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Harlan et al.

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(54) **SYSTEM FOR ANALYZING AN ORGANIC PHOTOCONDUCTING DRUM AND A METHOD THEREOF**

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(51) **Int. Cl.**
G03G 15/00 (2006.01)

(52) **U.S. Cl.** **399/26**; 399/81; 399/116

(58) **Field of Classification Search** 399/26, 399/116, 81

See application file for complete search history.

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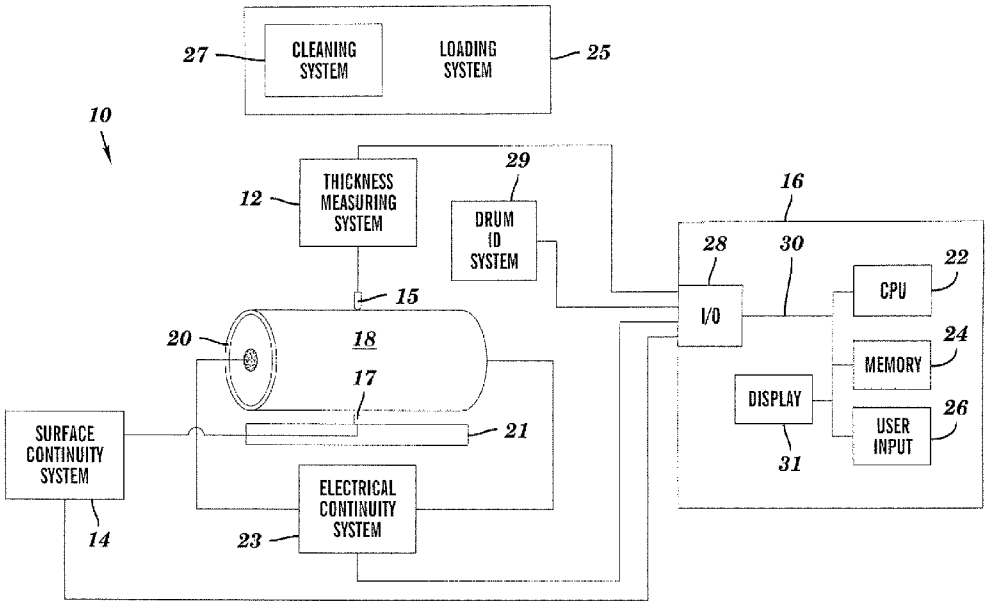
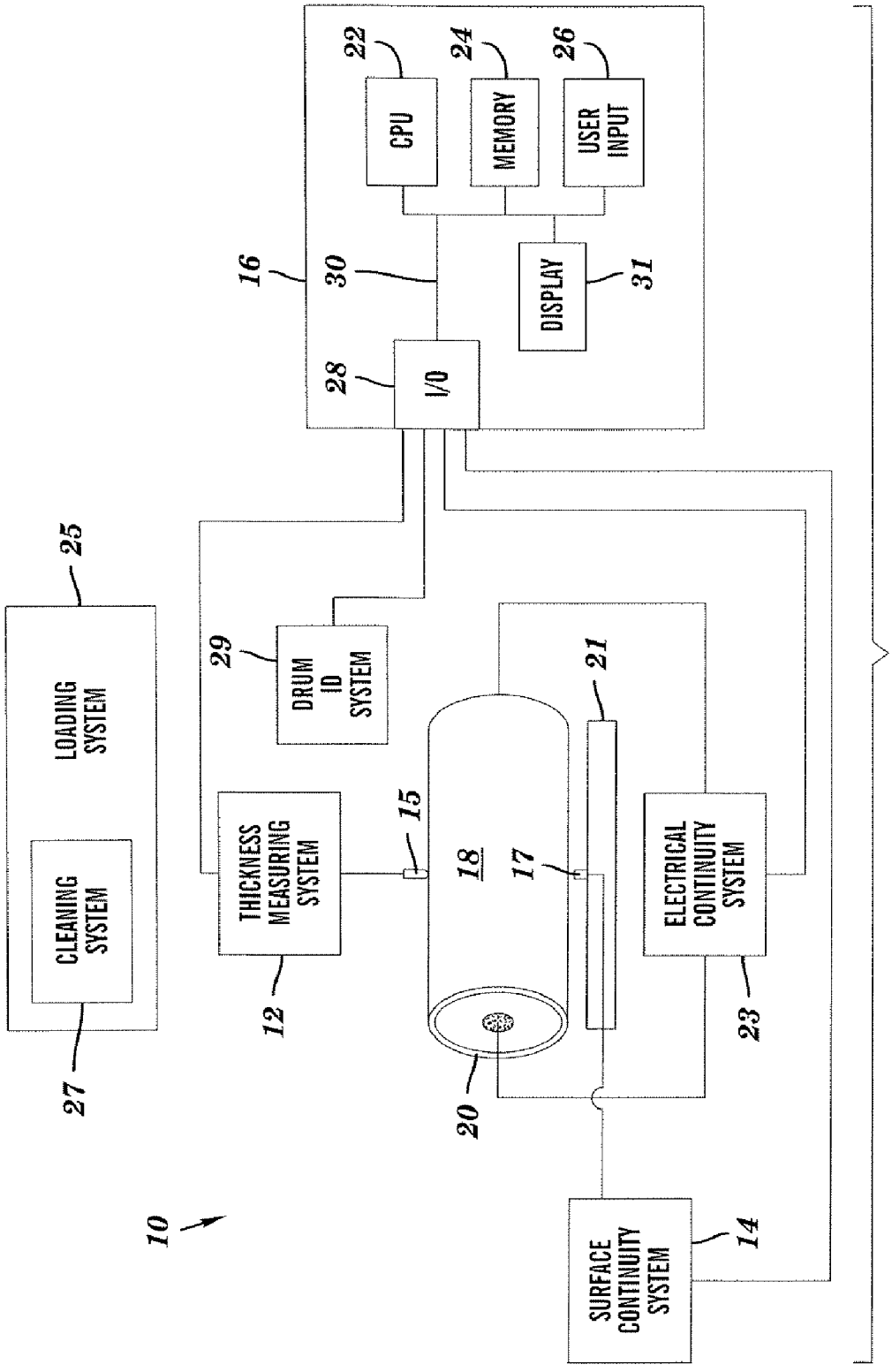
(74) *Attorney, Agent, or Firm*—Nixon Peabody LLP

(57) **ABSTRACT**

A system for analyzing an organic photo conducting drum includes an identification system, a feature examination system, and an evaluation processing system. The identification system identifies one or more characteristic relating to the organic photo conducting drum. The feature examination system examines one or more features of the organic photo conducting drum. The evaluation processing system provides an analysis of the organic photo conducting drum based on the identified one or more characteristics and the examined one or more features.

32 Claims, 9 Drawing Sheets

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CPU
24
MEMORY
26
USER INPUT
16
30
DISPLAY
31
28
I/O
25
LOADING SYSTEM
CLEANING SYSTEM
27
29
DRUM ID SYSTEM
21
THICKNESS MEASURING SYSTEM
15
18
17
ELECTRICAL CONTINUITY SYSTEM
12
20
23
10
SURFACE CONTINUITY SYSTEM
14

FIG. 1

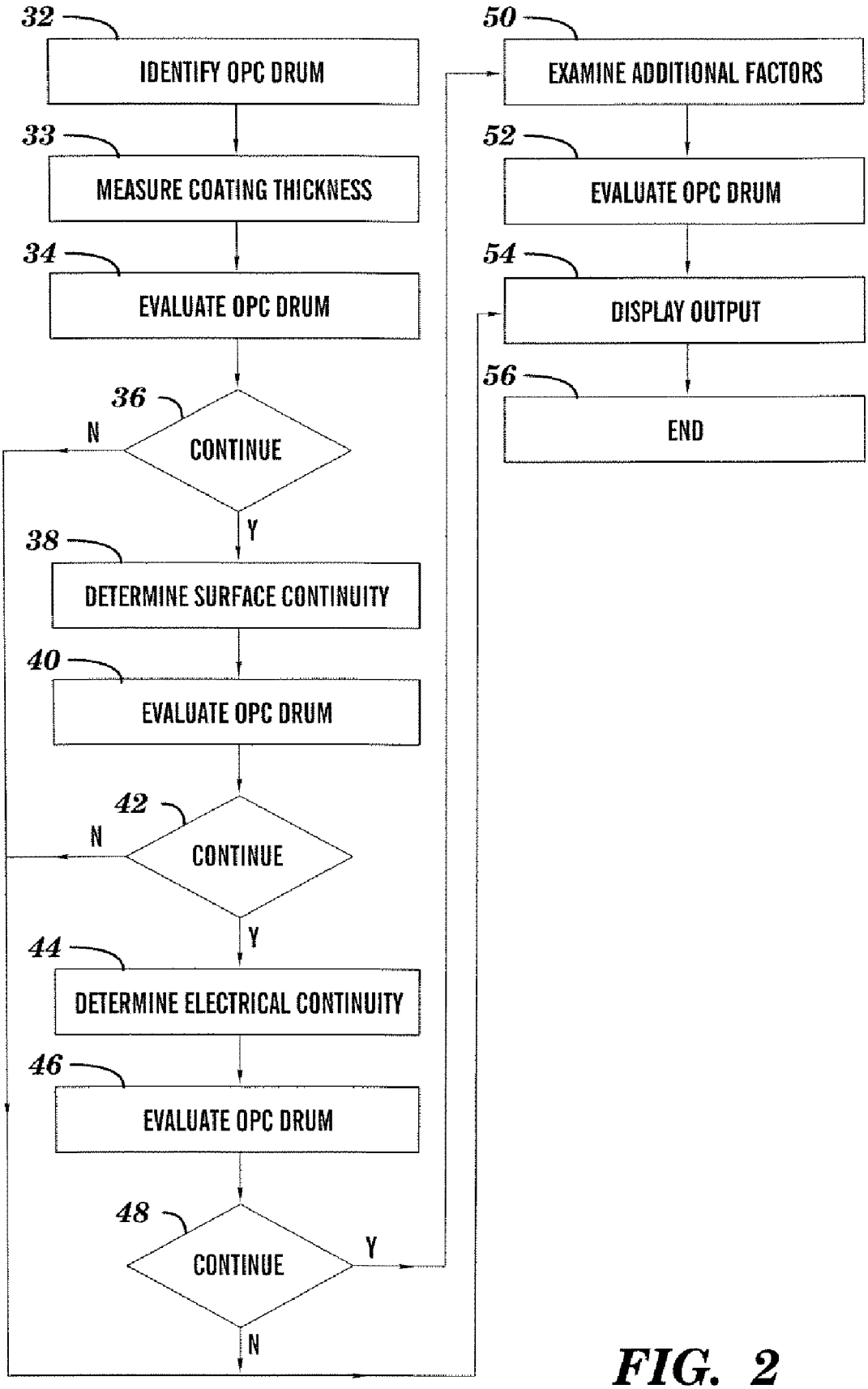

32
IDENTIFY OPC DRUM
33
MEASURE COATING THICKNESS
34
EVALUATE OPC DRUM
36
CONTINUE
N
Y
38
DETERMINE SURFACE CONTINUITY
40
EVALUATE OPC DRUM
42
CONTINUE
N
Y
44
DETERMINE ELECTRICAL CONTINUITY
46
EVALUATE OPC DRUM
48
CONTINUE
Y
N
50
EXAMINE ADDITIONAL FACTORS
52
EVALUATE OPC DRUM
54
DISPLAY OUTPUT
56
END

FIG. 2

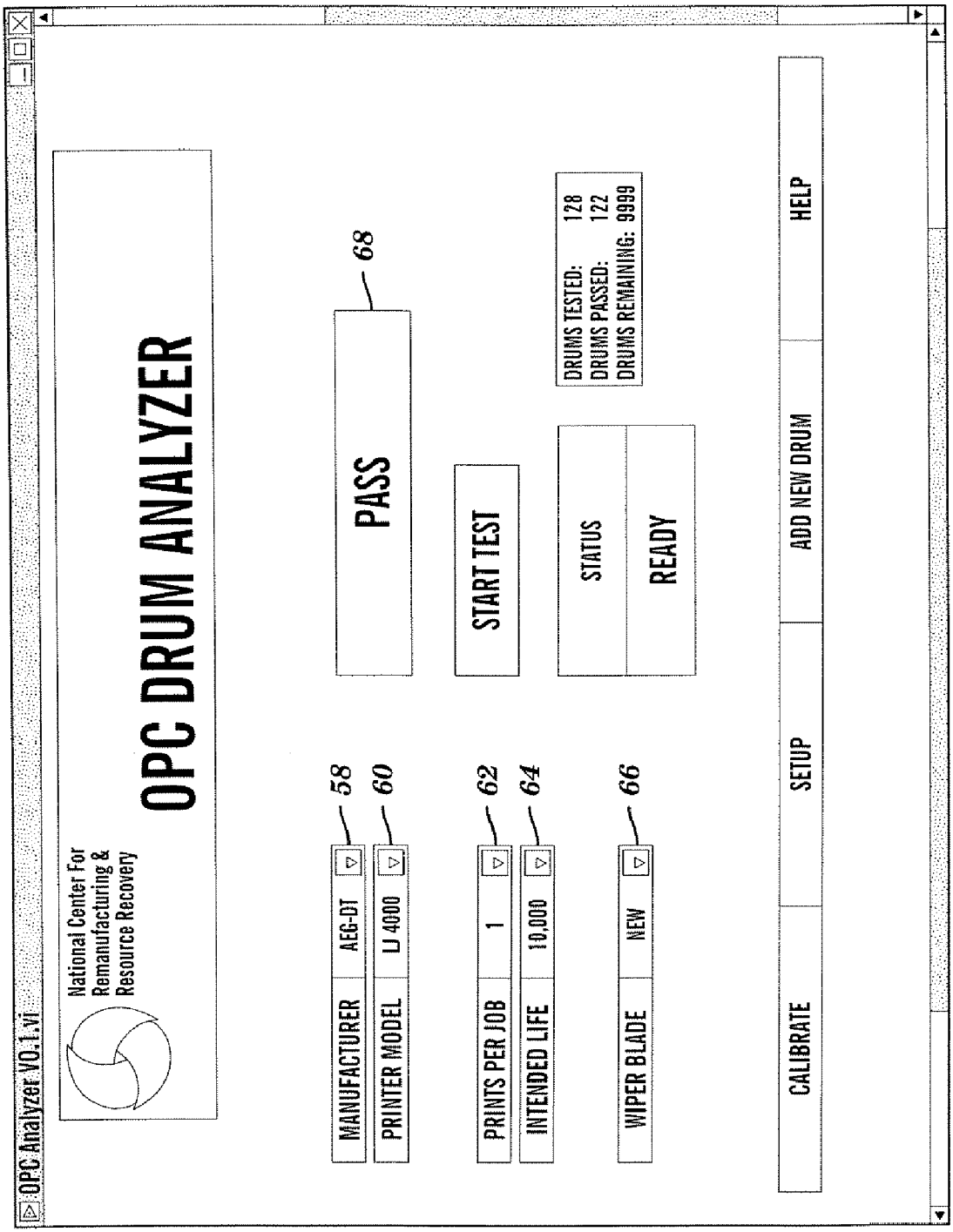

OPC Analyzer V0.1.vi
OPC DRUM ANALYZER
National Center For Remanufacturing & Resource Recovery
MANUFACTURER
AEG-DT
PRINTER MODEL
LJ 4000
PRINTS PER JOB
1
INTENDED LIFE
10,000
WIPER BLADE
NEW
58
60
62
64
66
68
PASS
START TEST
STATUS
READY
DRUMS TESTED: 128
DRUMS PASSED: 122
DRUMS REMAINING: 9999
CALIBRATE
SETUP
ADD NEW DRUM
HELP

FIG. 3A

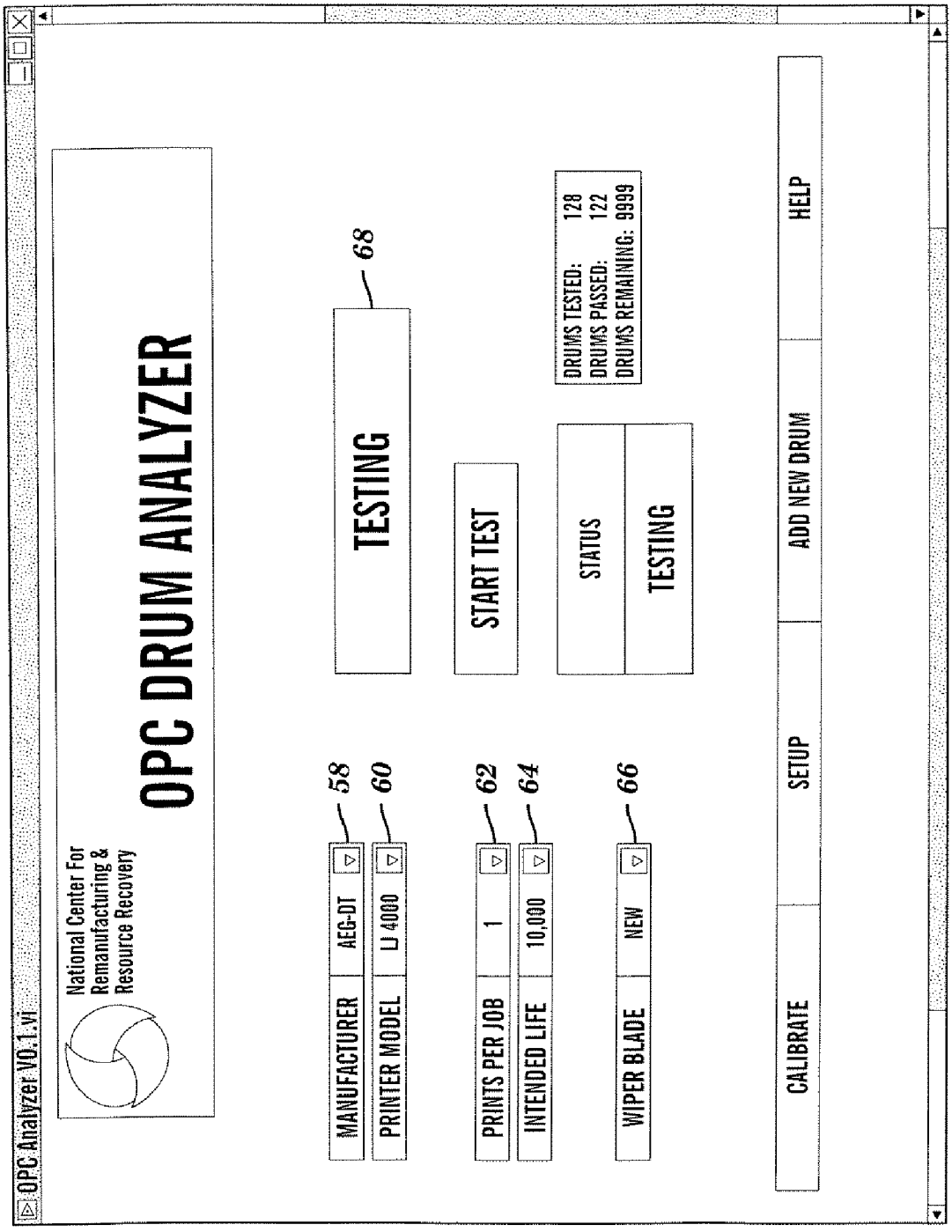
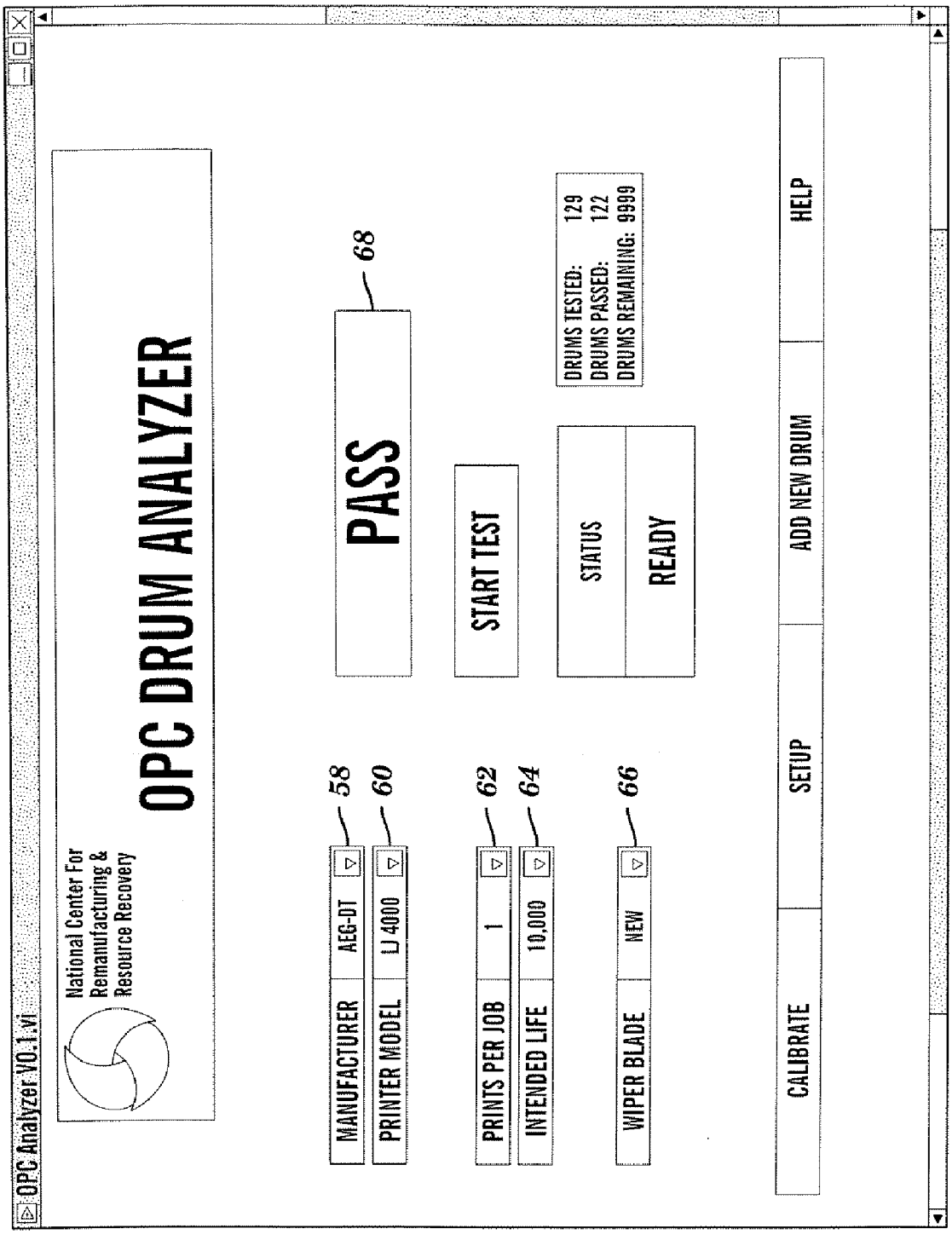

OPC Analyzer V0.1.vi
OPC DRUM ANALYZER
National Center For Remanufacturing & Resource Recovery
MANUFACTURER
AEG-DT
PRINTER MODEL
LJ 4000
PRINTS PER JOB
1
INTENDED LIFE
10,000
WIPER BLADE
NEW
58
60
62
64
66
TESTING
68
START TEST
STATUS
TESTING
DRUMS TESTED: 128
DRUMS PASSED: 122
DRUMS REMAINING: 9999
CALIBRATE
SETUP
ADD NEW DRUM
HELP

FIG. 3B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National Center For Remanufacturing & Resource Recovery
OPC DRUM ANALYZER
58
MANUFACTURER
AEG-DT
60
PRINTER MODEL
LJ 4000
62
PRINTS PER JOB
1
64
INTENDED LIFE
10,000
66
WIPER BLADE
NEW
68
PASS
START TEST
STATUS
READY
DRUMS TESTED: 129
DRUMS PASSED: 122
DRUMS REMAINING: 9999
CALIBRATE
SETUP
ADD NEW DRUM
HELP

FIG. 3C

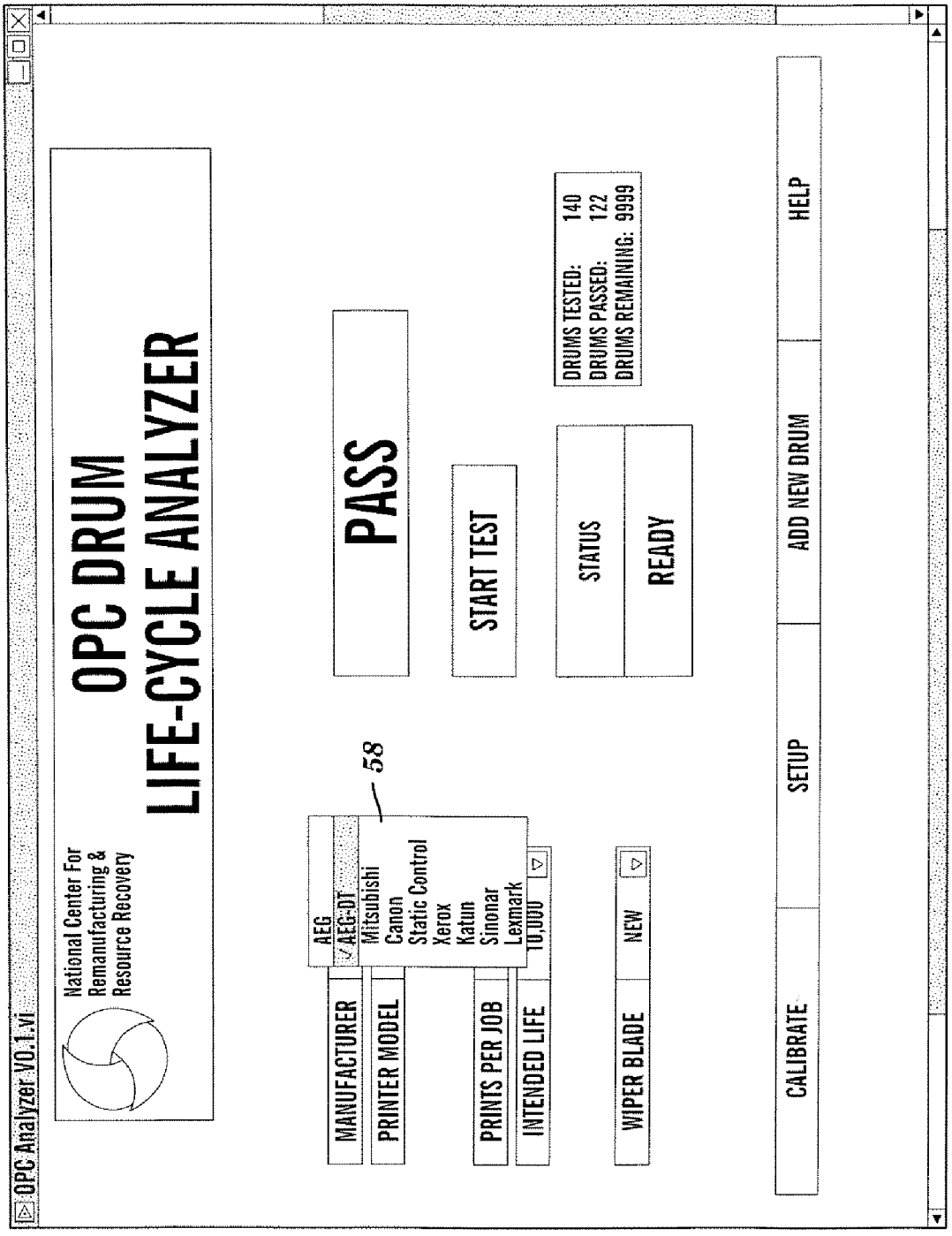
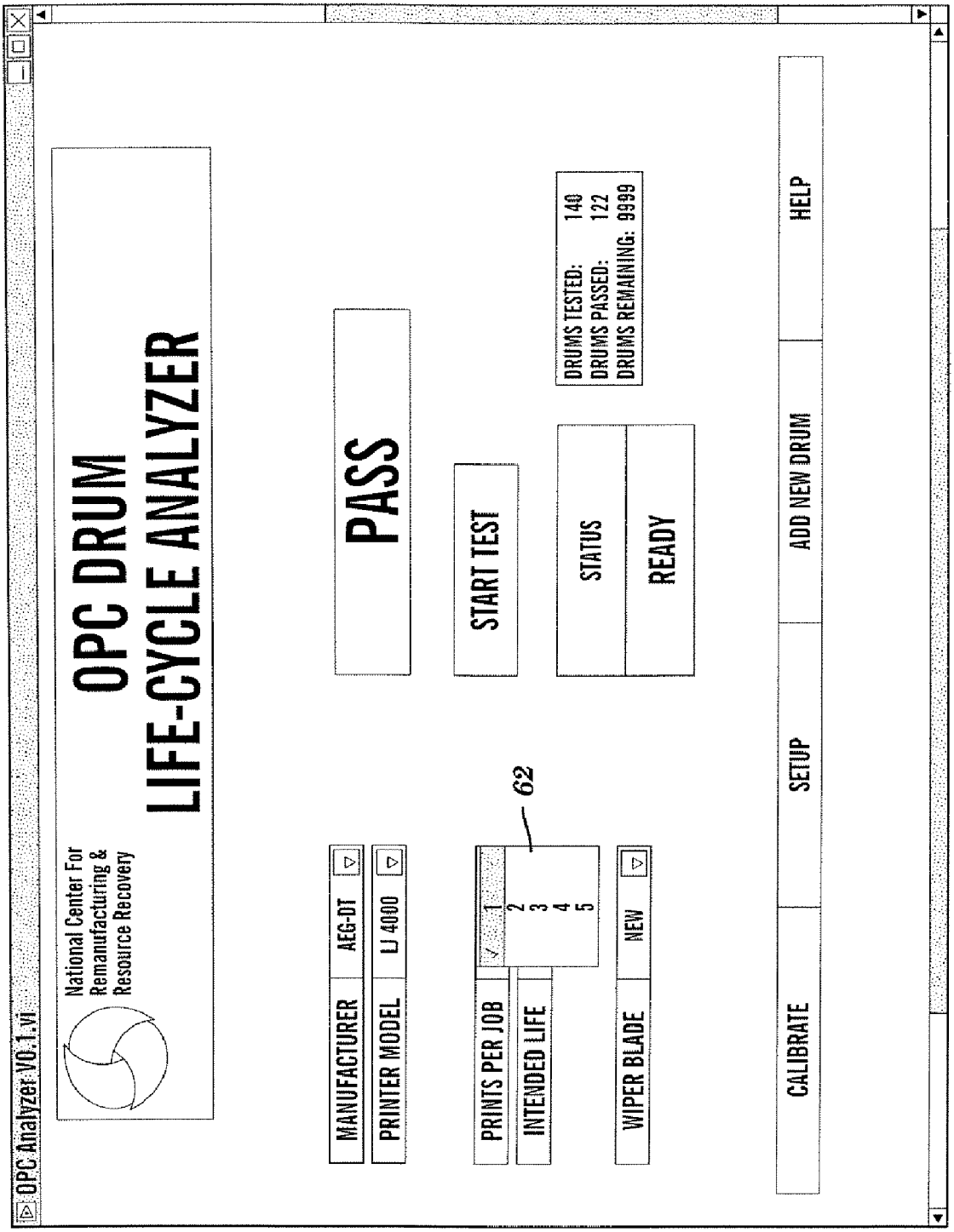

OPC Analyzer V0.1.vi
OPC DRUM
LIFE-CYCLE ANALYZER
National Center For
Remanufacturing &
Resource Recovery
MANUFACTURER
AEG
AEG-DT
PRINTER MODEL
Mitsubishi
Canon
Static Control
Xerox
Katun
Sinonar
Lexmark
58
PRINTS PER JOB
INTENDED LIFE
10,000
WIPER BLADE
NEW
PASS
START TEST
STATUS
READY
DRUMS TESTED: 140
DRUMS PASSED: 122
DRUMS REMAINING: 9999
CALIBRATE
SETUP
ADD NEW DRUM
HELP

FIG. 3D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National Center For Remanufacturing & Resource Recovery
OPC DRUM LIFE-CYCLE ANALYZER
PASS
START TEST
STATUS
READY
DRUMS TESTED: 140
DRUMS PASSED: 122
DRUMS REMAINING: 9999
MANUFACTURER
AEG-DT
PRINTER MODEL
LJ 4000
PRINTS PER JOB
INTENDED LIFE
WIPER BLADE
NEW
1
2
3
4
5
62
CALIBRATE
SETUP
ADD NEW DRUM
HELP

FIG. 3E

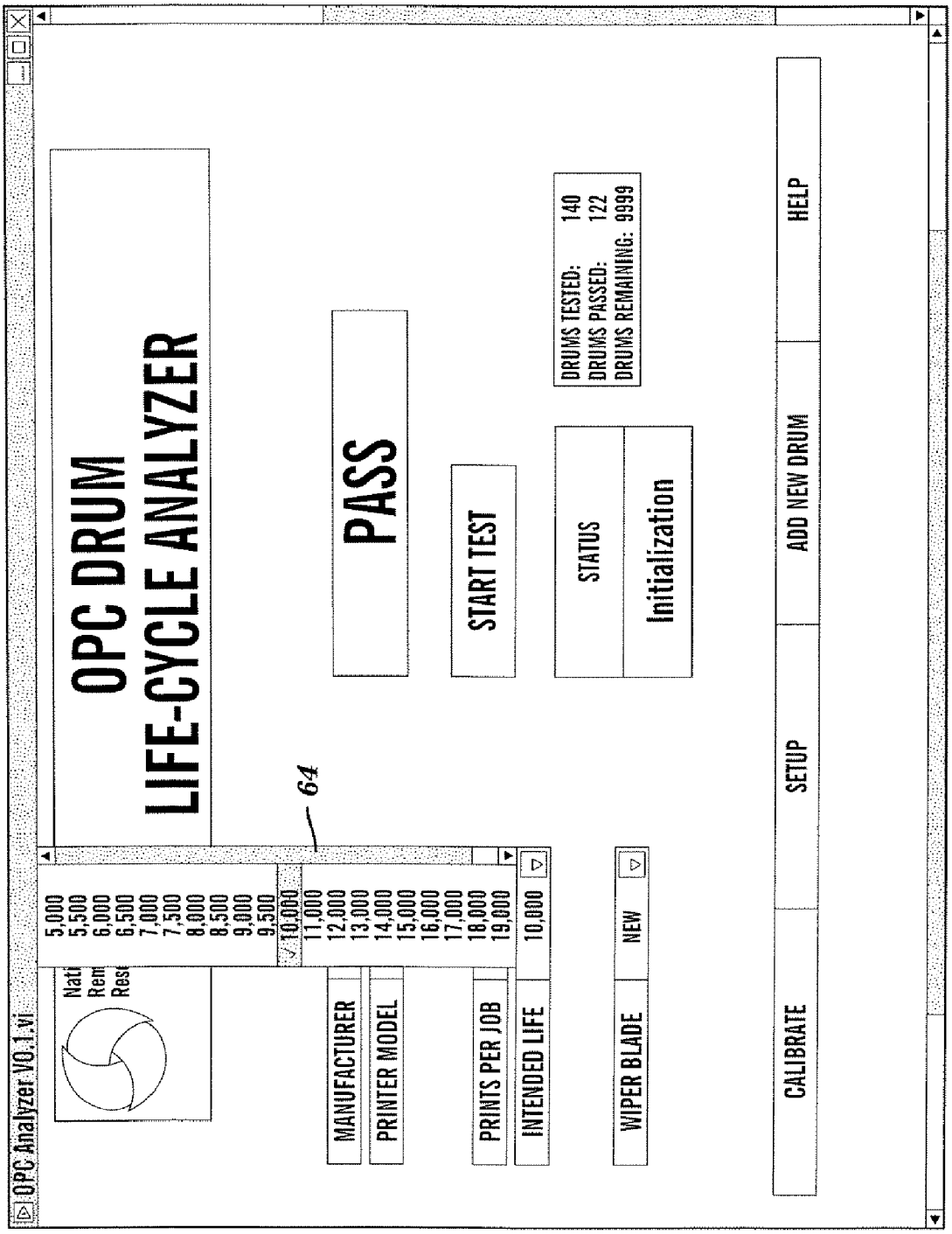
OPC Analyzer V0.1.vi
OPC DRUM
LIFE-CYCLE ANALYZER
64
5,000
5,500
6,000
6,500
7,000
7,500
8,000
8,500
9,000
9,500
10,000
11,000
12,000
13,000
14,000
15,000
16,000
17,000
18,000
19,000
MANUFACTURER
PRINTER MODEL
PRINTS PER JOB
INTENDED LIFE
10,000
WIPER BLADE
NEW
PASS
START TEST
STATUS
Initialization
DRUMS TESTED: 140
DRUMS PASSED: 122
DRUMS REMAINING: 9999
CALIBRATE
SETUP
ADD NEW DRUM
HELP

FIG. 3F

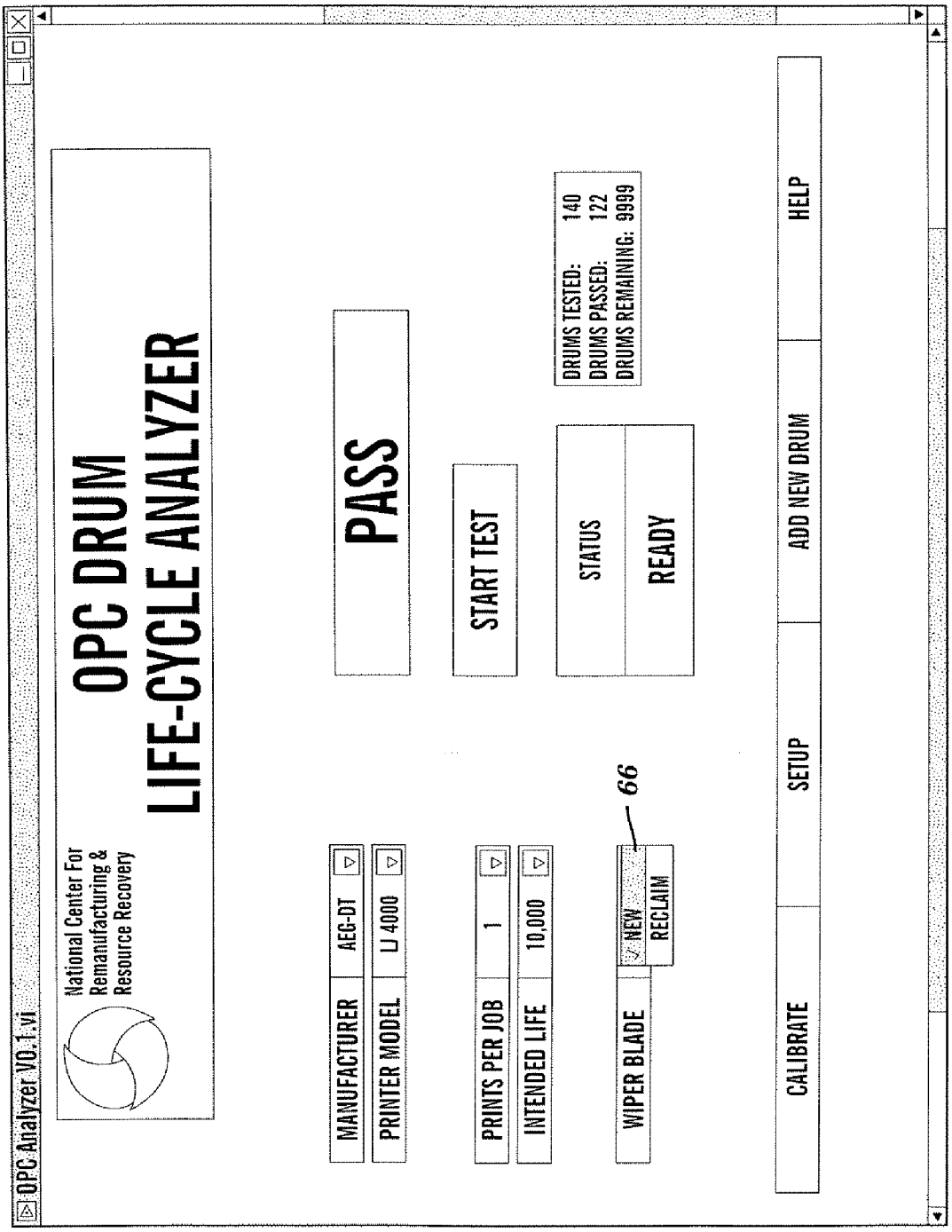
OPC Analyzer V0.1.vi
OPC DRUM
LIFE-CYCLE ANALYZER
National Center For
Remanufacturing &
Resource Recovery
PASS
START TEST
STATUS
READY
DRUMS TESTED: 140
DRUMS PASSED: 122
DRUMS REMAINING: 9999
MANUFACTURER AEG-DT
PRINTER MODEL LJ 4000
PRINTS PER JOB 1
INTENDED LIFE 10,000
WIPER BLADE
NEW
RECLAIM
66
CALIBRATE
SETUP
ADD NEW DRUM
HELP

FIG. 3G

SYSTEM FOR ANALYZING AN ORGANIC PHOTOCONDUCTING DRUM AND A METHOD THEREOF

This application claims the benefit of U.S. Provisional Patent Application Ser. No. 60/563,666, filed Apr. 20, 2004, which is hereby incorporated by reference in its entirety

FIELD OF THE INVENTION

This invention generally relates to evaluation devices for printing systems and, more particularly, to a system for analyzing an organic photoconducting (OPC) drum and a method thereof.

BACKGROUND

A coating layer on an OPC drum in a printing system acts as a charge transfer layer. During printing operations, the coating layer of the OPC drum is slowly worn down. Typically, this wear rate is about one micron per one-thousand pages and one life cycle of an OPC drum is usually about ten-thousand printed pages. Often after one life cycle, the OPC drum is disposed of, even though the OPC drum may have multiple life cycles left.

Attempts have been made to determine which OPC drums may have additional life cycles remaining, but these attempts have not been successful. For example, after use an OPC drum may be visually inspected for obvious flaws. If the OPC drum does not appear to be damaged, then the OPC drum is reused. Additionally, a manual measurement of the coating thickness may be taken and if the operator believes there is enough coating left to complete an additional life-cycle, then the OPC drum may be reused.

Unfortunately, these prior techniques are often inaccurate in analyzing the remaining life span of an OPC drum. Additionally, these techniques can be time consuming and thus the OPC drum is more likely to be replaced, then reused even though remaining life cycles may be available.

SUMMARY

A method for analyzing an organic photo conducting drum in accordance with embodiments of the present invention includes identifying one or more characteristics relating to the organic photo conducting drum and examining one or more features of the organic photo conducting drum. An analysis of the organic photo conducting drum is provided based on the identified one or more characteristics and the examined one or more features.

A system for analyzing an organic photo conducting drum in accordance with embodiments of the present invention includes an identification system, a feature examination system, and an evaluation processing system. The identification system identifies one or more characteristic relating to the organic photo conducting drum. The feature examination system examines one or more features of the organic photo conducting drum. The evaluation processing system provides an analysis of the organic photo conducting drum based on the identified one or more characteristics and the examined one or more features.

The present invention provides a system and method for determining the condition of and estimating the remaining usable life of an OPC drum. The present invention enables toner cartridge remanufacturers and others to safely determine which OPC drums can be reused without risking warranty return issues directly related to the coating thickness of the OPC drum. Additionally, the present invention provides a system and method where a high volume of OPC drums can quickly be measured and evaluated.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of an analyzing system for an OPC drum in accordance with embodiments of the present invention;

FIG. **2** is a flow chart of a method for analyzing an OPC drum in accordance with embodiments of the present invention;

FIGS. **3**A-**3**G are screen shots on a display of the analyzing system during an analysis in accordance with embodiments of the present invention.

DETAILED DESCRIPTION

An analyzing system **10** for an OPC drum **18** in accordance with embodiments of the present invention is illustrated in FIG. **1**. The analyzing system **10** includes a thickness measuring system **12**, a surface continuity system **14**, an electrical continuity system **23**, and an OPC drum evaluation system **16**, although the analyzing system **10** can comprise other numbers and types of components in other configurations. The present invention provides a system and method for providing an analysis of an OPC drum.

Referring more specifically to FIG. **1**, the OPC drum **18** is connected to the analyzing system **10** for rotational movement, although the OPC drum **18** can be connected to the analyzing **10** system in other manners. The OPC drum **18** includes a coating layer **20** which acts as a charge transfer layer and wears down during use in printing operations.

The thickness measuring system **12** is used to determine or measure a thickness of the coating layer **20**. In this particular embodiment, the current meter system **12** is an eddy current meter system, although other types of systems to measure the thickness of the coating layer **20** on the OPC drum **18** can be used. The current meter system **12** includes a probe **15** which is positioned adjacent a known region of wear on the coating layer **20**, although the current meter system **12** can comprise other numbers of probes and the measurement or measurements can be taken at other locations. The current meter system **12** retrieves the known region of wear from memory **24** in the OPC drum evaluation system **16** based on the identified manufacturer and model type for the OPC drum **18** being evaluated, although the location can be obtain in other manners.

The surface continuity system **14** comprises a probe **17** which is moved along an outer surface of the coating layer **20** by a transport system **21** to examine a substantial portion of an outer surface of coating layer on the OPC drum **18**, although the system **14** can comprise other numbers of probes which scan different portions of the coating layer **20**, such as just the known regions of wear, and other manners for scanning the coating layer **20**, such as with a stationary probe or probes can be used. A voltage is applied across the OPC drum **18** by the electrical continuity system **23** and the probe **18** is used to identify current spikes which indicate a void in the coating layer **20**, although other sources for the voltage and other techniques for checking the surface continuity of the coating layer **20** can be used. The readings from the probe **18** are transmitted to the OPC drum evaluation system **16** for evaluation.

The electrical continuity system **23** is coupled to the center of the OPC drum **18** and the outer surface of the coating layer **20** and a voltage is applied across the OPC

drum **18**, although other types of systems for checking electrical continuity can be used. The electrical continuity system **23** measures the voltage drop across the OPC drum **18** and transmits the reading to the OPC drum evaluation system **16** for evaluation.

The drum identification system **29** comprises a densitometer which is positioned adjacent the OPC drum **18** to take a color reading of the OPC drum, although other types of identification systems could be used. The drum identification system **29** transmits the measured color of the OPC drum **18** to the OPC drum evaluation system **16** for evaluation to determine the manufacture and the type of model of OPC drum **18**, although other types of information could be determined and the OPC evaluation system **16** can obtain information about the OPC drum **18** in other manners as described below.

The OPC drum evaluation system **16** analyzes the OPC drum **18** based on the inputs from the thickness measuring system **12**, the surface continuity system **14**, the electrical continuity system **23**, and the drum identification system **29**, although the OPC drum evaluation system **16** can base the evaluation on other numbers and types of inputs. The OPC drum evaluation system **16** includes a central processing unit (CPU) or processor **22**, a memory **24**, a user input device **26**, an input/output (I/O) interface system **28**, and a display **31** which are coupled together by a bus system or other link **30**, although the OPC drum evaluation system **16** may comprise other numbers and types of components in other configurations. The CPU **22** executes a program of stored instructions for the method for analyzing an OPC drum **18** in accordance with embodiments of the present invention as described herein and as illustrated in FIG. **2**. In this particular embodiment, those programmed instructions are stored in the memory **24**, although some or all could be stored and retrieved from other locations. A variety of different types of memory storage devices, such as a random access memory (RAM) or a read only memory (ROM) in the system or a floppy disk, hard disk, CD ROM, or other computer readable medium which is read from and/or written to by a magnetic, optical, or other reading and/or writing system that is coupled to the CPU **22**, can be used for memory **24**.

The input/output interface system **28** is used to operatively couple and communicate between other components, including the thickness measuring system **12**, the surface continuity system **14**, the electrical continuity system **23**, and the drum identification system **29**. In this particular embodiment, the connection is shown as a hard wire connection, although a variety of different types of connections and communication techniques can be used to transmit signals from the thickness measuring system **12**, the surface continuity system **14**, the electrical continuity system **23**, and the drum identification system **29** to the OPC drum evaluation system **16** and/or from the OPC drum evaluation system to the thickness measuring system **12**, the surface continuity system **14**, the electrical continuity system **23**, and the drum identification system **29**.

The user input device **26** enables an operator to generate and transmit signals or commands to the CPU **22**. A variety of different types of user input devices, such as a keyboard or computer mouse, can be used. The display **31** is a cathode ray tube which is used to provide an output to the operator on the condition of the OPC drum **20**, although other types of displays can be used.

Referring to FIGS. **3**A-**3**G, screen shots on the interactive display **31** for the analysis of an OPC drum are illustrated, although other types of displays could be used. More specifically, the display **31** has a field **68** which can display the output of the evaluation "PASS" in the color green to indicate the OPC drum **18** has another life cycle as shown in FIG. **3**A, "TESTING" to indicate the OPC drum **18** is currently being examined as shown in FIG. **3**B, and "FAIL" in the color red to indicate the OPC drum **18** should not be reused as shown in FIG. **3**C, although OPC drum evaluation system **16** can provide other outputs, such as REUSE to indicate the OPC drum **18** has another life cycle, REMANUFACTURE to indicate the OPC drum **18** can be refurbished for further use, and RECYCLE to indicate the OPC drum should be salvaged for scrap materials. The display **31** also includes fields and drop down menus for identifying the manufacturer in field **58**, the type of printer model in filed **60**, the number of prints per job in field **62**, the intended number of prints during a life cycle for the OPC drum in field **64**, and the status of the wiper blade used on the OPC drum in field **66** as shown in FIGS. **3**D-**3**G, although other numbers and types of fields can be used. An operator can use the user input device **26** to access and select from the drop down menus for fields **58**, **60**, **62**, **64**, and **66**. The information input in fields **58**, **60**, **62**, **64**, and **66** is used by the OPC drum evaluation system **16** to evaluate the OPC drum **18**.

An automated loading system **25** is used to load the OPC drum **18** into the analyzing system **10**, although other devices and techniques for loading the OPC drum **18** can be used, such as loading the OPC drum **18** by hand. The automated loading system **25** may hold a plurality of the OPC drums which are individually loaded for testing. With the automated loading system **25**, the OPC drum **18** is less likely to become damaged or contaminated during handling by an operator, such as from being accidentally scraped against another surface or having oils transferred from the operator's hands.

A cleaning system **27** is located in the loading system **27**, although the cleaning system **27** could be in other places. The cleaning system **27** cleans the outer surface of the OPC drum **18**, for example by removing any remaining toner on the OPC drum **18**.

A method for analyzing an OPC drum in accordance with embodiments of the present invention will now be described with reference to FIGS. **1**-**3**. In step **32**, the analyzing system **10** identifies the OPC drum **18** being evaluated and the expected operating parameters based on the information entered in the fields **58**, **60**, **62**, **64**, and **66** in the display **31**, although other numbers and types of information can be entered and the OPC drum can be evaluated in other manners. For example, the OPC drum **18** could be identified by the drum identification system **29** taking a color reading of the OPC drum **18** and transmitting the identified color back to the OPC drum evaluation system **16**. The OPC drum evaluation system **18** matches the identified color to a stored color which is correlated to a particular manufacturer and model type. The manufacture and model type in fields **58** and **60** are used by the OPC drum evaluation system **16** to retrieve data about the wear rate and image quality produced by that particular type of OPC drum **18**. The prints per job and the intended life cycle entered in fields **62** and **64** are used by the OPC drum evaluation system **16** to set parameters for use of the OPC drum in the next life cycle which is used in evaluating the OPC drum **18**. The wiper blade status entered in field **66** is also used by the OPC drum evaluation system **16** in evaluating the OPC drum **18** because a reclaimed wiper blade will cause less wear on the OPC drum **18** during use. Although five fields are shown, other numbers and types of information to identify the OPC drum and the operating parameters can be used.

In step **33**, the thickness measuring system **12** determines a thickness of the coating layer **20** on the OPC drum **18**. In these embodiments, the probe **15** for the thickness measuring system **12** is positioned at a known region of wear on the OPC drum **18** to take a thickness measurement, although other locations and numbers of measurements can be taken. The position of the known region of wear is obtained by the OPC drum evaluation system **16** based on the information input in fields **58** and **60** and can be displayed on display **31** so the operator can position probe **15** or the positioning process could be automated. The thickness for the coating layer **20** measured by the probe **15** of the thickness measuring system **12** is transmitted to the OPC drum evaluation system **16**, although other amounts and types of information can be transmitted to the OPC drum evaluation system **16**.

In step **34**, the OPC drum evaluation system **16** evaluates the OPC drum **18** based on the measured thickness and the information entered in the fields **58**, **60**, **62**, **64**, and **66**, although the OPC drum evaluation system **16** can evaluate the OPC drum **18** based on other factors. For example, if the measured thickness for the coating layer **20** is thick enough to last for the intended number of prints entered in field **64**, then the OPC drum evaluation system **16** would pass the OPC drum **18** through this stage. In another example, if the measured thickness for the coating layer **20** is thick enough to last for the intended number of prints entered in field **64**, but the OPC drum evaluation system **16** determines that based on the manufacturer and model type for the OPC drum **18** and the prints per job entered in field **62** would result in unacceptable print quality at the measured thickness, then the OPC drum evaluation system **16** would fail the OPC drum **18** at this stage.

In step **36**, the OPC drum evaluation system **16** determines whether to continue with the evaluation of the OPC drum **18**. If the OPC drum **18** has failed the evaluation for measured thickness in step **34** and/or there are no more desired evaluations, then the No branch is taken to step **54** where the display **31** would provide an output in field **68** as shown in FIG. **3**A or **3**C based on the evaluation in step **34**. If the OPC drum **18** has not failed the evaluation for measured thickness in step **34** and additional evaluations are desired, then the Yes branch is taken to step **38**.

By way of example only, an evaluation of a coating layer **20** on an OPC drum **18** is described below. The thickness measuring system **12** measures the thickness of the coating layer **20** to be twenty-three microns and this is transmitted to the OPC drum evaluation system **16**. Additionally, the type of OPC drum **18** is input or otherwise provided to the OPC drum evaluation system **16**. The OPC drum evaluation system **16** retrieves from data stored in memory **24** that this particular type of OPC drum **18** should be capable of printing 10,000 pages and that the wear rate for the coating layer **20** for this OPC drum **18** is one micron per 1,000 pages. The OPC drum evaluation system **16** calculates that ten microns of wear will occur in one life-cycle and since the coating layer has a thickness of twenty-three microns, the OPC drum evaluation system **16** determines that the OPC drum **18** should be able to perform another life cycle without failure caused by issues with the thickness of the coating layer **20**. If the OPC drum evaluation system **16** determines there is less than a life cycle left, it may signal to discard the OPC drum **18**, although the OPC drum evaluation system **16** may provide other information.

In step **38**, the surface continuity system **14** evaluates the surface continuity of a substantial portion of the outer surface of the coating layer **20**, although other amounts of the coating layer **20** could be evaluated, such as just known regions of wear. The electrical continuity system **23** applies a voltage across the leads coupled to the center of the OPC drum **18** and to the coating layer **20**. A transport system **21** moves a probe **17** along adjacent to and spaced from the outer surface of the coating layer **20** to measure for current spikes. Once the probe **17** has traversed the length of the OPC drum **18**, the OPC drum **18** is rotated slightly and the probe **17** traverses the length of the OPC drum **18** measuring for current spikes. This process is repeated until the entire OPC drum **18** is scanned. The measured current spike or spikes indicate a void or voids in the coating layer **20** and are transmitted to the OPC drum evaluation system **16** for further evaluation. The size of the measured current spike or spikes provides an indication of the severity of the void or voids. Although one technique for determining surface continuity is described, other techniques for determining surface continuity can be used.

In step **40**, the OPC drum evaluation system **16** evaluates the OPC drum **18** based on the determined surface continuity and the information entered in the fields **58**, **60**, **62**, **64**, and **66**, although the OPC drum evaluation system **16** can evaluate the OPC drum **18** based on other factors. For example, if the determined surface continuity identified two voids whose size did not indicate any unacceptable problems with print quality based on the identified manufacturer and type of model, then the OPC drum evaluation system **16** would pass the OPC drum **18** at this stage.

In step **42**, the OPC drum evaluation system **16** determines whether to continue with the evaluation of the OPC drum **18**. If the OPC drum **18** has failed the evaluation for surface continuity in step **40** and/or there are no more desired evaluations, then the No branch is taken to step **54** where the display **31** would provide an output in field **68** as shown in FIG. **3**A or **3**C. If the OPC drum **18** has not failed the evaluation for surface continuity in step **40** and additional evaluations are desired, then the Yes branch is taken to step **44**.

In step **44**, the electrical continuity system **14** evaluates the electrical continuity of the OPC drum **18** with the coating layer **20**, although other factors could be evaluated. The electrical continuity system **23** applies and measures a voltage across the leads coupled to the center of the OPC drum **18** and to the coating layer **20**. The measured voltage is transmitted to the OPC drum evaluation system **16** for further evaluation. Although one technique for determining electrical continuity is described, other techniques can be used.

In step **46**, the OPC drum evaluation system **16** evaluates the OPC drum **18** based on the determined electrical continuity and the information entered in the fields **58**, **60**, **62**, **64**, and **66**, although the OPC drum evaluation system **16** can evaluate the OPC drum **18** based on other factors. For example, if the measured voltage for electrical continuity corresponds within a range which is acceptable for the identified manufacture and type of model of OPC drum **18**, then the OPC drum evaluation system **16** would pass the OPC drum **18** at this stage.

In step **48**, the OPC drum evaluation system **16** determines whether to continue with the evaluation of the OPC drum **18**. If the OPC drum **18** has failed the evaluation for electrical continuity in step **46** and/or there are no more desired evaluations, then the No branch is taken to step **54** where the display **31** would provide an output in field **68** as shown in FIG. **3**A or **3**C. If the OPC drum **18** has not failed the evaluation for electrical continuity in step **46** and additional evaluations are desired, then the Yes branch is taken to step **50**.

In step **50**, an additional evaluation of the OPC drum **18** can be performed and then the results can be evaluated in step **52**. For example, the gears of the OPC drum **18** may be examined to determine if any teeth are missing and the results of this evaluation can be transmitted to the OPC drum evaluation system **16** for further evaluation to provide an analysis of the future life of the OPC drum. To examine the gears of the OPC drum **18**, a visual inspection system could be positioned adjacent each of the gears of the OPC drum **18** to inspect and identify any missing or damaged gear teeth and this information would be transmitted to the OPC drum evaluation system **16** for evaluation. The OPC drum evaluation system **16** based on visual inspection data and corresponding stored visual inspection data for gears for the identified manufacturer and model type of OPC drum **18** would determine whether the extent of the damage would preclude further use of the OPC drum **18** or require other action, such as replacement of the damaged gear or gears or recycling of the OPC drum **18**. Although one example of inspecting the gears is disclosed, other types of inspection systems could be used to inspect the gears, such as a system which would measure the torque to turn the OPC drum **18** by engaging the gear of the OPC drum **18** and transmitting the measured torque data to the OPC drum evaluation system **16** for evaluation. The OPC drum evaluation system **16** based on received torque data and corresponding stored torque data for gears for the identified manufacturer and model type of OPC drum **18** would determine whether the extent of the damage would preclude further use of the OPC drum **18** or require other action, such as replacement of the damaged gear or gears or recycling of the OPC drum **18**. Although examples of different evaluations or failure modes are set forth above, other numbers and types of evaluations can be performed and in other orders. In another example, two or more of the measurements and/or determinations can be made before an evaluation of the OPC drum **18** is performed.

In step **54**, the field **68** in the display **31** provides an output on the results of the analysis of the OPC drum **18**, although other types of displays and methods for providing the results can be used. As described earlier, in these embodiments, the provided output in field **68** is PASS or FAIL, although other types of outputs can be provided, such as REUSE, REMANUFACTURE, or RECYCLE. In step **56**, the analysis of the OPC drum **18** ends.

Accordingly, the present invention provides an accurate indication of whether an OPC drum **18** has another life cycle available and can provide other information, such as recommendations to remanufacture or recycle the OPC drum **18**. Additionally, the present invention is very easy to use and is able to quickly provide a reliable evaluation of the OPC drum **18**.

Having thus described the basic concept of the invention, it will be rather apparent to those skilled in the art that the foregoing detailed disclosure is intended to be presented by way of example only, and is not limiting. Various alterations, improvements, and modifications will occur and are intended to those skilled in the art, though not expressly stated herein. These alterations, improvements, and modifications are intended to be suggested hereby, and are within the spirit and scope of the invention. Additionally, the recited order of processing elements or sequences, or the use of numbers, letters, or other designations therefore, is not intended to limit the claimed processes to any order except as may be specified in the claims. Accordingly, the invention is limited only by the following claims and equivalents thereto.

What is claimed is:

1. A method for analyzing an organic photo conducting drum, the method comprising:

identifying the type of organic photo conducting drum being analyzed based on one or more characteristics of the organic photo conducting drum;

obtaining at least an intended life cycle for the identified type of organic photo conducting drum;

examining one or more features of the organic photo conducting drum, wherein the examining further comprises determining if the identified organic photo conducting drum has another life cycle based on the identified type of organic photo conducting drum, the obtained intended life cycle, and the examined one or more features; and

providing an analysis of an availability of the another life cycle for the organic photo conducting drum based on the determining.

2. The method as set forth in claim **1** wherein the one or more characteristics comprise at least one of an identified manufacturer of the organic photo conducting drum, a type of model of the organic photo conducting drum, an intended number of prints per job, an intended number of pages to be printed, and a status of a wiper blade used on the organic photo conducting drum.

3. The method as set forth in claim **1** wherein the one or more features comprise at least one of a thickness of a coating layer on the organic photo conducting drum, a surface continuity for the coating layer, an electrical continuity for the organic photo conducting drum, and gear quality for the organic photo conducting drum.

4. The method as set forth in claim **1** wherein the examining further comprises determining the thickness of at least one coating layer on the organic photo conducting drum at at least one location and wherein the determining determines if the organic photo conducting drum has another life cycle based on the determined thickness.

5. The method as set forth in claim **1** wherein the examining further comprises examining a surface continuity of at least a portion of at least one coating layer, wherein the determining determines if the organic photo conducting drum has another life cycle based on the examined surface continuity.

6. The method as set forth in claim **5** wherein the examining a surface continuity further comprises identifying and characterizing any voids in the outer surface of the coating layer.

7. The method as set forth in claim **1** wherein the examining further comprises examining an electrical continuity of the organic photo conducting drum, wherein the determining determines if the organic photo conducting drum has another life cycle based on the examined electrical continuity of at least one coating layer.

8. The method as set forth in claim **1** further comprising displaying the provided analysis.

9. The method as set forth in claim **1** further comprising automatically loading the organic photo conducting drum for the examining.

10. The method as set forth in claim **1** further comprising at least partially cleaning the organic photo conducting drum.

11. The method as set forth in claim **1** further comprising displaying the provided analysis, wherein the provided analysis comprises an output recommendation that the photo conducting drum be one of pass and fail for an additional life cycle for the organic photo conducting drum.

12. A method for analyzing an organic photo conducting drum, the method comprising:
identifying the type of organic photo conducting drum being analyzed based on one or more characteristics of the organic photo conducting drum;
examining one or more features of the organic photo conducting drum; and
providing an analysis of the organic photo conducting drum based on the identified type of organic photo conducting drum and the examined one or more features;
wherein the one or more characteristics comprise at least one of an identified manufacturer of the organic photo conducting drum, a type of model of the organic photo conducting drum, an intended number of prints per job, an intended number of pages to be printed, and a status of a wiper blade used on the organic photo conducting drum and wherein the identifying further comprises:
identifying a color of the organic photo conducting drum; and
determining the manufacturer and the type of model of the organic photo conducting drum based on the identified color.

13. A method for analyzing an organic photo conducting drum, the method comprising:
identifying the type of organic photo conducting drum being analyzed based on one or more characteristics of the organic photo conducting drum;
examining one or more features of the organic photo conducting drum; and
providing an analysis of the organic photo conducting drum based on the identified type of organic photo conducting drum and the examined one or more features;
wherein the examining further comprises determining the thickness of at least one coating layer on the organic photo conducting drum at at least one location and wherein the determining determines if the organic photo conducting drum has another life cycle based on the determined thickness;
wherein determining the thickness of the coating layer on the organic photo conducting drum further comprises identifying at least one region of known wear on the coating layer on the organic photo conducting drum based on the identified one or more characteristics, wherein the determining the thickness takes place at the identified region.

14. A method for analyzing an organic photo conducting drum, the method comprising:
identifying the type of organic photo conducting drum being analyzed based on one or more characteristics of the organic photo conducting drum;
examining one or more features of the organic photo conducting drum;
providing an analysis of the organic photo conducting drum based on the identified type of organic photo conducting drum and the examined one or more features; and
displaying the provided analysis, wherein the provided analysis comprises an output recommendation that the photo conducting drum be one of pass and fail for an additional life cycle for the organic photo conducting drum.

15. A method for analyzing an organic photo conducting drum, the method comprising:
identifying the type of organic photo conducting drum being analyzed based on one or more characteristics of the organic photo conducting drum;
examining one or more features of the organic photo conducting drum;
providing an analysis of the organic photo conducting drum based on the identified type of organic photo conducting drum and the examined one or more features; and
displaying the provided analysis, wherein the provided analysis comprises an output recommendation that the photo conducting drum be one of reused for another life cycle, remanufactured, and recycled.

16. A method for analyzing an organic photo conducting drum, the method comprising:
identifying the type of organic photo conducting drum being analyzed based on one or more characteristics of the organic photo conducting drum;
examining one or more features of the organic photo conducting drum; and
providing an analysis of the organic photo conducting drum based on the identified type of organic photo conducting drum and the examined one or more features, wherein the examining further comprises examining one or more gears of the organic photo conducting drum, wherein the determining determines if the organic photo conducting drum has another life cycle based on the examined one or more gears.

17. A system for analyzing an organic photo conducting drum, the system comprising:
an identification system that identifies the type of organic photo conducting drum being analyzed based on one or more characteristics of the organic photo conducting drum and obtains at least an intended life cycle for the identified type of organic photo conducting drum;
a feature examination system that examines one or more features of the organic photo conducting drum, wherein the feature examination system determines if the identified organic photo conducting drum has another life cycle based on the identified type of organic photo conducting drum, the obtained intended life cycle, and the examined one or more features; and
an evaluation processing system that provides an analysis of an availability of the another life cycle for the organic photo conducting drum based on the determination of the feature examination system.

18. The system as set forth in claim 17 wherein the one or more characteristics comprise at least one of an identified manufacturer of the organic photo conducting drum, a type of model of the organic photo conducting drum, an intended number of prints per job, an intended number of pages to be printed, and a status of a wiper blade used on the organic photo conducting drum.

19. The system as set forth in claim 18 wherein the one or more features comprise at least one of a thickness of a coating layer on the organic photo conducting drum, a surface continuity for the coating layer, an electrical continuity for the organic photo conducting drum, and gear quality for the organic photo conducting drum.

20. The system as set forth in claim 17 wherein the feature examination system further comprises a thickness determination system that determines the thickness of at least one coating layer on the organic photo conducting drum at at least one location and wherein the evaluation processing system determines if the organic photo conducting drum has another life cycle based on the determined thickness.

21. The system as set forth in claim 17 wherein the feature examination system further comprises a surface examination system that examines a surface continuity of at least a portion of at least one coating layer, wherein the evaluation processing system determines if the organic photo conducting drum has another life cycle based on the examined surface continuity.

22. The system as set forth in claim 21 wherein the surface examination system further comprises a void detection system that identifies and characterizes any voids in an outer surface of the coating layer.

23. The system as set forth in claim 17 wherein the feature examination system further comprises an electrical continuity system that examines an electrical continuity of the organic photo conducting drum, wherein the evaluation processing system determines if the organic photo conducting drum has another life cycle based on the examined electrical continuity of at least one coating layer.

24. The system as set forth in claim 17 further comprising a display that displays the provided analysis.

25. The system as set forth in claim 17 further comprising an automated loading system that automatically loads the organic photo conducting drum for the examining.

26. The system as set forth in claim 25 further comprising a cleaning system that at least partially cleans the organic photo conducting drum.

27. The system as set forth in claim 17 further comprising a display system that displays the provided analysis, wherein the provided analysis comprises an output recommendation that the photo conducting drum be one of pass and fail for an additional life cycle for the organic photo conducting drum.

28. A system for analyzing an organic photo conducting drum, the system comprising:

an identification system that identifies the type of organic photo conducting drum being analyzed based on one or more characteristics of the organic photo conducting drum;

a feature examination system that examines one or more features of the organic photo conducting drum; and

an evaluation processing system that provides an analysis of the organic photo conducting drum based on the identified type of organic photo conducting drum and the examined one or more features;

wherein the one or more characteristics comprise at least one of an identified manufacturer of the organic photo conducting drum, a type of model of the organic photo conducting drum, an intended number of prints per job, an intended number of pages to be printed, and a status of a wiper blade used on the organic photo conducting drum and wherein the identification system further comprises:

a color identification system that identifies a color of the organic photo conducting drum; and

a determination processing system that determine the manufacturer and the type of model of the organic photo conducting drum based on the identified color.

29. A system for analyzing an organic photo conducting drum, the system comprising:

an identification system that identifies the type of organic photo conducting drum being analyzed based on one or more characteristics of the organic photo conducting drum;

a feature examination system that examines one or more features of the organic photo conducting drum; and

an evaluation processing system that provides an analysis of the organic photo conducting drum based on the identified type of organic photo conducting drum and the examined one or more features;

wherein the feature examination system further comprises a thickness determination system that determines the thickness of at least one coating layer on the organic photo conducting drum at at least one location and wherein the evaluation processing system determines if the organic photo conducting drum has another life cycle based on the determined thickness;

wherein determination system further comprises a locator system that identifies at least one region of known wear on the coating layer on the organic photo conducting drum based on the identified one or more characteristics, wherein the feature examination system determines the thickness at the identified region.

30. A system for analyzing an organic photo conducting drum, the system comprising:

an identification system that identifies the type of organic photo conducting drum being analyzed based on one or more characteristics of the organic photo conducting drum;

a feature examination system that examines one or more features of the organic photo conducting drum; and

an evaluation processing system that provides an analysis of the organic photo conducting drum based on the identified type of organic photo conducting drum and the examined one or more features;

a display that displays the provided analysis, wherein the provided analysis comprises an output recommendation that the photo conducting drum be one of pass and fail for an additional life cycle for the organic photo conducting drum.

31. A system for analyzing an organic photo conducting drum, the system comprising:

an identification system that identifies the type of organic photo conducting drum being analyzed based on one or more characteristics of the organic photo conducting drum;

a feature examination system that examines one or more features of the organic photo conducting drum; and

an evaluation processing system that provides an analysis of the organic photo conducting drum based on the identified type of organic photo conducting drum and the examined one or more features;

a display that displays the provided analysis, wherein the provided analysis comprises an output recommendation that the photo conducting drum be one of reused for another life cycle, remanufactured, and recycled.

32. A system for analyzing an organic photo conducting drum, the system comprising:

an identification system that identifies the type of organic photo conducting drum being analyzed based on one or more characteristics of the organic photo conducting drum;

a feature examination system that examines one or more features of the organic photo conducting drum; and

an evaluation processing system that provides an analysis of the organic photo conducting drum based on the identified type of organic photo conducting drum and the examined one or more features, wherein the feature examination system further comprises a gear examination system that examines one or more gears of the organic photo conducting drum, wherein the evaluation processing system determines if the organic photo conducting drum has another life cycle based on the examined one or more gears.

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