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(54) Title: SYSTEM AND METHOD FOR MDB DATA PROCESSING OF VENDING MACHINES

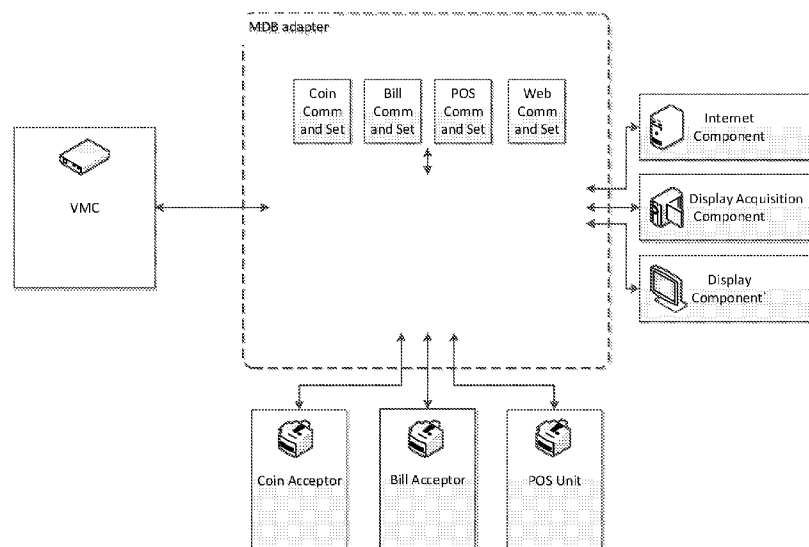


Figure 1

(57) Abstract: The present disclosure relates to the field of vending machine technology. In particular, it involves a control system and control method implementing data processing under multidrop bus (MDB) protocol.



SYSTEM AND METHOD FOR MDB DATA PROCESSING OF VENDING MACHINES

BACKGROUND OF THE DISCLOSURE

[0001] The disclosure below will assume common knowledge of multidrop bus
5 (MDB) commonly found in vending machines.

[0002] In commercial vending machine architecture, a common cash accepting
component of the vending machine is comprised of vending control and bill/coin
acceptors. They are communicating through standard MDB/Internal Communication
Protocol (ICP). Even though MDB/ICP standard can support master to multi-slave
10 device communication, older vending machines did not consider more components
for additional payment options. Therefore, preexisting vending machines are difficult
to be reconfigured or upgraded. In addition, for supporting central cloud management
platform, there needs to be an aggregation function of all payments (mobile payment
and cash payment). Based on the master/slave architecture in MDB/ICP, it is not
15 possible for cloud management to communicate with the slave device directly (such
as bill/coin acceptor). Commercial MDB/ICP-232 replacement is based on simulating
MDB/Vending Machine Controller (VMC) timing control to communicate with
bill/coin acceptor, but it does not offer communication with the master device through
MDB/ICP standard. Therefore, this replacement cannot be used directly to upgrade
20 existing older vending machines.

[0003] As discussed in US2013/0013107 A1, current technology can only be replaced
as a whole by VMC board. But this method comes with high cost and complexity.

SUMMARY OF THE DISCLOSURE

[0004] Based on the above deficiencies, an objective of the disclosure is to provide a
25 new processing system (adapter) that will interface with MDB to provide upgrade
options. This adaptor system includes main processing unit, database unit, first MDB

connector, second MDB connector and external interface.

[0005] The database unit stores the commands applicable to be retrieved and executed in the master control unit. The said adaptor system is configured to:

[0006] when receiving from the first MDB connector transmitted data from the vending machine's VMC, store the data sequentially into buffer, and determine whether the data in the buffer requires to be modified by following a predetermined data processing procedure, and when the data is required to be modified, then modifying it before forwarding it to the second MDB connector;

[0007] after the vending machine VMC data has been received, determine whether the data is for a second card reader, if is, then have the main processing unit collect and report the second card reader data over an Internet payment management interface, and after such reporting, return back to the first MDB connector step; if the data is not for the second card reader, then the data needs to be translated and forwarding to the external interface for processing;

[0008] similarly, when receiving from the second MDB connector transmitted data from slave devices, store the data sequentially into buffer, and determine whether the data in the buffer requires to be modified by following a predetermined data processing procedure, and when the data is required to be modified, then modifying it before forwarding it to the second MDB connector; and after forwarding, further determine the MDB slave device type, then have the main processing unit translate the data based on the device type, and forward the translated data to the external interface.

[0009] The aforementioned predetermined data processing procedure is based on data characteristics and processing functionality. It also takes into consideration of the VMC data characteristics and external data processing characteristics, in formulating

the corresponding data processing functionality.

[00010] The database unit can store for external data processing procedure the data from coin acceptor, bill acceptor and POS data.

BRIEF DESCRIPTION OF THE DRAWINGS

- 5 [00011] Figure 1 shows a MDB adaptor and data processing of this disclosure.
- [00012] Figure2 shows a flowchart of the VMC data processing of this disclosure.
- [00013] Figure 3 shows a flowchart of the MDB data processing that can be interfaced externally.

10 DETAILED DESCRIPTION OF THE DISCLOSURE

Embodiment

- [00014] The following embodiment should be read together with the drawing to provide context and details. But one should note that the following embodiment
- 15 should not be read in isolation in terms of the described characteristics or technical combination. One can rearrange the technical combination in order to achieve better results. When the following embodiment refers to a similar identification of a component or characteristic, they are equally applicable in other embodiments.
- [00015] Figure 1 depicts the embodiment's design suitable for existing MDB data
- 20 processing. It is comprised of main processing unit, database unit, first MDB connector, second MDB connector and external interface. The main processing unit is for MDB data processing. The database unit is for storing commands for processing data. The first MDB connector interfaces with VMC, and for facilitating the data communication with the vending machine. The second MDB connector is for
- 25 communicating with MDB slave components such as coin acceptor and bill acceptor,

in order to connect them with the VMC vending machine. The external interface is for extending MDB components with external processing units, such as Internet communication unit, display unit, input unit and non-cash acceptor unit.

[00016] There are two main MDB data processing components in this embodiment.

5 The first is for MDB data processing with VMC. The second is for processing MDB data with external MDB enhancement units.

[00017] First, as shown in Figure 2, particularly regarding the MDB data processing with VMC, when VMC data is received, the processing procedure picks up from the MDB protocol first segment that contains the destination MDB unit identification.

10 This destination identifier is recorded. The main process unit then stores the first segment data into the database unit, and forwards this first segment to the second MDB connector.

[00018] Based on the MDB standard, a vending machine can support two card readers.

15 In this embodiment, when interacting with MDB components, one can preserve the first card reader for POS unit, but reserve the second card reader as virtual POS. This virtual POS' MDB address is 0x60. This virtual POS is then used for Internet data communication and facilitate Internet payment as POS payment back to VMS.

[00019] To guarantee VMC data timing integrity, the main processing unit should forward the first segment of VMC data to the second MDB connector in real time.

20 Thereafter, with the first segment of VMC data unit is stored in buffer, the subsequent segments are received sequentially into buffer to be processed by the predetermined processing procedure. The processing procedure will determine whether each segment data in the buffer needs to be modified. If required modification, the data is replaced by the modified data, and then forwarded to the second MDB connector. If not, the
25 processing procedure continues onto the next segment until all segments are

processed.

[00020] The aforementioned predetermined processing procedure is based on data characteristics and processing functionality. First, the different VMC data types are modeled before processing. The data type of this embodiment is applicable but not limited to VMC generated coin return or bill return, digital coupon netted cash requirement, return cash modification and modified card reader payment. As for the above VMC data types, the predetermined processing procedure provides a set of corresponding data replacement instructions.

[00021] After all the data in the buffer has been processed, the next step is to determine if the data is intended to be the second card reader (virtual POS). If that is the case, then the main processing unit will process this data in accordance with the Internet payment aggregation processing instructions, and return the processed data back to the first MDB connector. If not, the main processing unit then translates the data into external processing data and forward it to the external interface.

[00022] The discussed Internet payment aggregation processing instructions can support multiple payment methods, like smart payment, coupon payment or prepaid. For example, when customers are using display terminals that support barcode or 2-D barcode, they can confirm and make payments on their mobile device. And after the main process unit receives confirmation over the Internet that the payment has been received, it translates such confirmation into a MDB second reader generated payment, and forwards it to the VMC.

[00023] When customer selects from the touchscreen display the option to pick-up merchandise, and enters the order number into the vending application, the main processing unit forwards this order and pick-up information to the remote processing server for verification. When verification is processed, an acknowledgement is

returned to the main processing unit. The acknowledgement information contains whether the order and pick-up information is valid, and if valid, the merchandise numbers used by the vending machine. When the main processing unit is satisfied with the user input and the verification, it will convert the pick-up task information into a transaction package that also includes payment set for second card reader.

Thereafter, the main processing unit forwards this package to VMC and inform VMC the payment has been made.

[00024] When the buffer data is not intended for the second card reader, it means there is a more complex transaction. Here, the main process unit will translate the buffer data into its intended format, and forward it to the external interface. The translated data can be transmitted through the external interface to a display component, where it will be displayed as transaction procedure, so that customers can control their purchase tasks. The external interface is also a gateway for collecting customers purchase behaviors for a wider management network.

[00025] As indicated in Figure 3, the flowchart is directed to the communication of the adaptor and other MDB slave devices. When the main processing unit receives from the second MDB connector the data transmitted by other MDB slave devices, it will cache the data into the buffer. When processing the buffer data segment by segment, it will determine whether the segment data needs to be modified. If there is a need to modify the data, then the main process unit will utilize the predetermined processing procedure to replace the buffer data. On the other hand, if there is no modification needed, then it will forward the data to the first MDB connector. The process will continue until all the data has been transmitted to VMC.

[00026] After all the data from the second MDB connector has been transmitted to the VMC, the next step is to do external aggregation function for the different data sets.

This embodiment works with external data sets for coin data, bill data and POS data.

After translating the buffer data into the external data set, the external data set is

forwarded to the external interface. This external interface can communicate the

transaction data to a display device, where customers can review the transaction

5 information such as payment amount. Further, the external interface can communicate

over the Internet to report to remote database then sales and merchandising

information.

[00027] In conclusion, the adaptor embodiment represents reengineering vending

machine design by way of utilizing the second card reader as an upgrade entry point.

10 This upgrade method achieves the smart payment vending needs by facilitating

multiple non-cash payment options on existing legacy vending machines. The

embodiment disclosed is only for teaching of the basis functionalities on how such

adaptor can work. A person ordinary skilled in the art should be able to implement

and expand the teaching regarding the adaptor. But in any case, this disclosure is only

15 for demonstration purpose and should not be construed as the limitation of the claims.

CLAIMS:

1. A vending machine MDB data processing system comprises: main processing unit, database unit, first MDB connector, second MDB connector and external interface, wherein

the system is configured to receive data from either the first MDB connector or the second MDB connector;

the data is first processed by the main processing unit before being sent to its destination.
2. The MDB data processing system claim 1, wherein

after the data is received from the first MDB connector, store this data into database unit;

first segment of the data is processed to obtain destination type.
3. The MDB data processing system according to claim 2 wherein

the data received from the first MDB connector is processed in a way that determination of whether the data should be modified is made, and if it needs to be modified, then that data is replaced according to predetermined set of process procedure, before that data is forwarded to the second MDB connector.
4. The MDB data processing system according to claim 3 wherein

after the data received from the first MDB connector has been processed, the system is configured to determine whether the data is intended for the system's own consumption, if yes, then perform aggregation function for payment management; if not, then translate the data into external package and send for the external interface.
5. The MDB data processing system according to claim 4 wherein

additional external components are attached to the external interface, at least including any combination selected from Internet component, display acquisition component, and display component.

6. The MDB data processing system according to claim 5 wherein
after the data is received from the second MDB connector, store this data into database unit;
the data received from the second MDB connector is processed in a way that determination of whether the data should be modified, and if it needs to be modified, then that data is replaced according to the predetermined set of process procedure, before that data is forwarded to the first MDB connector.
7. The MDB data processing system according to claim 6 wherein
after the data received from the second MDB connector has been processed, the system is configured to do aggregation function for remote management.
8. The MDB data processing system according to claim 7, wherein
any data processed by the system can be displayed as customer transaction.
9. The MDB data processing system to claim 8, wherein
the system is configured to work as a virtual card reader conforming to the MDB protocol.

FIGURES:

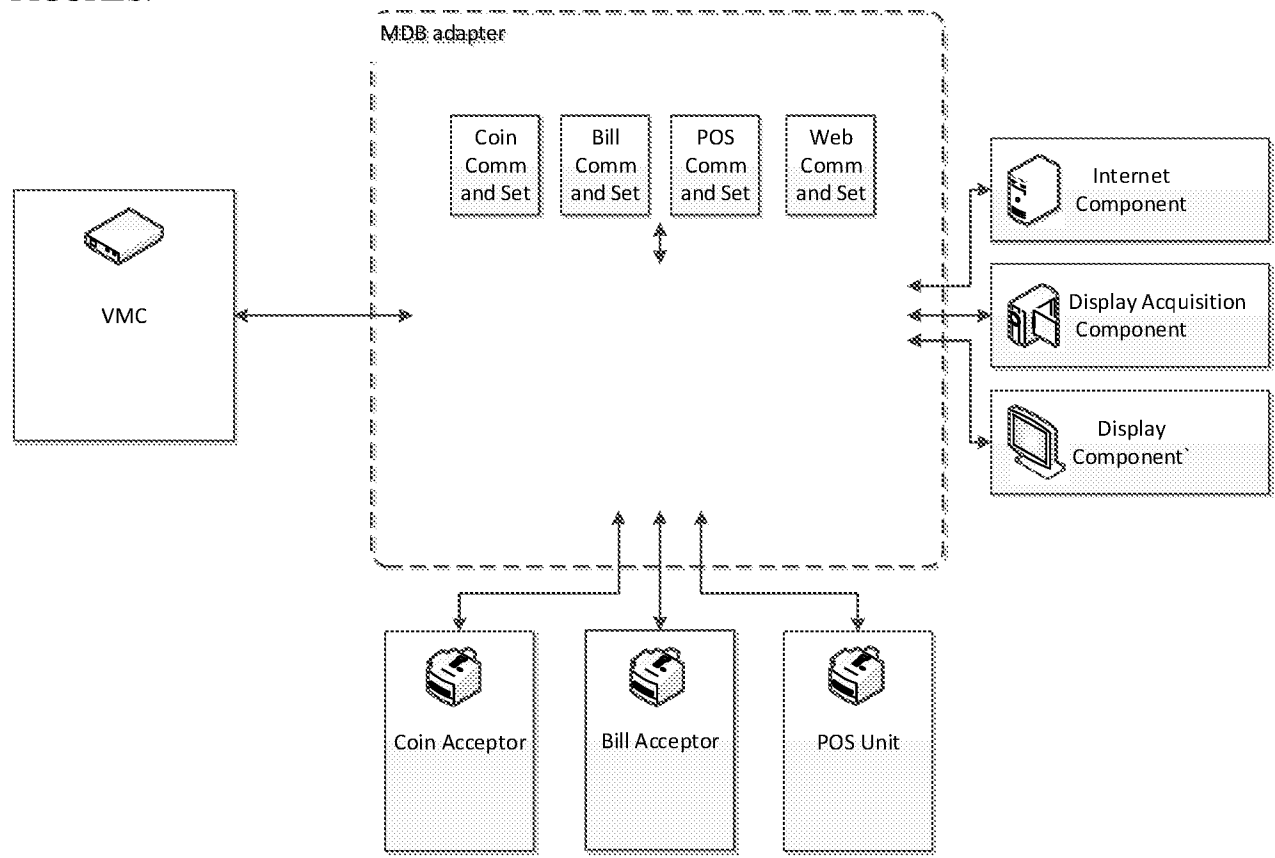


Figure 1

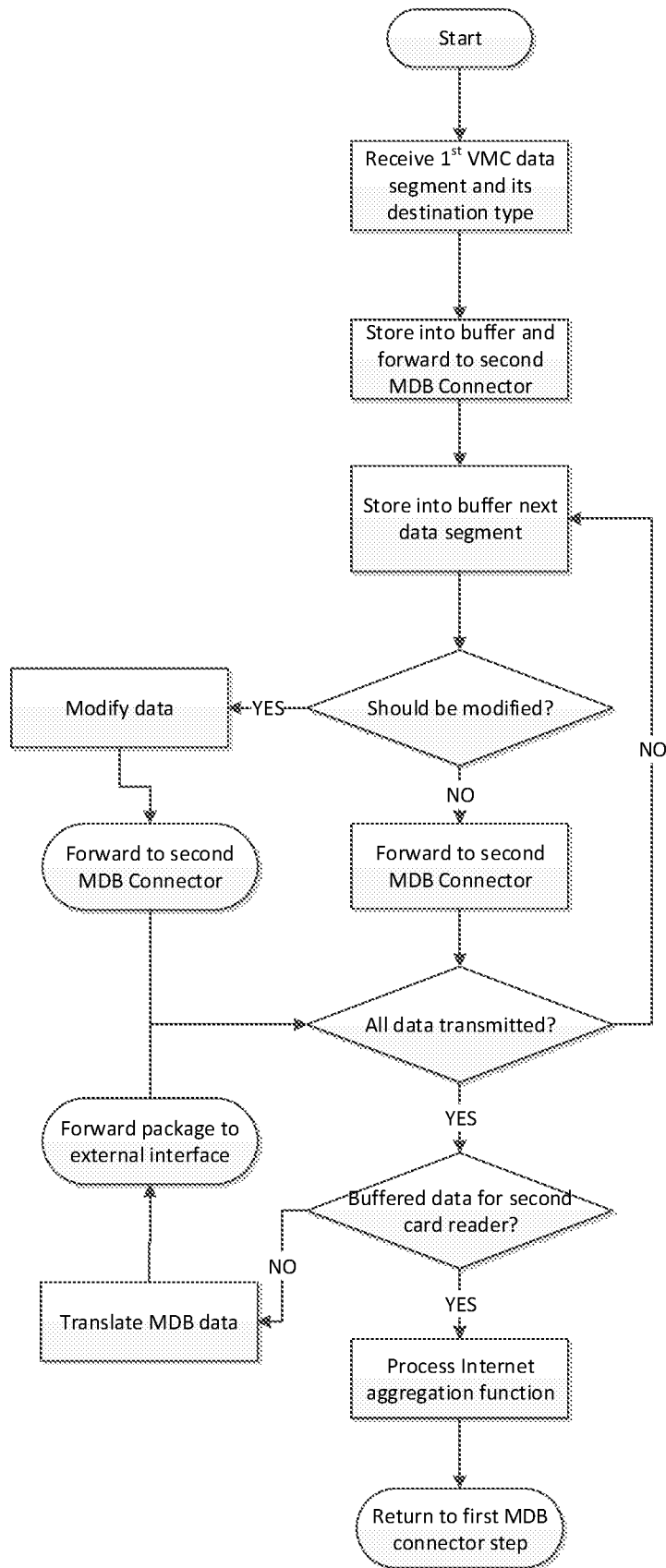


Figure 2

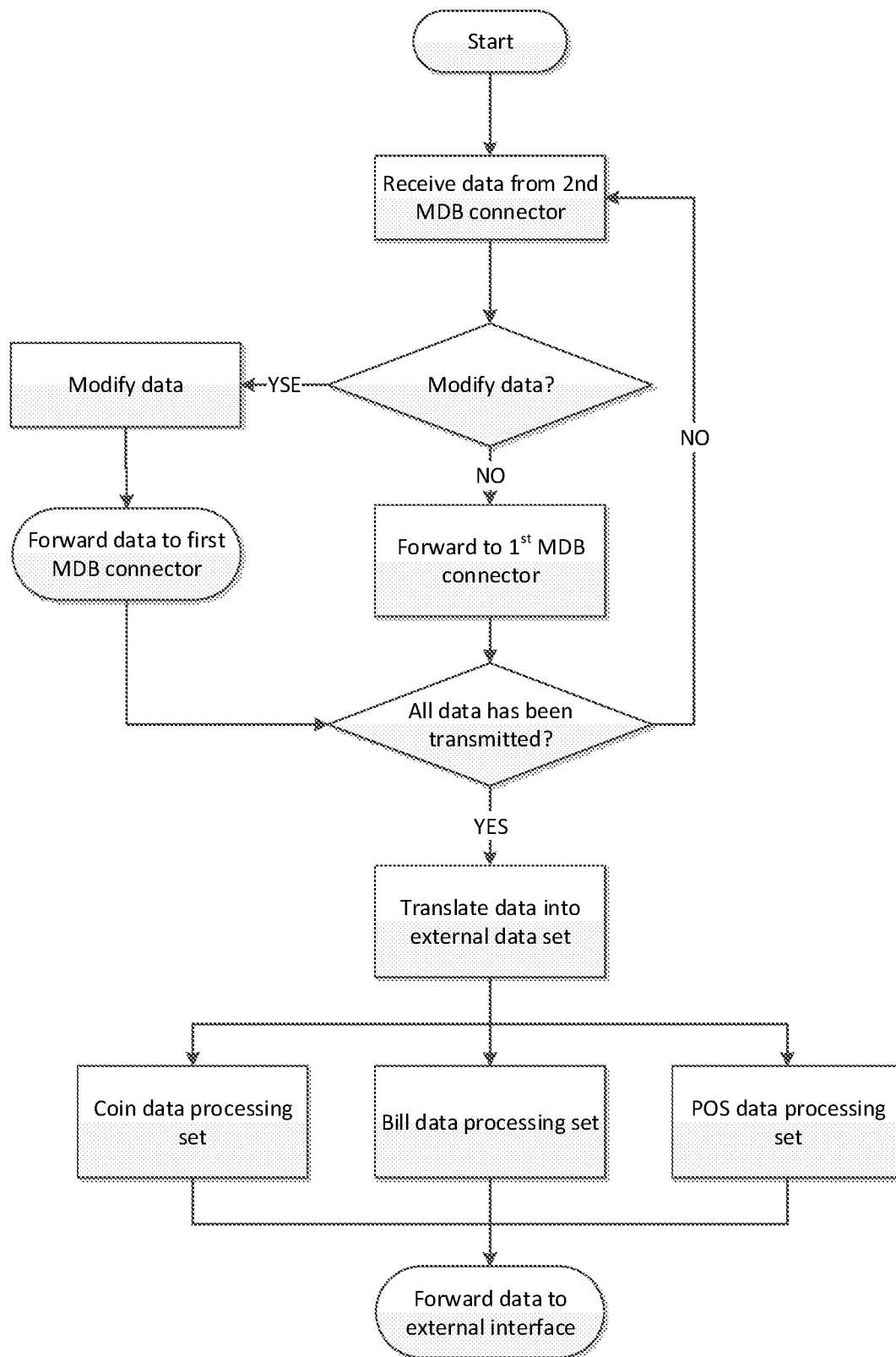


Figure 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US17/52153

A. CLASSIFICATION OF SUBJECT MATTER

IPC - G06Q 20/04, 20/08, 20/20, 30/06 (2017.01)

CPC - G06Q 20/04, 20/027, 20/065, 20/085, 20/201, 20/22, 20/20, 30/0268, 30/0641

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- A	US 7,131,575 B1 (KOLLS, H) November 7, 2006; abstract, figures 5, 9C, 9D, 10C, column 23, lines 32-55, column 24, lines 8-37, column 31, lines 12-24	1-3 -- 4-9
A	US 2016/0071077 A1 (AUTOMATED VENDING TECHNOLOGY INC.) March 10, 2016; the entire document	1-9
A	US 2011/0172814 A1 (BREITENBACH, P et al.) July 14, 2011; the entire document	1-9

☐

Further documents are listed in the continuation of Box C.

☐

See patent family annex.

* Special categories of cited documents:

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document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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document member of the same patent family

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