UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

UNIVERSAL IMAGING INDUSTRIES, LLC
Petitioner

v.

LEXMARK INTERNATIONAL, INC.
Patent Owner

Patent No. 7,844,786

PETITION FOR *INTER PARTES REVIEW* OF U.S. PATENT NO. 7,844,786

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I. INTRODUCTION

Universal Imaging Industries, LLC ("Universal" or "Petitioner"), requests *inter partes* review of Claims 1-16 of U.S. Patent No. 7,844,786 ("the '786" Patent, Ex. 1001), currently assigned to Lexmark International, Inc., in accordance with 35 U.S.C. §§ 311-319 and 37 C.F.R. §§ 42.100 *et seq.* This Petition presents non-cumulative grounds of invalidity that the U.S. Patent and Trademark Office ("PTO") did not consider during prosecution. These grounds are each likely to prevail, and this Petition should be granted. The challenged claims should each be cancelled.

II. MANDATORY NOTICES

Real Parties-in-Interest: Petitioner identifies the following real parties-in-interest: Universal Imaging Industries, LLC.

Related Matters: Patent Owner has asserted the '786 Patent against Petitioner in *Lexmark International, Inc. v. Universal Imaging Industries, LLC*, M.D. of FL, 8:18-cv-01047-EAK-AEP. Patent Owner has also asserted U.S. Patent No. 8,966,193 in the related action. Petitioner is concurrently filing an IPR petition for the '193 Patent as well.

The '786 is a division of U.S. Patent 7,426,613. The '193 Patent is a continuation of U.S. Patent 8,521,970, which is a continuation-in-part of the '613 Patent. This Petition and the IPR directed to the '193 Patent rely on the same prior art.

Lead Counsel: Woodrow Pollack (Reg. No. 58,908) (wpollack@shutts.com), Shutts & Bowen, LLP, 4301 W Boy Scout Blvd, Suite 300, Tampa, FL 33607.

Back-up Counsel: Ryan Santurri (Reg. No. 61,894) (rsanturri@allendyer.com), Allen, Dyer, Doppelt + Gilchrist, PA, PO Box 3791, Orlando, FL 32802.

Service Information: Please address all correspondence to counsel at the addresses shown above. Petitioner consents to electronic service by email to wpollack@shutts.com.

III. FEE AUTHORIZATION

The PTO is authorized to charge $31,100 to Deposit Account 50-4000 for the fee set forth in 37 C.F.R. § 42.15(a), and any additional fees that might be due in connection with this Petition.

IV. GROUNDS FOR STANDING

Petitioner certifies that the '786 Patent is available for IPR and Petitioner is not barred or estopped from requesting IPR on the grounds identified herein.

V. PRECISE RELIEF REQUESTED

Petitioner respectfully requests review and cancellation of Claims 1-16 of the '786 Patent on the below grounds:

Ground	Claims	Basis	Prior art

1	1-4, 6-14, 16	§ 102	Applegate
2	5 and 15	§ 103	Applegate and Bruce

VI. SUMMARY OF THE '786 PATENT

A. Overview of the Technology

The '786 Patent relates to tracking the level of toner or ink remaining in a printer cartridge.

B. Overview of the '786 Patent

The '786 Patent is generally directed to storing the remaining level of toner or ink in a printer cartridge. The '786 Patent stores this information in an "irreversible" form, so that once the printer cartridge records that a toner level is low, a user or retrofitter may not change this information. The level is stored with the printer cartridge, so that if the printer cartridge is moved from one printer to another printer, the printer can determine whether there is toner remaining in the cartridge. This has the purported advantage that a non-reusable printer cartridge that is near depletion cannot be refilled, as the printer cartridge itself has recorded that it is empty.

The '786 Patent implements this solution through what it calls a "punch out" bit. A punch out bit is not a term of art, but rather how the '786 Patent describes the manner in which Patent Owner itself has stored such information in printer cartridges

since at least 1998. According to the '786 Patent, a particular bit field is "punched out" when it is changed from an erased state to a programmed state. Ex. 1001, '786 Patent at 12:44-48.

The '786 Patent further describes the process as follows:

> Each bit field may be in either an erased or programmed state (e.g. a "0" or "1" while each page count may include a plurality of bits representing a numeric value. As an example, a non-volatile memory module provided with a toner cartridge may contain thirty-two bit fields, and as a particular amount of toner has been depleted (e.g., 1/32 of the total toner), a bit field may be "punched out," thereby changing the bit field from an erased state to a programmed state. For instance, the value in the bit field may be changed from an initial value of "0" to a value of "1". In this illustrative example, all thirty-two bit fields may be punched out after all of the toner had been depleted, thereby signifying full depletion of the toner cartridge.

Ex. 1001, '786 Patent at 4:67-5:13.

Irreversibly storing information in a bit field is not novel. Indeed, Patent Owner's own U.S. Patent 5,995,774 ("Applegate"), Ex 1004, discloses the same technique, using a commercial off the shelf EPROM (erasable programmable read-only memory). Petitioner asks the Board to institute review of claims 1-16 of the '786 Patent.

As explained in detail in the corresponding Declaration of Dr. Harry Direen

(attached as Ex. 1002[1]), and addressed in further detail below, the challenged claims of the '786 Patent would not have been considered new or nonobvious to a person of ordinary skill in the art at the time of filing.

VII. LEVEL OF SKILL

At the time of the priority date of the '786 Patent, a person of ordinary skill in the art would have a bachelor's degree in electrical and/or computer engineering with training and one or more years of experience in embedded systems, including both hardware and embedded software design. Ex. 1002, Direen Decl. at ¶¶ 29-32.

VIII. CLAIM CONSTRUCTION

The grounds in this Petition render obvious the challenged claims under both the broadest reasonable interpretation standard and the *Phillips* standard. To resolve the grounds presented in this Petition, Petitioner does not believe any term requires construction.

IX. OVERVIEW OF THE PRIOR ART

A. Applegate

U.S. Patent 5,995,774 ("Applegate"), Ex. 1004, issued November 30, 1999 and is prior art to the '786 Patent under 35 U.S.C. § 102. Applegate was not relied upon during prosecution of the '786 Patent.

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[1] Ex. 1002 includes Dr. Direen's declaration, as well as a claim chart identified as Ex. 1002-A.

Applegate discloses an "improved electrophotographic printer … having a detachable process cartridge that contains a non-volatile memory device." Ex. 1004, Applegate at Abstract. Applegate discloses a mechanism for measuring the toner level in the process cartridge, and storing consumption of the toner level in the non-volatile memory. *Id.* ("A toner 'gas-gauge' is created which uses 'bucket levels' as discrete steps to indicate how much of the measured physical toner material actually remains within the toner reservoir. After a given amount of toner material has been dispensed through the developer unit, one of the bits of the EPROM memory device is irreversibly burned, thereby providing a permanent record on the process cartridge of a certain amount of toner usage.").

Applegate discloses storing this toner information in an irreversible fashion so that it may not be changed:

> In the present invention, after a given amount of toner material has been dispensed through the developer unit, one of the bits of the EPROM memory device is irreversibly burned, thereby providing a permanent record on the process cartridge of a certain amount of toner usage. In this invention, the EPROM memory device acts as a "write once read often" memory device, because the EPROM cannot be erased by ultraviolet light, since the window through which this normally occurs is permanently sealed closed by the manufacturer (i.e., Dallas Semiconductor, Inc. in the preferred embodiment). The burning of a bit in the EPROM memory device occurs at "critical" transitions, which include times when a new bucket level has been reached (i.e., when the

> amount of toner material remaining in the toner reservoir has decreased to the point where the next lower bucket level is declared to be the "current" bucket level).

Ex. 1004, Applegate at 6:10-27. Applegate discloses physically write-protecting the non-volatile memory, so that once a bit is burned, its value is permanently set. *Id*. at 14:43-54.

Applegate discloses that this process was well-known in 1998:

> The EPROM 144 preferably comprises a Dallas Semiconductor, Inc. integrated circuit, part number DS1982, which is a "one-wire" read only memory device. While most EPROM's are capable of being erased (hence the letter "E" in "EPROM"), the DS1982 integrated circuit is first erased with ultraviolet light at the time of manufacturing, and then its ultraviolet window is permanently sealed so that the chip cannot later be erased after a bit is "burned" or "blown" by a method well known in the art within the EPROM device. Using this construction, the preferred EPROM chip becomes a "one-way" device that can be written to only once, but read many times. Such a chip is also referred to in the industry as an "add-only memory."

Id. at 12:40-52.

B. Hama

U.S. Patent 7,269,362 to ("Hama"), Ex. 1005, issued September 11, 2007 and is prior art to the '786 Patent under 35 U.S.C. § 102. Hama was not relied upon during prosecution of the '786 Patent.

Hama discloses an image forming apparatus, control method, and toner consumption calculating apparatus and method. Ex. 1005, Hama at Title. Hama discloses a number of printer cartridges (called "developers"), each with an associated memory. Ex. 1005, Hama at Figs. 1, 2 (items FY, 4C, 4M, and 4K). Each toner unit has an associated non-volatile memory. Ex. 1005, Hama at 4:54-56 ("Non-volatile memories 91 through 94 which store information regarding the respective developers are disposed to the developers 4Y, 4C, 4M, and 4K.") Hama further discloses that a processing unit updates and stores information in the memories 91-94. *Id*. at 4:61-64 ("In this manner, the information regarding the respective developers is transmitted to the CPU 101 and the information inside the respective memories 91 through 94 is updated and stored.").

Hama discloses the printing device updating respective counters in the print cartridges. *Id*. at 22:41-49 ("The CPU 101 of the engine controller 10 calculates a toner consumption, subtracts this from the initial value and updates information regarding the current remaining toner amount. Thus, updated information regarding the remaining toner amount is stored in the RAM 107 and also in the memory of the toner cartridge 4Y or the like. The remaining amounts information is updated separately for the respective colors, so that the RAM 107 and the memories of the toner cartridges always store the latest remaining toner amounts.")

C. Bruce

U.S. Patent 5,822,251 ("Bruce"), Ex. 1003 issued on October 13, 1998 and is prior art under 35 U.S.C. § 102. Bruce was not relied upon during prosecution of the '786 Patent.

Bruce discloses an expandable flash-memory mass-storage using shared buddy lines, and intermediate flash-bus between device-specific buffers and flash-intelligent DMA controllers. Ex. 1003 Bruce at Title. Bruce discloses memory devices with multiple memory cells and multiple signal lines for communicating with the device. *Id.* at Fig. 2. The memory includes a busy condition status line. *Id.* at Fig. 1.

Bruce discloses a busy signal provided by a memory chip. *Id*. at 1:66-2:3 ("A busy signal is usually provided by each flash-memory chip to indicate when the read, write, or erase operation has completed. The busy signal allows a local processor to continue with other tasks while the flash-memory integrated circuit chip performs the flash operation.").

Bruce further discloses a plurality of signal lines. *Id.* at 2:57-60 ("The flash bus has shared lines that transmit the sequence of command bytes and address bytes from the flash-specific DMA controller. The shared lines also transmit data bytes from the flash-specific DMA controller for the host interface.").

X. DETAILED EXPLANATION OF GROUNDS

A. Ground 1: Claims 1-4, 6-14, and 16 are Anticipated by Applegate

1. Claim 1

a) "A method of updating memory modules, comprising:

Applegate is a method of updating memory modules. Ex. 1002, Direen Decl. at ¶¶ 42-45; Ex. 1002-A at Claim 1; Ex. 1004, Applegate at Figs. 8 ("write machine data to EPROM"); 9 ("record bucket level in EPROM").

> ***b) "receiving, at one or more memory modules, a command transmitted from a processing device, wherein the command comprises a) an increment counter command operable to instruct the one or more memory modules to increment a counter within the one or more memory modules and b) a punch out bit field command operable to instruct the one or more memory modules to punch out a specified bit field within the one or more memory modules; and***

Applegate discloses receiving a command transmitted from a processing device. Ex. 1002-A at Claim 1; Ex. 1004, Applegate at Fig. 5-6; 11:31-38.

Applegate discloses the command comprises an increment counter command operable to instruct the one or more memory modules to increment a counter within the one or more memory modules. Ex. 1004, Applegate at 2:17-21 ("The non-volatile memory comprises an EEPROM integrated circuit which has a new count value incremented every time the printer produces a new printed sheet of print media."); 20:18-22 ("Starting at a step 350 on FIG. 8, a sheet of print media is printed for a particular print job. This step is arrived at for every print job received by printer 10. After that occurs, at a step 352 the toner gram count is updated after this sheet of print media has completed its printing.").

Applegate discloses the command comprises a punch out bit field command operable to instruct the one or more memory modules to punch out a specified bit field within the one or more memory modules. Ex. 1002, Direen Decl. at ¶ 43; Ex. 1004, Applegate at Abstract ("After a given amount of toner material has been dispensed through the developer unit, one of the bits of the EPROM memory device is irreversibly burned, thereby providing a permanent record on the process cartridge of a certain amount of toner usage."). *Id.* at 6:10-14.

Applegate, owned by Patent Owner, even discloses the same thirty-two (32) bit field for tracking toner consumption:

The main portion of memory elements of the EPROM **144** comprise the 1024 bits of non-volatile memory elements **180** that are initially set to a Logic 1 value, and which can be irreversibly cleared to a Logic 0 on a bit-by-bit basis. As discussed above, these 1024 bits are logically divided into four 32-bit "pages." Each of the logical pages of this set of EPROM memory elements **180** can be physically write-protected by circuitry that falls within the function block **186** as depicted on FIG. **6**. Once a page has been write-protected, none of its bits can then be burned thereafter, and their values at that point are permanently set as either Logic 1 or Logic 0.	plurality of bits representing a numeric value. As an example, a non-volatile memory module provided with a toner cartridge may contain thirty-two bit fields, and as a particular amount of toner has been depleted (e.g., 1/32 of the total toner), a bit field may be "punched out," thereby changing the bit field from an erased state to a programmed state. For instance, the value in the bit field may be changed from an initial value of "0" to a value of "1". In this illustrative example, all thirty-two bit fields may be punched out after all of the toner had been depleted, thereby signifying full depletion of the toner cartridge. It will be appreciated by one of ordinary skill in the art that imaging and printing devices may contain
Applegate at 14:43-54	'786 Patent at 5:2-13

c) processing the command at the one or more memory modules."

Applegate discloses the command being processed at the one or more memory modules. Figure 6 from Applegate (shown below with annotations) shows a block diagram of the non-volatile memory device attached to the toner cartridge

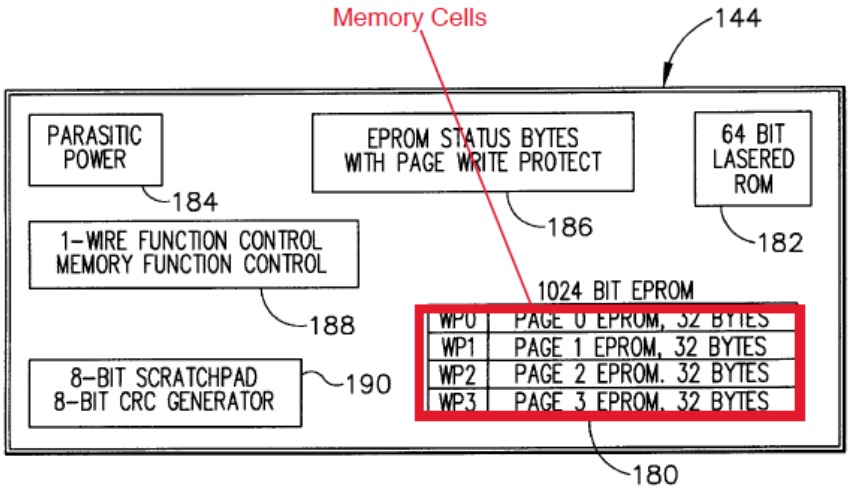

FIG. 6

Figure 9 in Applegate is a flowchart that includes a process for monitoring the toner level in the toner cartridge. Step 406 indicates that if a Toner Low condition occurs, a cycle count is written to the EPROM (non-volatile memory device on the toner cartridge). *Id*. at 22:32-35 ("[At] step 406 now writes the toner wheel cycle count to EPROM 144. This cycle count is stored in EPROM 144 in its EPROM registers 180 at Page 2, bytes 3-4."). These commands are processed at the one or more memory modules.

Applegate also explains that a bucket level relating to the amount of toner in the toner cartridge is stored in the EPROM. *Id*. at 22:3-23; 23:1-3; Fig. 9 at step 444. As toner is consumed, Applegate discloses incrementing the count of toner used. *Id*. at Abstract ("After a given amount of toner material has been dispensed through the developer unit, one of the bits of the EPROM memory device is irreversibly burned, thereby providing a permanent record on the process cartridge

of a certain amount of toner usage."). These commands are processed at the one or more memory modules.

2. Claim 2

a) "The method of claim 1, wherein processing the command comprises incrementing, in each of the one or more memory modules, at least one counter."

Applegate discloses incrementing a counter. Ex. 1002-A at Claim 2; Ex. 1004, Applegate at 2:17-21 ("The non-volatile memory comprises an EEPROM integrated circuit which has a new count value incremented every time the printer produces a new printed sheet of print media."); 20:18-22 ("Starting at a step 350 on FIG. 8, a sheet of print media is printed for a particular print job. This step is arrived at for every print job received by printer 10. After that occurs, at a step 352 the toner gram count is updated after this sheet of print media has completed its printing.").

3. Claim 3

a) "The method of claim 2, wherein incrementing further comprises incrementing, in each of the one or more memory modules, the at least one counter by an increment value specified in the command."

Applegate discloses incrementing the counter by an increment value specified in the command, namely the toner gram count. Ex. 1002-A at Claim 3; Ex. 1004, Applegate at 20:21-27 ("After that occurs, at a step 352 the toner gram count is updated after this sheet of print media has completed its printing. This toner gram count is determined by a 'toner tally' which is an estimate of the quantity of the toner

material that has been consumed from the process cartridge 100 after it has been installed in the printer 10.").

4. Claim 4

a) "The method of claim 2, wherein the command further comprises memory module addresses corresponding to each of the one or more one or memory modules."

Applegate discloses the command further comprises memory module addresses corresponding to each of the one or more memory modules. Ex. 1004, Applegate at 9:36-42 ("It will be understood that the address, data, and control lines are typically grouped in buses, which are electrically conductive pathways that are physically communicated in parallel (sometimes also multiplexed) around the various electronic components within laser printer 10. For example, the address and data buses are typically sent to all ROM and RAM integrated circuits…").

Figure 6 from Applegate (shown below with annotations) shows a block diagram of the non-volatile memory device attached to the toner cartridge.

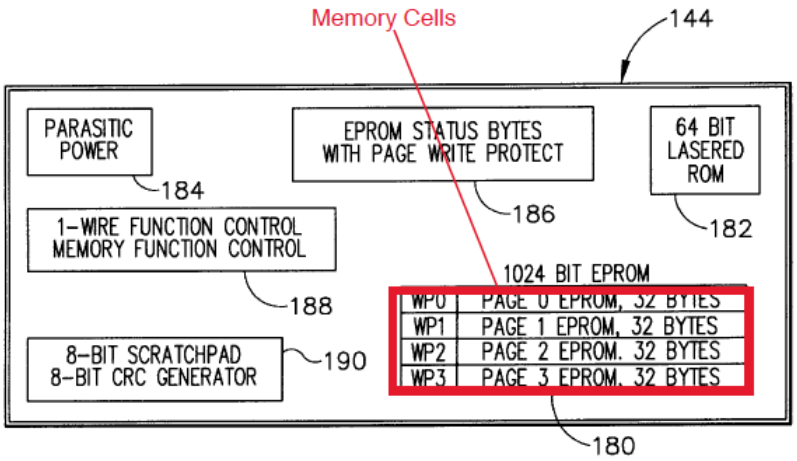

FIG. 6

Applegate further discloses memory module addresses corresponding to the memory module. Ex. 1004, Applegate at 22:32-35 ("[At] step 406 now write the toner wheel cycle count to EPROM 144. This cycle count is stored in EPROM 144 in its EPROM registers 180 at Page 2, bytes 3-4."). Applegate further discloses Table 1, providing a mapping of values stored in memory by the address or byte offset to use. *Id*. at 14:60-17:40.

5. Claim 6

a) "The method of claim 1, wherein receiving further comprises receiving, at the one or more memory modules, the command from the processing device transmitted to the one or more memory modules via an asynchronous data channel."

Applegate's preferred embodiment discloses using a particular EPROM, namely a Dallas Semiconductor, Inc. integrated circuit, part number DS1982. Ex. 1004, Applegate at 12:40-45. This part is a "'one-wire' read only memory device." *Id*. This 1-wire device is an asynchronous data channel. Ex. 1002-A at Claim 6. Thus, Applegate discloses this limitation.

6. Claim 7

a) "The method of claim 1, wherein the punch out bit field command comprises implementing a command to change a bit associated with at least one memory module from an erased state to a programmed state."

Applegate discloses this limitation. Ex. 1002-A at Claim 7; Ex. 1004, Applegate at 12:43-44 ("the DS1982 integrated circuit is first erased with ultraviolet

light at the time of manufacturing,…"). Thus, when a bit is changed in Applegate, it must be programmed from an originally erased state.

Applegate discloses a command to change a bit associated with at least one memory module from an erased state to a programmed state:

> In the present invention, after a given amount of toner material has been dispensed through the developer unit, one of the bits of the EPROM memory device is irreversibly burned, thereby providing a permanent record on the process cartridge of a certain amount of toner usage. In this invention, the EPROM memory device acts as a "write once read often" memory device, because the EPROM cannot be erased by ultraviolet light, since the window through which this normally occurs is permanently sealed closed by the manufacturer (i.e., Dallas Semiconductor, Inc. in the preferred embodiment). The burning of a bit in the EPROM memory device occurs at "critical" transitions, which include times when a new bucket level has been reached (i.e., when the amount of toner material remaining in the toner reservoir has decreased to the point where the next lower bucket level is declared to be the "current" bucket level).

Ex. 1004, Applegate at 6:10-27.

7. Claim 8

a) "The method of claim 1, wherein the bit field comprises at least eight bits."

Applegate discloses the bit field comprises at least eight bits. Ex. 1002-A at Claim 8; Ex. 1004, Ex. 1004, Applegate at Fig.6 (disclosing memory PAGE 2,

comprising 32 bytes, which is at least eight bits); Table 1, memory PAGE 2 (disclosing a number of bit fields, each a byte in length, where a byte is eight bits). An annotated copy of Fig. 6 is below:

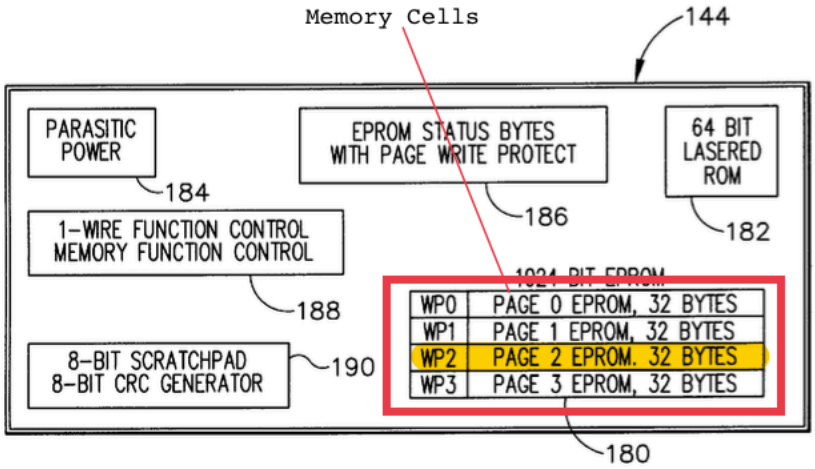

FIG. 6

8. Claim 9

Claim 9 is identical to Claim 1, except elements (a) and (b) in the "receiving" step have been reversed. Claim 9 is unpatentable for at least the same reasons identified for Claim 1.

a) "A method of updating memory modules, comprising:"

Applegate is a method of updating memory modules. Ex. 1002, Direen Decl. at ¶¶ 42-45; Ex. 1002-A at Claim 9; Ex. 1004, Applegate at Figs. 8 ("write machine data to EPROM"); 9 ("record bucket level in EPROM").

b) "receiving, at one or more memory modules, a command transmitted from a processing device, wherein the command is a) a punch out bit field command operable to instruct the one or more memory modules to punch out a specified bit field within the one or more memory modules and b) an increment

counter command operable to instruct the one or more memory modules to increment a counter within the one or more memory modules; and"

Applegate discloses receiving a command transmitted from a processing device. Ex. 1002-A at Claim 1; Ex. 1004, Applegate at Fig. 5-6; 11:31-38.

Applegate discloses the command comprises an increment counter command operable to instruct the one or more memory modules to increment a counter within the one or more memory modules. Ex. 1004, Applegate at 2:17-21 ("The non-volatile memory comprises an EEPROM integrated circuit which has a new count value incremented every time the printer produces a new printed sheet of print media."); 20:18-22 ("Starting at a step 350 on FIG. 8, a sheet of print media is printed for a particular print job. This step is arrived at for every print job received by printer 10. After that occurs, at a step 352 the toner gram count is updated after this sheet of print media has completed its printing.").

Applegate discloses the command comprises a punch out bit field command operable to instruct the one or more memory modules to punch out a specified bit field within the one or more memory modules. Ex. 1002, Direen Decl. at ¶ 43; Ex. 1004, Applegate at Abstract ("After a given amount of toner material has been dispensed through the developer unit, one of the bits of the EPROM memory device is irreversibly burned, thereby providing a permanent record on the process cartridge of a certain amount of toner usage."). *Id.* at 6:10-14.

Applegate, owned by Patent Owner, even discloses the same thirty-two (32) bit field for tracking toner consumption:

The main portion of memory elements of the EPROM **144** comprise the 1024 bits of non-volatile memory elements **180** that are initially set to a Logic 1 value, and which can be irreversibly cleared to a Logic 0 on a bit-by-bit basis. As discussed above, these 1024 bits are logically divided into four 32-bit "pages." Each of the logical pages of this set of EPROM memory elements **180** can be physically write-protected by circuitry that falls within the function block **186** as depicted on FIG. **6**. Once a page has been write-protected, none of its bits can then be burned thereafter, and their values at that point are permanently set as either Logic 1 or Logic 0.	plurality of bits representing a numeric value. As an example, a non-volatile memory module provided with a toner cartridge may contain thirty-two bit fields, and as a particular amount of toner has been depleted (e.g., 1/32 of the total toner), a bit field may be "punched out," thereby changing the bit field from an erased state to a programmed state. For instance, the value in the bit field may be changed from an initial value of "0" to a value of "1". In this illustrative example, all thirty-two bit fields may be punched out after all of the toner had been depleted, thereby signifying full depletion of the toner cartridge. It will be appreciated by one of ordinary skill in the art that imaging and printing devices may contain
Applegate at 14:43-54	'786 Patent at 5:2-13

c) "processing the command at the one or more memory modules."

Applegate discloses the command being processed at the one or more memory modules. Figure 6 from Applegate (shown below with annotations) shows a block diagram of the non-volatile memory device attached to the toner cartridge

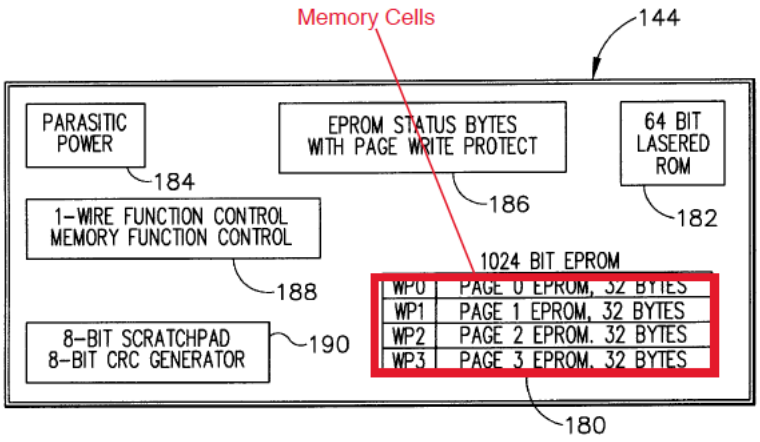

FIG. 6

Figure 9 in Applegate is a flowchart that includes a process for monitoring the

toner level in the toner cartridge. Step 406 indicates that if a Toner Low condition occurs, a cycle count is written to the EPROM (non-volatile memory device on the toner cartridge). *Id*. at 22:32-35 ("[At] step 406 now writes the toner wheel cycle count to EPROM 144. This cycle count is stored in EPROM 144 in its EPROM registers 180 at Page 2, bytes 3-4."). These commands are processed at the one or more memory modules.

Applegate also explains that a bucket level relating to the amount of toner in the toner cartridge is stored in the EPROM. *Id*. at 22:3-23; 23:1-3; Fig. 9 at step 444. As toner is consumed, Applegate discloses incrementing the count of toner used. *Id*. at Abstract ("After a given amount of toner material has been dispensed through the developer unit, one of the bits of the EPROM memory device is irreversibly burned, thereby providing a permanent record on the process cartridge of a certain amount of toner usage."). These commands are processed at the one or more memory modules.

9. Claim 10

a) "The method of claim 9, wherein the punch out bit field command comprises implementing a command to change a bit associated with at least one memory module from an erased state to a programmed state."

Applegate discloses this limitation. Ex. 1002-A at Claim 10; Ex. 1004, Applegate at 12:43-44 ("the DS1982 integrated circuit is first erased with ultraviolet light at the time of manufacturing,…"). Thus, when a bit is changed in Applegate, it

must be programmed from an originally erased state.

Applegate discloses a command to change a bit associated with at least one memory module from an erased state to a programmed state:

> In the present invention, after a given amount of toner material has been dispensed through the developer unit, one of the bits of the EPROM memory device is irreversibly burned, thereby providing a permanent record on the process cartridge of a certain amount of toner usage. In this invention, the EPROM memory device acts as a "write once read often" memory device, because the EPROM cannot be erased by ultraviolet light, since the window through which this normally occurs is permanently sealed closed by the manufacturer (i.e., Dallas Semiconductor, Inc. in the preferred embodiment). The burning of a bit in the EPROM memory device occurs at "critical" transitions, which include times when a new bucket level has been reached (i.e., when the amount of toner material remaining in the toner reservoir has decreased to the point where the next lower bucket level is declared to be the "current" bucket level).

Ex. 1004, Applegate at 6:10-27.

10. Claim 11

a) "The method of claim 9, wherein the bit field comprises at least eight bits."

Applegate discloses the bit field comprises at least eight bits. Ex. 1002-A at Claim 11; Ex. 1004, Applegate at Fig.6 (disclosing memory PAGE 2, comprising 32 bytes, which is at least eight bits); Table 1, memory PAGE 2 (disclosing a number

of bit fields, each a byte in length, where a byte is eight bits). An annotated copy of Fig. 6 is below:

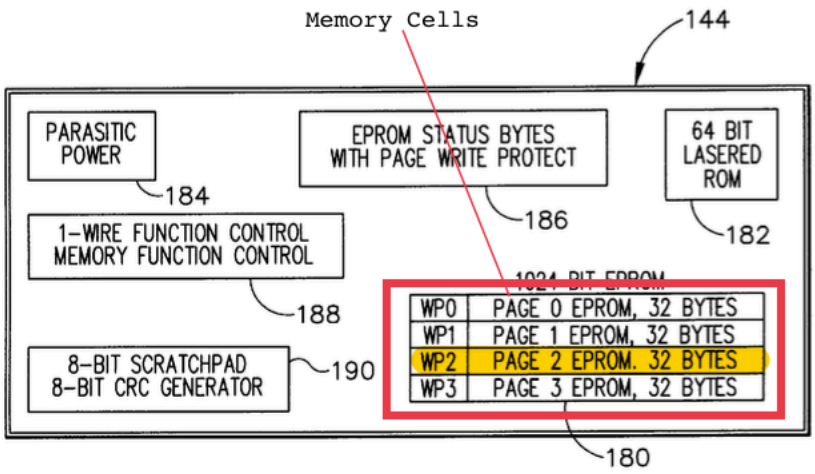

FIG. 6

11. Claim 12

a) "The method of claim 9, wherein receiving further comprises receiving, at the one or more memory modules, the command from the processing device transmitted to the one or more memory modules via an asynchronous data channel."

Applegate's preferred embodiment discloses using a particular EPROM, namely a Dallas Semiconductor, Inc. integrated circuit, part number DS1982 (Ex. 1007). Ex. 1004, Applegate at 12:40-45. This part is a "'one-wire' read only memory device." *Id*. This 1-wire device is an asynchronous data channel. Ex. 1002-A at Claim 9. Thus, Applegate discloses this limitation.

12. Claim 13

a) "The method of claim 9, wherein processing the command comprises incrementing, in each of the one or more memory modules, said counter."

Applegate discloses incrementing a counter. Ex. 1002-A at Claim 13; Ex. 1004, Applegate at 2:17-21 ("The non-volatile memory comprises an EEPROM integrated circuit which has a new count value incremented every time the printer produces a new printed sheet of print media."); 20:18-22 ("Starting at a step 350 on FIG. 8, a sheet of print media is printed for a particular print job. This step is arrived at for every print job received by printer 10. After that occurs, at a step 352 the toner gram count is updated after this sheet of print media has completed its printing.").

13. Claim 14

a) "The method of claim 9, wherein incrementing further comprises incrementing, in each of the one or more memory modules, the counter by an increment value specified in the command."

Applegate discloses incrementing the counter by an increment value specified in the command, namely the toner gram count. Ex. 1002-A at Claim 14; Ex. 1004, Applegate at 20:21-27 ("After that occurs, at a step 352 the toner gram count is updated after this sheet of print media has completed its printing. This toner gram count is determined by a 'toner tally' which is an estimate of the quantity of the toner material that has been consumed from the process cartridge 100 after it has been installed in the printer 10.").

14. Claim 16

a) "A method of updating memory modules in an imaging device, comprising:"

Applegate is a method of updating memory modules in an imaging device. Ex. 1002, Direen Decl. at ¶¶ 42-45; Ex. 1002-A at Claim 1; Ex. 1004, Ex. 1004, Applegate at Figs. 8 ("write machine data to EPROM"); 9 ("record bucket level in EPROM").

> ***b) "receiving, at one or more memory modules, a command transmitted from a processing device, wherein the command is indicative of usage of toner or ink in a consumable item in the imaging device and is operable to instruct the one or more memory modules to punch out a specified bit within the one or more memory modules indicative of said usage of toner or ink; and"***

Applegate discloses receiving a command transmitted from a processing device. Ex. 1002-A at Claim 16; Ex. 1004, Applegate at Fig. 5-6; 11:31-38. Applegate discloses the command is indicative of usage of toner or ink in a consumable item in the imaging device and comprises a punch out bit field command operable to instruct the one or more memory modules to punch out a specified bit field within the one or more memory modules indicative of said usage of toner or ink. Ex. 1002, Direen Decl. at ¶ 43; Ex. 1004, Applegate at Abstract ("After a given amount of toner material has been dispensed through the developer unit, one of the bits of the EPROM memory device is irreversibly burned, thereby providing a permanent record on the process cartridge of a certain amount of toner usage."). *Id.* at 6:10-14. Applegate discloses the command is indicative of usage of toner or ink. *Id*.

Applegate, owned by Patent Owner, even discloses the same thirty-two (32) bit field for tracking toner consumption:

The main portion of memory elements of the EPROM **144** comprise the 1024 bits of non-volatile memory elements **180** that are initially set to a Logic 1 value, and which can be irreversibly cleared to a Logic 0 on a bit-by-bit basis. As discussed above, these 1024 bits are logically divided into four 32-bit "pages." Each of the logical pages of this set of EPROM memory elements **180** can be physically write-protected by circuitry that falls within the function block **186** as depicted on FIG. **6**. Once a page has been write-protected, none of its bits can then be burned thereafter, and their values at that point are permanently set as either Logic 1 or Logic 0.	plurality of bits representing a numeric value. As an example, a non-volatile memory module provided with a toner cartridge may contain thirty-two bit fields, and as a particular amount of toner has been depleted (e.g., 1/32 of the total toner), a bit field may be "punched out," thereby changing the bit field from an erased state to a programmed state. For instance, the value in the bit field may be changed from an initial value of "0" to a value of "1". In this illustrative example, all thirty-two bit fields may be punched out after all of the toner had been depleted, thereby signifying full depletion of the toner cartridge. It will be appreciated by one of ordinary skill in the art that imaging and printing devices may contain
Applegate at 14:43-54	'786 Patent at 5:2-13

c) "processing the command at the one or more memory modules."

Applegate discloses the command being processed at the one or more memory modules. Figure 6 from Applegate (shown below with annotations) shows a block diagram of the non-volatile memory device attached to the toner cartridge

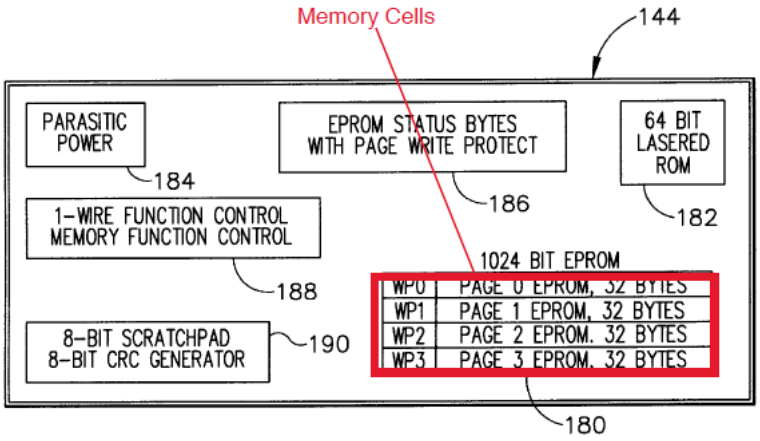

FIG. 6

Figure 9 in Applegate is a flowchart that includes a process for monitoring the

toner level in the toner cartridge. Step 406 indicates that if a Toner Low condition occurs, a cycle count is written to the EPROM (non-volatile memory device on the toner cartridge). *Id*. at 22:32-35 ("[At] step 406 now writes the toner wheel cycle count to EPROM 144. This cycle count is stored in EPROM 144 in its EPROM registers 180 at Page 2, bytes 3-4."). These commands are processed at the one or more memory modules.

Applegate also explains that a bucket level relating to the amount of toner in the toner cartridge is stored in the EPROM. *Id*. at 22:3-23; 23:1-3; Fig. 9 at step 444. As toner is consumed, Applegate discloses incrementing the count of toner used. *Id*. at Abstract ("After a given amount of toner material has been dispensed through the developer unit, one of the bits of the EPROM memory device is irreversibly burned, thereby providing a permanent record on the process cartridge of a certain amount of toner usage."). These commands are processed at the one or more memory modules.

B. Ground 2: Claims 5 and 15 are Obvious in View of Applegate in further view of Bruce.

1. Reasons to combine

Applegate is directed to a method and apparatus for storing data in a non-volatile memory circuit mounted on a printer's process cartridge. Applegate discloses using non-volatile memory to store information about the printing system. Ex. 1004, Applegate at Title ("Method and Apparatus for Storing Data in a Non-

Volatile Memory Circuit Mounted on a Printer's Process Cartridge.") Bruce discloses an expandable flash-memory mass-storage. Ex. 1003, Bruce at Title. Both Applegate and Bruce deal with integrated circuits comprising memory cells. A POSITA would be motivated to combine Bruce's improved memory handling techniques in order to improve the memory capabilities of the printer cartridges disclosed in Applegate. Ex. 1002, Direen Decl. at ¶¶ 50-51.

2. Claim 5

a) "The method of claim 1, further comprising establishing a busy status signal during the processing of the command at the one or more memory modules."

Ground 1 discloses how Applegate anticipates claim 1, and is incorporated by reference herein. Ground 1 also shows how Applegate anticipates claim 5. Bruce additionally discloses establishing a busy status signal during the processing of the command at the one or more memory modules. Ex. 1002-A at Claim 5; Ex. 1003, Bruce at 1:66-2:3 ("A busy signal is usually provided by each flash-memory chip to indicate when the read, write, or erase operation has completed. The busy signal allows a local processor to continue with other tasks while the flash-memory integrated circuit chip performs the flash operation."). Thus, in addition to the reasons of Ground 1, this claim is also obvious in light of Bruce's disclosure.

3. Claim 15

a) "The method of claim 9, further comprising establishing a busy status signal during the processing of the command at the one or more memory modules."

Ground 1 also shows how Applegate anticipates claim 5. Bruce additionally discloses establishing a busy status signal during the processing of the command at the one or more memory modules. Ex. 1002-A at Claim 15; Ex. 1003, Bruce at 1:66-2:3 ("A busy signal is usually provided by each flash-memory chip to indicate when the read, write, or erase operation has completed. The busy signal allows a local processor to continue with other tasks while the flash-memory integrated circuit chip performs the flash operation."). Thus, in addition to the reasons of Ground 1, this claim is also obvious in light of Bruce's disclosure.

XI. CONCLUSION

Petitioner requests institution of IPR for Claim 1-16 of the '786 Patent based on the grounds specified in this Petition.

Dated: July 23, 2019

By:/Woodrow Pollack/
Woodrow Pollack (Reg. No 58,908)

Certification of Word Count

Pursuant to 37 C.F.R. § 42.24(d), Petitioner certifies that this Petition includes 6090 words, as measured by Microsoft Word, exclusive of the table of contents, mandatory notices under § 42.8, certificates of service, and word count, and exhibits.

CERTIFICATE OF SERVICE

The undersigned certifies services pursuant to 37 C.F.R. § 42.6(e) and 42.105(a)(b) on the Patent Owner via Priority Mail Express of a copy of the Petition for *Inter Partes* Review and supporting materials at the correspondence address of record for the 7,844,786 Patent:

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Dated: July 23, 2019

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