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(71) Applicant: **THOMSON LICENSING** [FR/FR]; 1-5 rue Jeanne d'Arc, F-92130 Issy-les-Moulineaux (FR).

(72) Inventors: **GUILLOT, Philippe**; TECHNICOLOR R&D FRANCE, 975 AVENUE DES CHAMPS BLANCS, CS17616, F-35576 CESSON SEVIGNE CEDEX (FR). **GUITTON, Xavier**; TECHNICOLOR R&D FRANCE, 975 AVENUE DES CHAMPS BLANCS, CS17616, F-35576 CESSON SEVIGNE CEDEX (FR). **MARCHAND, Philippe**; TECHNICOLOR R&D FRANCE, 975 AVENUE DES CHAMPS BLANCS, CS17616, F-35576 CESSON SEVIGNE CEDEX (FR).

(74) Agents: **PERROT, Sebastien** et al.; Technicolor, 1-5 Rue Jeanne d'Arc, F-92130 Issy-les-Moulineaux Cedex (FR).

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(54) **Title**: DEVICE AND METHOD FOR CONTROLLING THE SUPPLY OF POWER TO PERIPHERALS

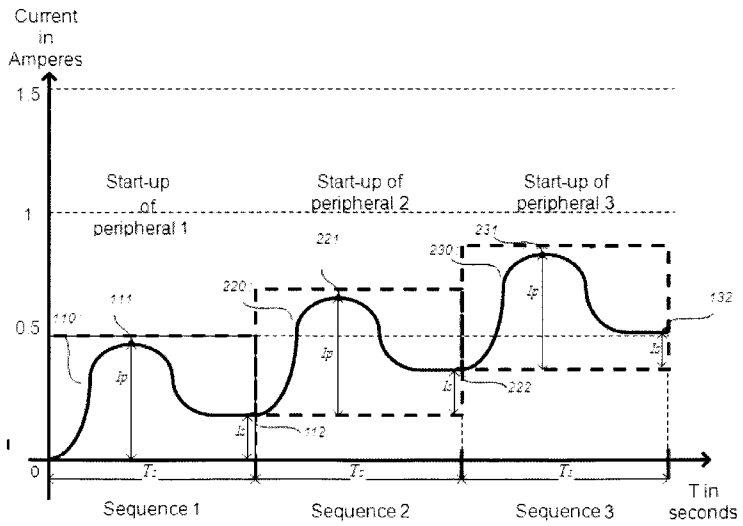

Fig. 2

(57) **Abstract**: The invention relates to a device (1) and a method for sequentially starting USB peripherals (C) in order to optimise the supply of electrical power. Using current profiles (P) corresponding to the start-up of peripherals, the connected peripherals are started one after the other. The delay (R) between each start-up corresponds to the time (Ts) necessary for the current consumption stabilisation (I) of the peripheral being started. The profiles are stored by the device. During the start-up, the invention identifies the connected peripheral and searches for its start-up profile (P) in the stored profiles (Ps), in order to determine the start-up delay to apply to the next peripheral.

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DEVICE AND METHOD FOR CONTROLLING THE SUPPLY OF POWER TO PERIPHERALS

1. Domain of the invention.

The invention relates to a method for optimising the supply of electric power to USB ports.

In electronic devices equipped with several USB ports, the devices, when started, power all ports simultaneously and consequently all connected peripherals. The start-up of each of the peripherals results in an electrical current inrush and a peak which the power supply must be able to withstand. In the cases where several peripherals are connected simultaneously before the start-up, the electrical current peaks of each of the peripherals accumulate. The power supply must therefore withstand a significant current peak.

On this type of electronic device, the solution consists in connecting the USB peripherals, one after the other, thus avoiding the accumulation of current peaks.

2. Prior art

Figure 1 represents a current consumption on a device such as exists in the prior art. In fact, on a device equipped with USB ports, if several peripherals are connected when the device is switched on, this device, during the start-up phase of the connected equipment, powers these items of equipment almost simultaneously.

The start-up phase of many items of electrical equipment results in a current peak. The illustration of a standard start-up phase is shown on the graph by the current curve 110 of *peripheral 1.* This typical current curve enables identification of two parts in the current consumption of the equipment. Initially,

there is a current inrush on the part of the peripheral to reach a peak 111, followed by a drop to the stabilised current consumption operational level 112.

When several items of equipment are present simultaneously on the device, and when these items of equipment are powered simultaneously, each item of equipment generates its own current peak, as described previously.

If two peripherals, *peripheral 1* and *peripheral 2* are connected, then there is an accumulation of current consumption during the start-up such as shown by the peak 121 and the value of the stabilised current 122 of the cumulative current curve 120. Likewise with three items of equipment, *peripheral 1*, *peripheral 2* and *peripheral 3*, the peak 131 and the nominal consumption 132 of the cumulative current curve 130.

The maximum current consumption as described in *Figure 1* is the product of the peak current of a peripheral and the number of peripherals, assuming for simplicity that the current curves are identical. The formula for calculating the maximum current is therefore:

$$Imax = Ip * n \qquad \underline{equation:}\ n°1$$

Where: Ip = value of the start-up peak current of the peripherals
n = number of connected peripherals

However, in a more realistic context where each of the peripherals possesses a different current profile P, for the prior art, according to *Figure 1*, the maximum total consumption is the sum of the peak currents of each of the peripherals and is calculated using the following formula:

$$Imax = \sum_{k=0}^{n} Ip_k \qquad \underline{equation:}\ n°2$$

Where: Ip_k = value of the start-up peak current of the peripheral k
n = number of connected peripherals

The power supply must then withstand the total peak 131, the sum of the peaks of each peripheral, otherwise current protection on the part of the device will be activated and a new start-up procedure initiated.

Operation such as described in *Figure 1* has several disadvantages. As has been mentioned, the power specifications of the power supply for this type of device must provide for an accumulation of the currents of all peripherals which can be simultaneously connected. This approach in terms of electronic design is not conducive to producing energy-efficient products. In order to protect the electrical power supply part, products are currently equipped with a power supply capable of supplying a signal warning of power supply overflow. The standard behaviour of products when this signal is transmitted by the power supply is a forced re-start. With this type of solution, a new problem appears: the sequencing of start-up cycles of the device, as long as the current peak remains above the power supply limit.

3. Summary of the invention.

The invention proposes to overcome at least one of the disadvantages of the prior art.

The invention relates to a device for controlling the supply of power to peripherals. It comprises at least 2 communication ports each able to electrically supply at least one peripheral, a processor and means for interrupting the supply of power to the peripherals. The processor is able to control the means for interrupting the power supply in order to sequentialise the start-up of the supply of electrical power to the communication ports.

Advantageously, the processor controls the means for interrupting the supply of power in order to delay supplying electrical power to at least a second peripheral by a time at least equal to a current consumption stabilisation time of the first peripheral.

Preferentially, the device comprises storage means, in order to store peripheral profiles. The processor is able to search amongst the stored profiles, a profile corresponding to the first peripheral.

Advantageously, the profile stored by the device comprises the stabilisation time and at least one identifier of the associated peripheral.

Advantageously, the communication ports are USB ports.

The invention also relates to a method for controlling the supply of electrical power to peripherals connected to an electronic device implementing the method. This method comprises the steps for:

- detecting at least two peripherals connected to the device,
- starting the first connected peripheral and,
- sequentially starting the supply of electrical power to the other detected peripherals, each peripheral being started one after the other after a delay with respect to the supply of electrical power to another peripheral.

For this control method, the start-up step of each detected peripheral is broken down into steps for:

- supplying power to the peripheral;
- timestamping start-up;
- obtaining a descriptor;
- searching for a profile of the peripheral comprising a current stabilisation time

Preferentially, if during the search for the profile amongst the stored profiles, the profile is found, the temporal delay takes the value of the current stabilisation time.

Advantageously, if during the search for the profile amongst the stored profiles, the search is unsuccessful, the temporal delay takes a default delay value.

Advantageously, the default delay value is a constant value.

Preferentially, the default delay value is the product of the information of the maximum current consumed (bMaxPower) by the peripheral with a constant.

Advantageously, the peripherals are of USB type.

4. List of figures.

The invention will be better understood and illustrated by means of non-restrictive embodiments and advantageous implementations, with reference to the accompanying drawings, wherein:

- **Figure 1** shows a cumulative current consumption curve for a device simultaneously powering all the peripherals, according to the prior art,
- **Figure 2** shows a current consumption curve for a device, according to a preferred embodiment of the invention,
- **Figure 3** shows a block diagram of a device according to a preferred embodiment of the invention,
- **Figure 4** shows an operation flowchart for a preferred embodiment of a device according to the present invention.

5. Detailed description of embodiments of the invention

Initially, it is assumed that the current profile during the start-up of each peripheral is identical. This assumption is made notably for the value of the nominal operating current Is. Likewise, the peak current Ip during the start-up of

each peripheral is identical, as is the current stabilisation time Ts. The purpose of this assumption is only to simplify the illustrations in the figures and in no way affects the description or the operation of the invention.

Figure 2 shows the current consumption of a device operating according to the invention.

This figure is divided on the time axis, into three sequences, corresponding to the current consumption during the successive start-up steps of the peripherals. Examining the first sequence, *sequence 1*, shows the change in the value I of the current consumption during the start-up step of a first peripheral. This change in current as a function of time begins with a rapid increase corresponding to the current inrush caused by the start-up of the first peripheral. After reaching a maximum Ip, at a peak 111, the current consumption value I drops to a stabilised value Is of operating current I. This change in the value I of the current as a function of time, for the start-up phase, is called current profile P, or simply profile, illustrated by the current curve 110. The profile P is therefore notably characterised by the stabilisation time Ts of the current I. According to the assumption made here, the profile P of each peripheral (*peripheral 1, peripheral 2 and peripheral 3*) is therefore identical.

The device operating according to the preferred embodiment of the invention is equipped with several USB communication ports on each one of which is connected a peripheral. In the manner known to those skilled in the art, the device detects the presence of peripherals connected on the USB ports. In the example in *figures 1* and *2*, three peripherals (*peripheral 1, peripheral 2 and peripheral 3*) are each connected on a USB port.

Unlike *Figure 1*, the device incorporating the invention does not power all the peripherals at the same time. In fact, this device waits until the sequence, *sequence 1*, of start-up of the first peripheral is finalised, at the end of time Ts, by the stabilisation Is on the current consumption curve before proceeding to the start-up of the supply of power to the next peripheral, here *sequence 2*.

According to the method of the invention, there is no longer an accumulation of each of the current peaks. The value of the peak 111 to which the power supply is subjected during the start-up of the first peripheral corresponds to the peak consumption Ip of this peripheral. However, since the second peripheral has its start-up delayed according to a time period Ts after the stabilisation of the current consumption of the first peripheral, the peak 221 is lower than the peak 121 of *figure 1*. The resulting peak 221 on the cumulative current curve 220, according to the invention, is equal to the sum of the current consumption of the first peripheral Is and the peak consumption Ip of the second peripheral.

Likewise, the transition to the start-up of the third peripheral in *sequence 3* is delayed, until the start-up of the second peripheral is finalised, at the end of time Ts, by the stabilisation Is on the current consumption curve before proceeding to the start-up of the supply of power to the next peripheral. According to the method of the invention, the current peaks are offset in time and there is no longer an accumulation of each of the current peaks. The value of the peak 211 to which the power supply is subjected during the start-up of the second peripheral corresponds to the consumption peak Ip of this peripheral. However, since the third peripheral has its start-up delayed according to a time period Ts after the stabilisation of the current consumption of the second peripheral, the peak 231 is lower than the peak 131 of *figure 1*. The resulting peak 231 on the cumulative current curve 230, according to the invention, is equal to the sum of the current consumption Is of the first and second peripherals and the consumption peak Ip of the third peripheral.

Within the scope of our description and according to the assumptions previously made that the profiles are identical for all the peripherals, the maximum current consumption Imax according to the invention can be estimated by the following formula:

$$Imax = \left[Is * \left[n - 1\right]\right] + Ip \qquad \underline{\text{equation:}}\ n°3$$

Where: Is = value of the stabilised nominal operating current

n = number of connected peripherals

Ip = value of the start-up peak current

In a more realistic context where each of the peripherals possesses a different current profile P and with the assumption that USB peripherals are started in an order of 0 to n, the formula for calculating the maximum current according to the invention is:

$$Imax = \sum_{k=0}^{n-1} Is_k + Ip_n \qquad \underline{equation:}\ n°4$$

Where: Is_k = value of the stabilised nominal operating current of the peripheral k

n = number of connected peripherals

Ip_n = value of the start-up peak current of the peripheral n

One of the advantages of the invention is to reduce the maximum electrical consumption of the device during the start-up of the peripherals. The gain Igain can be estimated by the difference between the maximum value (*equation n°2*), consumed by a device according to the prior art and the maximum value (*equation n°4*), consumed by a device according to the invention. The calculation is obtained with the following formula:

$$Igain = \sum_{k=0}^{n-1} (Ip_k - Is_k) \qquad \underline{equation:}\ n°5$$

Where: Is_k = value of the stabilised nominal operating current of the peripheral k

n = number of connected peripherals

Ip_k = value of the start-up peak current of the peripheral k

As shown in *Figure 2*, the invention consists in proceeding to a sequential start-up of the USB peripherals connected to our device. Thus, each of the peaks is temporally delayed.

Figure 3 shows a block diagram describing a preferred embodiment of the invention.

The description of the invention will be better understood with a brief reminder concerning the signals present on a USB port. This is illustrated in the bubble in *figure 3*. The USB is a serial bus comprising four insulated wires. The ports complying with the USB standard mounted on a device such as the invention comprise four pins. Two pins are dedicated to the supply of electrical power to the peripheral, respectively to the ground GND and the power supply voltage V_{BUS}. The standard specifies that the maximum current delivered by V_{BUS} is 500mA. The two remaining pins carry the differential data signals D+ and D-, also called data lines.

The block diagram shows a device 1 comprising USB ports 30, 31 and 32, of means 20, 21 and 22, for interrupting the power supply for delivering the supply of electrical power and a processor 10. The processor 10 comprises time management means 12 and control means 11.

The means for controlled interruption of the power supply 20, 21 and 22 (also called means for supplying power) enable delivery or interruption on demand of the supply of electrical power V_{BUS} at each of the USB ports.

The time management means 12 (or waiting means) enable definition of the moment at which the supply of electrical power can be provided on a determined USB port.

The control means 11 of the USB ports (or control means) manages notably the distribution and supply using the means for interrupting the power supply 20, 21 and 22.

In the diagram, the use of an index ‘n’ for the notation on the means for supplying power 22 and the port 32, symbolises the possibility of equipping the device with as many ports as the USB standard allows. The invention imposes no

restrictions on a maximum number of ports used. The invention is however only useful if the device is equipped with a minimum of two USB ports.

At the start-up of the device, none of the USB ports 30, 31 or 32 is electrically powered. The means for interrupting the power supply 20, 21 and 22 ensure no current is supplied on the V_{BUS} bus power supply lines. This state is controlled by the control means 11.

After the device 1 is switched on, the control means 11 detect the presence of a peripheral at a port by a potential variation on the data lines D+ and D-. This potential variation is due to the presence in the peripherals of pull-up resistors on each of the data lines D+ and D-. The control means 11 can then proceed to the start-up cycles of a USB peripheral. While complying with the specification of the USB standard, the control means can initially proceed to the detection of all connected USB peripherals, then move on to the start-up cycles. But the control means can also detect a first peripheral, then pass to the start-up steps of this peripheral and when these steps are finished, move to the detection of the next USB peripheral. The method of detection used has no impact on the invention.

To illustrate the operation with an example, the presence of two peripherals on ports USB_0 30 and USB_1 31 is considered. The control means 11 detect the potential variation at port USB_0 30. Then the control means 11 request this port USB_0 30 to be supplied using the means for interrupting the power supply 20. The detailed actions by the control means 11 at this stage are described using the flowchart of *Figure 4*. When the initialisation phase of the peripheral is finished, at the end of a delay T_S and notably with a stabilisation of the current I_S, the control means 11 restarts the process with the next port, here in our example USB_1 31.

By processor 10 is understood for example the use of a microcontroller. But this can also be obtained using a microprocessor, an SoC, an FPGA or an ASIC. For example, Intel's Groveland SoC provides the function perfectly. It

should be noted that this example is non-restrictive and can be extended to all electronic devices.

The control means 11 as well as the time management means 12 are carried out for example using software bricks which are executed on the processor 10.

The means for interrupting the power supply 20, 21 and 22 are advantageously carried out by power supply switches. This type of switch is powered with a reference power supply present on the IN line. It possesses an EN line to authorise or prohibit the supply of electrical current on an output line OUT.

Preferentially, these switches possess an OC line to inform the control means 11 of a current overload on the output line OUT. The switches can for example be provided by components of the ST brand, under reference STMPS2141 or of the RICHTEK brand under reference RT9728A. However these means 20, 21 and 22 could be embedded in the processor 10, of type SoC, FPGA, etc.

Figure 4 shows a preferred operational flowchart of the invention. The references used relate to the references of the means described in *figure 3.*

The device 1 possessing USB connection ports detects the presence of a peripheral C during its connection via the pull-up resistors on the peripheral C connected on the two data wires, generating a voltage variation. The principle of this detection already discussed in the previous figure is described in the USB specifications, detection is followed by enumeration. Enumeration is a method for identifying the peripheral during its connection, by the device 1, in order to identify the device which has just been connected by obtaining its characteristics and attributing an address to it, which it will use for the communications.

If a peripheral C has been detected for example on port 30, the device 1 proceeds in the following manner, complying with the enumeration specifications of the standard.

During a first step E1, the device 1 and its control means 11 power the peripheral C connected to port 30 using the means for interrupting the power supply 20, 21 and 22. Immediately the device, using the time management means 12, proceeds to a timestamping E2 to fix the reference time t0 of the start-up. This timestamping can be effected by any known method, such as saving the internal clock or saving the tick counter used by the operating system or the real-time kernel. It can also be obtained by using an event, fitting an alarm, using a counter or any other method known to those skilled in the art.

Then, the control means 11 while complying with the sequence of exchanges with the peripheral C receives during a step E3, a descriptor DD enabling the connected peripheral C to be identified.

Using the descriptor DD supplied by the peripheral C, during a step E4, the device 1 searches for the corresponding stored profile P. The purpose is to obtain a value of the delay time R between the beginning of the start-up of the current peripheral on port 30 and the beginning of the start-up of the next peripheral for example on port 31. This delay time R is later provided to the time management means 12. It corresponds to the time necessary for the current stabilisation of the peripheral being started on port 30. The value of the delay time R is fixed as follows:

If the search has been successful, during a step E5, the control means 11 use the data constituting the profile P and notably the stabilisation time Ts, in order to fix the delay time R, equal to Ts, step E6.

If the search has not been successful, the peripheral C is therefore unknown and the delay time value R takes a default value Td, step E7. The default value is fixed. But it can also be calculated from the information received with the descriptor of the peripheral, and advantageously the descriptor field

bMaxPower which provides the maximum electrical consumption in graduations of 2 mA. It is then the product of bMaxPower with a constant.

Finally, during a last step E8, there is a check using timestamping t0 to see if the time elapsed since the power supply initiation of peripheral C is greater or less than the delay time R of the power supply stabilisation time. If the time elapsed is less, then the means for time management 12 allow the remaining time to elapse and thus delay the start-up of the peripherals not yet supplied. Otherwise, the time elapsed is greater than or equal to the delay time R, the start-up process of the first peripheral C is finished. It is then possible to move to the start-up of the next USB peripheral by repeating the detection phase if all of the connected USB peripherals have not previously been detected, then the start-up procedure, steps E1 to E8. Thus, the device 1 applies a sequential start-up of the peripherals such as described for *figure 2*, by supplying them with power one after the other. The peak currents Ip are therefore spaced out throughout the start-up phase.

A profile P is constituted from data enabling control of the start-up duration of the peripheral C to which it relates. These profiles are known and established by measurements carried out in the laboratory. The time Ts necessary for the current stabilisation during the start-up is notably measured. The maximum current Ip reached and the stabilised current Is are also measured. According to a preferred embodiment, the profile P comprises the value of the stabilisation time Ts. As we have seen previously, it is this value which serves to fix the temporal delay R in order to defer the supply of a next peripheral. In order to satisfy the search requirement, the profile P comprises an identifier ID enabling the peripheral C to be identified. This identifier ID is from the descriptor DD of the peripheral C. The comparison between the identifier ID from the descriptor DD transmitted by the peripheral C and those which are stored with the profile enable an efficient search.

Advantageously, the profile P can also comprise the maximum current value Ip during the current peak and the stabilised current value Is.

The choice from the list of profiles Ps to be stored is dependent on the device concerned. For example, for a multimedia device for audiovisual reception, such as a digital decoder, the manufacturer knows the list of peripherals which can be connected to its device. These are normally mass memories, such as flash memory sticks or USB hard disks. This manufacturer is therefore able to create a profile P for each device.

For the purposes of the invention, the profiles established in the laboratory are stored by the device 1. The means for storing the profiles are all means known to those skilled in the art. An example can be cited of storing profiles in a read-only memory (ROM), or in flash, under any form known as a file, a table or a linked list. The profile Ps can also be stored on any type of mass memory such as hard disks and be loaded in the random access memory, during the start-up of the device.

The identifier ID of the peripheral C is constituted from all information useful in the search, available in the descriptor provided by the peripheral C. For example, this can be done using the *idProduct* field and the *idVendor* field, but also with the product class defined by the *bDeviceClass* field.

The invention applies for any device described as, for example, an item of multimedia equipment (television, digital decoder, etc.) but also a computer. It applied not only to any device equipped with USB ports, but also applies to other types of ports for external or internal peripherals, for which the electrical power supply is provided by the host connection port and for which a sequential start-up is not prohibited by the operating constraints of the host device.

CLAIMS

1. Device (1) for controlling the supply of power to peripherals comprising at least two communication ports (30,31), each adapted to supply electrical power to at least a first peripheral (C), said device comprising a processor (10) and means (20,21,22) for interrupting the supply of power to said peripherals and being characterised in that:

   - said processor (10) is configured for controlling said means for interrupting the supply of power in order to sequence the start-up of the supply of electrical power to said communication ports by delaying by a delay time (R) the supply of electrical power to at least a second peripheral, said delay time (R) being at least equal to a current consumption stabilisation time (Ts) of said first peripheral, and

   - said device comprises storage means for storing consumption profiles of said peripherals and said processor (10) is able to search amongst the stored profiles (Ps), for a profile (P) corresponding to said first peripheral.

2. Device according to claim 1 characterised in that said profile (P) comprises said stabilisation time (Ts) and at least one identifier (ID) of said associated peripheral.

3. Device according to any one of the previous claims, characterised in that said communication ports are ports compatible with a Universal Serial Bus standard.

4. Method for controlling the supply of electrical power to peripherals connected to an electronic device (1) implementing said method characterised in that it comprises the steps of:

   - detecting at least two peripherals (C) connected to said device,
   - starting said first connected peripheral (C) and,

- sequentially starting the supply of electrical power to the other detected peripherals, each peripheral being started one after the other after a delay time (R) with respect to the supply of electrical power to another peripheral.

5. Control method according to claim 4, characterised in that the start-up step of each detected peripheral is broken down into steps for:

- supplying power (E1) to said peripheral (C);
- timestamping (E2) start-up (t0);
- obtaining (E3) a descriptor (DD);
- searching (E4) for a profile (P) of said peripheral (C) comprising a current stabilisation time (Ts)

6. Control method according to claim 5, characterised in that, if (E5) during the search (E4) for said profile (P) amongst the stored profiles, said profile (P) is found, said temporal delay (R) takes (E6) the value of said current stabilisation time (Ts).

7. Control method according to claim 5, characterised in that, if (E5) during said search (E4) for said profile (P) amongst said stored profiles, said search is unsuccessful, said temporal delay takes (E7) a default delay value (Td).

8. Control method according to claim 7 characterised in that, said default delay value (Td) is a constant value.

9. Control method according to claim 8 characterised in that, said default delay value (Td) is the product of the information of the maximum current consumed (bMaxPower) by said peripheral (C) with a constant.

10. Control method according to any one of the previous claims, characterised in that said peripherals are compatible with a Universal Serial Bus standard.

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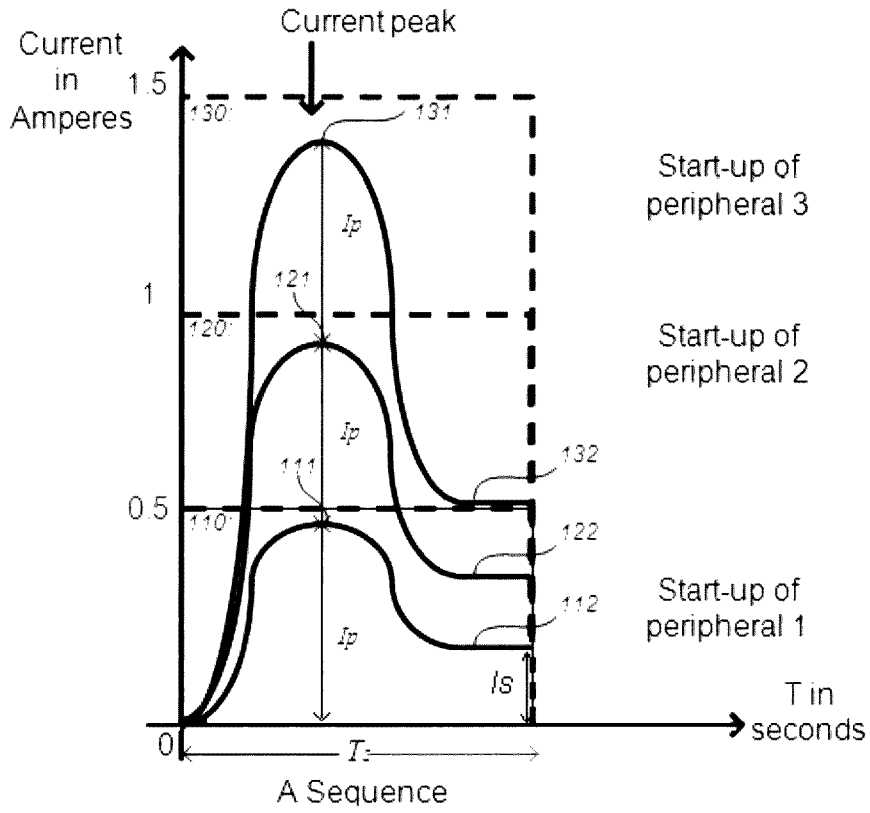


Fig. 1: prior art

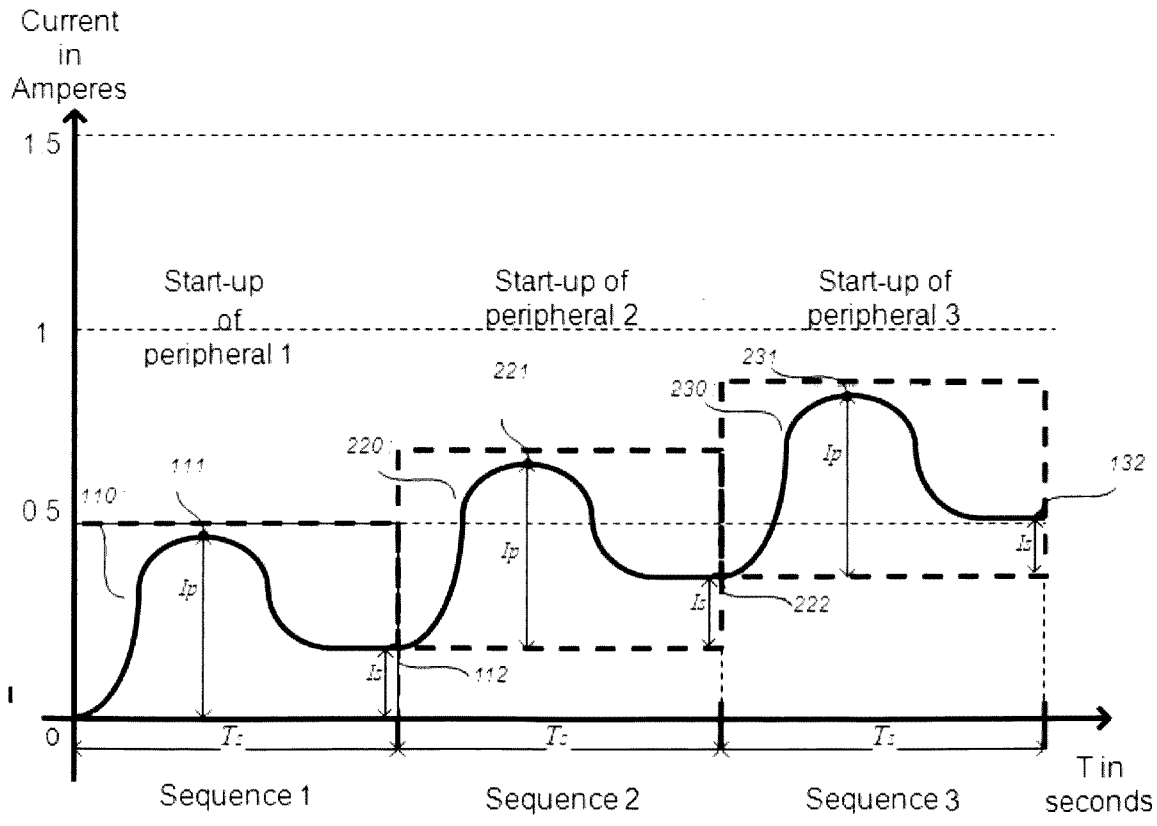
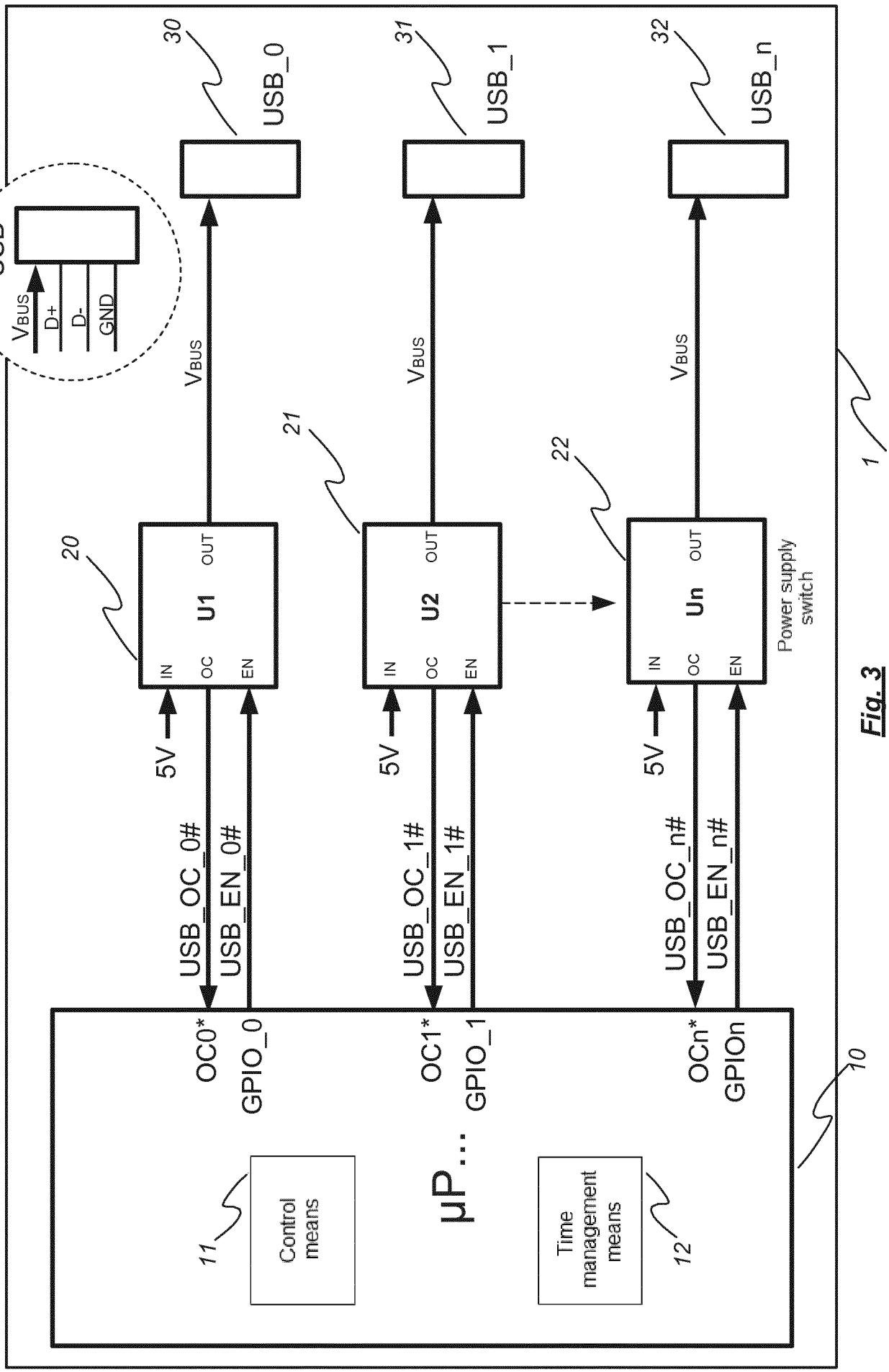


Fig. 2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VBUS
D+
D-
GND
30
USB_0
31
USB_1
32
USB_n
VBUS
VBUS
VBUS
21
22
20
U1
U2
Un
IN
OC
EN
OUT
Power supply switch
5V
5V
5V
USB_OC_0#
USB_EN_0#
USB_OC_1#
USB_EN_1#
USB_OC_n#
USB_EN_n#
OC0*
GPIO_0
OC1*
GPIO_1
OCn*
GPIOn
1
10
µP...
11
Control means
12
Time management means

Fig. 3

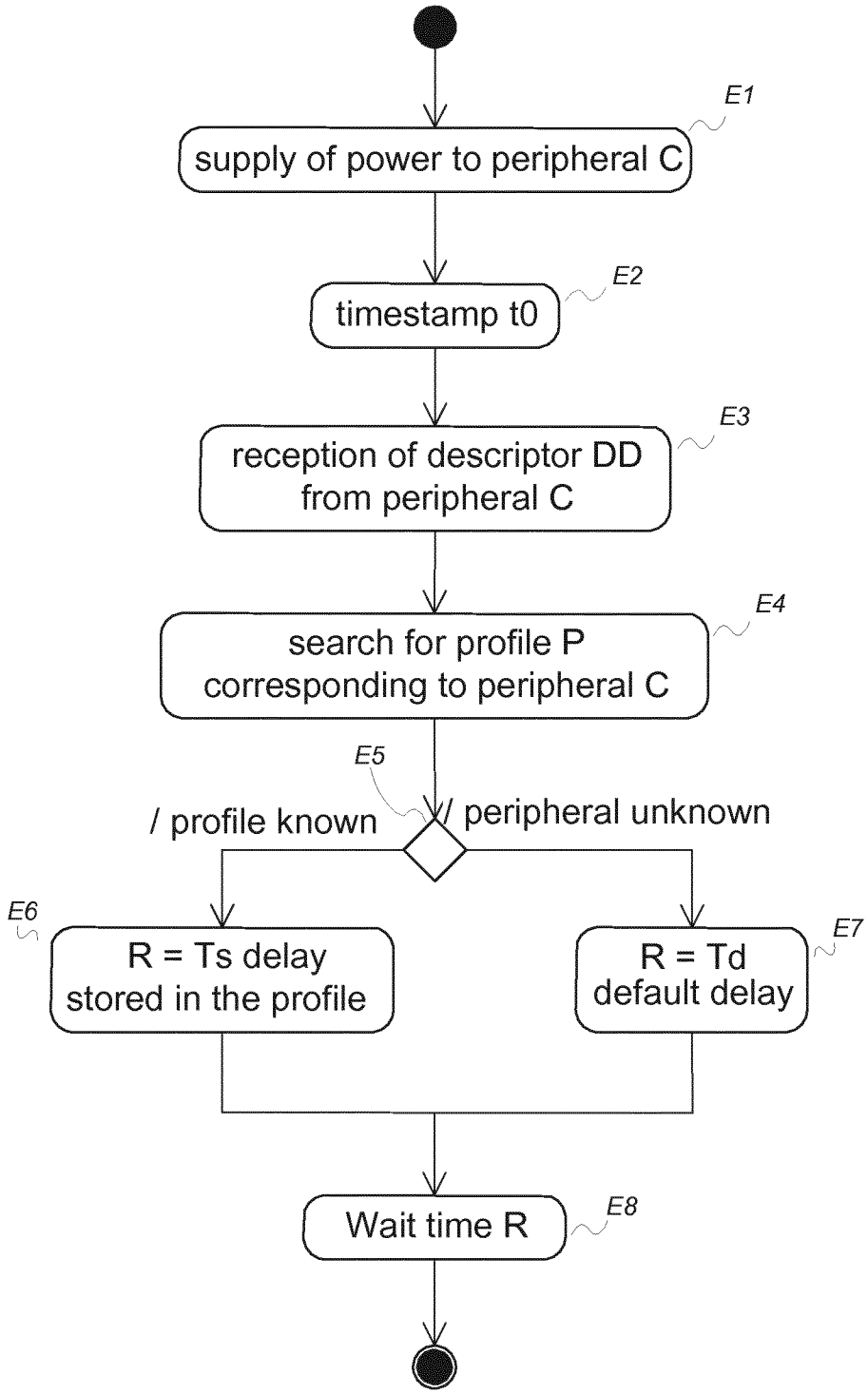
E1
supply of power to peripheral C
E2
timestamp t0
E3
reception of descriptor DD
from peripheral C
E4
search for profile P
corresponding to peripheral C
E5
/ profile known
/ peripheral unknown
E6
R = Ts delay
stored in the profile
E7
R = Td
default delay
E8
Wait time R

Fig. 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/050073

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F1/26
ADD.

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)
G06F

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)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 674 031 A (SISKA JR ANDREW F [US]) 16 June 1987 (1987-06-16) column 1, line 62 - column 4, line 57; figures 1,2	1-10
X	WO 01/96993 A2 (ADVANCED MICRO DEVICES INC [US]) 20 December 2001 (2001-12-20) page 2, line 10 - page 5, line 3; figure 1	1-10
X	US 4 593 349 A (CHASE MARK T [US] ET AL) 3 June 1986 (1986-06-03) column 1, line 50 - column 3, line 28; figure 1	1,4

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 May 2013	27/05/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Alonso Nogueiro, M

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2013/050073

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4674031 A	16-06-1987	NONE	
WO 0196993 A2	20-12-2001	CN 1436328 A	13-08-2003
		DE 60106438 D1	18-11-2004
		DE 60106438 T2	03-03-2005
		EP 1290537 A2	12-03-2003
		JP 4698120 B2	08-06-2011
		JP 2004503996 A	05-02-2004
		TW 523655 B	11-03-2003
		US 6766222 B1	20-07-2004
		WO 0196993 A2	20-12-2001
US 4593349 A	03-06-1986	NONE	