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(54) **A method for providing control of the component devices of an electromechanical locking system**

Verfahren zur Bestandteilssteuerung eines elektromechanischen Schlosssystems

Procédé de commande des éléments d'un système de verrouillage électromécanique

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(56) References cited:  
**DE-A- 4 026 439** **US-A- 4 727 369**

- **NEW ELECTRONICS. INCORPORATING**  
**ELECTRONICS TODAY** vol. 18, no. 2, 1 January  
**1984, LONDON GB pages 40 - 46 GONZALES**  
**'data security techniques using on-chip**  
**eeeproms'**

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## Description

[0001] The invention relates to a method according to the preamble of claim 1 for providing control of the component devices of an electromechanical locking system including at least a plurality of electromechanically controlled locking units.

[0002] Electromechanical locking and monitoring systems for a plurality of doors or other objects requiring to be locked are known in which each locking unit is separately connected via a cable to a central control unit, from which the basic programming of the system, as well as the subsequent continuous control of the locking units, is effected. Installation of a system of this kind is laborious and costly due to the considerable cable installing work and switching work required. Initial programming of the individual devices in the system and reprogramming when subsequent changes thereto are required is accomplished one by one from the central control unit, which is time consuming and increases the degree of communications needed.

[0003] One problem is the need to provide special systems for particular clients who require non-conventional locking units, because any change in the operating mode of a standard lock has to be made either by changing the electronic unit or the program in the processor unit, both of which are laborious and costly operations.

[0004] A further problem in known cabled locking systems is posed by possible defects in the security of the electric control of the locking units.

[0005] US-A-4727369 discloses an electronic security system having a multi-tiered distributed architecture in which passwords and codes can be entered via a master controller coupled to decision-making subcontrollers. Each subcontroller controls a plurality of terminal controllers which can verify codes identifying individual users of the system.

[0006] One aim of the present invention is to provide a novel way of providing control for electromechanical locking systems, from which the drawbacks mentioned above have at least been reduced and preferably have essentially been eliminated. A further aim is to develop the control system so that it becomes possible to provide a system which is constructionally uncomplicated and cost effective as to its installation and maintenance. In addition a still further aim is to improve the security of the electric control of the locking system and the possibility of flexibly modifying the operation of the component devices in the system to correspond to the circumstances applicable in each case.

[0007] The aims of the invention can be met with the method featured in the following claim 1 and its dependent subclaims. In accordance with the invention a message is transmitted through the data transmission bus to all the component devices in the system and is provided with an identifier for the transmitting locking unit or device in question. At least one (and preferably all)

of the attachment units is provided with a control data register, into which identification data is fed relating to those devices, which are authorised to control the locking unit or device attached to the attachment unit in each case. In this way identification of the message and execution of the operations implied by the message is determined in each attachment unit on the basis of the identifier of said transmitting device and control data preprogrammed in the control data register. Thus each component device in the locking system can simultaneously be in connection with all the other locking units and devices in the system, which simplifies the structure of the system and the data transmission. Future changes in the locking system can easily be accomplished by changing the programming of the attachment units.

[0008] Security for its part is improved by the fact that as an identifying address in the control messages to be transmitted through the data transmission bus is the identifier or identification data of the device sending the message, whereby those component devices for which the message is directed need not be named separately. When the execution of the operations implied by the message is determined on the basis of control data to be preprogrammed in each attachment unit, the operations to be accomplished can be encrypted in a code form in the messages passed through the data transmission bus.

[0009] In practice each attachment unit is also provided with an operating data register, into which different operating data for the locking unit or device attached to that attachment unit are supplied. Then a control command for accomplishing the operation of a component device in the locking system can be formed in the attachment unit so that on the basis of the received message and the data in the control data register it is first determined, which part of the operating data register is to be utilised. Thereafter the control is provided on the basis of both the data in the operating data register and the data to be provided by indicator means, e.g. limit switches, in the locking unit or device and indicating the state of the device in each case.

[0010] The method of the invention includes the use of a known form of programming device, for instance a portable micro computer, which is connected to said transmission bus for accomplishing programming of said registers. Each attachment unit can be separately programmed, but by arranging the programming device to operate through the data transmission bus parameters of the entire locking system can be put into a special programming state, under which the locking units or other component devices are allowed to utilise the data transmission bus only under the control of the programming device, the programming needed by the separate devices can be accomplished through any of the attachment units connected in the system. In accordance with the invention it is thus possible to flexibly accomplish all the programming required by the installation and to allow for possible subsequent changes of the system with-

out the need to provide the system with a separate central unit to be continuously fixed thereto.

**[0011]** The invention will now be further described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows the basic components of an attachment unit included in a locking system operating according to the method of the invention and by means of which component devices in the locking system are connected to a data transmission bus,

Figure 2 shows the principles of transmission and reception of a message through a data transmission bus in accordance with the method of the invention, and

Figure 3 illustrates how a programming device can be used to program a component device included in the locking system.

**[0012]** With reference to the drawings, in a locking system according to the invention all the operating devices 6 of the system, for instance electromechanically-operated locking units, control units, control panels, or registration devices, are connected to each other by means of a common data transmission bus 8 by making use of attachment units, the elements of which are shown in Figure 1.

**[0013]** Connection to the data transmission bus 8 takes place by means of a transmitter/receiver circuit 1, which is of a kind in which a received signal shows the state of the bus even when the device itself is transmitting, in other words the receiving mode is continuously on. A timer/counter circuit 2 is used for timing reception and transmission operations and for computing values for desired delays. A RAM memory circuit 3 is used as a data buffer, into which the actual operational data part in a received message is supplied.

**[0014]** An EEPROM memory circuit 4 is provided with a control data register, into which data is fed about those devices which are authorised to exert control over the operating device 6 attached to the attachment unit in question. The memory circuit 4 also includes an operating data register, into which is fed different operating data for the locking unit or other operating device 6 attached to the attachment unit in question. In addition identification data, for example, a password or encryption data for the operating device 6 is stored in the memory circuit 4.

**[0015]** A processing unit 5 controls the data transmission bus operations and the operations of the associated operating device 6. "INPUT" in Figure 1 refers to the operational limits for the operating device 6 itself or the signals from limit switches connected to the device and indicating its state and operation in each case. When the device 6 is a locking device the limit switches indicate for instance different positions and states of oper-

ation for a lock bolt. "OUTPUT" in Figure 1 indicates the role of the unit 5 in controlling the operation of the operating device 6, for instance its relays or an electric motor operating the lock bolt.

**[0016]** Figure 2 shows in principle how the transmission, reception and processing of a message 7 occurs. As will be clear from the foregoing, all these operations take place through the attachment unit in each device. A message 7 can be associated with control, supervision or registration of data of the component devices depending on the application and the device. In Figure 2 a first operating device 6a (Device 1) transmits a message 7 into a data transmission bus 8. The message 7 includes a data checking part 7a, an operating data part or data part 7b, an identifier part 7c for the sending device itself and a part 7d indicating the type of the message. The device 6a transmits its message 7 when there is a change in its input or after a certain time has elapsed from a previous transmission. The message 7 is sent via the data transmission bus 8 to all the other devices 6b, 6c ... etc. attached to the data transmission bus 8. Those of the devices 6b (Device 2), 6c (Device 3) ... etc., which need the message 7, start processing it further in phase 1. In each of these devices the message 7 and the identification data of the various devices 6 that are authorised to the act on the message in question have been stored in the control data register in the EEPROM memory circuit 4 of the attachment unit for the device in question. If desired the identification data can be arranged as a special address list 9 in the EEPROM circuit 4 for speeding up and simplifying the operation.

**[0017]** In the reception phase, the data checking part 7a of the message 7 is first checked against the identification data of the device 6 and in case of a correct match, the data part 7b of the message 7 is fed into a STATES buffer in the RAM memory circuit 3. This buffer includes the data parts 7b of the messages from all the other devices in the system needed by the receiving device 6 in question.

**[0018]** In phase 2 of device 6b a control command is formed in accordance with the control data register in the EEPROM memory circuit 4 and the data part 7b of the message stored in the RAM memory circuit 3. The control command determines which part of the operation data register in the EEPROM memory circuit 4 is to be utilised.

**[0019]** In phase 3 an OUTPUT control command is formed for the device 6 on the basis of its own INPUT state and the operation data register in the EEPROM memory circuit 4. Forming of the commands on the level of bits can be accomplished in a way known as such and will not be described more fully here.

**[0020]** Figure 3 shows the attachment of a programming device 10 to a data transmission bus 8 for programming one or more devices 6 in the system. The means needed for this purpose are generally known and are indicated by the reference number 11. The programming device 10 can be a fixed part of the system but it

can, as well, be attached to an established system only when needed. The various devices 6 in the locking system can be programmed either one by one or several at a time, for instance according to the type of the devices used.

**[0021]** First the programming device 10 changes all the devices 6 in the system so that they are all in a programming state, whereby each is allowed to use the data transmission bus 8 only when the programming device 10 allows it. The device 6 to be programmed is determined by a message, which includes the identification data for the device in question and its password, possibly in encrypted form (phase 1). The programming can relate to the EEPROM memory circuit 4 of the device or the device can be, for instance, commanded to transmit the data in its EEPROM memory circuit into the programming device (phases 2 and 3).

**[0022]** This kind of system is advantageous and flexible i.a. due to the fact that its basic elements, the different locking units and the possible control or supervising devices therefor, as well as the principles for forming the system can remain the same, whereby the need for modification and changes for different applications can be taken account of simply through programming. Flexibility is increased by the fact that programming of the different devices can be accomplished through the respective attachment unit, and a separate portable programming device like a micro computer can be used for the purpose.

**[0023]** The invention is not limited to the embodiment illustrated since several modifications thereof are feasible within the scope of the following claims.

#### Claims

1. A method for providing control of a plurality of component devices (6) of an electromechanical locking system, said devices (6) including at least some of a plurality of electromechanical locking units, control means and registration means, which devices (6) are connected by means of a programmable attachment unit (1, 2, 3, 4, 5) to a common data transmission bus (8), whereby the attachment unit transmits, receives and processes messages, especially control commands, **characterised in that** for control of any specific one of said plurality of component devices (6) a message (7) is transmitted through the data transmission bus (8) to all the devices (6) in the system, said message being provided with an identifier part (7c) uniquely associated with the transmitting one of said plurality of devices (6), in that each attachment unit (1, 2, 3, 4, 5) is provided with a control data register, into which identification data of each device (6), which is authorised to control a component device (6) attached to the attachment unit in each case, is stored, whereby identification of the message (7) and execution of the op-

erations implied by the message is determined in each attachment unit (1, 2, 3, 4, 5) on the basis of the identifier part (7c) of the transmitting message and control data preprogrammed in the control data register.

2. A method according to claim 1, **characterised in that** at least one attachment unit (1, 2, 3, 4, 5) is provided with an operating data register, into which is fed operating data specific to the component device (6) attached to the attachment unit in question.
3. A method according to either of the preceding claims, **characterised in that** a control command for accomplishing the operation of a component device (6) in the locking system is formed in the respective attachment unit (1, 2, 3, 4, 5) so that on the basis of the received message (7) and the data in the control data register it is initially determined which part of the operating data register is to be utilised, whereby control is exercised on the basis of both the data in the operating data register and data provided by an indicator means in the component device (6) which indicates the state of the device (6).
4. A method according to claim 3, **characterised in that** the indicator means is at least one limit switch.
5. A method according to any one of the preceding claims, **characterised in that** the locking system includes a programming device (10) which is connected to at least one attachment unit (1, 2, 3, 4, 5) for accomplishing programming of the control data register thereof.
6. A method according to claim 5, **characterised in that** the programming device (10) is a portable micro computer.
7. A method according to claim 5 or claim 6, **characterised in that** the programming device (10), acting via the data transmission bus (8), modifies the entire locking system to adopt a special programming state under which the component devices (6) are allowed to utilise the data transmission bus (8) only under the control of the programming device (10).

#### Patentansprüche

1. Verfahren zur Steuerung einer Mehrzahl von Bestandteilen (6) eines elektromechanischen Schloßsystems, wobei die Bestandteile (6) mindestens einige aus einer Mehrzahl von elektromechanischen Schloßeinheiten, Steuervorrichtungen, und Registrierungsvorrichtungen enthalten und mittels einer programmierbaren Anschlußeinheit

(1, 2, 3, 4, 5) an einen gemeinsamen Datenübertragungs-Bus (8) angeschlossen sind, wobei die Anschlußeinheit Nachrichten, insbesondere Steuerbefehle, überträgt, empfängt und verarbeitet, dadurch gekennzeichnet, das zur Steuerung jedes speziellen Einzelnen aus der Mehrzahl der Bestandteile (6) eine Nachricht (7) durch den Datenübertragungs-Bus (8) an alle Bestandteile (6) in dem System übertragen wird, wobei die Nachricht mit einem Identifizierer-Teil (7c) versehen ist, der eindeutig mit dem Übertragungsbestandteil aus der Mehrzahl der Bestandteile (6) gekoppelt ist, und daß jede Anschlußeinheit (1, 2, 3, 4, 5) mit einem Steuerdatenregister versehen ist, in das Identifizierungsdaten von jedem Bestandteil (6) eingespeichert werden, der zur Steuerung eines Bestandteils (6) autorisiert ist und an die Anschlußeinheit in jedem Fall angeschlossen ist, wobei die Identifizierung der Nachricht (7) und die Ausführung der durch die Nachricht mit einbezogenen Operationen in jeder Anschlußeinheit (1, 2, 3, 4, 5) auf der Grundlage des Identifizierer-Teils (7c) der Übertragungsnachricht und den in dem Steuerdatenregister vorprogrammierten Steuerdaten bestimmt werden.

2. Verfahren gemäß Anspruch 1, dadurch gekennzeichnet, daß mindestens eine Anschlußeinheit (1, 2, 3, 4, 5) mit einem Betriebsdatenregister versehen ist, in das Betriebsdaten speziell für den an die Anschlußeinheit angeschlossenen Bestandteil (6) gegeben werden.
3. Verfahren gemäß einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß ein Steuerbefehl zum Ausführen der Operation eines Bestandteils (6) in dem Schloßsystem in der jeweiligen Anschlußeinheit (1, 2, 3, 4, 5) gebildet wird, so daß auf der Grundlage der empfangenen Nachricht (7) und den Daten in dem Steuerdatenregister zu Beginn bestimmt wird, welcher Teil des Betriebsdatenregisters zu verwenden ist, wobei die Steuerung auf der Grundlage sowohl der Daten in dem Betriebsdatenregister als auch den durch eine Anzeigevorrichtung in dem Bestandteil (6) gelieferten Daten ausgeübt wird, die den Zustand des Bestandteils (6) aufzeigen.
4. Verfahren gemäß Anspruch 3, dadurch gekennzeichnet, daß die Anzeigevorrichtung zumindest ein Begrenzungsschalter ist.
5. Verfahren gemäß einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß das Schloßsystem eine Programmierungsvorrichtung (10) enthält, die an mindestens eine Anschlußeinheit (1, 2, 3, 4, 5)

zum Ausführen der Programmierung des diesbezüglichen Steuerdatenregisters angeschlossen ist.

6. Verfahren gemäß Anspruch 5, dadurch gekennzeichnet, daß die Programmierungsvorrichtung (10) ein tragbarer Mikrocomputer ist.
7. Verfahren gemäß Anspruch 5 oder 6, dadurch gekennzeichnet, daß die über den Datenübertragungs-Bus (8) wirkende Programmierungsvorrichtung (10) das gesamte Schloßsystem modifiziert, um einen bestimmten Programmierzustand anzunehmen, unter dem die Bestandteile (6) den Datenübertragungs-Bus (8) nur unter der Kontrolle der Programmierungsvorrichtung (10) nutzen können.

## Revendications

1. Procédé de commande d'une pluralité de dispositifs constitutifs (6) d'un système de verrouillage électromécanique, lesdits dispositifs (6) comprenant au moins certains parmi une pluralité d'unités de verrouillage électromécaniques, de moyens de commande et de moyens d'enregistrement, lesquels dispositifs (6) sont reliés au moyen d'une unité de raccordement programmable (1, 2, 3, 4, 5) à un bus de transmission de données commun (8), grâce à quoi l'unité de raccordement émet, reçoit et traite des messages, en particulier des instructions de commande, caractérisé en ce que pour la commande d'un dispositif particulier quelconque de ladite pluralité de dispositifs constitutifs (6) un message (7) est émis par l'intermédiaire du bus de transmission de données (8) vers tous les dispositifs (6) du système, ledit message étant muni d'une partie d'identificateur (7c) associée de façon unique au dispositif en cours d'émission parmi ladite pluralité de dispositifs (6), en ce que chaque unité de raccordement (1, 2, 3, 4, 5) est pourvue d'un registre de données de commande, dans lequel les données d'identification de chaque dispositif (6) qui est autorisé à commander un dispositif constitutif (6) raccordé à l'unité de raccordement dans chaque cas, sont mémorisées, grâce à quoi l'identification du message (7) et l'exécution des opérations impliquées par le message sont définies dans chaque unité de raccordement (1, 2, 3, 4, 5) sur la base de la partie d'identificateur (7c) du message en cours de transmission et des données de commande programmées au préalable dans le registre de données de commande.
2. Procédé selon la revendication 1, caractérisé en ce qu'au moins une unité de raccordement (1, 2, 3, 4, 5) est pourvue d'un registre de données de fonc-

tionnement, dans lequel sont entrées des données de fonctionnement particulières au dispositif constitutif (6) raccordé à l'unité de raccordement concernée.

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3. Procédé selon l'une quelconque des revendications précédentes, caractérisé en ce qu'une instruction de commande destinée à l'obtention du fonctionnement d'un dispositif constitutif (6) se trouvant dans le système de verrouillage est élaborée dans l'unité de raccordement respective (1, 2, 3, 4, 5) de sorte que sur la base du message reçu (7) et des données se trouvant dans le registre des données de commande il est déterminé initialement quelle partie du registre de données de fonctionnement doit être utilisée, grâce à quoi une commande est exercée sur la base à la fois des données se trouvant dans le registre de données de fonctionnement et des données fournies par un moyen d'indicateur se trouvant dans le dispositif constitutif (6) qui indiquent l'état du dispositif (6). 10 15 20
4. Procédé selon la revendication 3, caractérisé en ce que le moyen d'indicateur est au moins un contacteur de fin de course. 25
5. Procédé selon l'une quelconque des revendications précédentes, caractérisé en ce que le système de verrouillage comprend un dispositif de programmation (10) qui est relié à au moins une unité de raccordement (1, 2, 3, 4, 5) afin de réaliser la programmation du registre des données de commande de celle-ci. 30
6. Procédé selon la revendication 5, caractérisé en ce que le dispositif de programmation (10) est un micro-ordinateur portable. 35
7. Procédé selon la revendication 5 ou la revendication 6, caractérisé en ce que le dispositif de programmation (10), agissant par l'intermédiaire du bus de transmission de données (8), modifie tout le système de verrouillage afin d'adopter un état de programmation spécial sous lequel les dispositifs constitutifs (6) peuvent utiliser le bus de transmission de données (8) uniquement sous la commande du dispositif de programmation (10). 40 45

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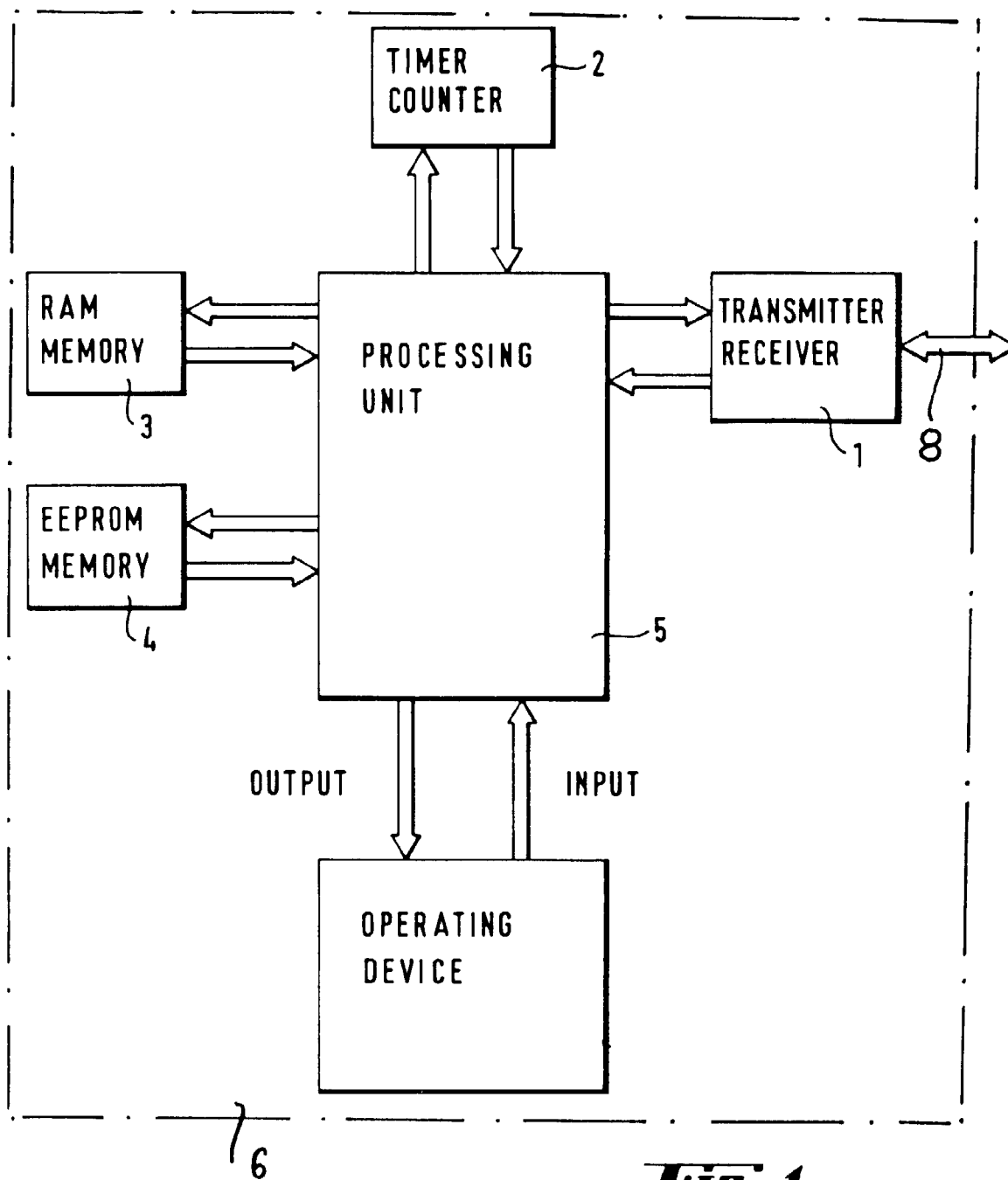
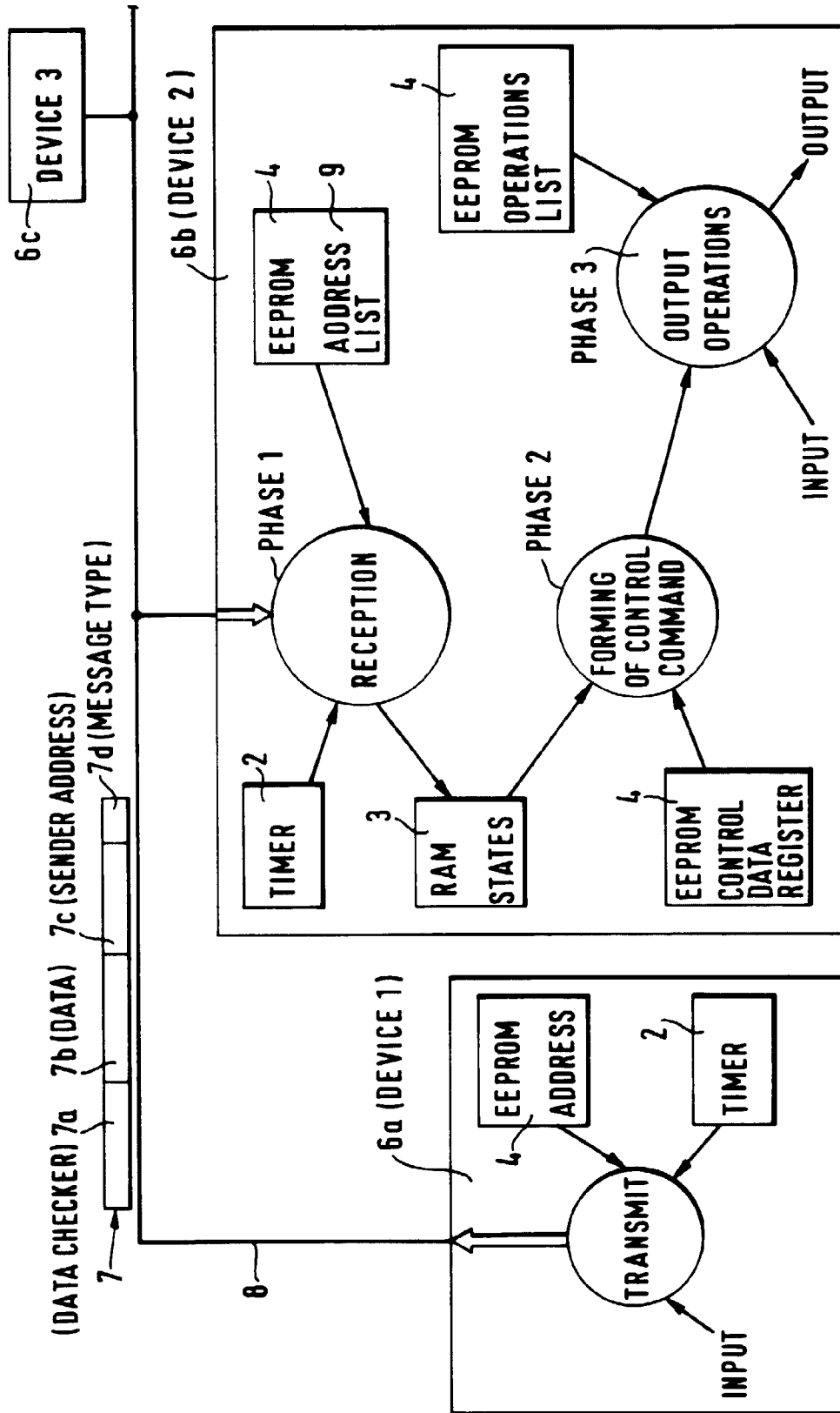


**Fig: 1**

**Fig. 2**

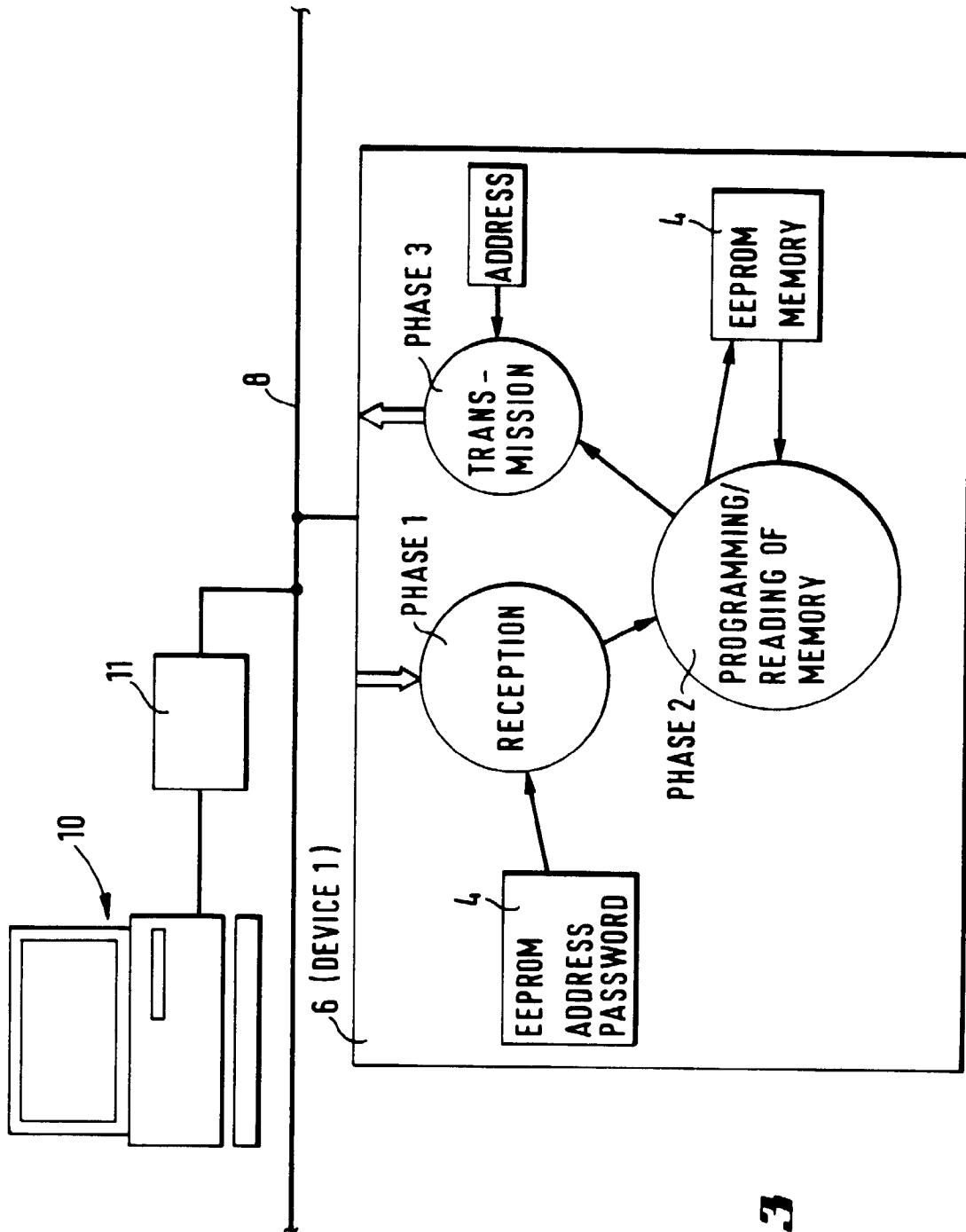


**Fig. 3**