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Dunivan

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(54) **AUTOMATED SCANNING AND BUTCHERING SYSTEM AND METHOD OF USE**

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Related U.S. Application Data

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(51) **Int. Cl.**
A22C 25/00 (2006.01)
A22C 17/00 (2006.01)
A22C 17/02 (2006.01)

(52) **U.S. Cl.**
CPC *A22C 17/0086* (2013.01); *A22C 17/0006* (2013.01); *A22C 17/02* (2013.01)

(58) **Field of Classification Search**
CPC *A22B 5/0041*; *A22B 5/0029*; *A22B 5/007*
USPC 452/149–153, 155–157
See application file for complete search history.

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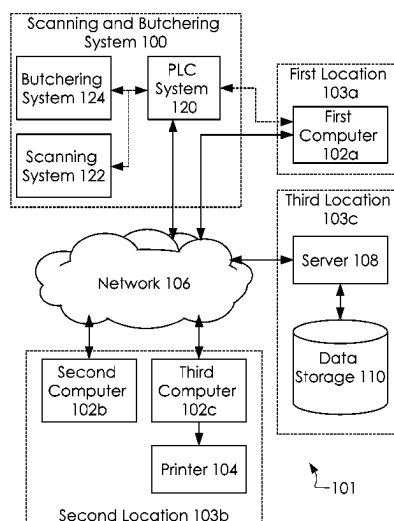
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(74) *Attorney, Agent, or Firm* — Shannon L Warren

(57) **ABSTRACT**

An automated scanning and butchering system is disclosed. Said system having a PLC system, a scanning system and a butchering system in data communication. The butchering system comprising a one or more saw assemblies, a conveyor system, a one or more cradles, and a first end and a second end. The one or more saw assemblies are arranged between the first end and the second end of the butchering system. The conveyor system comprises a conveyor comprising the one or more cradles configured to move items from the first end to the second end of the butchering system. The one or more cradles are configured to releaseably receive and hold a target object as the conveyor moves the target object from the first end to the second end of the butchering system. The scanning system comprising a one or more scanners.

17 Claims, 22 Drawing Sheets



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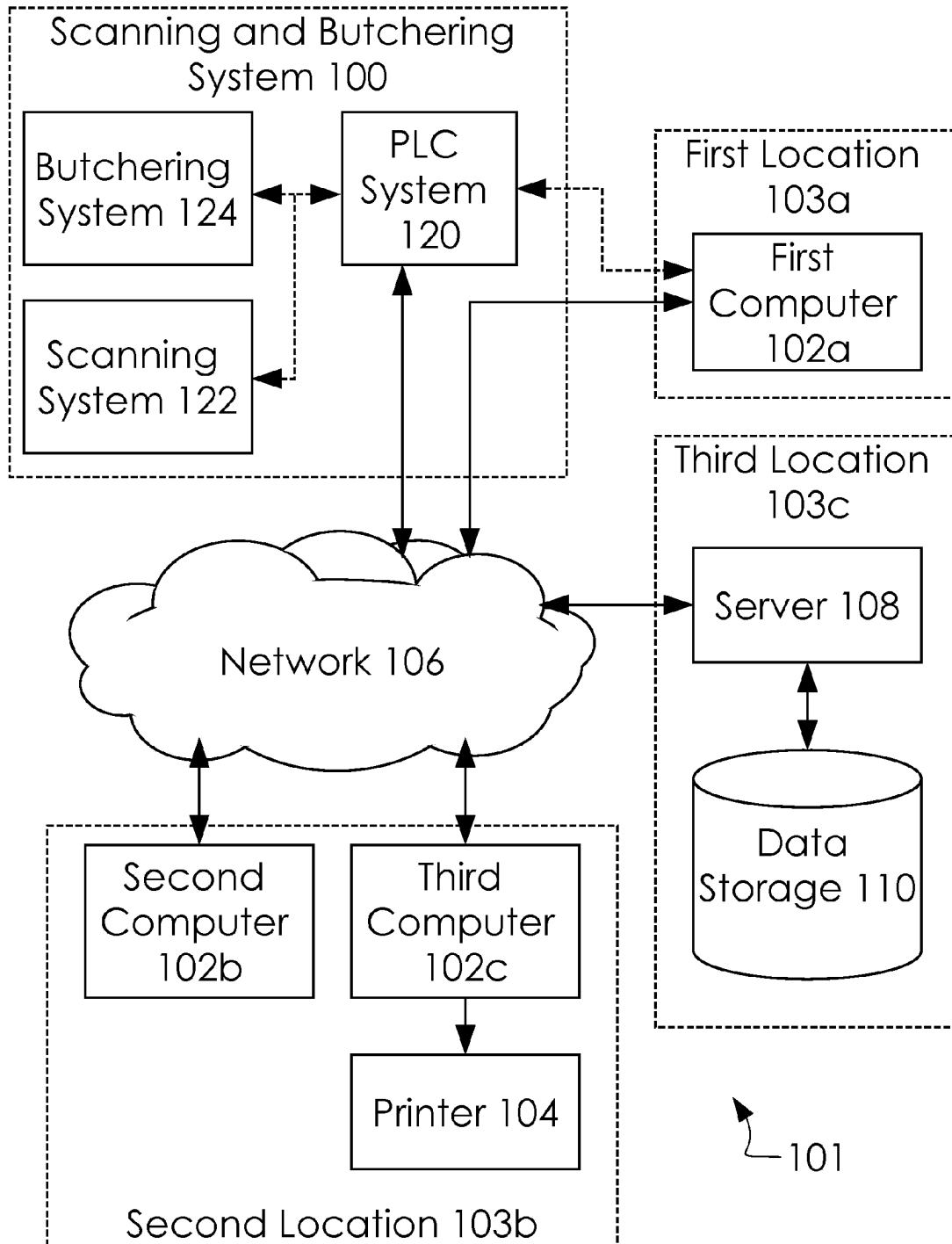


FIG. 1

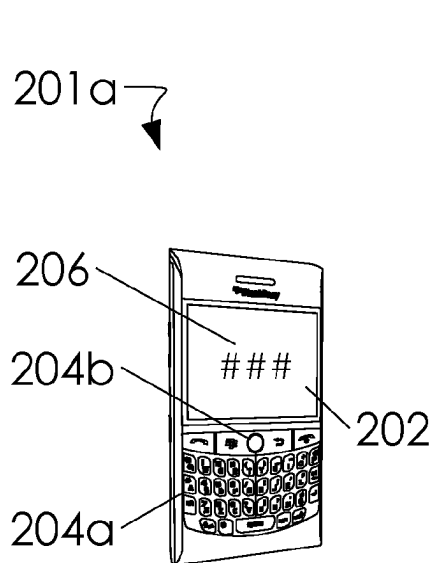


FIG. 2A

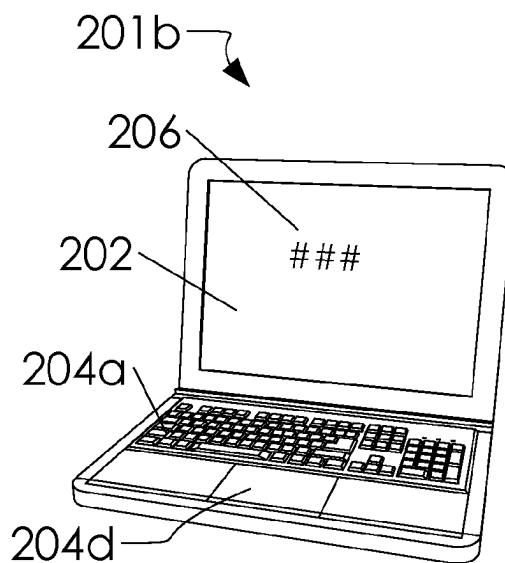


FIG. 2B

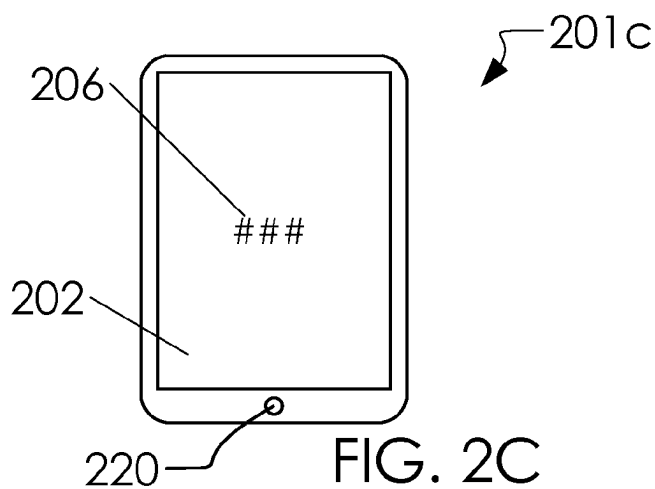


FIG. 2C

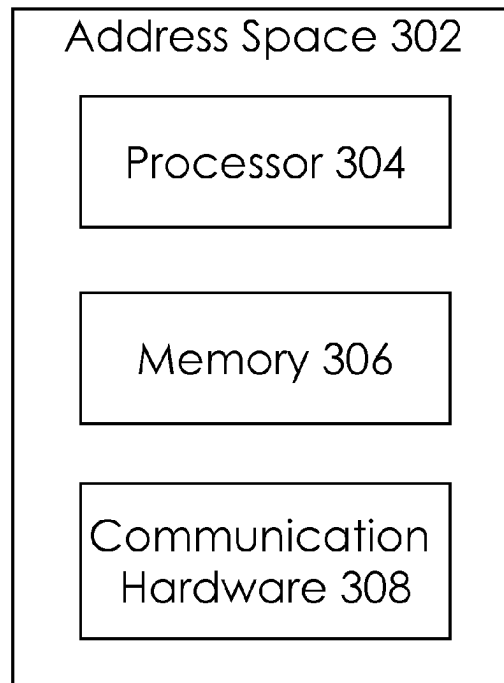


FIG. 3A

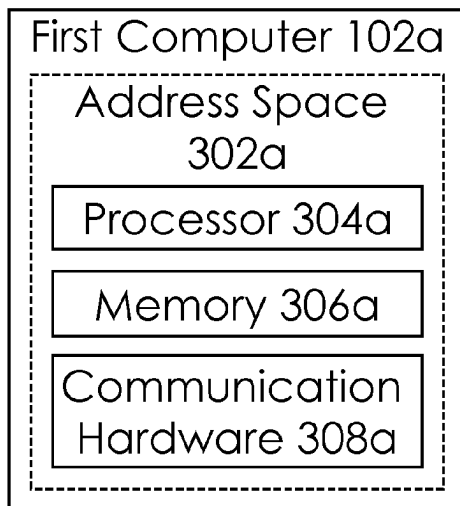


FIG. 3B

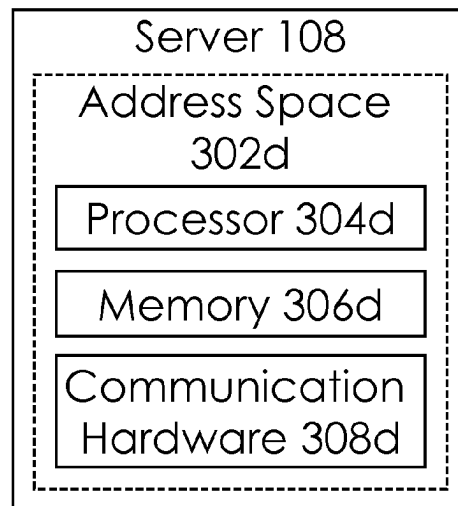


FIG. 3C

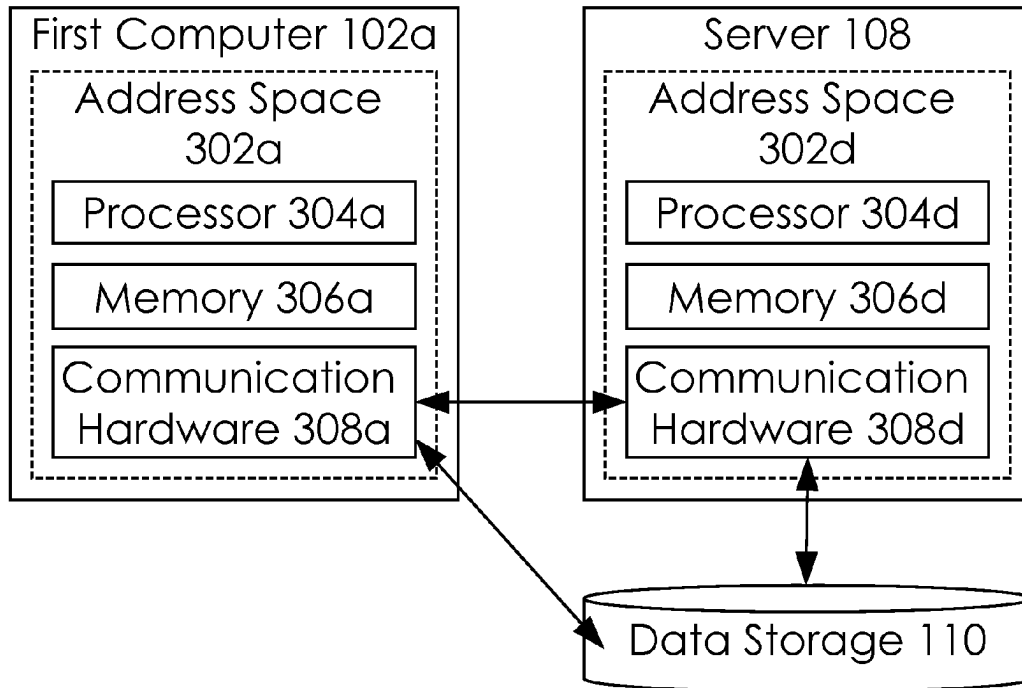


FIG. 4A

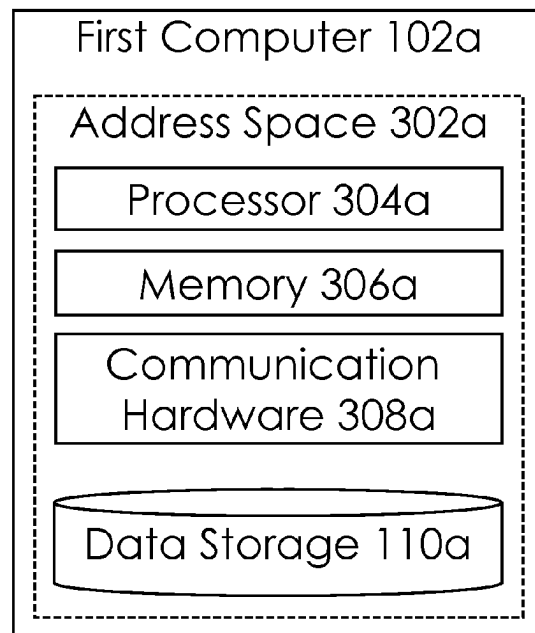


FIG. 4B

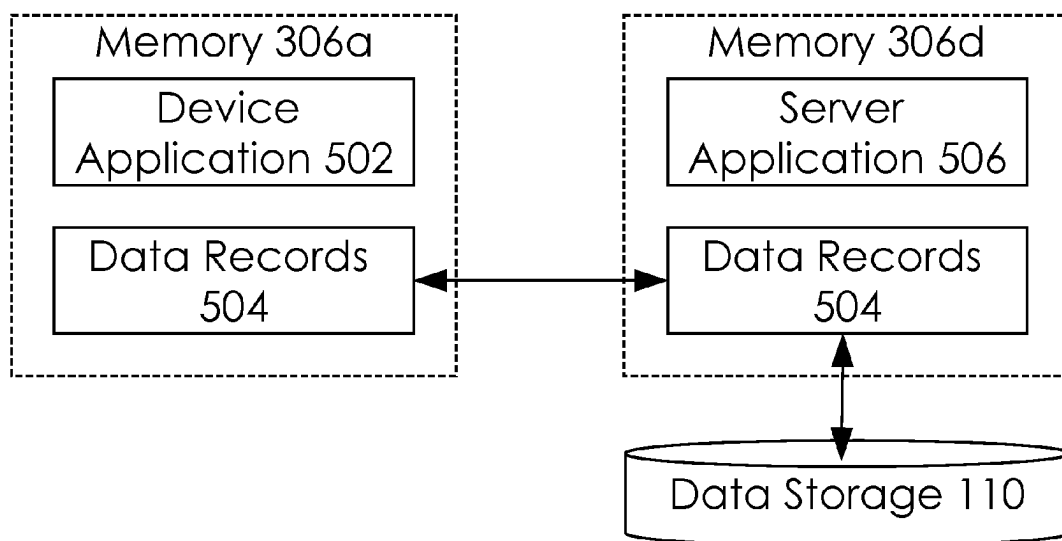


FIG. 5A

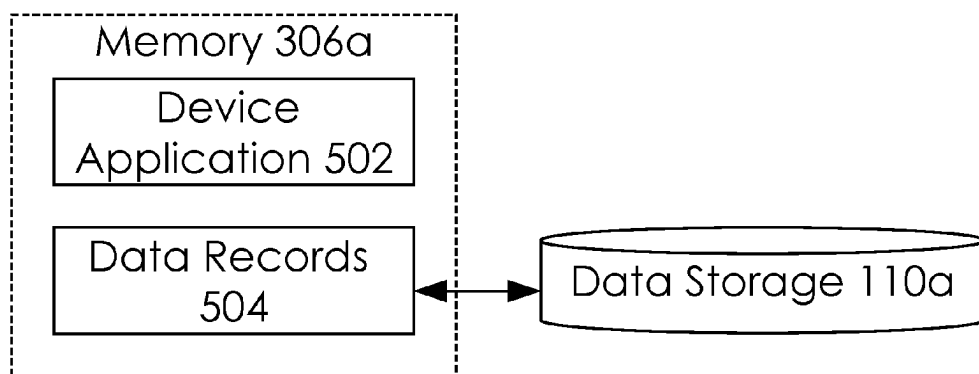


FIG. 5B

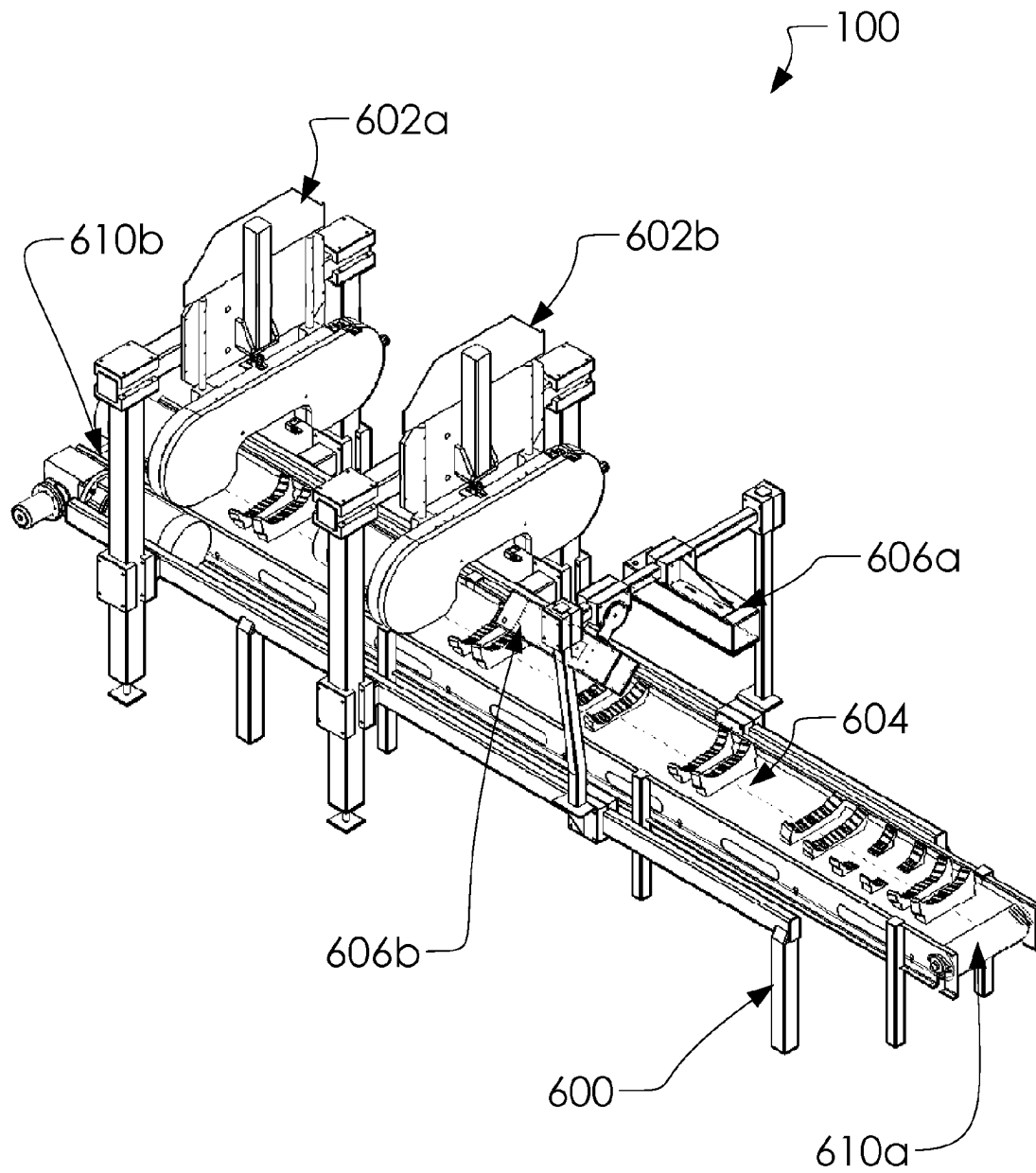


FIG. 6

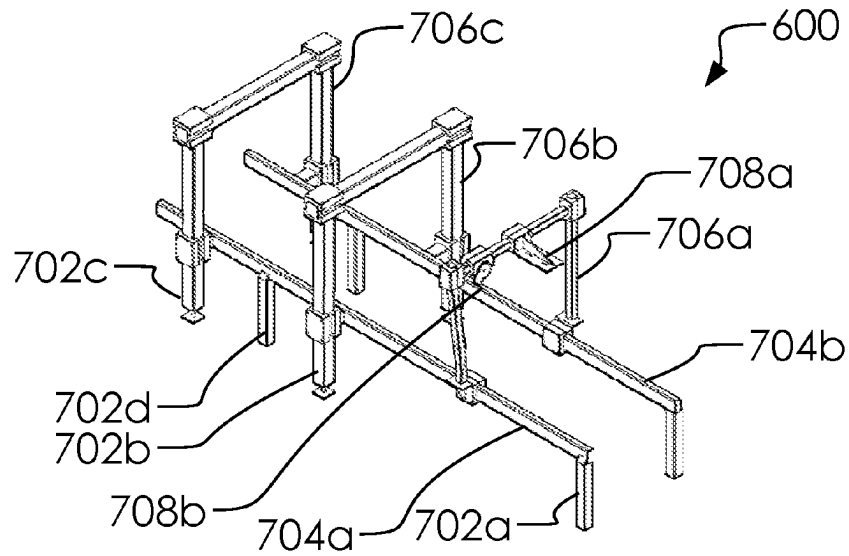


FIG. 7A

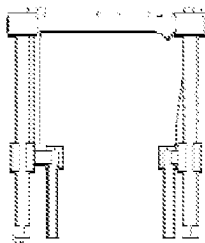


FIG. 7B

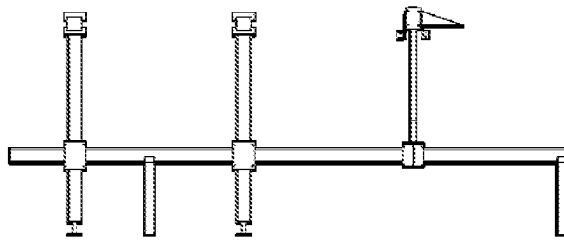


FIG. 7C

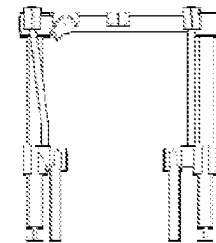


FIG. 7D

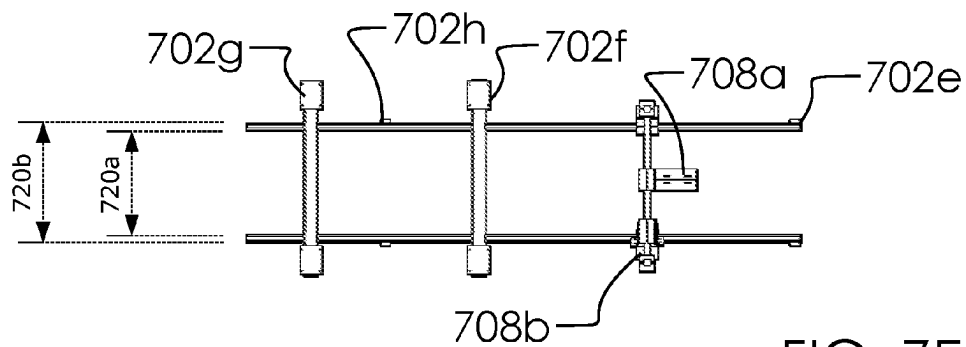
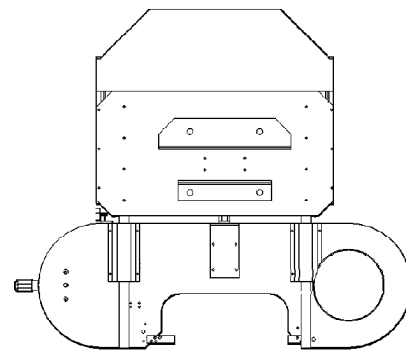
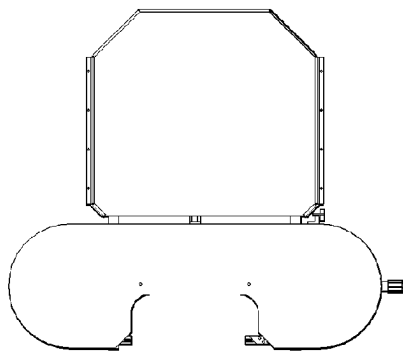
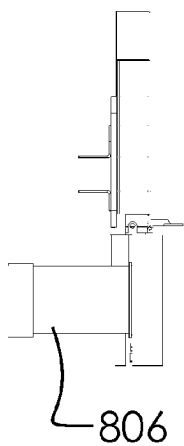
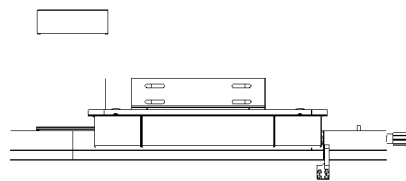
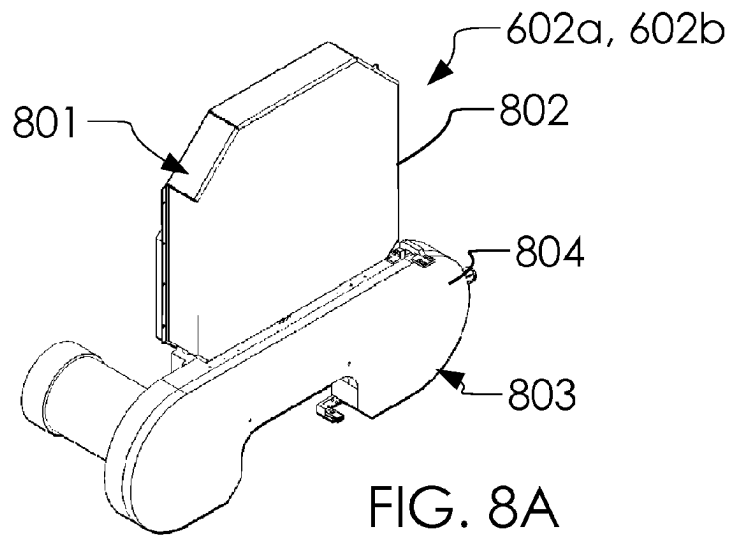


FIG. 7E



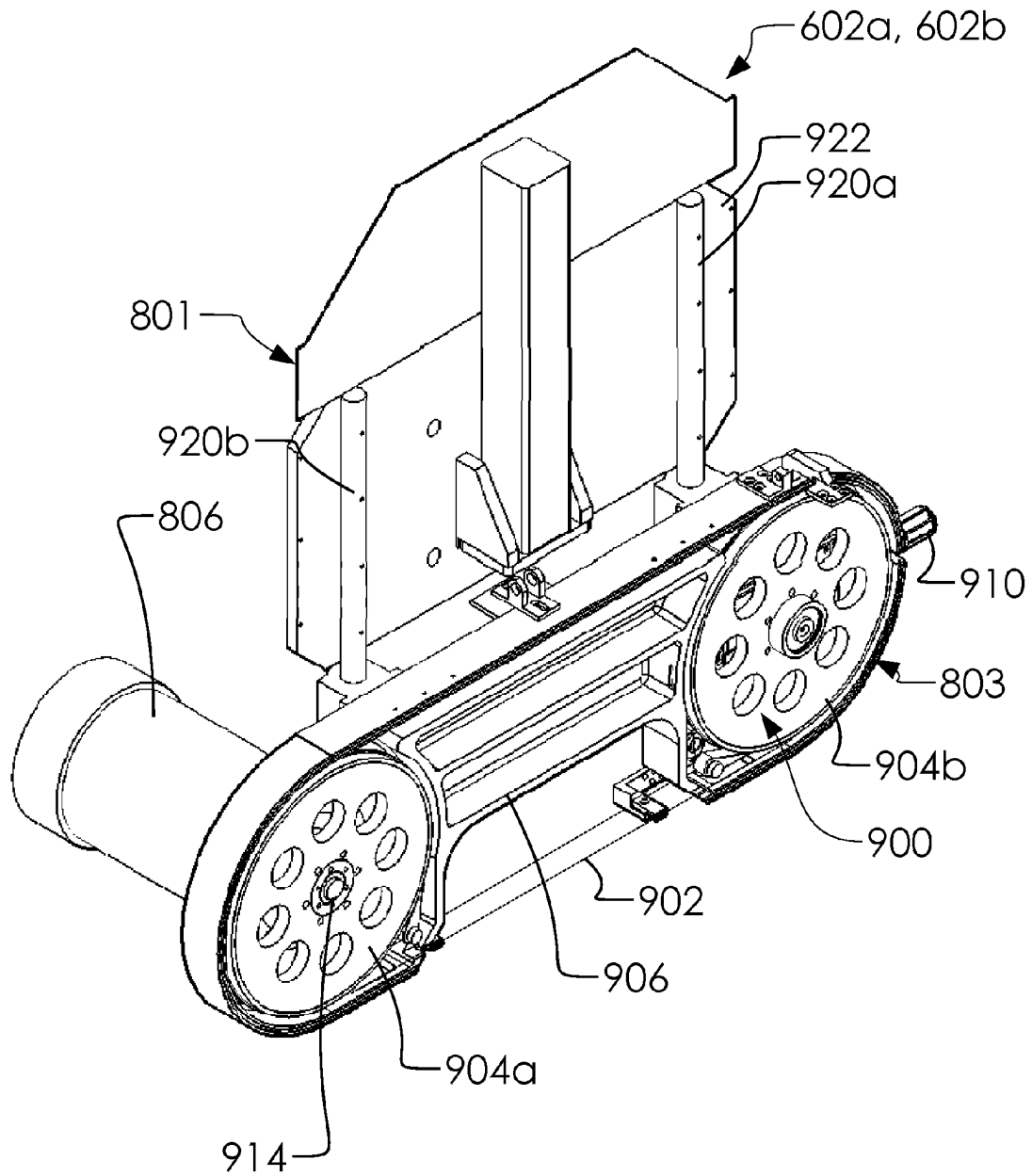


FIG. 9

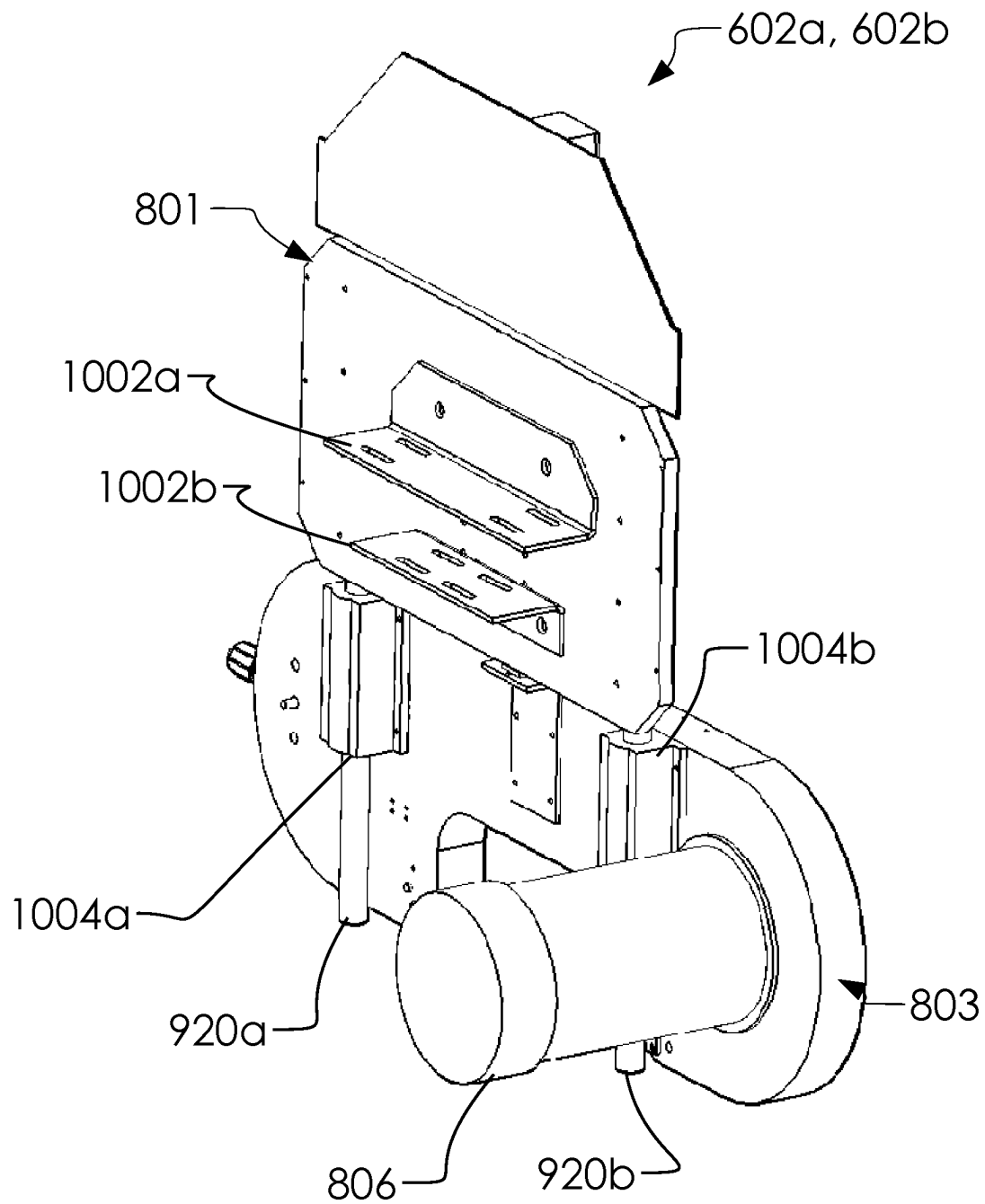


FIG. 10

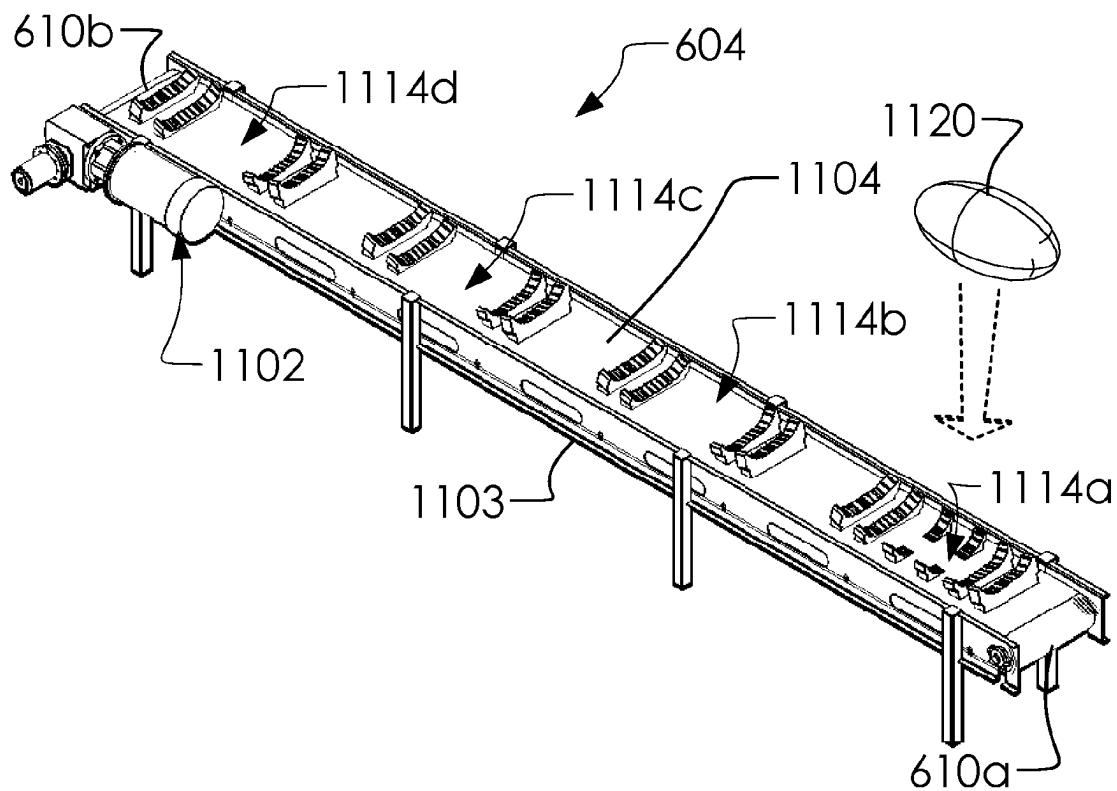


FIG. 11A

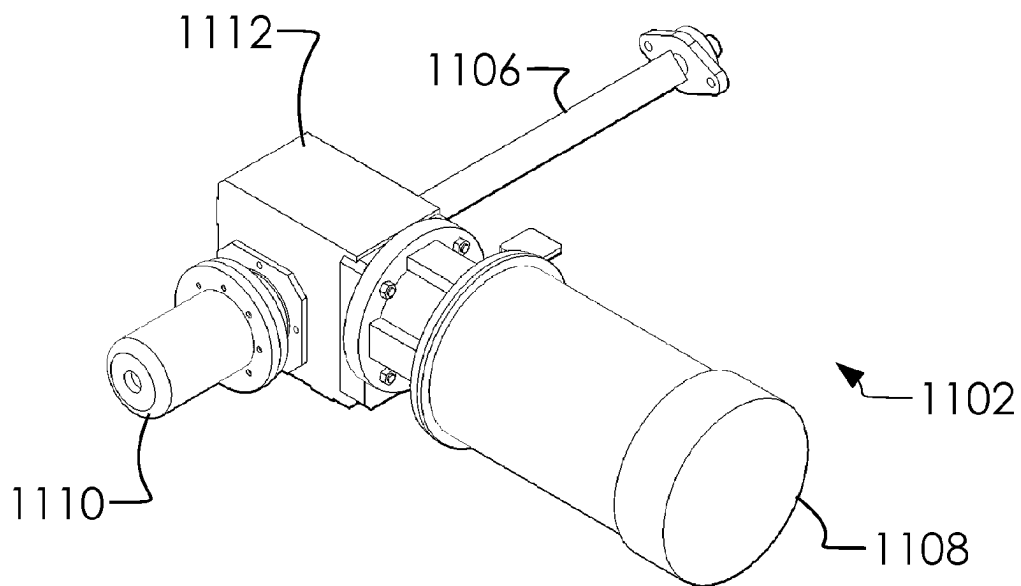


FIG. 11B

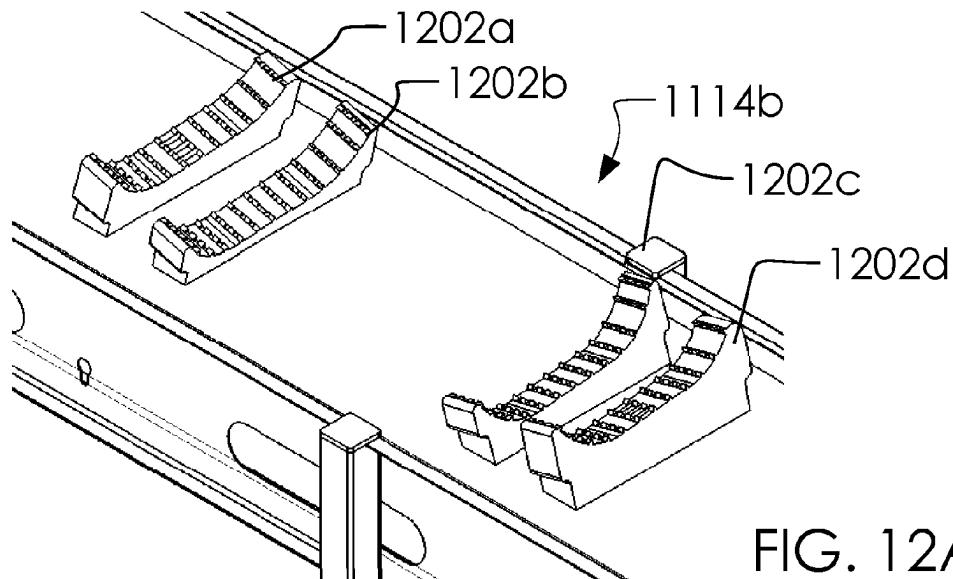


FIG. 12A

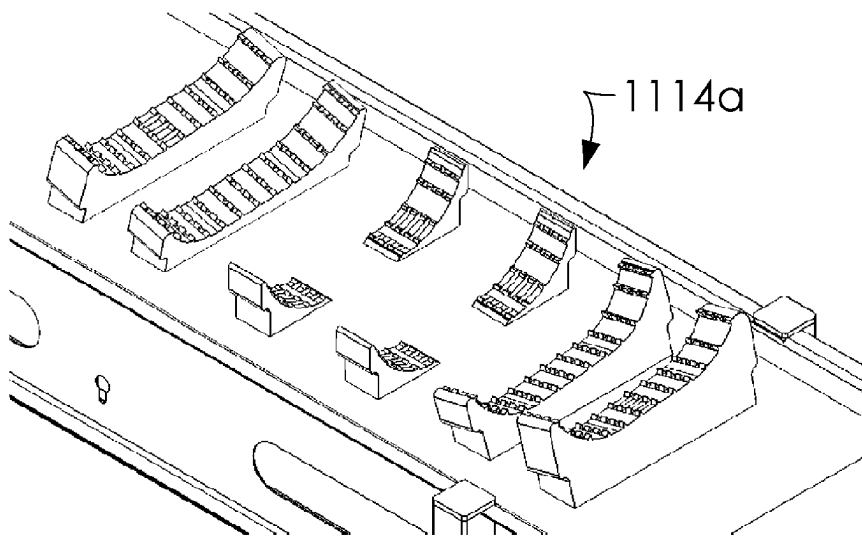


FIG. 12B

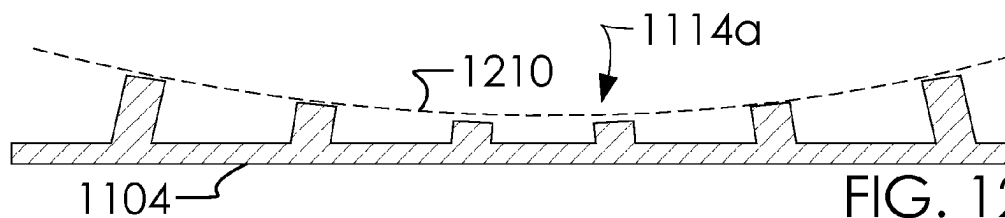


FIG. 12C

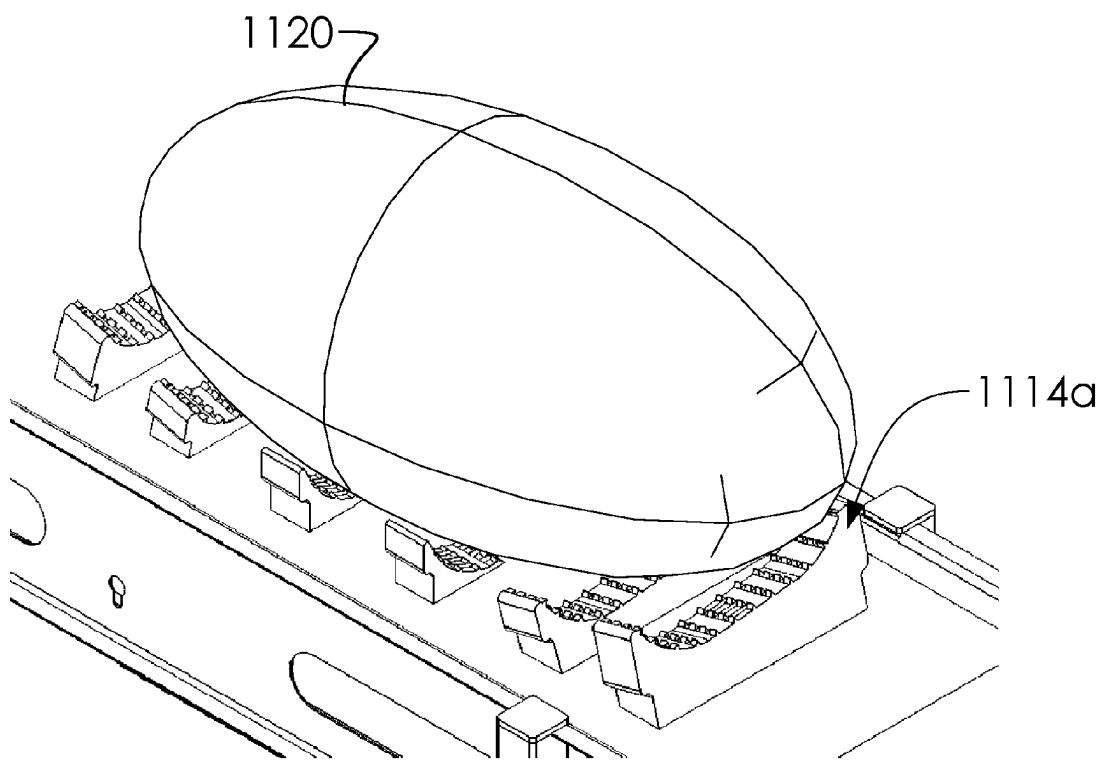


FIG. 13

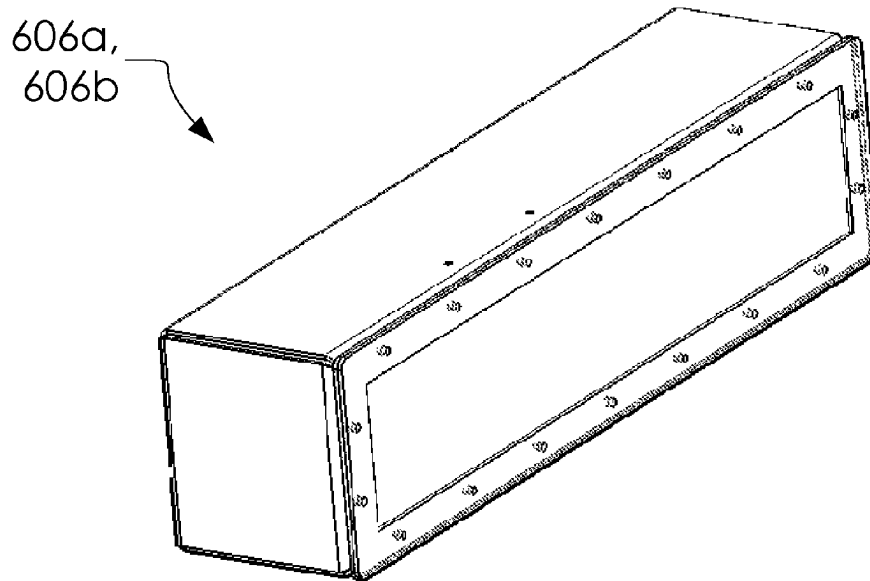


FIG. 14A

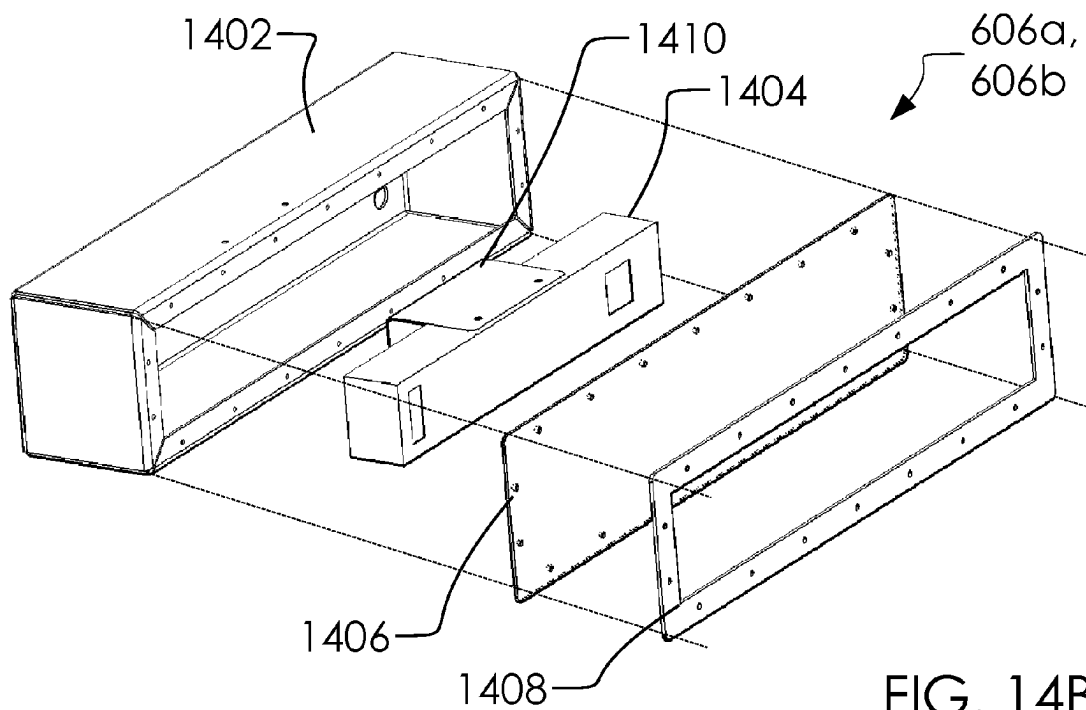
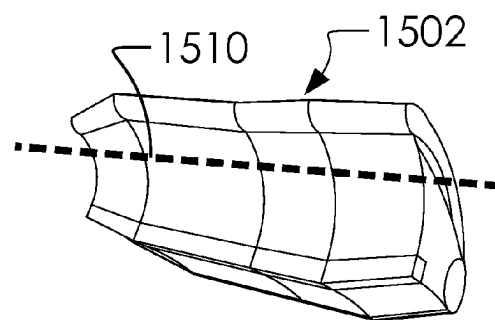
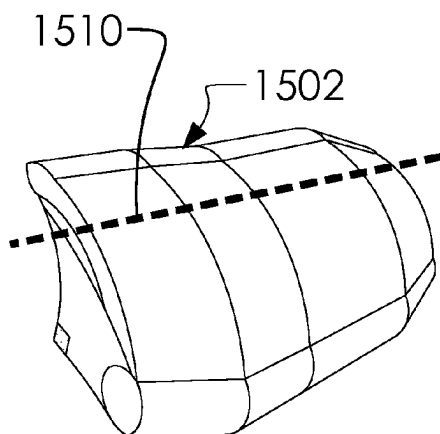
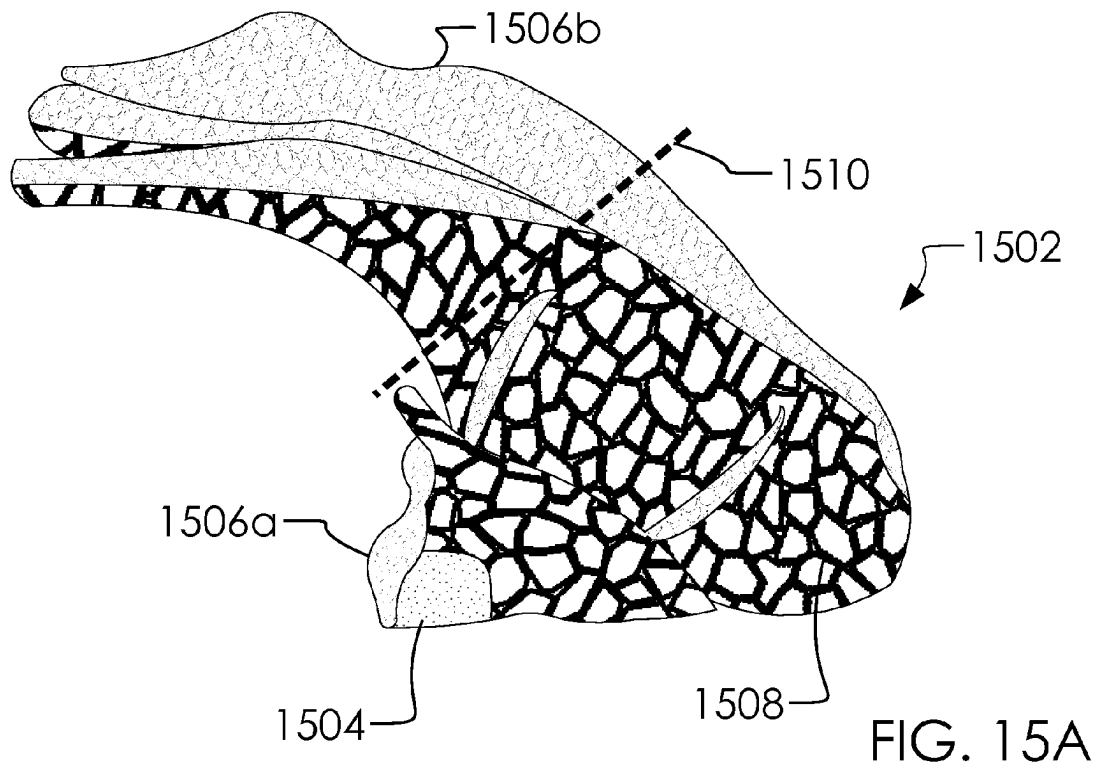


FIG. 14B



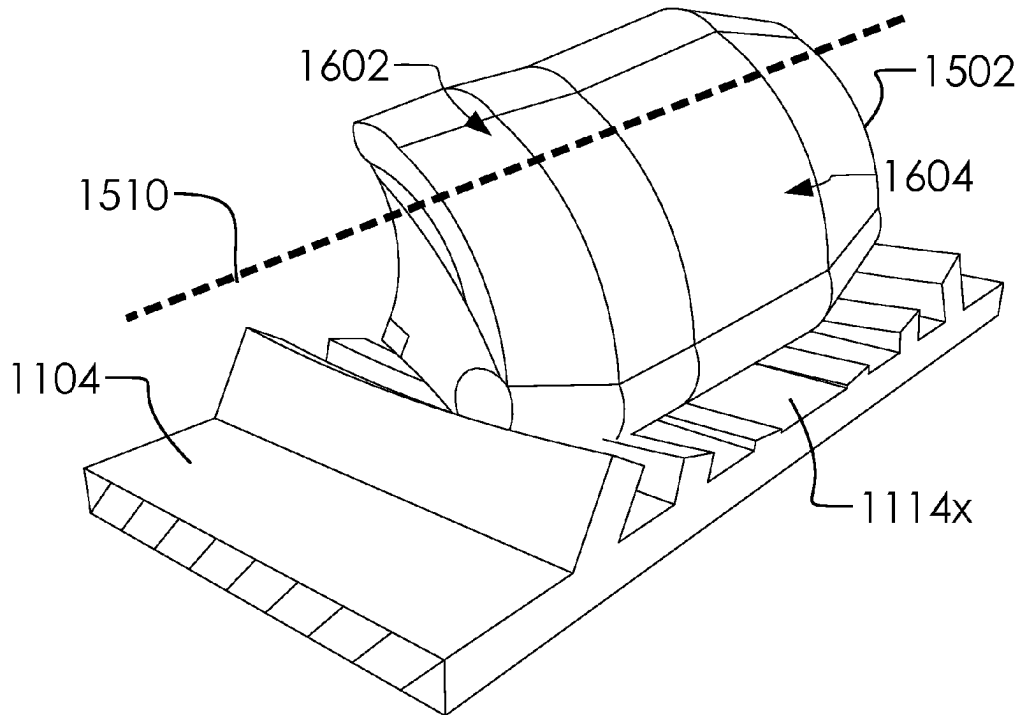


FIG. 16A

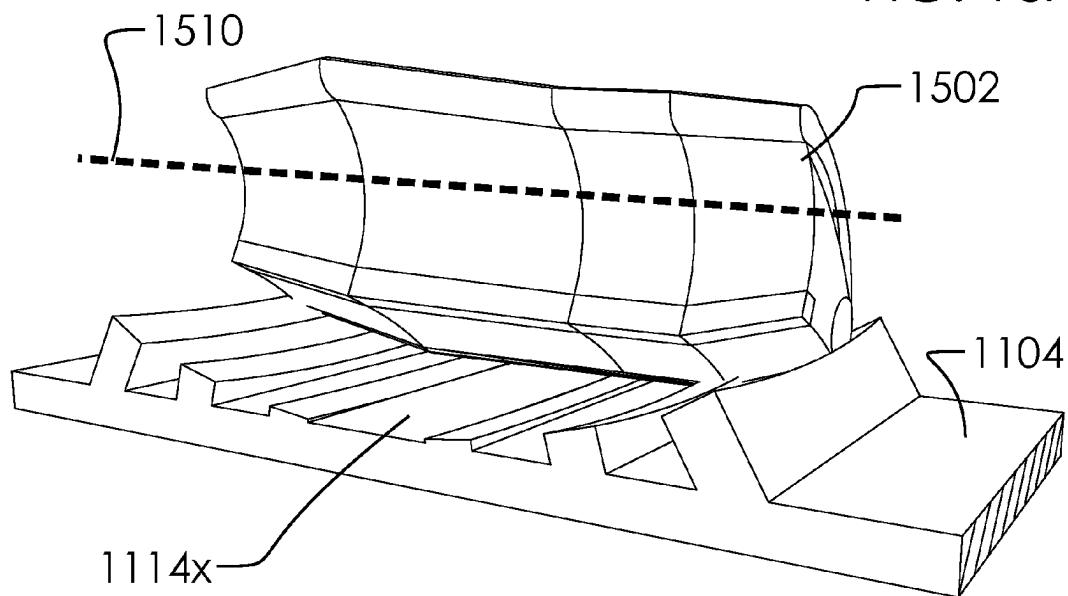


FIG. 16B

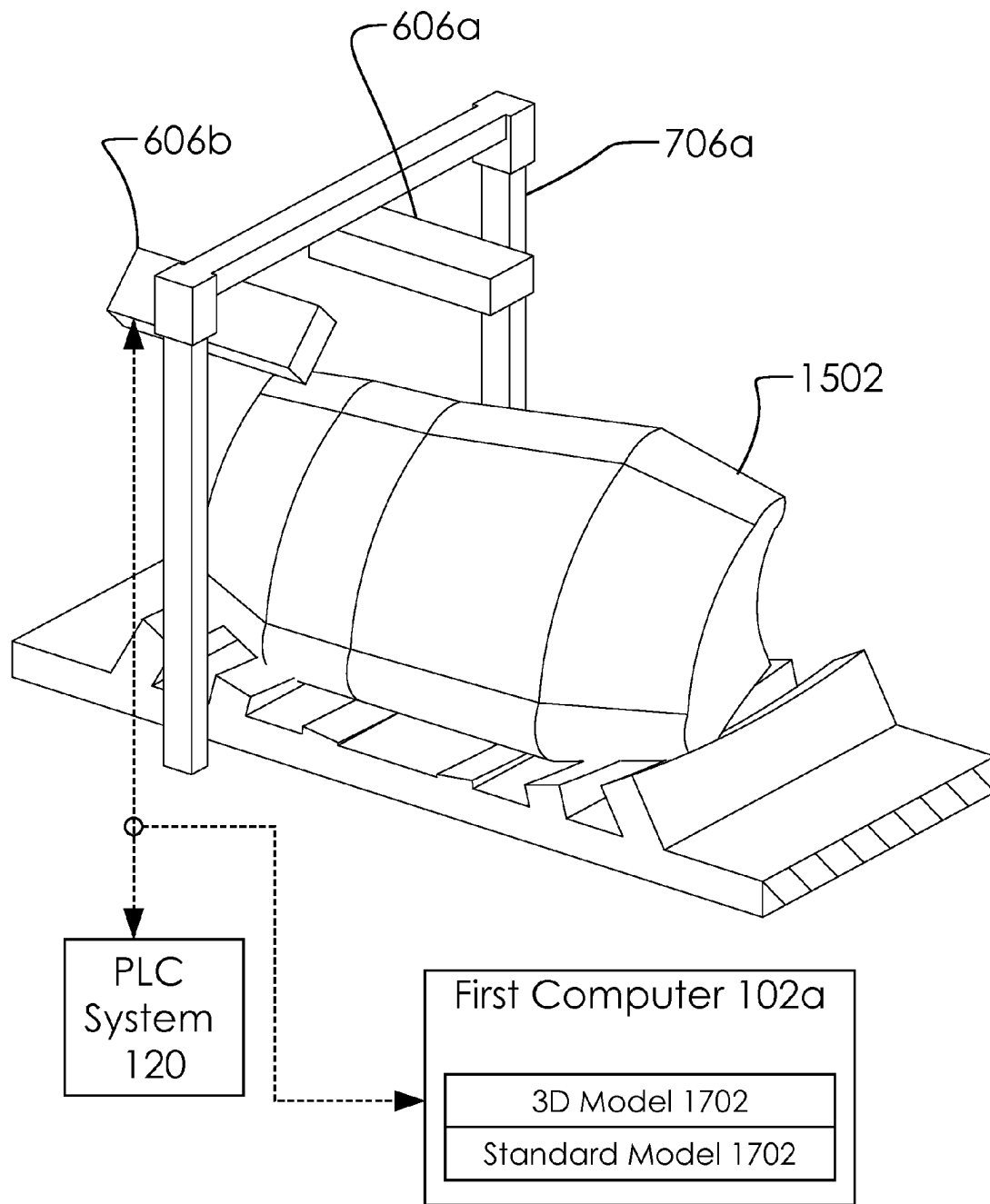


FIG. 17

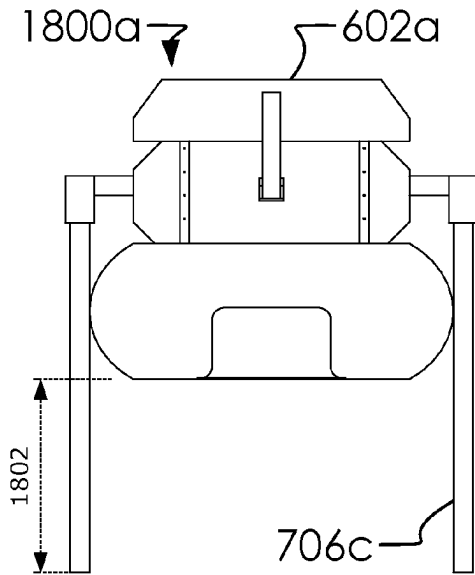


FIG. 18A

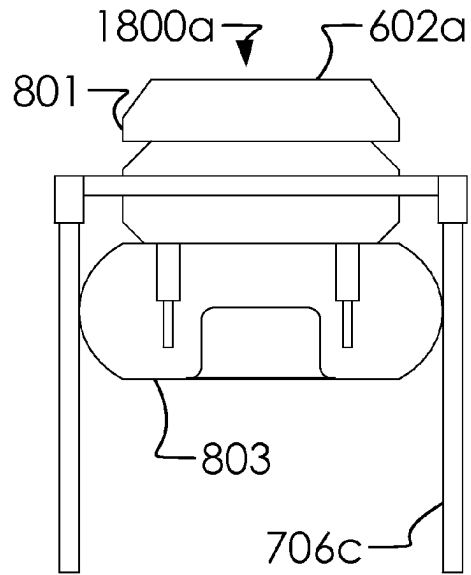


FIG. 18B

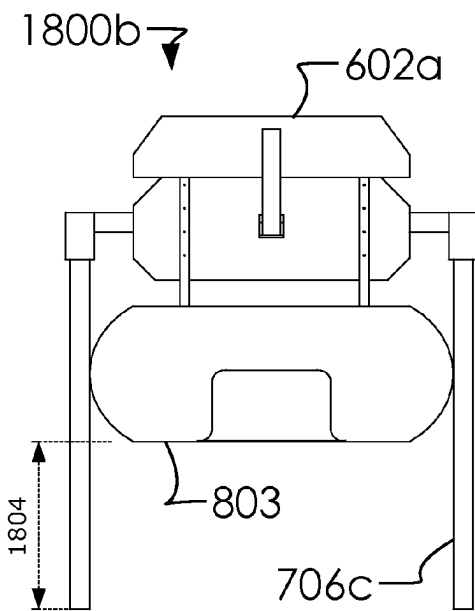


FIG. 18C

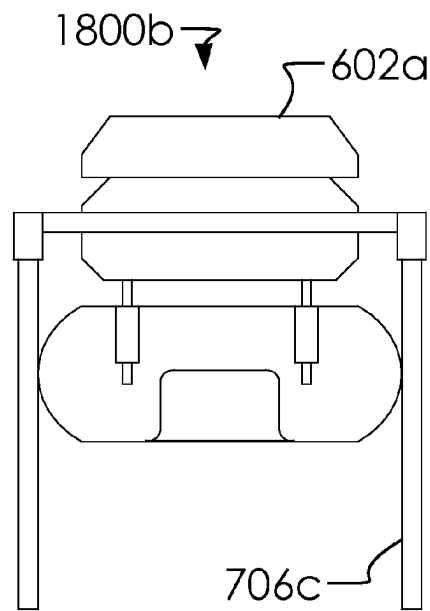


FIG. 18D

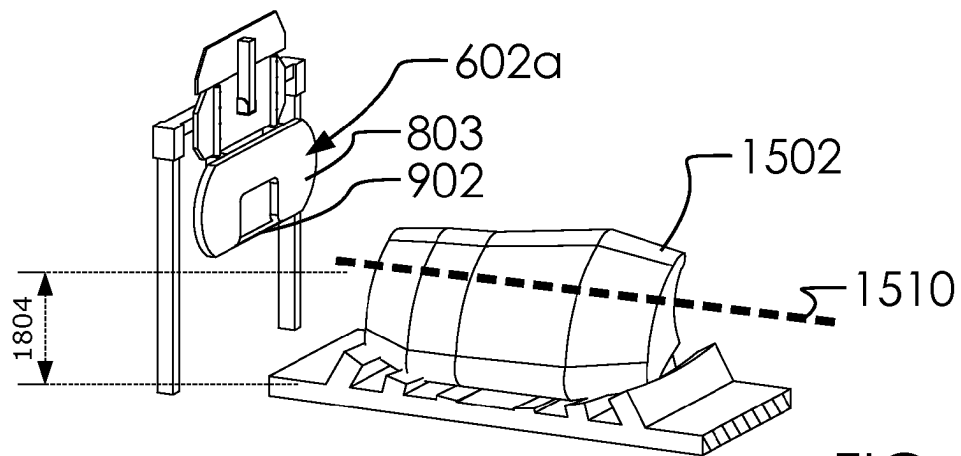


FIG. 19A

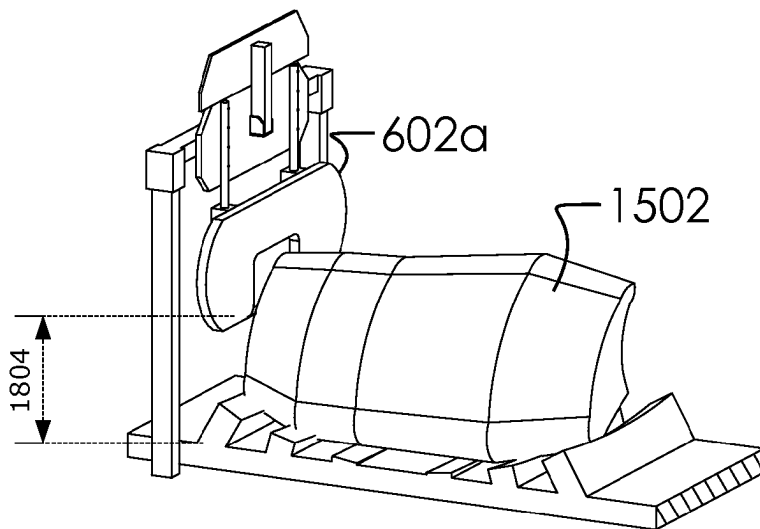


FIG. 19B

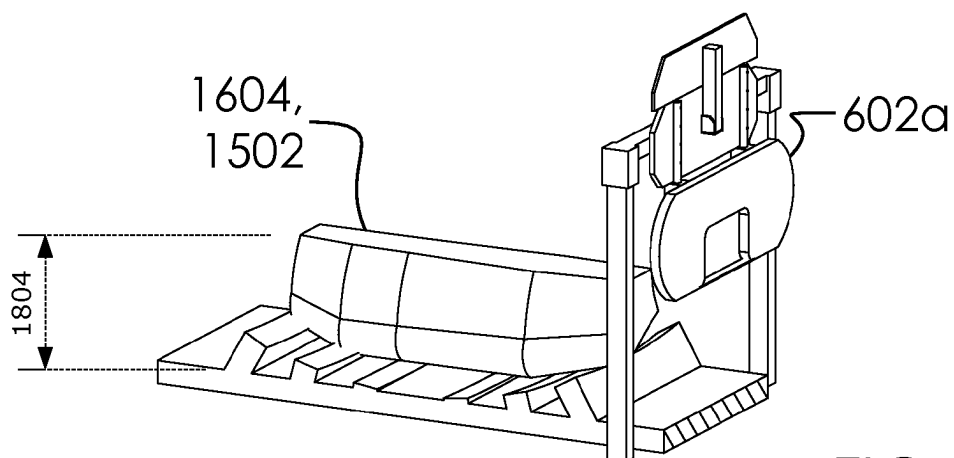


FIG. 19C

2000

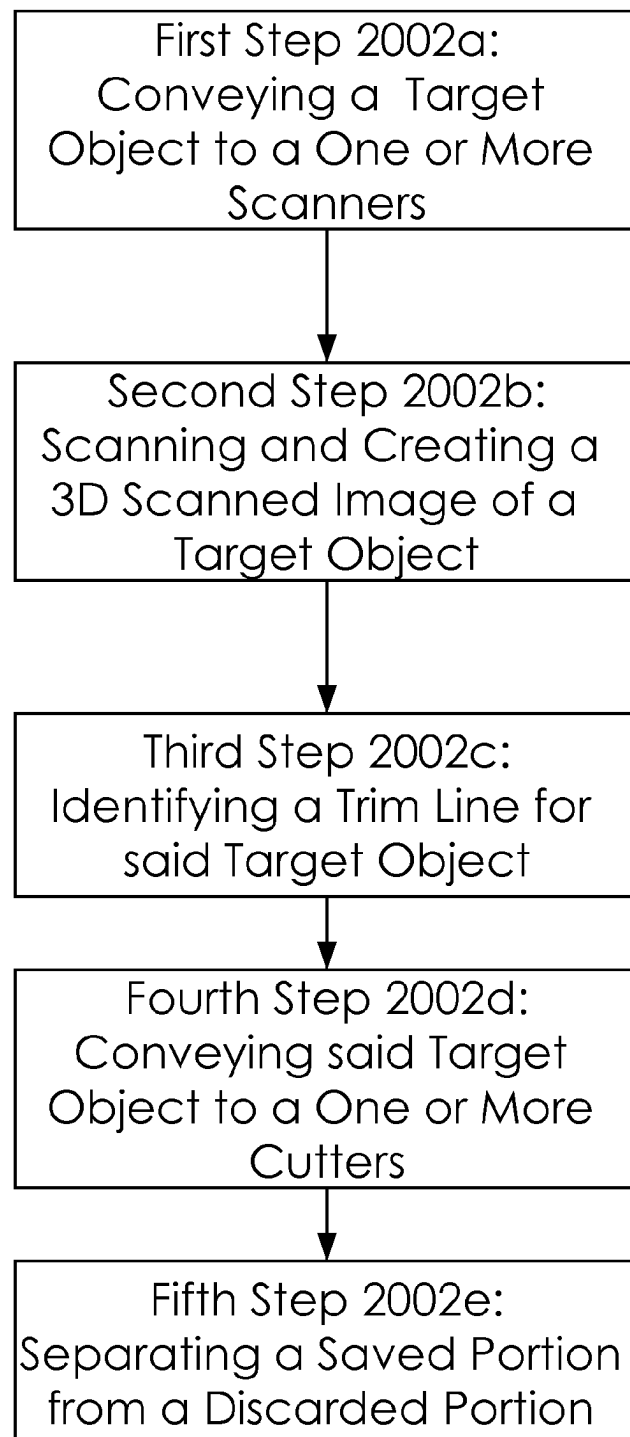


FIG. 20

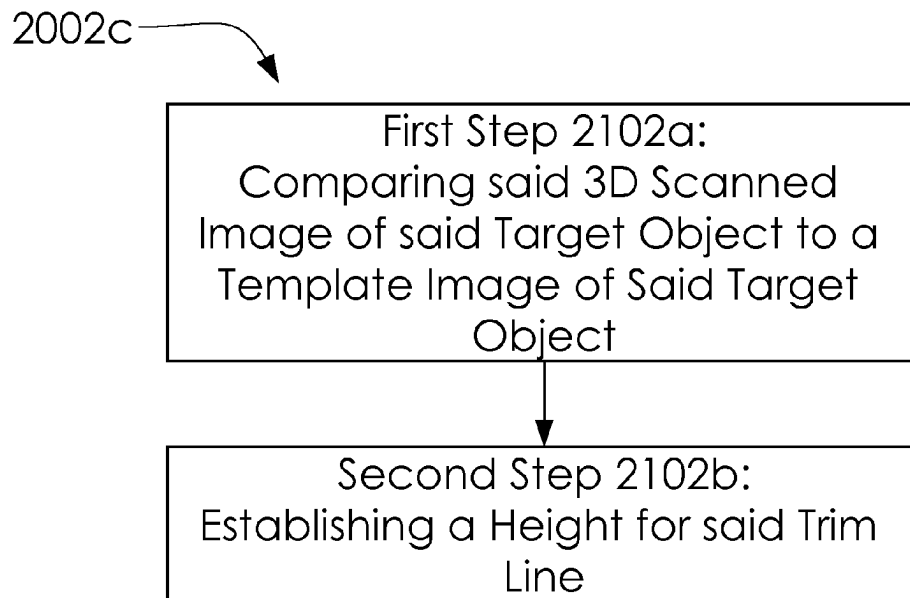


FIG. 21A

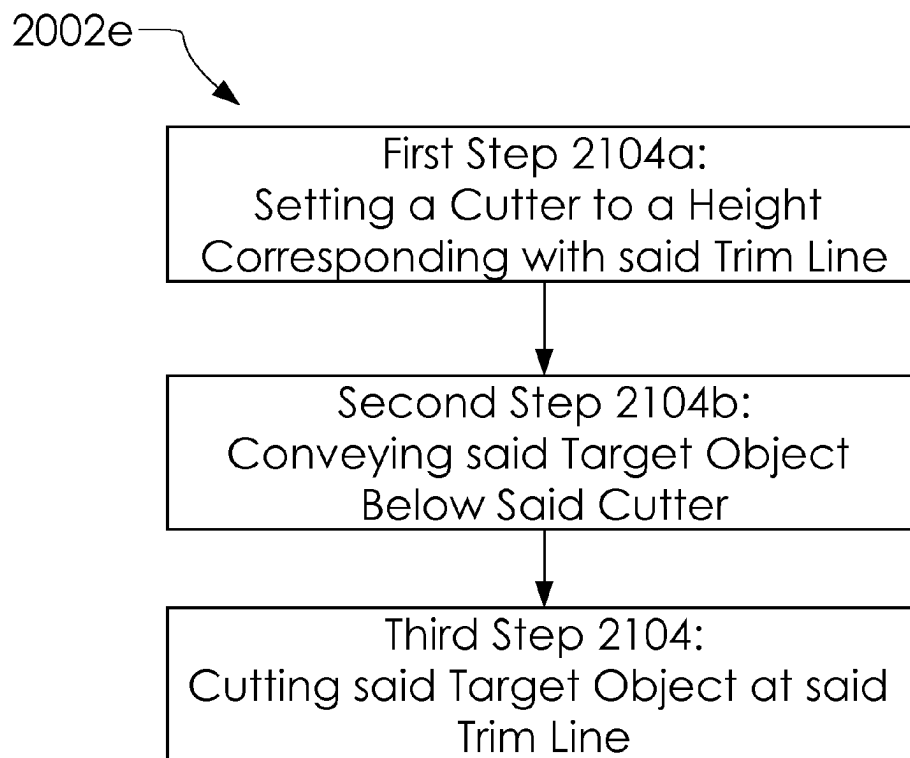


FIG. 21B

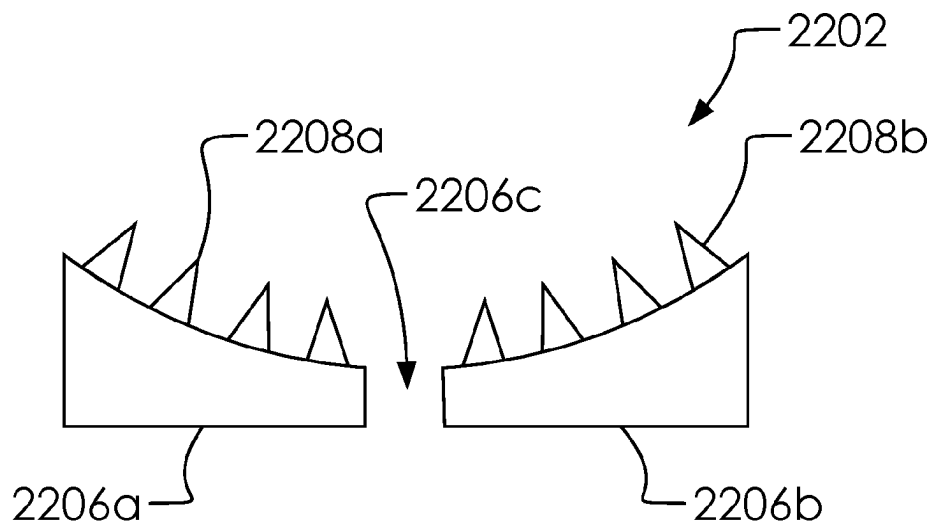


FIG. 22A

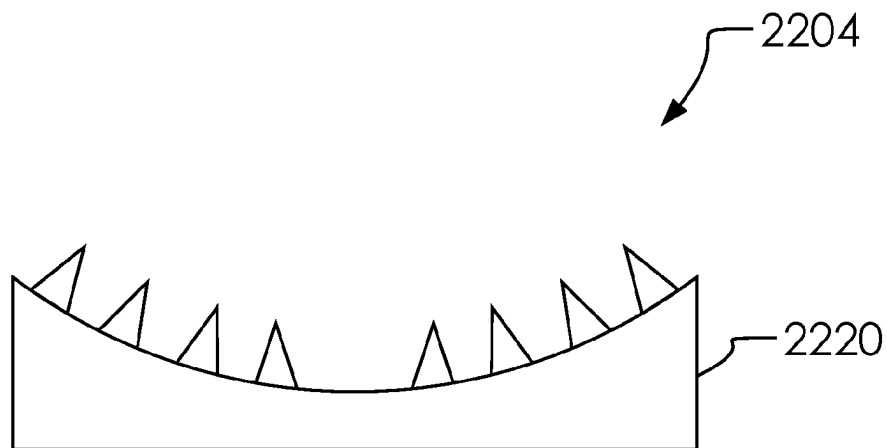


FIG. 22B

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AUTOMATED SCANNING AND BUTCHERING SYSTEM AND METHOD OF USE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Patent Application No. 62/051,767 filed on Sep. 17, 2014, which is hereby incorporated by reference.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT (IF APPLICABLE)

Not applicable.

REFERENCE TO SEQUENCE LISTING, A TABLE, OR A COMPUTER PROGRAM LISTING COMPACT DISC APPENDIX (IF APPLICABLE)

Not applicable.

BACKGROUND OF THE INVENTION

This disclosure relates generally to an automated scanning and butchering system and method of use. None of the known inventions and patents, taken either singularly or in combination, is seen to describe the instant disclosure as claimed. Accordingly, an improved Automated Scanning and Butchering System and Method of Use would be advantageous.

BRIEF SUMMARY OF THE INVENTION

A system and a method are disclosed.

An automated scanning and butchering system is disclosed. Said system having a PLC system, a scanning system and a butchering system in data communication. The butchering system comprising a one or more saw assemblies, a conveyor system, a one or more cradles, and a first end and a second end. The one or more saw assemblies are arranged between the first end and the second end of the butchering system. The conveyor system comprises a conveyor comprising the one or more cradles configured to move items from the first end to the second end of the butchering system. The one or more cradles are configured to releaseably receive and hold a target object as the conveyor moves the target object from the first end to the second end of the butchering system. The scanning system comprising a one or more scanners.

A method of automatically scanning and butchering meat is disclosed. The method comprising: conveying a target object a one or more scanners on a conveyor belt of an automated scanning and butchering system, scanning the target object with a one or more scanners and creating a 3D Model thereof, identifying a trim line of the target object, conveying the target object toward the one or more saw assemblies on the conveyor belt, and cutting the target object with the one or more saw assemblies. The automated scanning and butchering system comprises a PLC system, a scanning system and a butchering system in data communication. The butchering system comprising a one or more saw assemblies, a conveyor system, a one or more cradles, and a first end and a second end. The one or more saw assemblies are arranged between the first end and the second end of the butchering system. The conveyor system com-

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prises a conveyor comprising the one or more cradles configured to move items from the first end to the second end of the butchering system. The one or more cradles are configured to releaseably receive and hold a target object as the conveyor moves the target object from the first end to the second end of the butchering system. The scanning system comprising a one or more scanners.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

FIG. 1 illustrates a first network configuration **101** of an automated scanning and butchering system **100**.

FIGS. 2A, 2B and 2C illustrate a perspective overview of a mobile phone **201a**, a personal computer **201b** and a tablet **201c**.

FIGS. 3A, 3B and 3C illustrate an address space **302** within said one or more computers, an address space **302a** and an address space **302d**.

FIGS. 4A and 4B illustrate two embodiments for collecting and storing data with said automated scanning and butchering system **100**; a first embodiment with a flow diagram between said first computer **102a** and said server **108**, and a second embodiment comprising of just said first computer **102a**.

FIGS. 5A and 5B illustrate two examples of a flow diagram between said memory **306a** and said memory **306d**.

FIG. 6 illustrates an elevated front side overview said automated scanning and butchering system **100**.

FIGS. 7A, 7B, 7C, 7D and 7E illustrate an elevated overview, an elevated first end view, an elevated front view, an elevated second end view, and an elevated top view of said frame assembly **600**.

FIGS. 8A, 8B, 8C, 8D and 8E illustrate an elevated overview, an elevated top view, an elevated first side view, an elevated front view and an elevated backside view of said first saw assembly **602a**.

FIG. 9 illustrates an elevated overview of said first saw assembly **602a** without a portion of said upper case **802** and said lower case **804**.

FIG. 10 illustrates an elevated rear overview of said first saw assembly **602a**.

FIGS. 11A and 11B illustrate an elevated overview of said conveyor system **604** and an elevated overview of a drive assembly **1102**.

FIGS. 12A, 12B and 12C illustrate an elevated overview of said second cradle **1114b** and said first cradle **1114a**, and an elevated front cross-section view of said first cradle **1114a**, respectively.

FIG. 13 illustrates an elevated overview of said first cradle **1114a** with said target object **1120**.

FIGS. 14A and 14B illustrate an elevated overview and an exploded elevated overview of said first scanner **606a**.

FIGS. 15A, 15B and 15C illustrate a cross-section elevated front view, and two perspective overviews of a meat **1502**.

FIGS. 16A and 16B illustrate a first side and a second side perspective overview of said meat **1502** on said conveyor belt **1104**.

FIG. 17 illustrates an elevated overview of said automated scanning and butchering system **100** in a scanning step.

FIGS. 18A, 18B, 18C and 18D illustrate an elevated front and rear view said first saw assembly **602a** in a disengaged configuration **1800a** and an engaged configuration **1800b**, respectively.

FIGS. 19A, 19B and 19C illustrate said automated scanning and butchering system 100 in a pre-cutting step, a cutting step and a post-cutting step, respectively.

FIG. 20 illustrates flow diagram of a method of scanning and butchering 2000.

FIGS. 21A and 21B illustrate two detailed sets of method steps for using said automated scanning and butchering system 100.

FIGS. 22A and 22B illustrate an elevated front view of a beef support 2202 and a pork support 2204, respectively.

DETAILED DESCRIPTION OF THE INVENTION

Described herein is a Automated Scanning and Butchering System and Method of Use. The following description is presented to enable any person skilled in the art to make and use the invention as claimed and is provided in the context of the particular examples discussed below, variations of which will be readily apparent to those skilled in the art. In the interest of clarity, not all features of an actual implementation are described in this specification. It will be appreciated that in the development of any such actual implementation (as in any development project), design decisions must be made to achieve the designers' specific goals (e.g., compliance with system-and business-related constraints), and that these goals will vary from one implementation to another. It will also be appreciated that such development effort might be complex and time-consuming, but would nevertheless be a routine undertaking for those of ordinary skill in the field of the appropriate art having the benefit of this disclosure. Accordingly, the claims appended hereto are not intended to be limited by the disclosed embodiments, but are to be accorded their widest scope consistent with the principles and features disclosed herein.

FIG. 1 illustrates a first network configuration 101 of an automated scanning and butchering system 100.

In one embodiment, said automated scanning and butchering system 100 can comprise a one or more computers at a one or more locations. In one embodiment, said one or more computers can comprise a first computer 102a, a second computer 102b and a third computer 102c. In one embodiment, said one or more locations can comprise a first location 103a, a second location 103b and a third location 103c. In one embodiment, said first location can comprise a field location. In one embodiment, said one or more computers can communicate on a network 106, which can connect to a one or more servers (such as a server 108). In one embodiment, a printer 104 can be hardwired to said first computer 102a (not illustrated here), or said printer 104 can connect to one of said one or more computers (such as said third computer 102c, illustrated) via network 106.

Said network 106 can be a local area network (LAN), a wide area network (WAN), a piconet, or a combination of LANs, WANs, or piconets. One illustrative LAN is a network within a single business. One illustrative WAN is the Internet.

In one embodiment, said server 108 represents at least one, but can be many servers, each connected to said network 106. Said server 108 can connect to a data storage 110. Said data storage 110 can connect directly to said server 108, as shown in FIG. 1, or may exist remotely on said network 106. In one embodiment, said data storage 110 can comprise any suitable long-term or persistent storage device and, further, may be separate devices or the same device and may be collocated or distributed (interconnected via any suitable communications network).

In one embodiment, said automated scanning and butchering system 100 can comprise a PLC system 120, a scanning system 122 and a butchering system 124. In one embodiment, said PLC system 120 can comprise a "programmable logic controller", which can comprise a computer used for automation of various processes. Here, said PLC system 120 can control said scanning system 122 and said butchering system 124 in real-time or near real-time, as is known in the art.

FIGS. 2A, 2B and 2C illustrate a perspective overview of a mobile phone 201a, a personal computer 201b and a tablet 201c.

In the last several years, the useful definition of a computer has become more broadly understood to include mobile phones, tablet computers, laptops, desktops, and similar. For example, Microsoft®, have attempted to merge devices such as a tablet computer and a laptop computer with the release of "Windows® 8". In one embodiment, said one or more computers each can include, but is not limited to, a laptop (such as said personal computer 201b), desktop, workstation, server, mainframe, terminal, a tablet (such as said tablet 201c), a phone (such as said mobile phone 201a), and/or similar. Despite different form-factors, said one or more computers can have similar basic hardware, such as a screen 202 and a one or more input devices (such as a keyboard 204a, a trackball 204b, a one or more cameras, a wireless—such as RFID—reader, a track pad 204d, and/or a home button 220). In one embodiment, said screen 202 can comprise a touch screen. In one embodiment, said track pad 204d can function similarly to a computer mouse as is known in the art. In one embodiment, said tablet 201c and/or said personal computer 201b can comprise a Microsoft® Windows® branded device, an Apple® branded device, or similar. In one embodiment, said tablet 201c can be an X86 type processor or an ARM type processor, as is known in the art.

Said automated scanning and butchering system 100 can comprise a data 206. In one embodiment, said data 206 can comprise data related to financial transactions.

In one embodiment, said one or more computers can be used to input and view said data 206. In one embodiment, said data 206 can be input into said one or more computers by taking pictures with one of said one or more camera, by typing in information with said keyboard 204a, or by using gestures on said screen 202 (where said screen 202 is a touch screen). Many other data entry means for devices similar to said one or more computers are well known and herein also possible with data 206. In one embodiment, said first computer 102a can comprise an iPhone®, a BlackBerry®, a smartphone, or similar. In one embodiment, one or more computers can comprise a laptop computer, a desktop computer, or similar.

FIGS. 3A, 3B and 3C illustrate an address space 302 within said one or more computers, an address space 302a and an address space 302d.

Each among said one or more computers and said server 108 can comprise an embodiment of address space 302. In one embodiment, said address space 302 can comprise a processor 304, a memory 306, and a communication hardware 308. In one embodiment, said processor 304 can comprise a plurality of processors, said memory 306 can comprise a plurality of memory modules, and said communication hardware 308 can comprise a plurality of communication hardware components. In one embodiment, said data 206 can be sent to said processor 304; wherein, said processor 304 can perform processes on said data 206 according to an application stored in said memory 306, as

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discussed further below. Said processes can include storing said data 206 into said memory 306, verifying said data 206 conforms to a one or more preset standards, or ensuring a required set among said required data 206 has been gathered for said data management system and method. In one embodiment, said data 206 can include data which said one or more computers can populate automatically, such as a date and a time, as well as data entered manually. Once a portion of gathering data has been performed said data 206 can be sent to said communication hardware 308 for communication over said network 106. Said communication hardware 308 can include a network transport processor for packetizing data, communication ports for wired communication, or an antenna for wireless communication. In one embodiment, said data 206 can be collected in one or more computers and delivered to said server 108 through said network 106.

In one embodiment, said first computer 102a can comprise said address space 302a, a processor 304a, a memory 306a, and a communication hardware 308a. Likewise, in one embodiment, said server 108 can comprise said address space 302d, a processor 304d, a memory 306d, and a communication hardware 308d.

FIGS. 4A and 4B illustrate two embodiments for collecting and storing data with said automated scanning and butchering system 100; a first embodiment with a flow diagram between said first computer 102a and said server 108, and a second embodiment comprising of just said first computer 102a.

In the first embodiment, said communication hardware 308a and said communication hardware 308d can send and receive data to and from one another and or can communicate with said data storage 110 across said network 106. Likewise, in the second embodiment, data storage 110 can be embedded inside of said one or more computers as a data storage 110a, which may speed up data communications by said automated scanning and butchering system 100. In another embodiment, said data can be stored temporarily on said data storage 110a and later moved to said data storage 110 for backup and sharing purposes.

As illustrated in FIG. 4A, in one embodiment, said server 108 can comprise a third party data storage and hosting provider or privately managed as well.

As illustrated in FIG. 4B, said data storage 110 can be located on said first computer 102a, here labeled as said data storage 110a. Thus, said first computer 102a can operate without a data connection out to said server 108 while performing said system and method for field capture of data.

FIGS. 5A and 5B illustrate two examples of a flow diagram between said memory 306a and said memory 306d.

As illustrated in FIG. 5A, in one embodiment, said automated scanning and butchering system 100 can process said data 206 on said first computer 102a and/or said server 108. For example, in one embodiment, said memory 306a can comprise a device application 502 capable of generating a data records 504 from user inputs or, otherwise, processing said data records 504 delivered to said device application 502 from said data storage 110. In one embodiment, said data records 504 can be transferred between said device application 502 on said memory 306a of said first computer 102a and a server application 506 in said memory 306d of said server 108. In one embodiment, said server 108 can be useful for processing said data 206, as is known in the art. As illustrated in FIG. 5B, in another embodiment, said server 108 can be removed from the flow diagram entirely

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as said memory 306a is capable of processing said data records 504 and/or said data 206 without the assistance of said server 108.

FIG. 6 illustrates an elevated front side overview said automated scanning and butchering system 100.

In one embodiment, said automated scanning and butchering system 100 can comprise said scanning system 122 (which can comprise a one or more scanners), said butchering system 124 (which can comprise a one or more saw assemblies), a frame assembly 600, and a conveyor system 604. In one embodiment, said one or more saw assemblies can comprise a first saw assembly 602a and a second saw assembly 602b. In one embodiment, said one or more scanners can comprise a first scanner 606a and a second scanner 606b. In one embodiment, said conveyor system 604 can comprise a first end 610a and a second end 610b. In one embodiment, said conveyor system 604 can be used to convey objects between said first end 610a and said second end 610b. In one embodiment, said frame assembly 600 can support said automated scanning and butchering system 100 and hold said conveyor system 604, said one or more saw assemblies, and said one or more scanners.

FIGS. 7A, 7B, 7C, 7D and 7E illustrate an elevated overview, an elevated first end view, an elevated front view, an elevated second end view, and an elevated top view of said frame assembly 600.

In one embodiment, said frame assembly 600 can comprise a plurality of legs, a pair of horizontal rails, a plurality of risers and a one or more brackets. In one embodiment, said plurality of legs can comprise a first leg 702a, a second leg 702b, a third leg 702c, a fourth leg 702d, a fifth leg 702e, a sixth leg 702f, a seventh leg 702g and an eighth leg 702h. In one embodiment, a portion of said plurality of legs can comprise variable height threaded feet, as is known in the art; said portion can comprise said second leg 702b, said third leg 702c, said sixth leg 702f and said seventh leg 702g. In one embodiment, said plurality of risers can comprise a first riser 706a, a second riser 706b, and a third riser 706c. In one embodiment, said one or more brackets can comprise a first bracket 708a and a second bracket 708b. In one embodiment, said pair of horizontal rails can comprise a first rail 704a and a second rail 704b.

FIGS. 8A, 8B, 8C, 8D and 8E illustrate an elevated overview, an elevated top view, an elevated first side view, an elevated front view and an elevated backside view of said first saw assembly 602a.

In one embodiment, said first saw assembly 602a and said second saw assembly 602b can be substantially similar, accordingly, FIG. 8A-8E are illustrated as the same device. In one embodiment, said first saw assembly 602a can comprise an upper portion 801 covered by an upper case 802, a lower portion 803 covered by a lower case 804 and a motor 806.

FIG. 9 illustrates an elevated overview of said first saw assembly 602a without a portion of said upper case 802 and said lower case 804.

In one embodiment, each of said one or more saw assemblies can each comprise a band saw 900 which can comprise a first wheel 904a, a second wheel 904b, a blade 902, an arm 906, and a wheel tensioner 910. In one embodiment, said first wheel 904a can be connected to and driven by said motor 806 with a drive hub subassembly 914. In one embodiment, said lower case 804 can be selectively disassembled with a latch assembly 906. As is known in the art, said blade 902 can be driven between said first wheel 904a and said second wheel 904b. In one embodiment, said blade 902 can be tightened between said first wheel 904a and said

second wheel **904b** with said wheel tensioner **910**. In one embodiment, said upper portion **801** can comprise an upper plate **922** attached to a one or more rods (which can comprise a first rod **920a** and a second rod **920b**).

FIG. **10** illustrates an elevated rear overview of said first saw assembly **602a**.

In one embodiment, said first saw assembly **602a** can comprise a one or more brackets (which can comprise a first bracket **1002a** and a second bracket **1002b**). In one embodiment, said one or more brackets can attach said first saw assembly **602a** to said plurality of risers. In one embodiment, said lower portion **803** can comprise a one or more servo motor actuators (which can comprise a first one or more servo motor actuators **1004a** and a second servo motor actuator **1004b**). In one embodiment, said one or more rods can be attached to said upper portion **801** at said upper plate **922** and said one or more servo motor actuators attach to said lower portion **803**. In one embodiment, said upper portion **801** can move vertically relative to said lower portion **803** by activating and adjusting said one or more servo motor actuators, as is known in the art.

FIGS. **11A** and **11B** illustrate an elevated overview of said conveyor system **604** and an elevated overview of a drive assembly **1102**.

In one embodiment, said conveyor system **604** can comprise said drive assembly **1102** mounted to a platform **1103** which can drive a conveyor belt **1104**. In one embodiment, said drive assembly **1102** can comprise a drive shaft **1106**, a motor **1108**, an encoder **1110**, and a stober **1112**. In one embodiment, said motor **1108** can drive said drive shaft **1106** which in turn drives said conveyor belt **1104**. In one embodiment, said conveyor belt **1104** can comprise a one or more cradles (which can comprise a first cradle **1114a**, a second cradle **1114b**, a third cradle **1114c**, and a fourth cradle **1114d**). In one embodiment, said one or more cradles can securely hold a target object **1120**. In one embodiment, said target object **1120** can be conveyed from said first end **610a** to said second end **610b** as said one or more saw assemblies remove unwanted portions from said target object **1120**.

FIGS. **12A**, **12B** and **12C** illustrate an elevated overview of said second cradle **1114b** and said first cradle **1114a**, and an elevated front cross-section view of said first cradle **1114a**, respectively.

In one embodiment, said one or more cradles can each comprise a plurality of supports (which can comprise a first support **1202a**, a second support **1202b**, a third support **1202c** and a fourth support **1202d**). In one embodiment, said plurality of supports **1202** can be generally arranged so as to hold said drive assembly **1102** along a concave cradle **1210**.

FIG. **13** illustrates an elevated overview of said first cradle **1114a** with said target object **1120**.

In one embodiment, said one or more cradles can hold a one or more of said target object **1120**, or similar.

FIGS. **14A** and **14B** illustrate an elevated overview and an exploded elevated overview of said first scanner **606a**.

In one embodiment, each of said one or more scanners can be substantially similar, so discussions of said first scanner **606a** can be similar to that of said second scanner **606b**. In one embodiment, said first scanner **606a** can comprise a case **1402**, a sensor **1404**, a screen **1406**, a frame **1408**, and a mounting bracket **1410**. In one embodiment, said mounting bracket **1410** can hold said sensor **1404** within said case **1402**. In one embodiment, said sensor **1404** can scan through said screen **1406**. In one embodiment, said frame **1408** can hold said screen **1406** in place over said case **1402**.

FIGS. **15A**, **15B** and **15C** illustrate a cross-section elevated front view, and two perspective overviews of a meat **1502**.

In one embodiment, said meat **1502** can comprise bone portion **1504**, a fat portion **1506a**, a fat portion **1506b** and a meat portion **1508**. In one embodiment, maintaining a portion of said meat **1502** for resale as a food product. In one embodiment, a useful amount of said meat **1502** can be harvested below a trim line **1510**. In one embodiment, calculating where said trim line **1510** should be can be accomplished by said scanning system **122**. In one embodiment, said automated scanning and butchering system **100** can separate said meat **1502** in to useful portions.

FIGS. **16A** and **16B** illustrate a first side and a second side perspective overview of said meat **1502** on said conveyor belt **1104**.

In one embodiment, said meat **1502** can be placed on one of said one or more cradles (here a cradle **1114x**) so as to position a discarded portion **1602** of said meat **1502** upward and a saved portion **1604** toward said conveyor belt **1104**. In one embodiment, said cradle **1114x** can comprise one among said one or more cradles.

FIG. **17** illustrates an elevated overview of said automated scanning and butchering system **100** in a scanning step.

In one embodiment, said meat **1502** can be conveyed under said one or more scanners for 3D scanning. In one embodiment, 3D scanning can analyze a real-world object (such as said target object **1120** and/or said meat **1502**) in order to collect data on its shape and, in turn, to construct a 3D Model **1702** in said first computer **102a** (or any digital system). In one embodiment, said first computer **102a** can comprise a standard model **1704**. In one embodiment, said 3D Model **1702** and/or said standard model **1704** can be stored in said data records **504** and/or said data storage **110** on said first computer **102a** and/or said PLC system **120**.

FIGS. **18A**, **18B**, **18C** and **18D** illustrate an elevated front and rear view said first saw assembly **602a** in a disengaged configuration **1800a** and an engaged configuration **1800b**, respectively.

In one embodiment, said first saw assembly **602a** can set said lower portion **803** to a variable height such as a maximum height **1802** and a cutting height **1804**. In one embodiment, said PLC system **120** can control where said lower portion **803** is set to. In one embodiment, said upper portion **801** and said lower portion **803** can move relative to one another. In one embodiment, said disengaged configuration **1800a** can comprise said lower portion **803** at said maximum height **1802**; and said engaged configuration **1800b** can comprise said lower portion **803** at one of a number of heights, including said cutting height **1804**.

FIGS. **19A**, **19B** and **19C** illustrate said automated scanning and butchering system **100** in a pre-cutting step, a cutting step and a post-cutting step, respectively.

In one embodiment, said pre-cutting step can comprise assessing said trim line **1510** with said PLC system **120** and said first computer **102a** in software, setting said lower portion **803** to a corresponding height (such as said cutting height **1804**), and conveying said meat **1502** toward said first saw assembly **602a**. In one embodiment, said cutting step can comprise: conveying said meat **1502** through said blade **902**, cutting said meat **1502** into said discarded portion **1602** and said saved portion **1604**. In one embodiment, said post-cutting step can comprise: conveying said saved portion **1604** of said meat **1502** past said first saw assembly **602a**.

FIG. **20** illustrates flow diagram of a method of scanning and butchering **2000**.

In one embodiment, said method of scanning and butchering **2000** can comprise a method of using said automated scanning and butchering system **100**. In one embodiment, said method of scanning and butchering **2000** can comprise a first step **2002a**, a second step **2002b**, a third step **2002c**, a fourth step **2002d**, and a fifth step **2002e**. In one embodiment, said first step **2002a** can comprise conveying said target object **1120** toward said one or more scanners on said conveyor belt **1104**. In one embodiment, said second step **2002b** can comprise: scanning said target object **1120** (and/or said meat **1502**) with said one or more scanners and creating said 3D Model **1702** thereof. In one embodiment, said third step **2002c** can comprise identifying said trim line **1510** of said target object **1120** (and/or said meat **1502**). In one embodiment, said fourth step **2002d** can comprise conveying said target object **1120** (and/or said meat **1502**) toward said one or more saw assemblies on said conveyor belt **1104**. In one embodiment, said fifth step **2002e** can comprise separating said target object **1120** (and/or said meat **1502**) into said discarded portion **1602** and/or said saved portion **1604**.

FIGS. **21A** and **21B** illustrate two detailed sets of method steps for using said automated scanning and butchering system **100**.

In one embodiment, said third step **2002c** of said method of scanning and butchering **2000** can comprise a first step **2102a** and a second step **2102b**. In one embodiment, said first step **2102a** can comprise: comparing said 3D Model **1702** to said standard model **1704** (which can comprise a template image for identifying said discarded portion **1602** and said saved portion **1604**). In one embodiment, said second step **2102b** can comprise: establishing said trim line **1510**.

In one embodiment, said fifth step **2002e** of said method of scanning and butchering **2000** can comprise a first step **2104a**, a second step **2104b** and a third step **2104c**. In one embodiment, said first step **2104a** can comprise: setting said blade **902** of said first saw assembly **602a** to said cutting height **1804** which corresponds to said trim line **1510**. In one embodiment, said second step **2104b** can comprise: conveying said meat **1502** below said blade **902** of said one or more saw assemblies with said conveyor belt **1104**. In one embodiment, said third step **2104c** can comprise: cutting said meat **1502** with said blade **902** at said cutting height **1804** and/or said trim line **1510**.

FIGS. **22A** and **22B** illustrate an elevated front view of a beef support **2202** and a pork support **2204**, respectively.

In one embodiment, said beef support **2202** can comprise a first side portion **2206a**, a second side portion **2206b**, a gap **2206c**, a first set of grippers **2208a** on said first side portion **2206a** and a first set of grippers **2208a** on said second side portion **2206b**. In one embodiment, said beef support **2202** can be designed with said gap between said first side portion **2206a** and said second side portion **2206b** so as to allow beef to reach said conveyor belt **1104** as it is thicker than other types of meat.

In one embodiment, said pork support **2204** allows said plurality of supports **1202** to pinch the meat (here pork) and hold it in place.

Various changes in the details of the illustrated operational methods are possible without departing from the scope of the following claims. Some embodiments may combine the activities described herein as being separate steps. Similarly, one or more of the described steps may be omitted, depending upon the specific operational environment the method is being implemented in. It is to be understood that the above description is intended to be

illustrative, and not restrictive. For example, the above-described embodiments may be used in combination with each other. Many other embodiments will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should, therefore, be 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.”

The invention claimed is:

1. An automated scanning and butchering system, comprising:
 - a PLC system, a scanning system and a butchering system in data communication;
 - said butchering system comprising a one or more saw assemblies, a conveyor system, a one or more cradles, and a first end and a second end;
 - said one or more saw assemblies are arranged between said first end and said second end of said butchering system;
 - said conveyor system comprises a conveyor comprising said one or more cradles configured to move items from said first end to said second end of said butchering system;
 - said one or more cradles are configured to releaseably receive and hold a target object as said conveyor moves said target object from said first end to said second end of said butchering system; and
 - said scanning system comprising a one or more scanners.
2. The automated scanning and butchering system of claim 1, wherein:
 - said conveyor comprises a conveyor belt.
3. The automated scanning and butchering system of claim 1, wherein:
 - said butchering system further comprises a drive assembly attached to said conveyor; and
 - said drive assembly selectively drives said conveyor and objects thereupon between said first end and said second end of said butchering system.
4. The automated scanning and butchering system of claim 3, wherein:
 - said drive assembly is in data communication with said PLC system; and
 - said PLC system selectively controls movements of said conveyor.
5. The automated scanning and butchering system of claim 4, wherein:
 - said drive assembly comprises an encoder, a stober and a drive shaft; and
 - said drive shaft is driven by said drive assembly so as to move said conveyor.
6. The automated scanning and butchering system of claim 1, wherein:
 - said one or more saw assemblies each comprise a band saw having
 - a motor,
 - a first wheel,
 - a second wheel,
 - a blade;
 - said blade is arranged between said first wheel and said second wheel; and
 - said motor is selectively driven by said motor.
7. The automated scanning and butchering system of claim 1, wherein:

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a portion of said one or more saw assemblies selectively comprise variable height settings so as to raise and lower on said target object on said conveyor.

8. The automated scanning and butchering system of claim 7, wherein:

said one or more saw assemblies comprise an upper portion and a lower portion being attached to one another with a one or more rods and a one or more servo motor actuators;

said one or more rods are attached to said upper portion; said one or more servo motor actuators are attached to said lower portion; and

said one or more saw assemblies selectively adjust their relative vertical distance from one another (and said conveyor) by adjusting said one or more servo motor actuators relative to said one or more rods.

9. The automated scanning and butchering system of claim 1, wherein:

said butchering system comprises a frame assembly;

said frame assembly comprises a pair of horizontal rails supporting said conveyor;

said frame assembly comprises a plurality of risers being arranged above said pair of horizontal rails;

a plurality of risers support said one or more saw assemblies and said scanning system; and

said target object is passed below said scanning system for analysis and said one or more saw assemblies selective trimming.

10. The automated scanning and butchering system of claim 1, wherein:

said target object is a portion of a meat having one or more among the following: a bone portion, a fat portion, and a meat portion.

11. The automated scanning and butchering system of claim 10, wherein:

said scanning system analyzes said meat to determine a trim line; and

said trim line comprises an optimal separation of said meat portion, said fat portion or said bone portion so as to separate said meat into useful portions.

12. The automated scanning and butchering system of claim 11, wherein:

said conveyor by moving said one or more cradles with said meat selectively controls a horizontal location of said meat;

said scanning system analyzes said meat and determines said trim line;

said PLC system is configured to position said meat below said one or more saw assemblies;

a lower portion of said one or more saw assemblies lower onto said meat and cut near said trim line; and said PLC system is configured to optimize these steps.

13. The automated scanning and butchering system of claim 1, wherein:

said PLC system is configured to collect a 3D Model of said target object, compare said 3D Model to a standard model of said target object, and calculate a trim line for said target object.

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14. The automated scanning and butchering system of claim 1, wherein:

said scanning system comprises a one or more scanners arranged on a first riser above said conveyor;

a one or more saw assemblies comprise a first saw assembly attached to a second riser; and

said first riser and said second riser are configured to straddle said conveyor and allow said conveyor and said target object to pass beneath a plurality of risers without interference from said first riser.

15. A method of automatically scanning and butchering meat, comprising:

conveying a target object a one or more scanners on a conveyor belt of an automated scanning and butchering system, scanning said target object with a one or more scanners and creating a 3D Model thereof,

identifying a trim line of said target object,

conveying said target object toward a one or more saw assemblies on said conveyor belt, and

cutting said target object with said one or more saw assemblies; wherein,

said automated scanning and butchering system comprises a PLC system, a scanning system and a butchering system in data communication;

said butchering system comprising a one or more saw assemblies, a conveyor system, a one or more cradles, and a first end and a second end;

said one or more saw assemblies are arranged between said first end and said second end of said butchering system;

said conveyor system comprises a conveyor comprising said one or more cradles configured to move items from said first end to said second end of said butchering system;

said one or more cradles are configured to releaseably receive and hold a target object as said conveyor moves said target object from said first end to said second end of said butchering system; and

said scanning system comprising a one or more scanners.

16. The method of automatically scanning and butchering meat of claim 15 wherein identifying a trim line of said target object comprises:

comparing said 3D Model to a standard model and establishing said trim line; and wherein,

said trim line comprises a template image for identifying a discarded portion and a saved portion of said target object.

17. The method of automatically scanning and butchering meat of claim 15 wherein cutting said target object with said one or more saw assemblies comprises:

setting said blade of a first saw assembly to a cutting height which corresponds to said trim line,

conveying said meat below a blade of said one or more saw assemblies with said conveyor belt, and

cutting said meat with said blade at a cutting height or said trim line.

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