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Chiu

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(54) **PROCESS FOR GENERATING A SERIAL NUMBER FROM RANDOM NUMBERS**

(56) **References Cited**

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(21) Appl. No.: **11/865,705**

(22) Filed: **Oct. 1, 2007**

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Reissue of:

(64) Patent No.: **6,647,402**
Issued: **Nov. 11, 2003**
Appl. No.: **09/655,151**
Filed: **Sep. 5, 2000**

* cited by examiner

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U.S. Applications:

(63) Continuation of application No. 11/274,714, filed on Nov. 14, 2005, now Pat. No. Re. 40,389.

(51) **Int. Cl.**
G06F 1/02 (2006.01)

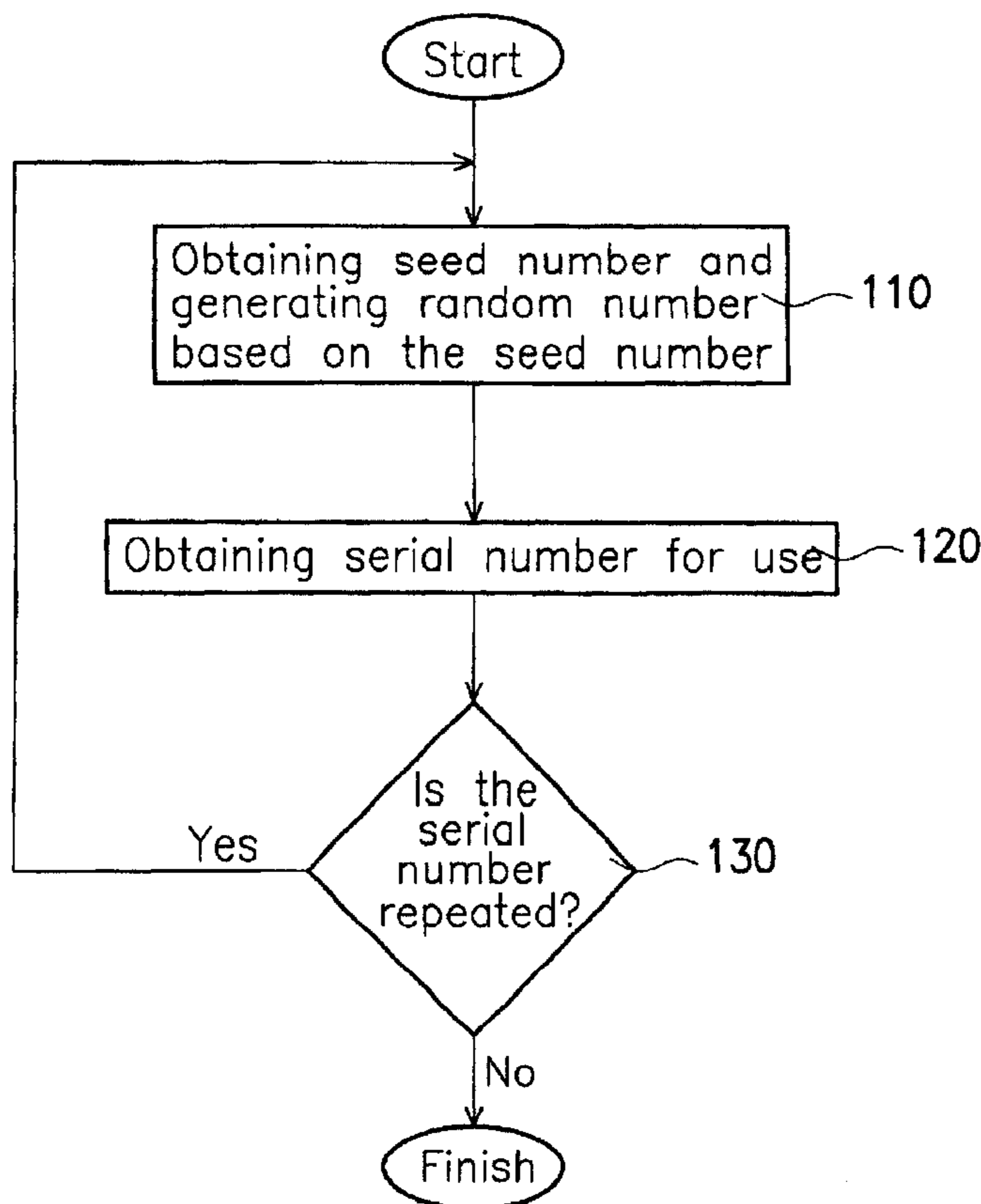
(52) **U.S. Cl.** **708/250; 708/254; 710/107**

(58) **Field of Classification Search** None
See application file for complete search history.

(57) **ABSTRACT**

A process for generating a serial number from a random number is suitable for being used on a device that uses serial number in a bus. First, this process generates a serial number for use from a random number according to a seed number, and then it checks if this generated serial number is repeated in the bus. When this generated serial number is the same as the serial number corresponding to any other devices that are of the same kind as the above mentioned device in the bus, a new serial number for use will be generated.

25 Claims, 2 Drawing Sheets



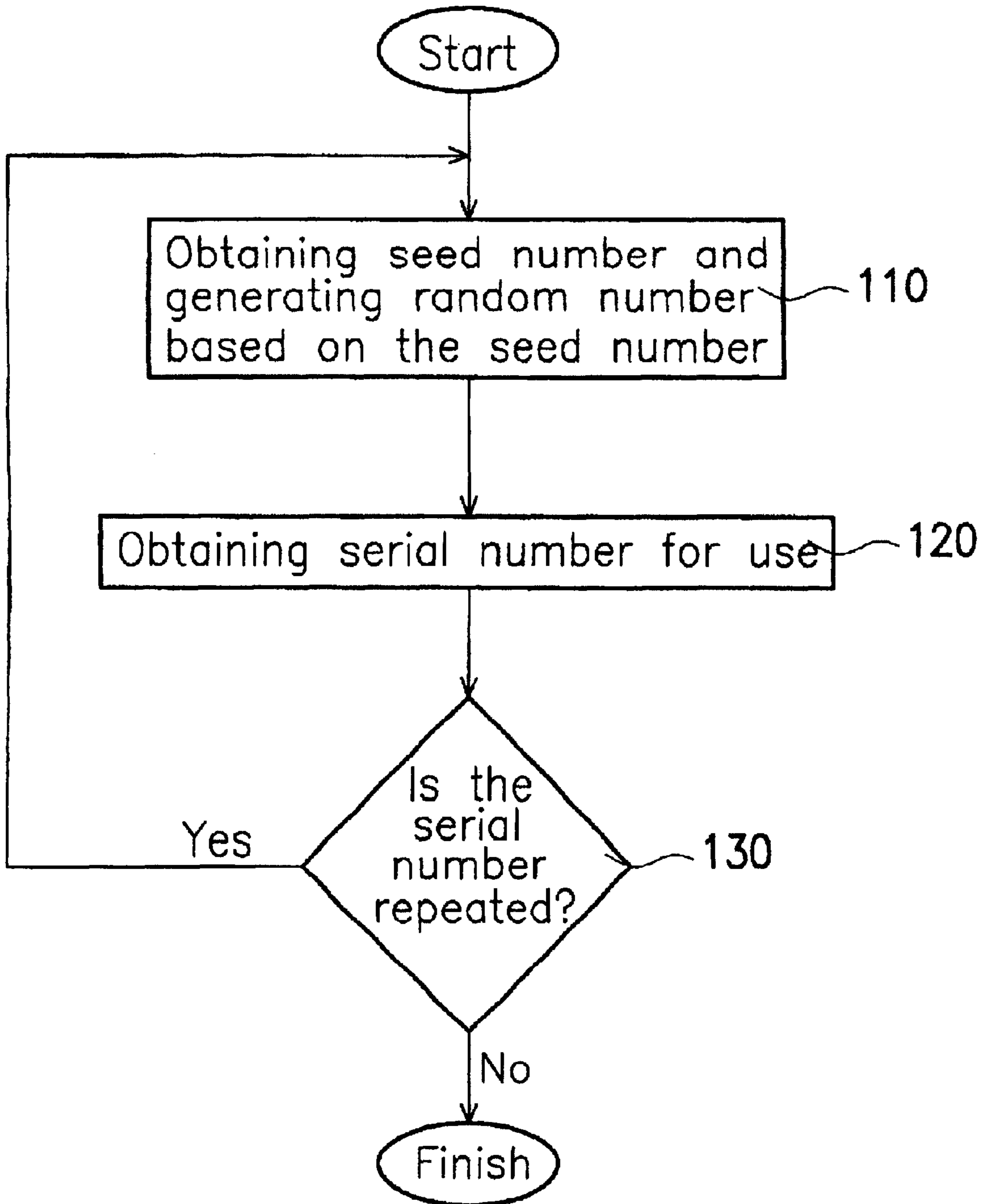


FIG. 1

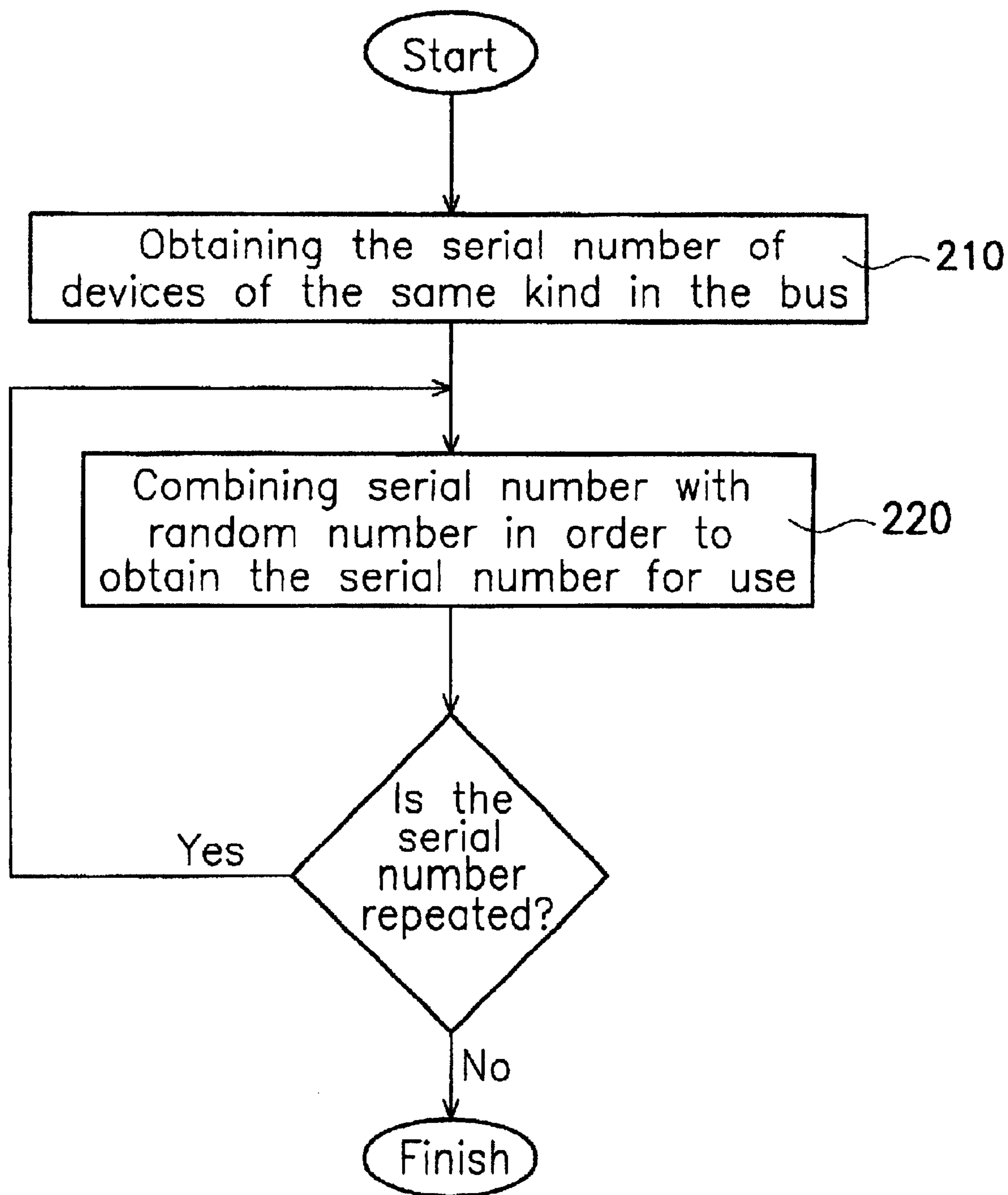


FIG. 2

PROCESS FOR GENERATING A SERIAL NUMBER FROM RANDOM NUMBERS

Matter enclosed in heavy brackets [] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

Notice: More than one reissue application has been filed for the reissue of U.S. Pat. No. 6,647,402 filed as application Ser. No. 09/655,151 on Sep. 5, 2000.

The present application is a continuation of U.S. application Ser. No. 11/274,714 filed Nov. 14, 2005, which in turn is a reissue of U.S. application Ser. No. 09/655,151 filed Sep. 5, 2000, all of which are assigned to the assignee of the present invention.

DESCRIPTION OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to a process for generating serial number, and particularly to a process for generating serial number from random number.

BACKGROUND OF THE INVENTION

In USB (Universal-Serial Bus) or IEEE 1394 Bus, every device will be given one and only serial number or ID. Generally speaking, the processes for generating serial number at present can be divided into two kinds. Wherein one kind of the processes for generating serial number is to use a fixed serial number on devices of the same kind. Although this process is simple and convenient, the devices of the same kind cannot be connected to one and the same USB or IEEE 1394 Bus and be used normally.

The other commonly known process for generating serial number is to store the serial number of devices in ROM, EPROM, EEPROM or flash memory, in order to make the serial number one and only. However, this process will cause the increase of the cost for programming the serial number and the increase of the expenses for memory circuit components in the process of manufacturing the devices. Apart from this, it is necessary to have control to prevent the serial number from repetition in the process of manufacturing, and in order to have the function of control, a related control circuit must be provided accordingly.

In such a situation, the present invention provides a process for generating serial number from random number. The process is suitable for being used on devices that use a serial number in a bus. This process first generates the serial number for use from random number based on a seed number, it then checks whether the serial number for use is repeated in the bus. If the generated serial number for use repeats the serial number corresponding to any other devices of the same kind in the bus, a new serial number for use is generated.

Among these numbers, the seed number can be any of the serial number corresponding to any of the devices of the same kind in the bus. The serial number for use is obtained from the combination in a random way of the serial numbers corresponding to these devices of the same kind.

Apart from this, when the device is a scanner, the seed number can be obtained by the variability of the increase of the tube's brightness after the device is started, the brightness of the reflected light of the correcting board, the random noise of the Charge Couple Device (CCD), or the distance between the edge of the correcting board and the home position, or by other ways. If the serial number for use

includes several digits, any one of the digits can be generated from the seed number obtained by any one of the ways for obtaining seed numbers.

To sum up, the present invention is to generate a needed serial number for use from random number. In most devices nowadays, a Central Processing Unit (CPU) is installed, therefore it will not be a problem to generate a random number. The invention can save time and the expense of related components, and can at the same time avoid the interference of the same serial numbers; thereby devices of the same kind can be installed on the same bus.

In order to make the above description and other objects, characteristics, and advantages of the invention clearer and easier to understand, A detailed description will be provided with preferred embodiments and with reference to the accompanying drawings as follows:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a step flow chart of a preferred embodiment according to the present invention; and

FIG. 2 shows another step flow chart of a preferred embodiment according to the present invention.

PREFERRED EMBODIMENT OF THE INVENTION

FIG. 1 shows a step flow chart of a preferred embodiment according to the invention. First in Step 110, the device that uses the process of the invention must obtain a seed number, and generate random number based on the seed number. Here the seed numbers that can be used may vary with devices. The better way would be to choose device that can obtain seed number with the least need of extra devices. For example, when this device is a scanner, the way to obtain seed number can be by the variability of the increase of the tube's brightness after the device is started, the brightness of the reflected light of the correcting board, the random noise of the Charge Couple Device, or by the distance between the edge of the correcting board and the home position.

Following Step 110, Step 120 is to generate a serial number from a combination of the random number. In this step, the most typical way is to take directly the random number obtained from Step 110 as the serial number for use. After this, Step 130 determines if the serial number for use obtained from Step 120 repeats the serial number of the other devices of the same kind in the bus. If it repeats, the device goes back to Step 110 to obtain a new seed number and then to obtain a new random number and a new serial number. Of course, it is also possible to renew only the random number without the need to obtain a new seed number.

Apart from this, when the serial number for use includes several digits, Step 110 can be repeated for several times, and a random number is obtained in the process of each repetition. Then the random numbers obtained from every time are combined together in Step 120. In another word, several random numbers can be taken as digits that form the serial numbers in use.

FIG. 2 shows flow chart of another preferred embodiment according to the invention. In this embodiment, the device that uses the process of the present invention first in Step 210 obtains serial numbers from the other devices of the same kind in the bus, then in Step 220 combines random numbers with these serial numbers, and obtain the serial number of the device according to the result of the combination. Finally, in Step 230 it checks the serial number for use in order to make sure the serial number for use does not repeats

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the serial numbers of the other devices of the same kind. When the serial number for use repeats the serial numbers of the other devices of the same kind, the device goes back to Step 220 to combine random number and serial numbers again to obtain another serial number for use.

It must be noted that while this invention can be used in devices with Central Processing Unit, it is not limited to the scanner mentioned herein. In addition, the processes disclosed in the two examples of embodiment for generating serial number from random number can be used together. They do not have to be used separately.

To sum up, the advantages of the present invention are as follows: the invention saves working time and the cost of the relevant component, and it easily avoids the disturbance caused by the same serial numbers.

While the invention is disclosed above with the preferred examples of embodiment, the invention is not limited by the preferred examples of embodiment. Anyone who is familiar with the art can make various modifications thereto, and it is intended that the appended claims cover all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

[1. A process for generating a serial number from a random number, which is suitable for being used on a device that uses the serial number in a bus, the process comprising:

generating the serial number for use from a random number based on a seed number, wherein the seed number is taken from an actual operation quantity carried by the device;

checking if the generated serial number is repeated in the bus; and

when the generated serial number is the same as a serial number corresponding to any other device of the bus, regenerating another serial number for the device.]

[2. A process for generating a serial number from a random number according to claim 1, wherein the seed number is a serial number corresponding to any of other devices in the bus.]

[3. A process for generating a serial number from a random number according to claim 2, wherein the generated serial number for use is formed by the combination of the serial number corresponding to any of the other devices in the bus.]

[4. A process for generating a serial number from a random number according to claim 3, wherein the said serial number is formed by permuting in a random way the said serial number corresponding to any of the other devices in the bus.]

[5. A process for generating a serial number from a random number, which is suitable for being used on a device that uses the serial number in a bus, the process comprising:

generating the serial number for use from a random number based on a seed number;

checking if the generated serial number is repeated in the bus; and

when the generated serial number is the same as a serial number corresponding to any other device of the bus, regenerating another serial number for the device,

wherein the device is a scanner, and the seed number is taken from a quantity selected from the group consisting of a variability of increasing of a tube's brightness after the scanner is started, a brightness of a reflected light of a correcting board, a random noise of a charge couple device, and a distance between an edge of the correcting board and a home position of the correcting board.]

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[6. A process for generating a serial number from a random number according to claim 5, wherein said generated serial number for use comprises a plurality of digit bits.]

[7. A process for generating a serial number from a random number according to claim 6, wherein each said digit bit of the generated serial number is generated from the seed number.]

[8. A process for generating a serial number from a random number according to claim 5, wherein the seed number is a serial number corresponding to any of other devices in the bus.]

[9. A process for generating a serial number from a random number according to claim 8, wherein the generated serial number for use is formed by the combination of the serial number corresponding to any of the other devices in the bus.]

[10. A process for generating a serial number from a random number according to claim 9, wherein the said serial number is formed by permuting in a random way the said serial number corresponding to any of the other devices in the bus.]

11. An apparatus, comprising:

a processor configured to generate a random number based on a seed number and to generate a serial number for use by a device on a bus, the generated serial number based at least in part on the random number that is based on the seed number;

wherein the seed number is taken from a property of the device, and wherein the processor is configured to determine whether the generated serial number is the same as a serial number corresponding to another device on the bus.

12. The apparatus of claim 11, wherein the device comprises a scanning device.

13. The apparatus of claim 12, wherein the seed number is based on at least one property selected from the group comprising a variability of a tube's brightness after the scanning device is started, a brightness of a reflected light of a correcting board, a random noise of a light sensing device, and a distance between an edge of the correcting board and a home position of the correcting board.

14. The apparatus of claim 11, wherein the processor is configured to generate a new serial number for use by the device on the bus in response to a determination that the generated serial number is repeated by another device on the bus.

15. The apparatus of claim 11, wherein the processor is configured to check other devices on the bus to determine whether the generated serial number is being used by another device.

16. The apparatus of claim 11, wherein the processor is configured to:

generate several random numbers using the seed number;

and

combine the generated random numbers to form the serial number.

17. The apparatus of claim 11, wherein the processor comprises a central processing unit for the apparatus.

18. The apparatus of claim 11, wherein the bus operates according to either the Universal Serial Bus (USB) standard or the Institute of Electrical and Electronics Engineers (IEEE) 1394 standard.

19. An apparatus to generate a serial number for use by a device on a bus, the apparatus comprising a processor configured to:

obtain a serial number associated with another device on the bus;

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generate the serial number for use by the device by combining a random number with the obtained serial number, wherein the processor is configured to use a seed number to obtain the random number, the seed number based on a property of the device; and

determine whether the generated serial number is the same as a serial number corresponding to other devices on the bus.

20. The apparatus of claim 19, wherein the processor is configured to:

identify any other devices on the bus that are the same type as the device; and

determine whether the generated serial number is the same as a serial number corresponding to only the identified devices.

21. The apparatus of claim 19, wherein the processor is configured to:

generate a new serial number for use by the device on the bus in response to a determination that the generated serial number is repeated by another device on the bus, the new serial number generated by combining the obtained serial number and a random value.

22. The apparatus of claim 19, wherein the device comprises a scanning device, and wherein the seed number is based on at least one property selected from the group comprising a variability of a tube's brightness after the scanning device is started, a brightness of a reflected light of a correcting board, a random noise of a light sensing device, and a distance between an edge of the correcting board and a home position of the correcting board.

23. An apparatus to generate a serial number for use by a device on a bus, the apparatus comprising:

means for obtaining a serial number associated with another device on the bus;

means for generating the serial number for use by the device by combining a random number with the obtained serial number, wherein the random number is based on a property of the device; and

means for determining whether the generated serial number is the same as a serial number corresponding to other devices on the bus.

24. The apparatus of claim 23, further comprising:

means for identifying other devices on the bus that are a same type as the device; and

means for obtaining the serial number only from the identified other devices.

25. The apparatus of claim 24, further comprising:

means for determining whether the generated serial number is the same as a serial number corresponding to only the identified other devices.

26. A method, comprising:

generating a random number based on a seed number to generate a serial number for use by a device on a bus, the generated serial number based at least in part on the random number that is based on the seed number; wherein the seed number is taken from a property of the device; and

determining whether the generated serial number is the same as a serial number corresponding to another device on the bus.

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27. The method of claim 26, wherein the device comprises a scanning device, and wherein the seed number is based on at least one property selected from the group comprising a variability of a tube's brightness after the scanning device is started, a brightness of a reflected light of a correcting board, a random noise of a light sensing device, and a distance between an edge of the correcting board and a home position of the correcting board.

28. The method of claim 26, further comprising generating a new serial number for use by the device on the bus in response to a determination that the generated serial number is repeated by another device on the bus.

29. The method of claim 26, further comprising checking other devices on the bus to determine whether the generated serial number is being used by another device.

30. The method of claim 26, further comprising:

generating several random numbers using the seed number; and

combining the generated random numbers to form the serial number.

31. A computer readable storage medium having instructions stored thereon, that, in response to execution by a system cause the system to perform operations comprising:

generating a random number based on a seed number to generate a serial number for use by a device on a bus, the generated serial number based at least in part on the random number that is based on the seed number;

wherein the seed number is taken from a property of the device; and

determining whether the generated serial number is the same as a serial number corresponding to another device on the bus.

32. The computer readable storage medium of claim 31, wherein the device comprises a scanning device, and wherein the seed number is based on at least one property selected from the group comprising a variability of a tube's brightness after the scanning device is started, a brightness of a reflected light of a correcting board, a random noise of a light sensing device, and a distance between an edge of the correcting board and a home position of the correcting board.

33. The computer readable storage medium of claim 31, wherein the operations further comprise generating a new serial number for use by the device on the bus in response to a determination that the generated serial number is repeated by another device on the bus.

34. The computer readable storage medium of claim 31, wherein the operations further comprise checking other devices on the bus to determine whether the generated serial number is being used by another device.

35. The computer readable storage medium of claim 31, wherein the operations further comprise:

generating several random numbers using the seed number; and

combining the generated random numbers to form the serial number.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : RE42,134 E
APPLICATION NO. : 11/865705
DATED : February 8, 2011
INVENTOR(S) : Chiu

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Title page, under "Related U.S. Patent Documents", Column 1, Line 7, above item (63) delete "(".

Column 4, line 28, in Claim 11, delete "*of the*" and insert -- *of a physical* --.

Column 4, line 33, in Claim 12, delete "*the device*" and insert -- *the physical device* --.

Column 5, line 5, in Claim 19, delete "*of the*" and insert -- *of a physical* --.

Column 5, line 23, in Claim 22, delete "*the device*" and insert -- *the physical device* --.

Column 5, line 38, in Claim 23, delete "*of the*" and insert -- *of a physical* --.

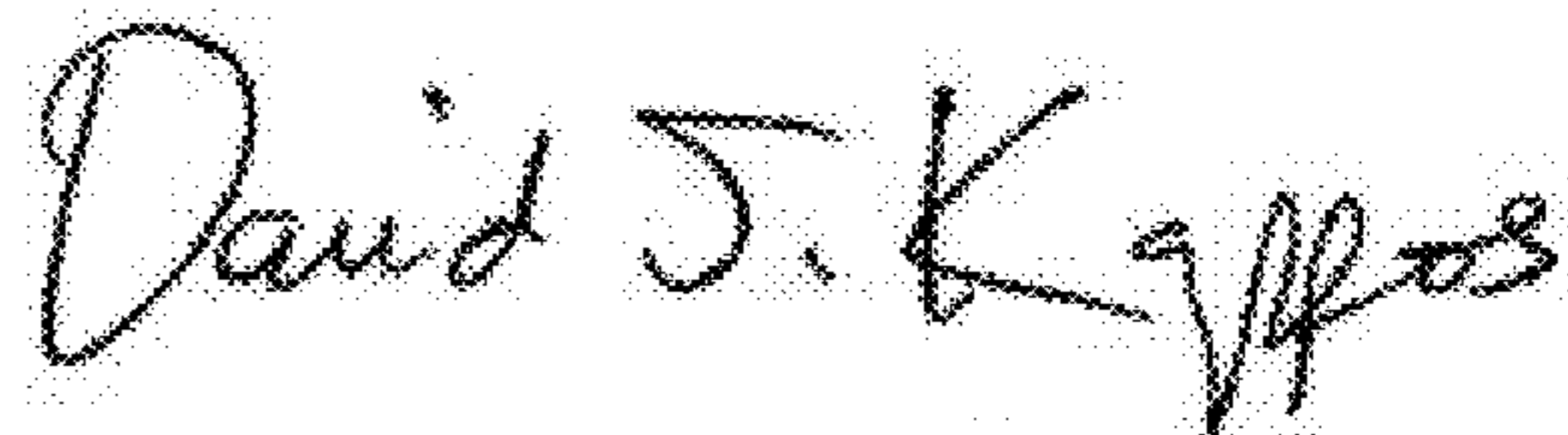
Column 5, line 57, in Claim 26, delete "*of the*" and insert -- *of a physical* --.

Column 6, line 1, in Claim 27, delete "*the device*" and insert -- *the physical device* --.

Column 6, line 30, in Claim 31, delete "*of the*" and insert -- *of a physical* --.

Column 6, line 36, in Claim 32, delete "*the device*" and insert -- *the physical device* --.

Signed and Sealed this
Thirty-first Day of May, 2011



David J. Kappos
Director of the United States Patent and Trademark Office