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Weinschenk

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(54) TRUSS JIGGING SYSTEM AND METHOD

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 222 days.

(21) Appl. No.: **16/671,982**

(22) Filed: **Nov. 1, 2019**

(65) **Prior Publication Data**

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Related U.S. Application Data

(60) Provisional application No. 62/754,578, filed on Nov. 1, 2018.

(51) **Int. Cl.**
B25H 1/10 (2006.01)

(52) **U.S. Cl.**
CPC ***B25H 1/10*** (2013.01)

(58) **Field of Classification Search**
CPC Y10S 269/91; Y10S 269/909; Y10T 29/5397; Y10T 29/53961; B23Q 3/102; B23Q 3/06; B23Q 5/38; B23Q 5/385; B27F 7/155; B25H 1/10
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,854,747 A * 12/1998 Fairlie B25B 11/00 700/114
8,109,493 B2 2/2012 Koskovich et al.
9,821,440 B1 11/2017 Fredrickson et al.
(Continued)

OTHER PUBLICATIONS

AVX, "High Capacitance Cylindrical SuperCapacitors", "download from: https://www.mouser.com/datasheet/2/40/AVX-SCC-1018831.pdf", No date provided.
(Continued)

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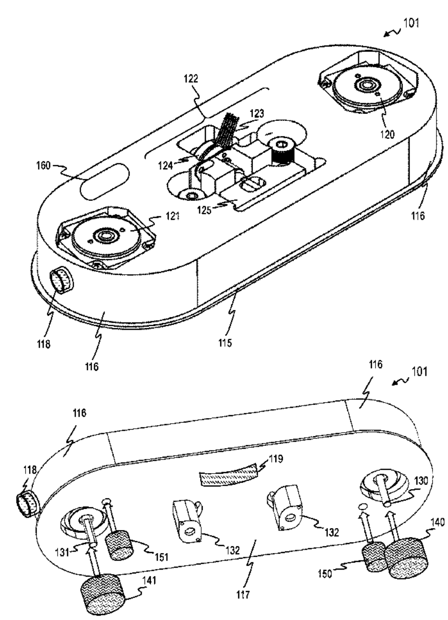
(57) ABSTRACT

A truss-jig-positioning system that includes a truss-assembly table having a support plane, a plurality of slots in the support plane, and a plurality of puck assemblies automatically movable along the slots. Each puck is self-powered and self-locks at selected locations. A controller controls the pucks. Images of the truss-assembly table and pucks allow the controller to locate pucks, and transmit location-correction information as needed to move pucks to desired locations for building various trusses, wall assemblies, etc. Pucks are self-powered, self-moving, motorized jigging members. Each operates from controller commands to unlock from one location, move along their slot and lock to a new location. Optionally location-measuring (machine-vision) subsystem(s) communicate wirelessly with the pucks to readjust positions and re-lock at the adjusted position. Optionally, the jigging pucks can automatically move along slots to connect to a recharging station to self-recharge on-puck batteries or supercapacitors.

20 Claims, 13 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

10,207,421	B1	2/2019	Weinschenk	
10,210,607	B1 *	2/2019	Weinschenk	H04N 9/3147
10,239,225	B1	3/2019	Weinschenk	
10,460,880	B2	10/2019	Snyder	
10,487,505	B2 *	11/2019	Joseph	E04C 3/17

OTHER PUBLICATIONS

Taiyo Yuden Co., Ltd., "Handling Precautions of Cylinder Type Lithium Ion Capacitors", "download from: http://www.mouser.com/datasheet/2/396/taiyoyuden_capacitor03_e-1488112.pdf", 2016.

* cited by examiner

FIG. 1A1

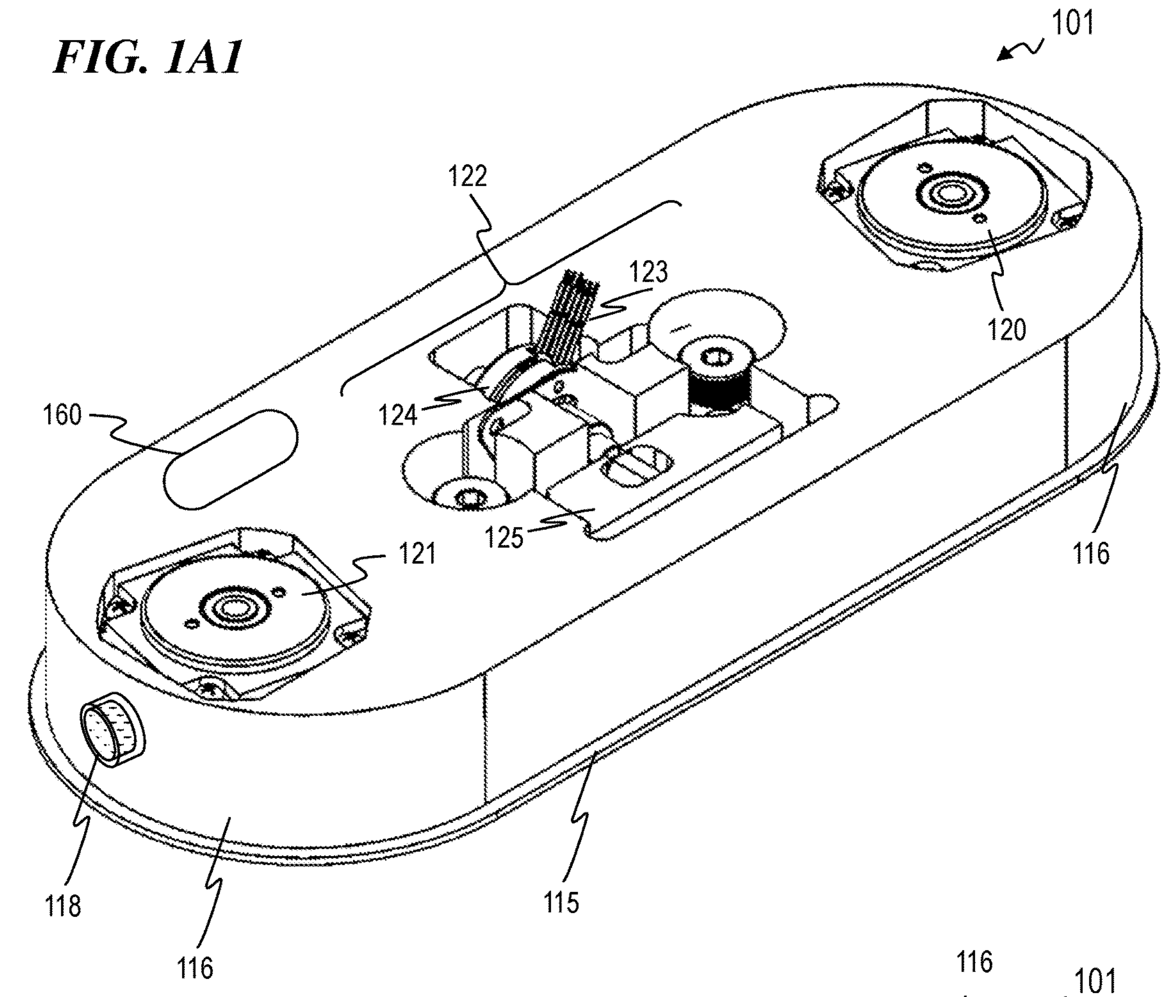


FIG. 1A2

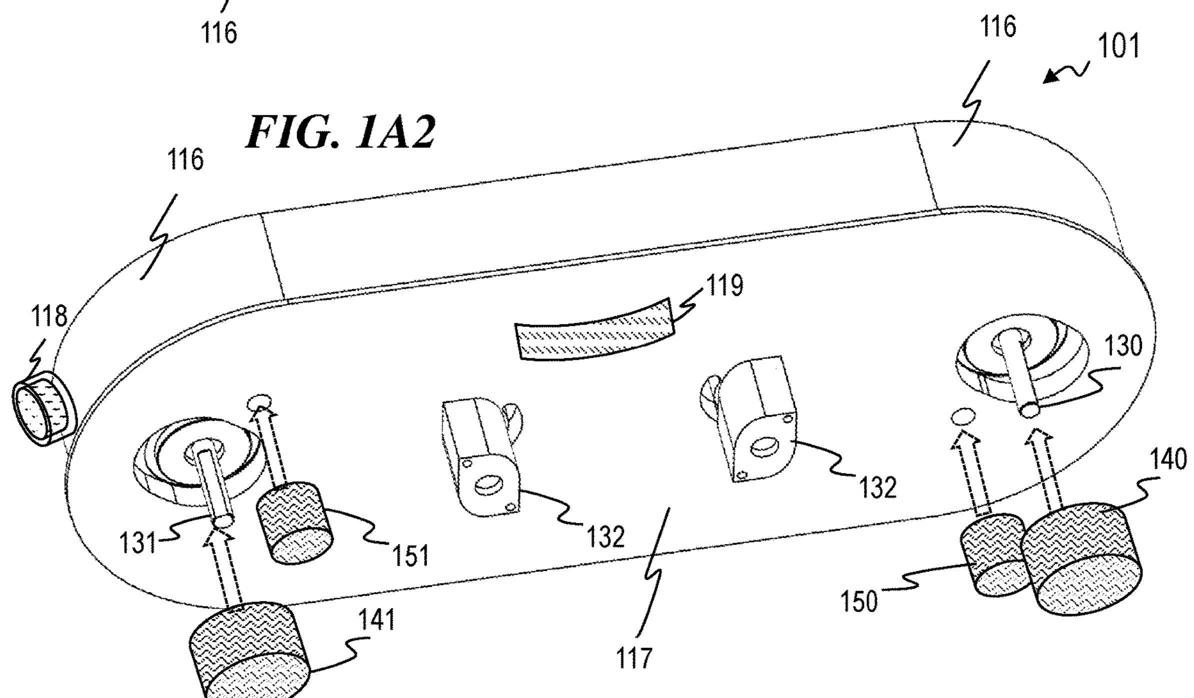


FIG. 1A3

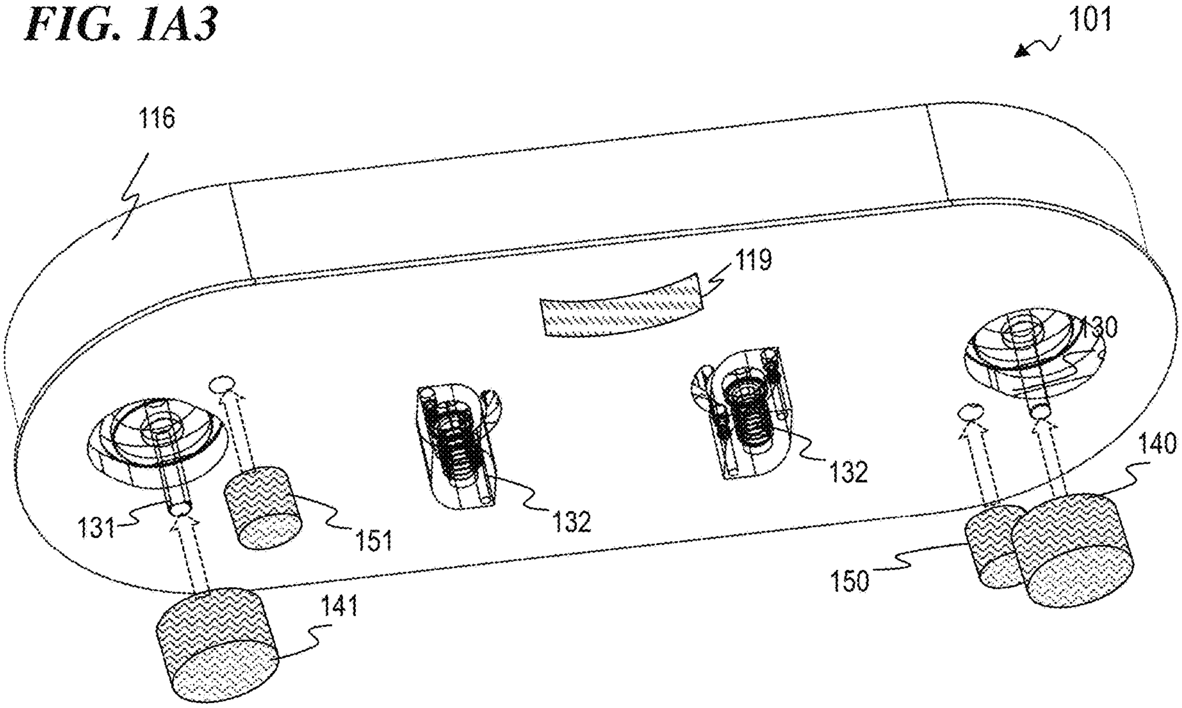


FIG. 1A4

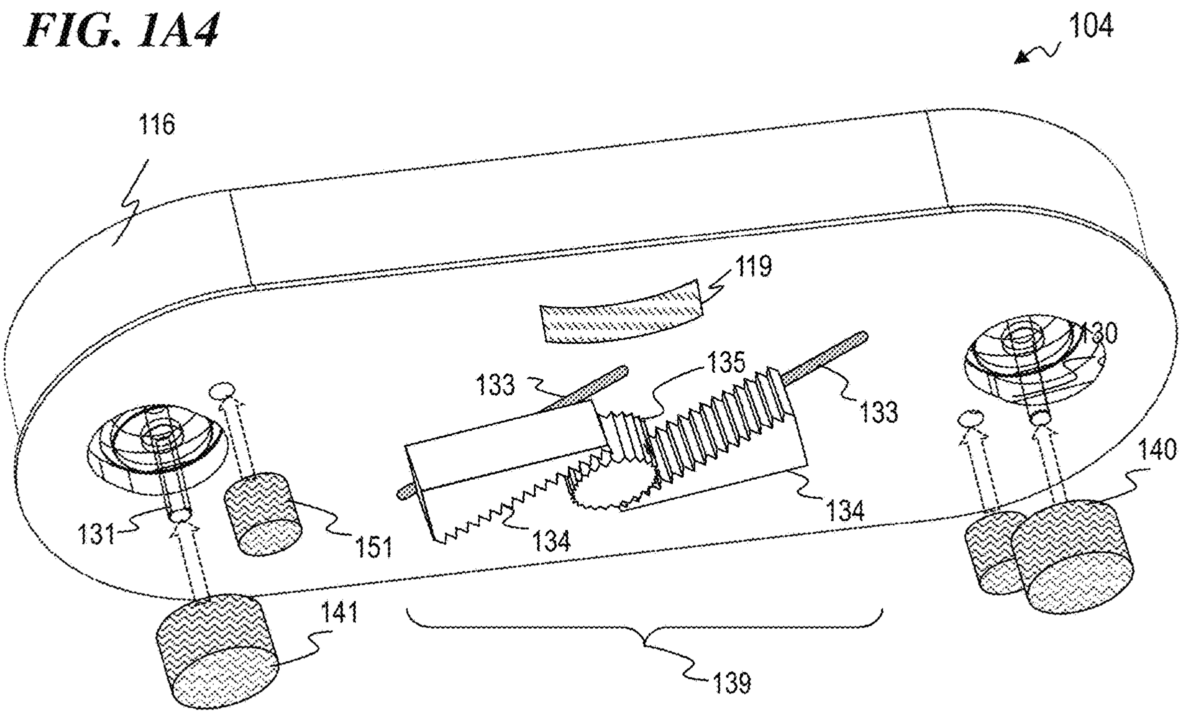


FIG. 1B

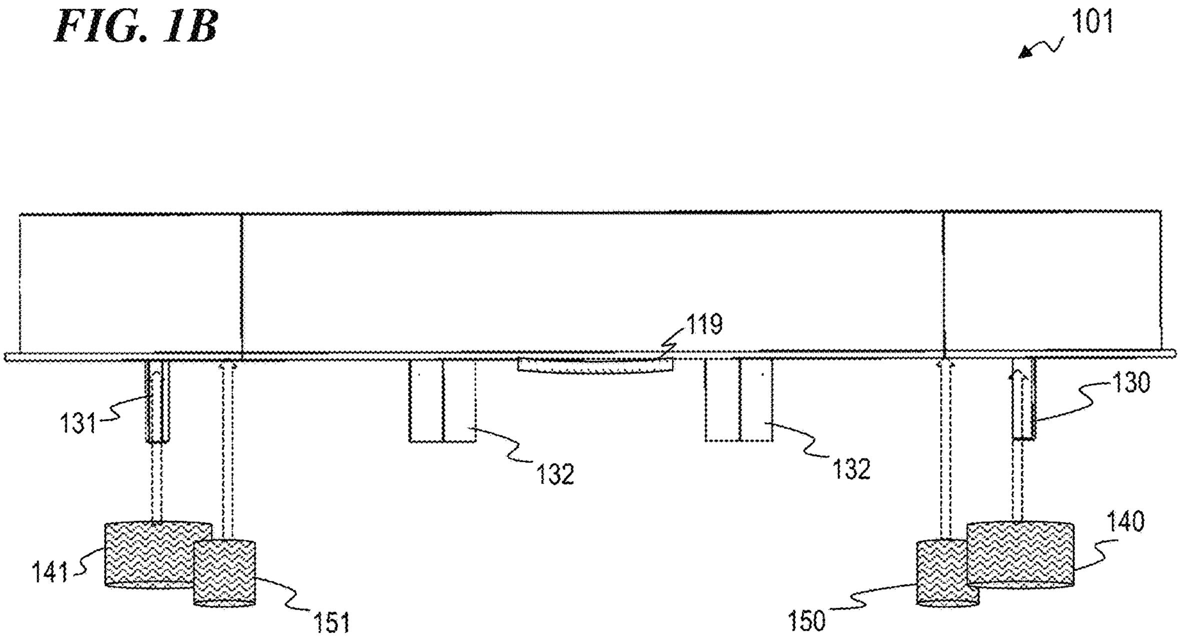


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FIG. 1C

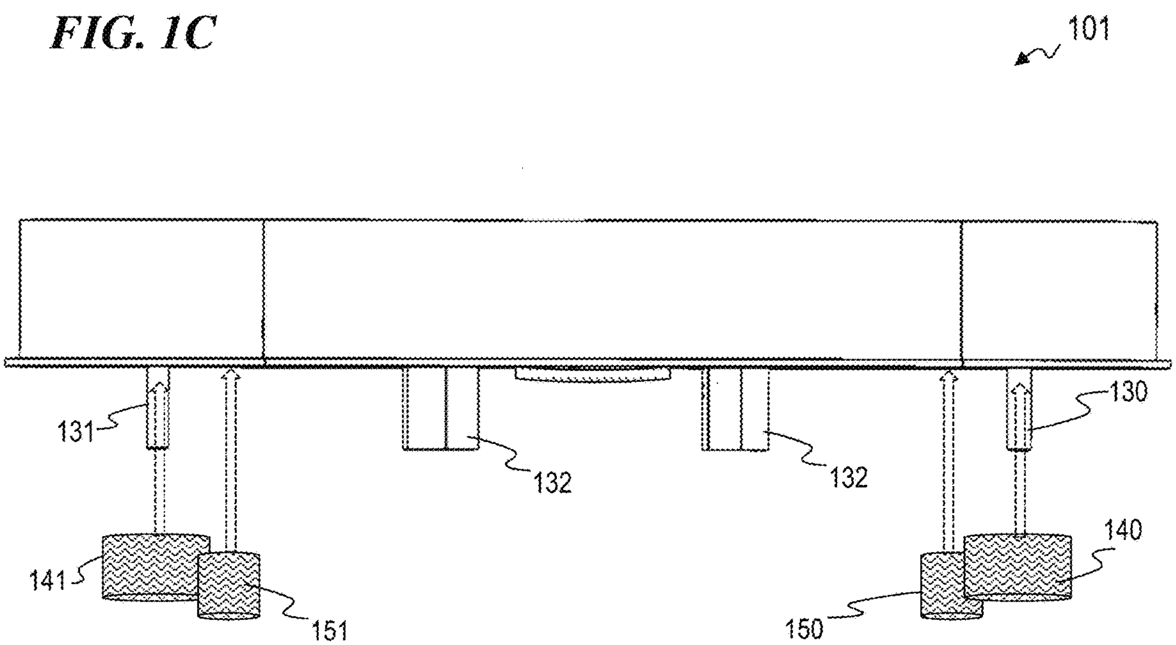

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FIG. 1D

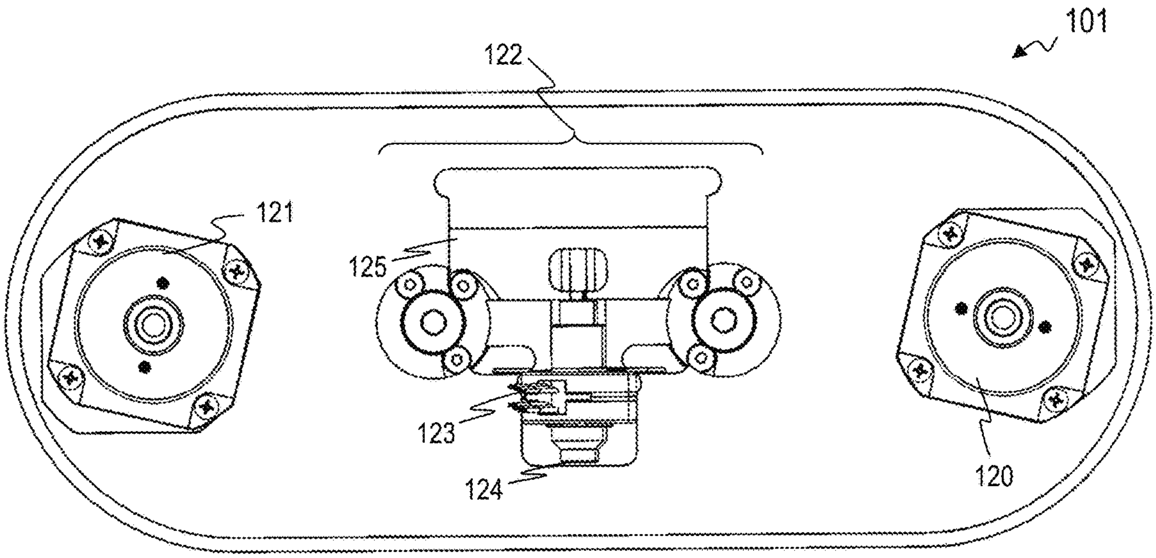
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FIG. 1E

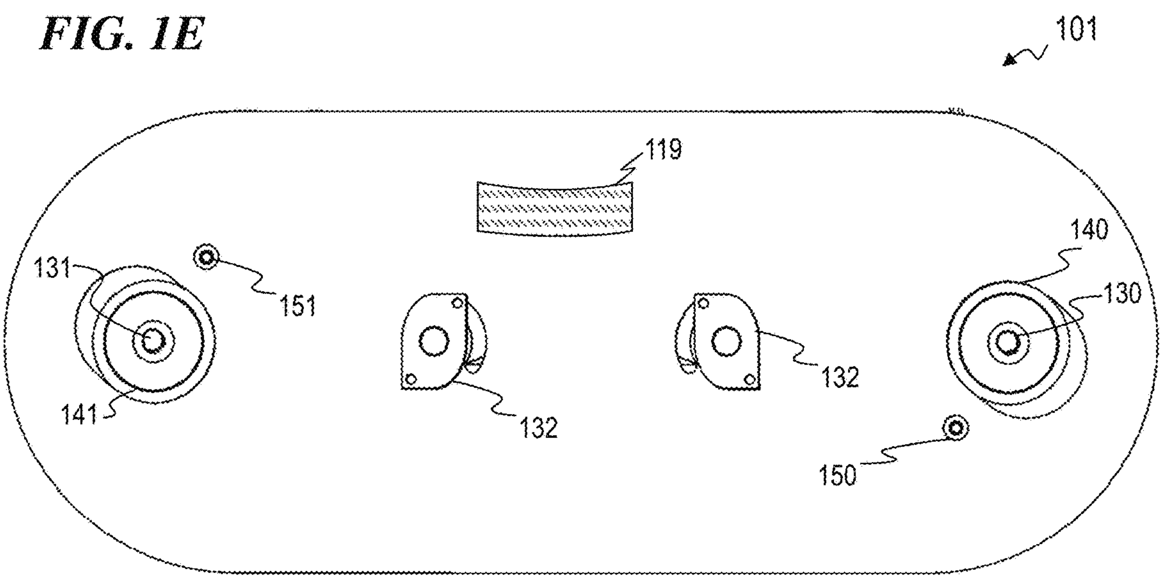
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FIG. 2A

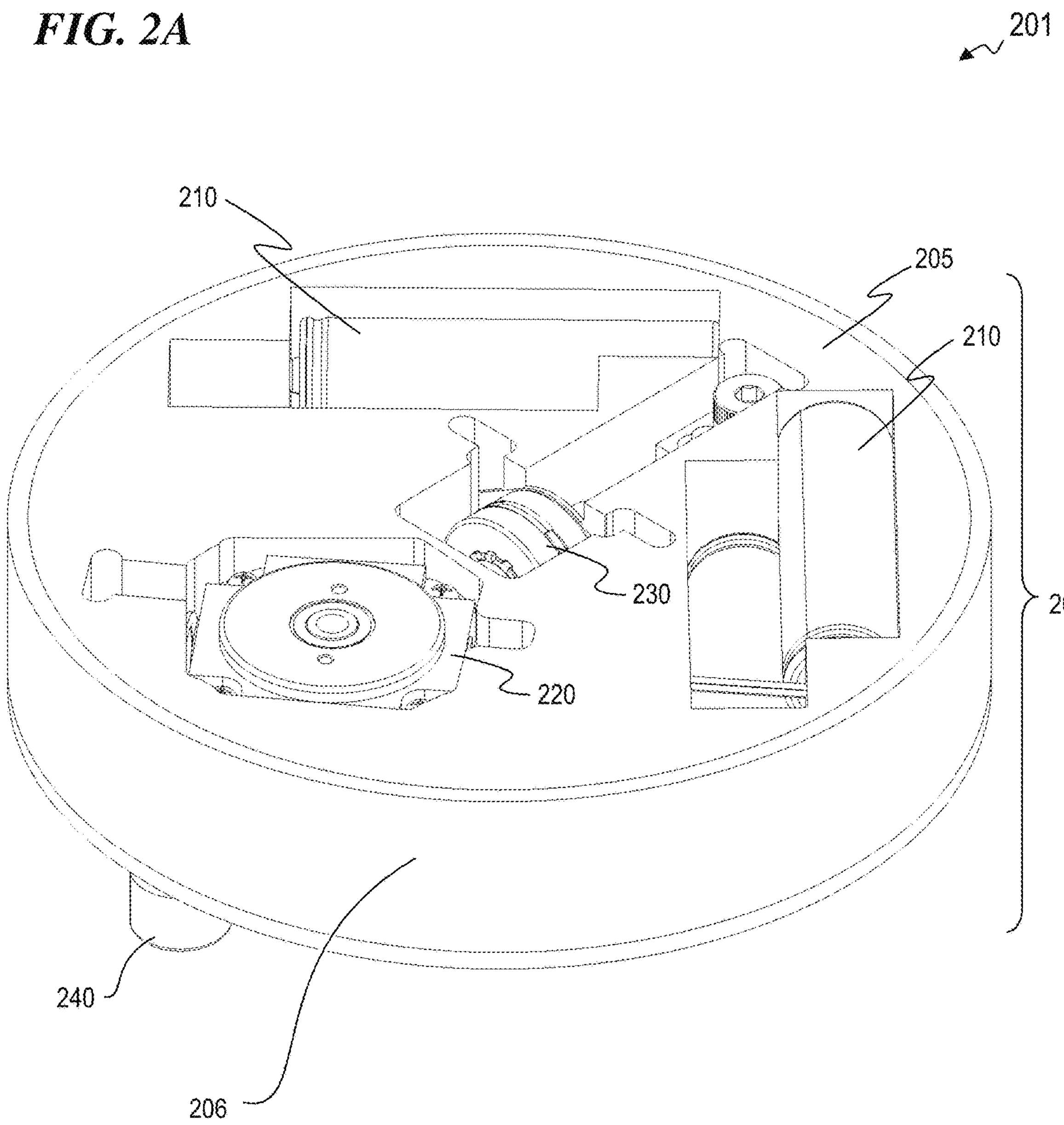

FIG. 2B

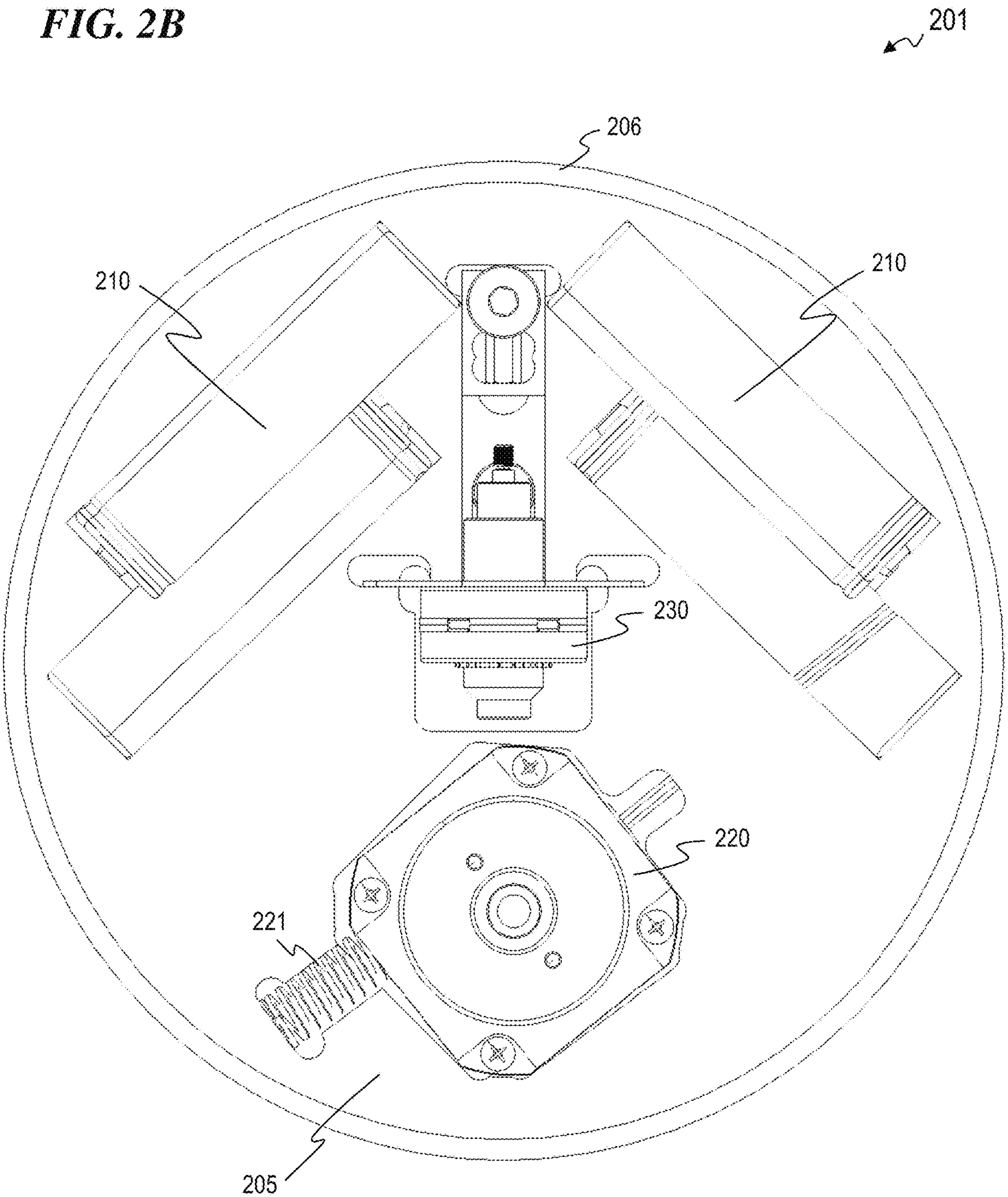

FIG. 2C

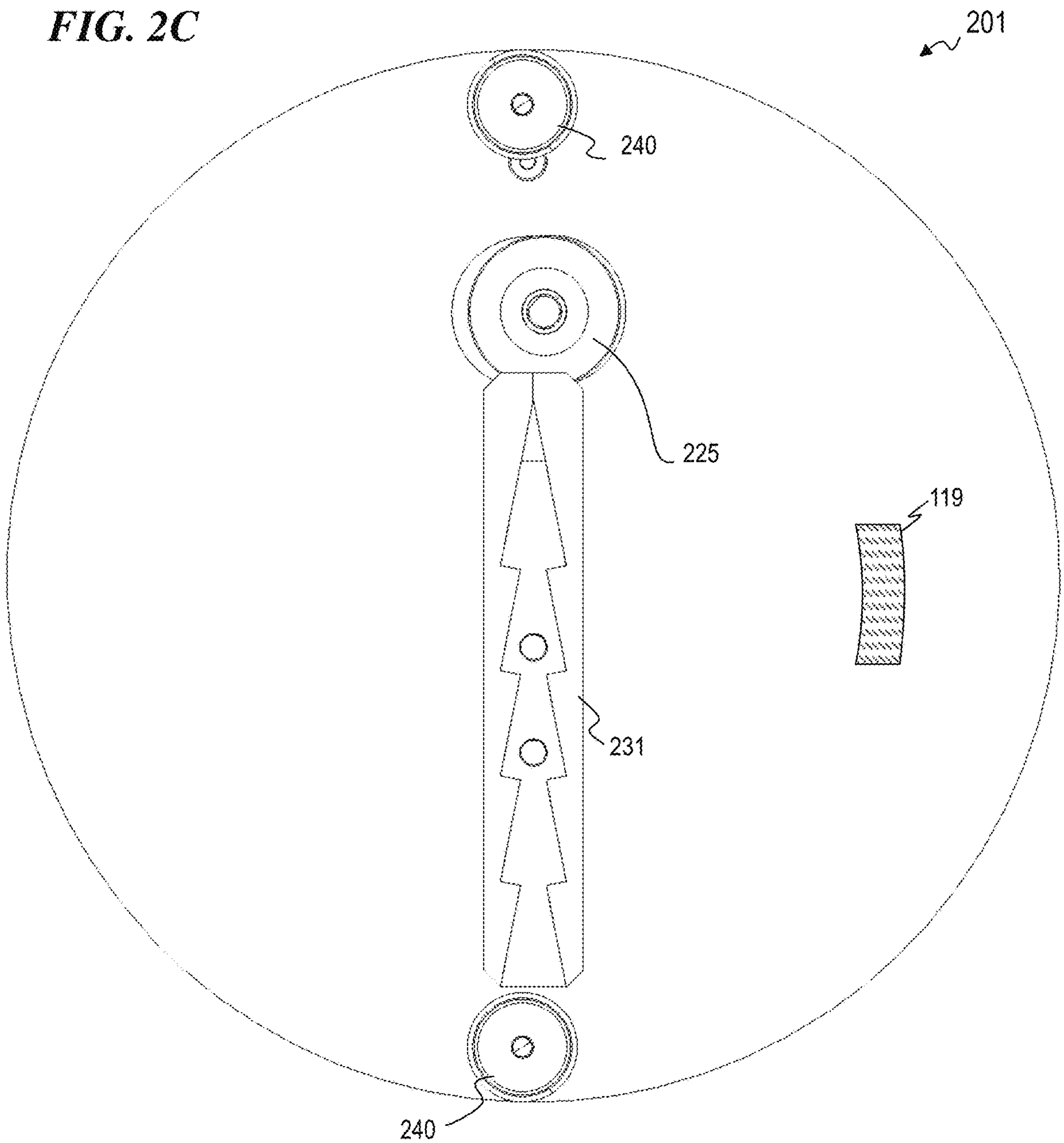

FIG. 2D

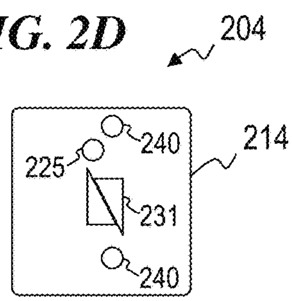

FIG. 2E

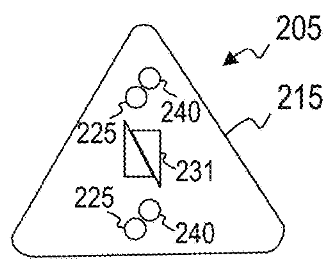

FIG. 3A

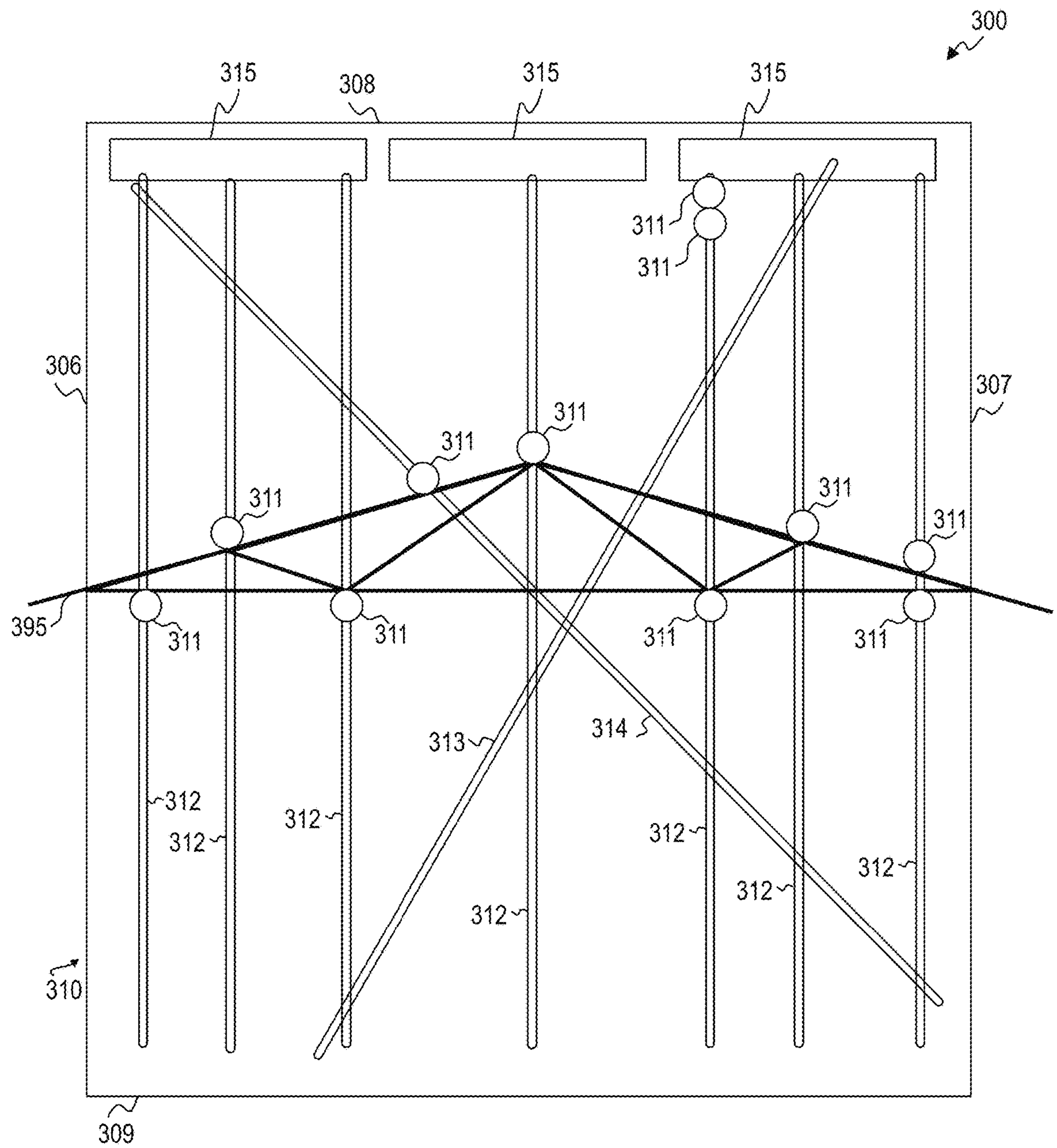
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FIG. 3B

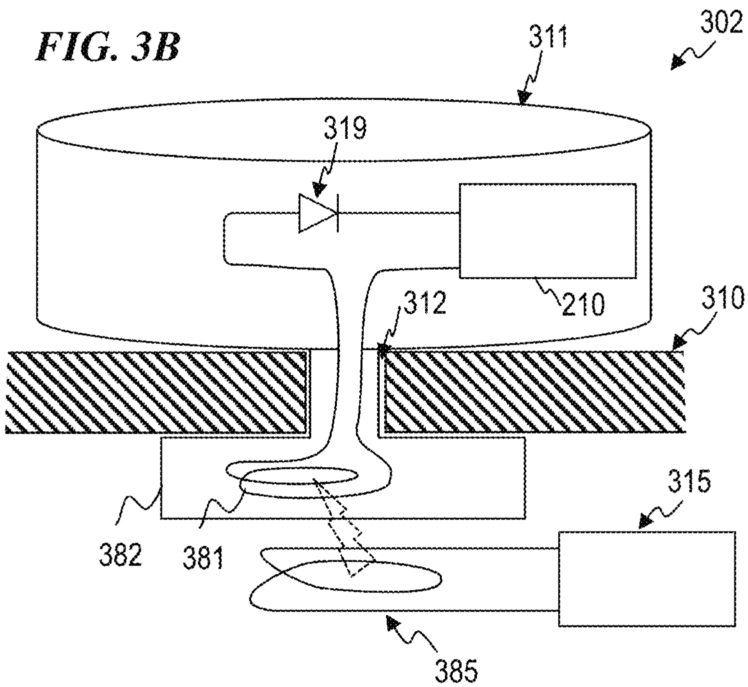
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FIG. 3C

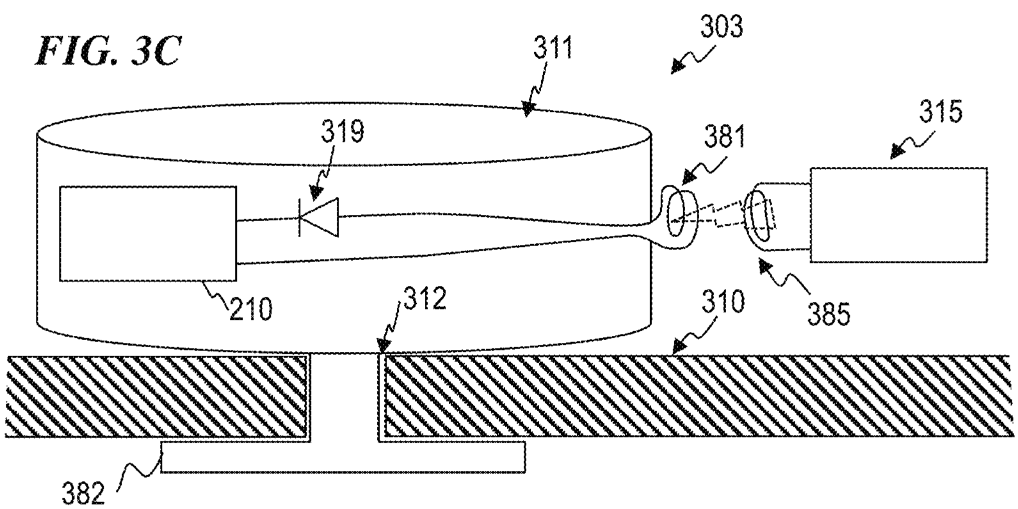
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FIG. 3D

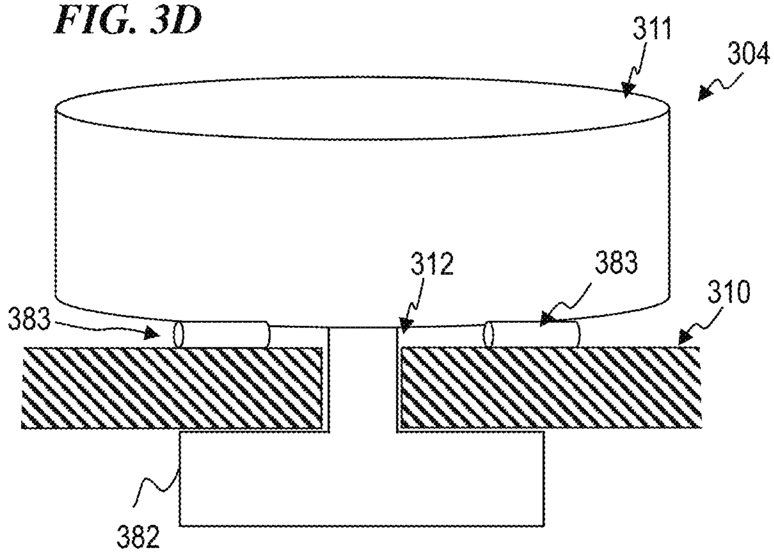


FIG. 3E

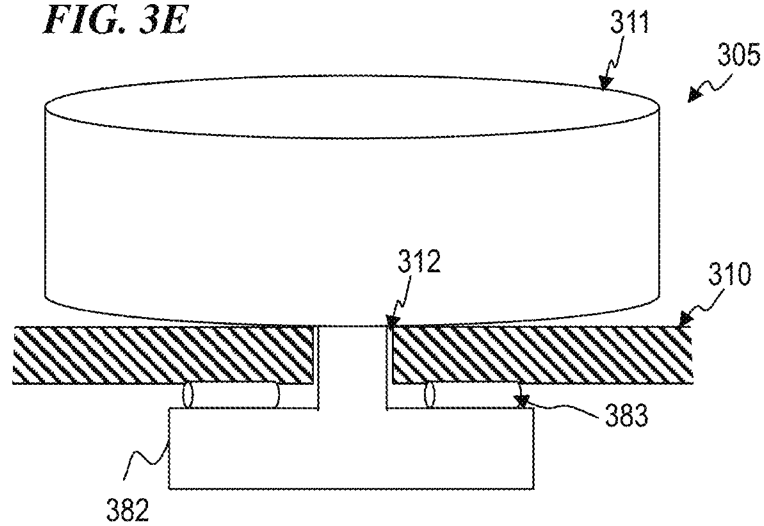


FIG. 3F

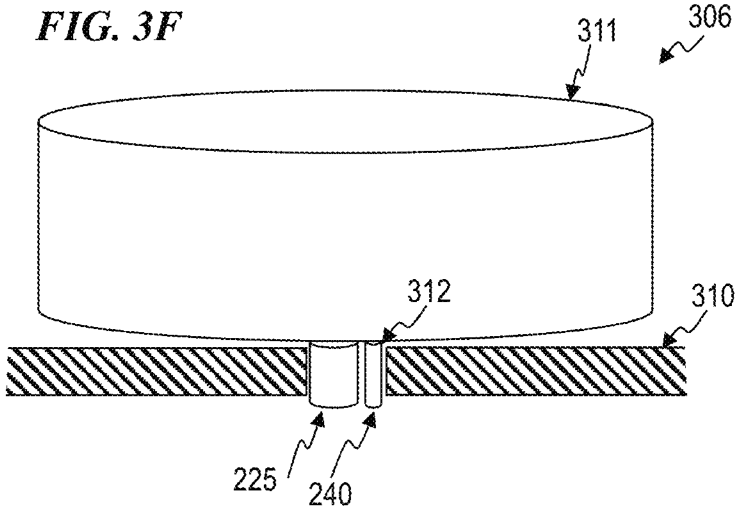
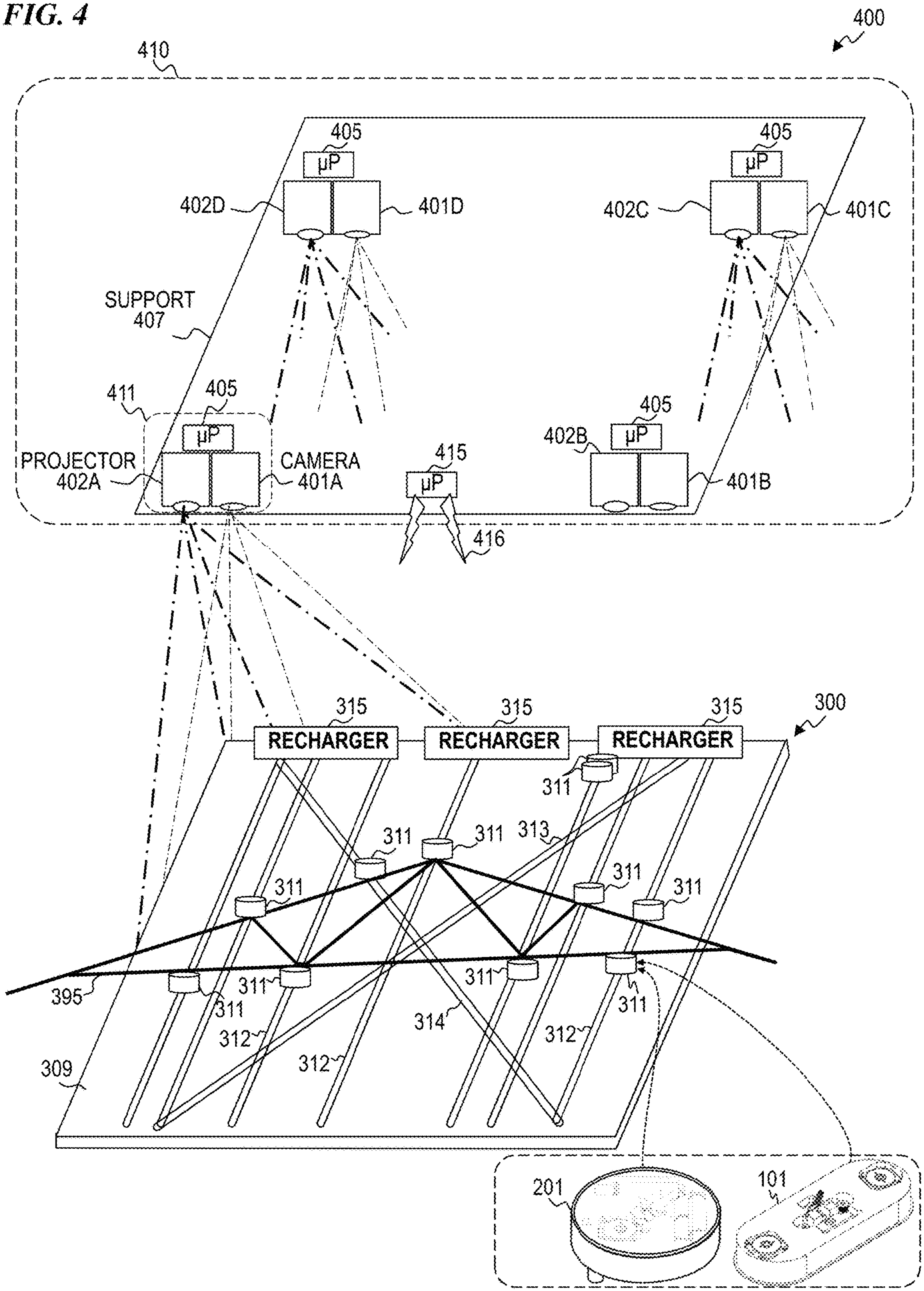


FIG. 4


400
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µP
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401D
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µP
402C
401C
SUPPORT
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µP
PROJECTOR
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CAMERA
401A
415
µP
416
405
µP
402B
401B
315
RECHARGER
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RECHARGER
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RECHARGER
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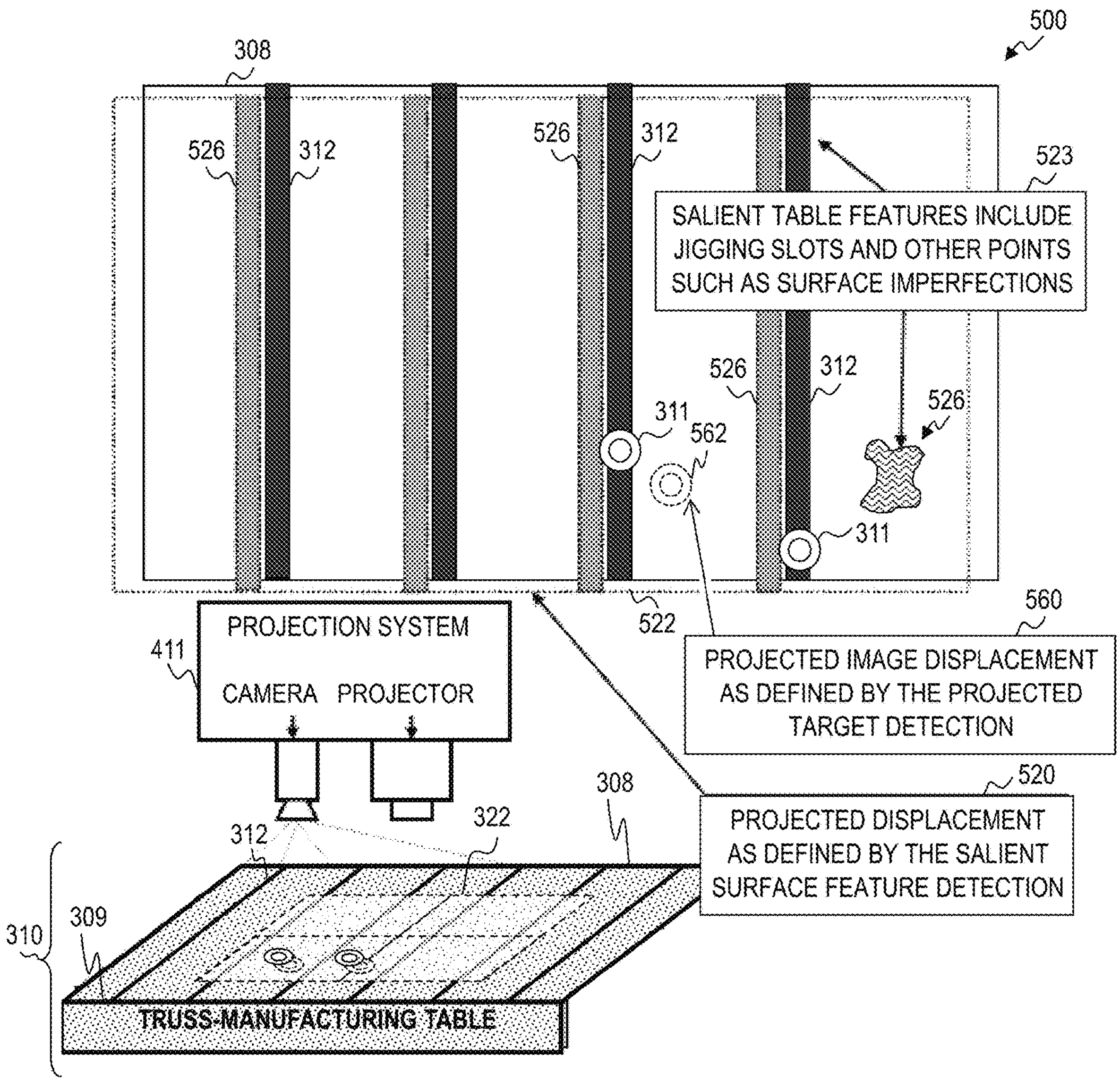
FIG. 5


500
308
526
312
526
312
523
SALIENT TABLE FEATURES INCLUDE JIGGING SLOTS AND OTHER POINTS SUCH AS SURFACE IMPERFECTIONS
526
312
311
562
526
311
522
560
PROJECTED IMAGE DISPLACEMENT AS DEFINED BY THE PROJECTED TARGET DETECTION
411
PROJECTION SYSTEM
CAMERA
PROJECTOR
308
520
PROJECTED DISPLACEMENT AS DEFINED BY THE SALIENT SURFACE FEATURE DETECTION
312
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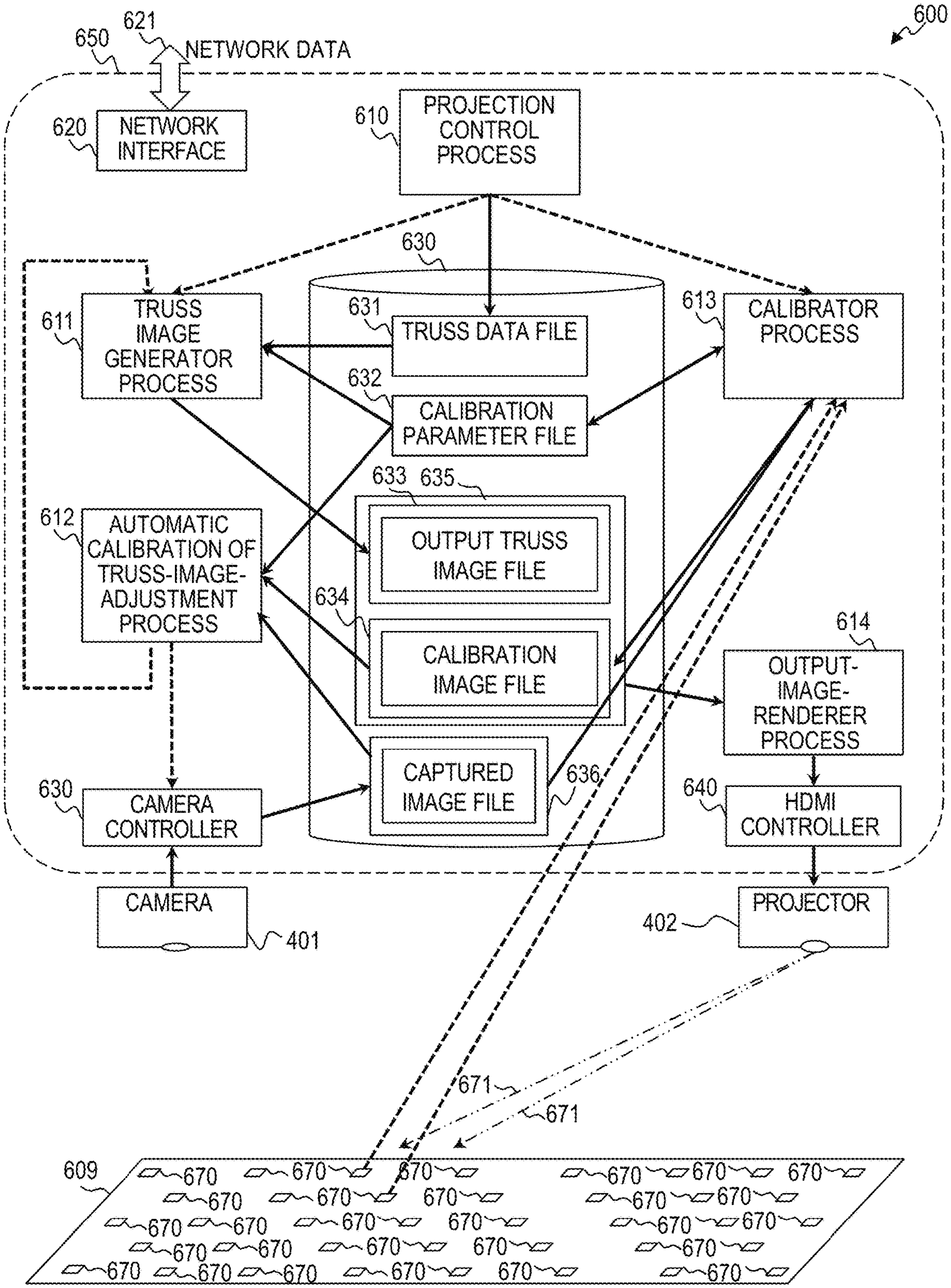
TRUSS-MANUFACTURING TABLE

FIG. 6



600
650
621
NETWORK DATA
620
NETWORK INTERFACE
610
PROJECTION CONTROL PROCESS
630
611
TRUSS IMAGE GENERATOR PROCESS
631
TRUSS DATA FILE
613
CALIBRATOR PROCESS
632
CALIBRATION PARAMETER FILE
633
635
612
AUTOMATIC CALIBRATION OF TRUSS-IMAGE-ADJUSTMENT PROCESS
OUTPUT TRUSS IMAGE FILE
634
CALIBRATION IMAGE FILE
614
OUTPUT-IMAGE-RENDERER PROCESS
CAPTURED IMAGE FILE
636
630
CAMERA CONTROLLER
640
HDMI CONTROLLER
CAMERA
401
PROJECTOR
402
671
671
609
670

TRUSS JIGGING SYSTEM AND METHOD

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority benefit, under 35 U.S.C. § 119(e), of U.S. Provisional Patent Application No. 62/754,578, filed Nov. 1, 2018 by Steven R. Weinschenk, titled "TRUSS JIGGING SYSTEM AND METHOD," which is incorporated herein by reference in its entirety.

This application is related to:

U.S. patent application Ser. No. 15/093,732 filed Apr. 7, 2016 by Steven R. Weinschenk, et al., titled "DIGITAL PROJECTION SYSTEM AND METHOD FOR WORKPIECE ASSEMBLY" (now U.S. Pat. No. 10,210,607);

U.S. patent application Ser. No. 15/408,369 filed Jan. 17, 2017 by Steven R. Weinschenk, titled "AUTOMATED SYSTEM AND METHOD TO ENHANCE SAFETY AND STRENGTH OF WOOD TRUSS STRUCTURES" (now U.S. Pat. No. 10,239,225);

U.S. patent application Ser. No. 15/426,966 filed Feb. 7, 2017 by Steven R. Weinschenk, titled "AUTOMATED SYSTEM AND METHOD FOR LUMBER PICKING" (now U.S. Pat. No. 10,493,636); and

U.S. patent application Ser. No. 15/658,026 filed Jul. 24, 2017 by Steven R. Weinschenk, titled "AUTOMATED MULTI-HEADED SAW AND METHOD FOR LUMBER (now U.S. Pat. No. 10,207,421)";

each of which is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

The present invention relates to devices and methods for truss manufacturing, and in particular to a truss-jigging system and method that includes a self-powered, self-moving, motorized jigging puck in a slot that operates to unlock from a current location in the slot, move itself along the slot to another desired new location and lock itself to the new location; the system optionally includes a location-measuring subsystem (such as a machine-vision system that communicates wirelessly with the jigging puck, and/or a location-indicating fiducial system engraved in the slot that is readable by the jigging puck) that provides feedback as to the current location of the jigging puck and optionally sends commands to the jigging puck to readjust its position and re-lock at the adjusted position; the system optionally includes a recharging station to which the jigging puck can connect to recharge its on-puck source of electrical power such as supercapacitor(s) or rechargeable batteries.

BACKGROUND OF THE INVENTION

Conventional jig-setting systems position lumber pieces on a truss-assembly table using pin carriages or pucks that are moved across the top surface of the slotted truss-assembly table in X and/or Y directions with a screw or chain (the pin carriages or pucks include a pin sticking through the table surface to position the lumber). These conventional systems permanently locate the pin carriages/pucks in the truss-assembly table so a lower-usage part of the truss-assembly table often has very expensive jigging sitting unused until a rare, larger truss needs to be built (e.g., the expensive rails of conventional systems are commonly in a location that is rarely used such as a normal parking spot for a roller gantry). Some conventional systems install a pin carriage/puck every two feet.

U.S. Pat. No. 8,109,493 by Jerome E. Koskovich, et al., titled "AUTOMATED TRUSS ASSEMBLY JIG SETTING SYSTEM," issued on Feb. 7, 2012, and is incorporated herein by reference. U.S. Pat. No. 8,109,493 describes a retrofitted automated truss assembly jig setting system and one or more removable plank units used therewith. Removable plank unit includes a pair of drive motors each connected to a motor plate that is fixed to the bottom surface of a plank. A pair of rods extends along the length of the plank and each is operatively connected to a motor such that activation of a motor rotates a rod. Puck assemblies are carried by rods and are linearly transposed along rods when motors are activated. A computerized control system is operatively connected to provide for automated positioning of pucks. Planks on existing truss assembly tables may be removed and replaced with removable plank units to turn a traditional truss assembly jigging table into an automated truss assembly jigging table.

U.S. Pat. No. 9,821,440 by Clyde R. Fredrickson, et al., titled "AUTOMATIC TRUSS JIG SETTING SYSTEM," issued on Nov. 21, 2017, and is incorporated herein by reference. U.S. Pat. No. 9,821,440 describes an automatic truss jig setting system that includes a table including a plurality of segments with a side edge of adjacent segments defining a slot. At least one pin assembly, and optionally a pair of pin assemblies, is movable independently of each other along the slot. Movement apparatus is provided for independently moving the pin assemblies along the slot. Each of the side edges of the segments associated with the slot defines a substantially vertical plane with a zone being defined between the substantially vertical planes of the side edges, and the movement apparatus is located substantially outside of the zone of the slot. The U.S. Pat. No. 9,821,440 invention may optionally include a system for handling the obstruction of pin assembly movement, and a system for keeping track of the position of the pin assembly when the pin assembly has encountered an obstruction.

U.S. Pat. No. 10,460,880 to Snyder issued Oct. 29, 2019 with the title "Capacitors having engineered electrodes with very high energy density and associated method" and is incorporated herein by reference. U.S. Pat. No. 10,460,880 describes an apparatus and associated method for an energy-storage device (e.g., a capacitor) having a plurality of electrically conducting electrodes including a first electrode and a second electrode separated by a non-electrically conducting region, and wherein the non-electrically conducting region further includes a non-uniform permittivity (K) value. In some embodiments, the method includes providing a substrate; fabricating a first electrode on the substrate; and fabricating a second electrode such that the second electrode is separated from the first electrode by a non-electrically conducting region, wherein the non-electrically conducting region has a non-uniform permittivity (K) value. The capacitor devices will find benefit for use in electric vehicles, of all kinds, uninterruptible power supplies, wind turbines, mobile phones, and the like requiring wide temperature ranges from several hundreds of degrees C. down to absolute zero, consumer electronics operating in a temperature range of −55 degrees C. to 125 degrees C.

SUMMARY OF THE INVENTION

In some embodiments, the present invention provides a jigging system that includes automated, self-powered jigging pucks that are moved by one or more friction wheels sticking into a slot in the table, and able to move themselves to any desired one of a plurality of selectable locations and then lock themselves in place. In some embodiments, the self-powered jigging pucks are battery powered (in other embodiments, a supercapacitor is used in place of batteries in order to provide faster charging times), and are able to move themselves and connect themselves to a recharging station, such as one or more such recharging stations located along one or more sides of the jigging table. In some embodiments, the present invention includes a method for correcting the position of the jigging puck that includes taking a picture of the puck (e.g., using cameras (in some embodiments, high-resolution digital-image or video cameras) located above the jigging table, wherein the cameras are by themselves or associated with, or located in, projection boxes that are capable of projecting test patterns for puck location determinization and/or lumber-layout patterns).

In some embodiments, the truss-jig-positioning system includes a truss-assembly table having a support plane on which work pieces are supported and a plurality of slots in the support plane, a plurality of puck assemblies automatically movable along the slots. Each puck is self-powered and self-locks at selected locations. A controller controls the pucks. Images of the truss-assembly table and pucks allow the controller to locate pucks, and transmit location-correction information as needed to move pucks to desired locations for building various trusses, wall assemblies, etc. Pucks are self-powered, self-moving, motorized jigging members. Each operates from controller commands to unlock from one location, move along their slot and lock to a new location. Optionally location-measuring (machine-vision) subsystem(s) communicate wirelessly with the pucks to readjust positions and re-lock at the adjusted position. Optionally, the jigging pucks can automatically move along slots to connect to a recharging station to self-recharge on-puck batteries or supercapacitors.

In some embodiments, once the puck "reports" (communicates signals to a controlling microprocessor) that the puck has reached what it "believes" (has sensed and calculated) to be its final position, the system uses imaging data from the overhead camera (which, in some embodiments, uses a process that includes projecting test location patterns that are detectable by the camera to locate the puck), and calculates a location-correction set of commands and issues these commands using a wireless communication to the puck of the correction distance and direction that the puck need to move, and/or a feedback of the puck's actual position in relation to the desired position (e.g., using the projection cameras). In some embodiments, each puck includes one or more indicia (i.e., an indicium, or a plurality of indicia) on a surface of the puck, wherein the indicia are readable by the camera for the identity of the puck and for the location and orientation of the puck (such as a bar code or quick-response (QR) code and orientation indicia that are read by the camera system so that location- and/or orientation-correction information can be calculated and transmitted to the puck). In other embodiments, the pucks include cameras or other optical sensors that obtain images or other optical data of indicia that the factory provides on, in, and/or under the slot, and/or on the ceiling of the factory room so that the puck can communicate to the computer system where, in the factory, the puck is located. This allows substitute pucks to be inserted into the production system in the case of a failure of a puck (such as a mechanical malfunction or an unexpected dead battery or overly discharged supercapacitor). In some embodiments, the pucks include light-emitting diodes (LEDs) and/or laser diodes (LDs) that emit coded light signals from point sources (e.g., pulsed patterns of light emitted from very small emitting areas (e.g., in some embodiments, spot sizes that are in a range of about 0.1 mm (100 microns or smaller) to 1 mm (1000 microns, or optionally larger in some embodiments) spaced across the top and/or side surfaces of the puck so that the cameras can identify and precisely determine the location and/or orientation and identification (such as a serial number) of each puck) that indicate the identity of the puck and that include a plurality of LEDs or LDs arranged as indicia at various locations on the puck. In other embodiments, the puck includes retro-reflective indicia so that projected light patterns from the ceiling-mounted projector-camera combinations can be changed from time-to-time to allow the identification, location and orientation of each puck to be determined. In some embodiments, any other suitable method and system is used to observe and/or correct the position of the jigging pucks, such as providing a plurality of projectors that project a line, and having the pucks drive to the line using a photo detector to get to the correct position.

In some embodiments, the jigging pucks are battery powered and are configured to move themselves to a self-charging station when not being used (e.g., between jobs and/or at night). In some embodiments, the pucks can be moved to any table slot at any time (e.g., manipulated by hand by a human operator) and the system uses camera images to determine which pucks are on a given slotted table and where each one of the identified pucks is on the table and adjusts each puck mission (the time sequence of locations to which the puck is moved) based on where it has been placed (this is important if multiple pucks are placed in the same slot because one puck might be located on the table near boards that will be at the top of the truss once it is completed, while others may be located on the table near boards that will be at the bottom of the truss or near the webs of the truss in the middle of the truss).

In some embodiments, the jigging pucks include a camera that takes pictures or other optical data of indicia that the factory provides on, in, and/or under the slot, and/or on the ceiling to get the puck's bearings (e.g., in some embodiments, the puck camera looks at Quick Response (QR) codes located on the ceiling or on or under the slot on the table). In some embodiments, the present invention includes ceiling camera(s) used to locate the jigging puck and provide adjustment information. In some embodiments where a factory has pre-existing truss-assembly tables, the present invention eliminates cutting out the old truss-assembly tables by being able to use the existing slots in the old table for the jigging pucks and camera-location equipment and/or other optional equipment of the present invention.

In some embodiments, the jigging pucks of the present invention are not permanent in the table so they can be re-positioned to other slots in the same truss setup or into another truss setup as needed. In some embodiments, the pucks include a way to communicate their identification to the controlling system (e.g., flashing a pulse-encoded light signal from a top-side LED so that one or more overhead cameras can identify both which puck is flashing and what the location is of that puck) so that pucks can be given their new location on the slotted table depending on need in that area of the truss setup. In some embodiments, the pucks communicate with a controller connected to the overhead camera(s) to get a corrected position and the location where the pucks should be moved to and locked in that stopped location. In some embodiments, the pucks are able to go to the location by themselves using a self-contained power source and motorized actuators such as rubber wheels that press against the table inside or above or below the slot in the table. In some embodiments, the pucks have their own cameras or other imaging devices that look at the surroundings (such as ruled and encoded lines on the slot) to determine how far they have moved. For example, in some embodiments, the pucks are given a relative move distance and a direction from a controller via wireless communications such as infrared (IR), WIFI, Bluetooth® or similar such signals). In some embodiments, the pucks are given an absolute move, wherein electronic components **160** of each puck (e.g., microprocessors, sensors, light emitters, sound emitters) determines the puck's location by tracking the objects above or beside the puck or from feedback from the other pucks on the truss-assembly table. In some embodiments, projectors located above the truss-assembly table project a line on the truss-assembly table and the puck senses and uses the projected line to position itself.

In some embodiments, the jigging pucks are electrically powered by rechargeable batteries. In some other embodiments, the jigging pucks are electrically powered by supercapacitors, since supercapacitors can be recharged in a shorter period of time than is possible if recharging batteries. In some such embodiments, the pucks are configured to automatically drive, under certain conditions (such as low on-board electrical power remaining in the batteries or supercapacitors) to a charging station, such as one or more located along an edge of the truss-assembly table (in some embodiments, the pucks are configured to stack against each other side-by-side in a slot connected to the recharging station to provide recharging power to multiple pucks in one slot at once). In other such embodiments, the pucks are pulled out of the truss-assembly table (e.g., by a human operator) and placed in a charging station. In some embodiments, the discharged batteries and/or supercapacitors are configured to be replaced by batteries and/or supercapacitors that were recharged outside the puck.

In some embodiments, the jigging pucks are elongated rectangular prisms with rounded ends or corners, while in other embodiments, the jigging pucks are elongated cylindrical prisms. In still other embodiments, the jigging pucks are square or triangular prisms or other-polyhedron prism shapes, optionally with rounded ends or corners.

BRIEF DESCRIPTION OF THE FIGURES

FIG. **1A1** is a perspective top view of a jigging puck assembly **101**, according to some embodiments of the present invention.

FIG. **1A2** is a partially exploded perspective bottom view of jigging puck assembly **101**, according to some embodiments of the present invention.

FIG. **1A3** is another partially exploded perspective bottom view of jigging puck assembly **101**, according to some embodiments of the present invention.

FIG. **1A4** is partially exploded perspective bottom view of a jigging puck assembly **104**, according to some embodiments of the present invention.

FIG. **1**B is a first partially exploded side view of puck assembly **101**, according to some embodiments of the present invention.

FIG. **1**C is a partially exploded second side view of puck assembly **101**, according to some embodiments of the present invention.

FIG. **1**D is a top view of puck assembly **101**, according to some embodiments of the present invention.

FIG. **1**E is a bottom view of puck assembly **101**, according to some embodiments of the present invention.

FIG. **2**A is a perspective view of a cylindrical jigging puck assembly **201**, according to some embodiments of the present invention.

FIG. **2**B is a top view of puck assembly **201**, according to some embodiments of the present invention.

FIG. **2**C is a bottom view of puck assembly **201**, according to some embodiments of the present invention.

FIG. **2**D is a bottom view of a square-prism puck assembly **204**, according to some embodiments of the present invention.

FIG. **2**E is a bottom view of triangular-prism puck assembly **205**, according to some embodiments of the present invention.

FIG. **3**A is a plan-view schematic of a jigging-table system **300**, according to some embodiments of the present invention.

FIG. **3**B is a side-view schematic, partially in cross section, of a jigging-table recharging system **302**, according to some embodiments of the present invention.

FIG. **3**C is a side-view schematic, partially in cross section, of a jigging-table recharging system **303**, according to some embodiments of the present invention.

FIG. **3**D is a side-view schematic, partially in cross section, of a jigging-puck top-side drive system **304**, according to some embodiments of the present invention.

FIG. **3**E is a side-view schematic, partially in cross section, of a jigging-puck bottom-side drive system **305**, according to some embodiments of the present invention.

FIG. **3**F is a side-view schematic, partially in cross section, of a jigging-puck in-slot drive system **306**, according to some embodiments of the present invention.

FIG. **4** is a perspective view schematic of a jigging table and projector-imaging system **400** having puck-identification and moving functions with a plurality of digital cameras **401** (e.g., **401**A-**401**D) that each obtain input images, and projectors **402** (e.g., **402**A-**402**D) that each project output images with distortion correction that compensates for projector and table distortions and imperfections, according to some embodiments of the present invention.

FIG. **5** is a perspective view block-diagram schematic of a system **500** having feature detection that identifies features that can be used to compensate for projector and table distortions and imperfections, according to some embodiments of the present invention.

FIG. **6** is a block-diagram schematic of a software- and hardware-based projection system **600** used by projector-camera subsystems **411**, according to some embodiments of the present invention.

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DETAILED DESCRIPTION OF THE INVENTION

Although the following detailed description contains many specifics for the purpose of illustration, a person of ordinary skill in the art will appreciate that many variations and alterations to the following details are within the scope of the invention. Specific examples are used to illustrate particular embodiments; however, the invention described in the claims is not intended to be limited to only these examples, but rather includes the full scope of the attached claims. Accordingly, the following preferred embodiments of the invention are set forth without any loss of generality to, and without imposing limitations upon the claimed invention. Further, in the following detailed description of the preferred embodiments, reference is made to the accompanying drawings that form a part hereof, and in which are shown by way of illustration specific embodiments in which the invention may be practiced. It is understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

It is specifically contemplated that the present invention includes embodiments having combinations and subcombinations of the various embodiments and features that are individually described herein (i.e., rather than listing every combinatorial of the elements, this specification includes descriptions of representative embodiments and contemplates embodiments that include some of the features from one embodiment combined with some of the features of another embodiment, including embodiments that include some of the features from one embodiment combined with some of the features of embodiments described in the patents and application publications incorporated by reference in the present application). Further, some embodiments include fewer than all the components described as part of any one of the embodiments described herein.

The leading digit(s) of reference numbers appearing in the Figures generally corresponds to the Figure number in which that component is first introduced, such that the same reference number is used throughout to refer to an identical component which appears in multiple Figures. Signals and connections may be referred to by the same reference number or label, and the actual meaning will be clear from its use in the context of the description.

Certain marks referenced herein may be common-law or registered trademarks of third parties affiliated or unaffiliated with the applicant or the assignee. Use of these marks is for providing an enabling disclosure by way of example and shall not be construed to limit the scope of the claimed subject matter to material associated with such marks.

FIG. **1A1** is a perspective view of a jigging puck assembly **101**, according to some embodiments of the present invention. In some embodiments, the lip **115** and most of the bottom surface **117** (see FIG. **1A2**) provides an insulating layer (e.g., of a polymer such as polyethylene or the like) between puck assembly **101** and the truss-assembly table (usually made of a metal such as steel or brass or the like, for example), such that electricity is not conducted between puck assembly **101** and the truss-assembly table except through grounding strap **119** (see FIG. **1A2**), which, in some embodiments, is bow shaped as a spring electrical contact to accommodate the different heights that may occur during moving or locking of the puck, or the like. In some embodiments, electrically conductive end surfaces **116** or electrically conductive plug-in connector(s) **118** are used to connect to recharging stations along sides of the table. In some embodiments, puck assembly **101** is configured to couple to the channels/slots that are already present in conventional truss-assembly tables (e.g., in some embodiments, puck assembly **101** can be used without having to reconfigure/build a new truss-assembly table). In some embodiments, motors **120** and **121** drive elastomeric drive wheels **140** and **141** located under the puck and within slots that exist in the jigging table. In some embodiments, locking-drive system **122** includes motor **124** having wiring **123** (only a portion of which is shown here) and a two-output transmission gear system **125**.

FIG. **1A2** is a partially exploded perspective bottom view of a jigging puck assembly **101**, according to some embodiments of the present invention. In some embodiments, motors **120** and **121** (see FIG. **1A1**) drive shafts **130** and **131**, respectively, that are connected to elastomeric drive wheels **140** and **141**, respectively, located under the puck and within slots that exist in the jigging table. In some embodiments, secondary wheels **150** and **151**, respectively, provide a balancing force on an opposite edge of the slot relative to drive wheels **140** and **141**. Thus, for example, when drive wheel **140** is rotating clockwise and urged against a left-hand edge of the slot, secondary wheel **141** is rotating counterclockwise and urged against a right-hand edge of the slot, and both wheels drive the puck in the same direction along their respective sides of the slot. As will be readily understood by persons of skill in the art, the wheels **140**, **141**, **150** and **151** are shown displaced from their respective drive shafts (**130** and **131**) and idler shafts (not shown here) for clarity of illustration. In some embodiments, locking-drive system **122** includes the two-output transmission gear system **125** that drive rotary locking-shaped devices **132** to lock the position of puck assembly **104** in a desired location and orientation in the slots **312** (see FIG. **3**) in the jigging table **309** (see FIG. **3**).

In other embodiments (as shown in FIG. **1D**), two-output transmission gear system **125** drives a rotary gear **125'** located between opposite facing wedge shapes **132'** each having a linear gear face surface facing the rotary gear, in order to provide a readily unlockable locking function. In still other embodiments, any suitable locking mechanism (such as electromagnets or the like) can be used.

FIG. **1A3** is another partially exploded perspective bottom view of a jigging puck assembly **101**, according to some embodiments of the present invention. This view shows spring mechanisms within the locking shapes, according to some embodiments.

FIG. **1A4** is partially exploded perspective bottom view of a jigging puck assembly **104**, according to some embodiments of the present invention. In some embodiments, jigging puck assembly **104** is substantially similar to jigging puck assembly **101**, but with the substitution of the locking mechanism **139** in place of locking units **132**. In some embodiments, locking mechanism **139** includes cylindrical gear **135** and two triangular gear-faced prisms **134** that move along slots **133** in puck assembly **104** to lock the position of puck assembly **104** in the slots **312** (see FIG. **3**) in the jigging table **309** (see FIG. **3**).

FIG. **1B** is a partially exploded first side view of puck assembly **101**, according to some embodiments of the present invention. The parts and reference numbers are explained above for cylindrical elastomeric drive wheels **140** and **141**, idler wheels **150** and **151**, rotatable drive shafts **130** and **131**, and locking shapes **132**, and bottom-side electrical contact **119**, according to some embodiments of the present invention.

FIG. **1C** is partially exploded a second side view of puck assembly **101**, according to some embodiments of the present invention.

FIG. **1D** is a top view of puck assembly **101**, according to some embodiments of the present invention. The parts and reference numbers are explained above for puck-motion motors **120** and **121**, locking-drive system **122** that includes motor **124** having wiring **123** and a two-output transmission gear system **125**, according to some embodiments of the present invention.

FIG. **1**E is a bottom view of puck assembly **101**, according to some embodiments of the present invention. The parts and reference numbers are explained above for cylindrical elastomeric drive wheels **140** and **141** located to press against opposite side walls of slots **312** (see FIG. **3**) in the jigging table **309** (see FIG. **3**) as do idler wheels **150** and **151**. In some embodiments, elastomeric drive wheels **140** and **141** are driven by rotatable drive shafts **130** and **131**. In some embodiments, locking shapes **132** are rotatable to press against opposite side walls of slots **312** to lock puck assembly **101** at a desired location along its respective slot **312**. In some embodiments of the present invention, bottom-side electrical contact **119** provides a grounding contact to jigging table **309** (see FIG. **3**).

In some embodiments, puck assembly **101** includes electrical connectors on both ends such that a plurality of puck assemblies **101** connect to one another end-to-end and to a single charging station **315** on an edge (or, in some embodiments, on two or more edges) of jigging table **309** (see FIG. **3**) in order to recharge the batteries (see batteries **210** described below) that power each puck assembly **101**. In some embodiments, each puck assembly **101** includes electronic components **160** having one or more microprocessors, sensors, light emitters, sound emitters, motor drive electronics, wireless communications transmitter(s) and receiver(s) and/or cameras that provide data gathering and processing in order to provide a "smart" puck.

FIG. **2**A is a perspective view of a jigging puck assembly **201**, according to some embodiments of the present invention. In some embodiments, puck assembly **201** is cylindrical in shape (having a circular base and top face) and is configured to couple to a slot along a truss-assembly table (e.g., in some such embodiments, components on the bottom side of puck assembly **201** (visible in FIG. **2**C) fit into the slot through and/or below the work surface of the truss-assembly table, while the main portion **204** of puck assembly **201** is located above the work surface of the truss-assembly table such that puck assembly **201** can be used to guide the location of a truss piece placed on the work surface of the truss-assembly table). In some embodiments, puck assembly **201** includes a main portion **205** that is made from a molded plastic polymer material, and a ring portion **206** that includes a conducting metal (e.g., brass, bronze, stainless steel, or the like), and in some such embodiments, ring portion **206** includes the conducting metal such that two or more pucks **201** can line up against and touching each other (i.e., in electrical contact with each other) and share a charging session in the same slot from a single charging station in order to recharge the power source **210** (such as batteries, supercapacitors or the like) that power each puck assembly **201**). In some embodiments, the conducting ring **206** and bottom contact **119** (see FIG. **2**C) provide the two or more electrical contacts used for recharging the puck assemblies **201**. In some embodiments, puck assembly **201** includes a cover (not illustrated in FIG. **2**A) to protect the components contained within puck assembly **201**. In other embodiments, the present invention uses contactless (also called wireless) recharging such is commonly used for recharging cell phones and the like, wherein the recharging station **315** (see FIG. **3**A, FIG. **3**B, and FIG. **3**C) includes an RF antenna or coil that transmits power via RF energy (or, in some other embodiments, other frequencies of alternating current (AC) electromagnetic (EM) energy), and the pucks **311** (such as puck assemblies **101** or **201**) each includes a coil or RF receiver antenna system that receives and rectifies the RF or EM energy to recharge the on-puck power source **210**. In some embodiments, the coil **385** of the recharging station **315** and the coil **381** of the puck **311** are coupled by near-field EM coupling to act as a transformer to pass EM energy (at 60 Hz or other suitable frequency) from coil **385** to coil **381**. In some embodiments, each of one or more recharging stations **315** includes RF antenna(s) or EM coil(s) located at one or more locations along an underside of one or more of the slots so that the pucks **311** can receive the RF or EM energy without actual electrical contact to the recharging station.

In some embodiments, power source **210** includes supercapacitors, also called ultracapacitors, that are high-capacity capacitors with a capacitance value much higher than other capacitors (e.g., in some embodiments, each supercapacitor being one to five-hundred farads and a plurality of such being connected in series if needed to comply with voltage limits), but with typically lower voltage capabilities each, that are used instead of rechargeable batteries (definition adapted from en.wikipedia.org/wiki/Supercapacitor). One amp represents a rate of electron flow of 1 coulomb of electrons per second, so a 1-farad capacitor can hold 1 amp-second of electrons at 1 volt. Accordingly, a 10-farad supercapacitor could be charged to 6 volts in 60 seconds. In some embodiments, the power supply **210** includes a supercapacitor circuit having a capacitance of at least 0.1 farad. In some embodiments, the power supply **210** includes a supercapacitor circuit having a capacitance of at least 0.2 farad. In some embodiments, the power supply **210** includes a supercapacitor circuit having a capacitance of at least 0.5 farad. In some embodiments, the power supply **210** includes a supercapacitor circuit having a capacitance of at least 1 farad. In some embodiments, the power supply **210** includes a supercapacitor circuit having a capacitance of at least 2 farads. In some embodiments, the power supply **210** includes a supercapacitor circuit having a capacitance of at least 5 farads. In some embodiments, the power supply **210** includes a supercapacitor circuit having a capacitance of at least 10 farads. In some embodiments, the power supply **210** includes a supercapacitor circuit having a capacitance of at least 20 farads. In some embodiments, the power supply **210** includes a supercapacitor circuit having a capacitance of at least 50 farads. In some embodiments, the power supply **210** includes a supercapacitor circuit having a capacitance of at least 100 farads. In some embodiments, power source **210** includes a supercapacitor circuit having two 200-farad capacitors of a type similar to part LIC2540R 3R8207, or two 270-farad capacitors of a type similar to part LIC2540RS3R8277, each by TAIYO YUDEN CO., LTD., as described at www.mouser.com/datasheet/2/396/taiyoyuden_capacitor03_e-1488112.pdf, are wired in series to provide at least 100-farad capacitance that can be charged to at least 7.4 volts and discharged to 4.4 volts before needing to be recharged. To recharge 100 farads (100 Coulombs/volt) by a 3-volt difference (i.e., 4.4 volts to 7.4 volts) the power-supply circuit **210** needs 300 Coulombs, which charged at 5 amps (5 coulombs/second), would take 60 seconds. In some embodiments, supercapacitors such as described by Snyder in U.S. Pat. No. 10,460,880 are used. In some embodiments, supercapacitors can be charged and discharged tens of thousands or hundreds of thousands of times, whereas rechargeable batteries can typically be recharged only up to one thousand times. Thus, a power source **210** that includes supercapacitors can be recharged much more quickly (a few seconds) and for many more times (tens of thousands to hundreds of thousands of times) than is possible using rechargeable batteries. In some embodiments, each supercapacitor-powered puck assembly **101** or **201** is recharged in one to sixty seconds once per hour rather than the one to eight hours once per day needed to recharge a rechargeable battery-powered puck assembly **101** or **201**.

In some embodiments, puck assembly **201** includes an electronic motor **220** that is coupled to and configured to drive a friction wheel **225** (see FIG. **2**C) that contacts a sidewall of the slot in the truss-assembly table where puck assembly **201** is located. In some such embodiments, motor **220** drives wheel **225** along the sidewall such that puck assembly **201** moves along the slot in the truss-assembly table. In some embodiments, puck assembly **201** includes a brake motor **230** that actuates braking-locking mechanism **231** (see FIG. **2**C) that provides a braking and/or locking force to puck assembly **201** such that it is held in place in the slot **312** or **313** (see FIG. **3**) once puck assembly **201** has reached a desired location in the slot **312** or **313**. In some embodiments, puck assembly **201** includes one or more sensors **240** that are configured to provide location information to puck assembly **201** and/or a control system that controls puck assembly **201**. In some embodiments, sensors **240** include infrared (IR) sensors, cameras, touch/contact/distance sensors, or the like. In some embodiments, the slots **312** or **313** include optical, engraved, or other rulings that are sensed by sensors **240**. In some embodiments, sensors **240** include idler-wheel outer side surfaces that provide a contralateral pressure on the sides of the slots relative to the drive wheel **225**. In other embodiments, braking-locking mechanism **231** provides the contralateral pressure on the sides of the slots relative to the drive wheel **225**. In yet other embodiments (such as shown in FIG. **1**E), separate idler wheels or other physical features of the puck assembly **201** provide the contralateral pressure on the sides of the slots relative to the drive wheel **225** such that when drive wheel **225** rotates and presses against the slot **312** or **313**, the puck is moved along the respective slot **312** or **313**.

FIG. **2**B is a top view of puck assembly **201**, according to some embodiments of the present invention. In some embodiments, motor **220** (and thus wheel **225**) is coupled to a spring **221** such that wheel **225** is spring-loaded against the sidewall of the slot regardless of how the sidewall width changes along the length of the slot.

FIG. **2**C is a bottom view of puck assembly **201**, according to some embodiments of the present invention. In some embodiments, puck assembly **201** includes braking/locking device **231** that is coupled to and controlled by brake mechanism **230** (see FIG. **2**B).

FIG. **2**D is a bottom view of a square-prism puck assembly **204**, according to some embodiments of the present invention. As used herein, a square prism is a three-dimensional shape with two substantially square bases (a square bottom base and a top face of the same size and shape, although in some embodiments, the corners may be rounded) and four flat sides that connect the edges of the bottom base to corresponding edges of the top face. In some embodiments, as shown here, square-prism puck assembly **204** includes a generally square housing **214** with optionally rounded corners, sensors/idler wheels **240**, drive wheel(s) **225** and braking-locking mechanism **231**, as well as internal power source(s), motor(s), microprocessor(s) and wireless communications features (not shown here) to allow the overall system to locate, move, lock, and recharge puck assembly **204**.

FIG. **2**E is a bottom view of triangular-prism puck assembly **205**, according to some embodiments of the present invention. As used herein, a triangular prism is a three-sided prism that has a triangular base and top face that is the size and shape of the base (although in some embodiments, the corners may be rounded), and three side faces joining corresponding edges of the base and top face. In some embodiments, as shown here triangular-prism puck assembly **205** includes a generally triangular housing **215** with optionally rounded corners, sensors/idler wheels **240**, drive wheel(s) **225** and braking-locking mechanism **231**, as well as internal power source(s), motor(s), microprocessor(s) and wireless communications features (not shown here) to allow the overall system to locate, move, lock, and recharge triangular-prism puck assembly **205**.

Other features of square-prism puck assembly **204** and triangular-prism puck assembly **205** are similar to corresponding features of puck assembly **201**, as described above.

FIG. **3**A is a plan-view schematic of a jigging table system **300**, according to some embodiments of the present invention. In some embodiments, jigging table system **300** includes a table surface **310** having a plurality of slots **312** running from a front edge **309** (at the bottom of FIG. **3**) to one or more power recharging stations **315** situated at a distal back edge **308** generally parallel to the side edges **306** and **307**. In some embodiments, the present invention further includes one or more diagonal slots **313** and **314** (or one or more slots perpendicular to slots **312**), which, in the case of diagonal slot **314**, allows the pucks **311** to switch among the slots **312** by their own motorized capabilities. In some embodiments, each of the plurality of pucks **311** are implemented by using puck assemblies **101** or **201** or the like.

FIG. **3**B is a side-view schematic, partially in cross section, of a jigging-table recharging system **302**, according to some embodiments of the present invention. In some embodiments, recharging system **302** includes one or more recharging stations **315** each includes one or more electromagnetic (EM) energy-transmitting coils **385** located under the slots **312**, and each puck **311** includes an EM-energy-receiving coil **381** configured to receive EM energy when EM-energy-receiving coil **381** is located adjacent to, or in the vicinity of, EM-energy-transmitting coil **385**. In some embodiments, each puck **311** includes a rectifying and signal-conditioning circuit **319** configured to receive AC power from its coil **381** and to provide DC recharging current to the puck's on-puck batteries or supercapacitors. While FIG. **3**B and FIG. **3**C show rectifying and signal-conditioning circuit **319** as a single diode (i.e., a half-wave rectifier), other embodiments use a full-wave bridge rectifier with over-voltage protection and other signal-conditioning circuitry, as are well-known in the art.

FIG. **3**C is a side-view schematic, partially in cross section, of a jigging-table recharging system **303**, according to some embodiments of the present invention. In some embodiments, recharging system **303** is similar in concept to system **302**, but includes one or more recharging stations **315** that each includes one or more electromagnetic (EM) energy-transmitting coils **385** located above table **310** and at the end of the slots **312**, and each puck **311** includes an EM-energy-receiving coil **381** on a side or edge of puck **311** configured to receive EM energy when EM-energy-receiving coil **381** is located adjacent to, or in the vicinity of, a corresponding EM-energy-transmitting coil **385**.

FIG. **3**D is a side-view schematic, partially in cross section, of a jigging-puck top-side drive system **304**, according to some embodiments of the present invention. In some embodiments, each puck **311** of jigging-puck top-side drive system **304** includes one or more drive wheels **383** that press against the top surface of table **310**, and includes a projection **382** that provides a balancing force to the bottom side of the table next to the respective slot **312**.

FIG. **3**E is a side-view schematic, partially in cross section, of a jigging-puck bottom-side drive system **305**, according to some embodiments of the present invention. In some embodiments, each puck **311** of jigging-puck top-side drive system **305** includes a projection **325** that extends through the respective slot **312** and has one or more drive wheels **383** that press against the bottom surface of table **310**, wherein the puck above the slot **312** provides a balancing force to the top side of the table next to the respective slot **312**.

FIG. **3**F is a side-view schematic, partially in cross section, of a jigging-puck in-slot drive system **306**, according to some embodiments of the present invention. In some embodiments, jigging-puck in-slot drive system **306** is equivalent to those shown in FIGS. **1A1-1A4**, **1B**, **1C**, **1D**, **1E** and **2A-2C**.

FIG. **4** is a schematic of a jigging table and projector-imaging system **400** having puck-identification and moving functions with a plurality of digital cameras **401** (e.g., **401**A-**401**D) that each obtain input images, and projectors **402** (e.g., **402**A-**402**D) that each project output images with distortion correction that compensates for projector and table distortions and imperfections, according to some embodiments of the present invention. In some embodiments, each of the plurality of pucks **311** are implemented by using puck assemblies **101** or **201** (such as represented in the lower right corner of FIG. **4**) or the like. In some embodiments, a puck-control microprocessor **415** uses wireless communications **416** to command and control each of the pucks **311** (each of which includes a wireless receiver configured to receive and act upon commands) to move to their respective positions, locations and/or orientations to hold the pieces of a truss **395** (or other structure to be assembled) while the truss pieces are being positioned and attached to one another using, e.g., a truss plate press and a plurality of truss plates (e.g., produced by punching light gauge galvanized steel to create teeth on one side for gripping the wood truss members). In some embodiments, each of the pucks **311** includes a microprocessor programmed to control the movement and locking actuators of its puck **311**. In some embodiments, each of the pucks **311** includes a wireless transmitter to communicate status and/or location information back to puck-control microprocessor **415**. In some embodiments, puck-control microprocessor **415** communicates to each of the camera-projector microprocessor **405** to receive image information from the cameras **401**A-**401**D that is analyzed to determine locations of each of the pucks **311**, and to transmit data to the camera-projector microprocessor **405** for the projectors **402**A-**402**D. In some embodiments, when the puck **311** determines (in some embodiments, in response to a query from puck-control microprocessor **415**) that the puck **311** needs to recharge itself, it notifies puck-control microprocessor **415**, which then, once it is not immediately needed to remain in its current location, sends a command authorizing the puck to move to a recharging station **315**, and the puck then moves itself to the respective recharging station **315**.

In some embodiments, a processor system **405** (such as a Raspberry Pi® or the like) is connected to control operation of its respective camera **401** (such as **401**A) and its respective projector **402** (such as **402**A); and together, each set of an image-processor system **405**, camera **401** and projector **402** of a projection subsystem **411**, and a plurality of projection subsystems **411** together form a projection system **410** that simultaneously projects a set of slightly overlapping output images **404** (comprising, for example, output image **404**A and output image **404**B) that slightly overlap one another at their common edge regions as they land on truss-assembly table **409** and on the truss pieces that are being assembled thereon. In some embodiments, the input images **403** (e.g., **403**A and **403**B) obtained by the cameras **401** have fields of view that slightly overlap one another at their common edges. In some embodiments, the plurality of respective systems **411** are mounted to a support **407** and each performs at least some geometric compensation on the output images **404** based on images acquired during initial and ongoing calibration procedures.

In some embodiments, the plurality of respective image-processor systems **405** additionally or alternatively each have image-analysis software and/or hardware to automatically examine the input images **403** and perform image-analysis calculations (e.g., feature extraction that identifies and locates features such as table imperfections and tool slots on the table **409** that are used for geometric adjustments of the output images **404**, and parts-identification and -location to verify that the correct parts are being used and that the parts (such as truss plates and two-by-four beams) are in the correct locations and are substantially defect-free).

FIG. **5** is a perspective view block-diagram schematic of a system **500** having feature detection that both locates pucks **311** and identifies features, such as slots **312** and marks **526**, that can be used to compensate for projector and table distortions and imperfections, according to some embodiments of the present invention. In some embodiments, the automatic calibration adjustment, to adjust for deviations of the projected image in relation to the truss manufacturing surface TMS **209** (a rigid metal structure), at the time of calibration, and subsequently at regular time intervals (or as requested), obtains from each projector/camera system **411** a first image of the table surface (including table edges **308** and **309**, slots **312**, jigging pucks **311**, and random or purposely made marks **526**), and a second image of the table with projected special targets (fiducial indicators of the image) on the surface (the second image being of the same table area as the first image, but with the addition of the projected targets). In some embodiments, using a machine-vision algorithm for salient table-feature detection, a displacement of the projector/camera system **411** in relation to the table is calculated. (In some embodiments, process **520** calculates displacement relative to salient surface features by imaging the salient surface features such as **526** without the projected image and then projecting a calibration image (which, in some embodiments, includes projected markings), and then imaging the table again to measure the distance between the projected markings and the salient surface features **526**; and process **560** calculates displacement between two features (e.g., **562** in the projected image and features such as jigging puck **311**) of the table and things on the table.) Then, using the target-detection algorithm, an absolute displacement of each portion or segment in the projected image (including, e.g., a projected image of the projected table edge **308**, projected slots **526**, projected jigging pucks **562**) in relation to each of the table surface features is obtained. Using this displacement map (i.e., the amount and direction of displacement for each area subdivision of the projected image), a new calibration matrix is calculated and the truss image is recreated and projected.

In some embodiments, each of the plurality of the pucks **311** include top-surface LEDs that are selectively driven with pulsed signals that are encoded with the puck serial number or other such data, such that the camera-projector system **411** can identify and locate each puck so that whether or not each puck is in the correct desired location can be determined.

FIG. **6** is a block-diagram schematic of a software- and hardware-based projection system **600** used by projector-camera subsystems **411**, according to some embodiments of the present invention. In some embodiments, system **600** includes a software-implemented process **650**.

In FIG. **6** dotted arrows represent control flow and solid arrows represent data flow. In some embodiments, the output image file **635** contains an output truss image **633** created by truss image generator process **611** (during normal operation), or calibration grid **634** created by calibrator process **613** (during calibration procedure). In some embodiments, an automatic calibration of truss-image-adjustment process **612** uses the calibration parameters obtained from calibration parameter file **632** and/or an image **636** or the analysis results obtained from a captured image **636** to adjust the locations of endpoints of each segment of the truss lines being generated by truss-image-generator process **611**. In some embodiments, a first embodiment of the calibration process **613** uses the input image **636** of the truss-manufacturing system (TMS) table **609** and performs an image-analysis process to identify features in that input image that are used for the calibration, monitoring and feedback.

In some embodiments, a different second embodiment of calibration process **613** is used as a substitute for, or as an addition to, the first embodiment of the calibration process **613** in which the input images **636** from the cameras **401** are used to obtain images of the table **109** of TMS table **609**, wherein the images are analyzed and used for calibration, monitoring and feedback. In some embodiments, the second embodiment of calibration process **613** uses light sensors **670** that are embedded in the table **609** at a plurality of spaced-apart locations, and each light sensor **670** communicates signals to calibration process **613**. In some such embodiments, the projected calibration image **634** (e.g., having an array of pixels that can each be illuminated or turned off, for example an HD (high-definition) image of 1024-by-1920 pixels) is controlled to move each respective calibration point **671** of the projected image (pixel-to-pixel) until the exact pixel that should correspond to a particular respective sensor **670** has activated that sensor **670**, and the signal from the particular sensor to calibration process **613** indicates that that exact pixel does correspond to the particular respective sensor **670**.

In some embodiments of the first embodiment of the calibration process **613**, reflectors are substituted for the sensors at each location on table **609** (the locations that would be used for sensors **670** in the second embodiment), and the camera **401** captures images that indicate when a particular pixel of projected light is detected to have been reflected by a particular reflector at the particular location **670**.

In some embodiments, when the computer system, using the camera images of puck locations, is unable to get a particular puck to move to the correct desired position or to successfully lock itself in position, the system transmits a code to the puck to cause the puck to issue a fault indication (such as flashing lights, audio sirens or voice alerts, or other indication) for a human user to pull the failing puck from the jigging table and get a replacement puck that the system can command to move to the correct desired location and lock itself into place.

In some embodiments, the present invention provides a truss jig positioning system that includes: a table having a support plane on which work pieces are supported, wherein the table includes a plurality of segments, and wherein side edges of a first pair of adjacent segments of the plurality of segments define a first slot; a puck assembly automatically movable along the first slot, wherein the puck assembly is self-powered; and a controller configured to control the puck assembly. In some embodiments, the puck assembly is configured to be moved from the first slot to a second slot defined by side edges of a second pair of adjacent segments of the plurality of segments. In some embodiments, the puck assembly includes one or more sensors configured to provide location information to the controller. In some embodiments, the controller is located remotely from the puck assembly. Some embodiments further include a recharge station is located on an end of the first slot, wherein the puck assembly is powered by one or more rechargeable batteries, and wherein the puck assembly is configured to automatically move to the recharge station and make electrical contact with the recharge station in order to recharge the one or more rechargeable batteries when the one or more rechargeable batteries are in need of being recharged. Some embodiments further include a recharge station is located on an end of the first slot, wherein the puck assembly is powered by one or more supercapacitors, and wherein the puck assembly is configured to automatically move to the recharge station and make electrical contact with the recharge station in order to recharge the one or more supercapacitors when the one or more supercapacitors are in need of being recharged. Some embodiments further include a camera system that obtains images of the jigging table and its pucks, determines the identity and location of each puck, and then transmits location-correction information as needed to the various pucks to move them to desired locations for building one of a plurality of different truss shapes.

In some embodiments, the present invention provides a first truss-jig positioning system for use with a table having a support plane on which work pieces are supported, wherein the table includes a plurality of slots including a first slot and a second slot. The truss jig positioning system includes: a first puck assembly configured to receive one or more move commands and based on the one or more move commands, move itself to each selected one of a plurality of selectable locations along the first slot of the table, wherein the first puck assembly is self-powered.

In some embodiments of the first truss-jig positioning system, the first puck assembly is configured to be removed from the first slot and coupled to (i.e., the slot portion of the first puck assembly being inserted into) the second slot.

Some embodiments of the truss-jig positioning system further include: a first controller configured to control movement of the first puck assembly, wherein the first puck assembly includes one or more sensors configured to provide location information to the first controller.

Some embodiments of the first truss-jig positioning system further include: a first controller configured to control movement of the first puck assembly, wherein the first controller is located remote from the first puck assembly.

Some embodiments of the truss-jig positioning system further include: a recharge station configured to be located on an end of the first slot, wherein the first puck assembly is powered by one or more rechargeable batteries, and wherein the first puck assembly is configured to automatically move to the recharge station and make electrical contact with the recharge station in order to recharge the one or more rechargeable batteries when the one or more rechargeable batteries are in need of being recharged.

Some embodiments of the truss-jig positioning system further include: a recharge station configured to be located on an end of the first slot, wherein the first puck assembly is powered by one or more supercapacitors having a total capacitance of at least 0.1 farad, and wherein the first puck assembly is configured to automatically move to the recharge station and make electrical contact with the recharge station in order to recharge the one or more supercapacitors when the one or more rechargeable batteries are in need of being recharged.

Some embodiments of the first truss-jig positioning system further include: a machine-vision system that obtains images of the jigging table and its puck assemblies, determines the identity and location of each puck assembly, and then transmits location-correction information as needed to the various puck assemblies to move them to desired locations for building one of a plurality of different truss shapes.

Some embodiments of the truss-jig positioning system further include: the table, wherein the table is a truss-assembly table; a plurality of additional puck assemblies each equivalent to the first puck assembly; one or more respective recharge stations, each located relative to one or more of the plurality of slots such that one or more respective ones of the puck assemblies can move to a location at which the respective puck can receive electrical power from one or more of the respective recharge stations; a first controller configured to control movement of the first puck assembly and the plurality of additional puck assemblies, wherein the first puck assembly and each of the plurality of additional puck assemblies includes one or more features configured to provide location information to the first controller; and a machine-vision system that obtains images of the jigging table and its puck assemblies, determines an identity and location of each respective puck assembly, and then transmits location-correction information as needed to the respective puck assembly to move the respective puck assembly to a respective one of selected desired locations for building one of a plurality of different truss shapes.

Some embodiments of the first truss-jig positioning system further include: the table, wherein the table is a truss-assembly table; a plurality of additional puck assemblies each equivalent to the first puck assembly; one or more respective recharge stations, each located relative to one or more of the plurality of slots such that one or more respective ones of the puck assemblies can move to a location at which the respective puck can receive electrical power from one or more of the respective recharge stations; a first controller configured to control movement of the first puck assembly and the plurality of additional puck assemblies; a machine-vision system that obtains images of the jigging table and its puck assemblies, determines an identity and location of each respective puck assembly, and then transmits location-correction information as needed to the respective puck assembly to move the respective puck assembly to a respective one of selected desired locations for building one of a plurality of different truss shapes; and a projection system configured to project a human-perceptible light pattern to help a human user position pieces of wood on the table to be assembled into a truss.

Some embodiments of the first truss-jig positioning system further include: the table, wherein the table is a truss-assembly table; a plurality of additional puck assemblies each equivalent to the first puck assembly; one or more respective recharge stations, each located relative to one or more of the plurality of slots such that one or more respective ones of the puck assemblies can move to a location at which the respective puck can receive electrical power from one or more of the respective recharge stations; a first controller configured to control movement of the first puck assembly and the plurality of additional puck assemblies; a machine-vision system that obtains images of the jigging table and its puck assemblies, determines an identity and location of each respective puck assembly, and then transmits location-correction information as needed to the respective puck assembly to move the respective puck assembly to a respective one of selected desired locations for building one of a plurality of different truss shapes; and an automatic part-positioning system configured to obtain and position pieces of wood on the table to be assembled into a truss.

In some embodiments, the present invention provides a first truss truss-jig positioning method for use with a table having a support plane on which work pieces are supported, wherein the table includes a plurality of slots including a first slot and a second slot. The first truss jig positioning method includes: providing a first puck assembly, wherein the first puck assembly is self-powered; wirelessly transmitting one or more positioning commands to the first puck assembly; receiving the one or more move commands by the first puck assembly, and based on the one or more positioning commands, having the first puck assembly move itself to each selected one of a plurality of selectable locations along the first slot of the table.

Some embodiments of the first truss-jig positioning method further include: removing the first puck assembly from the first slot and coupling the first puck assembly to (i.e., inserting the slot portion of the first puck assembly into) the second slot.

Some embodiments of the first truss-jig positioning method further include: removing the first puck assembly from the first slot and coupling a second puck assembly to (i.e., inserting the slot portion of the first puck assembly into) the first slot.

Some embodiments of the first truss-jig positioning method further include: controlling movement of the first puck assembly from a remote first controller, wherein the first puck assembly includes one or more sensors configured to determine location information; and wirelessly communicating the location information from the first puck assemble to the first controller.

Some embodiments of the first truss-jig positioning method further include: obtaining image information into a first controller remote from the first puck assembly; and controlling movement of the first puck assembly from the remote first controller based on the image information.

Some embodiments of the first truss-jig positioning method further include: positioning a recharge station on an end of the first slot; powering the first puck assembly from one or more rechargeable batteries, and wherein the puck assembly is configured to automatically move to the recharge station and make electrical contact with the recharge station in order to recharge the one or more rechargeable batteries when the one or more rechargeable batteries are in need of being recharged.

Some embodiments of the first truss-jig positioning method further include: locating a recharge station on an end of the first slot; powering the first puck assembly from one or more supercapacitors having a total capacitance of at least 0.1 farad, and wherein the puck assembly is configured to automatically move to the recharge station and make electrical contact with the recharge station in order to recharge the one or more supercapacitors when the one or more supercapacitors are in need of being recharged.

Some embodiments of the first truss-jig positioning method further include: positioning a recharge station on an end of the first slot; powering the first puck assembly from one or more supercapacitors having a total capacitance of at least 0.1 farad, and wherein the puck assembly is configured to automatically move to the recharge station and wirelessly receiving power from the recharge station in order to recharge the one or more supercapacitors when the one or more supercapacitors are in need of being recharged. Some such embodiments improve reliability over similar embodiments that make electrical contact with the recharge station that are susceptible to failure due to dust, corrosion and/or contaminants of a factory environment.

Some embodiments of the first truss-jig positioning method further include: obtaining images of the jigging table and its pucks by a machine-vision system; determining an identity and location of each puck, and then transmits location-correction information as needed to the various pucks to move them to desired locations for building one of a plurality of different truss shapes.

Some embodiments of the first truss-jig positioning method further include: providing a plurality of additional puck assemblies each equivalent to the first puck assembly; positioning one or more respective recharge stations relative to one or more of the plurality of slots such that one or more of the pucks can move to a location at which the puck can receive electrical power from one or more of the respective recharge stations; controlling movement of the first puck assembly and the plurality of additional puck assemblies by a first controller; obtaining images of the jigging table and its puck assemblies by a machine-vision system coupled to the first controller; determining, by the first controller, an identity and location of each respective puck assembly; transmitting location-correction information from the first controller to a respective one of the puck assemblies to move the respective puck assembly to a respective one of selected desired locations for building one of a plurality of different truss shapes.

Some embodiments of the first truss-jig positioning method further include: providing a plurality of additional puck assemblies each equivalent to the first puck assembly; positioning one or more respective recharge stations relative to one or more of the plurality of slots such that one or more of the pucks can move to a location at which the puck can receive electrical power from one or more of the respective recharge stations; controlling movement of the first puck assembly and the plurality of additional puck assemblies by a first controller; determining, by the first controller, an identity and location of each respective puck assembly; transmitting location-correction information from the first controller to a respective one of the puck assemblies to move the respective puck assembly to a respective one of selected desired locations for building one of a plurality of different truss shapes; and projecting a human-perceptible light pattern under control of the first controller to assist a human user position pieces of wood on the table to be assembled into a truss. In some such embodiments, the first puck assembly and each of the plurality of additional puck assemblies includes one or more features configured to provide location information to the first controller.

Some embodiments of the first truss-jig positioning method further include: providing a plurality of additional puck assemblies each equivalent to the first puck assembly; positioning one or more respective recharge stations relative to one or more of the plurality of slots such that one or more of the pucks can move to a location at which the puck can receive electrical power from one or more of the respective recharge stations; controlling movement of the first puck assembly and the plurality of additional puck assemblies by a first controller; obtaining images of the jigging table and its puck assemblies; determining by the first controller an identity and location of each respective puck assembly; transmitting location-correction information as needed to a respective puck assembly to control movement of the respective puck assembly to a respective one of selected desired locations for building one of a plurality of different truss shapes; and obtaining and positioning pieces of wood on the table to be assembled into a truss by an automatic part-positioning system. In some such embodiments, the first puck assembly and each of the plurality of additional puck assemblies includes one or more features configured to provide location information to the first controller.

In some embodiments, the present invention provides a second jigging puck system for use with a jigging table that includes a plurality of slots. The second jigging puck system includes: a first puck assembly that includes: a power source, a drive mechanism configured to move the first puck assembly along at least one of the plurality of slots, a first motor coupled to receive power from the power source and configured to power the drive mechanism, a communications module configured to wirelessly communicate signals, and a microprocessor coupled to the communications module and configured to control movement of the first puck assembly based at least in part on the communicated signals.

Some embodiments of the second jigging puck system further include: the jigging table.

Some embodiments of the second jigging puck system further include: the jigging table, wherein the first puck assembly further includes a locking system coupled to the microprocessor and configured to lock the first puck assembly in a desired position in the at least one of the plurality of slots.

In some embodiments of the second jigging puck system, the drive mechanism includes a plurality of elastomeric drive wheels.

In some embodiments of the second jigging puck system, the power source includes a battery.

In some embodiments of the second jigging puck system, the power source includes a battery, and wherein the first puck assembly further includes a plurality of electrical contacts electrically coupled to the battery and configured to electrically connect to a recharging station in order to recharge the battery.

In some embodiments of the second jigging puck system, the power source includes a battery, and wherein the first puck assembly further includes an electromagnetic device coupled to the battery and configured to charge the battery via a recharging station without electrically contacting the recharging station.

In some embodiments of the second jigging puck system, the first puck assembly is one of a plurality of substantially similar puck assemblies including the first puck assembly, a second puck assembly, and a third puck assembly, and wherein each one of the plurality of puck assemblies is configured to move independently from others of the plurality of puck assemblies.

In some embodiments of the second jigging puck system, the first puck assembly has a shape, and wherein the shape is an elongated rectangular prism with rounded ends.

In some embodiments of the second jigging puck system, the power source includes a battery, and the second jigging puck system further includes: the jigging table; and one or more recharging stations coupled to the table and configured to recharge the battery.

Some embodiments of the second jigging puck system further include: the jigging table, wherein the first puck assembly is one of a plurality of identical puck assemblies including the first puck assembly, a second puck assembly, and a third puck assembly, wherein each one of the plurality of puck assemblies is configured to fit into and move along at least one of the plurality of slots, and wherein each respective one of the plurality of puck assemblies further includes a locking system coupled to the microprocessor and configured to lock the respective puck assembly in a desired position in the at least one of the plurality of slots; one or more image-processor devices configured to obtain input images of the jigging table and the plurality of puck assemblies, and to project output images onto the jigging table in order to guide assembly of a truss on the jigging table; and a system microprocessor operatively coupled to the plurality of image-processor devices and configured to wirelessly communicate with the plurality of puck assemblies in order to control movement of the plurality of puck assemblies such that the plurality of puck assemblies are positioned on the jigging table to hold pieces of the truss in place during the assembly of the truss. In some such embodiments, each one of the plurality of image-processor devices includes a camera and a projector.

In some embodiments of the second jigging puck system, each one of the plurality of image-processor devices is configured to perform image-analysis calculations on the input images to verify that parts of the truss are placed in correct locations on the jigging table.

In some embodiments of the second jigging puck system, the plurality of image-processor devices is configured to calculate a displacement of the plurality of image-processor devices in relation to the jigging table.

In some embodiments of the second jigging puck system, the first puck assembly includes one or more sensors configured to provide location information to the first puck assembly.

Some embodiments of the second jigging puck system further include: a jigging table that includes a plurality of slots, wherein the first puck assembly is configured to fit into and move along at least one of the plurality of slots; wherein the first puck assembly further includes a locking system coupled to the microprocessor and configured to lock the first puck assembly in a desired position in the at least one of the plurality of slots, and wherein the locking system includes a brake mechanism that provides contralateral pressure on sides of the at least one of the plurality of slots that contains the first puck assembly.

In some embodiments of the second jigging puck system, the power source includes a supercapacitor.

In some embodiments of the second jigging puck system, the power source includes a supercapacitor, and the jigging puck system further includes: the jigging table; and one or more recharging stations coupled to the table and configured to recharge the supercapacitor.

Some embodiments of the second jigging puck system further include: the table, wherein the table is a truss-assembly table; a plurality of additional puck assemblies each equivalent to the first puck assembly; one or more respective recharge stations, each located relative to one or more of the plurality of slots such that one or more respective ones of the puck assemblies can move to a location at which the respective puck can receive electrical power from one or more of the respective recharge stations; a first controller configured to control movement of the first puck assembly and the plurality of additional puck assemblies; a machine-vision system that obtains images of the jigging table and its puck assemblies, determines an identity and location of each respective puck assembly, and then transmits location-correction information as needed to the respective puck assembly to move the respective puck assembly to a respective one of selected desired locations for building one of a plurality of different truss shapes; and a projection system configured to project a human-perceptible light pattern to help a human user position pieces of wood on the table to be assembled into a truss.

Some embodiments of the second jigging puck system further include: the table, wherein the table is a truss-assembly table; a plurality of additional puck assemblies each equivalent to the first puck assembly; one or more respective recharge stations, each located relative to one or more of the plurality of slots such that one or more respective ones of the puck assemblies can move to a location at which the respective puck can receive electrical power from one or more of the respective recharge stations; a first controller configured to control movement of the first puck assembly and the plurality of additional puck assemblies; a machine-vision system that obtains images of the jigging table and its puck assemblies, determines an identity and location of each respective puck assembly, and then transmits location-correction information as needed to the respective puck assembly to move the respective puck assembly to a respective one of selected desired locations for building one of a plurality of different truss shapes; and an automatic part-positioning system configured to obtain and position pieces of wood on the table to be assembled into a truss.

In some embodiments, the present invention provides a third truss jigging puck system for use with a jigging table that includes a plurality of slots. The third truss jigging puck system includes: a first puck assembly, wherein the first puck assembly is self-powered; means for wirelessly transmitting one or more positioning commands to the first puck assembly; and means for receiving the one or more move commands by the first puck assembly, and based on the one or more positioning commands, having the first puck assembly move itself to each selected one of a plurality of selectable locations along the first slot of the table.

Some embodiments of the third truss jigging puck system further include: the jigging table.

Some embodiments of the third truss jigging puck system further include: means for removing the first puck assembly from the first slot and for coupling the first puck assembly to the second slot.

Some embodiments of the third truss jigging puck system further include: means for controlling movement of the first puck assembly from a remote first controller, wherein the first puck assembly includes one or more sensors configured to determine location information; and means for wirelessly communicating the location information from the first puck assemble to the first controller.

Some embodiments of the third truss jigging puck system further include: means for obtaining image information into a first controller remote from the first puck assembly; and means for controlling movement of the first puck assembly from the remote first controller based on the image information.

In some embodiments of the third truss jigging puck system, a recharge station is positioned on an end of the first slot, and the third system further includes: rechargeable battery means for powering the first puck assembly, wherein the puck assembly is configured to automatically move to the recharge station and make electrical contact with the recharge station in order to recharge the rechargeable battery means when the rechargeable battery means are in need of being recharged.

In some embodiments of the third truss jigging puck system, a recharge station is positioned on an end of the first slot, and the third system further includes: one or more supercapacitors having a total capacitance of at least 0.1 farad, and wherein the puck assembly includes means for automatically moving to the recharge station and for making electrical contact with the recharge station in order to recharge the one or more supercapacitors when the one or more supercapacitors are in need of being recharged.

Some embodiments of the third truss jigging puck system further include: means for obtaining images of the jigging table and its pucks by a machine-vision system; and means for determining an identity and location of each puck, and then for transmitting location-correction information as needed to the various pucks to move them to desired locations for building one of a plurality of different truss shapes.

Some embodiments of the third truss jigging puck system further include: a plurality of additional puck assemblies each equivalent to the first puck assembly; means for positioning one or more respective recharge stations relative to one or more of the plurality of slots such that one or more of the pucks can move to a location at which the puck can receive electrical power from one or more of the respective recharge stations; means for controlling movement of the first puck assembly and the plurality of additional puck assemblies by a first controller; means for obtaining images of the jigging table and its puck assemblies by a machine-vision system coupled to the first controller; means for determining, by the first controller, an identity and location of each respective puck assembly; and means for transmitting location-correction information from the first controller to a respective one of the puck assemblies to move the respective puck assembly to a respective one of selected desired locations for building one of a plurality of different truss shapes.

Some embodiments of the third truss jigging puck system further include: a plurality of additional puck assemblies each equivalent to the first puck assembly; means for positioning one or more respective recharge stations relative to one or more of the plurality of slots such that one or more of the pucks can move to a location at which the puck can receive electrical power from one or more of the respective recharge stations; means for controlling movement of the first puck assembly and the plurality of additional puck assemblies by a first controller; wherein the first puck assembly and each of the plurality of additional puck assemblies includes one or more features configured to provide location information to the first controller; means for determining, by the first controller, an identity and location of each respective puck assembly; means for transmitting location-correction information from the first controller to a respective one of the puck assemblies to move the respective puck assembly to a respective one of selected desired locations for building one of a plurality of different truss shapes; and means for projecting a human-perceptible light pattern under control of the first controller to assist a human user position pieces of wood on the table to be assembled into a truss.

Some embodiments of the third truss jigging puck system further include: a plurality of additional puck assemblies each equivalent to the first puck assembly; means for positioning one or more respective recharge stations relative to one or more of the plurality of slots such that one or more of the pucks can move to a location at which the puck can receive electrical power from one or more of the respective recharge stations; means for controlling movement of the first puck assembly and the plurality of additional puck assemblies by a first controller; wherein the first puck assembly and each of the plurality of additional puck assemblies includes one or more features configured to provide location information to the first controller; means for obtaining images of the jigging table and its puck assemblies; means for determining by the first controller an identity and location of each respective puck assembly; means for transmitting location-correction information as needed to a respective puck assembly to control movement of the respective puck assembly to a respective one of selected desired locations for building one of a plurality of different truss shapes; and means for obtaining and positioning pieces of wood on the table to be assembled into a truss by an automatic part-positioning system.

It is to be understood that the above description is intended to be illustrative, and not restrictive. Although numerous characteristics and advantages of various embodiments as described herein have been set forth in the foregoing description, together with details of the structure and function of various embodiments, many other embodiments and changes to details will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should be, therefore, determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled. In the appended claims, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein," respectively. Moreover, the terms "first," "second," and "third," etc., are used merely as labels, and are not intended to impose numerical requirements on their objects.

What is claimed is:

1. A truss jig positioning system for use with a table having a support plane on which work pieces are supported, wherein the table includes a plurality of slots including a first slot and a second slot; the truss jig positioning system comprising:

a first puck assembly that includes a first motor in the first puck assembly and an on-board electrical power source operatively coupled to the first motor, wherein the first puck assembly is configured to receive one or more move commands and based on the one or more move commands, move itself via the first motor to each selected one of a plurality of selectable locations along the first slot of the table, wherein the first puck assembly is self-powered by the on-board electrical power source.

2. The truss jig positioning system of claim **1**, wherein the first puck assembly is configured to be removed from the first slot and coupled to the second slot.

3. The truss jig positioning system of claim **1**, further comprising:

a recharge station configured to be located on an end of the first slot, wherein the first puck assembly is powered by one or more supercapacitors having a total capacitance of at least 0.1 farad, and wherein the first puck assembly is configured to automatically move to the recharge station and make electrical contact with the recharge station in order to recharge the one or more supercapacitors when the one or more rechargeable batteries are in need of being recharged.

4. The truss jig positioning system of claim 1, further comprising:

a machine-vision system that obtains images of the jigging table and its puck assemblies, determines the identity and location of each puck assembly, and then transmits location-correction information as needed to the various puck assemblies to move them to desired locations for building one of a plurality of different truss shapes.

5. The truss jig positioning system of claim 1, further comprising:

the table, wherein the table is a truss-assembly table;

a plurality of additional puck assemblies each equivalent to the first puck assembly;

one or more respective recharge stations, each located relative to one or more of the plurality of slots such that one or more respective ones of the puck assemblies can move to a location at which the respective puck can receive electrical power from one or more of the respective recharge stations;

a first controller configured to control movement of the first puck assembly and the plurality of additional puck assemblies, wherein the first puck assembly and each of the plurality of additional puck assemblies includes one or more features configured to provide location information to the first controller; and

a machine-vision system that obtains images of the jigging table and its puck assemblies, determines an identity and location of each respective puck assembly, and then transmits location-correction information as needed to the respective puck assembly to move the respective puck assembly to a respective one of selected desired locations for building one of a plurality of different truss shapes.

6. The truss jig positioning system of claim 1, further comprising:

the table, wherein the table is a truss-assembly table;

a plurality of additional puck assemblies each equivalent to the first puck assembly;

one or more respective recharge stations each located relative to one or more of the plurality of slots such that one or more respective ones of the puck assemblies can move to a location at which the respective puck can receive electrical power from one or more of the respective recharge stations;

a first controller configured to control movement of the first puck assembly and the plurality of additional puck assemblies;

a machine-vision system that obtains images of the jigging table and its puck assemblies, determines an identity and location of each respective puck assembly, and then transmits location-correction information as needed to the respective puck assembly to move the respective puck assembly to a respective one of selected desired locations for building one of a plurality of different truss shapes; and

a projection system configured to project a human-perceptible light pattern to help position pieces of wood on the table to be assembled into a truss.

7. The truss jig positioning system of claim 1, further comprising:

the table, wherein the table is a truss-assembly table;

a plurality of additional puck assemblies each equivalent to the first puck assembly;

one or more respective recharge stations, each located relative to one or more of the plurality of slots such that one or more respective ones of the puck assemblies can move to a location at which the respective puck can receive electrical power from one or more of the respective recharge stations;

a first controller configured to control movement of the first puck assembly and the plurality of additional puck assemblies;

a machine-vision system that obtains images of the jigging table and its puck assemblies, determines an identity and location of each respective puck assembly, and then transmits location-correction information as needed to the respective puck assembly to move the respective puck assembly to a respective one of selected desired locations for building one of a plurality of different truss shapes; and

an automatic part-positioning system configured to obtain and position pieces of wood on the table to be assembled into a truss.

8. A truss jig positioning system for use with a table having a support plane on which work pieces are supported, wherein the table includes a plurality of slots including a first slot and a second slot; the truss jig positioning system comprising:

a first puck assembly configured to receive one or more move commands and based on the one or more move commands, move itself to each selected one of a plurality of selectable locations along the first slot of the table, wherein the first puck assembly is self-powered; and

a recharge station configured to be located on an end of the first slot, wherein the first puck assembly is powered by one or more rechargeable batteries, and wherein the first puck assembly is configured to automatically move to the recharge station and make electrical contact with the recharge station in order to recharge the one or more rechargeable batteries when the one or more rechargeable batteries are in need of being recharged.

9. A truss jig positioning method for use with a table having a support plane on which work pieces are supported, wherein the table includes a plurality of slots including a first slot and a second slot; the truss jig positioning method comprising:

providing a first puck assembly that includes a first motor in the first puck assembly and an on-board electrical power source operatively coupled to the first motor, wherein the first puck assembly is self-powered by the on-board electrical power source; wirelessly transmitting one or more positioning commands to the first puck assembly; and

receiving the one or more positioning commands by the first puck assembly, and based on the one or more positioning commands, having the first puck assembly move itself via the first motor to each selected one of a plurality of selectable locations along the first slot of the table.

10. The truss jig positioning method of claim 9, further comprising:

removing the first puck assembly from the first slot and coupling the first puck assembly to the second slot.

11. The truss jig positioning method of claim 9, further comprising:

obtaining image information into a first controller remote from the first puck assembly; and

controlling movement of the first puck assembly from the remote first controller based on the image information.

12. The truss jig positioning method of claim 9, further comprising:

positioning a recharge station on an end of the first slot; and

powering the first puck assembly from one or more supercapacitors having a total capacitance of at least 0.1 farad, and wherein the puck assembly is configured to automatically move to the recharge station and make electrical contact with the recharge station in order to recharge the one or more supercapacitors when the one or more supercapacitors are in need of being recharged.

13. The truss jig positioning method of claim 9, further comprising:

obtaining images of the jigging table and its pucks by a machine-vision system; and

determining an identity and location of each puck, and then transmitting location-correction information as needed to the various pucks to move them to desired locations for building one of a plurality of different truss shapes.

14. The truss jig positioning method of claim 9, further comprising:

providing a plurality of additional puck assemblies each equivalent to the first puck assembly;

positioning one or more respective recharge stations relative to one or more of the plurality of slots such that one or more of the pucks can move to a location at which the puck can receive electrical power from one or more of the respective recharge stations;

controlling movement of the first puck assembly and the plurality of additional puck assemblies by a first controller;

obtaining images of the jigging table and its puck assemblies by a machine-vision system coupled to the first controller;

determining, by the first controller, an identity and location of each respective puck assembly; and

transmitting location-correction information from the first controller to a respective one of the puck assemblies to move the respective puck assembly to a respective one of selected desired locations for building one of a plurality of different truss shapes.

15. The truss jig positioning method of claim 9, further comprising:

providing a plurality of additional puck assemblies each equivalent to the first puck assembly;

positioning one or more respective recharge stations relative to one or more of the plurality of slots such that one or more of the pucks can move to a location at which the puck can receive electrical power from one or more of the respective recharge stations;

controlling movement of the first puck assembly and the plurality of additional puck assemblies by a first controller; wherein the first puck assembly and each of the plurality of additional puck assemblies includes one or more features configured to provide location information to the first controller;

determining, by the first controller, an identity and location of each respective puck assembly;

transmitting location-correction information from the first controller to a respective one of the puck assemblies to move the respective puck assembly to a respective one of selected desired locations for building one of a plurality of different truss shapes; and

projecting a human-perceptible light pattern under control of the first controller to assist in positioning pieces of wood on the table to be assembled into a truss.

16. The truss jig positioning system of claim 1, wherein the first puck assembly includes:

a communications module configured to wirelessly receive the one or more move commands, and

a microprocessor coupled to the communications module and configured to control movement of the first puck assembly based at least in part on the wirelessly received one or more move commands.

17. The truss jig positioning system of claim 16, further comprising:

the jigging table, wherein the first puck assembly further includes a locking system coupled to the microprocessor and configured to lock the first puck assembly in a desired position in the at least one of the plurality of slots.

18. The truss jig positioning system of claim 16, wherein the first puck assembly further includes a plurality of elastomeric drive wheels.

19. The truss jig positioning system of claim 16, wherein the first puck assembly is one of a plurality of substantially similar puck assemblies including the first puck assembly, a second puck assembly, and a third puck assembly, and wherein each one of the plurality of puck assemblies is configured to move independently from others of the plurality of puck assemblies.

20. A truss jig positioning system comprising:

a first puck assembly;

means for moving the first puck assembly, wherein the means for moving is located in the first puck assembly;

means for electrically powering the means for moving, wherein the means for electrically powering is on board the first puck assembly;

means for wirelessly transmitting one or more positioning commands to the first puck assembly; and

means for receiving the one or more positioning commands at the first puck assembly, and based on the one or more positioning commands, causing the first puck assembly to move itself to each selected one of a plurality of selectable locations along the first slot of the table.

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