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(54) **TURNOUT CONTROL STATE MARKING METHOD AND DEVICE, AND COMPUTER STORAGE MEDIUM**

(57) The present disclosure provides a method for marking switch control status, comprising steps of: collecting all control status of the switch, and marking different control status with different characteristic words. The present disclosure can effectively save the storage

space of the computer-based interlocking system while better avoiding overlapping conflicts of various control status of the switch. A device for marking switch control status and a computer-based storage medium are also disclosed.

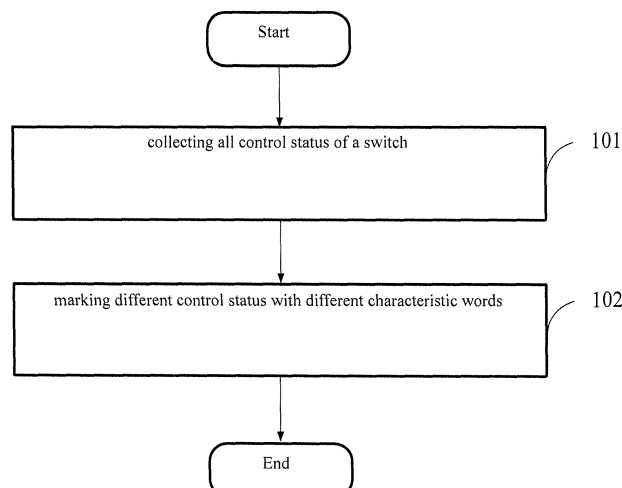


Fig. 1

Description**CROSS-REFERENCE TO RELATED APPLICATIONS**

5 [0001] This application claims priority from Chinese Patent Application No. 201711001776.5 filed on Tuesday, October 24, 2017, the disclosure of the above-mentioned Chinese Patent Application is incorporated herein by reference in its entirety as part of the present application.

FIELD OF TECHNOLOGY

10 [0002] The present disclosure relates to the field of computer control technology, in particular, to a device and method for marking switch control status, and a computer-based storage medium.

BACKGROUND

15 [0003] At present, China's railway signal control system for high-speed passenger rail line has formed a relatively complete technical system, named Chinese Train Control System (CTCS system). CTCS system includes signal apparatuses such as computer interlocking apparatus, column control center apparatus, track circuit apparatus, line side central apparatus, track circuit apparatus, on-board train automatic protection apparatus, signal centralized monitoring apparatus, dispatching centralized apparatus, motor vehicle monitoring apparatus, temporary speed limit server. Among them, the computer interlocking apparatus performs logic calculation on the execution command of the station operator and the information indicated on the site, thereby realizing centralized control and monitoring of the switch, the route and the signal machine.

20 [0004] As the main apparatus of computer interlocking control, the switch requires that it be automatically rotated by the single operation or the selection of the route. Among them, automatic selection should be carried out in a sequential manner. The individual operation of the switch shall be prior to the automatic selection of the route. the switch shall be subjected to route locking, section locking, protection, individual locking, total locking, power-on locking and manual blocking. The switch should not rotate during locking, including individual operation, route selection and driving, but the route can be arranged through the current position of the switch. The switch in manual blocking can be manipulated individually, but the route cannot be arranged through the switch and driven.

25 [0005] However, due to the large number of markings of the locking of the switch and the overlapping of multiple markings, such as the overlapping of the individual locking marking, the route locking marking and route protection marking of the switch, interference will occur if the problems are not solved well. Therefore, those skilled in the art has to develop a method of marking the switch locking, so as to prevent anomalies from occurring when the switch markings are overlapped.

SUMMARY

30 [0006] In view of this, the technical problem to be solved by the present disclosure is to provide a device and method for marking switch control status, and a computer-based storage medium, which solves the problem of interference among the switch markings in the prior art.

35 [0007] To solve the above technical problem, the implementation of the present disclosure is specifically to provide a method for marking switch control status comprising steps of collecting all control status of a switch, and marking different control status with different characteristic words.

40 [0008] The implementation of the present disclosure is to further provide a computer-based storage medium containing computer-executable instructions, wherein a data processing apparatus performs steps of collecting all control status of a switch, and marking different control status with different characteristic words when the computer-executable instructions are processed via the data processing apparatus.

45 [0009] The implementation of the present disclosure is to further provide a device for marking switch control status comprising a collection unit for collecting all control status of a switch, and a marking unit for marking different control status with different characteristic words.

50 [0010] According to above specific implementations of the present disclosure, the device and method for marking switch control status and the computer-based storage medium at least have the following beneficial effects: processing the switch control status in a manner of one characteristic word according to the control process of a switch and situations such as individual locking, power-on locking, protection, manual blocking, route locking (considering that a set of switches may be locked simultaneously by 4 routes at most) and total locking (considering that a set of switches may be locked simultaneously by three regions) may effectively save the storage space of the computer-based interlocking system while better solving the defect of overlapping conflicts of various locking status, and clears the corresponding placement

problem according to the timing of the lock after the subsequent unlocking while considering the action command of the switch.

[0011] It is to be understood that the above general description and the following specific embodiments are merely illustrative and exemplary, and are not intended to limit the scope of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The following drawings are part of the specification of the present disclosure, which illustrate exemplary embodiments of the present invention. The accompanying drawings, together with the description of specification, are used to explain the principles of the disclosure.

Fig. 1 is a flow chart of Embodiment 1 of a method for marking switch control status according to a specific embodiment of the present disclosure;

Fig. 2 is a flow chart of Embodiment 2 of a method for marking switch control status according to a specific embodiment of the present disclosure;

Fig. 3 is a flow chart of Embodiment 3 of a method for marking switch control status according to a specific embodiment of the present disclosure;

Fig. 4 is a flow chart of Embodiment 4 of a method for marking switch control status according to a specific embodiment of the present disclosure;

Fig. 5 is a structural view of Embodiment 1 of a device for marking switch control status according to a specific embodiment of the present disclosure;

Fig. 6 is a structural view of Embodiment 2 of a device for marking switch control status according to a specific embodiment of the present disclosure;

Fig. 7 is a structural view of Embodiment 3 of a device for marking switch control status according to a specific embodiment of the present disclosure;

Fig. 8 is a structural view of Embodiment 4 of a device for marking switch control status according to a specific embodiment of the present disclosure;

Fig. 9 is a flow chart of a switch execution service according to a specific embodiment of the present disclosure.

DESCRIPTION OF THE EMBODIMENTS

[0013] In order to make the objects, technical solutions and advantages of the embodiments of the present disclosure more clear, the spirit of the disclosure of the present disclosure will be clearly described in the accompanying drawings and detailed description. Those skilled in the art can change and modify the embodiments of the present disclosure based on the teaching in the present disclosure without departing from the spirit and scope of the disclosure.

[0014] Fig. 1 is a flow chart of Embodiment 1 of a for marking method switch control status according to a specific embodiment of the present disclosure. As shown in Fig. 1, all of the control status are marked respectively by different characteristic words.

[0015] In the specific embodiment as shown, the method for marking the switch control status comprises:

step S101: collecting all control status of a switch. In a specific embodiment of the present disclosure, the control status of a switch include route locking, driving, individual execution, fixed execution command, reverse execution command, protection, manual blocking, individual locking, total locking, and power-on locking, etc.

step 102: marking different control status with different characteristic words. In a specific embodiment of the present disclosure, different fields are used to indicate different control status. Table 1 below shows a way for marking the control status. Table 1 shows the logic word position of the characteristic word.

Table 1

15	power-on locking	14	total locking	13	total locking	12	total locking	11	individual locking	10	manual blocking	9	reserving	8	protection locking	7	reverse execution command	6	fixed execution command	5	individual operation	4	driving	3	route locking	2	route locking	1	route locking	0	route locking
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[0016] With reference to Fig. 1, processing the switch control status in a manner of using a characteristic word may effectively save the storage space of the computer-based interlocking system while better solving the defects of overlapping conflicts of various locking status, as well as facilitating the expansion of the control range of the switch, such as the use of multiple switches to meet the corresponding requirements.

[0017] Fig. 2 is a flow chart of Embodiment 2 of a method of marking switch control status according to a specific embodiment of the present disclosure. As shown in Fig. 2, the switch execution is controlled according to the characteristic word.

[0018] In the specific embodiment as shown, after step 102, the method for marking the switch control status further comprises:

step 103: controlling the switch to execute according to the characteristic word. In a specific embodiment of the present disclosure, the characteristic word is a field, and the characteristic word is used to control the switch to execute, so that the execution is convenient and the control is simple.

[0019] With reference to Fig. 2, controlling the switch execution by the characteristic word may effectively save the storage space of the computer-based interlocking system while better solving overlapping conflicts of various locking status of the switch, so that the execution is convenient and the control is simple.

[0020] Fig. 3 is a flow chart of Embodiment 3 of a method for marking switch control status according to a specific embodiment of the present disclosure. As shown in Fig. 3, the switch operation and locking are controlled according to the characteristic word.

[0021] In the specific embodiment as shown, the step 103 specifically includes:

step 1031: controlling the switch to operate according to the characteristic word. In an specific embodiment of the present disclosure, the switch operation specifically includes individual operation and automatic selection.

step 1032: controlling the switch to lock according to the characteristic word. In a specific embodiment of the present disclosure, the switch locking specifically includes route locking of the switch, and route protection locking of the switch, etc.

[0022] As shown in Fig. 3, controlling the switch to operate and switch to lock according to the characteristic word saves the storage space of the computer-based interlocking system, and the various locking status of the switch may not overlap.

[0023] Fig. 4 is a flow chart of Embodiment 4 of a method for marking switch control status according to a specific embodiment of the present disclosure. As shown in Fig. 4, the switch operation and locking are controlled according to the characteristic word.

[0024] In the specific embodiment as shown, the step 1031 specifically includes:

step 10311: individually manipulating an interlocking switch. In a specific embodiment of the present disclosure, the individual operation of the interlocking switch is the operation of a certain switch.

step 10312: automatically selecting the interlocking switch according to a route arrangement, wherein the individual operation of the interlocking switch is prior to the automatic selection of the interlocking switch. In a specific embodiment of the present disclosure, the automatic selection should be started in sequence, and the speed-increasing switch may only convert one set at the same time according to the power supply condition to operate in sequence.

[0025] The step 1032 specifically includes:

step 10321: locking a switch in the route according to the route locking conditions in the centralized interlocking. In a specific embodiment of the present disclosure, once the switch is locked, the switch should not be activated.

step 10322: locking a protective switch in the route and a branching switch in an arrival-departure track according to the route locking conditions in the centralized interlocking.

Step 10323: locking all switches in a section according to the section locking status in the centralized interlocking.

Step 10324: locking a designated switch according to a manual individual locking command in the centralized interlocking.

Step 10325: locking a designated set of switch according to a manual total locking command in the centralized interlocking.

Step 10326: blocking a designated switch according to a manual blocking command in the centralized interlocking.

Step 10327: locking all switches according to a power-on locking status in the centralized interlocking.

wherein the switch or the protective switch should not be activated after the switch or the protective switch is locked.

[0026] As shown in Fig. 4, performing the switch to operate and switch to lock according to the characteristic word saves the storage space of the computer-based interlocking system without causing the various locking status of the

switch to overlap, so as to be safe and reliable, making execution convenient.

[0027] Fig. 5 is a structural view of Embodiment 1 of a device for marking switch control status according to a specific embodiment of the present disclosure. The device as shown in Fig. 5 may be applied to the method as shown in Figs. 1 to 4, and all of the control status are marked respectively by different characteristic words.

[0028] In the specific embodiment as shown, the device for marking the switch control status comprises a collection unit 1 and a marking unit 2. Among them, the collection unit 1 is used for collecting all control status of a switch, and the marking unit 2 is used for marking different control status with different characteristic words.

[0029] With reference to Fig. 5, processing the switch control status in a manner of using a characteristic word may effectively save the storage space of the computer-based interlocking system while better solving the defects of overlapping conflicts of various locking status, as well as facilitating the expansion of the control range of the switch, such as the use of multiple switches to meet the corresponding requirements.

[0030] Fig. 6 is a structural view of Embodiment 6 of a device of marking switch control status according to a specific embodiment of the present disclosure. As shown in Fig. 6, a control unit controls the switch to execute according to the characteristic word.

[0031] In the specific embodiment as shown, the device for marking the switch control status further comprises a control unit 3. Among them, the control unit 3 is used for controlling the switch to execute according to the characteristic word.

[0032] With reference to Fig. 6, controlling the switch to execute by the characteristic word may effectively save the storage space of the computer-based interlocking system while better solving overlapping conflicts of various locking status of the switch, so that the execution is convenient and the control is simple.

[0033] Fig. 7 is a structural view of Embodiment 3 of a device of marking switch control status according to a specific embodiment of the present disclosure. As shown in Fig. 7, a control module controls the switch to operate and switch to lock according to the characteristic word.

[0034] In the specific embodiment as shown, the control unit 3 specifically includes a first control module 31 and a second control module 32. Among them, the first control module 31 is used for controlling the switch to operate according to the characteristic word; the second control module 32 is used for controlling the switch to lock according to the characteristic word.

[0035] As shown in Fig. 7, controlling the switch to operate and switch to lock according to the characteristic word saves the storage space of the computer-based interlocking system, and the various locking status of the switch may not overlap.

[0036] Fig. 8 is a structural view of Embodiment 4 of a device of marking switch control status according to a specific embodiment of the present disclosure. As shown in Fig. 8, the switch operation and switch to lock are controlled according to the characteristic word.

[0037] In the specific embodiment as shown, the first control module 31 specifically includes an individual operation sub-module 311 and an automatic selection sub-module 312. Among them, the individual operation sub-module 311 is used for individually manipulating an interlocking switch; the automatic selection sub-module 312 is used for automatically selecting the interlocking switch according to a route arrangement. Among them, the individual operation of the interlocking switch is prior to the automatic selection of the interlocking switch. The second control module 32 specifically includes a first locking sub-module 321, a second locking sub-module 322, a third locking sub-module 323, a fourth locking sub-module 324, a fifth locking sub-module 325, a sixth locking sub-module 326 and a seventh locking sub-module 327. Among them, the first locking sub-module 321 is used for locking a switch in the route according to the route locking conditions in the centralized interlocking; the second locking sub-module 322 is used for locking a protective switch in the route and a branching switch in an arrival-departure track according to the route locking in the centralized interlocking; the third locking sub-module 323 is used for locking all switches in a section according to the section locking status in the centralized interlocking; the fourth locking sub-module 324 is used for locking a designated switch according to a manual individual locking command in the centralized interlocking; the fifth locking sub-module 325 is used for locking a designated set of switches according to a manual total locking command in the centralized interlocking; the sixth locking sub-module 326 is used for blocking a designated switch according to a manual blocking command in the centralized interlocking; the seventh locking sub-module 327 is used for locking all switches according to power-on locking status in the centralized interlocking. wherein the switch or the protective switch should not be activated after the switch or the protective switch is locked.

[0038] As shown in Fig. 8, performing the switch to operate and switch to lock according to the characteristic word saves the storage space of the computer-based interlocking system without causing the various locking status of the switch to overlap, so as to be safe and reliable, making execution convenient.

[0039] The implementation of the present disclosure is to further provide a computer-based storage medium containing computer-executable instructions, wherein a data processing apparatus performs steps of:

step S101: collecting all control status of a switch.

step 102: marking different control status with different characteristic words.

[0040] The implementation of the present disclosure is to further provide a computer-based storage medium containing computer-executable instructions, wherein a data processing apparatus performs steps of:

step S101: collecting all control status of a switch.

step 102: marking different control status with different characteristic words.

step 103: controlling the switch to execute according to the characteristic word.

[0041] The implementation of the present disclosure is to further provide a computer-based storage medium containing computer-executable instructions, wherein a data processing apparatus performs steps of:

step S101: collecting all control status of a switch.

step 102: marking different control status with different characteristic words.

[0042] step 1031: controlling the switch to operate according to the characteristic word.

[0043] step 1032: controlling the switch to lock according to the characteristic word.

[0044] The implementation of the present disclosure is to further provide a computer-based storage medium containing computer-executable instructions, wherein a data processing apparatus performs steps of:

step S101: collecting all control status of a switch.

step 102: marking different control status with different characteristic words.

[0045] step 10311: individually manipulating an interlocking switch.

[0046] step 10312: automatically selecting the interlocking switch according to a route arrangement, wherein the individual operation of the interlocking switch is prior to the automatic selection of the interlocking switch.

[0047] step 1032: controlling the switch to lock according to the characteristic word.

[0048] The implementation of the present disclosure is to further provide a computer-based storage medium containing computer-executable instructions, wherein a data processing apparatus performs steps of:

step S101: collecting all control status of a switch.

step 102: marking different control status with different characteristic words.

[0049] step 1031: controlling the switch to operate according to the characteristic word.

[0050] step 10321: locking a switch in the route according to the route locking conditions in the centralized interlocking.

[0051] step 10322: locking a protective switch in the route and a branching switch in an arrival-departure track according to the route locking conditions in the centralized interlocking.

[0052] Step 10323: locking all switches in a section according to the section locking status in the centralized interlocking; Step 10324: locking a designated switch according to a manual individual locking command in the centralized interlocking; Step 10325: locking a designated set of switch according to a manual total locking command in the centralized interlocking; Step 10326: blocking a designated switch according to a manual blocking command in the centralized interlocking; Step 10327: locking all switches according to a power-on locking status in the centralized interlocking; wherein the switch or the protective switch should not be activated after the switch or the protective switch is locked.

[0053] Fig. 9 is a flow chart of a switch execution service according to a specific embodiment of the present disclosure. As shown in Fig. 9, after the operator presses the button, the button information processing is first performed to convert the button information into a control command, and then the control command is converted into a switch individual control command, and finally converted into a driving command.

[0054] Further, centralized interlocking switches should have an individual locking function (manual locking): the centralized interlocking should be able to lock the switch individually; after the switch is individually locked, the route through the switch may be arranged without switching the position; after the switch is individually locked, the switch may not be manipulated individually; the switch under the route control may be individually locked, and the unlocking of the route should not affect the switch to be locked individually; after the switch is individually locked, the individual unlocking execution for the switch may be used to unlock the switch, and if the switch is locked at the same time by the route, the individual unlocking of the switch should not affect the switch being locked by the route.

[0055] In addition, centralized interlocking switches should have manual blocking functions: centralized interlocking should be able to manually block the switch; after the switch is manually blocked, the route through the switch (including the guide route) is forbidden to be arranged; after the switch is manually blocked, the switch may be operated individually; the switch under the route control may not be manually blocked; the manual blocking and individual locking of the switch

should not affect each other; after the switch is manually blocked, the manual blocking of the switch may be used to unblock the switch. Table 2 is a check table for related execution conditions of the switch (checking required is ticked by $\checkmark$, otherwise ticked by x).

Table 2

	individual locking	manual blocking	section occupied	route locking	total locking	power-on locking	protection locking	others
individual execution	$\checkmark$	x	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
manual blocking	x	x	x	$\checkmark$	x	x	x	
manual unblocking	x	$\checkmark$	x	x	x	x	x	
individual locking	x	x	x	x	x	x	x	
individual unblocking	$\checkmark$	x	x	x	x	x	x	

[0056] The present disclosure provides a device and method for marking switch control status and a computer-based storage medium, wherein processing the switch control status in a manner of one characteristic word according to the control process of a switch and situations such as individual locking, power-on locking, protection, manual blocking, route locking (considering that a set of switches may be locked simultaneously by 4 routes at most) and total locking (considering that a set of switches may be locked simultaneously by three regions) may effectively save the storage space of the computer-based interlocking system while better solving the defect of overlapping conflicts of various locking status, and clears the corresponding placement problem according to the timing of the lock after the subsequent unlocking while considering the action command of the switch.

[0057] The embodiments of the present disclosure described above may be implemented in various hardware, software code, or a combination of both. For example, an embodiment of the present disclosure may also be a program code that executes the above method in a Digital Signal Processor (DSP). The present disclosure may also involve various functions performed by a computer processor, a digital signal processor, a microprocessor, or a Field Programmable Gate Array (FPGA). The above described processor may be configured to perform specific tasks in accordance with the present disclosure, which are accomplished by executing machine readable software code or firmware code that defines a particular method disclosed herein. The software code or firmware code may be developed into different programming languages and different formats or forms. The software code may also be compiled for different target platforms. However, different code patterns, types, and languages of the software code and other types of configuration code that perform tasks in accordance with the present disclosure do not depart from the spirit and scope of the present disclosure.

[0058] The above is only the exemplary embodiments of the present disclosure, and any equivalent changes and modifications made by those skilled in the art should be within the scope of the present disclosure without departing from the spirit and scope of the present disclosure.

Claims

1. A method for marking switch control status, comprising steps of:

collecting all control status of a switch; and
marking different control status with different characteristic words.

2. The method for marking switch control status according to claim 1, wherein the method further comprises a step of: controlling the switch to execute according to the characteristic word.

3. The method for marking switch control status according to any one of claims 1 to 2, wherein the control status includes route locking, driving, individual execution, fixed execution command, reverse execution command, pro-

tection, manual blocking, individual locking, total locking, and power-on locking.

4. The method for marking switch control status according to any one of claims 1 to 3, wherein the step of controlling the switch to execute according to the characteristic word specifically includes:

controlling the switch to operate according to the characteristic word; and
controlling the switch to lock according to the characteristic word.

5. The method for marking switch control status according to any one of claims 1 to 4, wherein the step of controlling the switch to operate according to the characteristic word specifically includes:

individually manipulating an interlocking switch; and
automatically selecting the interlocking switch according to a route arrangement, wherein the individual operation to the interlocking switch is prior to the automatic selection of the interlocking switch.

6. The method for marking switch control status according to any one of claims 1 to 5, wherein the step of controlling the switch to lock according to the characteristic word specifically includes:

locking a switch in the route according to the route locking conditions in the centralized interlocking;
locking a protective switch in the route and a branching switch in an arrival-departure track according to the route locking conditions in the centralized interlocking;
locking all switches in a section according to the section locking status in the centralized interlocking;
locking a designated switch according to a manual individual locking command in the centralized interlocking;
locking a designated set of switches according to a manual total locking command in the centralized interlocking;
blocking a designated switch according to a manual blocking command in the centralized interlocking;
locking all switches according to a power-on locking status in the centralized interlocking;
wherein the switch or the protective switch should not be activated after the switch or the protective switch is locked.

7. A device for marking switch control status, comprising:

a collection unit for collecting all control status of a switch; and
a marking unit for marking different control status with different characteristic words.

8. The device for marking switch control status according to claim 7, wherein the device further comprises:
a control unit for controlling the switch to execute according to the characteristic word.

9. The device for marking switch control status according to any one of claims 7 to 8, wherein the control unit specifically includes:

a first control module for controlling the switch to operate according to the characteristic word;
a second control module for controlling the switch to lock according to the characteristic word;

10. The device for marking switch control status according to any one of claims 7 to 9, wherein the first control module specifically includes:

an individual operation sub-module for individually manipulating an interlocking switch; and
an automatic selection sub-module for automatically selecting the interlocking switch according to a route arrangement, wherein the individual operation of the interlocking switch is prior to the automatic selection of the interlocking switch.

11. The device for marking switch control status according to any one of claims 7 to 10, wherein the second control module specifically includes:

a first locking sub-module for locking a switch in the route according to the route locking conditions in the centralized interlocking;
a second locking sub-module for locking a protective switch in the route and a branching switch in an arrival-departure track according to the route locking in the centralized interlocking;

a third locking sub-module for locking all switches in a section according to the section locking status in the centralized interlocking;
a fourth locking sub-module for locking a designated switch according to a manual individual locking command in the centralized interlocking;
5 a fifth locking sub-module for locking a designated set of switches according to a manual total locking command in the centralized interlocking;
a sixth locking sub-module for blocking a designated switch according to a manual blocking command in the centralized interlocking;
a seventh locking sub-module for locking all switches according to power-on locking status in the centralized interlocking;
10 wherein the switch or the protective switch should not be activated after the switch or the protective switch is locked.

12. A computer-based storage medium containing computer-executable instructions, wherein a data processing apparatus performs the method according to any one of claims 1-6 when the computer-executable instructions are processed via the data processing apparatus.

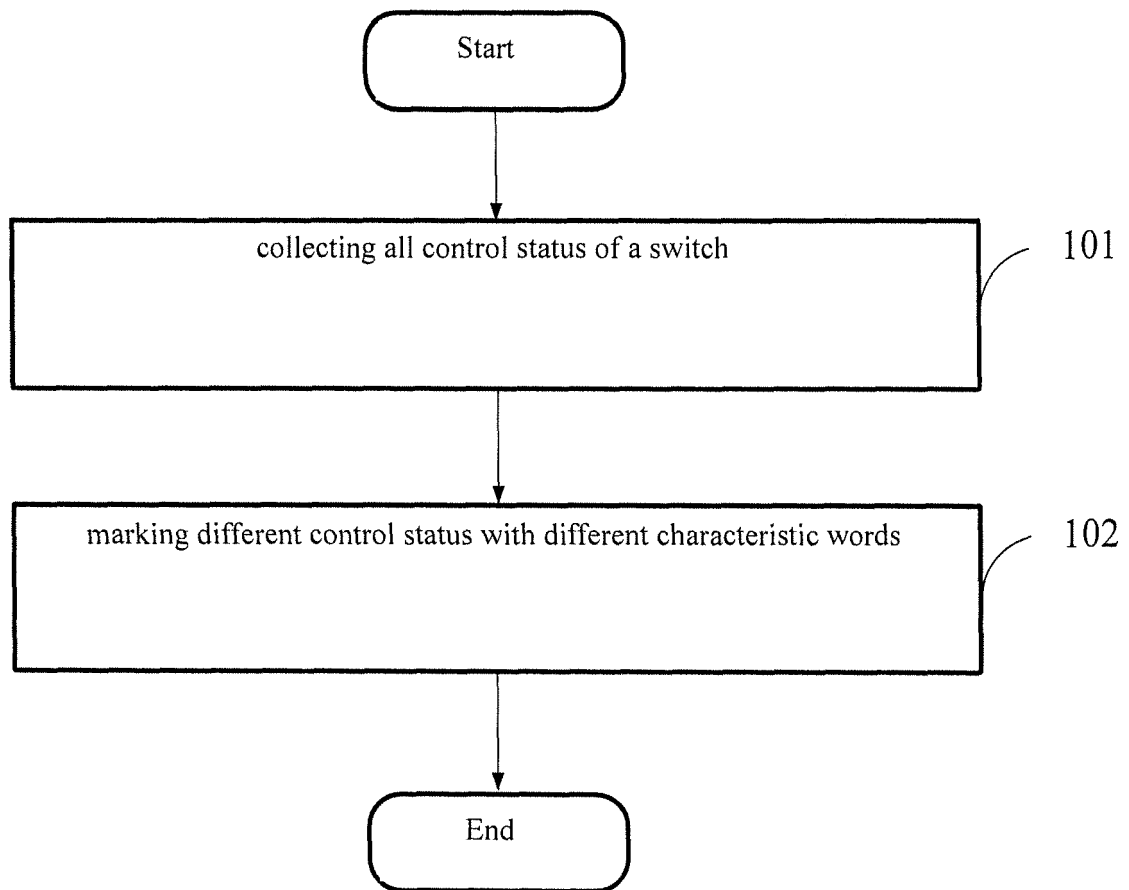


Fig. 1

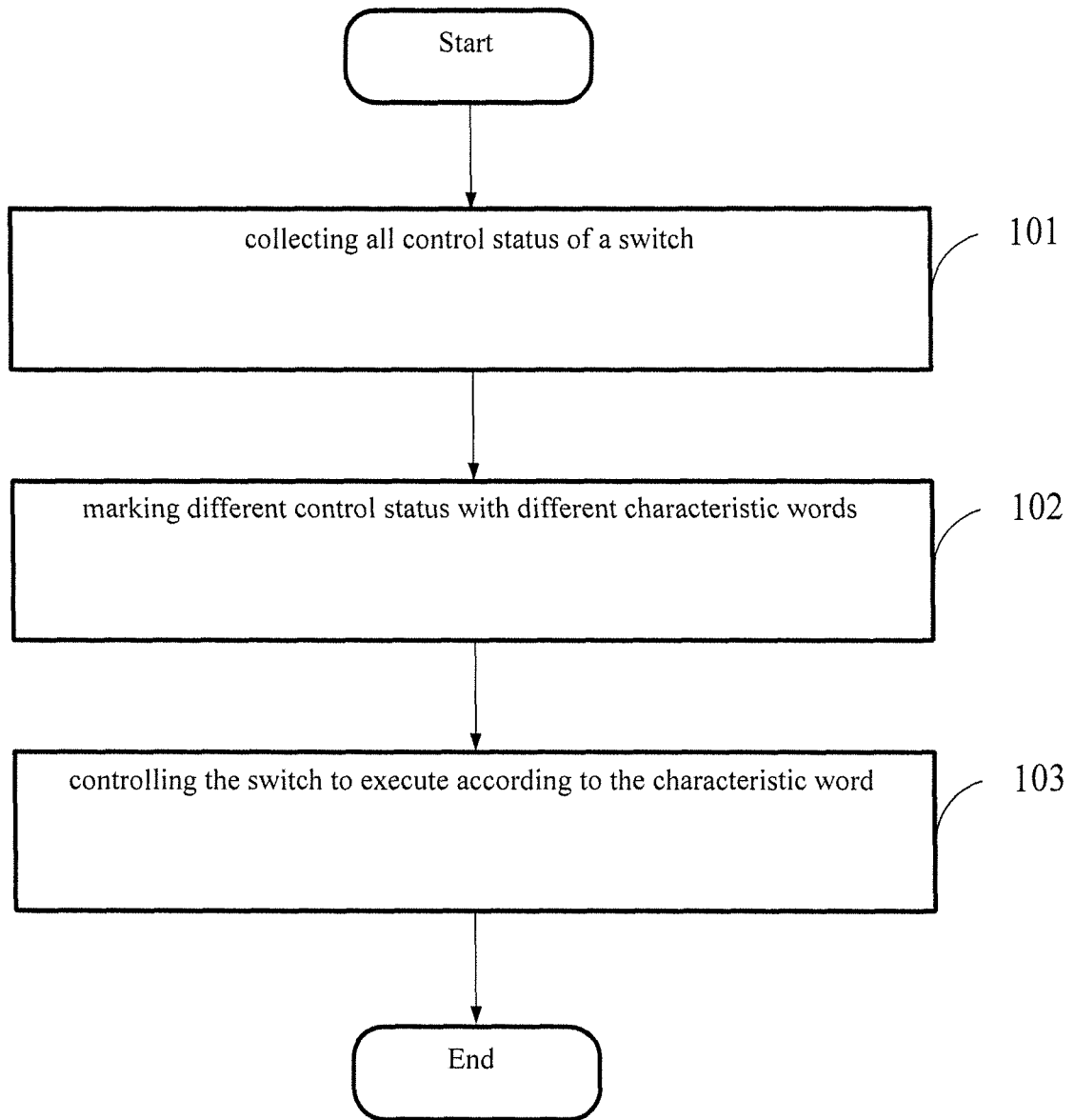


Fig. 2

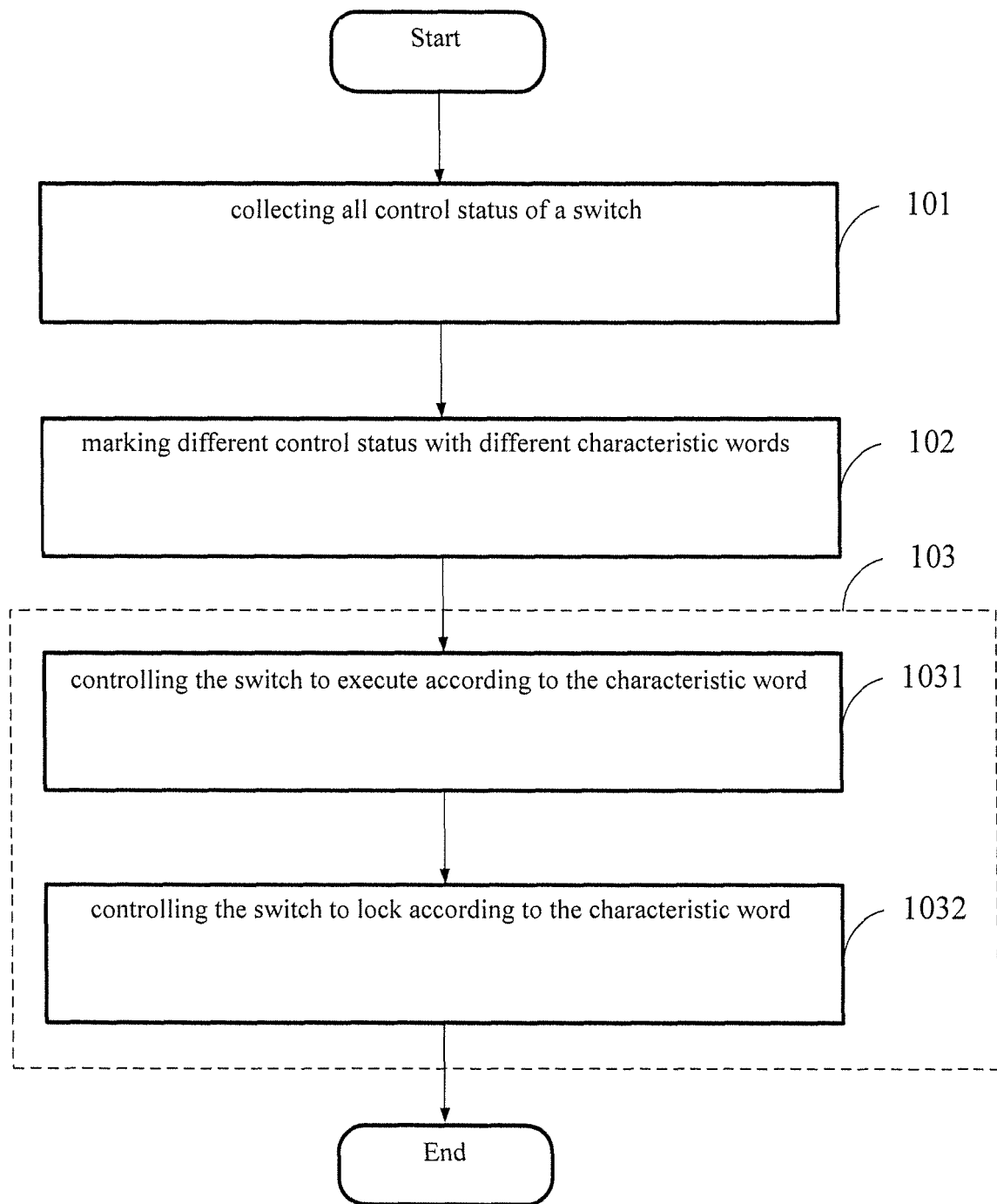


Fig. 3

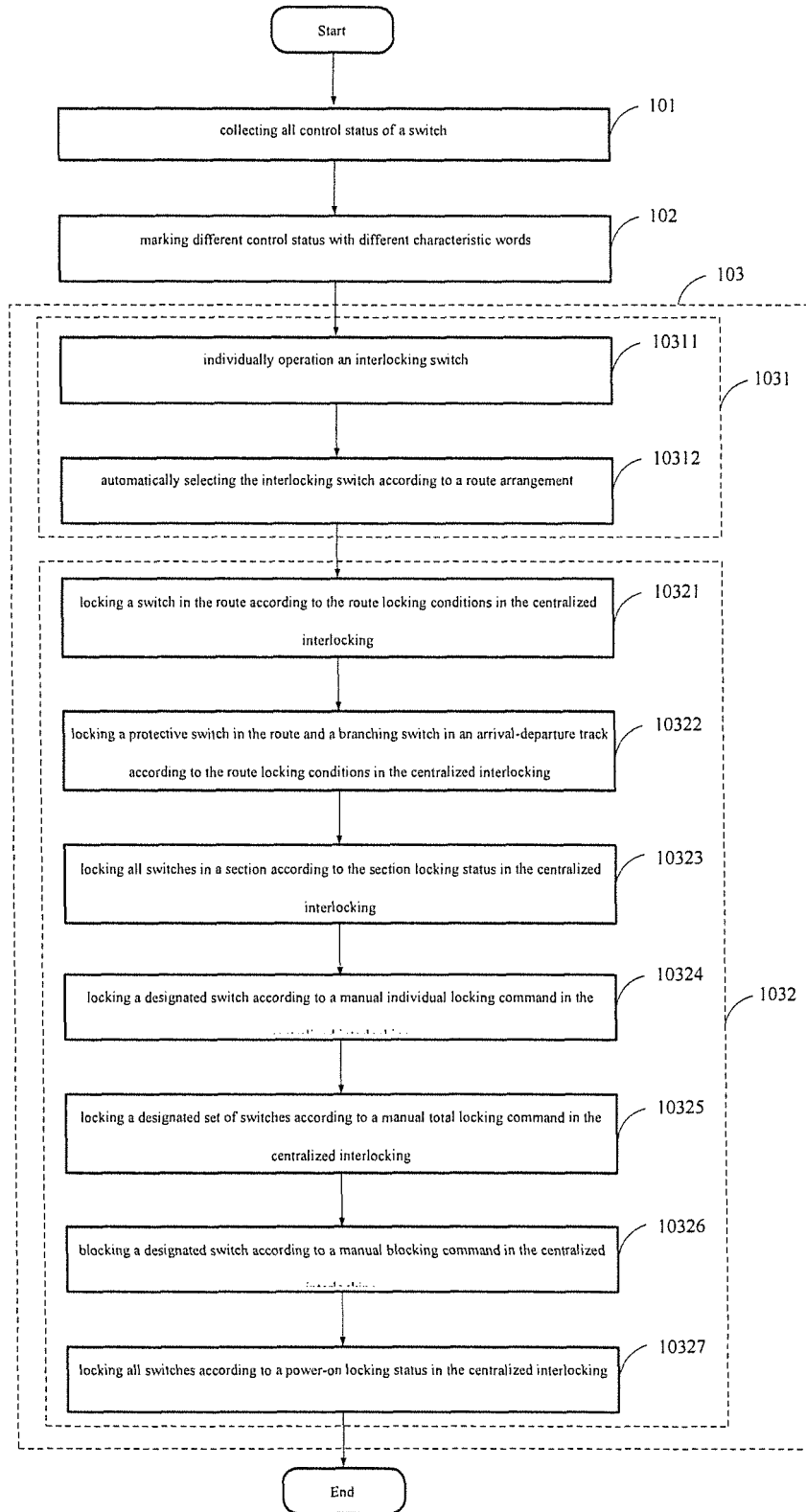


Fig. 4

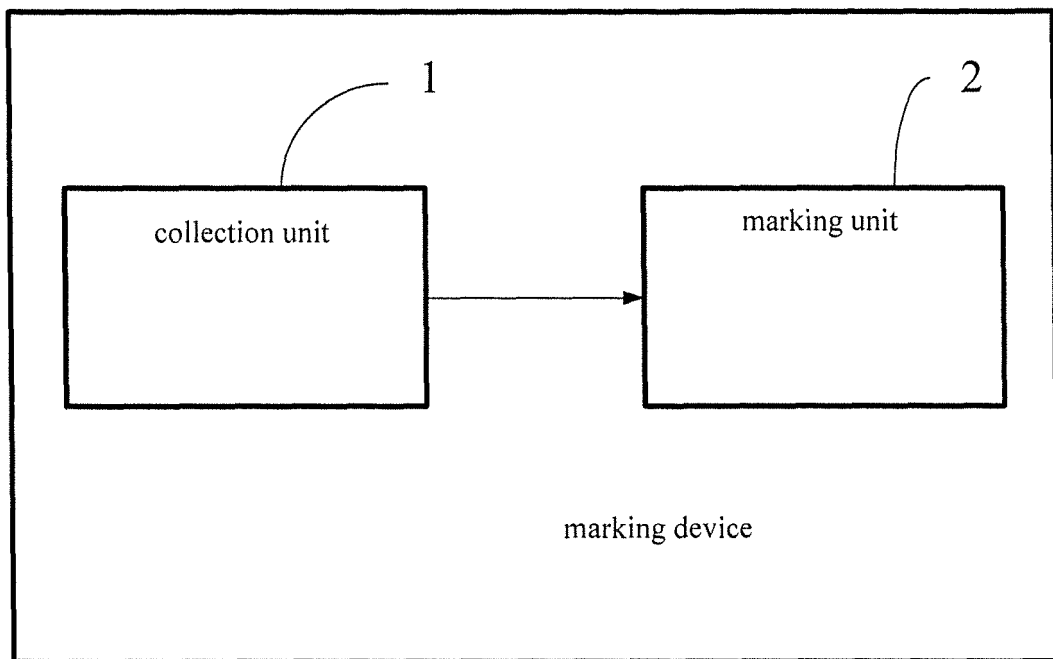


Fig. 5

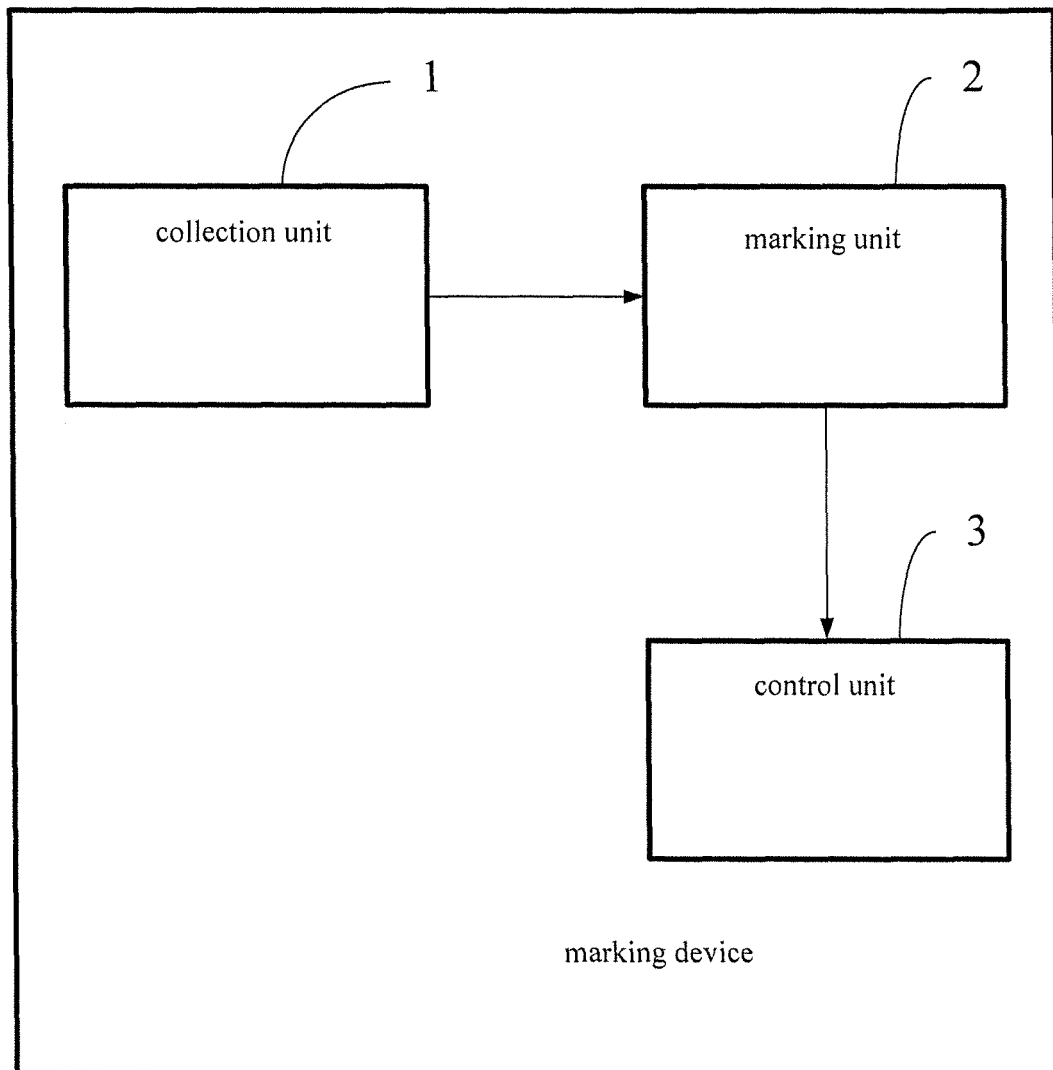


Fig. 6

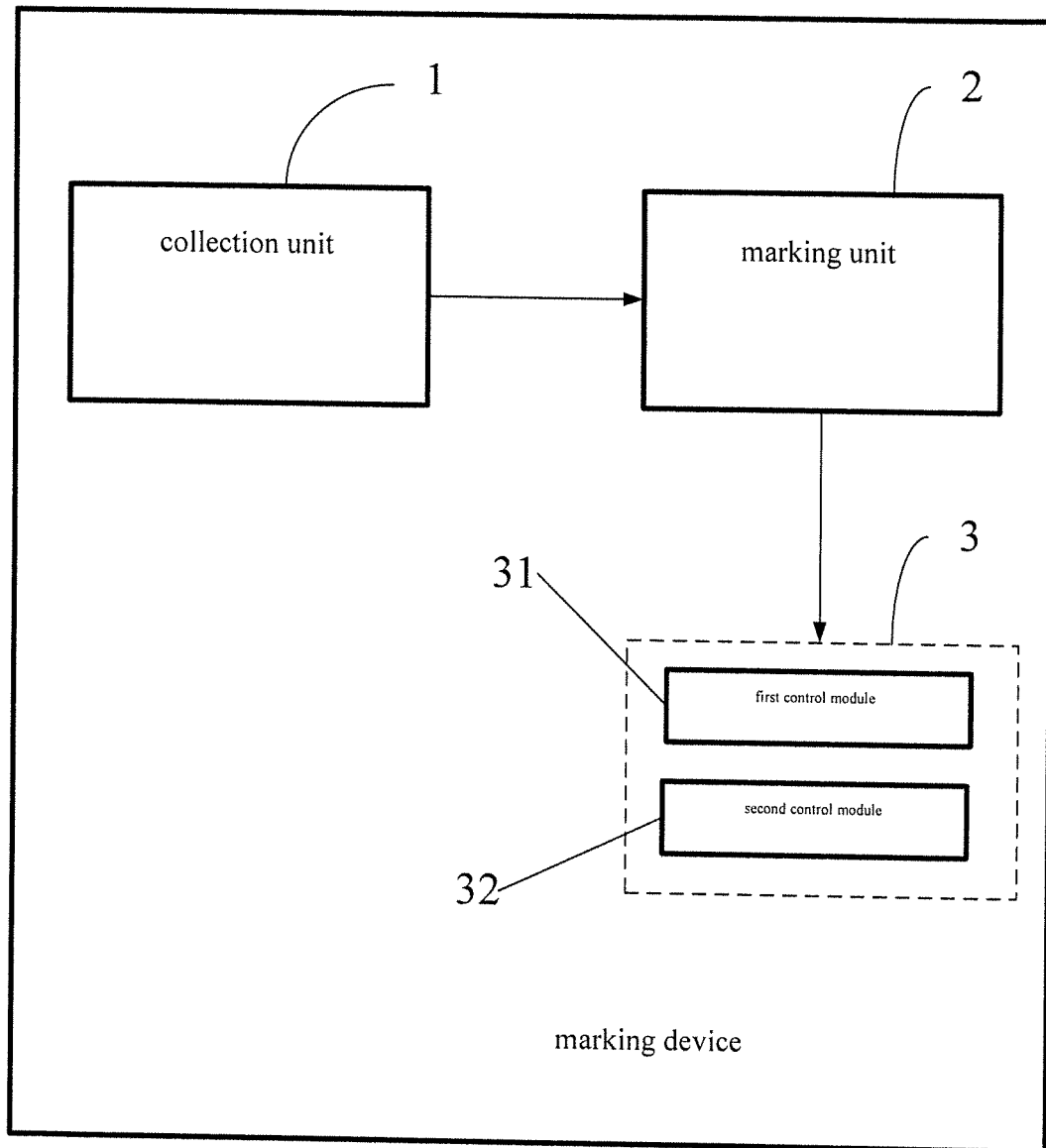


Fig. 7

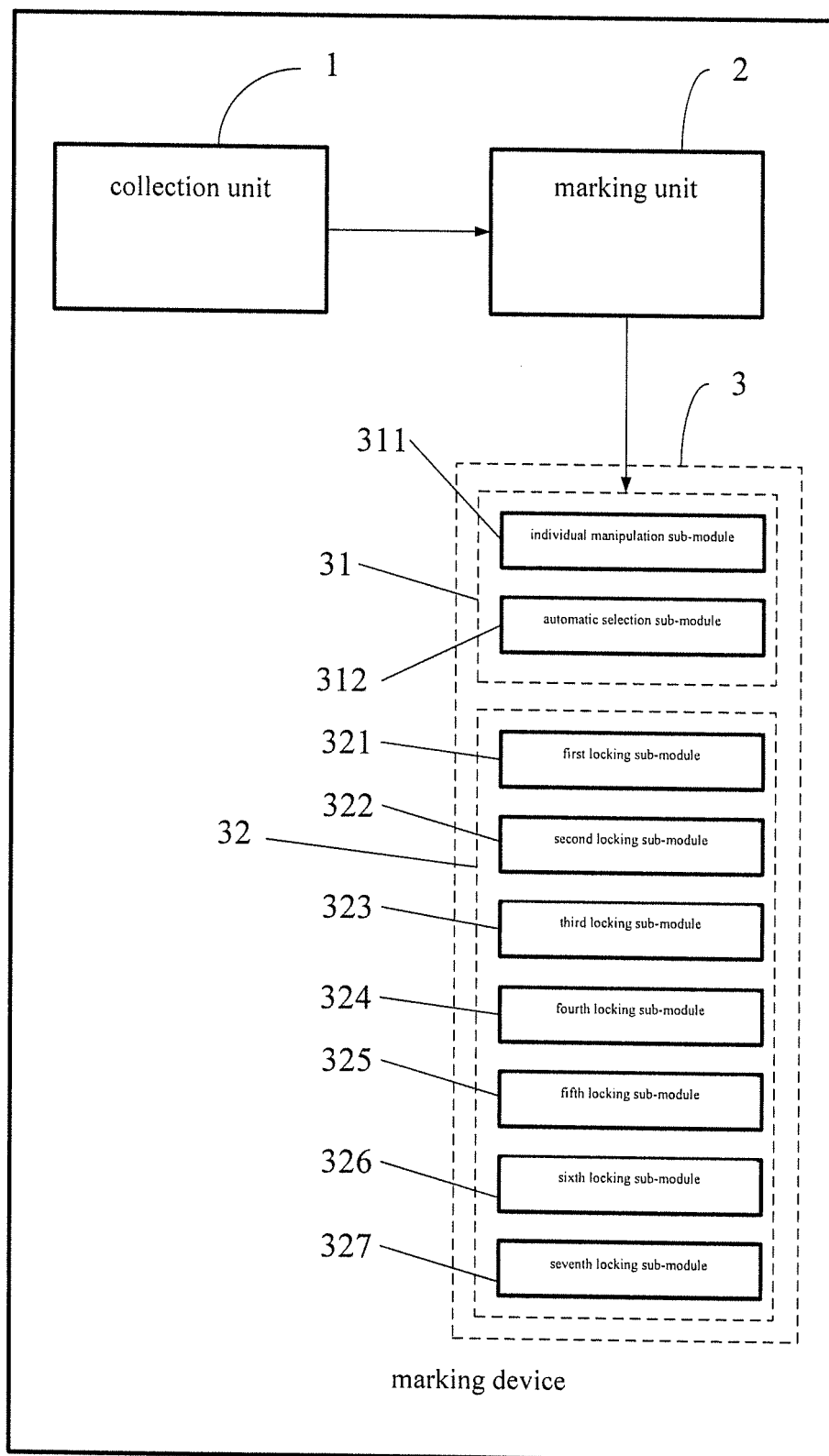


Fig. 8

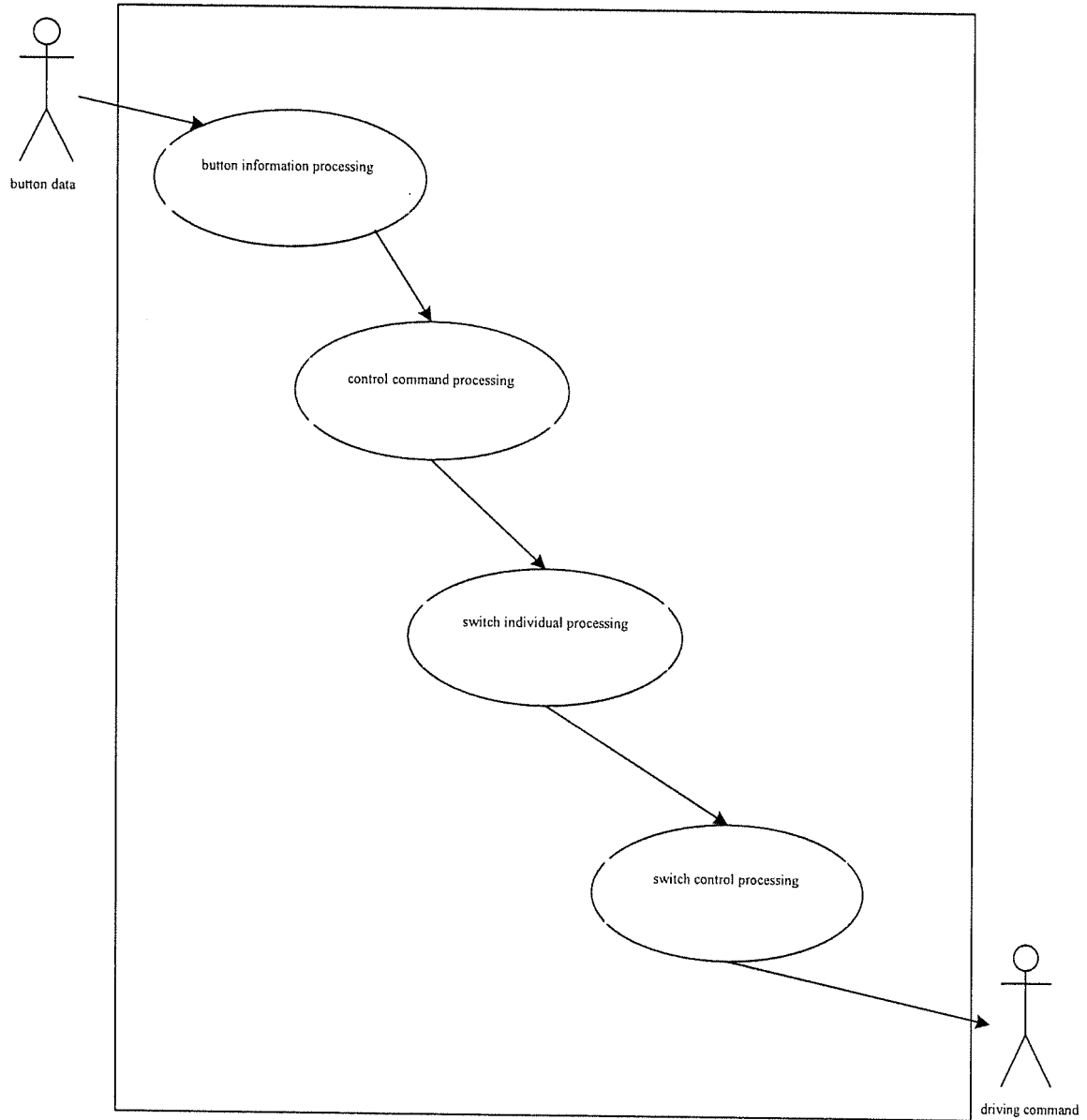


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2018/085828

A. CLASSIFICATION OF SUBJECT MATTER

B01L 5/00 (2006.01) i

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)

B01L

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

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

CNPAT, WPI, EPODOC, CNKI, IEEE: 道岔, 控制, 状态, 标记, 封锁, 锁闭, control+, sign, state, mark

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 105172841 A (PENG, Lan) 23 December 2015 (23.12.2015), description, paragraphs [0034]-[0051]	1-12
X	CN 102556120 A (BEIJING TRAFFIC CONTROL TECHNOLOGY CO., LTD.) 11 July 2012 (11.07.2012), description, paragraphs [0007]-[0029]	1-12
A	CN 104260757 A (BEIJING RAILWAY ADMINISTRATION et al.) 07 January 2015 (07.01.2015), entire document	1-12
PX	CN 107914734 A (BEIJING NATIONAL RAILWAY RESEARCH & DESIGN INSTITUTE OF SIGNAL & COMMUNICATION CO., LTD.) 17 April 2018 (17.04.2018), claims 1-16	1-12

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT
Information on patent family membersInternational application No.
PCT/CN2018/085828

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 105172841 A	23 December 2015	None	
CN 102556120 A	11 July 2012	None	
CN 104260757 A	07 January 2015	None	
CN 107914734 A	17 April 2018	None	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 201711001776 [0001]