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(71) Applicant(s): L&T TECHNOLOGY SERVICES LIMITED

(72) Inventor(s): Saraswat, Luv
Kate, Parag Sudhir
Chaudhary, Dhaval Mahendra

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(54) Title: METHOD AND SYSTEM FOR SPLICE POSITIONING AND VALIDATION

(57) Abstract: The present disclosure relates to a system and method for positioning at least one splice in a wire harness. The method comprises identifying a plurality of connections including inlet and outlet connections in the wire harness, and identifying an inlet connection to be connected to a plurality of outlet connections. The method further comprises determining a position for the at least one splice for connecting the inlet connections with the plurality of outlet connections based on predetermined factors, and displaying the wire harness including the at least one splice determined, wherein the splice position is determined by iteratively placing the at least one splice at various positions in between the inlet connection and the plurality of outlet connection.

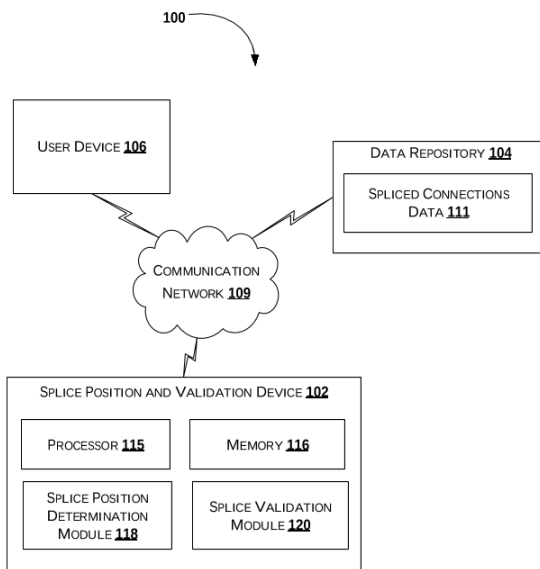


FIGURE 1

FORM 2

THE PATENTS ACT 1970
(39 OF 1970)

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The Patent Rules, 2003

Complete Specification

(See Section 10 and Rule 13)

1. TITLE OF THE INVENTION

METHOD AND SYSTEM FOR SPLICE POSITIONING AND VALIDATION

2. APPLICANT(S)

(a) NAME : **L&T TECHNOLOGY SERVICES LIMITED**

(b) NATIONALITY : **INDIAN**

(c) ADDRESS : **DLF IT SEZ Park, 2nd Floor – Block 3**

1/124, Mount Poonamallee Road,

Ramapuram, Chennai – 600 089,

INDIA.

3. PREAMBLE TO THE DESCRIPTION

COMPLETE

The following specification describes the invention and the manner in which it is to be performed

DESCRIPTION

TECHNICAL FIELD

[001] Embodiments of the present disclosure are related, in general to wire harness, and more particularly, but not exclusively to a method and system for splice positioning and validation in the wire harness.

BACKGROUND

[002] Connectivity between electrical, optical, and electromechanical components may be accomplished by way of a wiring harness. The wiring harness is a collection of one or more wires, that is used to transmit electric power from a power source to an electronic controller, sensors and one or more devices. The wiring harness is also used to transmit signals from the sensors to the electronic controller and from the electronic controller to actuators. Splices are used in the wiring harness to distribute same signal or power for different elements such as sensors. However, in the present scenario, the splices may or may not be correctly placed, as the positioning of the splices is manually done based on the experience and knowledge of the person involved in developing the wire harness. Further, the positioning of the splices using the manual process is time consuming. Also, due to incorrect placement of the splices in the wire harness, a length and volume of copper wire used increases drastically. Further, the heat dissipated from the wires located in right side and left side of the splices are not balanced properly, due to incorrect placement of the splices. Currently, there is no such system and tool available that accurately determines a positioning of the splice and to validate the splices already placed in the wire harness.

[003] Accordingly, there is required an intelligent technique to provide a method and system for splice positioning and validation in the wire harness.

[004] The information disclosed in this background of the disclosure section is only for enhancement of understanding of the general background of the disclosure and should not be taken as an acknowledgement or any form of suggestion that this information forms prior art already known to a person skilled in the art.

SUMMARY

[005] Embodiments of the present disclosure relate to a method of positioning at least one splice in a wire harness. The method comprises identifying a plurality of connections including inlet and outlet connections in the wire harness, and identifying an inlet connection to be connected to a plurality of outlet connections. The method further comprises determining a position for the at least one splice for connecting the inlet connection with the plurality of outlet connections based on predetermined factors, and displaying the wire harness including the at least one splice determined, wherein the splice position is determined by iteratively placing the at least one splice at various positions in between the inlet connection and the plurality of outlet connections.

[006] Another aspect of the present disclosure relates to a device to position at least one splice in a wire harness. The device comprises a memory, and a processor coupled to the memory. The processor is configured to identify a plurality of connections including inlet and outlet connections in the wire harness, and identify an inlet connection to be connected to a plurality of outlet connections. The processor is further configured to determine a position for the at least one splice for connecting the inlet connection with the plurality of outlet connections based on predetermined factors, and display the wire harness including the at least one splice determined, wherein the splice position is determined by iteratively placing the at least one splice at various positions in between the inlet connection and the plurality of outlet connections.

[007] Another embodiment of the present disclosure relate to a method of validating at least one splice position in a wire harness. The method comprises identifying a plurality of connections including inlet and outlet connections in the wire harness, and identifying the at least one splice positioned between an inlet connection and a plurality of outlet connections. The method further comprises validating the at least one splice position identified, and displaying a validated result about the identified splice position based on the validation, wherein the splice position is validated by iteratively comparing the identified splice position vis-a-vis various other positions in between the inlet connection and the plurality of outlet connections.

[008] Another aspect of the present disclosure relates to validate at least one splice position in a wire harness. The device comprises a memory, and a processor coupled to the memory. The processor is configured to identify a plurality of connections including inlet and outlet connections in the wire

harness, and identify the at least one splice positioned between an inlet connection and a plurality of outlet connections. The processor is further configured to validate the at least one splice position identified, and display a validated result about the identified splice position based on the validation, [009] wherein the splice position is validated by iteratively comparing the identified splice position vis-a-vis various other positions in between the inlet connection and the plurality of outlet connections.

[010] The system, and associated method of the present disclosure overcome one or more of the shortcomings of the prior art. Additional features and advantages may be realized through the techniques of the present disclosure. Other embodiments and aspects of the disclosure are described in detail herein and are considered a part of the claimed disclosure.

[011] The foregoing summary is illustrative only and is not intended to be in any way limiting. In addition to the illustrative aspects, embodiments, and features described above, further aspects, embodiments, and features will become apparent by reference to the drawings and the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[012] The accompanying drawings, which are incorporated in and constitute a part of this disclosure, illustrate exemplary embodiments and, together with the description, serve to explain the disclosed principles. In the figures, the left-most digit(s) of a reference number identifies the figure in which the reference number first appears. The same numbers are used throughout the figures to reference like features and components. Some embodiments of device or system and/or methods in accordance with embodiments of the present subject matter are now described, by way of example only, and with reference to the accompanying figures, in which:

[013] **Figure 1** illustrates an exemplary architecture of a proposed system, to position at least one splice and to validate the splice positioned in accordance with some embodiments of the present disclosure;

[014] **Figure 2** illustrates a block diagram of splice position and validation device of **Figure 1** in accordance with some embodiments of the present disclosure;

[015] **Figure 3A** illustrates an exemplary flow diagram to position at least one splice in accordance with an embodiment of the present disclosure;

[016] **Figure 3B** illustrates an exemplary flow diagram to validate a position of at least one splice in accordance with an embodiment of the present disclosure;

[017] **Figure 4** illustrates a block diagram of an exemplary computer system for implementing embodiments consistent with the present disclosure;

[018] **Figure 5A** illustrates an exemplary circuit having four connections to position a splice;

[019] **Figure 5B** illustrates the exemplary circuit of **Figure 5A** having a splice placed in incorrect position; and

[020] **Figure 5C** illustrates the exemplary circuit of **Figure 5A** having a splice placed in correct position.

[021] The figures depict embodiments of the disclosure for purposes of illustration only. One skilled in the art will readily recognize from the following description that alternative embodiments of the structures and methods illustrated herein may be employed without departing from the principles of the disclosure described herein.

DETAILED DESCRIPTION

[022] In the present document, the word "exemplary" is used herein to mean "serving as an example, instance, or illustration." Any embodiment or implementation of the present subject matter described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other embodiments.

[023] While the disclosure is susceptible to various modifications and alternative forms, specific embodiment thereof has been shown by way of example in the drawings and will be described in detail below. It should be understood, however that it is not intended to limit the disclosure to the particular forms disclosed, but on the contrary, the disclosure is to cover all modifications, equivalents, and alternative falling within the spirit and the scope of the disclosure.

[024] The terms “comprises”, “comprising”, or any other variations thereof, are intended to cover a non-exclusive inclusion, such that a setup, device or method that comprises a list of components or steps does not include only those components or steps but may include other components or steps not expressly listed or inherent to such setup or device or method. In other words, one or more elements in a device or system or apparatus preceded by “comprises... a” does not, without more constraints, preclude the existence of other elements or additional elements in the device or system or apparatus.

[025] In the following detailed description of the embodiments of the disclosure, 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 disclosure may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the disclosure, and it is to be understood that other embodiments may be utilized and that changes may be made without departing from the scope of the present disclosure. The following description is, therefore, not to be taken in a limiting sense.

[026] **Figure 1** illustrates an exemplary architecture of a proposed system to position at least one splice and, to validate the splice positioned in accordance with some embodiments of the present disclosure.

[027] As illustrated in **Figure 1**, the exemplary system 100 comprises one or more components configured for effectively positioning one or more splices in a wire harness, and also to validate a position of one or more splices already placed. In one embodiment, the exemplary system 100 comprises a splice position and validation device (hereinafter referred to as SPVD) 102, a data repository (interchangeably referred to as repository) 104, and a user device 106 connected via a communication network 109. The communication network 109 can be a LAN (local area network), WAN (wide area network), wireless network, point-to-point network, or another configuration. One of the most common types of network in current use is a TCP/IP (Transfer Control Protocol and Internet Protocol) network for communication between database client and database server. Other common Internet protocols used for such communication include HTTPS, FTP, AFS, and WAP and using secure communication protocols etc.

[028] The data repository 104 stores a list of spliced connections data 111. In one embodiment, the list of spliced connections data 111 include information about various connections included in the wire harness, and a position of one or more splices. In one embodiment, the data repository 104 may be integrated within the SPVD 102. In another embodiment, the data repository 104 may be a standalone repository communicatively coupled with the SPVD 102.

[029] The user device 106 may be a mobile device or a computing device including the functionality for communicating over the network 109. For example, the mobile device can be a conventional web-enabled personal computer in the home, mobile computer (laptop, notebook or subnotebook), Smart Phone (iOS, Android), personal digital assistant, wireless electronic mail device, tablet computer or other device capable of communicating both ways over the Internet or other appropriate communications network. The user device 106 may comprise an integrated software application with a user interface that enables interaction with the SPVD 102. The integrated software application that is configured to generate a input file including a layout of the wire harness. The integrated software application is also configured to transmit the input file including the layout of the wire harness to the SPVD 102. In one example, the user device 106 may be communicatively coupled with the SPVD 102.

[030] The SPVD 102 is configured to position one or more splices in a wire harness and also to validate the position of the one or more splices in the wire harness. In one example, the SPVD 102 may be configured as a standalone system. In another example, the SPVD 102 may be configured in cloud environment. In yet another example, the SPVD 102 may include a desktop personal computer, workstation, laptop, PDA, cell phone, or any WAP-enabled device or any other computing device capable of interfacing directly or indirectly to the Internet or other network connection. The SPVD 102 typically includes one or more user interface devices, such as a keyboard, a mouse, touch screen, pen or the like, for interacting with the GUI provided on a display. The SPVD 102 also includes a graphical user interface (GUI) provided therein for interacting with the data repository 104 to access the spliced connections data 111.

[031] The SPVD 102 comprises at least a processor 115 and a memory 116 coupled with the processor 115. The SPVD 102 further comprises a splice position determination module 118 and a splice validation module 120. The splice position determination module 118 is configured to

determine a position for the at least one splice in the wire harness. The splice validation module 120 is configured to validate already known position of the at least one splice in the wire harness.

[032] In an embodiment, the SPVD 102 may be a typical SPVD as illustrated in **Figure 2**. The SPVD 102 comprises the processor 115, the memory 116, and an I/O interface 202. The I/O interface 202 is coupled with the processor 115 and an I/O device (not shown). The I/O device is configured to allow the processor 115 to communicate with and control from various I/O devices. The I/O device is configured to receive inputs via the I/O interface 202 and transmit outputs via the I/O interface 202. The SPVD 102 further includes data 204 and one or more modules 206. In one implementation, data 204 may be stored within the memory 116. In one example, the data 204 may include inlet connections data 208, outlet connections data 210, splice position data 212, and other data 216.

[033] In some embodiments, the data 204 may be stored within the memory 116 in the form of various data structures. Additionally, the data 204 may be organized using data models, such as relational or hierarchical data models. The other data 216 may store temporary data and temporary files, generated by the components for performing the various functions of the SPVD 102.

[034] The modules 206 may include, for example the splice position determination module 118, the splice validation module 120, a receiving module 218, a connections determination module 220, a display module 222, and other modules 224.

[035] The receiving module 218 is configured to receive an input file including a layout of the wire harness. In one embodiment, the input file can be at least one of schematic file, navisworks file, netlist file, or any other file.

[036] The connections determination module 220 is coupled to the receiving module 218, and is configured to identify a plurality of connections in the wire harness based on the received input file. In one example, the plurality of connections can be power source, lamp, sensor, or any other electronic component. The plurality of connections includes input connections and output connections.

[037] The splice position determination module 118 is configured to determine a position for at least one splice. In order to determine the position for the at least one splice, the splice position

determination module 118 is configured to initially identify an inlet connection to be connected to a plurality of outlet connections. The splice position determination module 118 is further configured to determine the position for the at least one splice for connecting the inlet connection with the plurality of outlet connections based on predetermined factors. The predetermined factors can be at least one of a) distance of the at least one splice vis-à-vis the inlet and outlet connections including i) equi-distance and ii) balance between inlet and outlet connections, b) minimal copper usage, and c) heat dissipation. In order to determine the at least one splice position, the splice position determination module 118 is configured to assign weights to each of the positions for the above identified factors, rank the positions based on the assigned weights, from highest to lowest rank, and choose the highest rank position for the at least splice placement.

[038] For example, the splice position determination module 118 is configured to assign a weight to the equi-distance factor as 0.8, and to assign a weight of the balance between inlet and outlet connections factor as 0.6. Further, the splice position determination module 118 is configured to assign a weight to the minimal copper usage factor as 0.7, and to assign a weight to the heat dissipation as 0.4. The splice position determination module 118 is further configured to rank the splice position with the factor of 'equi-distance factor' as 1, rank the splice position with the factor of 'minimal copper usage' as 2, rank the splice position with the factor of 'balance between inlet and outlet connections' as 3, and rank the splice position with the factor of 'heat dissipation' as 4.

[039] Accordingly, the splice position determination module 118 choose the splice position corresponding to the factor 'equi-distance factor', as the determined position for the at least one splice

[040] In another embodiment, in order to determine the position for the at least one splice, the splice position determination module 118 is configured to compare the one or more identified inlet and outlet connections with a spliced connections data 111 stored in the data repository. Based on the comparison, when one or more identified inlet and outlet connections is similar to spliced connections data, the splice position determination module 118 is configured retrieve the position of the splice from the spliced connections data 111, and assign the retrieved position as determined position for the at least one splice. In another embodiment, Based on the comparison, splice position determination module 118 is configured retrieve the position of the splice from the spliced connections data 111 using at least one of machine learning, neural network model.

[041] The splice validation module 120 is configured to validate a known position of the at least one splice, and to correct the position if the known position is incorrect placement. In order to validate the known position, the splice validation module 120 is configured to identify the known position of the at least one splice between an inlet connection and a plurality of outlet connections. Upon identification of the the known position of the at least one splice, the splice validation module 120 is configured to validate the at least one splice position identified. In order to validate the at least one splice position, the splice validation module 120 is configured to consider the following factors such as a) distance of the at least one splice vis-à-vis the inlet and outlet connections including i) equi-distance, ii) balance between inlet and outlet connections, b) minimal copper usage, and c) heat dissipation. The splice validation module 120 is further configured to validate the at least one splice position identified that comprises concur with the identified position, if the above identified factors are satisfied; and determine an ideal position for the at least one splice, if the above identified factors are not satisfied. If the above identified factor are not satisfied, the splice validation module 120 is configured to determine an ideal position for the at least one splice by following a procedure similar to the procedure followed by the splice position determination module 118.

[042] The display module 222 is coupled to the splice position determination module 118 and the splice validation module 120, and configured to display the wire harness including the at least one splice determined or display the validated result based on the validation.

[043] Thus, using the embodiments implemented, the device achieves efficient positioning of at least one splice in a wire harness and validating an already known position for the at least one splice. The device also enables the reduction of heat dissipation and copper wires used in the wire harness, by accurately determining the placement of the splices. Further, the device also reduces the time consumed to determine the at least splice in the wire harness, compared to manual process.

[044] **Figure 3A** illustrates an exemplary steps to position at least one splice in accordance with an embodiment of the present disclosure.

[045] As illustrated in **Figure 3A**, the method **300** comprises one or more blocks implemented by the processor **115** for effectively positioning at least one splice in a wire harness. The method **300** may be described in the general context of computer executable instructions. Generally, computer executable instructions can include routines, programs, objects, components, data structures,

procedures, modules, and functions, which perform particular functions or implement particular abstract data types.

[046] The order in which the method **300** is described is not intended to be construed as a limitation, and any number of the described method blocks can be combined in any order to implement the method **300**. Additionally, individual blocks may be deleted from the method **300** without departing from the spirit and scope of the subject matter described herein. Furthermore, the method **300** can be implemented in any suitable hardware, software, firmware, or combination thereof.

[047] At block **302**, a plurality of connections are identified. In one embodiment, the connections determination module 220 is configured to identify a plurality of connections in the wire harness based on the received input file. In one example, the plurality of connections can be power source, lamp, sensor, or any other electronic component. The plurality of connections include input connections and output connections. In one embodiment, the input file can be at least one of schematic file, navisworks file, netlist file, or any other file.

[048] At block **304**, an inlet connection to be connected to a plurality of outlet connections is identified. In one embodiment, the splice position determination module 118 is configured to identify an inlet connection to be connected to a plurality of outlet connections.

[049] At block **306**, a position for the at least one splice for connecting the inlet connection with the outlet connections is determined. The splice position determination module 118 is further configured to determine the position for the at least one splice for connecting the inlet connection with the plurality of outlet connections based on predetermined factors. The predetermined factors can be at least one of a) distance of the at least one splice vis-à-vis the inlet and outlet connections including i) equi-distance and ii) balance between inlet and outlet connections, b) minimal copper usage, and c) heat dissipation. In order to determine the at least one splice position, the splice position determination module 118 is configured to assign weights to each of the position for the above identified factors, rank the positions based on the assigned weights, from highest to lowest rank, and choose the highest rank position for the at least splice placement.

[050] For example, the splice position determination module 118 is configured to assign a weight to the equi-distance factor as 0.8, and to assign a weight of the balance between inlet and outlet

connections factor as 0.6. Further, the splice position determination module 118 is configured to assign a weight to the minimal copper usage factor as 0.7, and to assign a weight to the heat dissipation as 0.4. The splice position determination module 118 is further configured to rank the splice position with the factor of 'equi-distance factor' as 1, rank the splice position with the factor of 'minimal copper usage' as 2, rank the splice position with the factor of 'balance between inlet and outlet connections' as 3, and rank the splice position with the factor of 'heat dissipation' as 4.

[051] Accordingly, the splice position determination module 118 choose the splice position corresponding to the factor 'equi-distance factor', as the determined position for the at least one splice.

[052] In another embodiment, in order to determine the position for the at least one splice, the splice position determination module 118 is configured to compare the one or more identified inlet and outlet connections with a spliced connections data 111 stored in the data repository. Based on the comparison, when one or more identified inlet and outlet connections is similar to spliced connections data, the splice position determination module 118 is configured retrieve the position of the splice from the spliced connections data 111, and assign the retrieved position as determined position for the at least one splice. In another embodiment, Based on the comparison, splice position determination module 118 is configured retrieve the position of the splice from the spliced connections data 111 using at least one of machine learning, neural network model.

[053] At block 308, the wire harness including the at least one splice determined is displayed. In one embodiment, the display module 222 is configured to display the wire harness including the at least one splice determined.

[054] Thus, using the embodiments implemented, the system achieves efficient positioning at least one splice in the wire harness.

[055] **Figure 3B** illustrates an exemplary steps to validate a position of at least one splice in accordance with an embodiment of the present disclosure.

[056] As illustrated in **Figure 3B**, the method **350** comprises one or more blocks implemented by the processor **115** for validating already known position of at least one splice. The method **350** may be described in the general context of computer executable instructions. Generally, computer executable instructions can include routines, programs, objects, components, data structure, procedures, modules, and functions, which perform particular functions or implement particular abstract data types.

[057] The order in which the method **350** is described is not intended to be construed as a limitation, and any number of the described method blocks can be combined in any order to implement the method **350**. Additionally, individual blocks may be deleted from the method **350** without departing from the spirit and scope of the subject matter described herein. Furthermore, the method **350** can be implemented in any suitable hardware, software, firmware, or combination thereof.

[058] At block **352**, a plurality of connections are identified. In one embodiment, the connections determination module 220 is configured to identify a plurality of connections in the wire harness based on the received input file. In one example, the plurality of connections can be power source, lamp, sensor, or any other electronic component. The plurality of connections include input connections and output connections. In one embodiment, the input file can be at least one of schematic file, navisworks file, netlist file, or any other file.

[059] At block **354**, the splice positioned between an inlet connection and a plurality of outlet connections is identified. In one embodiment, the splice validation module 120 is configured to identify the known position of the at least one splice between an inlet connection and a plurality of outlet connections.

[060] At block **356**, at least one splice position is validated. In one embodiment, the splice validation module 120 is configured to validate a known position of the at least one splice, and to correct the position if the known position is incorrect placement. In order to validate the known position, the splice validation module 120 is configured to identify the known position of the at least one splice between an inlet connection and a plurality of outlet connections. Upon identify the known position of the at least one splice, the splice validation module 120 is configured to validate the at

least one splice position identified. In order to validate the at least one splice position, the splice validation module 120 is configured to consider the following factors such as a) distance of the at least one splice vis-à-vis the inlet and outlet connections including i) equi-distance, ii) balance between inlet and outlet connections, b) minimal copper usage, and c) heat dissipation. The splice validation module 120 is further configured to validate the at least one splice position identified that comprises concur with the identified position, if the above identified factors are satisfied; and determine an ideal position for the at least one splice, if the above identified factors are not satisfied. If the above identified factor are not satisfied, the splice validation module 120 is configured to determine an ideal position for the at least one splice similar to the procedure followed by the splice position determination module 118.

[061] At block **358**, a validated result about the identified splice position based on the validation is displayed. In one embodiment, the display module 222 is configured to display a validated result about the identified splice position based on the validation.

[062] Thus, using the embodiments implemented, the system achieves efficient validation of already known position of at least one splice in the wire harness.

[063] **Figure 4** illustrates a block diagram of an exemplary computer system for implementing embodiments consistent with the present disclosure.

[064] In an embodiment, the computer system 402 may be splice position and validation device 102, which is used for effectively positioning one or more splices in a wire harness, and also to validation a position of one or more splices already placed. The computer system 402 may include a central processing unit (“CPU” or “processor”) 404. The processor 404 may comprise at least one data processor for executing program components for executing user or system-generated business processes. The processor 404 may include specialized processing units such as integrated system (bus) controllers, memory management control units, floating point units, graphics processing units, digital signal processing units, etc.

[065] The processor 404 may be disposed in communication with one or more input/output (I/O) devices (406 and 408) via I/O interface 410. The I/O interface 410 may employ communication

protocols/methods such as, without limitation, audio, analog, digital, stereo, IEEE-1394, serial bus, Universal Serial Bus (USB), infrared, PS/2, BNC, coaxial, component, composite, Digital Visual Interface (DVI), high-definition multimedia interface (HDMI), Radio Frequency (RF) antennas, S-Video, Video Graphics Array (VGA), IEEE 802.n /b/g/n/x, Bluetooth, cellular (e.g., Code-Division Multiple Access (CDMA), High-Speed Packet Access (HSPA+), Global System For Mobile Communications (GSM), Long-Term Evolution (LTE) or the like), etc.

[066] Using the I/O interface 410, the computer system 402 may communicate with one or more I/O devices. For example, the input device 406 may be an antenna, keyboard, mouse, joystick, (infrared) remote control, camera, card reader, fax machine, dongle, biometric reader, microphone, touch screen, touchpad, trackball, sensor (e.g., accelerometer, light sensor, GPS, gyroscope, proximity sensor, or the like), stylus, scanner, storage device, transceiver, video device/source, visors, etc. Output device 408 may be a printer, fax machine, video display (e.g., cathode ray tube (CRT), liquid crystal display (LCD), light-emitting diode (LED), plasma, or the like), audio speaker, etc. In some embodiments, a transceiver 409 may be disposed in connection with the processor 404. The transceiver may facilitate various types of wireless transmission or reception. For example, the transceiver may include an antenna operatively connected to a transceiver chip (e.g., Texas Instruments WiLink WL1283, Broadcom BCM4750IUB8, Infineon Technologies X-Gold 618-PMB9800, or the like), providing IEEE 802.11a/b/g/n, Bluetooth, FM, global positioning system (GPS), 2G/3G HSDPA/HSUPA communications, etc.

[067] In some implementations, the processor 404 may be disposed in communication with a communication network 412 via a network interface 414. The network interface 414 may employ connection protocols including, without limitation, direct connect, Ethernet (e.g., twisted pair 10/100/1000 Base T), Transmission Control Protocol/Internet Protocol (TCP/IP), token ring, IEEE 802.11a/b/g/n/x, etc. Using the network interface 414 and the communication network 412, the computer system 402 may be connected to the product management system 102, user device 106 and the data repository 104.

[068] The communication network 412 can be implemented as one of the several types of networks, such as intranet or any such wireless network interfaces. The communication network 412 may either be a dedicated network or a shared network, which represents an association of several

types of networks that use a variety of protocols, for example, Hypertext Transfer Protocol (HTTP), Transmission Control Protocol/Internet Protocol (TCP/IP), Wireless Application Protocol (WAP), etc., to communicate with each other. Further, the communication network 412 may include a variety of network devices, including routers, bridges, servers, computing devices, storage devices, etc.

[069] In some embodiments, the processor 404 may be disposed in communication with a memory 416 e.g., RAM 418, and ROM 420, etc. as shown in **Figure 4**, via a storage interface 422. The storage interface 422 may connect to memory 416 including, without limitation, memory drives, removable disc drives, etc., employing connection protocols such as Serial Advanced Technology Attachment (SATA), Integrated Drive Electronics (IDE), IEEE-1394, Universal Serial Bus (USB), fiber channel, Small Computer Systems Interface (SCSI), etc. The memory drives may further include a drum, magnetic disc drive, magneto-optical drive, optical drive, Redundant Array of Independent Discs (RAID), solid-state memory devices, solid-state drives, etc.

[070] The memory 416 may store a collection of program or database components, including, without limitation, user/application 424, an operating system 426, a web browser 428, a mail client 430, a mail server 432, a user interface 434, and the like. In some embodiments, computer system 402 may store user/application data 424, such as the data, variables, records, etc. as described in this invention. Such databases may be implemented as fault-tolerant, relational, scalable, secure databases such as Oracle or Sybase.

[071] The operating system 426 may facilitate resource management and operation of the computer system 402. Examples of operating systems include, without limitation, Apple Macintosh™ OS X™, UNIX™, Unix-like system distributions (e.g., Berkeley Software Distribution (BSD), FreeBSD™, Net BSD™, Open BSD™, etc.), Linux distributions (e.g., Red Hat™, Ubuntu™, K-Ubuntu™, etc.), International Business Machines (IBM™) OS/2™, Microsoft Windows™ (XP™, Vista/7/8, etc.), Apple iOS™, Google Android™, Blackberry™ Operating System (OS), or the like. A user interface may facilitate display, execution, interaction, manipulation, or operation of program components through textual or graphical facilities. For example, user interfaces may provide computer interaction interface elements on a display system operatively connected to the computer system 402, such as cursors, icons, check boxes, menus, windows, widgets, etc. Graphical User Interfaces (GUIs) may be employed, including, without limitation, Apple™ Macintosh™ operating

systems' Aqua™, IBM™ OS/2™, Microsoft™ Windows™ (e.g., Aero, Metro, etc.), Unix X-
Windows™, web interface libraries (e.g., ActiveX, Java, JavaScript, AJAX, HTML, Adobe Flash,
etc.), or the like.

[072] The illustrated steps are set out to explain the exemplary embodiments shown, and it should be anticipated that ongoing technological development will change the manner in which particular functions are performed. These examples are presented herein for purposes of illustration, and not limitation. Further, the boundaries of the functional building blocks have been arbitrarily defined herein for the convenience of the description. Alternative boundaries can be defined so long as the specified functions and relationships thereof are appropriately performed. Alternatives (including equivalents, extensions, variations, deviations, etc., of those described herein) will be apparent to persons skilled in the relevant art(s) based on the teachings contained herein. Such alternatives fall within the scope and spirit of the disclosed embodiments. Also, the words "comprising," "having," "containing," and "including," and other similar forms are intended to be equivalent in meaning and be open ended in that an item or items following any one of these words is not meant to be an exhaustive listing of such item or items, or meant to be limited to only the listed item or items. It must also be noted that as used herein and in the appended claims, the singular forms "a," "an," and "the" include plural references unless the context clearly dictates otherwise.

[073] Furthermore, one or more computer-readable storage media may be utilized in implementing embodiments consistent with the present disclosure. A computer-readable storage medium refers to any type of physical memory on which information or data readable by a processor may be stored. Thus, a computer-readable storage medium may store instructions for execution by one or more processors, including instructions for causing the processor(s) to perform steps or stages consistent with the embodiments described herein. The term "computer-readable medium" should be understood to include tangible items and exclude carrier waves and transient signals, i.e., are non-transitory. Examples include random access memory (RAM), read-only memory (ROM), volatile memory, non-volatile memory, hard drives, CD ROMs, DVDs, flash drives, disks, and any other known physical storage media.

[074] **Figure 5A** illustrates an exemplary circuit having four connections to position a splice. As shown in Figure 5A, the exemplary circuit comprises four connections C1, C2, C3, and C4. Assuming that the connector C1 is a power source, and connections C2, C3, and C4 are devices which consume

power such as sensors. If the splice SP1 is placed as shown in figure 5B, the below table shows the length and volume of wire used.

SP1 Cavity Table					
Splice Entry	Wire	Connector	Wire Length (mm)	CSA (mm ²)	Volume (mm ³)
R	001A	C1	250	1.5	375
R	001B	C2	150	0.75	112.5
R	001C	C3	150	0.75	112.5
L	001D	C4	50	0.75	37.5

the total volume of copper wire required in this case, wherein splice is not placed at optimized location is 637.5 mm³.

If the splice SP1 is placed as shown in figure 5C, the below table shows the length and volume of wire used.

SP1 Cavity Table					
Cavity	Wire	Connector	Wire Length (mm)	CSA (mm ²)	Volume (mm ³)
R	001A	C1	150	1.5	225
L	001B	C2	150	0.75	112.5
L	001C	C3	150	0.75	112.5
L	001D	C4	150	0.75	112.5

[075] Here the total volume of copper wire required is reduced to 562.5 mm³., when the splice is placed at optimized location using SPVD. Perhaps reducing the overall cost and weight of the harness.

[076] Finally, the language used in the specification has been principally selected for readability and instructional purposes, and it may not have been selected to delineate or circumscribe the inventive subject matter. Accordingly, the disclosure of the embodiments of the disclosure is intended to be illustrative, but not limiting, of the scope of the disclosure.

[077] With respect to the use of substantially any plural and/or singular terms herein, those having skill in the art can translate from the plural to the singular and/or from the singular to the plural as is appropriate to the context and/or application. The various singular/plural permutations may be expressly set forth herein for sake of clarity.

WE CLAIM:

1. A method of positioning at least one splice in a wire harness, the method comprises:
 - identifying a plurality of connections including inlet and outlet connections in the wire harness;
 - identifying an inlet connection to be connected to a plurality of outlet connections;
 - determining a position for the at least one splice for connecting the inlet connections with the plurality of outlet connections based on predetermined factors; and
 - displaying the wire harness including the at least one splice determined, wherein the splice position is determined by iteratively placing the at least one splice at various positions in between the inlet connection and the plurality of outlet connections.

2. A method of validating at least one splice position in a wire harness, the method comprises:
 - identifying a plurality of connections including inlet and outlet connections in the wire harness;
 - identifying the at least one splice positioned between an inlet connection and a plurality of outlet connections;
 - validating the at least one splice position identified; and
 - displaying a validated result about the identified splice position based on the validation, wherein the splice position is validated by iteratively comparing the identified splice position vis-a-vis various other positions in between the inlet connection and the plurality of outlet connections.

3. The method as claimed in claim 2, wherein the at least one splice position is validated based on one or more of the following factors:
 - a) distance of the at least one splice vis-à-vis the inlet and outlet connections including
 - i) equi-distance, ii) balance between inlet and outlet connections,
 - b) minimal copper usage, and
 - c) heat dissipation.

4. The method as claimed in claim 3, wherein the validating the at least one splice position identified comprises:

a) concurring with the identified position, if the above identified factors are satisfied;
and

b) determining an ideal position for the at least one splice, if the above identified factors are not satisfied.

5. The method as claimed in claim 1 or 4, wherein the position of the at least one splice is determined based on one or more of the following factors:

a) distance of the at least one splice vis-à-vis the inlet and outlet connections including
i) equi-distance, ii) balance between inlet and outlet connections,

b) minimal copper usage, and

c) heat dissipation,

wherein determining the at least one splice position comprises:

assigning weights to each of the positions for the above identified factors;

ranking the positions based on the assigned weights, from highest to lowest rank; and

choosing the highest rank position for the at least splice placement.

6. A device to position at least one splice in a wire harness, the device comprises:

a memory; and

a processor, coupled to the memory, and configured to:

identify a plurality of connections including inlet and outlet connections in the wire harness;

identify an inlet connection to be connected to a plurality of outlet connections;

determine a position for the at least one splice for connecting the inlet connections with the plurality of outlet connections based on predetermined factors; and

display the wire harness including the at least one splice determined, wherein the splice position is determined by iteratively placing the at least one splice at various positions in between the inlet connection and the plurality of outlet connections.

- 7.** A device to validate at least one splice position in a wire harness, the device comprises:
a memory; and
a processor, coupled to the memory, and configured to:
 identify a plurality of connections including inlet and outlet connections in the wire harness;
 identify the at least one splice positioned between an inlet connection and a plurality of outlet connections;
 validate the at least one splice position identified; and
 display a validated result about the identified splice position based on the validation,
 wherein the splice position is validated by iteratively comparing the identified splice position vis-a-vis various other positions in between the inlet connections and the plurality of outlet connections.
- 8.** The device as claimed in claim 8, wherein to validate the at least one splice position, the processor is configured to consider one or more of the following factors:
 a) distance of the at least one splice vis-à-vis the inlet and outlet connections including
 i) equi-distance, ii) balance between inlet and outlet connections,
 b) minimal copper usage, and
 c) heat dissipation.
- 9.** The device as claimed in claim 9, wherein to validate the at least one splice position, the processor is configured to:
 a) concur with the identified position, if the above identified factors are satisfied; and
 b) determine an ideal position for the at least one splice, if the above identified factors are not satisfied.
- 10.** The device as claimed in claim 7 or 10, wherein to determine the at least one splice, the processor is configured to consider one or more of the following factors:
 a) distance of the at least one splice vis-à-vis the inlet and outlet connections including
 i) equi-distance, ii) balance between inlet and outlet connections,
 b) minimal copper usage, and

c) heat dissipation,

wherein to compute the at least one splice position, the processor is configured to:

assign weights to each of the positions for the above identified factors;

rank the positions based on the assigned weights, from highest to lowest rank; and

choose the highest rank position for the at least splice placement.

Dated this 3rd day of August 2022

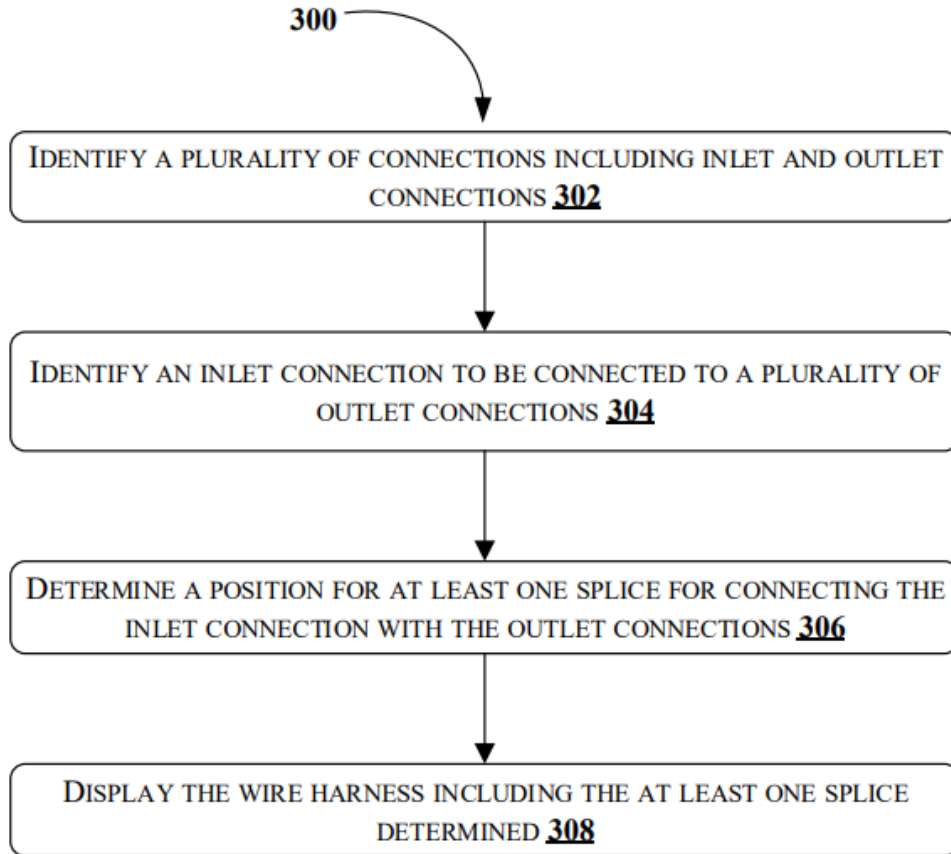
-- Digitally Signed--

Bhanu Prasad (INPA No: 3253)
Manager, IPR Dept.,
L&T Technology Services Limited,
DLF 3rd Block, 2nd Floor,
Manapakkam, Chennai - 600089.

ABSTRACT

METHOD AND SYSTEM FOR SPLICE POSITIONING AND VALIDATION

The present disclosure relates to a system and method for positioning at least one splice in a wire harness. The method comprises identifying a plurality of connections including inlet and outlet connections in the wire harness, and identifying an inlet connection to be connected to a plurality of outlet connections. The method further comprises determining a position for the at least one splice for connecting the inlet connections with the plurality of outlet connections based on predetermined factors, and displaying the wire harness including the at least one splice determined, wherein the splice position is determined by iteratively placing the at least one splice at various positions in between the inlet connection and the plurality of outlet connection.



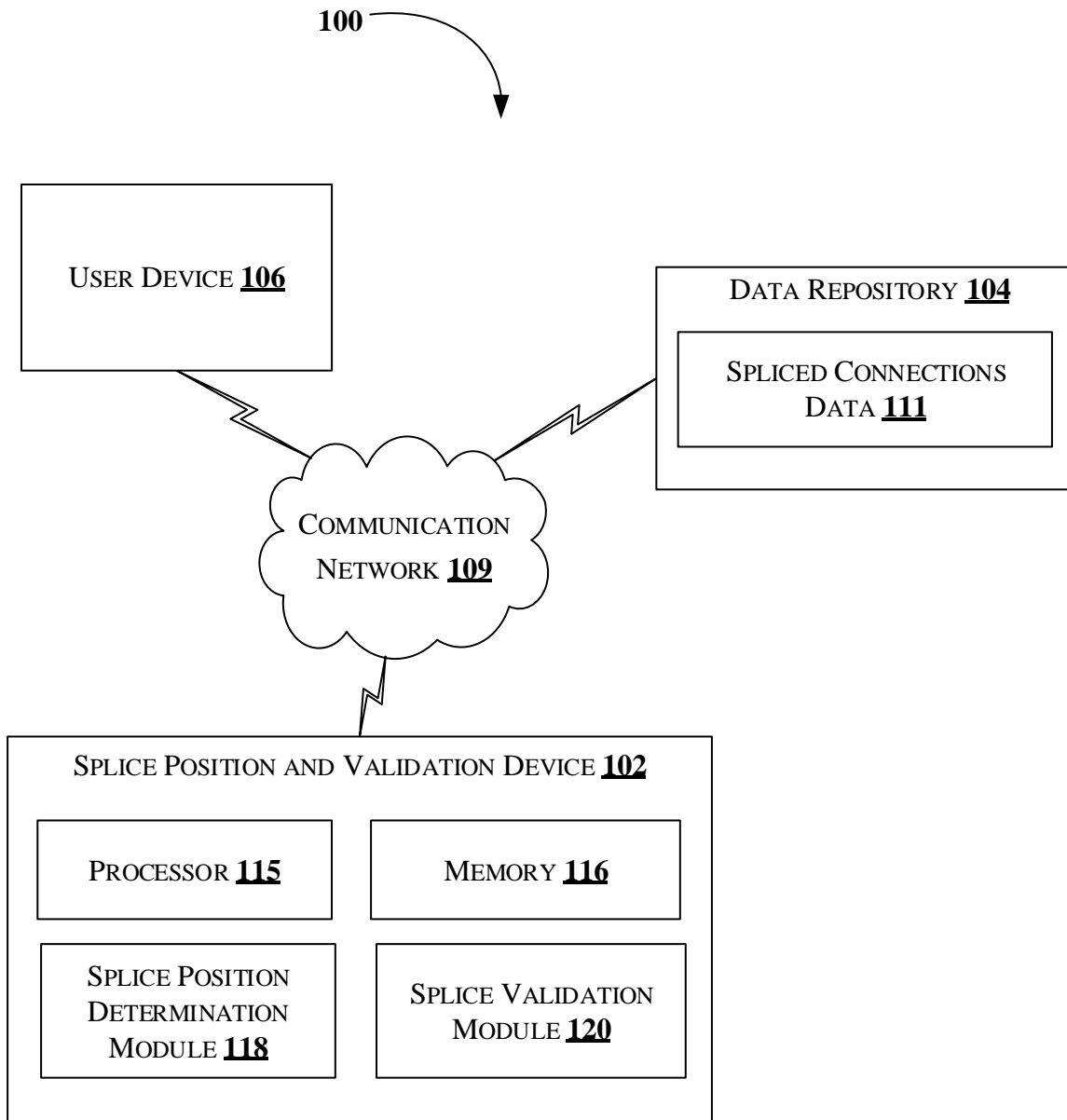


FIGURE 1

-- Digitally Signed--

Bhanu Prasad (INPA No: 3253)
Manager, IPR Dept.,
L&T Technology Services Limited,
DLF 3rd Block, 2nd Floor,
Manapakkam, Chennai - 600089.

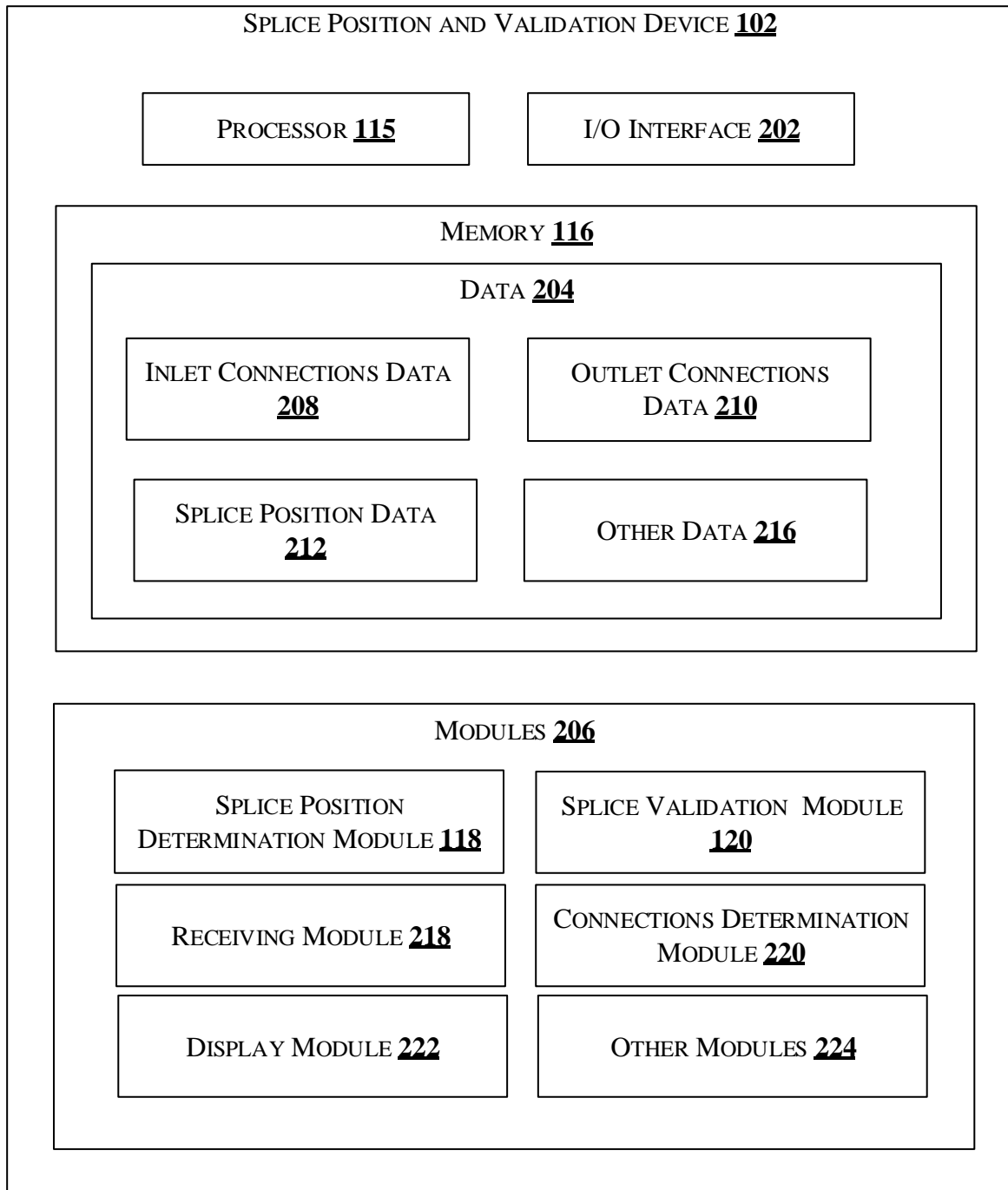


FIGURE 2

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**Bhanu Prasad (INPA No: 3253)
Manager, IPR Dept.,
L&T Technology Services Limited,
DLF 3rd Block, 2nd Floor,
Manapakkam, Chennai - 600089.**

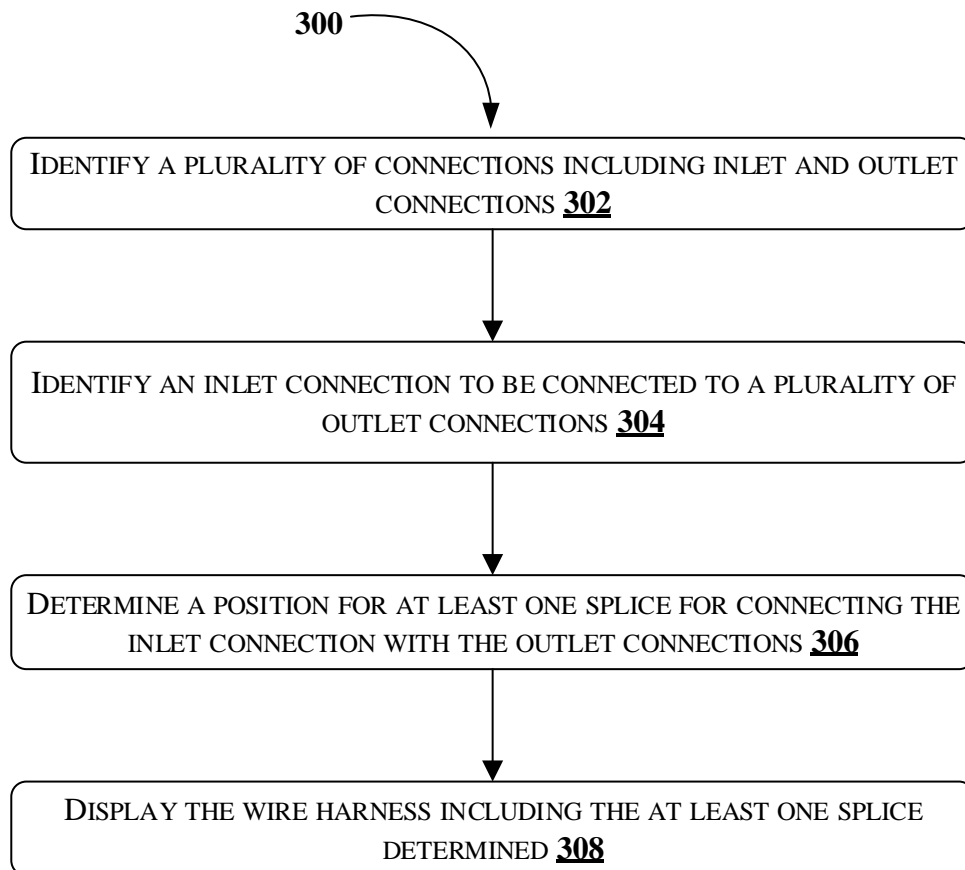


FIGURE 3A

-- Digitally Signed--

Bhanu Prasad (INPA No: 3253)
Manager, IPR Dept.,
L&T Technology Services Limited,
DLF 3rd Block, 2nd Floor,
Manapakkam, Chennai - 600089.

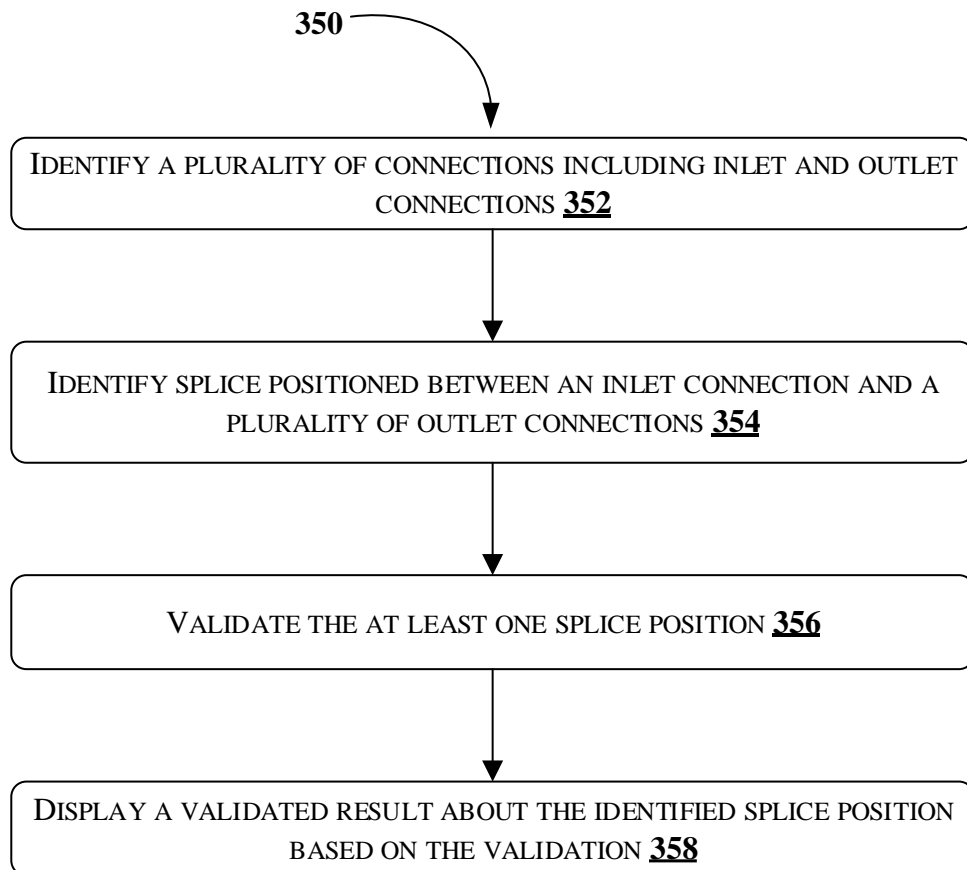


FIGURE 3B

-- Digitally Signed--

Bhanu Prasad (INPA No: 3253)
Manager, IPR Dept.,
L&T Technology Services Limited,
DLF 3rd Block, 2nd Floor,
Manapakkam, Chennai - 600089.

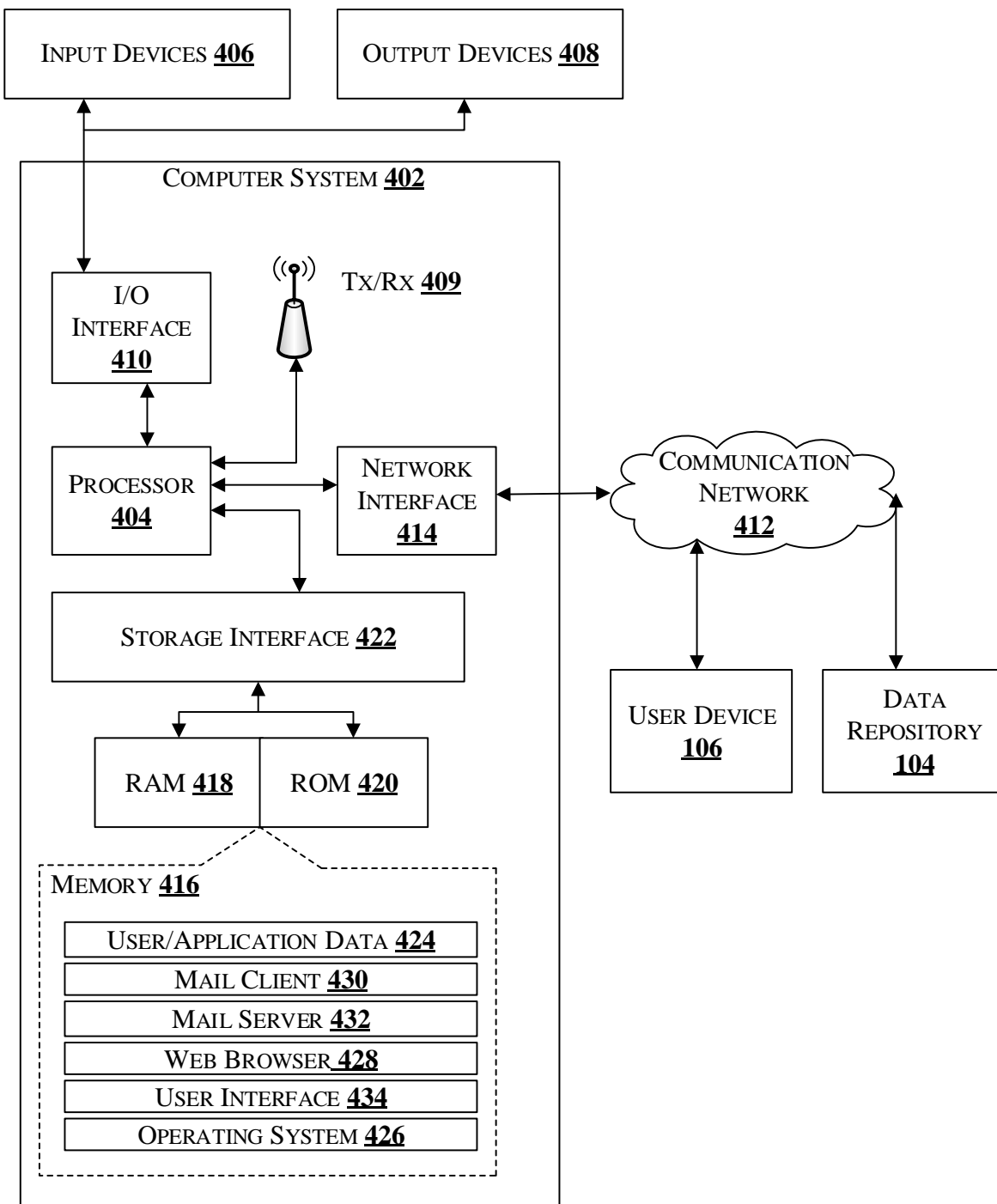


FIGURE 4

-- Digitally Signed--

Bhanu Prasad (INPA No: 3253)
Manager, IPR Dept.,
L&T Technology Services Limited,
DLF 3rd Block, 2nd Floor,
Manapakkam, Chennai - 600089.

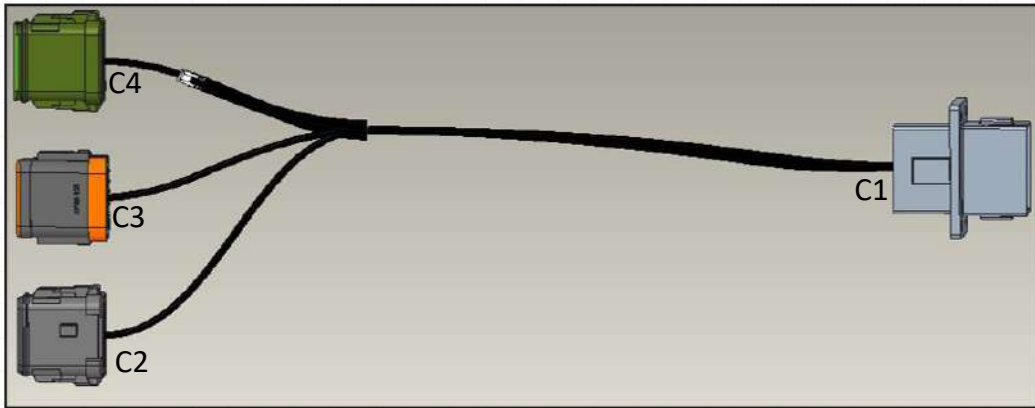


FIGURE 5A

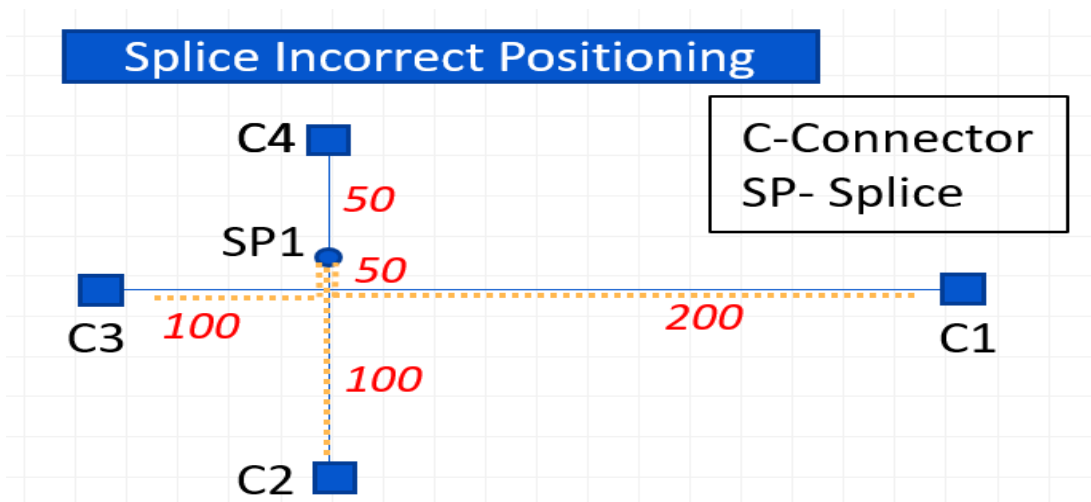


FIGURE 5B

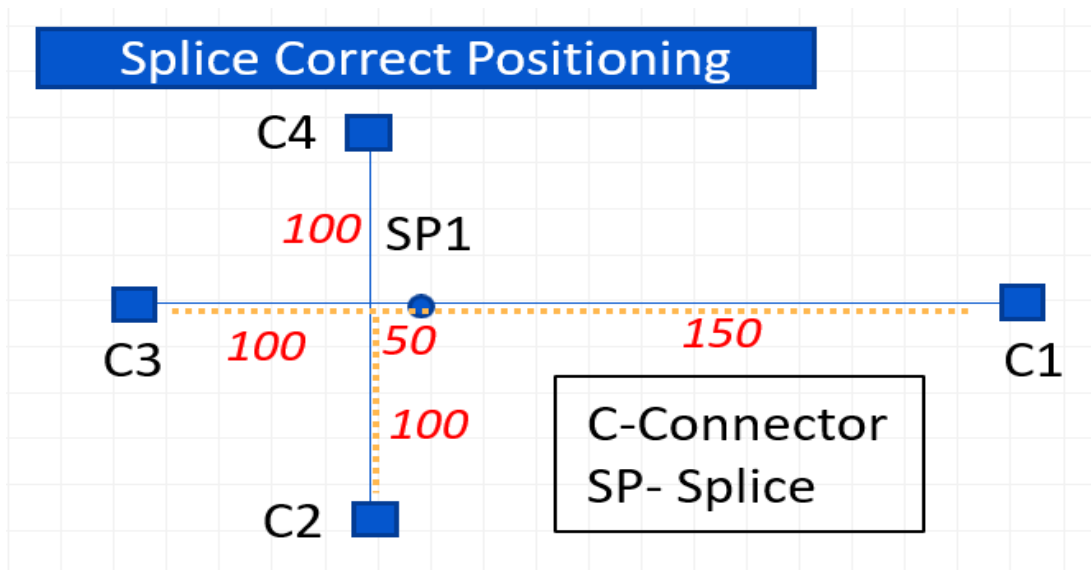


FIGURE 5C

-- Digitally Signed--
Bhanu Prasad (INPA No: 3253)
Manager, IPR Dept.,
L&T Technology Services Limited,
DLF 3rd Block, 2nd Floor,
Manapakkam, Chennai - 600089.