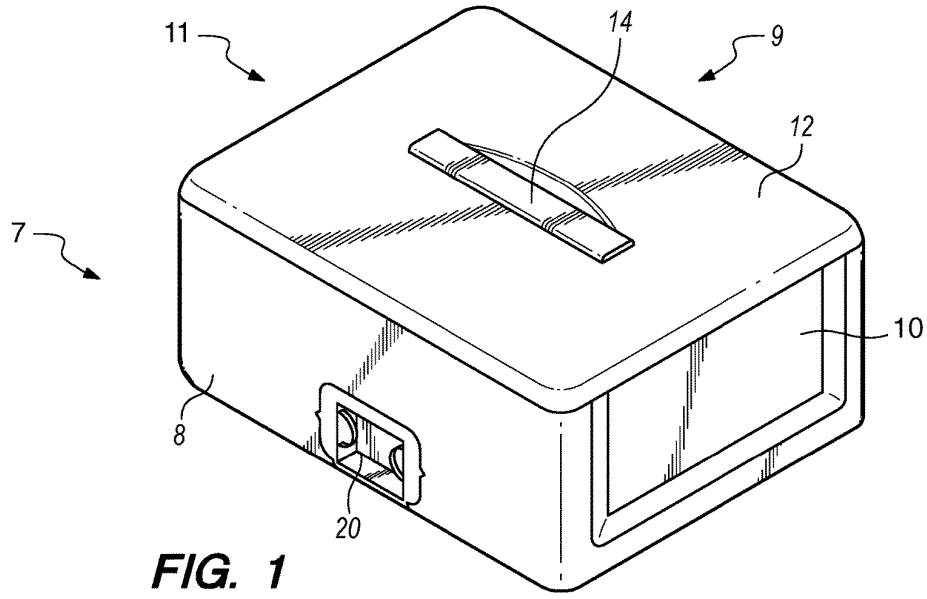
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FIG. 1

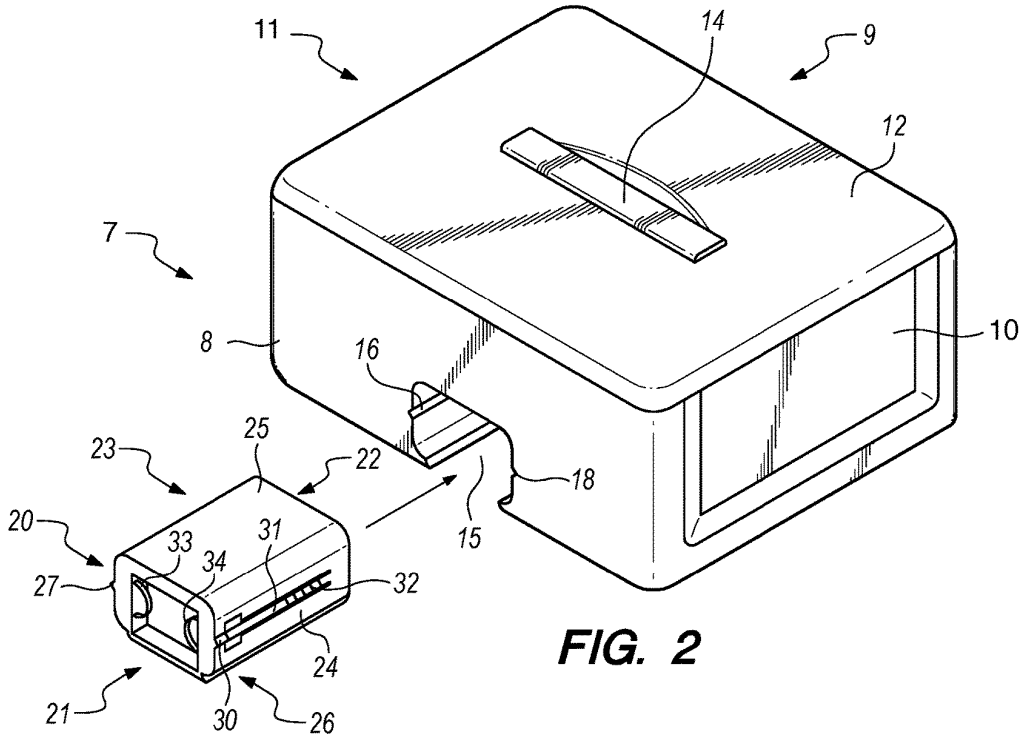
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FIG. 2

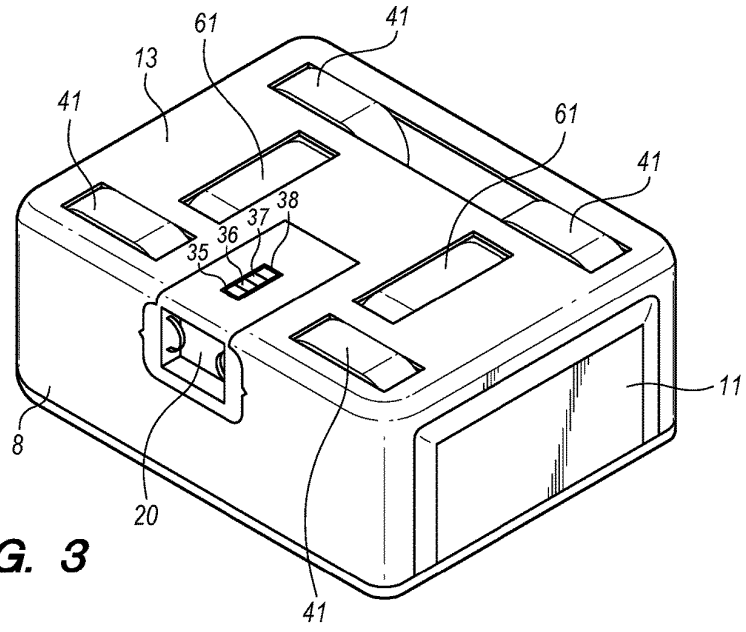
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FIG. 3

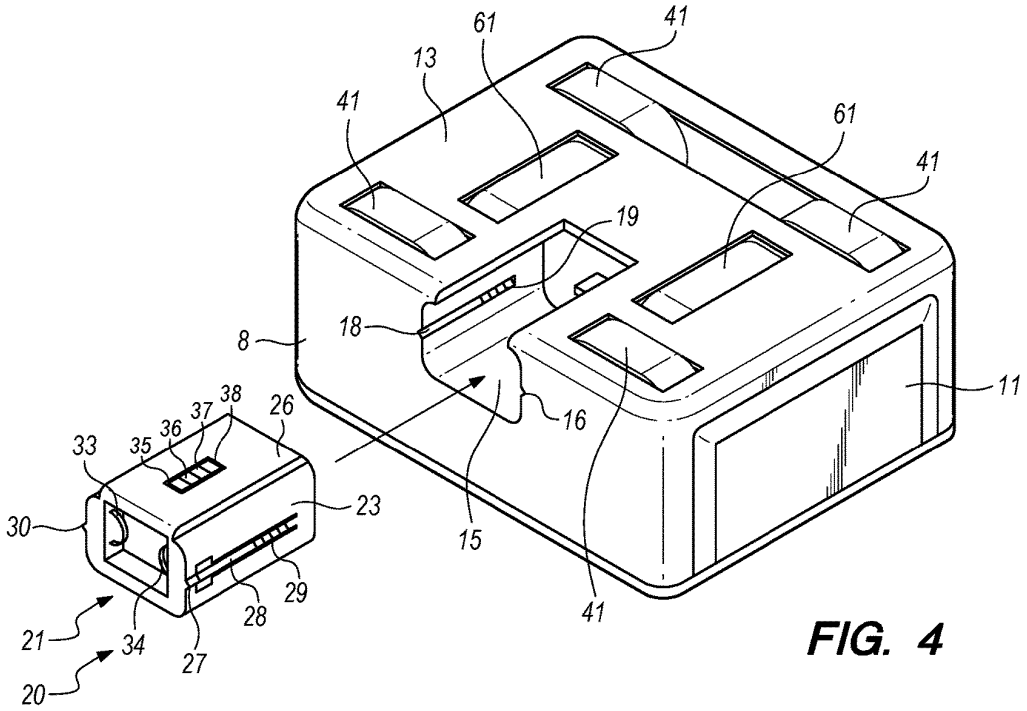
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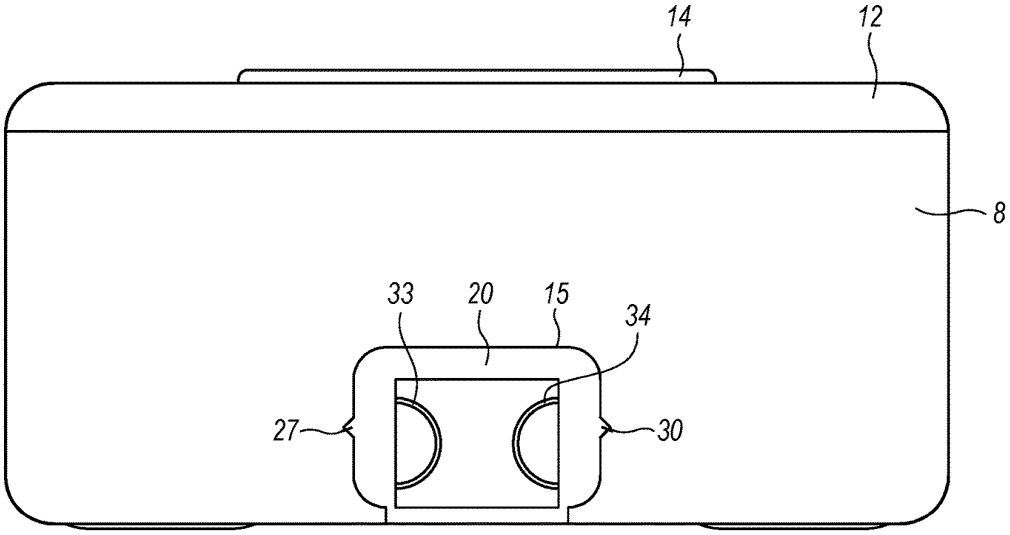
FIG. 4



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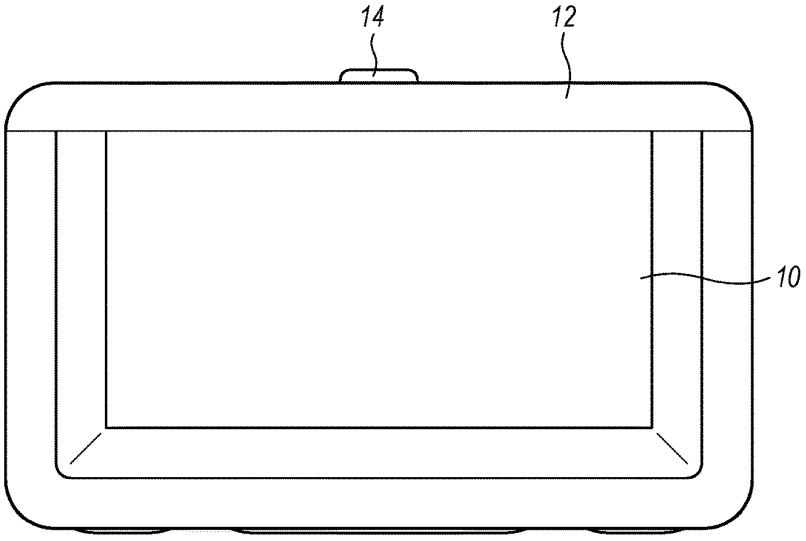

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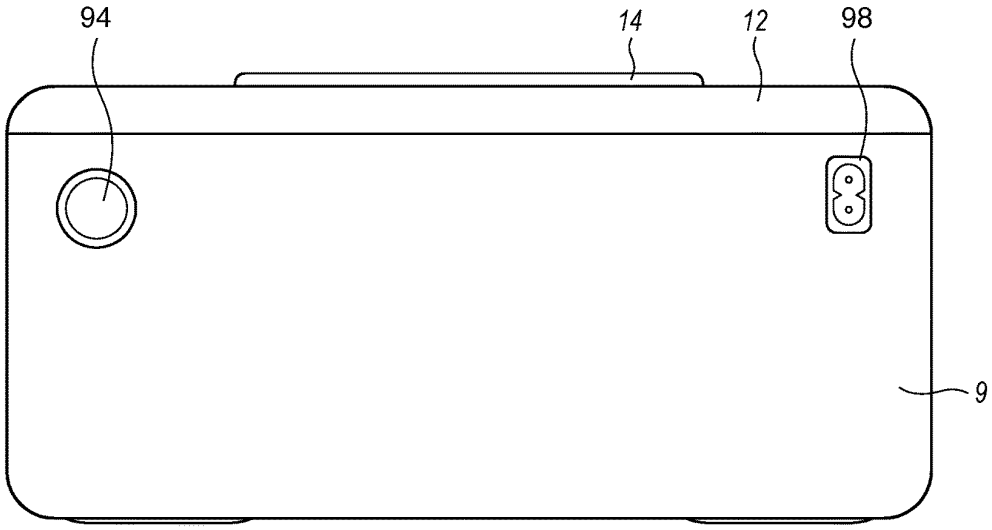

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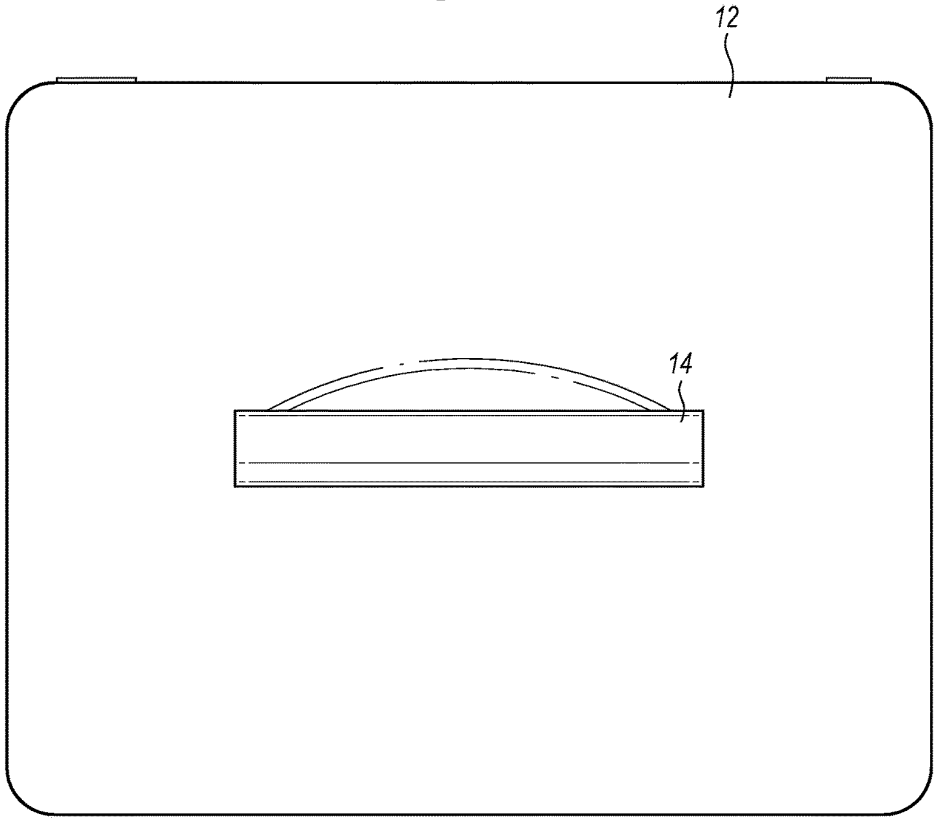

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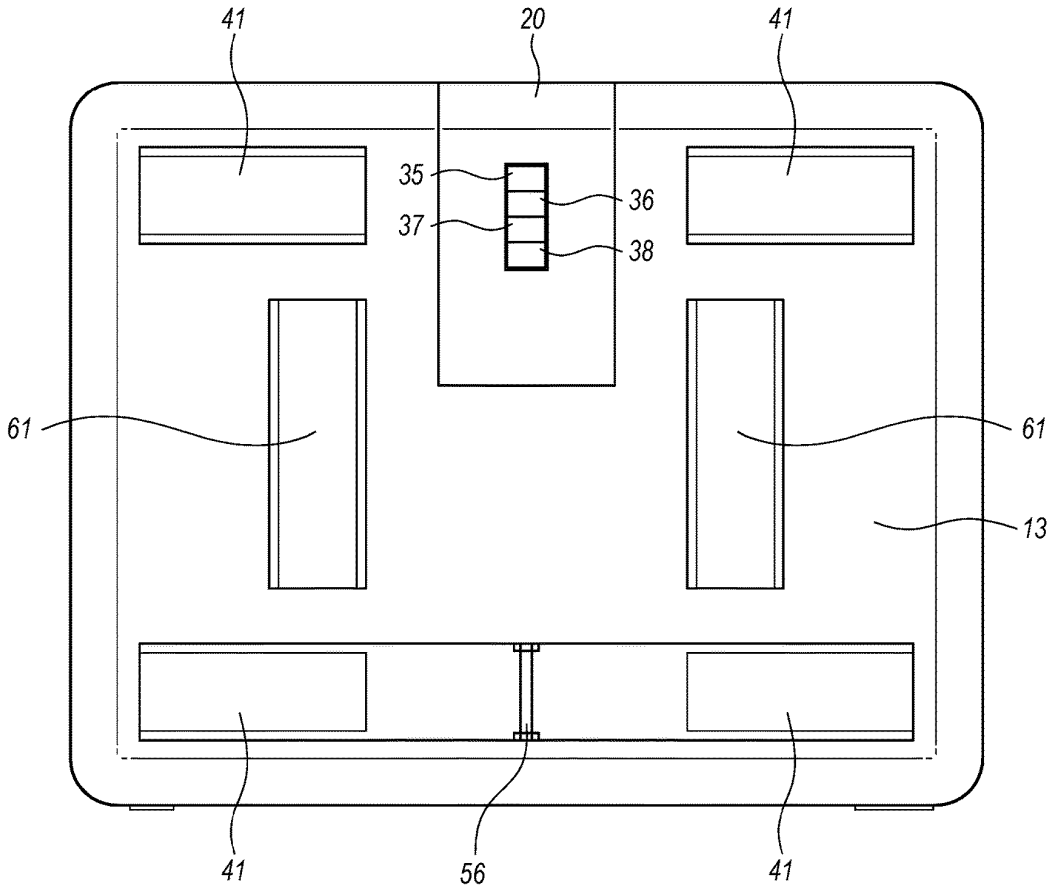

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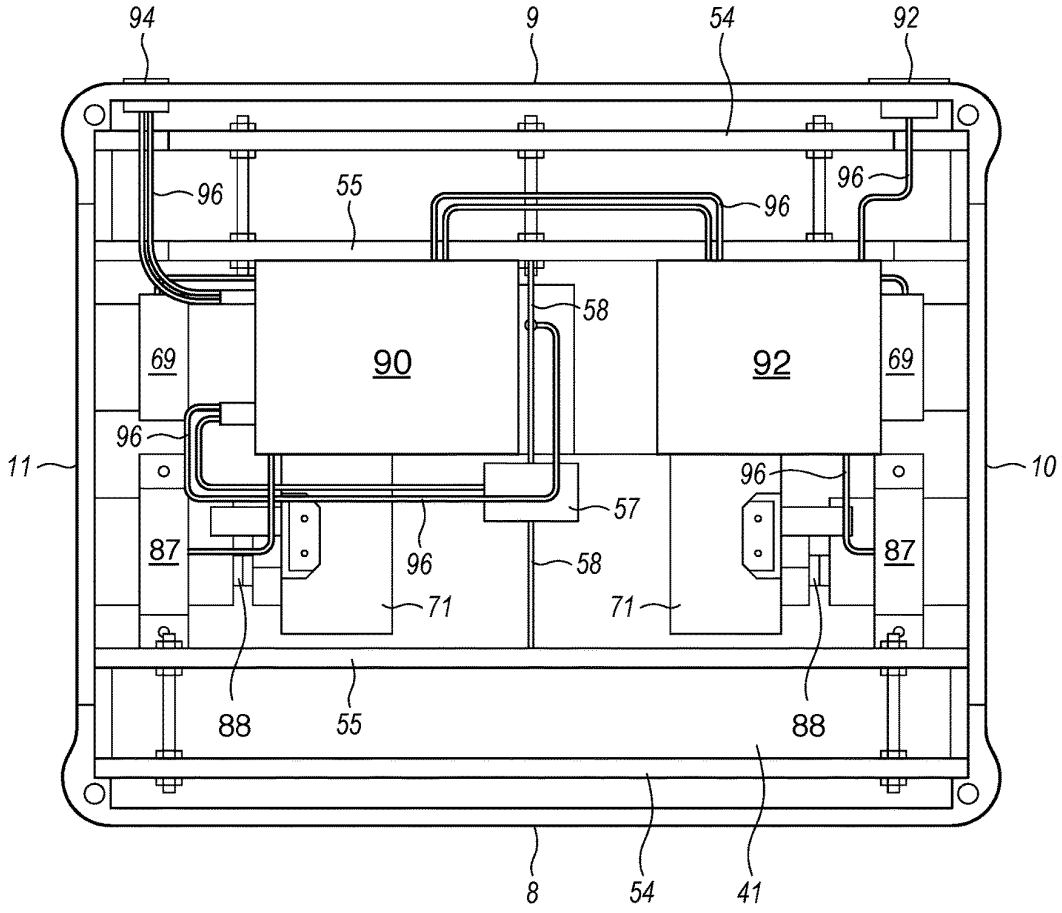
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FIG. 10

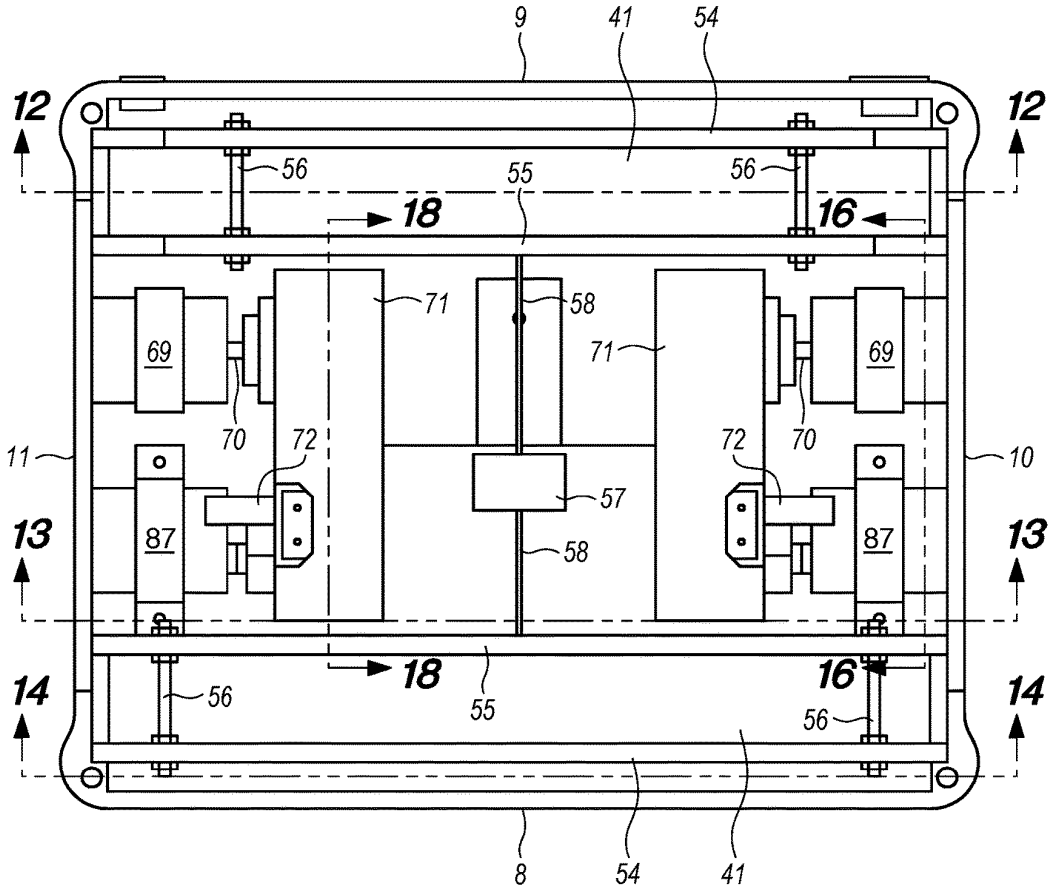
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FIG. 11

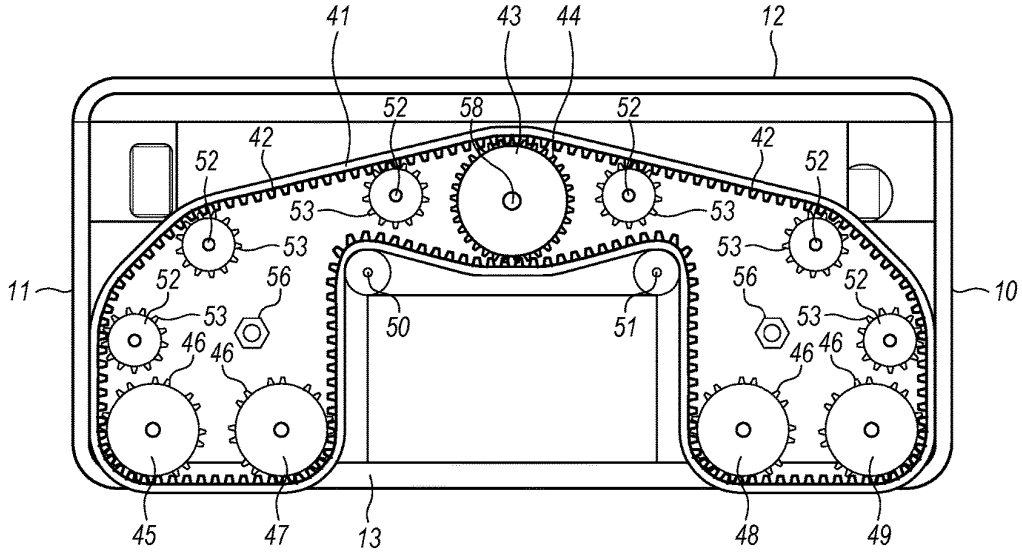
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FIG. 12

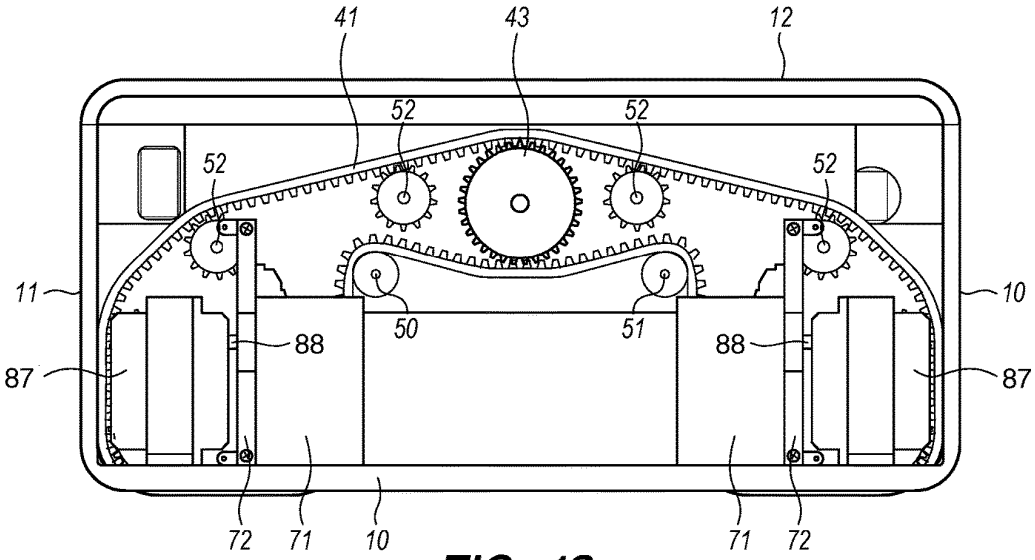
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FIG. 13

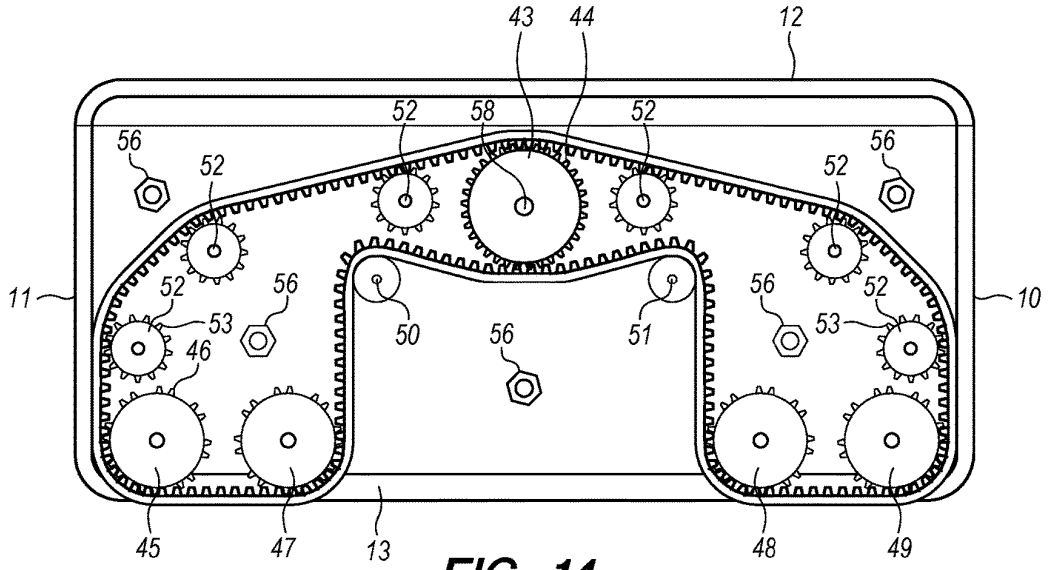
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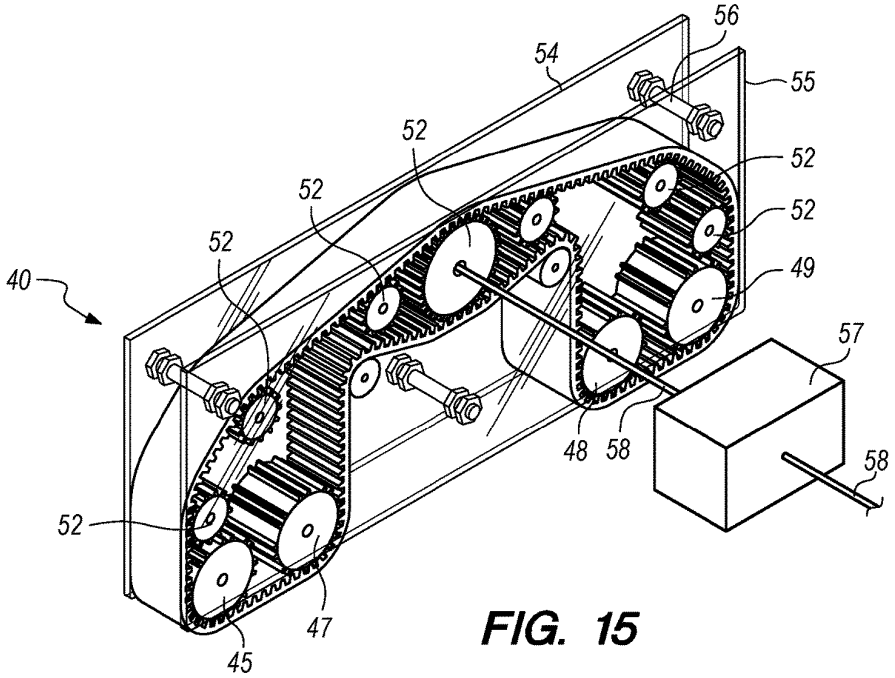
FIG. 14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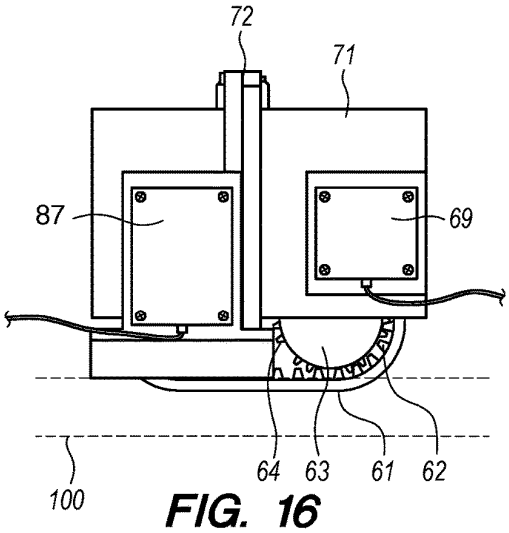

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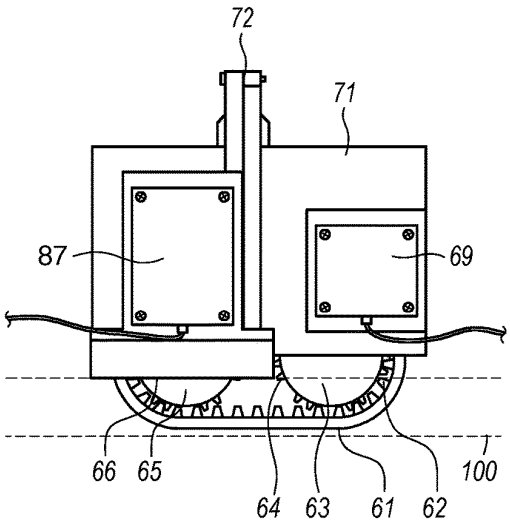

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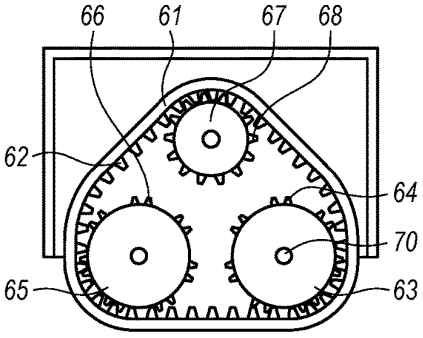

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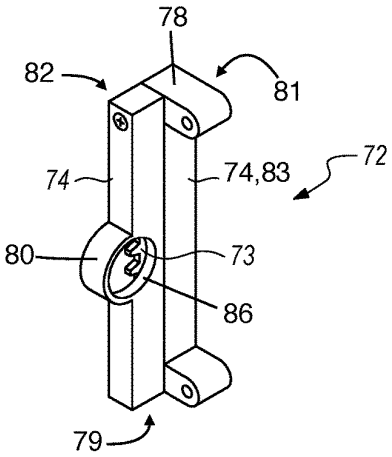

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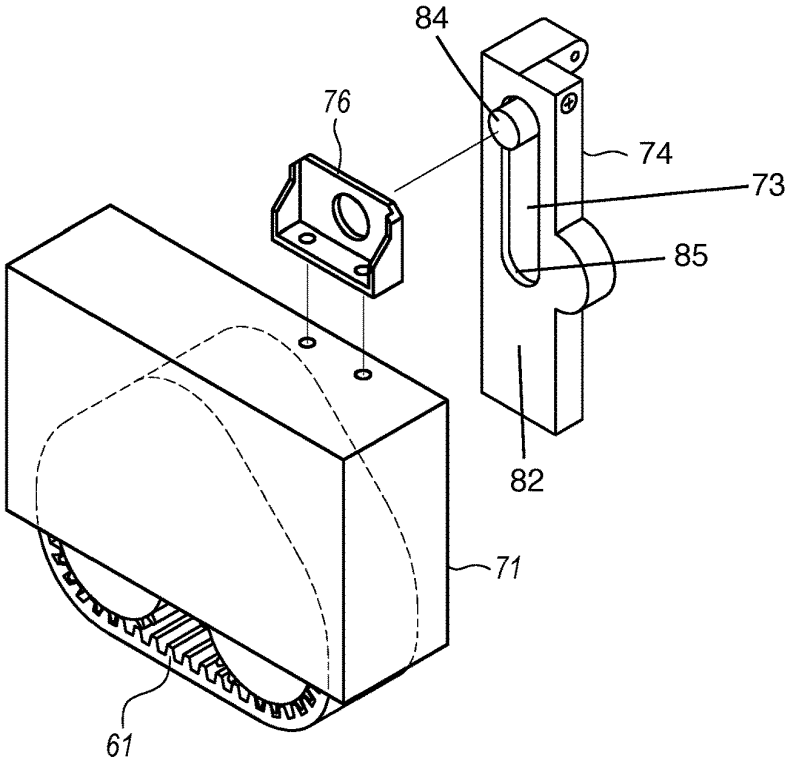

FIG. 20

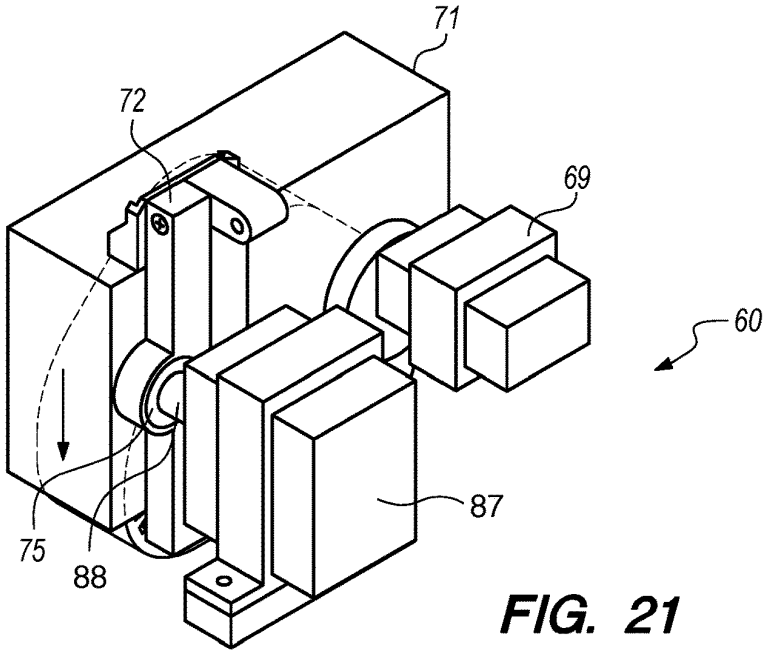

FIG. 21

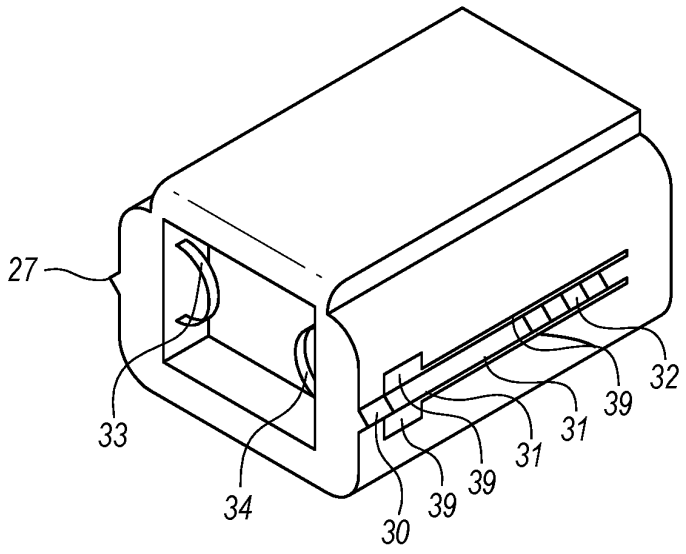

FIG. 22

FREE AXIS OR FREE-ROLLING PRINTER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention pertains to a printer that ejects ink or colorants onto a surface to yield a clearly printed image on the surface. Specifically, this invention relates to a special printer that is self-propelled and capable of printing on any stationary flat horizontal surface by moving itself around the stationary flat horizontal surface while ejecting the ink or colorants onto the stationary flat horizontal surface to create the clear image on the stationary flat horizontal surface.

2. Description of Related Art

Most printers in the prior art are stationary which operate or print by moving the print surface through the printer, which remains stationary. There are some self-propelled printers in the prior art but none have the X-axis drive system and the retractable Y-axis drive system disclosed herein. Additionally, none of the self-propelled printers in the prior art have the interchangeable colorant cartridge system disclosed herewith which includes a special locking mechanism that firmly locks the interchangeable colorant cartridge within the bottom of the printer.

BRIEF SUMMARY OF THE INVENTION

It is an aspect of free axis or free-rolling printer to be self-propelled and capable of self-propelled movement along a flat horizontal plane or surface under its own power.

It is an aspect of free axis or free-rolling printer to print onto a stationary print surface that is a flat horizontal plane or surface made of any material.

It is an aspect of free axis or free-rolling printer to include a main circuit board or motherboard as well as a servomotor control circuit board.

It is an aspect of free axis or free-rolling printer to have a tread system that causes motion along an x-axis of the flat horizontal plane or surface

It is an aspect of free axis or free-rolling printer to have a tread that causes motion along a y-axis of the flat horizontal plane or surface.

It is an aspect of x-axis tread system to include at least one track that is looped around a gearbox that is linked to a servomotor.

It is an aspect of y-axis tread system to include at least one track that is looped around a gearbox that is linked to a servomotor.

It is an aspect of y-axis tread system to be retractable and capable reversible contact with the flat horizontal plane or surface.

It is an aspect of free axis or free-rolling printer to be a color printer and a black and white printer.

It is an aspect of free axis or free-rolling printer to include a plurality of interchangeable ink or medium cartridges.

It is an aspect of free axis or free-rolling printer to accept, marry-to, receive therein, or reversibly attach to one or more interchangeable ink or medium cartridges.

It is an aspect of free axis or free-rolling printer to allow for the interchangeability of various different types of interchangeable ink or medium cartridges to allow for free axis or free-rolling printer to successfully print on any known type material or surface.

It is an aspect of each of the plurality of interchangeable ink or medium cartridges to contain four reservoirs where each reservoir is filled with an ink jet ink, garment based ink, solvent based ink, or any other known type of ink, paint, dye, or colorant.

It is an aspect of each of the plurality of interchangeable ink or medium cartridges to contain four print heads where each is capable of ejecting ink jet ink, garment based ink, solvent based ink, or any other known type of ink, paint, dye, or colorant in a precise and/or accurate fashion to yield a clearly imaged print out.

It is an aspect of each of the plurality of interchangeable ink or medium cartridges to contain a locking mechanism that holds and locks interchangeable ink or medium cartridge steady and motionless relative to the rest of the free axis or free-rolling printer when interchangeable ink or medium cartridge is properly attached to free axis or free-rolling printer.

It is an aspect of each of the plurality of interchangeable ink or medium cartridges to include an internal electronic chip or circuit board that identifies the type of colorant contained within the interchangeable ink or medium cartridge where internal electronic chip or circuit board is capable of communicating with the main circuit board or motherboard on the free axis or free-rolling printer.

It is an aspect of free axis or free-rolling printer to adjust its rate of motion along the flat horizontal plane or surface according to the specific type of print media or medium that is loaded into the free axis or free-rolling printer.

It is an aspect of free axis or free-rolling printer to adjust the flow rate of print media or medium being ejected from the interchangeable ink or medium cartridges according to the specific type of print media or medium that is loaded into the free axis or free-rolling printer.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a top perspective view of free axis or free-rolling printer.

FIG. **2** is a top perspective view of free axis or free-rolling printer depicting how a print media cartridge is installed into free axis or free-rolling printer.

FIG. **3** is a bottom perspective view of free axis or free-rolling printer.

FIG. **4** is a bottom perspective view of free axis or free-rolling printer depicting how a print media cartridge is installed into free axis or free-rolling printer.

FIG. **5** is a front elevation view of free axis or free-rolling printer.

FIG. **6** is a side elevation view of free axis or free-rolling printer. Note that left side elevation view and right side elevation view are identical.

FIG. **7** is a rear elevation view of free axis or free-rolling printer.

FIG. **8** is a top plan view of free axis or free-rolling printer.

FIG. **9** is a bottom plan view of free axis or free-rolling printer.

FIG. **10** is a top plan view of free axis or free-rolling printer with printer housing top side removed.

FIG. **11** is a top plan view of free axis or free-rolling printer with: printer housing top side, main circuit board, servomotor control circuit board, and electrical wiring removed. FIG. **11** also defines cross-sectional planes **12-12**, **13-13**, **14-14**, **16-16**, and **18-18**.

FIG. **12** is a cross-sectional view taken from lines **12-12**.

FIG. **13** is a cross-sectional view taken from lines **13-13**.

FIG. **14** is a cross-sectional view taken from lines **14-14**.

FIG. **15** is a perspective cutaway view of X-axis tread system.

FIG. **16** a cross-sectional view taken from lines **16-16** with Y-axis tread system raised or retracted.

FIG. **17** a cross-sectional view taken from lines **16-16** with Y-axis tread system lowered or extended.

FIG. **18** is a cross-sectional view taken from lines **18-18**.

FIG. **19** is perspective view of gantry assembly.

FIG. **20** is an exploded view of Y-axis tread assembly, gantry, and gantry bracket.

FIG. **21** is a perspective view of Y-axis tread system.

FIG. **22** is a perspective view of print media cartridge.

DEFINITION LIST

Term	Definition
5	Free Axis or Free-Rolling Printer
7	Printer Housing
8	Printer Housing Front Side
9	Printer Housing Rear Side
10	Printer Housing Left Side
11	Printer Housing Right Side
12	Printer Housing Top Side
13	Printer Housing Bottom Side
14	Handle
15	Print Media Cartridge Socket
16	Left Alignment Groove
17	Left Alignment Groove Locking Teeth
18	Right Alignment Groove
19	Right Alignment Groove Locking Teeth
20	Print Media Cartridge
21	Cartridge Housing Front Side
22	Cartridge Housing Rear Side
23	Cartridge Housing Left Side
24	Cartridge Housing Right Side
25	Cartridge Housing Top Side
26	Cartridge Housing Bottom Side
27	Left Alignment Fin
28	Left Alignment Tongue
29	Left Alignment Tongue Locking Teeth
30	Right Alignment Fin
31	Right Alignment Tongue
32	Right Alignment Tongue Locking Teeth
33	Left Pinch Tab
34	Right Pinch Tab
35	Print Head One
36	Print Head Two
37	Print Head Three
38	Print Head Four
39	Void Area
40	X-Axis Tread System
41	X-Axis Continuous Track or Tread
42	X-Axis Track Ridge
43	X-Axis Drive Gear
44	X-Axis Drive Gear Tooth or Ridge
45	First X-Axis Foot Gear
46	X-Axis Foot Gear Tooth or Ridge
47	Second X-Axis Foot Gear
48	Third X-Axis Foot Gear
49	Fourth X-Axis Foot Gear
50	First X-Axis Roller
51	Second X-Axis Roller
52	X-Axis Upper Alignment Gear
53	Upper Alignment Gear Tooth or Ridge
54	X-Axis Tread System Outside Panel
55	X-Axis Tread System Inside Panel
56	X-Axis Tread System Spacer
57	X-Axis Servomotor
58	X-Axis Drive Axle
60	Y-Axis Tread System
61	Y-Axis Continuous Track or Tread
62	Y-Axis Track Ridge
63	Y-Axis Drive Gear
64	Y-Axis Drive Gear Tooth or Ridge

-continued

Term	Definition
65	Y-Axis Foot Gear
66	Y-Axis Foot Gear Tooth or Ridge
67	Y-Axis Top Gear
68	Y-Axis Top Gear Tooth or Ridge
69	Y-Axis Servomotor
70	Y-Axis Drive Axle
71	Y-Axis Tread System Housing
72	Gantry Assembly
73	Gantry Rack
74	Rack Housing
75	Gantry Pinion or Gear
76	Gantry Bracket
78	Rack Housing Top Side
79	Rack Housing Bottom Side
80	Rack Housing Front Side
81	Rack Housing Rear Side
82	Rack Housing Inner Side
83	Rack Housing Outer Side
84	Rack Pin
85	Rack Pin Slot
86	Pinion or Gear Window
87	Gantry Servomotor
88	Gantry Servomotor Axle
90	Main Circuit Board or Motherboard
92	Servomotor Control Circuit Board
94	On/Off Switch
96	Electrical Wiring
98	Power Connector
100	Printing Surface

DETAILED DESCRIPTION OF THE INVENTION

Free axis or free-rolling printer **5** comprises a printer housing **7**. Printer housing **7** is a rigid hollow rectangular cuboid member or box-shaped member that houses or encases all electrical and mechanical components of free axis or free-rolling printer **5**, with the exception of the print media cartridges **20**, which are removeably attachable to printer housing **7**. Printer housing **7** comprises: a printer housing front side **8**, a printer housing rear side **9**, a printer housing left side **10**, a printer housing right side **11**, a printer housing top side **12**, and a printer housing bottom side **13**. Printer housing front side **8**, printer housing rear side **9**, printer housing left side **10**, printer housing right side **11**, printer housing top side **12**, and printer housing bottom side **13** each are a rigid rectangular planar member with a longitudinal axis, a lateral axis, an inside surface, an outside surface, and four edges. Printer housing front side **8**, printer housing rear side **9**, printer housing left side **10**, printer housing right side **11**, printer housing top side **12**, and printer housing bottom side **13** are rigidly connected to each other at their edges to form the rigid hollow rectangular cuboid member or hollow box-shaped member as depicted. The edges and/or corners of the rectangular cuboid member or hollow box-shaped member may be rounded as depicted.

Printer housing bottom side **13** further comprises at least two X-axis tread clearance windows or void areas. At least two X-axis tread clearance windows or void areas function to provide clearance space for an X-axis tread system **40** and an X-axis continuous track or tread **41** to extend downward through at least two X-axis tread clearance windows or void areas in order to make contact with the printing surface **100** as described below. Printer housing bottom side **13** further comprises at least one Y-axis tread clearance window or void area. At least one Y-axis tread clearance window or void area to allow functions to provide clearance space for a Y-axis

tread system **60** and a Y-axis continuous track or tread **61** to extend downward through at least one Y-axis tread clearance window or void area to allow for reversible contact with the printing surface **100** as described below.

Alternately, printer housing top side **12** may be removeably attachable to the rest of the rigid hollow rectangular cuboid member or hollow box-shaped member to yield a removable lid to the rigid hollow rectangular cuboid member or hollow box-shaped member. Printer housing top side **12** may further comprises a handle **14** on its outside surface. Removable attachment may be accomplished by any know means such as by press fit, slip fit, latch or latches, fasteners, magnets, pins, or any other known means. Handle **14** is a handle member to allow for easier carrying of the free axis or free-rolling printer **5** and/or easier removal of printer housing top side **12** from the rigid hollow rectangular cuboid member or hollow box-shaped member. Handle **14** may be any known type of handle designed or sized to fit the human hand.

Printer housing **7** further comprises at least one print media cartridge socket **15**. Each print media cartridge socket **15** functions to accept therein or reversibly attach therein a print media cartridge **20**, which is described below. Each print media cartridge socket **15** is a specially shaped slot or void in printer housing bottom side **13**. In best mode, the specially shaped slot or void of at least one print media cartridge socket **15** breaks out of printer housing front side **8** as depicted. Each print media cartridge socket **15** comprises: a left wall, a right wall, a rear wall, a top wall, an open bottom, and an open front, as depicted, which are each a rigid rectangular planar member with a longitudinal axis, a lateral axis, an inside surface, an outside surface, and four edges. Each print media cartridge socket **15** is sized and shaped to make a slip fit with the exterior of a print media cartridge **20**.

The left wall of print media cartridge socket **15** comprises a left alignment groove **16**. Left alignment groove **16** is an elongated horizontal groove or recess on the outside surface of left wall of print media cartridge socket **15**, running parallel with the longitudinal axis of the left wall of print media cartridge socket **15** as depicted. Left alignment groove **16** has a length, a width, a depth, a distal end, and a proximal end. The length, width, and depth of left alignment groove **16** are sized to make a slip fit with the length, width, and height respectively of a left alignment tongue **28** on print media cartridge **20** described below. The distal end of left alignment groove **16** is located toward the inside of the print media cartridge socket **15**. The proximal end of left alignment groove **16** is located toward the outside of the print media cartridge socket **15**. The distal end of left alignment groove **16** comprises a plurality of left alignment groove locking teeth **17**. Each left alignment grove locking tooth **17** is a pyramid-shaped or triangular-shaped tooth that has been carved, machined, molded, cast, or otherwise added into left alignment groove **16**. Left alignment grove locking teeth **17** are sized, spaced, and shaped to make a slip fit with left alignment tongue locking teeth **29** on print media cartridge **20**. Any particular shaped teeth positioned or located at any angle may be used. Left alignment grove locking teeth **17** function to locate and align print media cartridge **20** properly within free axis or free rolling printer **5** during insertion or installation of print media cartridge **20** into print media cartridge socket **15**. Left alignment grove locking teeth **17** further function to lock onto left alignment tongue locking teeth **29** on print media cartridge **20** when the print media cartridge **20** is fully inserted and installed within free axis or free-rolling printer **5**.

The right wall of print media cartridge socket **15** comprises a right alignment groove **18**. Right alignment groove **18** is an elongated horizontal groove or recess on the outside surface of right wall of print media cartridge socket **15**, running parallel with the longitudinal axis of the right wall of print media cartridge socket **15** as depicted. Right alignment groove **18** has a length, a width, a depth, a distal end, and a proximal end. The length, width, and depth of right alignment groove **18** are sized to make a slip fit with the length, width, and height respectively of a right alignment tongue **31** on print media cartridge **20** described below. The distal end of right alignment groove **18** is located toward the inside of the print media cartridge socket **15**. The proximal end of right alignment groove **18** is located toward the outside of the print media cartridge socket **15**. The distal end of right alignment groove **18** comprises a plurality of right alignment groove locking teeth **19**. Each right alignment grove locking tooth **19** is a pyramid-shaped or triangular-shaped tooth that has been carved, machined, molded, cast, or otherwise added into right alignment groove **18**. Right alignment grove locking teeth **19** are sized, spaced, and shaped to make a slip fit with right alignment tongue locking teeth **32** on print media cartridge **20**. Any particular shaped teeth positioned or located at any angle may be used. Right alignment grove locking teeth **19** function to locate and align print media cartridge **20** properly within free axis or free rolling printer **5** during insertion or installation of print media cartridge **20** into print media cartridge socket **15**. Right alignment grove locking teeth **19** further function to lock onto right alignment tongue locking teeth **32** on print media cartridge **20** when the print media cartridge **20** is fully inserted and installed within free axis or free-rolling printer **5**.

Left and right alignment grove locking teeth **17**,**19** function to lock print media cartridge **20** firmly within free axis or free rolling printer **5** to hold print media cartridge **20** steady and without motion or vibration within free axis or free rolling printer **5** during operation of free axis or free rolling printer **5**. The operation of free axis or free rolling printer **5** involves substantial movement of free axis or free rolling printer **5**. Very typically, printer errors occur or blurred images are produced when a print media cartridge **20** moves relative to the rest of the free axis or free rolling printer **5** during the printing process and motion of free axis or free rolling printer **5**. Therefore, it is very important for all print media cartridges **20** installed within free axis or free rolling printer **5** to remain motionless and free from vibration with respect to the rest of the free axis or free rolling printer **5**.

The rear wall of print media cartridge socket **15** further comprises an electrical connector. This print media cartridge socket electrical connector functions to provide electrical continuity or an electrical connection between a print media cartridge **20** and a main circuit board or motherboard **150** located within the printer housing **7** of free axis or free-rolling printer **5**, as discussed below. Print media cartridge socket electrical connector may be any known type of electrical connector such as a parallel or serial connector such as a USB connector.

Printer housing **7** may further comprises a second print media cartridge socket **15**. In best mode, second print media cartridge socket **15** breaks out of printer housing rear side **9**. Second print media cartridge socket **15** contains the same elements as the first print media cartridge socket **15** described above. With a second print media cartridge socket **15**, free axis or free-rolling printer **5** may include and house two different types of print media cartridges **20** that hold two

different types of liquid print media or ink in order to allow for printing onto two totally different surfaces such as one set of liquid print media or ink for printing onto fabric or clothing along with another set of liquid print media or ink for printing onto paper or sign board.

Free axis or free-rolling printer **5** further comprises at least one print media cartridge **20**. Each print media cartridge **20** is a rigid hollow rectangular cuboid member or box-shaped member as depicted. Print media cartridge **20** comprises: a cartridge housing front side **21**, a cartridge housing rear side **22**, a cartridge housing left side **23**, a cartridge housing right side **24**, a cartridge housing top side **25**, and a cartridge housing bottom side **26**. Cartridge housing front side **21**, a cartridge housing rear side **22**, a cartridge housing left side **23**, a cartridge housing right side **24**, a cartridge housing top side **25**, and a cartridge housing bottom side **26**, each are a rigid rectangular planar member with a longitudinal axis, a lateral axis, an inside surface, an outside surface, and four edges. Cartridge housing front side **21**, a cartridge housing rear side **22**, a cartridge housing left side **23**, a cartridge housing right side **24**, a cartridge housing top side **25**, and a cartridge housing bottom side **26** are rigidly connected to each other to form the rigid hollow rectangular cuboid member or hollow box-shaped member as depicted. The edges and/or corners of the rectangular cuboid member or hollow box-shaped member may be rounded as depicted.

Each print media cartridge **20** contains at least four print medium reservoirs, namely, print medium reservoir one, print medium reservoir two, print medium reservoir three, and print medium reservoir four. Each print medium reservoir is a tank or container that is capable of holding a volume of liquid print media or ink including ink jet ink, garment based ink, solvent based ink, or any other known type of liquid ink, liquid paint, liquid dye, or liquid colorant. Typically, each print medium reservoir holds a certain color liquid print media or ink, namely cyan, magenta, yellow, and black.

Each print media cartridge **20** also contains at least four print heads, namely, print head one **35**, print head two **36**, print head three **37**, and print head four **38**. Print head one **35** is plumbed to or connected to print medium reservoir one. Print head two **36** is plumbed to or connected to print medium reservoir two. Print head three **37** is plumbed to or connected to print medium reservoir three. Print head four **38** is plumbed to or connected to print medium reservoir four. Each print head **35**,**36**,**37**,**38** can be any known type of print head that is capable printing on a flat surface. Each print head **35**,**36**,**37**,**38** could be a thermal print head or piezoelectric print head. Each print head **35**,**36**,**37**,**38** is capable of ejecting ink jet ink, garment based ink, solvent based ink, or any other known type of ink, paint, dye, or colorant in a precise and/or accurate fashion in order to yield a clearly imaged print out.

Each print media cartridge **20** further comprises an electronic chip or circuit board. Print media cartridge electronic chip or circuit board may be any known type of electronic chip, circuit board, or integrated circuit. Print media cartridge electronic chip or circuit board has electrical continuity with each print head **35**,**36**,**37**,**38** or is otherwise connected by electrical wiring **96** to each print head **35**,**36**,**37**,**38**. Each print media cartridge **20** further comprises an electrical connector located on the rear side **22** of print media cartridge **20**. Print media cartridge electrical connector functions to provide electrical continuity or an electrical connection between print media cartridge electronic chip or circuit board and a main circuit board or motherboard **150** located within the printer housing **7** of free axis or free-rolling printer **5**. Print media cartridge electrical connector on print media cartridge **20** mates with, pairs with, or otherwise reversibly connects with print media cartridge socket electrical connector on print media cartridge socket **15** when print media cartridge is installed within print media cartridge socket **15**. Print media cartridge electrical connector may be any known type of electrical connector such as a parallel or serial connector such as a USB connector. Print media cartridge electrical connector has electric continuity with or is otherwise connected by electrical wiring **96** to print media cartridge electronic chip or circuit board.

Cartridge housing left side **23** further comprises a left alignment fin **27**. Left alignment fin **27** is an oblong protrusion jutting perpendicularly outward from the outside surface of cartridge housing left side **23** as depicted. The longitudinal axis of the oblong protrusion runs parallel with the longitudinal axis of cartridge housing left side **23**. Left alignment fin **27** has a length, a width, and a height that are each sized to make a slip-fit with the length, width, and depth respectively of left alignment groove **16**. Length of left alignment fin **27** is about 0.1-1.0 inches. Width of left alignment fin **27** is about 0.01-0.5 inches. Height of left alignment fin **27** is about 0.01-0.8 inches. Left alignment fin **27** slides into left alignment groove **16** on print media cartridge socket **15** as the print media cartridge **20** is inserted within the print media cartridge socket **15**. Left alignment fin **27** functions to locate and align print media cartridge **20** properly within print media cartridge socket **15** as print media cartridge **20** is inserted and installed into print media cartridge socket **15**.

Cartridge housing left side **23** further comprises a left alignment tongue **28**. Left alignment tongue **28** is an elongated horizontal ridge or protrusion jutting perpendicularly outward from the outside surface of cartridge housing left side **23** as depicted. The longitudinal axis of the elongated horizontal ridge or protrusion runs parallel with the longitudinal axis of cartridge housing left side **23**. Left alignment tongue **28** is has a length, a width, a height, a distal end, and a proximal end. The length, width, and height of left alignment tongue **28** are sized to make a slip fit with the length, width, and depth respectively of left alignment groove **16** on print media cartridge socket **15**. The distal end of left alignment tongue **28** is located toward the rear side **22** of the print media cartridge **20**. The proximal end of left alignment tongue **28** is located toward the front side **21** of the print media cartridge **20**.

The distal end of left alignment tongue **28** further comprises a plurality of left alignment tongue locking teeth **29**. Each left alignment tongue locking tooth **29** is a pyramid-shaped or triangular-shaped void that has been carved, machined, molded, cast, or otherwise removed from left alignment tongue **28**. Left alignment tongue locking teeth **29** are sized and shaped to make a slip fit with left alignment groove locking teeth **17** on print media cartridge socket **15**. Any particular shaped void positioned or located at any angle may be used. Left alignment tongue locking teeth **29** function to locate print media cartridge **20** properly within free axis or free rolling printer **5** during installation within free axis or free-rolling printer **5**. Left alignment tongue locking teeth **29** are the first portions of print media cartridge **20** to enter left alignment groove **16** during insertion or installation of print media cartridge **20** into print media cartridge socket **15**. Left alignment tongue locking teeth **29** also function to lock onto left alignment groove locking teeth **17** on print media cartridge socket **15** when the print media cartridge **20** is fully inserted and installed within free

axis or free-rolling printer **5**. As stated, it is very important for the all print media cartridges **20** installed within free axis or free rolling printer **5** to remain motionless and free from vibration with respect to the rest of the free axis or free rolling printer **5**.

There is a void area **39** around three sides of left alignment tongue **28**. There is a void area **39** above left alignment tongue **28**, below left alignment tongue **28**, and around the proximal end of left alignment tongue **28** as depicted. These void areas **39** allow left alignment tongue **28** to slightly pivot around the distal end of left alignment tongue **28**, which is the only end of left alignment tongue **28** that is attached to cartridge housing left side **23**. In this way the entire left alignment tongue **28** becomes a hinge so to speak that can be pivoted inward, pressed inward, or flexed inward when pressed. When released, left alignment tongue **28** springs back outward or returns to its original position.

Cartridge housing front side **21** further comprises a window or void area to allow for access to a left pinch tab **33** as depicted. Left pinch tab **33** is a rigid loop, ring, cup, or depression that functions to provide an easy gripping point or grab point for a human finger or thumb. Left pinch tab **33** is rigidly connected to the proximal end of left alignment tongue **28**. Left pinch tab **33** is accessible to the operator through the window or void area in cartridge housing front side **21**. Left pinch tab **33** functions to allow the user to place their finger or thumb therein and squeeze or pull left alignment tongue **28** inward to cause the entire left alignment tongue **28** to pivot inward about its distal end which unlocks the print media cartridge **20** and allows for removal and/or insertion of print media cartridge **20**. The user releases their thumb or finger from left pinch tab **33** to cause the entire left alignment tongue **28** to spring back or pivot back about its distal end to return to its original position in order to lock the print media cartridge **20**.

Cartridge housing right side **24** further comprises a right alignment fin **30**. Right alignment fin **30** is an oblong protrusion jutting perpendicularly outward from the outside surface of cartridge housing right side **24** as depicted. The longitudinal axis of the oblong protrusion runs parallel with the longitudinal axis of cartridge housing right side **24**. Right alignment fin **30** has a length, a width, and a height that are each sized to make a slip-fit with the length, width, and depth respectively of right alignment groove **18**. Length of right alignment fin **30** is about 0.1-1.0 inches. Width of right alignment fin **30** is about 0.01-0.5 inches. Height of right alignment fin **30** is about 0.01-0.8 inches. Right alignment fin **30** slides into right alignment groove **18** on print media cartridge socket **15** as the print media cartridge **20** is inserted within the print media cartridge socket **15**. Right alignment fin **30** functions to locate and align print media cartridge **20** properly within print media cartridge socket **15** as print media cartridge **20** is inserted and installed into print media cartridge socket **15**.

Cartridge housing right side **24** further comprises a right alignment tongue **31**. Right alignment tongue **31** is an elongated horizontal ridge or protrusion jutting perpendicularly outward from the outside surface of cartridge housing right side **24** as depicted. The longitudinal axis of the elongated horizontal ridge or protrusion runs parallel with the longitudinal axis of cartridge housing right side **24**. Right alignment tongue **31** is has a length, a width, a height, a distal end, and a proximal end. The length, width, and height of right alignment tongue **31** are sized to make a slip fit with the length, width, and depth respectively of right alignment groove **18** on print media cartridge socket **15**. The distal end of right alignment tongue **31** is located toward the rear side **22** of the print media cartridge **20**. The proximal end of right alignment tongue **31** is located toward the front side **21** of the print media cartridge **20**.

The distal end of right alignment tongue **31** comprises a plurality of right alignment tongue locking teeth **32**. Each right alignment tongue locking tooth **32** is a pyramid-shaped or triangular-shaped void that has been carved, machined, molded, cast, or otherwise removed from right alignment tongue **31**. Right alignment tongue locking teeth **32** are sized and shaped to make a slip fit with right alignment groove locking teeth **19** on print media cartridge socket **15**. Any particular shaped void positioned or located at any angle may be used. Right alignment tongue locking teeth **32** function to locate print media cartridge **20** properly within free axis or free rolling printer **5** during installation within free axis or free-rolling printer **5**. Right alignment tongue locking teeth **32** are the first portions of print media cartridge **20** to enter right alignment groove **18** during insertion or installation of print media cartridge **20** into print media cartridge socket **15**. Right alignment tongue locking teeth **32** also function to lock onto right alignment groove locking teeth **19** on print media cartridge socket **15** when the print media cartridge **20** is fully inserted and installed within free axis or free-rolling printer **5**. As stated, it is very important for the all print media cartridges **20** installed within free axis or free rolling printer **5** to remain motionless and free from vibration with respect to the rest of the free axis or free rolling printer **5**.

There is a void area **39** around three sides of right alignment tongue **31**. There is a void area **39** above right alignment tongue **31**, below right alignment tongue **31**, and around the proximal end of right alignment tongue **31** as depicted. These void areas **39** allow right alignment tongue **31** to slightly pivot around the distal end of right alignment tongue **31**, which is the only end or part of right alignment tongue **31** that is attached to cartridge housing right side **24**. In this way the entire right alignment tongue **31** becomes a hinge so to speak that can be pivoted inward, pressed inward, or flexed inward when pressed. When released, left alignment tongue **28** springs back outward or returns to its original position.

The window or void area on cartridge housing front side **21** also allows access to a right pinch tab **34** as depicted. Right pinch tab **34** is a rigid loop, ring, cup, or depression that functions to provide an easy gripping point or grab point for a human finger or thumb. Right pinch tab **34** is rigidly connected to the proximal end of right alignment tongue **31**. Right pinch tab **34** is accessible to the operator through the window or void area in cartridge housing front side **21**. Right pinch tab **34** functions to allow the user to place their finger or thumb therein and squeeze or pull right alignment tongue **31** inward to cause the entire right alignment tongue **31** to pivot inward about its distal end which unlocks the print media cartridge **20** and allows for removal and/or insertion of print media cartridge **20**. The user releases their thumb or finger from right pinch tab **34** to cause the entire right alignment tongue **31** to spring back or pivot back about its distal end to return to its original position in order to lock the print media cartridge **20**. Left and right pinch tabs **33**,**34** are usually operated together where both are pinched or both released at the same time.

Free axis or free-rolling printer **5** further comprises: an X-axis tread system **40** and a Y-axis tread system **60**. X-axis tread system **40** moves or mobilizes free axis or free-rolling printer **5** along an x-axis. The x-axis lies in the plane of the printing surface **100** and runs laterally along the printing surface **100**. The x-axis runs from left to right or right to left

on the printing surface **100** just as the words of a sentence on a printout run from left to right. Y-axis tread system **60** moves or mobilizes free axis or free-rolling printer **5** along a y-axis. The y-axis also lies in the plane of the printing surface **100** but is perpendicular to the x-axis. The y-axis runs up and down or top to bottom on the printing surface **100**.

Y-axis tread system **60** is retractable. X-axis tread system **40** and y-axis tread system **60** work together or in tandem to properly move free axis or free-rolling printer **5** across the printing surface **100** in order to successfully complete a printing application. X-axis tread system **40** moves free axis or free-rolling printer **5** across the printing surface **100** from left to right and from right to left in repeated fashion. Each time free axis or free-rolling printer **5** moves from left to right or from right to left it prints a line or a portion of a line on the printing surface **100**. After the line or line portion is completed and printed across the full width of the print surface **100**, the Y-axis tread system **60** extends downward to contact the printing surface **100** and to lift X-axis tread system **40** out from contact with the printing surface **100** as depicted in FIG. **17**. Then, Y-axis tread system **60** moves free axis or free-rolling printer **5** some distance along the y-axis in order to properly position or locate free axis or free-rolling printer **5** itself onto the proper starting point on the printing surface **100** in order for the next line of printing to begin. After free axis or free-rolling printer **5** is properly positioned along the y-axis for the next line of printing to begin, Y-axis tread system **60** retracts in order to restore contact of the X-axis tread system **40** with the printing surface **100** as depicted in FIG. **16**. Upon which time, X-axis tread system **40** starts to move free axis or free-rolling printer **5** across the width of the printing surface **100** again in order to print the next line or portion of a line on the printing surface **100**. This process is repeated until the print out is complete.

X-axis tread system **40** comprises: a X-axis continuous track or tread **41**, a X-axis drive gear **43**, a first X-axis foot gear **45**, a second X-axis foot gear **47**, a third X-axis foot gear **48**, a fourth X-axis foot gear **49**, a first X-axis roller **50**, a second X-axis roller **51**, and plurality of X-axis upper alignment gears **52**. X-axis continuous track or tread **41** is a closed loop of resilient, flexible, or elastomeric material with a width, a circumference, an inner surface, and an outer surface. Any known type of resilient, flexible, or elastomeric material may be used such as: rubber, EPDM, EPM, ECO, ACM, ABR, Viton or FKM, Silicone, Buna-N, or other known flexible material. The width of X-axis continuous track or tread **41** is about 0.25-5 inches. The circumference of X-axis continuous track or tread **41** is about 10-50 inches. The outer surface of X-axis continuous track or tread **41** is smooth or flat. The outer surface of X-axis continuous track or tread **41** touches or makes contact with the print surface as free axis or free-rolling printer **5** is printing on the printing surface **100**. The inner surface of X-axis continuous track or tread **41** has a plurality of ridges **42** that protrude perpendicularly inward from the inner surface of X-axis continuous track or tread **41**. X-axis track ridges **42** are oblong protrusions that run longitudinally perpendicular to the circumference of X-axis continuous track or tread **41**. X-axis track ridges **42** function to provide grip or traction for gears **43**,**45**,**47**,**48**,**49**,**52** by inter weaving with or meshing with teeth or ridges **44** on gears **43**,**45**,**47**,**48**,**49**,**52**. In best mode, X-axis track ridges **42** are molded directly into X-axis continuous track or tread **41** and thus form an integral part of X-axis continuous track or tread **41**. X-axis continuous track or tread **41** is wrapped around or wound around gears **43**,**45**,**47**,**48**,**49**,**52** to form an upside down or inverted U-shape as depicted. This inverted U-shape of X-axis continuous track or tread **41** is required to allow room or clearance space for the print media cartridge socket **15** and the print media cartridge **20** located in the center of the inverted U-shape.

X-axis drive gear **43** is located at the top of the inverted U-shape as depicted. X-axis drive gear **43** is a gear or cogwheel with teeth or ridges **44** protruding outward from the entire circumference of a rigid disk member. X-axis drive gear **43** may be any know type of gear. X-axis drive gear teeth or ridges **44** are sized and shaped to make a slip fit into the spaces between ridges **42** on X-axis continuous track or tread **41**. X-axis drive gear teeth or ridges **44** intermesh with X-axis track ridges **42** on X-axis continuous track or tread **41** on the top and bottom of X-axis drive gear **43** as depicted. X-axis drive gear **43** functions to drive X-axis continuous track or tread **41** or rotate continuous track or tread **41** by transferring rotation motion from gear **43** to continuous track or tread **41** thereby causing rotation of continuous track or tread **41** to cause translational motion of free axis or free-rolling printer **5**. X-axis drive gear **43** is rigidly attached to a main drive axle **95**.

First and second X-axis foot gears **45**,**47** are located on the left side of the inverted U-shape as depicted. Third and fourth X-axis foot gears **48**,**49** are located on the right side of the inverted U-shape as depicted. First, second, third, and fourth X-axis foot gears **45**,**47**,**48**,**49** are each a gear or cogwheel with teeth or ridges **46** protruding outward from the entire circumference of a rigid disk member. First, second, third, and fourth X-axis foot gears **45**,**47**,**48**,**49** may be any known type of gears. X-axis foot gear teeth or ridges **46** are sized and shaped to make a slip fit into the spaces between X-axis track ridges **42** on X-axis continuous track or tread **41**. Every third X-axis foot gear tooth or ridge **46** is missing as depicted to allow for proper alignment between X-axis foot gear teeth or ridges **46** and the spaces between ridges **42** on X-axis continuous track or tread **41** as X-axis continuous track or tread **41** makes the ninety degree bend around each foot gear to form the inverted U-shape.

First X-axis roller **50** is a roller or rigid cylindrical member. First X-axis roller **50** is located just above second X-axis foot gear **47** as depicted. First X-axis roller **50** helps form the inverted U-shape. First X-axis roller **50** presses against and supports the outer surface of X-axis continuous track or tread **41** to create a ninety degree bend in X-axis continuous track or tread **41** to create the left leg of the inverted U-shape. Second X-axis roller **51** is a roller or rigid cylindrical member. Second X-axis roller **51** is located just above third foot gear **48** as depicted. Second X-axis roller **51** helps form the inverted U-shape. Second X-axis roller **51** presses against and supports the outer surface of X-axis continuous track or tread **41** to create a ninety degree bend in X-axis continuous track or tread **41** to create the right leg of the inverted U-shape.

There are a plurality of X-axis upper alignment gears **52** located above X-axis foot gears **45**,**47**,**48**,**49** and above rollers **50**,**51** as depicted. Each X-axis upper alignment gear **52** is a gear or cogwheel with teeth or ridges protruding outward from the entire circumference of a rigid disk member. X-axis upper alignment gear teeth or ridges **53** are sized and shaped to make a slip fit into the spaces between X-axis track ridges **42** on X-axis continuous track or tread **41**. X-axis upper alignment gears **52** function to retain tension in X-axis continuous track or tread **41** by pushing X-axis continuous track or tread **41** outward and keeping the inverted U-shape from collapsing as the X-axis continuous

track or tread **41** is rotating. In best mode, there are six X-axis upper alignment gears **52**, as depicted, however, there could be as few as two X-axis upper alignment gears **52** utilized to retain the inverted U-shape of X-axis continuous track or tread **41**.

X-axis tread system **40** further comprises: an outside panel **54**, inside panel **55**, and a plurality of spacers **56**. Outside panel **54** and inside panel **55** are each rigid planar members and are positioned parallel to each other with their edges aligned. Outside panel **54** and inside panel **55** are rigidly attached to each other by a plurality of spacers **56**. All components of X-axis tread system listed above are sandwiched between outside panel **54** and inside panel **55** as depicted. X-axis drive gear **43**, first X-axis foot gear **45**, second axis foot gear **47**, third axis foot gear **48**, fourth axis foot gear **49**, first x-axis roller **50**, second X-axis roller **51**, and all X-axis upper alignment gears **52** each have individual axles which they are pivotally attached thereto. Each of these individual axles is rigidly attached to the outside panel **54** and the inside panel **55** and positioned perpendicular to each. The assembly of outside panel **54**, inside panel **55**, and all spacers **56** functions to provide a support structure for X-axis tread system **40** and to hold all components of X-axis tread system **40** together.

Free axis or free-rolling printer **5** further comprises: an X-axis servomotor **57** and an X-axis drive axle **58**. X-axis servomotor **57** is a servomotor that generates rotational motion in a precise and measured capacity. X-axis servomotor **57** may be any known type of servomotor. In best mode X-axis servomotor **57** is an electric motor. X-axis servomotor **57** has electrical continuity with a power source and a main circuit board or motherboard **90**. X-axis servomotor **57** can rotate clockwise and counterclockwise. X-axis servomotor **57** is rigidly connected to X-axis drive axle **58**. X-axis drive axle **58** is an axle. Any known type of axle may be used. X-axis drive axle **58** is positioned with its longitudinal axis running perpendicular to the loop of X-axis continuous track or tread **41**. X-axis drive axle **58** is also rigidly connected to X-axis drive gear **43**. When X-axis servomotor **57** rotates, this rotates X-axis drive gear **43**, which rotates the loop of X-axis continuous track or tread **41**.

In best mode, free axis or free-rolling printer **5** comprises two X-axis tread systems **40** as depicted with one X-axis tread system **40** on the front of a free axis or free-rolling printer **5** and a second X-axis tread system **40** on the rear of free axis or free-rolling printer **5**. In this configuration, there is still only one X-axis drive axle **58** that is rigidly attached to a first X-axis drive gear **43** on one end and another first X-axis drive gear **43** on the other end as depicted. In this configuration, there are four X-axis tread clearance windows or void areas.

Y-axis tread system **60** comprises: a Y-axis continuous track or tread **61**, a Y-axis drive gear **63**, a Y-axis foot gear **65**, and a Y-axis top gear **67**. Y-axis continuous track or tread **61** is a resilient, flexible, or elastomeric closed loop of material with a width, a circumference, an inner surface, and an outer surface. Y-axis continuous track or tread **61** is a closed loop of resilient, flexible, or elastomeric material with a width, a circumference, an inner surface, and an outer surface. Any known type of resilient, flexible, or elastomeric material may be used such as: rubber, EPDM, EPM, ECO, ACM, ABR, Viton or FKM, Silicone, Buna-N, or other known flexible material. The width of Y-axis continuous track or tread **61** is about 0.25-5 inches. The circumference of Y-axis continuous track or tread **61** is about 5-30 inches. The outer surface of Y-axis continuous track or tread **61** is smooth or flat. The outer surface of Y-axis continuous track or tread **61** touches or makes contact with the print surface as free axis or free-rolling printer **5** is printing on the printing surface **100**. The inner surface of Y-axis continuous track or tread **61** has a plurality of ridges **62** that protrude perpendicularly inward from the inner surface of Y-axis continuous track or tread **61**. Y-axis track ridges **62** are oblong protrusions that run longitudinally perpendicular to the circumference of Y-axis continuous track or tread **61**. Y-axis track ridges **62** function to provide grip or traction for gears **63**,**65**,**67** by inter weaving or meshing with teeth on these gears as depicted. In best mode, Y-axis track ridges **62** are molded directly into Y-axis continuous track or tread **61** and thus form an integral part of Y-axis continuous track or tread **61**. Y-axis continuous track or tread **61** is wrapped around r wound around gears **63**,**65**,**67** to form a general triangular shape as depicted.

Y-axis drive gear **63** is located at the bottom rear of the triangular shape as depicted. Y-axis drive gear **63** is a gear or cogwheel with teeth or ridges **64** protruding outward from the entire circumference of a rigid disk member. Y-axis drive gear **63** may be any know type of gear. Y-axis drive gear teeth or ridges **64** are sized and shaped to make a slip fit into the spaces between ridges **62** on Y-axis continuous track or tread **61**. Y-axis drive gear teeth or ridges **64** intermesh with Y-axis track ridges **62** on Y-axis continuous track or tread **61** on the bottom side and rear side of Y-axis drive gear **63** as depicted. Every third Y-axis drive gear tooth or ridge **64** is missing as depicted to allow for proper alignment between Y-axis drive gear teeth or ridges **64** and the spaces between ridges **62** on Y-axis continuous track or tread **61** as Y-axis continuous track or tread **61** makes the greater than ninety degree bend around drive gear **63** to form the triangular shaped loop. Y-axis drive gear **63** functions to drive Y-axis continuous track or tread **61** or rotate continuous track or tread **61** by transferring rotation motion from gear **63** to continuous track or tread **61** thereby causing rotation of continuous track or tread **61** to cause translational motion of free axis or free-rolling printer **5**. Y-axis drive gear **63** is rigidly attached to a Y-axis drive axle **70**.

Y-axis foot gear **65** is located at the bottom front of the triangular shape as depicted. Y-axis foot gear **65** is a gear or cogwheel with teeth or ridges **66** protruding outward from the entire circumference of a rigid disk member. Y-axis foot gear **65** may be any known type of gear. Y-axis foot gear teeth or ridges **66** are sized and shaped to make a slip fit into the spaces between Y-axis track ridges **62** on Y-axis continuous track or tread **61**. Y-axis foot gear teeth or ridges **66** intermesh with Y-axis track ridges **62** on Y-axis continuous track or tread **61** on the bottom side and front side of Y-axis drive gear **63** as depicted. Every third Y-axis foot gear tooth or ridge **66** is missing as depicted to allow for proper alignment between Y-axis foot gear teeth or ridges **66** and the spaces between ridges **62** on Y-axis continuous track or tread **61** as Y-axis continuous track or tread **61** makes the greater than ninety degree bend around foot gear **65** to form the triangular shaped loop.

Y-axis top gears **67** located above Y-axis drive gear **63** and Y-axis foot gear **65** as depicted. Y-axis top gear **67** is a gear or cogwheel with teeth or ridges protruding outward from the entire circumference of a rigid disk member. Y-axis top gear teeth or ridges **68** are sized and shaped to make a slip fit into the spaces between Y-axis track ridges **62** on Y-axis continuous track or tread **61**. Y-axis top gear **67** functions to retain tension in Y-axis continuous track or tread **61** by pushing Y-axis continuous track or tread **61** upwards and

keeping the triangular shape from collapsing as the Y-axis continuous track or tread **61** is rotating.

Y-axis tread system **60** further comprises: a Y-axis servomotor **69** and a Y-axis drive axle **70**. Y-axis servomotor **69** is a servomotor that generates rotational motion in a precise and measured capacity. Y-axis servomotor **69** may be any known type of servomotor. In best mode Y-axis servomotor **69** is an electric motor. Y-axis servomotor **69** has electrical continuity with a power source and electrical continuity with a main circuit board or motherboard **90**. Y-axis servomotor **69** can rotate clockwise and counterclockwise. Y-axis servomotor **69** is rigidly connected to Y-axis drive axle **70**. Y-axis drive axle **70** is an axle. Any known type of axle may be used. Y-axis drive axle **70** is positioned with its longitudinal axis running perpendicular to the loop of Y-axis continuous track or tread **61**. Y-axis drive axle **70** is also rigidly connected to Y-axis drive gear **63**. When Y-axis servomotor **69** rotates, this rotates Y-axis drive gear **63**, which rotates the loop of Y-axis continuous track or tread **61**.

Y-axis tread system **60** further comprises a housing **71**. Y-axis tread system housing **71** is a rigid cover, bonnet, or hood that houses the above listed components of Y-axis tread system **60**. Y-axis drive gear **63**, Y-axis foot gear **65**, and Y-axis top gear **67** each have individual axles pivotally attached thereto. Each of these individual axles is rigidly attached to Y-axis tread system housing **71** as depicted. Y-axis drive axle **70** is pivotally attached to Y-axis tread system housing **71**. Y-axis servomotor **69** is rigidly attached to Y-axis tread system housing **71**. This assembly of items attached to Y-axis tread system housing **71** functions to provide a support structure for the Y-axis tread system **60** and to hold all components of Y-axis tread system **60** together as this assembly is extended downwards from and reversibly retracted upwards into the bottom of free axis or free-rolling printer **5**. This assembly is defined as Y-axis tread system housing assembly.

Y-axis tread system **60** further comprises a gantry assembly **72** that functions to vertically lower the Y-axis tread system **60** down from the bottom of free axis or free-rolling printer **5** and to vertically raise the Y-axis tread system **60** up into the bottom of free axis or free-rolling printer **5**. Gantry assembly **72** uses a rack and pinion to translate rotational motion from a servomotor into translational motion of a rack where the rack is attached to the Y-axis tread system **60** and the rack is used to raise and lower the entire Y-axis tread system **60**.

Gantry assembly **72** comprises: a rack **73**, a rack housing **74**, a pinion or gear **75**, a gantry bracket **76**, and a rack pin **84**. Rack **73** is a rack member that is an elongated rigid member with a row of teeth or grooves along the entire length of one side. Any know type of rack may be used. Rack **73** has an upper end, a lower end, and a longitudinal axis. Pinion or gear **75** is a pinion, gear, or cogwheel with teeth or ridges protruding outward from the entire circumference of a rigid disk member. Any known type of pinion, gear, or cogwheel may be used. Rack housing **74** is an oblong rigid hollow cover structure with an upper end, a lower end, and a longitudinal axis. Rack housing **74** covers or encapsulates rack **73**. Rack housing **74** is rigidly attached to rack **73**. Rack housing **74** has: a top side **78**, a bottom side **79**, a front side **80**, a rear side **81**, an inner side **82**, and an outer side **83**. Rack housing top side **78**, rack housing bottom side **79**, rack housing front side **80**, rack housing rear side **81**, rack housing inner side **82**, and rack housing outer side **83** are rigidly connected to each other at their edges to form a rigid hollow cover structure. In best mode, rack housing **74** is a rectangular cuboid member or hollow box-shaped member. The edges and/or corners of the rectangular cuboid member or hollow box-shaped member may be rounded. Rack housing **74** is rigidly attached to bottom side **13** of printer housing **7**.

The longitudinal axis of rack housing **74** is positioned vertically. Rack **73** is located within the hollow structure of rack housing **74** as depicted. Rack **73** is positioned vertically and parallel with the longitudinal axis of rack housing **74**. The longitudinal axis of rack **73** is parallel with that of rack housing **74**. Rack **73** is positioned entirely within rack housing **74**. The outer side **83** of rack housing **74** further comprises a pinion or gear window **86**. Pinion or gear window **86** is a void or window in outer side **83**. Pinion or gear window **86** functions to allow for a mechanical connection or linkage between the pinion or gear **75** and the rack **73**. The pinion or gear **75** is installed within teeth or grooves on rack **73** just as a pinion is normally installed within a rack. The teeth or ridges from pinion or gear **75** are interweaved within the teeth or grooves on rack **73** where pinion or gear **75** is inserted through the pinion or gear window **86** in order to make contact with the rack **73**. The inner side **82** of rack housing **74** further comprises a rack pin slot **85** at its upper end. Rack pin slot **85** is an elongated void or elongated window running longitudinally along inner side **82**. The longitudinal axis of rack pin slot **85** is parallel with the longitudinal axis of rack **73**. The length of rack pin slot **85** is about 0.5-10 inches. Rack pin slot **85** may extend to the lower end of rack housing **74**.

Rack pin **84** is a rigid oblong member. In best mode, rack pin **84** is a rigid solid cylindrical member. Rack pin **84** is positioned horizontally and perpendicular to the longitudinal axis of rack **73**. Rack pin **84** has an inner end and an outer end. Rack pin is rigidly attached to the upper end of rack **73**. The inner end of rack pin **84** is rigidly attached to the upper end of rack **73** or near the upper end of rack **73**. The outer end of rack pin **84** protrudes through rack pin slot **85** as depicted. The outer end of rack pin **84** is rigidly attached to gantry bracket **76**. Gantry bracket **76** is a rigid bracket member. Gantry bracket **76** is rigidly attached to rack housing **74**. Rack housing **74** and gantry bracket **76** function to rigidly attach rack **73**, through rack pin **84**, to Y-axis tread system housing **71**. These rigid attachments thereby rigidly linking the entire Y-axis tread system housing assembly to the upper end of rack **73**. With this linkage, the entire Y-axis tread system housing assembly is raised and lowered as rack **73** is raised and lowered.

Y-axis tread system **60** further comprises: a gantry servomotor **87** and a gantry servomotor axle **88**. Gantry servomotor **87** is a servomotor that generates rotational motion in a precise and measured capacity. Gantry servomotor **87** may be any known type of servomotor. In best mode gantry servomotor **87** is an electric motor. Gantry servomotor **87** has electrical continuity with a power source and electrical continuity with a main circuit board or motherboard **90**. Gantry servomotor **87** can rotate clockwise and counterclockwise. Gantry servomotor **87** is rigidly connected to gantry servomotor axle **88**. Gantry servomotor axle **88** is an axle with a longitudinal axis. Any known type of axle may be used. Gantry servomotor axle **88** is positioned with its longitudinal axis running perpendicular to the loop of Y-axis continuous track or tread **61**. Gantry servomotor axle **88** is also rigidly connected to gantry pinion or gear **75**.

During extension and retraction of the Y-axis tread system **60**, the gantry servomotor **87** rotates the gantry pinion or gear **75** clockwise or counterclockwise. When the gantry pinion or gear **75** rotates in one direction, this forces rack **73** and rack pin **84** downward, thereby lowering the whole

Y-axis tread system housing assembly downward with respect to housing **7** in order to cause Y-axis continuous track or tread **61** to contact printing surface **100** as depicted in FIG. **17**. When the gantry pinion or gear **75** rotates in the other direction, this forces the rack **73** and rack pin **84** upward in order to lift the whole Y-axis tread system housing assembly upward with respect to printer housing **7** to remove Y-axis continuous track or tread **61** from contact with printing surface **100** as depicted in FIG. **16**. The gantry servomotor **77** drives the retraction and extension mechanism of the Y-axis tread system **60**.

In best mode, free axis or free-rolling printer **5** comprises two Y-axis tread systems **60** as depicted with one Y-axis tread system **60** on the left side of a free axis or free-rolling printer **5** and a second Y-axis tread system **60** on the right side of free axis or free-rolling printer **5**, each with its own Y-axis tread clearance window or void area.

Free axis or free-rolling printer **5** further comprises: a main circuit board or motherboard **90** and a servomotor control circuit board **92**. Main circuit board or motherboard **90** and servomotor control circuit board **92** are each circuit boards with a plurality of electrical circuits. Main circuit board or motherboard **90** has electrical continuity with servomotor control circuit board **92**. Main circuit board or motherboard **90** and servomotor control circuit board **92** each have electrical continuity with a power source. Servomotor control circuit board **92** has electrical continuity with: X-axis drive servomotor **57**, each Y-axis servomotor **69**, and each gantry servomotor **77**. Electrical wiring **96** is used for these electrical connections. Free axis or free-rolling printer **5** further comprises an on/off switch **94** that has electrical continuity with main circuit board or motherboard **90** and servomotor control circuit board **92**. Free axis or free-rolling printer **5** further comprises a power connector **98** that has electrical continuity with main circuit board or motherboard **90** and servomotor control circuit board **92**. Power connector **98** has electrical continuity with either a wireless battery or an alternating current wired power source.

What is claimed is:

1. A free axis or free-rolling printer comprising:

an X-axis continuous track or tread; an X-axis drive gear; a first X-axis foot gear; a second X-axis foot gear; a third X-axis foot gear; a fourth X-axis foot gear; an X-axis servomotor; and an X-axis drive axle;

a Y-axis continuous track or tread; a Y-axis drive gear; a Y-axis drive axle; a Y-axis foot gear; a Y-axis top gear; a housing; a rack; a pinion gear; a Y-axis servomotor; a gantry servomotor; a gantry servomotor axle; and

a print media cartridge socket,

wherein, said free axis or free-rolling printer is a printer that ejects ink or colorant onto a stationary flat horizontal plane or surface, said free axis or free-rolling printer is self-propelled or capable of self-propelled movement along said stationary flat horizontal plane or surface, said free axis or free-rolling printer comprises: a front side, a rear side, a left side, a right side, a top side, and bottom side;

wherein said X-axis continuous track or tread is a closed loop of resilient, flexible, or elastomeric material with an outer surface and an inner surface, said outer surface of said X-axis continuous track or tread continuously contacts said stationary flat horizontal plane or surface during operation of said free axis or free-rolling printer, and said inner surface of said X-axis continuous track or tread has a plurality of ridges that protrude inward therefrom;

wherein said X-axis drive gear is a gear or cogwheel with a plurality teeth or ridges protruding radially outward therefrom, said X-axis drive axle is an axle, said X-axis drive gear is rigidly attached to said X-axis drive axle, said first, second, third, and fourth X-axis foot gears are each a gear or cogwheel with a plurality teeth or ridges protruding radially outward therefrom,

said X-axis drive gear, said first X-axis foot gear, said second X-axis foot gear, said third X-axis foot gear, and said fourth X-axis foot gear are each pivotally attached to said free axis or free-rolling printer,

said X-axis continuous track or tread is wrapped around or wound around said X-axis drive gear, said first X-axis foot gear, said second X-axis foot gear, said third X-axis foot gear, and said fourth X-axis foot gear, so that the plurality of ridges of said X-axis continuous track or tread inter weave or mesh with the plurality teeth or ridges on each of said X-axis drive gear, said first X-axis foot gear, said second X-axis foot gear, said third X-axis foot gear, and said fourth X-axis foot gear,

wherein said X-axis servomotor is a servomotor, and said X-axis servomotor is rigidly attached to said X-axis drive axle;

wherein said Y-axis continuous track or tread is a closed loop of resilient, flexible, or elastomeric material with an outer surface and an inner surface, said outer surface of said Y-axis continuous track or tread periodically or intermittingly contacts said stationary flat horizontal plane or surface during operation of said free axis free-rolling printer, and said inner surface of said Y-axis continuous track or tread has a plurality of ridges that protrude inward therefrom,

wherein said Y-axis drive gear is a gear or cogwheel with a plurality of teeth or ridges protruding radially outward therefrom, said Y-axis drive axle is an axle, said Y-axis drive gear is rigidly attached to said Y-axis drive axle, said Y-axis foot gear is a gear or cogwheel with a plurality teeth or ridges protruding radially outward therefrom, and said Y-axis top gear is a gear or cogwheel with a plurality teeth or ridges protruding radially outward therefrom,

wherein said housing is a rigid member, and said Y-axis drive gear, said Y-axis foot gear, and said Y-axis top gear are each pivotally attached to said housing,

said Y-axis continuous track or tread is wrapped around or wound around said Y-axis drive gear, said Y-axis foot gear, and said Y-axis top gear, so that said plurality of ridges of said Y-axis continuous track or tread inter weave or mesh with said plurality of teeth or ridges on each of said Y-axis drive gear, said Y-axis foot gear, and said Y-axis top gear,

said rack is a rack or an elongated rigid member with a row of teeth or grooves along one side, said rack is rigidly connected to said housing, said pinion gear is a pinion, gear, or cogwheel with a plurality of teeth or ridges protruding radially outward therefrom, said pinion gear is positioned so that said plurality of teeth or ridges of said pinion gear interweave or mesh with said teeth or grooves of said rack,

said gantry servomotor axle is an axle, and said pinion gear is rigidly attached to said gantry servomotor axle,

said gantry servomotor is a servomotor, and said gantry servomotor is rigidly attached to said gantry servomotor axle,

said Y-axis servomotor is a servomotor, and said Y-axis servomotor is rigidly attached to said Y-axis drive axle;

wherein the print media cartridge socket, is a slot or void in said bottom side of said free axis or free-rolling printer, said print media cartridge socket comprises: a left wall, a right wall, a rear wall, and a top wall, which are each a rigid rectangular planar member with a longitudinal axis, a lateral axis, an inside surface, and an outside surface,

said left wall of said print media cartridge socket has a left alignment groove that is an elongated horizontal groove or recess in said outside surface of said left wall, running parallel with said longitudinal axis of said left wall, said left alignment groove has a proximal end and a distal end, said distal end of said left alignment groove comprises a plurality of left alignment groove locking teeth, wherein each of said plurality of left alignment groove locking teeth is a pyramid-shaped or triangular-shaped protrusion in said left alignment groove,

said right wall of said print media cartridge socket has a right alignment groove that is an elongated horizontal groove or recess in said outside surface of said right wall, running parallel with said longitudinal axis of said right wall, said right alignment groove has a proximal end and a distal end, said distal end of said right alignment groove comprises a plurality of right alignment groove locking teeth, and wherein each of said plurality of right alignment groove locking teeth is a pyramid-shaped or triangular-shaped protrusion in said right 1 50 alignment groove.

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