

WO 91/07056

REPLACED SHEETS		SG
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PCT/EP90/01845

Process and device for activating a chip card

The invention relates to a process for activating a chip card according to the precharacterizing clause of the main claim, and to a preferred device, suitable for carrying out the process according to the invention, according to the precharacterizing clause of the first device claim.

A card with an integrated circuit with contacts or "chip card" usually has a rectangular form and has at a fixed location an integrated circuit with contacts on the surface. Such a device has many applications: cheque or credit card, telephone, pay-TV etc.

Such a card enables its owner to access a service or to operate an apparatus. It is considered in particular for use for a pay-TV system, in which the encoded television signal is received by a decoding device, which recreates a decoded signal if this device is connected to a chip card which contains the authorization information. The device for receiving and decoding the signals is intended for the information exchange with the circuit of the card to check whether the owner has the authorization to receive the broadcast. This information exchange is intended to receive the broadcast. This information exchange [sic] or dialogue takes place via an interface circuit. The latter includes, in particular, a programming d.c. voltage generator, to write information permanently to the integrated circuit.

There are various types of chip cards and one programming voltage corresponds to each type.

The invention is based on the object of providing a reliable process for activating a chip card and a device which is easy to realise and can be used as part of an apparatus which is ensured of being fully functional only in connection with an active chip card.

According to the invention, a control unit of the apparatus, for example a decoding device, receives from a control unit of a chip card brought into connection with the apparatus a signal which determines the value of



an activation voltage. On the basis of the said signal, the control unit of the apparatus actuates other stages, which supply the requisite activation voltage to the chip card. The activation voltage with the desired voltage value makes it possible for the chip card to be able to be used for further steps, for example for the decoding of information.

A refinement of the invention defines the time sequence for the applying of supply voltages to the said control units.

Thus, the control unit present in the apparatus is supplied with a necessary first supply voltage immediately after switching on the apparatus. If the presence of a chip card is detected, the control system of the latter is supplied with a second supply voltage, which is delayed with respect to the first supply voltage.

A preferred refinement of the device according to the invention includes a d.c. voltage generator, which generates the requisite activation voltage for the chip card in a simple way.

This is characterized in that it includes a generator for a controlled voltage, followed by a resistive voltage divider, which has resistors connected in parallel in a branch, of which at least one is connected in series with a switch which is actuated in dependence on the d.c. voltage to be supplied.

The voltage made available by the voltage divider can be used directly for activating the card.

In an advantageous embodiment, however, the output voltage of the voltage divider represents a set voltage, which controls a control loop, for example with a ballast transistor, which supplies current of sufficient intensity to the programming.

Other measures and advantages of the invention are emphasised by the description of a number of exemplary embodiments thereof, which makes reference to the drawing, in which:

Fig. 1 shows a preferred exemplary embodiment of the device according to the invention,



Fig. 2 shows the flow diagram of a preferred exemplary embodiment of the process according to the invention and

Fig. 3 shows a preferred exemplary embodiment of an activation d.c. voltage generator.

Before going into more detail concerning the description of the exemplary embodiment, it should be pointed out that the blocks represented individually in the figures serve merely for a better understanding of the invention. Usually, individual or a number of these blocks are combined to form units. These may be realized by integrated or hybrid technology or as program-controlled microcomputers, or as part of a program suitable for controlling the latter.

Furthermore, it should be pointed out that the devices and elements included in the individual stages may also be configured separately.

Fig. 1 shows a first d.c. voltage controller 1, to which a first uncontrolled d.c. voltage V_{p1} is fed and which feeds a first controlled d.c. voltage VMB to a first electronic control unit 2 (Electronic Control Unit ECU1), which is assigned to an apparatus, for example to a decoding device.

Furthermore, there is provided a second d.c. voltage controller 3, to which a second uncontrolled d.c. voltage V_{p2} is fed and which supplies a second controlled d.c. voltage V_{cc} to a second electronic control unit 4 (ECU2), which is assigned to a chip card (not shown). For carrying out decoding operations, this chip card must be brought into direct or indirect connection with the apparatus.

A d.c. voltage generator 5 receives a third uncontrolled d.c. voltage V_{p3} and supplies a third controlled d.c. voltage V_{pp} , also referred to in the following as the programming d.c. voltage, to the second electronic control unit 4.

The first electronic control unit 2 contains [sic] on the one hand a signal CP, which assumes the value 1 when the connection between the chip card and the



apparatus is established, and on the other hand an activation signal from the second electronic control unit 4.

5 The first electronic control unit supplies a first control signal CMDVcc to the second voltage controller 3, a second control signal CMDVpp and a third control signal CMMDVppn to the d.c. voltage generator 5 and also a further signal to the second electronic control unit 4.

10 The function of the preferred exemplary embodiment according to Fig. 1 of the device according to the invention is now explained with the aid of the process according to the invention, the flow diagram of which is represented in Fig. 2.

15 The process starts with step 100, in which the apparatus is switched on and there are applied the uncontrolled voltages Vp, correspondingly, Vp1, Vp2, Vp3. The first voltage controller 1 generates in step 101 the controlled d.c. voltage VMB, whereby the first electronic control unit 2 is switched on.

20 Only after the latter is in operation, i.e. in the case of a microprocessor, for example, that first of all a so-called RESET routine has to be carried out, does a step 102 follow, in which it is checked whether an encoded broadcast is being received.

25 Once it has been established in step 103 that a connection between the chip card and the apparatus has been made (CP=1), in step 104 the control signal CMDVcc is supplied to the second voltage controller 3. The latter thereupon generates the controlled d.c. voltage Vcc, whereby the second electronic control unit 4 is switched on (step 104a). By the control signal CMDVpp, which is supplied by the first electronic control device 2 in step 105 to the d.c. voltage generator, the latter supplies in step 105a the voltage Vpp with a fixed value, in this example with 5 volts.

35 The second electronic control unit 4 supplies in step 106 to the first electronic control unit 2 the activation signal, which contains information on the



value V_n of the programming d.c. voltage V_{pp} required for activation.

On the basis of the activation signal, the first electronic control unit 2 supplies in step 107 the control signal $CMDV_{ppn}$ to the d.c. voltage generator 5, which thereupon switches on the d.c. voltage V_{pp} with the desired value V_n , which is fed to the second electronic control device (step 108).

There subsequently follows the end of the process in step 109, which also follows directly if it is established in step 102 or step 103 that there is no encoded broadcast suitable for the system or no connection between the chip card and the apparatus (CP not equal to 1).

In versions of the device according to the invention as shown in Fig. 1, the uncontrolled d.c. voltages V_{p1} , V_{p2} , V_{p3} may be identical, so that the inputs of the voltage controllers 1, 3 and of the d.c. voltage generator 5 are connected to one another. Furthermore, it is conceivable for the voltage controller 3 to be such that the amplitude of the voltage V_{cc} rises over time.

A preferred exemplary embodiment of the d.c. voltage generator 5, which supplies the activation d.c. voltage V_{pp} , referred to in the following also as the programming voltage, with desired values is represented in Fig. 3.

It should be pointed out that the values specified for voltages and component dimensioning merely characterize a preferred exemplary embodiment, but do not restrict the invention itself to these values. The d.c. voltage generator represented in the figure comprises a d.c. voltage generator (not shown) which represents the mains supply and supplies the uncontrolled d.c. voltage V_{p3} of 30 volts via a terminal 11. The latter is connected to the output terminal 12 via an on/off switch 13, which can be actuated by the control signal $CMDV_{pp}$, a current limiter 14 and a ballast transistor 15 of the NPN type, the conductivity of which is controlled in such a



way that there appears at the output 12 a programming d.c. voltage V_{pp} which makes it possible to write information permanently to a chip card (not shown). The programming voltage V_{pp} can assume one of the following values: 5 volts, 12.5 volts, 15 volts and 21 volts. The accuracy of this programming voltage is $\pm 2.5\%$.

The ballast transistor 15 serves the purpose of setting the d.c. voltage at the output 12 to the selected value and of controlling this output voltage.

For this purpose, the base of this transistor 15 is connected to the output of a comparator 16, at the one input 16_1 of which there is applied via a voltage divider with the resistors 17 and 18 of the values 407 and 196 kohms, respectively, a voltage proportional to the output voltage V_{pp} . At a second input 16_2 of the comparator 16 there is applied the set value of the feedback control, which corresponds to the value desired at the output 12.

For generating the set value there is provided a controlled d.c. voltage source 19, which supplies a d.c. voltage signal of the value 12 volts. The accuracy of this value is $\pm 5\%$. This voltage is passed on via a resistor 20 of the value 470 ohms to the terminals of a Zener diode 21, which supplies a d.c. voltage of 6.8 volts with an accuracy of $\pm 2\%$.

Provided in parallel with the Zener diode 21 is a voltage divider 22 with output 23, which is connected to the input 16_2 of the comparator 16.

The voltage divider 22 includes between the terminal 23 and mass a rheostat 24 and between the terminal 23 and a conductor 25, which is connected to the cathode of the Zener diode 21, a resistor 26 of the value 6.8 kohms.

In addition, resistors 27 and 28 are connected in parallel with the resistor 26. Each of these resistors is connected in series with a switch 27_1 and 28_1 , respectively, controlled by the control signal (MDVppn).

The resistors 27 and 28 have the values 1.82 kohms and 1.37 ohms [sic], respectively. The accuracy of the value of these resistors is $\pm 1\%$.



Depending on the state (open/closed) of each of the switches 27_1 and 28_1 , the resistor between the terminal 23 and the conductor 25 has a different value. Three of the values are available: the first if the two
5 switches 27_1 and 28_1 are open, the second if the switch 27_1 is closed and the switch 28_1 is open, and the third if the switch 27_1 is open and the switch 28_1 is closed.

The controlling of the switches 27_1 and 28_1 takes place through the interface switch by means (not shown)
10 which receive from the chip card the information on the voltage required for the programming of the latter. Each switch is controlled by an output of a microactuator. It is conceivable for the switches 27_1 , 28_1 to be realized in the form of semiconductor components, such as transistors, which are correspondingly actuated.
15

The circuit operates as follows: the comparator 16 supplies the base of the transistor 15 with an error signal, which represents the difference between the actual value of the signal V_{pp} at the output 12 and the
20 set value, which is present at the input 16_2 . The value of the signal of the output 12 depends on the state of conduction of the ballast transistor 15. The ballast transistor may 15 [sic] be substituted by any other component of which the conductivity is controllable.

The circuit just described makes possible the
25 generation of three d.c. voltages with the desired accuracy ($\pm 2.5\%$) and has an extremely simple construction. By increasing the number of the resistors connected in parallel with the resistor 26, a switch being con-
30 nected to each of these additional resistors, the number of the voltage values which can be supplied to the output 12 can be increased. It is also possible to provide only two resistors, for example the resistors 26 and 27. In this case, only two possible voltage values are avail-
35 able.

The feedback control of the value of the resistor 24 makes it possible to use the advantageous range of the characteristic of the Zener diode 21.



Patent Claims

1. Process for activating a chip card which has a first control unit and, when it is connected to an apparatus which has a second control unit, makes it possible for the said apparatus to operate properly, characterized in that the first control unit supplies a signal to the second control unit, whereupon the latter actuates other stages of the apparatus, so that an activation voltage with predetermined values is made available to the chip card.
2. Process according to Claim 1, characterized in that a supply voltage for the first control unit is made available only after a predetermined time after switching on the apparatus.
3. Process according to Claim 2, characterized in that the predetermined time is determined by the time which is required in order that the second control unit is ready for operation after switching on.
4. Process according to Claim [sic] 1 to 3, characterized in that the value of the activation voltage rises over time in a manner controlled from a predetermined initial value to a predetermined final value.
5. Process according to one Claims 1 to 4, characterized in that the apparatus is designed as a decoding device and the chip card contains information, whereby an encoded video signal can be decoded after the activation voltage has been made available to the chip card.
6. Device for activating a chip card which has a first control unit (4) and, when it is connected to an apparatus which has a second control unit (2), makes it possible for the said apparatus to operate properly, characterized in that the first control unit (4) is designed in such a way that it supplies a signal to the second control unit (2), whereupon the latter actuates further stages (5) of the apparatus, which make an activation voltage (V_{pp}) with predetermined values (V_n) available to the chip card.
7. Device according to Claim 6, characterized in that there are first means (2, 3), which have the effect



that the supply voltage (Vcc) for the first control unit is made available only after a predetermined time after switching on the apparatus.

8. Device according to Claim 7, characterized in that the first means (2, 3) determine the predetermined time on the basis of the time which is required in order that the second control unit (2) is ready for operation after switching on.

9. Device according to one of Claims 6 to 8, characterized in that there are provided further means (2, 5), which control the value of the activation voltage (Vpp) over time, so that it rises from a predetermined initial value to a predetermined final value (Vn).

10. Device according to one of Claims 6 to 9, characterized in that the apparatus is designed as a decoding device and the chip card contains information, whereby an encoded video signal can be decoded after the activation voltage (Vpp) has been made available to the chip card.

11. Device according to one of Claims 6 to 10, characterized in that there is provided a d.c. voltage generator (5) which can be actuated by the second control unit (2), comprises a voltage divider (22) with resistors (24, 26) and has in a branch at least two parallel-connected resistors 26, 27) of which at least one is connected in series with a controlled switch (27₁), the value of the d.c. voltage supplied by the generator (5) depending on the state (open or closed) of the switch (27₁).

12. Device according to Claim 11, characterized in that the voltage divider (22) has a resistor (26), in parallel with which there are connected two resistors (27 and 28), of which each is connected in series with a corresponding controlled switch (27₁, 28₁).

13. Device according to Claim 11 or 12, characterized in that the output signal of the voltage divider (22) is connected to the set-value input (16₂) of a control loop, which supplies the desired d.c. voltage to its output (12).

14. Device according to Claim 13, characterized in



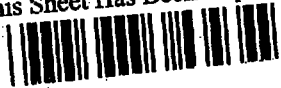
that the control loop has a ballast transistor (15) or the like, the state of power [sic] of which is controlled in dependence on the error signal of the feedback control, i.e. on the deviation of the actual output value from the set value.

15. Device according to Claim 14, characterized in that it has a comparator (16), at the first input of which there is applied the signal which the voltage divider supplies, and at the second input of which there is applied a signal which represents the output signal (Vpp).

16. Device according to one of Claims 11 to 15, characterized in that a resistor (24) with a variable value is provided in a second branch of the voltage divider.



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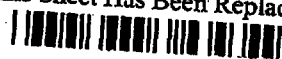
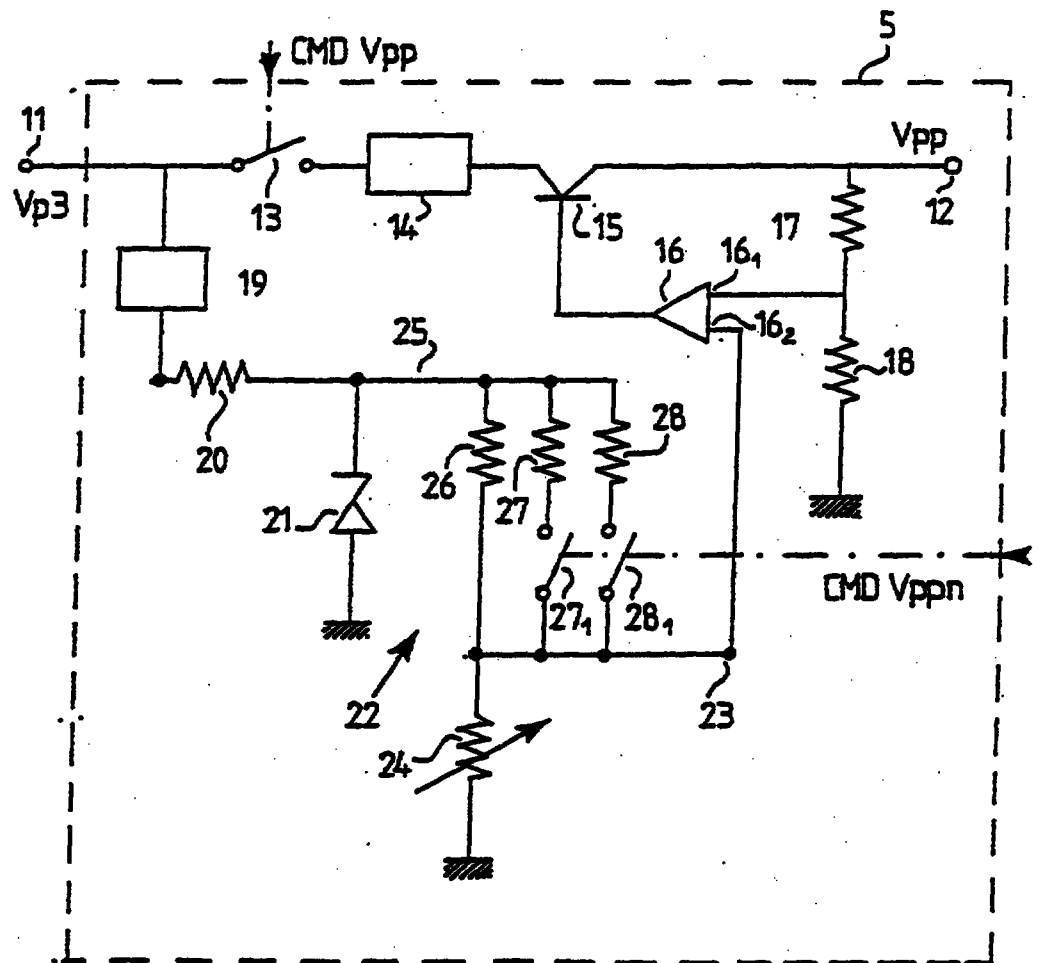
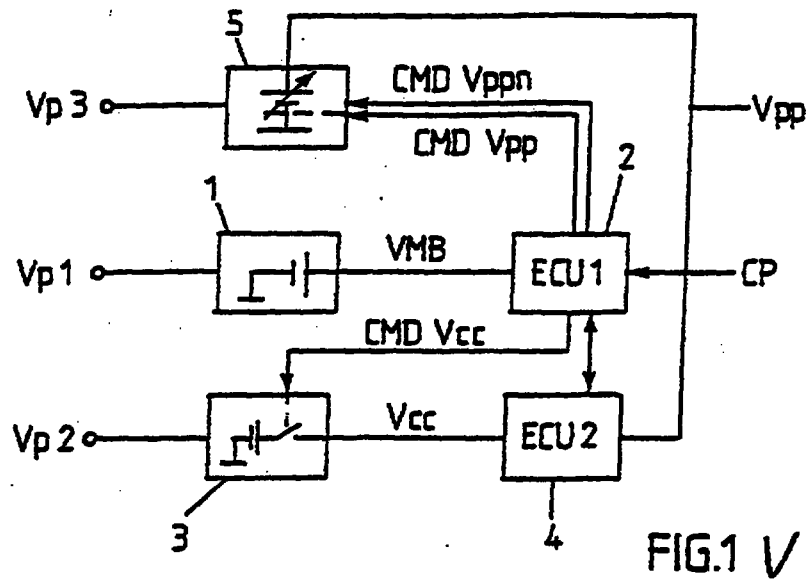
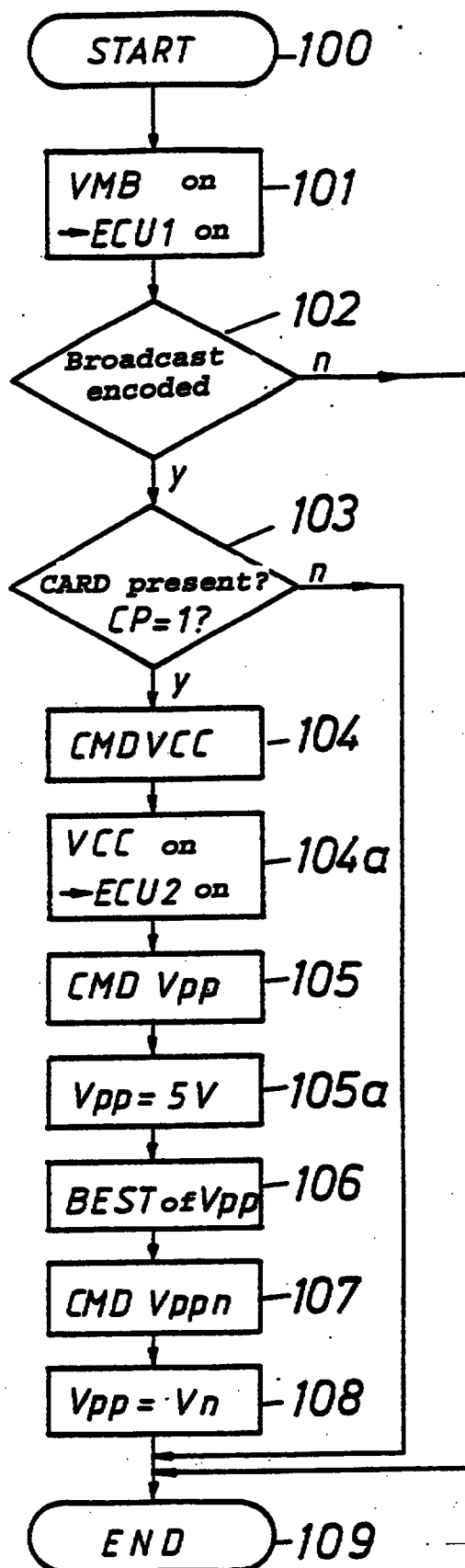


FIG. 2 2/2



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☒	Claim(s)	: paged ...1... to paged ...10.....
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~~Process and device for activating a chip card~~

The invention relates to a process for activating a chip card according to the precharacterizing clause of the main claim, and to a preferred device, suitable for carrying out the process according to the invention, according to the precharacterizing clause of the first device claim.

A card with an integrated circuit with contacts or "chip card" usually has a rectangular form and has at a fixed location an integrated circuit with contacts on the surface. Such a device has many applications: cheque or credit card, telephone, pay-TV etc.

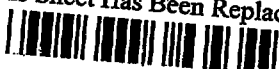
Such a card enables its owner to access a service or to operate an apparatus. It is considered in particular for use for a pay-TV system, in which the encoded television signal is received by a decoding device, which recreates a decoded signal if this device is connected to a chip card which contains the authorization information. The device for receiving and decoding the signals is intended for the information exchange with the circuit of the card to check whether the owner has the authorization to receive the broadcast. This information exchange is intended to receive the broadcast. This information exchange [sic] or dialogue takes place via an interface circuit. The latter includes, in particular, a programming d.c. voltage generator, to write information permanently to the integrated circuit.

There are various types of chip cards and one programming voltage corresponds to each type.

The invention is based on the object of providing a reliable process for activating a chip card and a device which is easy to realise and can be used as part of an apparatus which is ensured of being fully functional only in connection with an active chip card.

According to the invention, a control unit of the apparatus, for example a decoding device, receives from a control unit of a chip card brought into connection with the apparatus a signal which determines the value of

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an activation voltage. On the basis of the said signal, the control unit of the apparatus actuates other stages, which supply the requisite activation voltage to the chip card. The activation voltage with the desired voltage value makes it possible for the chip card to be able to be used for further steps, for example for the decoding of information.

A refinement of the invention defines the time sequence for the applying of supply voltages to the said control units.

Thus, the control unit present in the apparatus is supplied with a necessary first supply voltage immediately after switching on the apparatus. If the presence of a chip card is detected, the control system of the latter is supplied with a second supply voltage, which is delayed with respect to the first supply voltage.

A preferred refinement of the device according to the invention includes a d.c. voltage generator, which generates the requisite activation voltage for the chip card in a simple way.

This is characterized in that it includes a generator for a controlled voltage, followed by a resistive voltage divider, which has resistors connected in parallel in a branch, of which at least one is connected in series with a switch which is actuated in dependence on the d.c. voltage to be supplied.

The voltage made available by the voltage divider can be used directly for activating the card.

In an advantageous embodiment, however, the output voltage of the voltage divider represents a set voltage, which controls a control loop, for example with a ballast transistor, which supplies current of sufficient intensity to the programming.

Other measures and advantages of the invention are emphasised by the description of a number of exemplary embodiments thereof, which makes reference to the drawing, in which:

Fig. 1 shows a preferred exemplary embodiment of the device according to the invention,

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Fig. 2 shows the flow diagram of a preferred exemplary embodiment of the process according to the invention and

Fig. 3 shows a preferred exemplary embodiment of an activation d.c. voltage generator.

Before going into more detail concerning the description of the exemplary embodiment, it should be pointed out that the blocks represented individually in the figures serve merely for a better understanding of the invention. Usually, individual or a number of these blocks are combined to form units. These may be realized by integrated or hybrid technology or as program-controlled microcomputers, or as part of a program suitable for controlling the latter.

Furthermore, it should be pointed out that the devices and elements included in the individual stages may also be configured separately.

Fig. 1 shows a first d.c. voltage controller 1, to which a first uncontrolled d.c. voltage V_{p1} is fed and which feeds a first controlled d.c. voltage V_{MB} to a first electronic control unit 2 (Electronic Control Unit ECU1), which is assigned to an apparatus, for example to a decoding device.

Furthermore, there is provided a second d.c. voltage controller 3, to which a second uncontrolled d.c. voltage V_{p2} is fed and which supplies a second controlled d.c. voltage V_{cc} to a second electronic control unit 4 (ECU2), which is assigned to a chip card (not shown). For carrying out decoding operations, this chip card must be brought into direct or indirect connection with the apparatus.

A d.c. voltage generator 5 receives a third uncontrolled d.c. voltage V_{p3} and supplies a third controlled d.c. voltage V_{pp} , also referred to in the following as the programming d.c. voltage, to the second electronic control unit 4.

The first electronic control unit 2 contains [sic] on the one hand a signal CP, which assumes the value 1 when the connection between the chip card and the



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apparatus is established, and on the other hand an activation signal from the second electronic control unit 4.

The first electronic control unit supplies a first control signal CMDVcc to the second voltage controller 3, a second control signal CMDVpp and a third control signal CMMDVppn to the d.c. voltage generator 5 and also a further signal to the second electronic control unit 4.

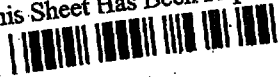
The function of the preferred exemplary embodiment according to Fig. 1 of the device according to the invention is now explained with the aid of the process according to the invention, the flow diagram of which is represented in Fig. 2.

The process starts with step 100, in which the apparatus is switched on and there are applied the uncontrolled voltages Vp, correspondingly, Vp1, Vp2, Vp3. The first voltage controller 1 generates in step 101 the controlled d.c. voltage VMB, whereby the first electronic control unit 2 is switched on.

Only after the latter is in operation, i.e. in the case of a microprocessor, for example, that first of all a so-called RESET routine has to be carried out, does a step 102 follow, in which it is checked whether an encoded broadcast is being received.

Once it has been established in step 103 that a connection between the chip card and the apparatus has been made (CP=1), in step 104 the control signal CMDVcc is supplied to the second voltage controller 3. The latter thereupon generates the controlled d.c. voltage Vcc, whereby the second electronic control unit 4 is switched on (step 104a). By the control signal CMDVpp, which is supplied by the first electronic control device 2 in step 105 to the d.c. voltage generator, the latter supplies in step 105a the voltage Vpp with a fixed value, in this example with 5 volts.

The second electronic control unit 4 supplies in step 106 to the first electronic control unit 2 the activation signal, which contains information on the



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value V_n of the programming d.c. voltage V_{pp} required for activation.

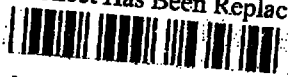
On the basis of the activation signal, the first electronic control unit 2 supplies in step 107 the control signal $CMDV_{ppn}$ to the d.c. voltage generator 5, which thereupon switches on the d.c. voltage V_{pp} with the desired value V_n , which is fed to the second electronic control device (step 108).

There subsequently follows the end of the process in step 109, which also follows directly if it is established in step 102 or step 103 that there is no encoded broadcast suitable for the system or no connection between the chip card and the apparatus (CP not equal to 1).

In versions of the device according to the invention as shown in Fig. 1, the uncontrolled d.c. voltages V_{p1} , V_{p2} , V_{p3} may be identical, so that the inputs of the voltage controllers 1, 3 and of the d.c. voltage generator 5 are connected to one another. Furthermore, it is conceivable for the voltage controller 3 to be such that the amplitude of the voltage V_{cc} rises over time.

A preferred exemplary embodiment of the d.c. voltage generator 5, which supplies the activation d.c. voltage V_{pp} , referred to in the following also as the programming voltage, with desired values is represented in Fig. 3.

It should be pointed out that the values specified for voltages and component dimensioning merely characterize a preferred exemplary embodiment, but do not restrict the invention itself to these values. The d.c. voltage generator represented in the figure comprises a d.c. voltage generator (not shown) which represents the mains supply and supplies the uncontrolled d.c. voltage V_{p3} of 30 volts via a terminal 11. The latter is connected to the output terminal 12 via an on/off switch 13, which can be actuated by the control signal $CMDV_{pp}$, a current limiter 14 and a ballast transistor 15 of the NPN type, the conductivity of which is controlled in such a



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way that there appears at the output 12 a programming d.c. voltage V_{pp} which makes it possible to write information permanently to a chip card (not shown). The programming voltage V_{pp} can assume one of the following values: 5 volts, 12.5 volts, 15 volts and 21 volts. The accuracy of this programming voltage is $\pm 2.5\%$.

The ballast transistor 15 serves the purpose of setting the d.c. voltage at the output 12 to the selected value and of controlling this output voltage.

For this purpose, the base of this transistor 15 is connected to the output of a comparator 16, at the one input 16_1 of which there is applied via a voltage divider with the resistors 17 and 18 of the values 407 and 196 kohms, respectively, a voltage proportional to the output voltage V_{pp} . At a second input 16_2 of the comparator 16 there is applied the set value of the feedback control, which corresponds to the value desired at the output 12.

For generating the set value there is provided a controlled d.c. voltage source 19, which supplies a d.c. voltage signal of the value 12 volts. The accuracy of this value is $\pm 5\%$. This voltage is passed on via a resistor 20 of the value 470 ohms to the terminals of a Zener diode 21, which supplies a d.c. voltage of 6.8 volts with an accuracy of $\pm 2\%$.

Provided in parallel with the Zener diode 21 is a voltage divider 22 with output 23, which is connected to the input 16_2 of the comparator 16.

The voltage divider 22 includes between the terminal 23 and mass a rheostat 24 and between the terminal 23 and a conductor 25, which is connected to the cathode of the Zener diode 21, a resistor 26 of the value 6.8 kohms.

In addition, resistors 27 and 28 are connected in parallel with the resistor 26. Each of these resistors is connected in series with a switch 27_1 and 28_1 , respectively, controlled by the control signal (MDVppn).

The resistors 27 and 28 have the values 1.82 kohms and 1.37 ohms [sic], respectively. The accuracy of the value of these resistors is $\pm 1\%$.

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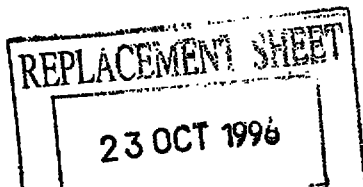
Depending on the state (open/closed) of each of the switches 27_1 and 28_1 , the resistor between the terminal 23 and the conductor 25 has a different value. Three of the values are available: the first if the two switches 27_1 and 28_1 are open, the second if the switch 27_1 is closed and the switch 28_1 is open, and the third if the switch 27_1 is open and the switch 28_1 is closed.

The controlling of the switches 27₁ and 28₁ takes place through the interface switch by means (not shown) which receive from the chip card the information on the voltage required for the programming of the latter. Each switch is controlled by an output of a microactuator. It is conceivable for the switches 27₁, 28₁ to be realized in the form of semiconductor components, such as transistors, which are correspondingly actuated.

The circuit operates as follows: the comparator 16 supplies the base of the transistor 15 with an error signal, which represents the difference between the actual value of the signal V_{pp} at the output 12 and the set value, which is present at the input 16₂. The value of the signal of the output 12 depends on the state of conduction of the ballast transistor 15. The ballast transistor may 15 [sic] be substituted by any other component of which the conductivity is controllable.

The circuit just described makes possible the generation of three d.c. voltages with the desired accuracy ($\pm 2.5\%$) and has an extremely simple construction. By increasing the number of the resistors connected in parallel with the resistor 26, a switch being connected to each of these additional resistors, the number of the voltage values which can be supplied to the output 12 can be increased. It is also possible to provide only two resistors, for example the resistors 26 and 27. In this case, only two possible voltage values are available.

The feedback control of the value of the resistor 24 makes it possible to use the advantageous range of the characteristic of the Zener diode 21.



Patent Claims

1. Process for activating a chip card which has a first control unit and, when it is connected to an apparatus which has a second control unit, makes it possible for the said apparatus to operate properly, characterized in that the first control unit supplies a signal to the second control unit, whereupon the latter actuates other stages of the apparatus, so that an activation voltage with predetermined values is made available to the chip card.
2. Process according to Claim 1, characterized in that a supply voltage for the first control unit is made available only after a predetermined time after switching on the apparatus.
3. Process according to Claim 2, characterized in that the predetermined time is determined by the time which is required in order that the second control unit is ready for operation after switching on.
4. Process according to Claim [sic] 1 to 3, characterized in that the value of the activation voltage rises over time in a manner controlled from a predetermined initial value to a predetermined final value.
5. Process according to one Claims 1 to 4, characterized in that the apparatus is designed as a decoding device and the chip card contains information, whereby an encoded video signal can be decoded after the activation voltage has been made available to the chip card.
6. Device for activating a chip card which has a first control unit (4) and, when it is connected to an apparatus which has a second control unit (2), makes it possible for the said apparatus to operate properly, characterized in that the first control unit (4) is designed in such a way that it supplies a signal to the second control unit (2), whereupon the latter actuates further stages (5) of the apparatus, which make an activation voltage (V_{pp}) with predetermined values (V_n) available to the chip card.
7. Device according to Claim 6, characterized in that there are first means (2, 3), which have the effect



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that the supply voltage (V_{cc}) for the first control unit is made available only after a predetermined time after switching on the apparatus.

8. Device according to Claim 7, characterized in that the first means (2, 3) determine the predetermined time on the basis of the time which is required in order that the second control unit (2) is ready for operation after switching on.

9. Device according to one of Claims 6 to 8, characterized in that there are provided further means (2, 5), which control the value of the activation voltage (V_{pp}) over time, so that it rises from a predetermined initial value to a predetermined final value (V_n).

10. Device according to one of Claims 6 to 9, characterized in that the apparatus is designed as a decoding device and the chip card contains information, whereby an encoded video signal can be decoded after the activation voltage (V_{pp}) has been made available to the chip card.

11. Device according to one of Claims 6 to 10, characterized in that there is provided a d.c. voltage generator (5) which can be actuated by the second control unit (2), comprises a voltage divider (22) with resistors (24, 26) and has in a branch at least two parallel-connected resistors (26, 27) of which at least one is connected in series with a controlled switch (27_1), the value of the d.c. voltage supplied by the generator (5) depending on the state (open or closed) of the switch (27_1).

12. Device according to Claim 11, characterized in that the voltage divider (22) has a resistor (26), in parallel with which there are connected two resistors (27 and 28), of which each is connected in series with a corresponding controlled switch (27_1 , 28_1).

13. Device according to Claim 11 or 12, characterized in that the output signal of the voltage divider (22) is connected to the set-value input (16_2) of a control loop, which supplies the desired d.c. voltage to its output (12).

14. Device according to Claim 13, characterized in



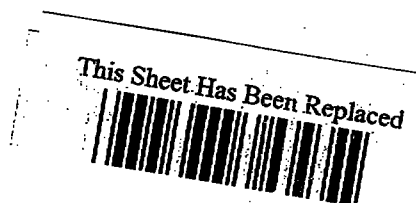
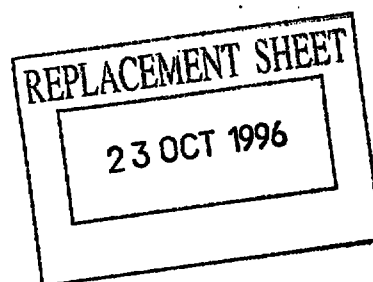


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that the control loop has a ballast transistor (15) or the like, the state of power [sic] of which is controlled in dependence on the error signal of the feedback control, i.e. on the deviation of the actual output value from the set value.

15. Device according to Claim 14, characterized in that it has a comparator (16), at the first input of which there is applied the signal which the voltage divider supplies, and at the second input of which there is applied a signal which represents the output signal (Vpp).

16. Device according to one of Claims 11 to 15, characterized in that a resistor (24) with a variable value is provided in a second branch of the voltage divider.

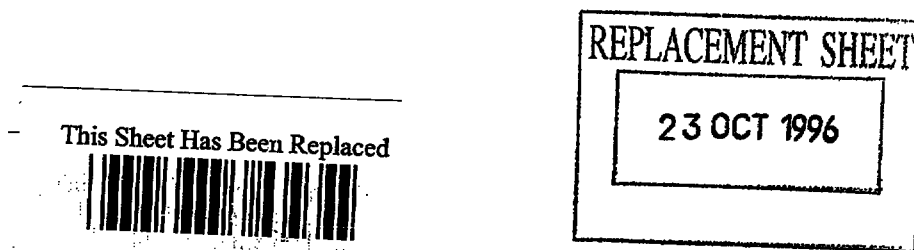


PROCESS AND DEVICE FOR ACTIVATING A CHIP CARD

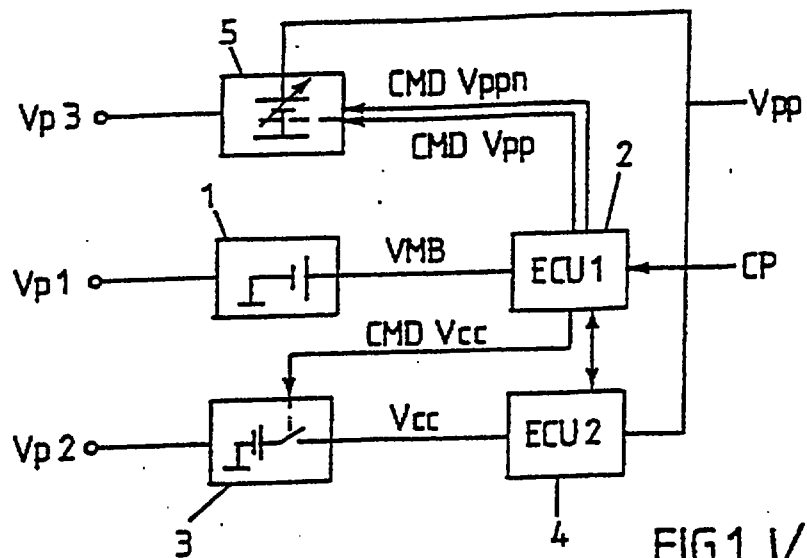
ABSTRACT

A system consisting of a process and suitable device for activating a chip card is simple and reliable and can be incorporated in an apparatus which is fully functional only in combination with an active chip card. A control unit (ECU1) of the apparatus (for example a decoding device) receives from a control unit (ECU2) of the chip card connected to the apparatus a signal which determines the value of an activation voltage. On the basis of said signal, the control unit of the apparatus actuates other stages (3, 5) which supply the requisite activation voltage to the chip card. The system of the invention is preferably used for decoding video signals (pay TV).

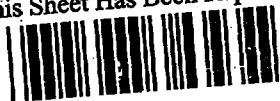
FIGURE 1.



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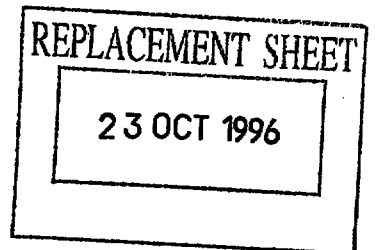
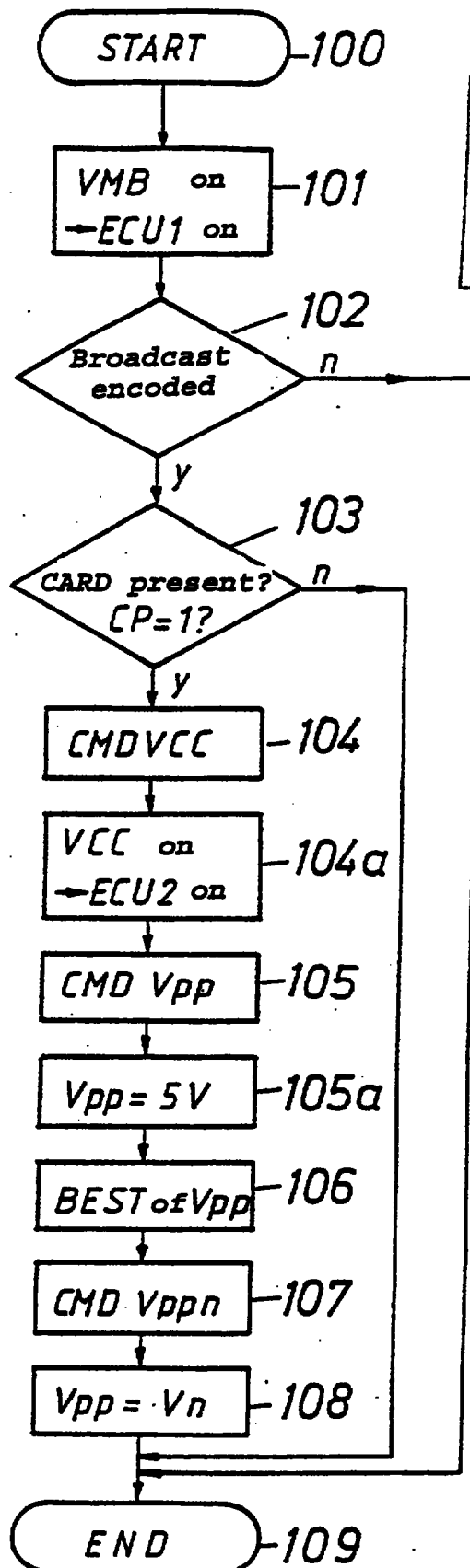


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FIG. 2



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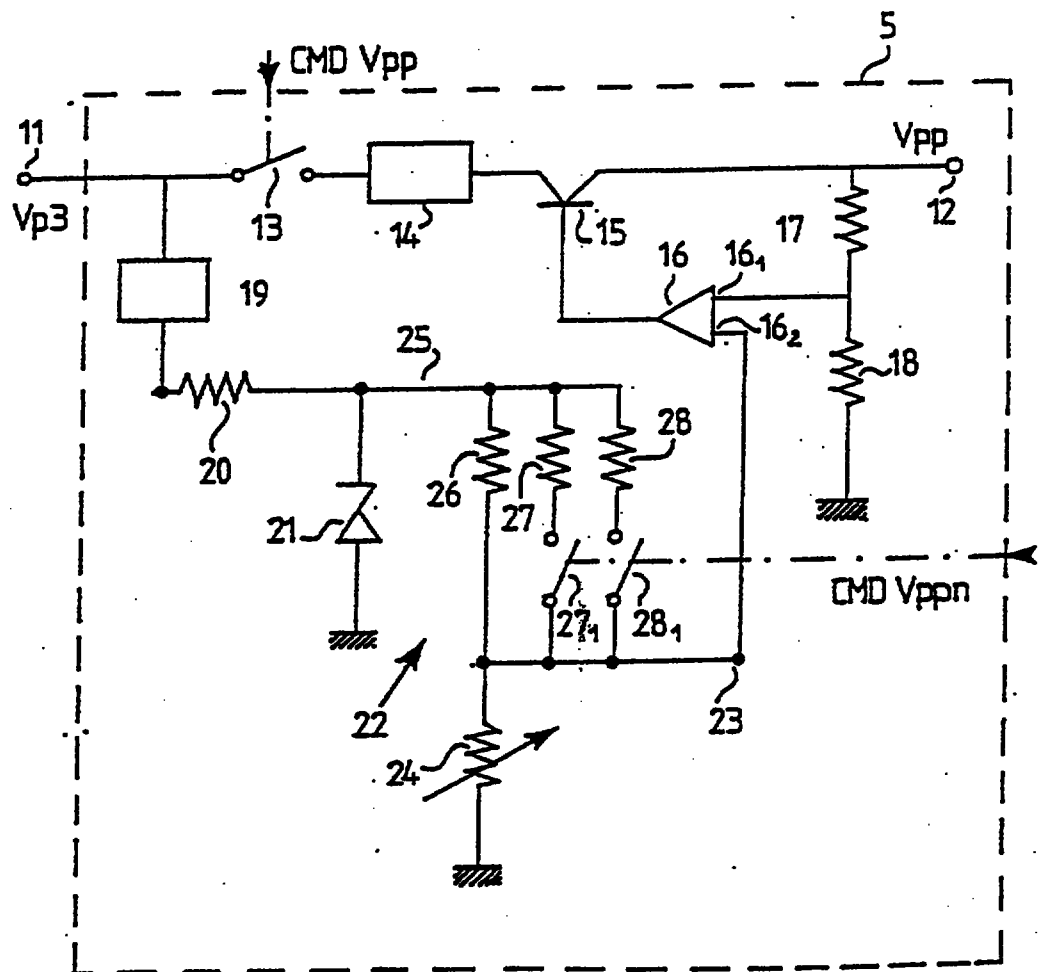


FIG.3

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☒ Claim(s) : paged 2... to paged 8...
☒ Drawing(s) : paged 1/2... to paged 3/2...
☐ Abstract : paged to paged

PROCESS AND DEVICE FOR ACTIVATING A CHIP CARD

DATE OF RECEIPT 2/12/97

This is a continuation of PCT application PCT/EP 09/01845 filed Nov. 3, 1990 by Jose I. Rodriguez and titled "Process And Device For Activating A Chip Card".

This invention is directed to a process for activating a chip card and to a device useful in employing the inventive process.

A "chip card" typically has a rectangular configuration and includes an integrated circuit having contacts. The integrated circuit is arranged at a particular location on the surface of the "chip card". Such a device has a number of applications, for example, cheque or credit card, telephone, pay TV, and many others. Such cards enable the owners to access a service or to operate a particular apparatus. In particular, such a card can be used in a pay TV system in which a coded television signal is received through a decoding device which regenerates a decoded signal when the decoding device is connected with a chip card which contains authorization data. The device for receiving and decoding the signals exchanges data with the circuit on the card to verify that the individual attempting to access a particular pay TV program is authorized to receive the broadcast. This exchange of information (dialog) between the decoder contains, in particular, a programming d.c. voltage generator in order to write information into the integrated circuit in a non-volatile manner. There are various types of "chip cards" and each type corresponds to a programming voltage.

It is an object of the invention to provide a reliable method for activating a chip card and to provide a device which is simple to realize and can be used as part of an apparatus which is fully functional only when used in conjunction with an active chip card.

According to the invention, a control unit of an apparatus, for example a decoding device, receives a signal from a control unit of a chip card connected with the apparatus. The value of the signal determines an activation voltage. On the basis of the signal, the control unit of the apparatus triggers further stages which deliver the necessary activation voltage to the chip card. The activation voltage, with the desired voltage value, renders it possible for the chip card to be utilized for further steps, for example, for decoding information.

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An embodiment of the invention defines the chronological sequence for the application of supply voltages to the control units. Thus, the control unit present in the apparatus is supplied with the necessary initial supply voltage immediately after the apparatus is switched on. When the presence of a chip card is detected, the control system is supplied with a second supply voltage which, relative to the first supply voltage, is delayed.

A preferred embodiment of the inventive device contains a d.c. voltage generator which generates the activation voltage required for the chip card in a simple manner. The d.c. voltage generator is characterized by the fact that it contains a generator for a regulated voltage, followed by an ohmic voltage divider which has resistors connected in parallel in one branch, at least one of the resistors is connected in series with a switch which is actuated in dependence upon the d.c. voltage to be supplied. The voltage made available through the voltage divider can be directly used to activate the card. However, in an advantageous configuration, the output voltage of the voltage divider represents a desired voltage which controls a regulating circuit, for example with a ballast transistor, which supplies the programming with a current level sufficient for the desired operation.

In the FIGURES:

FIG. 1 is a preferred embodiment of the inventive device.

FIG. 2 is a flow chart of a preferred embodiment of the inventive method.

FIG. 3 is a preferred embodiment of a generator used to generate the activation direct voltage for the preferred embodiment of FIG. 1.

Before the preferred embodiment is more closely described, it should be pointed out that the blocks illustrated individually in the figures serve merely for a better understanding of the invention. Normally, single or several blocks are combined to form units. These can be realized in integrated or hybrid technology or as a program-controlled microcomputer or, respectively, as a part of a program suited for its control. Also, the devices and elements contained in the individual stages can also be realized separately.

In FIG. 1, a first d.c. voltage regulator 1 receives a first unregulated d.c. voltage V_{p1} and provides a first regulated d.c. voltage V_{MB} to a first electronic control unit 2 (ECU1) which is assigned to an apparatus, for

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example, a decoding device. Also, a second d.c. voltage generator 3 receives a second unregulated d.c. voltage V_{p2} and which supplies a second regulated d.c. voltage V_{cc} to a second electronic control unit 4 (ECU2) which is assigned to a chip card, which is not illustrated. This chip card must be directly or indirectly connected to the apparatus in order to perform decoding procedures. A d.c. voltage generator 5 receives a third unregulated d.c. voltage V_{p3} and supplies a third regulated d.c. voltage V_{pp} , hereinafter also called the programming voltage, to the second electronic control unit 4.

The first electronic control unit 2 receives a signal CP which assumes the value 1 when the connection between the chip card and the apparatus exists, and also an activation signal from the second electronic control unit 4. The first electronic control unit 2 sends a first control signal $CMDV_{cc}$ to the second voltage regulator 3, a second and third control signal $CMDV_{pp}$ and $CMMDV_{ppn}$ respectively to the d.c. voltage generator 5, as well as a further signal to the second electronic control unit 4.

The operation of the preferred embodiment shown in FIG. 1 can be understood from the flow chart shown in FIG. 2. The process starts with step 100 in which the apparatus is switched on and the unregulated voltages V_p , corresponding to V_{p1} , V_{p2} , V_{p3} are applied. The first voltage regulator 1 generates the regulated d.c. voltage VMB in step 101 and the first electronic control unit 2 is switched on.

After electronic control unit 2 is turned on, with the aid of a microprocessor, which first performs a so-called RESET routine, step 102 is entered in which a check is made to verify whether a coded broadcast is being received.

Step 103 is used to establish that a connection between the chip card and the apparatus has been made ($CP=1$), and, after the time required to turn control unit 2 on has expired, the control signal $CMDV_{cc}$ is supplied, in step 104, to the second voltage regulator 3. The second voltage regulator 3 responds to the $CMDV_{cc}$ signal and provides the regulated d.c. voltage V_{cc} to the second electronic control unit 4 and turn the unit on, as indicated at step 104a. The control signal $CMDV_{pp}$ is supplied to the d.c. voltage generator 5 by the first electronic control device 2 in step 105 and the generator 5 provides the voltage V_{pp} to control unit 4, in this example at a fixed value of 5 V, as indicated at step 105a.

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In step 106, the second electronic control unit 4 supplies the first electronic control unit 2 with the activation signal which contains information on the value V_n of the programming d.c. voltage V_{pp} required for the activation. On the basis of the activation signal, the first electronic control unit 2 provides, in step 107, the control signal $CMDV_{ppn}$ to the d.c. voltage generator 5. The generator 5 then provides the voltage V_{pp} with the desired value V_n and provides the voltage V_{pp} to the second electronic control unit 4 in step 108. The process comes to an end in step 109 after voltage V_{pp} is provided to control unit 4. Also, step 109 is directly entered when it is established in step 102 or step 103 that no coded broadcast suitable for the system is present or that no connection between chip card and apparatus (CP not equal to 1) is present.

For some versions of the preferred embodiment shown in FIG. 1, the unregulated direct voltages V_{p1} , V_{p2} , V_{p3} can be identical, so that the input terminals of voltage regulators 1, 3 and direct voltage generator 5 are interconnected. Also, it is conceivable that the voltage regulator 3 can be designed in such a way that the amplitude of voltage V_{cc} increases with time from a predetermined initial value to a predetermined final value.

A preferred embodiment of the d.c. voltage generator 5, which supplies the activation direct voltage V_{pp} , hereinafter also called the programming voltage, with desired values, is illustrated in FIG. 3.

It should be pointed out that the specified values for voltages and dimensioning of components merely characterize a preferred embodiment and do not limit the invention. The voltage generator shown in FIG. 3 consists of a d.c. voltage generator (not illustrated) which represents the main supply and deliver the unregulated d.c. voltage V_{p3} of 30 V to an input terminal 11. Terminal 11 is connected to output terminal 12 of an on/off switch 13, which can be actuated by the control signal $CMDV_{pp}$, a current limiter 14 and a ballast transistor 15 of the NPN type. The conductivity of ballast transistor 15 is controlled in such a way that a programming voltage V_{pp} appears at output terminal 12 allowing information to be written into a (not illustrated) chip

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card in a non-volatile manner. The programming voltage V_{pp} can assume one of the following values: 5 V, 12.5 V, 15 V and 21 V. The accuracy of this programming voltage is plus/minus 2.5 per cent. The ballast transistor 15 serves to adjust the voltage at output terminal 12 to the chosen value and to regulate the output voltage at output terminal 12. For voltage regulating purposes, the base of transistor 15 is connected to the output of a comparator 16. One input terminal 16₁ of comparator 16 is connected to a voltage divider composed of resistors 17 and 18, which can be 407 and 196 kohm respectively, for example. Input terminal 16, thus receives a voltage proportional to the output voltage V_{pp} . The desired regulation voltage value is applied to the second input terminal 16₂ of the comparator 16, and is the voltage value which is desired at output terminal 12.

A regulated d.c. voltage source 19, which supplies a 12 V voltage, for example, provides the desired voltage level to input terminal 16₂. The accuracy of the desired voltage level is plus/minus 5 per cent, for this example. This voltage is transmitted via a resistor 20, having a value of 470 ohm, for example, to the terminals of a breakdown diode 21 which supplies a d.c. voltage of 6.8 V at an accuracy of plus/minus 2 per cent. A voltage divider 22, having an output terminal 23 connected to the input 16₂ terminal of comparator 16, is parallel to the breakdown diode 21. The voltage divider 22 contains a rheostat 24 connected between output terminal 23 and ground, and a resistor 26, having a value of 6.8 kohm for example, is connected between output terminal 23 and a conductor 25 which is connected to the cathode of breakdown diode 21. Resistors 27 and 28 are connected in parallel with resistor 26. The resistors 27 and 28 are respectively connected in series with switches 27₁ and 28₁. The switches 27₁ and 28₁ are controlled by the control signal $CMDV_{ppn}$. The resistors 27 and 28 can have the values 1.82 kohm and 1.37 kohm respectively, for example and the accuracy of the value of these resistors can be plus/minus 1 per cent.

Depending upon the open and closed status of the switches 27₁ and 28₁, the parallel resistance value between output terminal 23 and conductor 25 can have different values. Three of the possible values available are: the first value when both switches 27₁ and 28₁ are open, the second value when switch 27₁ is closed and switch 28₁ is open, and the third when switch 27₁ is open.

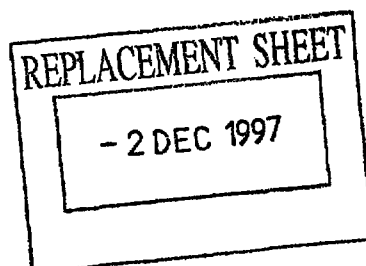
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and switch 28₁ is closed. The control of switches 27₁ and 28₁ is carried out through an interface (not illustrated) which receives, information on the voltage required from the chip card. Both of switches 27₁ and 28₁ are controlled by an output of a micro-actuator. It is conceivable and preferable that the switches 27₁ and 28₁ are in the form of semiconductor components, such as transistors which are voltage triggered.

In operation, comparator 16 supplies an error signal, representing the difference between the actual value of signal V_{pp} at output 12 and the desired value applied to input terminal 16₂, to the base of transistor 15. The value of the signal at output terminal 12 depends on the conduction state of ballast transistor 15. The ballast transistor 15 can be replaced by other types of solid state devices, the conductivity of which can be controlled.

The circuit just described enables the generation of three d.c. voltages with the desired accuracy (plus/minus 2.5 percent) and is very simple in construction. By increasing the number of resistors connected in parallel with resistor 26, whereby a switch is connected to each of the additional resistors, the number of voltage values, which can be delivered to output 12, may be increased. It is also possible to provide just two resistors, for example, resistors 26 and 27. In this case only two possible voltage values are available. The regulation of the value of resistor 24 enables the use of the advantageous region of the steady state characteristic of breakdown diode 21.



I claim:

1. A method of using a chip card to enable the generation of first and second supply voltages for said chip card by a control apparatus, said method comprising the steps of:

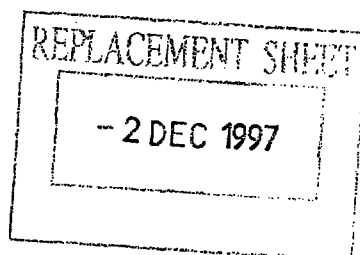
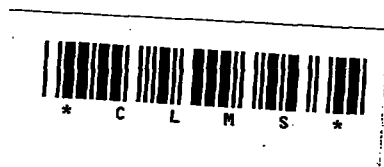
generating said first supply voltage at a first output of said control apparatus in response to said chip card being coupled to said control apparatus;
applying said first supply voltage to said chip card;
generating said second supply voltage at a second output of said control apparatus, said second supply voltage exhibiting an initial voltage level;
applying said second supply voltage at said initial voltage level to said chip card while said first supply voltage is applied to said chip card;
receiving at an input of said control apparatus a control signal from said chip card indicating a programming voltage level required for activation of said chip card;
adjusting said second supply voltage from said initial level to said programming voltage level in response to said control signal.

2. The method of claim 1 wherein said first supply voltage for said chip card is first made available a predetermined time after said control apparatus is turned on.

3. The method of claim 2 wherein said predetermined time is determined by the time required for said control apparatus to become ready for operation after turning said apparatus on.

4. The method of claim 3 wherein said adjustment of said second voltage supply level rises from said initial value to said programming voltage level during a predetermined time interval.

5. Control apparatus for providing first and second supply voltages to a chip card, said control apparatus comprising:



means for generating said first and second supply voltages;

means for applying said first supply voltage to said chip card in response to said chip card being coupled to said control apparatus;

means for applying said second supply voltage at an initial voltage level to said chip card while said first supply voltage is applied to said chip card; and

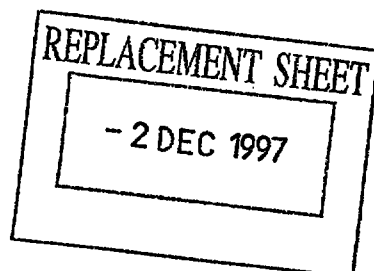
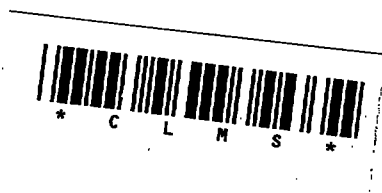
means for adjusting said second supply voltage from said initial value to a programming voltage level required for activation of said chip card in response to a control signal from said chip card indicating the required value of said programming voltage level.

6. The system of claim 5 wherein said supply voltage generating means comprises a voltage regulator including a voltage divider having one branch including resistors connected at a node and a plurality of parallel branches, each of said branches including a series connection of a resistor and a switch responsive to said control signal for varying the output voltage of said voltage regulator.

7. The system of claim 6 wherein said voltage regulation means includes a comparator for comparing the output voltage of said voltage regulator with a reference voltage to regulate said output voltage.

8. The system of claim 7 wherein said voltage regulation means includes a ballast transistor responsive to said comparator for regulating the output voltage of said voltage regulation means.

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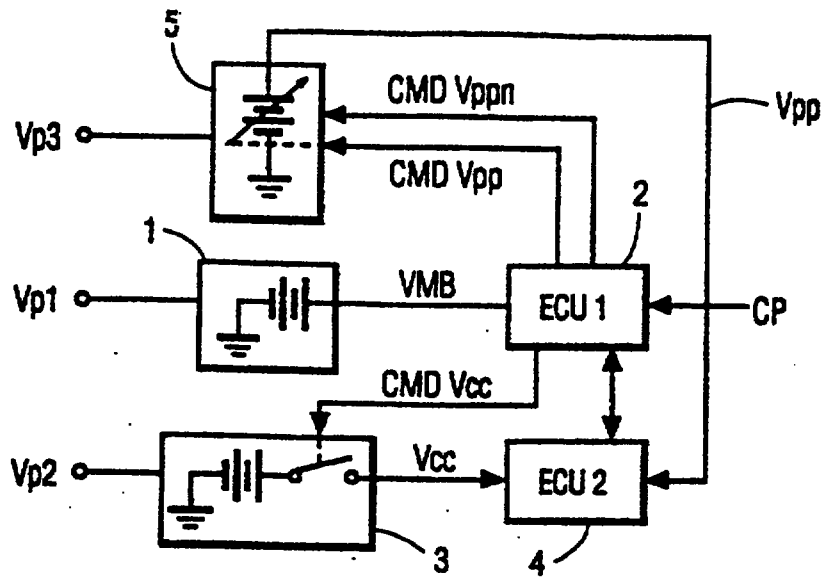


FIG. 1

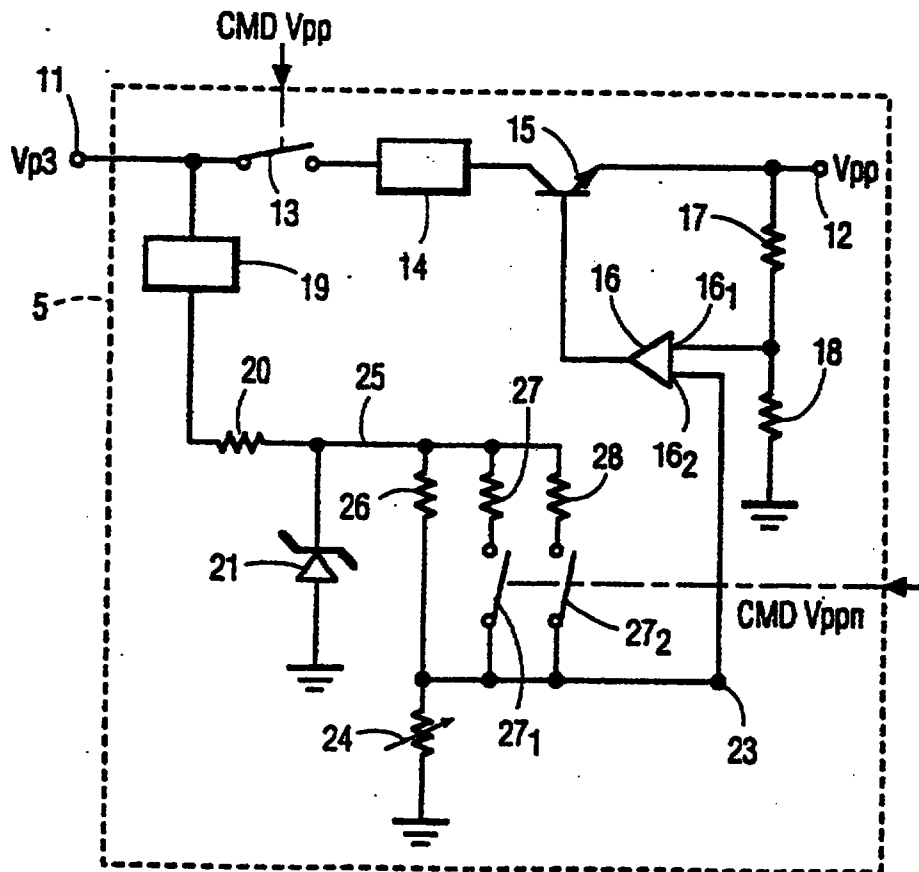
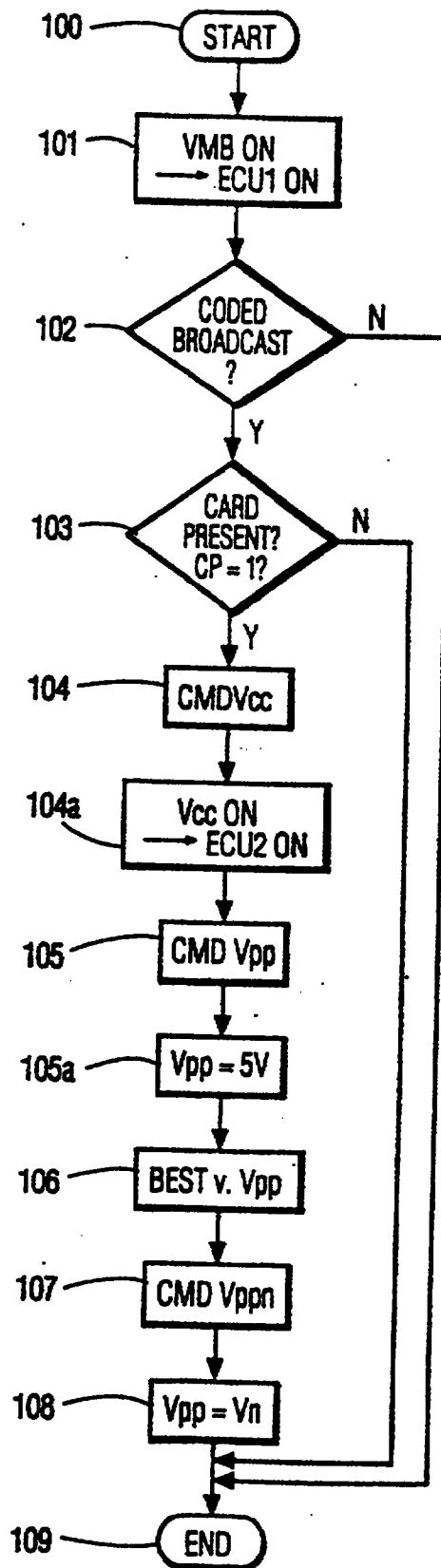


FIG. 3

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FIG. 2