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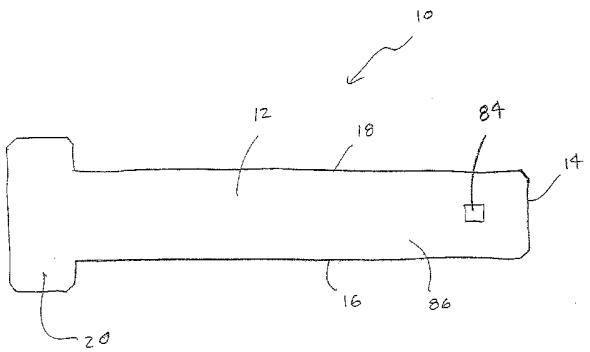
(54) Title: APPARATUS AND METHODS FOR CLEANING THE COMPONENTS OF A FEED DEVICE



(57) Abstract: Apparatus and associated methods for cleaning a feed device are provided. For example, the present invention may provide a cleaning media for cleaning a printer or other device having a feed path along which cards or other stock media are fed during printing. The cleaning media, which can be used to automatically clean the feed device, can include an identification feature by which the feed device can identify the media. Thus, the feed device can distinguish the cleaning media from a stock media and or an improper cleaning media. The cleaning media can also define a stop portion that prevents the media from being entirely inserted into the feed path of the feed device. Thus, the cleaning media can be held stationary during part of the cleaning operation so that rollers or other moving members along the feed path make sliding contact with the cleaning media. In some cases, the feed device can be cleaned automatically, e.g., according to a predetermined program of operations that also notifies and prompts an operator during and prior to the cleaning operation.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

APPARATUS AND METHODS FOR CLEANING THE COMPONENTS OF A FEED DEVICE

BACKGROUND OF THE INVENTION

1) Field of the Invention

This invention relates to the cleaning of a feed device and, more particularly, to a cleaning media and associated methods for cleaning a feed device such as the head and rollers of a printer.

2) Description of Related Art

Conventional feed devices are used for feeding or transporting stock materials such as plastic cards, paper, and the like. For example, a typical printer defines a feed path along which stock is transported during printing. Rollers are disposed along the feed path and oriented generally perpendicular to the feed direction of the stock. The rollers are typically configured in pairs to define nips for engaging the stock in the feed path so that rotation of the rollers causes the stock to be fed or transported along the path.

It is known that debris such as dust, oil, moisture, ink, and the like can be introduced into the feed path and can interfere with the operation of the feeding or other processing of the stock. For example, if rollers are used to transport the stock through the feed path, the debris can interfere with the frictional engagement between the rollers and the stock. Further, in the case of a printer, the debris can interfere with the operation of the printing mechanism therein. For example, a card printer for thermally printing plastic cards can include a print head that disposes dye onto the cards, a magnetic head that programs a magnetic strip on the card, a smart card contact station with an electrical contact that contacts a conductive pad on the card to communicate with a chip on the card, and/or a lamination mechanism with heat rollers that applies laminates to the surfaces of the card. The operation of the print head, the magnetic head, the smart card contact station, and the lamination mechanism can be compromised by the presence of debris in the printer. Further, the cards are typically relatively slippery, and therefore debris on

the cards or the rollers used to transport the cards through the feed path can prevent the rollers from transporting the cards properly.

According to a conventional cleaning operation for the card printer, the cards that are normally fed through the device are substituted with a cleaning card. The cleaning card can be fed through the printer in the conventional manner, and can be similar in size as the stock cards or longer than the stock cards. A typical cleaning card has a plastic core layer that is sandwiched between layers of felt that are soaked with isopropyl alcohol or the like so that the rollers and/or the heads of the printer are cleaned as the cleaning card is fed through the printer. By routinely feeding such a cleaning card through the printer, the feed path can be cleaned to maintain the proper operation of the printer. However, if the cleaning operation is not performed, or is performed with insufficient frequency, the printer will not be kept clean. In some cases, an operator of the printer may neglect the cleaning operation in order to avoid the time or expense associated with the cleaning operation. In addition, while the printer may include a display that prompts the operator regarding the cleaning operation, the prompts can be confusing and frustrating to the user, resulting in additional delay or neglect in cleaning. For example, the operator might use a cleaning card that has already been used, or the operator may perform the cleaning operation using a piece of stock material instead of the cleaning card.

Another problem is that most, if not all, conventional cleaning cards are designed to pass through a printer similar to a normal stock card, while cleaning different components as it goes. In some instances, a single pass of the card may not be enough to sufficiently clean the various components.

Thus, there exists a need for an improved apparatus and methods for cleaning the feed path of a feeding device. The apparatus and methods should provide effective cleaning of the feed path, thereby improving the operation of the device. In addition, the apparatus and methods should not be excessively difficult to implement so that effective cleaning can be easily achieved by the operator.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other advantages and features of the invention, and the manner in which the same are accomplished, will become more readily apparent

upon consideration of the following detailed description of the invention taken in conjunction with the accompanying drawings, which illustrate preferred and exemplary embodiments, but which are not necessarily drawn to scale, wherein:

Figure 1 is a plan view illustrating a cleaning media according to one embodiment of the apparatus and methods of the present invention;

Figure 1A is an elevation view illustrating the cleaning media of Figure 1;

Figure 1B is a partial elevation view illustrating a cleaning media according to another embodiment of the present invention in which the stop portion of the media has a thickness greater than that of the laminar portion;

Figure 1C is an elevation view illustrating a cleaning media according to another embodiment of the present invention having a barcode for identification of the media;

Figure 1D is an elevation view illustrating a cleaning media according to another embodiment of the present invention having alphanumeric symbols for identification of the media;

Figure 1E is an elevation view illustrating a cleaning media according to another embodiment of the present invention having an RF device for identification of the media;

Figure 1F is an elevation view illustrating a cleaning media according to another embodiment of the present invention having a magnetic strip for identification of the media;

Figure 1G is an elevation view illustrating a cleaning media according to another embodiment of the present invention having a conductive contact for identification of the media;

Figure 1H is an elevation view illustrating a cleaning media according to another embodiment of the present invention having a capacitive or resistive element for identification of the media;

Figure 1I is an elevation view illustrating a cleaning media according to another embodiment of the present invention having an optical reflector, pattern, or hologram for identification of the media;

Figure 1J is an elevation view illustrating a cleaning media according to another embodiment of the present invention having an optical pass-through for identification of the media;

Figure 2 is a section view in elevation illustrating the cleaning media of Figure 1 disposed in a feed path of a printer for cleaning according to one embodiment of the present invention;

Figure 3 is a plan view illustrating a cleaning media according to another embodiment of the present invention;

Figure 4 is a flow chart diagram illustrating the operations associated with cleaning a printer according to one embodiment of the present invention;

Figure 5 is a schematic view in section illustrating a printer with a bar code reader or optical sensor for detecting indicia or patterns on a cleaning media according to another embodiment of the present invention; and

Figure 6 is a schematic view in section illustrating a printer with a roll drive and tension-sensing device for detecting an increased thickness of the cleaning media according to yet another embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

According to one embodiment of the present invention, there is provided an apparatus and associated methods for cleaning a feed device such as a printer. For example, a cleaning media can be used to automatically clean the feed device. The cleaning media can include an identification feature by which the feed device can identify the cleaning media to assure that a proper cleaning media is used for the cleaning operation. In addition, the cleaning media can define a stop portion by which the media can be held stationary during at least part of the cleaning operation so that rollers or other members along the feed path make sliding contact with the cleaning media, thereby increasing the effectiveness of the cleaning operation. According to another embodiment of the present invention, there is provided a method by which the feed device can be cleaned, e.g., automatically, and in conjunction with a user-friendly interface by which an operator can be notified and prompted during and prior to the cleaning operation.

According to one embodiment, the cleaning media is a card that defines a laminar portion that extends in a longitudinal direction from a leading edge to an opposite end, which can be defined by a stop portion. The laminar portion of the card defines first and second opposite transverse edges and has a width sufficiently narrow so that the laminar portion can at least partially pass through a feed path of

a feed device. According to one aspect of the invention, a stop portion of the card has at least one dimension that is greater than the corresponding dimension of the laminar portion and the feed path. Thus, the stop portion is configured to be retained by the feed device while the laminar portion is disposed in the feed path during cleaning, even while the rollers rotate against the card. For example, the stop portion can be wider than both the laminar portion and the feed path.

According to another aspect of the invention, the laminar portion also defines an identification feature configured to identify the cleaning card to the printer. The identification feature can be of any nature for identifying the card as a cleaning card, such as either a physical attribute of the card or data stored on or in the card. For example, the identification feature could be a physical attribute of the card, such as its shape, thickness, material from which it is made, density, color, magnetic resonance, resistive or capacitive characteristics, etc. One example of a physical characteristic is notches in the transverse edges of the card. Another example is holes or transparent portions in the card. Further or alternatively, the card could include indicia thereon to identify the card, such as barcode, text, printed patterns, holograms, magnetic strips, a radio frequency identification (RFID) tag disposed on or in the cleaning card, and the like.

The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

Referring to Figures 1 and 1A, there is shown a cleaning media according to one embodiment of the present invention. The cleaning media **10** is generally a laminar sheet of material that can be transported or fed through a feed path **32** of a feed device **30** (Figure 2). The cleaning media **10** can be formed of a variety of materials and can include special cleaning substances. For example, the media **10** can have a plastic inner core **22** with absorbent layers **24, 26** disposed on opposite sides of the core **22** to define opposite surfaces **86, 88** of the media **10**. The absorbent layers **24, 26** can be formed of felt that is soaked with isopropyl alcohol

or other cleaning fluids. As illustrated in Figure 1, the cleaning media **10** defines a laminar portion **12** that extends between a first, or leading, edge **14** of the media **10** to a stop portion **20** of the media **10**. The laminar portion **12** of the media **10** is sufficiently thin and narrow that the laminar portion **12** can be inserted through at least part of the feed path **32**. For example, the laminar portion **12** can have a thickness T_L, as defined between the surfaces **86**, **88**, and a width W_L, as defined between the transverse edges **16**, **18**, that are about equal to the thickness and width of the stock typically transported through the same feed device that the media **10** is used to clean.

The feed device is described below as a card printer **30**, and the cleaning media **10** is described below in conjunction with the cleaning operation of the card printer **30**. However, it is appreciated that the cleaning media **10** can alternatively be used to clean other feed devices. For example, the cleaning media **10** can be used to clean the rollers, stationary elements, and other portions of various types of feed devices such as other types of printers, lamination stations and machines, copiers, or transport mechanisms used to feed stock such as paper, cardboard, plastic, metal, and the like. In this regard, the size and material of the cleaning media **10** can be selected according to the dimensions, operating parameters, and cleaning demands of the particular feed device that is to be cleaned with the media **10**.

The stop portion **20** of the cleaning media **10** defines at least one dimension that is greater than a corresponding dimension of the feed path **32** and, hence, the laminar portion **12**. That is, at least one of the dimensions of the cleaning media **10** is sufficiently large to prevent the passage of the stop portion **20** through the feed path **32**. For example, as illustrated in Figure 1, the stop portion **20** defines a width W_S that is greater than the width W_L of the laminar portion **12**. Moreover, the width W_S of the stop portion **20** can also be greater than width of a space, for example, exit **36**, in the feed device **30** along the feed path **32** (Figure 1). In an alternative configuration, the stop portion **20** could have a thickness that is greater than the laminar portion **12** and a space, for example, exit **36**, in the printer feed path **32** Figure 1B).

Figure 2 illustrates a feed path **32** defined by a card printer such as the P310i Printer available from Zebra Technologies Corp. The feed path **32**, which

extends through a housing **31** of the printer **30** from an entrance **34** to an exit **36**, defines the path of travel of a piece of stock, such as a plastic card, through the printer **30**. Rotatable rollers **38, 40, 42, 44, 46, 48, 50, 52, 56, 58**, or other media transport device such as a belt, are provided along the feed path **32**, and the rollers **38, 40, 42, 44, 46, 48** are configured to rotate to feed the cards or other media through the printer **30** during operation. For example, lower rollers **38, 40, 42, 44, 46, 48** can mechanically communicate with a rotational driver **60** such as an electric motor. Thus, during normal printing operation of the printer **30**, a stack of the cards can be provided in a hopper **62** proximate to the entrance **34** of the feed path **32**, and the cards can be individually fed from one side of the stack and then fed along the feed path **32** to the exit **36**. The adjacent rollers **38, 40, 42, 44, 46, 48** can be separated by distances less than the length of each stock card so that each stock card is always engaged by at least one of the rollers **38, 40, 42, 44, 46, 48** while being transported through the feed path **32**. Further, each of the lower rollers **38, 40, 42, 44, 46, 48** can be configured opposite the feed path **32** from an upper member. For example, as illustrated in Figure 2, the lower rollers **40, 42, 44, 46, 48** are disposed opposite a cleaning cassette roller **50**, an upper roller **52**, a head **54**, and upper rollers **56, 58**, respectively. Thus, the cards are engaged between the lower rollers **40, 42, 44, 46, 48** and the respective upper member **50, 52, 54, 56, 58** so that the rollers frictionally engage the cards. In this regard, the rollers **38, 40, 42, 44, 46, 48, 50, 52, 56, 58** can be formed of a material such as rubber or an elastically deformable polymer so that the rollers **38, 40, 42, 44, 46, 48, 50, 52, 56, 58** can frictionally engage stock such as the cards, which can have smooth surfaces formed of polyvinyl chloride (PVC) or other somewhat slippery materials.

As is known in the printing industry, the head **54** of the card printer **30** can be a device for disposing a dye onto the stock cards. For example, a thermal dye ribbon **70** can extend from a supply spool **72** to a take-up spool **74** with the ribbon **70** disposed between the head **54** and one of the cards in the feed path **32**. Dyes of one or more colors are disposed on the ribbon **70**, and the head **54** is configured to press the ribbon **70** against the card and/or heat the ribbon **70** at particular locations so that the dye in the particular locations of the ribbon **70** is transferred to the card. Such a thermal printing operation is described, e.g., in U.S. Patent No. 6,151,037 to Kaufman, et al.; U.S. Patent No. 5,978,004 to Ehrhardt; and U.S. Patent No.

5,657,066 to Adams, et al., each of which is assigned to the assignee of the present application, and the contents of each of which are incorporated herein in their entirety by reference.

Thus, as each stock card is fed along the feed path **32** of the printer **30**, the head **54** can dispose one or more colors onto the card in a predetermined pattern. In some cases, the ribbon **70** can define repeating frames of panels, each panel having a dye of a different color than the other panels of the same frame. For example, each frame can include panels that are yellow, magenta, and cyan, respectively. The stock cards can be alternately advanced and retracted in opposite directions along the feed path **32** so that each card is fed under the head **54** multiple times, during which the head **54** can print different colors from the different panels of a frame. The ribbon **70** and spools **72, 74** are shown in dashed lines in Figure 2 to indicate that the ribbon **70** and spools **72, 74** are typically removed from the printer **30** before the cleaning media **10** is inserted into the feed path **32** for the cleaning operation.

The cleaning media **10** is configured to be received at least partially in the feed path **32**, and in some cases, the laminar portion **12** of the cleaning media **10** can have a length L_L as long as the feed path **32** so that the media **10**, when fed through the feed path **32**, can be disposed entirely through the path **32**. For example, Figure 2 illustrates the operation of the printer **30** in a cleaning mode in which the cleaning media **10** is disposed in the path **32** with the stop portion **20** proximate to the exit **36** of the feed path **32** and the laminar portion **12** of the media **10** extending from the exit **36** to the entrance **34**. In some cases, the length L_L of the cleaning media **10** can be 12 inches or greater, depending on the length of the feed path **32** of the device **30** for which the cleaning media **10** is to be used for cleaning. In other embodiments of the present invention, the cleaning media **10** can be configured to be disposed through only a portion of the feed path **32**, and/or the cleaning media **10** can be inserted alternatively through the entrance **34** and fed toward the exit **36** in which case the stop portion **20** of cleaning media **10** would engage the housing of entrance **34** rather than exit **36**.

As described above, the stop portion **20** of the media **10** is larger in at least one dimension than the feed path **32** so that the stop portion **20** is restrained from entering the feed path **32**. For example, as illustrated in Figure 1, the cleaning

media **10** generally defines a T-shape with the stop portion **20** having a width W_S that is greater than the width W_L of the laminar portion **12** and greater than the width of the feed path **32**. Thus, the stop portion **20** of the media **10** does not enter the feed path **32** during the cleaning mode. In other embodiments of the present invention, the stop portion **20** can alternatively be uniformly thicker than the feed path **32**, or the stop portion **20** can define one or more areas that are individually thicker than the feed path **32**. It is also appreciated that the cleaning media **10** can be formed without the stop portion **20**, i.e., so that the entire media **10** is capable of being fed through the feed path **32**. In that case, the cleaning media **10** can be unrestrained or can be restrained by a different feature such as a connection between the printer **30** and one end of the cleaning media **10**.

According to another embodiment of the invention, the cleaning media **10** can be engaged in the feed path **32** by contact between an adjustable member and the cleaning media **10**. For example, a smart card contact **94** can be configured to make electrical contact with a conductive pad on a smart card in the feed path **32**. An electromagnetic solenoid **96** can be positioned opposite the feed path **32** from the smart card contact **94** and configured to adjust a cap **98** or plunger against the smart card in the feed passage **32** to urge the smart card against the smart card contact **94**. With the cleaning media **10** in the feed path **32**, the solenoid **96** can move the cap **98** to an extended position (shown in dashed lines in Figure 2) so that the cap **98** contacts the cleaning media **10** and urges the cleaning media **10** against the smart card contact **94**, thereby securing the media **10** in place and preventing the media **10** from moving, even when the rollers are operated. In addition, or alternative, other members can be positioned to move and engage the cleaning media **10** in the feed path **32** to immobilize the cleaning media **10**. For example, the head **54** can be adjustable in a direction generally normal to the feed passage **32**, i.e., in directions **55a**, **55b**. By adjusting the head **54** in direction **55a** and urging the cleaning media **10** against the roller **44**, the head **54** can restrain the media **10** to prevent movement of the cleaning media **10** during cleaning.

The cleaning media **10** also defines an identification feature, by which the printer **30** can identify the cleaning media **10**. For example, as illustrated in Figure 1, the laminar portion **12** defines notches **80**, **82** extending inward from the opposite transverse edges **16**, **18**. However, it is appreciated that the identification

feature can be any characteristic of the cleaning media **10**, either a physical characteristic or something located or stored in or on the media **10**, and the identification feature can be located anywhere on the media **10**. For example, the identification feature can be a barcode (Figure 1C), alphanumeric symbols or text (Figure 1D), or other indicia on the cleaning media **10**; a portion of the cleaning media **10** that is colored differently than the surrounding area on the cleaning media **10**; an electronic article surveillance (ESA) RF resonant security element **82a** (Figure 1E) or magnetic strip **82b** (Figure 1F) disposed on or in the cleaning media **10**; a conductive contact (**82c** (Figure 1G); a capacitive or resistive element **82d** (Figure 1H); an optical reflector, pattern, or hologram **82e** (Figure 1I); an optical pass-through such as an aperture or transparent window **82f** (Figure 1J); and the like. Further, the identification feature can be a general characteristic of the media **10** such as a geometric dimension of a portion of the media **10** such as a step or other nonuniformity, change, or perturbation in a dimension or configuration of the cleaning media **10**; a capacitive, resistive, or inductive quality of the media **10**; an optical characteristic of the media **10**; and the like. In addition, the identification feature can identify the printer **30** or other device with which the cleaning media **10** is to be used or a printer characteristic or attribute that is compatible with the cleaning media **10**.

The identification feature can be detected by the printer **30** in order to distinguish the cleaning media **10** from the stock medias typically printed in the printer **30** and/or to identify the particular cleaning media **10**. For example, as shown in Figure 3, the identification feature is a tag **84** such as an RFID tag or a magnetic strip. The tag **84** can be encoded with data, i.e., by storing the data in a memory of an RFID tag or magnetically encoding the data on a magnetic strip. The data can be read or retrieved by the printer **30**, e.g., to identify the cleaning media **10**, to detect if the cleaning media **10** has been used before, to detect aspects of the cleaning media **10** such as the type or age of the media **10**, and the like. In some cases, the printer **30** can also reject the cleaning media **10** according to the data, such as if the cleaning media **10** is the wrong type of media **10** for the printer **30**, is older than a threshold age, has been used before, or is dirty. For example, the tag **84** can include a serial number, counter, or other identification data that is retrieved from the identification feature by the printer **30**, e.g., to be used by the

printer **30** to control the printer **30** or the cleaning thereof by the cleaning media **10**. In the case of a counter stored in the media **10**, the printer **30** can store in the counter the number of times that the media **10** has been used. Such a counter is typically part of the media **10**, e.g., a memory of the identification feature, but the counter can alternatively be part of the printer **30**. In either case, the printer **30** can display data from the counter in order to indicate to the user the remaining number of uses of the media **10**, e.g., via a liquid crystal display (LCD) **100**. After a predetermined number of uses, the printer **30** can automatically reject the media **10** or inform the operator that the media **10** is no longer effective and needs to be replaced.

Thus, the identification feature can be used to "lock" the media **10** to prevent its use after a predetermined number of uses. Further, in some cases, the printer **30** can lock the media **10** in other ways. For example, the printer **30** can provide an indication of the use of the media **10** by printing a mark on the media **10**, by breaking or deforming the media **10** using a physical force or heat, or by otherwise subjecting the media **10** to pressure, heat, light, or the like.

In other embodiments, the printer **30** can alternatively detect whether the media **10** is dirty, regardless of the number of times that the media **10** has been used. That is, the printer **30** can include a detector for detecting the amount of use or remaining life of the media **10**, e.g., by detecting cleanliness of the media **10**. For example, the printer **30** can include an optical sensor for detecting the amount of lint or other debris on the media **10**, the amount of wear or discoloration of the media **10**, or other attributes of the media **10** that are indicative of the remaining use of the media **10**.

As illustrated in Figure 1, in another embodiment, notches **80, 82** in the cleaning media **10** could be used to identify the media **10**. As described below, in this embodiment, the printer **30** may include a sensor, such as an optical sensor that senses the presence of these notches **80, 82** as the media **10** is inserted or after the media **10** is disposed in the printer **30**. The notches **80, 82** may even form a pattern that corresponds to specific data about the cleaning media **10**. The media **10** could include a bar code or other indicia or pattern (Figure 1C). In this instance, the printer **30** would include a bar code reader or optical sensor **200** (Figure 5) to detect these indicia or patterns. The cleaning media **10** could be designed to have a

particular resistance characteristic or a specific capacitive characteristic that could be detected with an appropriate sensor in the printer **30**. The cleaning media **10** could have an increased thickness that is detectable by the increases tension on the feed rolls (Figure 6). The cleaning media **10** could include a magnetic strip that is read by a reader in the printer similar to the system of Figure 5.

In any case, the identification feature(s) can be disposed symmetrically on the cleaning media **10** so that the cleaning media **10** can be received into the printer **30** in more than one orientation with the identification feature properly oriented. For example, the two notches **80, 82** of the cleaning media **10** illustrated in Figure 1 are located at corresponding positions on the opposite transverse edges **16, 18** of the media **10**. Thus, even if the printer **30** is configured to identify only the one of the notches **80, 82** at one side of media **10**, the media **10** can be installed with the transverse edges **16, 18** in opposite positions (i.e., with the media **10** flipped over) so that one of the two notches **80, 82** is detectable by the printer **30**. Alternatively, in the case of the cleaning media **10** of Figure 3, the identification tag **84** can be disposed in the plastic core **22** of the media **10** equidistant from the transverse edges **16, 18** so that the tag **84** is detectable from either of opposite sides of the media **10**. Thus, the media **10** can similarly be used in either of opposite (flipped) orientations, i.e., with either of the surfaces **86, 88** directed toward the lower rollers **38, 40, 42, 44, 46, 48**. In other embodiments of the invention, the cleaning media **10** can be formed without any identification feature.

According to one method of cleaning the printer **30** illustrated in Figure 2, the printer **30** is first emptied of any stock media that are being printed. The stock media are typically ejected from the exit **36** of the feed path **32** after being printed. A cleaning mode is then initiated, e.g., automatically by the printer **30** or upon an operator's command. The operator then provides the cleaning media **10** to the exit **36** of the feed path **32** and partially inserts the first edge **14** of the media **10** into the feed path **32** so that the rollers **48, 58** engage the cleaning media **10**. Thereafter, the printer **30** can perform the cleaning operation automatically without assistance from the operator. The printer **30** feeds the cleaning media **10** through the feed path **32** toward the entrance **34** so that the identification feature of the media **10** passes proximately to a detector. The detector can be configured to detect the identification feature using an electrical, optical, electromagnetic, RFID, or other

mode of detection. For example, in the case of the cleaning media **10** of Figure 1, the detector can include a light source **90**, such as a light emitting diode (LED), and a light-triggered transducer **92** or receiver. The light source **90** and the transducer **92** are disposed on opposite sides of the feed path **32** so that the transducer **92** can detect when the media **10** is disposed in the feed path **32** and blocking the passage of light from the source **90**. Thus, as the media **10** is fed through the feed path **32**, the first edge **14** of the media **10** passes between the source **90** and transducer **92** and interrupts the passage of light. As the media **10** is further fed along the path **32**, one of the notches **80, 82** becomes disposed between the source **90** and transducer **92** so that the passage of light is not interrupted. Then, with further passage of the media **10**, the same notch **80, 82** passes beyond the source **90** and transducer **92** so that the media **10** again interrupts the passage of light. These changes in the passage of light are detected, and the printer **30** can determine the size and location of the notch **80, 82** on the media **10**, e.g., in order to authenticate the cleaning media **10**. In addition, the notch **80, 82** or other identification feature can be transported proximate to the detector at multiple stages of the cleaning operation to verify that the cleaning media **10** is still in the feed path **32**. If the detector does not detect the proper cleaning media **10**, the printer **30** can halt the cleaning operation and any material in the passage **32** can be rejected. Thus, if the operator starts to perform the cleaning operation with an improper media, such as with a stock card, the printer **30** can automatically stop the operation until the correct cleaning media **10** is provided.

In other embodiments, the detector (previously described as the source **90** and transducer **92**) can instead be configured to interact with the identification feature through electromagnetic or magnetic energy. For example, the detector can be a radio frequency interrogation system configured to interrogate a radio frequency identification device on the cleaning media **10**. Alternatively, the detector can be an optical reader **200** (Figure 5) configured to read a bar code of other optical pattern or text or hologram on the cleaning media **10**. Further, the detector can be a magnetic reader configured to read a magnetic strip or other information stored magnetically on the cleaning media **10**.

The cleaning operation can proceed with multiple stages of operation. In one stage, the rollers **38, 40, 42, 44, 46, 48** can be actuated to advance and retract

the cleaning media **10** in opposite directions of the feed path **32** while the head **54** is disposed against the cleaning media **10** so that the cleaning media **10** makes sliding contact with the head **54**, thereby cleaning the head **54**. In some cases, the head **54** can be adjustably mounted in the printer **30**, and can be adjusted toward the roller **44** during at least part of the cleaning operation to achieve sufficient contact between the head **54** and the cleaning media **10**. Similarly, other stationary members along the feed path **32** can be cleaned by the passage of the cleaning media **10**. For example, the cleaning media **10** can clean a magnetic encoder device **64a**, **64b** that is used for encoding magnetic strips on the stock media, an optical device that detects features of the media, and the like, each of which can be mounted on the head **54** or elsewhere along the feed path **32**. For example, the cleaning media **10** can also clean the smart card contact **94** and/or the electromagnetic solenoid **96** that is positioned opposite the feed path **32** from the smart card contact **94**. The devices that are cleaned by the cleaning media **10** can be located on either side of the cleaning media **10**. For example, as illustrated, the magnetic encoder device can be located at positions indicated by reference numerals **64a** or **64b**, though only one magnetic encoder device is typically provided.

Before or after the cleaning of the head **54**, a second cleaning stage can be performed to clean the rotating rollers **38**, **40**, **42**, **44**, **46**, **48**, **50**, **52**, **56**, **58**. In the second stage, the cleaning media **10** is fed along the feed path **32** until the stop portion **20** of the cleaning media **10** is disposed against the exit of the printer **30**, and the stop portion **20** is restrained from entering the feed path **32**. The rollers **38**, **40**, **42**, **44**, **46**, **48** are then rotated in a direction to generally urge the stop portion **20** of the cleaning media **10** into the feed path **32**. Thus, the cleaning media **10** remains stationary while the rollers **38**, **40**, **42**, **44**, **46**, **48** rotate so that the surface of each roller **38**, **40**, **42**, **44**, **46**, **48** makes sliding contact with the cleaning media **10**, thereby cleaning debris from the rollers **38**, **40**, **42**, **44**, **46**, **48** and onto the cleaning media **10**. In other embodiments of the present invention, the upper rollers **50**, **52**, **56**, **58** can also communicate with a rotational driver, such as a motor, so that the upper rollers **50**, **52**, **56**, **58** also rotate against the cleaning media **10**. As discussed, the cleaning media **10** may be fed through the feed path **32** in an opposite direction from the direction used to print on the media stock. This is

typically done because the exit **30** is more accessible and is not a limitation to the present invention. The cleaning media **10** could be fed in the opposite direction if desired. The motor drive or drives for the rollers is shown schematically in Figure 2 at **202**.

In some embodiments of the invention, the printer **30** can signal or indicate to the operator that the cleaning operation should be performed, e.g., after a predetermined number of printing operations have been performed, at predetermined intervals, when debris is detected in the printer **30**, when stock media in the printer **30** is detected by the printer to be dirty, or at other times. For example, the printer **30** can count the number of stock media that are printed, store a value in a memory **106** of the printer that is incremented (or decremented) upon each printing operation, and notify the operator or automatically cease the operation of printing when the count reaches a threshold value such as a minimum or maximum so that the cleaning operation can be performed.

Alternatively, the printer **30** can detect the cleanliness of the stock media passing through the feed path **32**, the cleanliness of the cleaning media, the cleanliness of the rollers **38**, **40**, **42**, **44**, **46**, **48**, **50**, **52**, **56**, **58**, or the cleanliness of other members of the printer **30** such as the print head **54**, e.g., using a detection device **104** such as an optical sensor. The images captured from the detection device could be analyzed to determine the amount of lint, dirt, etc. on the media, rollers, etc. using known defect detection software. For example, there is known software in the semiconductor industry for detecting from captured images flaws in semiconductor wafers. Further, imaging software is used in the papermaking industry to detect flaws in the paper web. Similar, the same software can be adapted in some embodiments of the present invention to determine the cleanliness of the media and/or rollers.

In some cases, the cleaning operation can be performed automatically by the printer **30**. In particular, the printer **30** can be configured to feed the cleaning media **10** from a stored position so that the cleaning media **10** is then disposed in the feed path **32**. For example, the cleaning media **10** can be stored in a special bin or position so that the printer **30** can retrieve the cleaning media **10** for a cleaning operation, without requiring that the operator provide the cleaning media **10** to a loading position at that time. The bin for the cleaning media **10** can be similar to

the hopper **62**, but configured to supply the cleaning media **10**. Alternatively, in some cases, the cleaning media **10** can be supplied from the same hopper **62** as the stock media that is used for printing. For example, the stock media can be loaded as a pack that includes one or more of the cleaning media **10**, i.e., with the cleaning media **10** stacked between a predetermined number of pieces of the stock media so that the cleaning media **10** is received through the feed path **32** after a predetermined number of pieces of the stock media are printed. Further, the printer **30** can include a detector that detects when the cleaning media **10** is being fed through the feed path **32**, so that the cleaning operation can be performed accordingly, e.g., by feeding the cleaning media **10** through the feed path **32** multiple times and/or restraining the cleaning media **10** in the feed path **32** (with an adjustable member such as the solenoid **96** or the head **54** as described above or otherwise) while the rollers are rotated against the media **10**.

Thus, the printer **30** can automatically perform the cleaning operation, e.g., when the printer **30** determines that the cleaning operation should be performed. As described above, the printer **30** can determine that cleaning should be performed according to a schedule, or when the printer **30** detects dirt or debris in the feed path **32**, such as on the rollers **38**, **40**, **42**, **44**, **46**, **48**, **50**, **52**, **56**, **58**, the head **54**, the stock media, and the like. In this regard, the detector **104** can be configured to monitor the cleanliness of the stock media, the cleaning media **10**, the roller **50**, or other aspects of the printer **30**. In one embodiment, the roller monitored by the detector **104** can be a tacky or sticky roller that is configured to remove debris from the stock media as the stock media passes through the feed path **32**. In another embodiment, the detector **104** is configured to monitor the stock media, and the stock media can define a transparent window or other structure and the detector **104** can be configured to direct an optical beam through the window to determine the amount of debris on the stock media and/or the detector **104**. Alternatively, a special piece of media having a window can be routinely fed through the feed path **32**. Further, in other embodiments, the detector **104** can be positioned elsewhere along the feed path **32**, such as proximate to the other rollers or the head **54**.

The printer **30** can also be configured to perform the cleaning operation when the printer **30** is being otherwise serviced. For example, printer **30** can be

configured to perform the cleaning operation or signal the operator to initiate the cleaning operation at a time such as when the ribbon **70** has been removed from the printer **30**. Thus, if the operator removes the ribbon **70** for replacement or for servicing of the other portions of the printer **30**, the printer **30** can signal to the operator via the LCD **100** that the cleaning operation should be performed. In this regard, the printer **30** can reduce the number of service operations of the printer **30** by combining the cleaning operation with the other service operations of the printer **30**.

In another embodiment, the printer may include an internal clock or counter that marks the amount of time from the last time the printer was cleaned. When the clock or counter reaches a time threshold, the printer can alert the user that the printer should be cleaned, or it may instead instigate an automatic cleaning process as described herein.

In various embodiments of the present invention, the printer **30** can additionally indicate to the operator before the cleaning operation is required. In this regard, the printer **30** can include the LCD **100** as shown in Figure 2 or another user interface device for signaling to the operator, e.g., for indicating the number of prints performed since the last cleaning operation and indicating when the number of prints since the last cleaning is at least equal to a threshold value. The LCD can be controlled by a controller **102** that also controls the other operations of the printer **30** such as the operation of the rollers **38**, **40**, **44**, **46**, **48**, the detector, the print head **54**, and the like.

Figure 4 illustrates the operations for a printer **30** according to one embodiment of the present invention in connection with the cleaning operation of the printer **30**. Reference numeral **110** indicates a ready state of the printer **30** in which the printer **30** is ready to receive commands for printing the stock medias. If a printing command is received in Box **112**, the printer **30** performs the printing operation and increments a printing counter n, so that the printing counter (n) corresponds to the number of print operations performed since the last cleaning operation. See Box **114**. In Box **116**, the printer **30** checks to see if the number of print operations (n) is within a predetermined interval of a maximum, e.g., if the number of print operations (n) is less than a maximum (max) minus 20. If so, the cleaning operation does not need to be performed and the printer **30** returns to the

ready state of Box **110** to await a printing command. However, if the number of print operations (n) is within the interval, the printer **30** next checks if the number of print operations (n) is within the interval but less than the maximum, i.e., if (max) - 20 < (n) and (n) < (max). If so, the printer **30** displays prompts on the LCD **100** to alert the operator of the impending requirement for the cleaning operation. For example, the LCD **100** can alternately flash a first message that indicates that a mandatory clean will occur after a specified number of cards are printed (see Box **120**) and a second message that prompts the operator to press a key to start cleaning (see Box **122**). Thereafter, if the operator presses a key on a keypad of the printer **30**, or if the number of printing operations (n) was not less than the maximum (max) in Box **118**, the printer **30** displays a message on the LCD **100** requesting the operator to press a key to start the cleaning operation. See Box **124**.

After the operator presses a key on the keypad, the operator is prompted with a first flashing message to remove the ribbon and press a key and a second message indicating that the printer **30** is in the cleaning mode. See Boxes **126**, **128**. In Box **130**, the printer detects whether a latch for closing the head, i.e., adjusting the head toward the roller **44**, is closed. If the latch is not closed, the operator is prompted with flashing messages indicating that the operator should close the head latch (see Box **132**) and that the printer **30** is in the cleaning mode (see Box **134**). At which time the head latch is closed, the printer **30** next detects whether a housing cover of the printer **30** is closed. See Box **136**. If the cover is not closed, the operator is prompted with flashing messages indicating that the operator should close the cover (see Box **138**) and that the printer **30** is in the cleaning mode (see Box **140**). At which time the cover is closed, the printer **30** prompts the operator with messages indicating that the operator should insert the cleaning media **10** at the exit **36** (see Box **142**) and then press any key to start (see Box **144**).

When a key is pressed on the keypad, the printer **30** begins to rotate the rollers **40**, **42**, **44**, **46**, **48** in a direction for feeding the cleaning media **10** through the feed path **32** toward the entrance **34**, i.e., in a clockwise direction as shown in Figure 2. Thus, when the operator inserts the media **10** into the exit **36**, the media **10** is received between the rollers **48**, **58** and the rollers **48**, **58** engage the media **10**

and transport the media **10** toward the exit **34**, i.e., toward the right as illustrated in Figure 2. The media **10** is successively engaged by the other rollers **40, 42, 44, 46, 50, 52, 56** as the media **10** is transported through the feed path **32**. After a predetermined time that is sufficient for the media **10** to have been transported through the feed path **32**, i.e., when a timeout condition is met in Box **146**, the rollers **40, 42, 44, 46, 48** stop rotating.

Next, the printer **30** determines if the correct cleaning media **10** has been inserted. For example, the rollers **40, 42, 44, 46, 48** of the printer **30** can be used to feed the media **10** through the feed path **32** in one or both directions while the detector of the printer **30** checks the identification feature of the media **30** to determine if the media is correct. See Box **148**. If the media is not correct, or if no media has been inserted and fed through the feed path **32**, any media that is disposed in the path **32** is ejected from the exit **36** (see Box **150**), and the operator is notified by the LCD **100** that the media is invalid and prompted to press a key (see Box **152**), then returned to Box **142** to be prompted to insert a cleaning media.

However, if the cleaning media **10** is determined to be correct in Box **148**, the operator is notified via the LCD **100** that cleaning is in progress. See Box **154**. The cleaning operation then proceeds as described above. For example, in a first stage of the cleaning operation, the cleaning media **10** can be fed through the feed path **32** in alternate directions, e.g., advanced and retracted five or more times, to clean the head **54**. During each successive motion of the cleaning media **10**, the identification feature can be fed proximate to the detector so that the printer **30** can verify that the correct media **10** is still in the feed path **32**. In some embodiments of the present invention, the detector may be able to verify the cleaning media **10** even when the media **10** is not disposed proximate to the detector. See Box **156**. In a second stage of the cleaning operation, the rollers **38, 40, 42, 44, 46, 48, 50, 52, 56, 58** of the printer **30** are cleaned by keeping the media **10** stationary and rotating at least some of the rollers **38, 40, 42, 44, 46, 48, 50, 52, 56, 58**. For example, the media **10** can be fed through the feed path **32** so that the stop portion **20** is disposed at the exit **36** and physically restrained from entering the feed path **32**. The rollers **38, 40, 42, 44, 46, 48** then continue to rotate to make sliding contact with the media **10**. In some cases, the rollers **38, 40, 42, 44, 46, 48** can alternately rotate in the opposite direction so that the media **10** is partially ejected

from the exit **36** before advancing the stop portion **20** to the exit **36** again and sliding the rollers **38, 40, 42, 44, 46, 48** on the media **10**. The identification feature can be detected during the second stage of the cleaning operation, e.g., by feeding the identification feature past the detector. See Box **158**. If the identification feature is an RFID tag, registration of the media **10** may be unnecessary, and the RFID tag may not need to be moved into proximity to the detector.

At the conclusion of the cleaning operation, the printer **30** determines if the cleaning operation was performed successfully. See Box **160**. If not, the cleaning media **10** is ejected (see Box **162**), and the operator is notified that the cleaning operation failed and prompted to press a key (see Box **164**), thereafter being returned to Box **142**. If the cleaning operation was successful, the cleaning media **10** is ejected and the maximum value (max) is incremented by a predetermined value (step_clean) equal to the number of printing operations that can be performed before the next cleaning operation is to be performed. See Box **166**. Of course, if the counter is configured to be incremented upon each printing operation, the counter can be reset to zero upon a successful cleaning operation. In either case, a data log can be maintained in the memory **106** of the printer, e.g., to count the number of times the printer has been cleaned, the number of prints made between one or more cleanings, a schedule of the timing and/or counts of printing and cleaning operations, and the like.

The operator is notified via the LCD **100** that the cleaning was successful (see Box **168**) and prompted to reinstall the ribbon **70** and close the latch (see Box **170**). When the ribbon **70** is reinstalled and the latch is closed, the printer **30** returns to the ready mode of Box **110** to await a printing command for continued operation.

It is appreciated that the cleaning operation described above can additionally be performed in conjunction with other operations for cleaning or maintaining the cleanliness of the printer **30**. For example, U.S. Patent Nos. 6,285,845 and 6,408,151 describe card cleaning devices that include a cleaning roller with a sticky silicone material that removes undesirable pollutants, such as dust particles, deposited on the printable surface of the stock cards. The entire contents of each of U.S. Patent Nos. 6,285,845 and 6,408,151 are incorporated herein in their entirety by reference. In one embodiment of the present invention,

the cleaning operation described above can be performed in conjunction with the use of such a sticky roller, such as the roller **50** that is part of a cleaning cassette. Thus, the cleanliness of the feed path **32** can be maintained by the combination of the use of the sticky roller **50** and the cleaning operation using the cleaning media **10**. In some cases, the cleaning media **10** can be used to clean the sticky roller **50** during the cleaning operation so that debris collected on the sticky roller **50** is then removed from the printer **30** with the cleaning media **10**.

The system may also include a sensor that monitors the amount of lint and dust removed by the sticky roller from the media. This is a good indication of the type of environment in which the printer is operated. Using this information, the printer can determine how often the printer should be cleaned.

Many modifications and other embodiments of the invention will come to mind to one skilled in the art to which this invention pertains having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the invention is not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

THAT WHICH IS CLAIMED:

1. A cleaning media configured to be inserted at least partially along a stock feed path of a printer to thereby clean portions of the printer, said cleaning media defining an identification feature configured to provide an identification to the printer of said cleaning media.

2. A cleaning media according to Claim 1 wherein the identification feature comprises a physical attribute of the cleaning media.

3. A cleaning media according to Claim 2 wherein the physical attribute comprises at least one optical pass-through in said cleaning media.

4. A cleaning media according to Claim 3 wherein the physical attribute comprises two of the optical pass-throughs, the optical pass-throughs being disposed in a symmetric configuration on cleaning media such that the media is configured to be inserted into the printer in at least two orientations.

5. A cleaning media according to Claim 2 wherein the physical attribute comprises a nonuniform dimension of the cleaning media.

6. A cleaning media according to Claim 1 wherein the identification feature identifies at least one of the cleaning media and an attribute of the cleaning media.

7. A cleaning media according to Claim 2 wherein the identification feature comprises a nonuniform optical characteristic of the cleaning media.

8. A cleaning media according to Claim 1 wherein the identification feature is configured to communicate information contained on the cleaning media using at least one of the group consisting of electromagnetic and magnetic energy.

9. A cleaning media according to Claim 8 wherein the identification feature comprises at least one of a bar code, printed indicia, magnetic strip, and hologram.

10. A cleaning media according to Claim 8 wherein the identification feature is a radio frequency identification tag.

11. A cleaning media according to Claim 1 wherein the identification feature identifies at least one of a printer and a characteristic of a printer with which the cleaning media is intended to be used.

12. A cleaning media according to Claim 1 wherein the identification feature indicates if the cleaning media has been used before.

13. A cleaning media according to Claim 12 wherein the identification feature provides a counter indicating at least one of the group consisting of a number of times that the media has been used and a remaining number of uses of the cleaning media.

14. A cleaning media according to Claim 1 wherein the media defines a first portion extending in a longitudinal direction from a leading edge to a stop portion, the first portion defining a width in a transverse direction between the transverse edges configured to pass through at least a portion of the feed path, wherein the stop portion defines a dimension greater than the first portion and the feed path such that the stop portion is configured to be retained by the device while at least part of the first portion is disposed in the feed path.

15. A printing system configured to detect an identification of a cleaning media provided by an identification feature on the cleaning media, when the cleaning media is inserted into said cleaning system.

16. A printing system according to Claim 15 wherein the printing system is configured to distinguish the cleaning media from stock media for printing by the system.

17. A printing system according to Claim 15 wherein the system is configured to detect a physical attribute of the cleaning media for identification thereof.

18. A printing system according to Claim 15 wherein the system is configured to detect from the identification feature an identification of an attribute of the cleaning media.

19. A printing system according to Claim 15 wherein the system is configured to communicate information contained on the cleaning media using at least one of the group consisting of electromagnetic and magnetic energy.

20. A printing system according to Claim 15 wherein the system is configured to detect at least one of a bar code, printed indicia, and hologram.

21. A printing system according to Claim 15 wherein the system is configured to communicate with a radio frequency identification tag of the cleaning media.

22. A printing system according to Claim 15 wherein the system is configured to detect information stored magnetically on the cleaning media.

23. A printing system according to Claim 15 wherein the system is configured to accept and reject the cleaning media according to the identification feature.

24. A printing system according to Claim 15 wherein the system is configured to determine if the cleaning media has been used before according to the identification feature.

25. A printing system according to Claim 15 wherein the system is configured to store a value in a counter of the cleaning media indicative of at least one of the group consisting of a number of times that the media has been used and a remaining number of uses of the cleaning media.

26. A printing system according to Claim 15 wherein the system is configured to lock the cleaning media to prevent subsequent use of the cleaning media for a cleaning operation.

27. A printing system according to Claim 15 wherein the system is configured to use the information from the cleaning media to control the cleaning of the printing system by the cleaning media.

28. A printing system according to Claim 15 wherein the printing system includes at least one movable member that is configured to be moved against the cleaning media, the printing system being configured to immobilize the cleaning media in the printing system during a cleaning operation of the printing system by the cleaning media and move the movable member against the cleaning media to clean the movable member.

29. A printing system according to Claim 15 further comprising a counter for counting the number of prints made by said system since the system was last cleaned.

30. A printing system according to Claim 29, wherein said printing system provides an indication when the number of prints since the last cleaning is at least equal to a threshold.

31. A printing system according to Claim 29, wherein said printing system resets said counter when the printing system is cleaned.

32. A printing system according to Claim 18, wherein said printing system comprises a memory containing a data log comprising the number of times the printing system has been cleaned.

33. A printing system according to Claim 18, wherein said printing system comprises a memory containing a data log comprising the number prints made by the printing system between one or more cleanings.

34. A method of cleaning a printer along a stock feed path thereof, the method comprising:

detecting an identification feature associated with a cleaning media disposed in the feed path of the printer; and

cleaning the printer along the feed path with the cleaning media.

35. A method according to Claim 34 wherein said detecting step comprises detecting a physical attribute of the cleaning media.

36. A method according to Claim 34 further comprising distinguishing the cleaning media from stock media for printing according to the identification feature detected by the printer.

37. A method according to Claim 34 wherein said detecting step comprises transmitting optical energy toward the cleaning media and detecting the passage of the optical energy therethrough.

38. A method according to Claim 34 wherein said detecting step comprises detecting a nonuniform dimension of the cleaning media.

39. A method according to Claim 34 wherein said detecting step comprises detecting an optical characteristic of the cleaning media.

40. A method according to Claim 34 wherein said detecting step comprises communicating information contained on the cleaning media using at least one of the group consisting of electromagnetic and magnetic energy.

41. A method according to Claim 34 wherein said detecting step comprises detecting at least one of a bar code, printed indicia, and hologram.

42. A method according to Claim 34 wherein said detecting step comprises communicating with a radio frequency identification tag of the cleaning media.

43. A method according to Claim 34 wherein said detecting step comprises detecting information stored magnetically on the cleaning media.

44. A method according to Claim 34 further comprising rejecting the cleaning media according to the identification feature of the cleaning media.

45. A method according to Claim 34 further comprising storing a value in a counter of the cleaning media indicative of at least one of the group consisting of a number of times that the media has been used and a remaining number of uses of the cleaning media.

46. A method according to Claim 34 further comprising controlling the cleaning of the printer according to the information detected from the cleaning media.

47. A method according to Claim 34 wherein said cleaning step comprises immobilizing the cleaning media in the printer and moving at least one movable member of the printer against the cleaning media while the cleaning media is immobilized in the printer.

48. A method according to Claim 34 wherein said immobilizing step comprises advancing the cleaning media into the feed path of the printer until a stop portion of the cleaning media engages the printer to retain the cleaning media in a stationary position and wherein said wherein said moving step comprises rotating the movable member such that the movable member makes sliding contact with the cleaning media.

49. A method according to Claim 34 further comprising counting the number of prints made by said system since the system was last cleaned.

50. A method according to Claim 49 further comprising providing an indication when the number of prints since the last cleaning is at least equal to a threshold.

51. A method according to Claim 49 further comprising resetting the counter when the printing system is cleaned.

52. A method according to Claim 49 further comprising storing a data log in a memory where the data log comprises the number of times the printing system has been cleaned.

53. A method according to Claim 49 further comprising storing a data log in a memory where the data log comprises the number prints made by the printing system between one or more cleanings.

54. A printer configured to determine the number of prints performed since a cleaning operation has been performed to clean a feed path of the printer.

55. A printer according to Claim 54 wherein the printer is configured to detect an identification feature of a cleaning media that is disposed in the feed path of the printer for cleaning the printer.

56. A printer according to Claim 55 wherein the printer is configured to distinguish the cleaning media from stock media for printing according to the identification feature detected by the printer.

57. A printer according to Claim 54 wherein the printer comprises a detector configured to communicate with the identification feature using at least one of the group consisting of electromagnetic and magnetic energy.

58. A printer according to Claim 54 wherein the printer comprises a memory, the printer being configured to adjust a counter stored in the memory according to the number of times that the printer is used to perform a printer operation and the number of times that the cleaning media is used to clean the printer.

59. A printer according to Claim 54 wherein the printer comprises a display, the printer being configured to provide an indication via the display indicative of when the number of prints since the last cleaning is at least equal to a threshold.

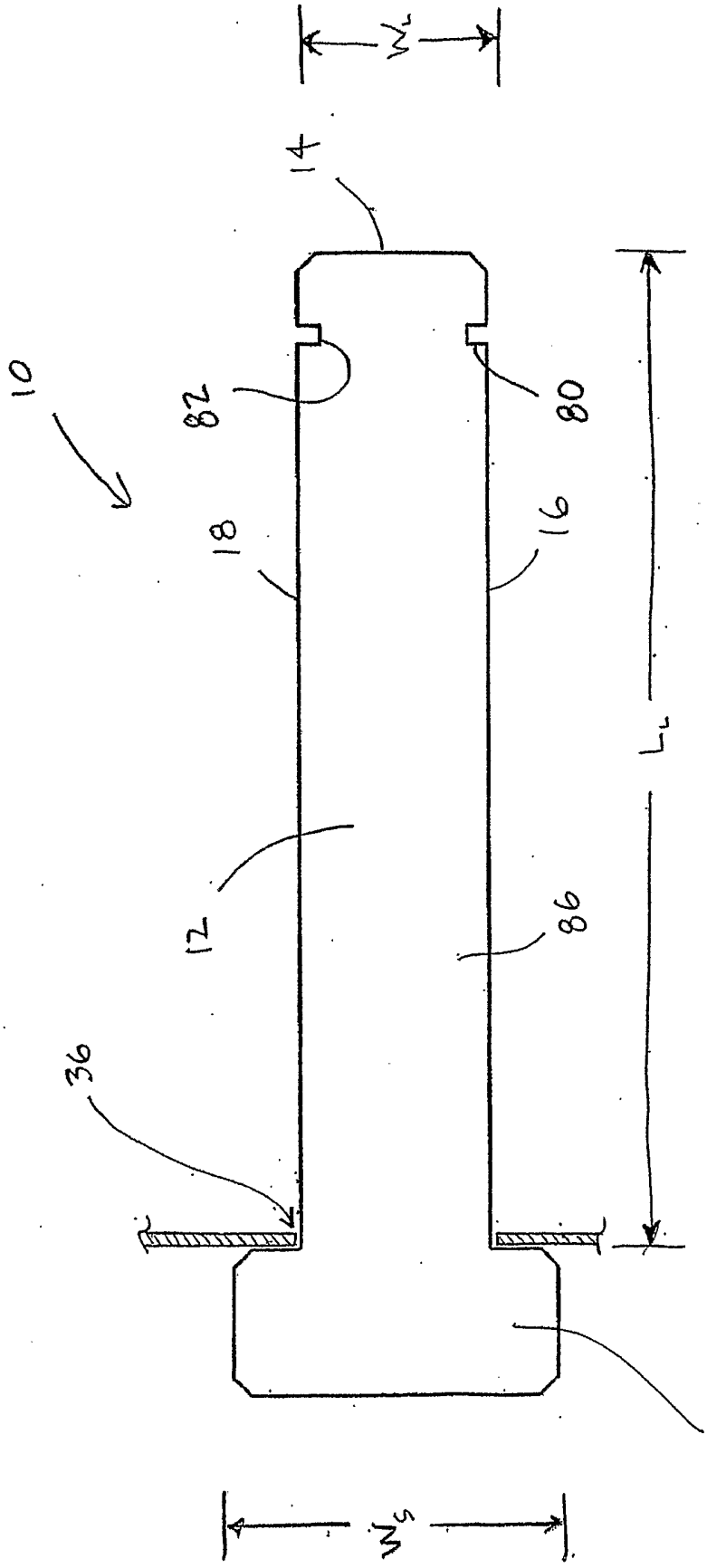

FIG. 1

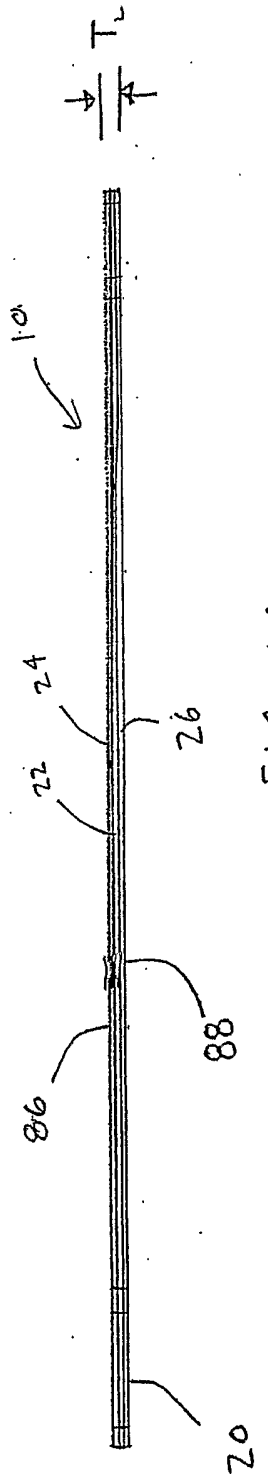

FIG. 1A

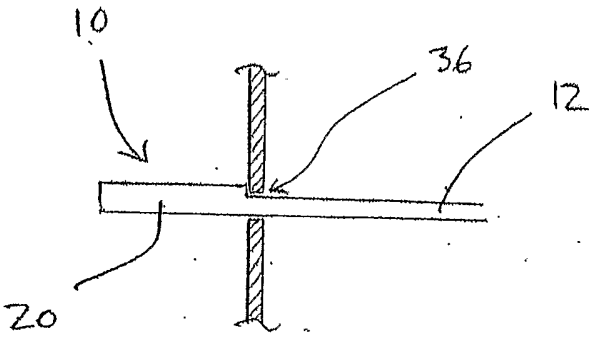

FIG. 1B

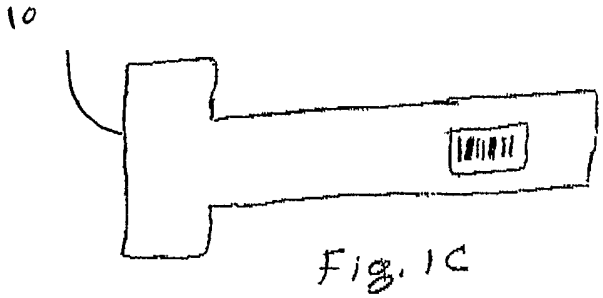

Fig. 1C

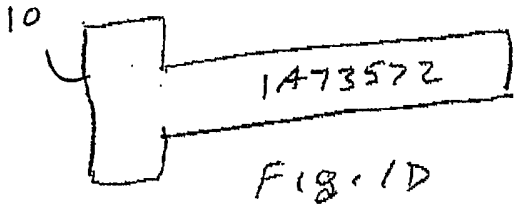

Fig. 1D

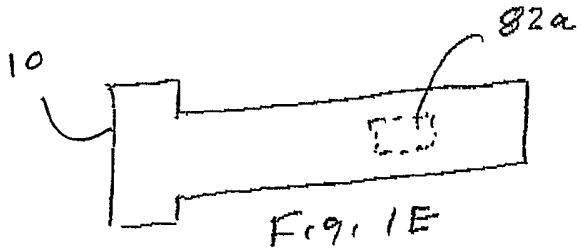

Fig. 1E

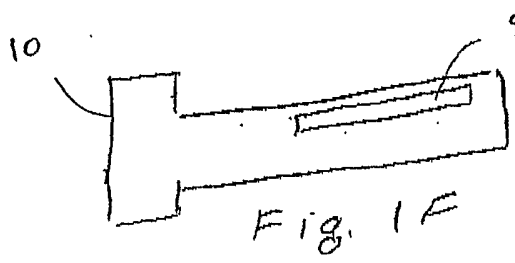

Fig. 1F

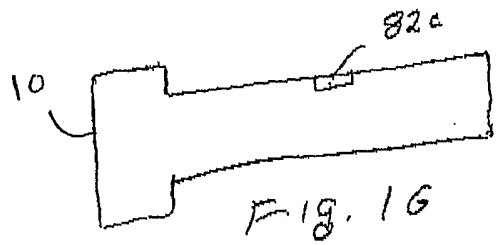

Fig. 1G

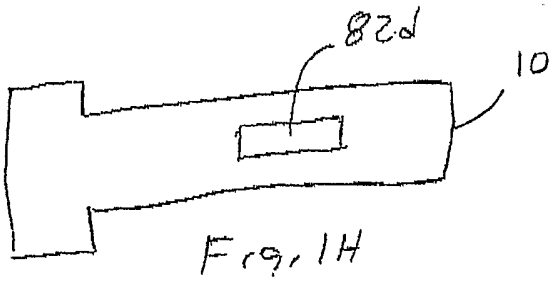

Fig. 1H

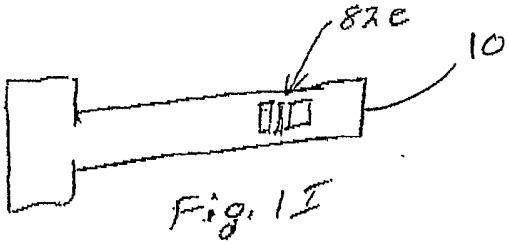

Fig. 1I

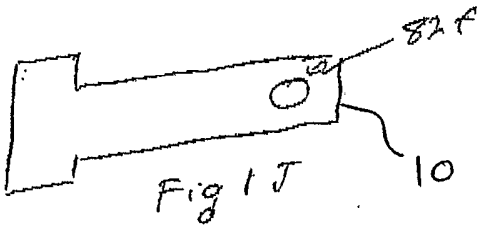

Fig 1J

Fig. 5

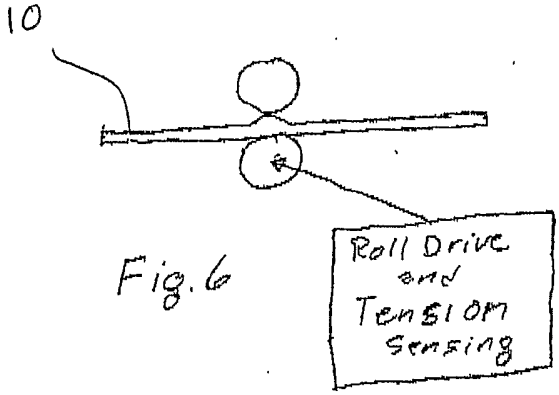

Fig. 6

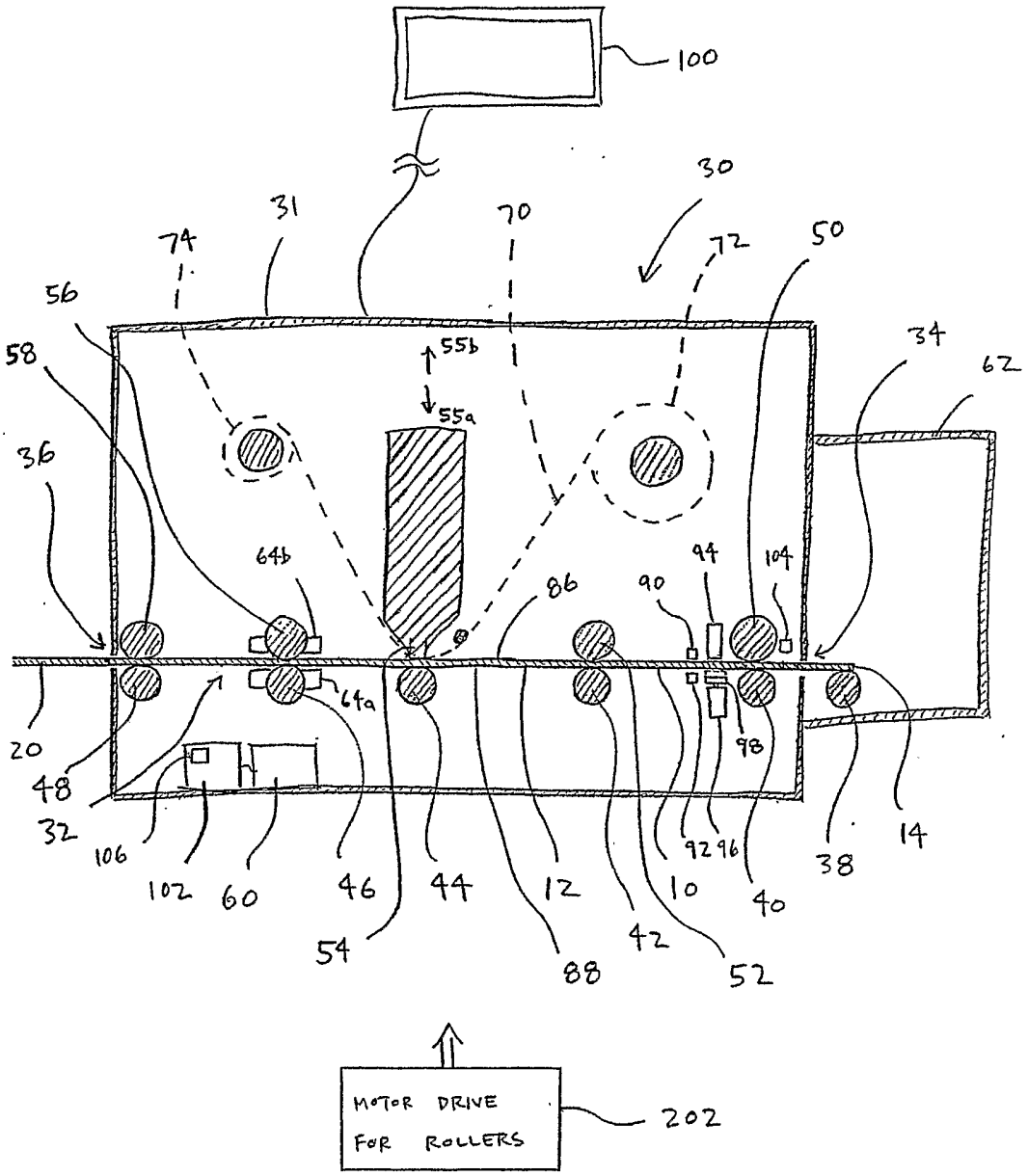
100
30
31
70
74
72
50
56
58
55b
55a
34
62
36
64b
86
90
94
104
20
48
64a
98
32
106
102
60
46
44
12
10
92
96
40
38
14
54
88
42
52
MOTOR DRIVE FOR ROLLERS
202

FIG. 2

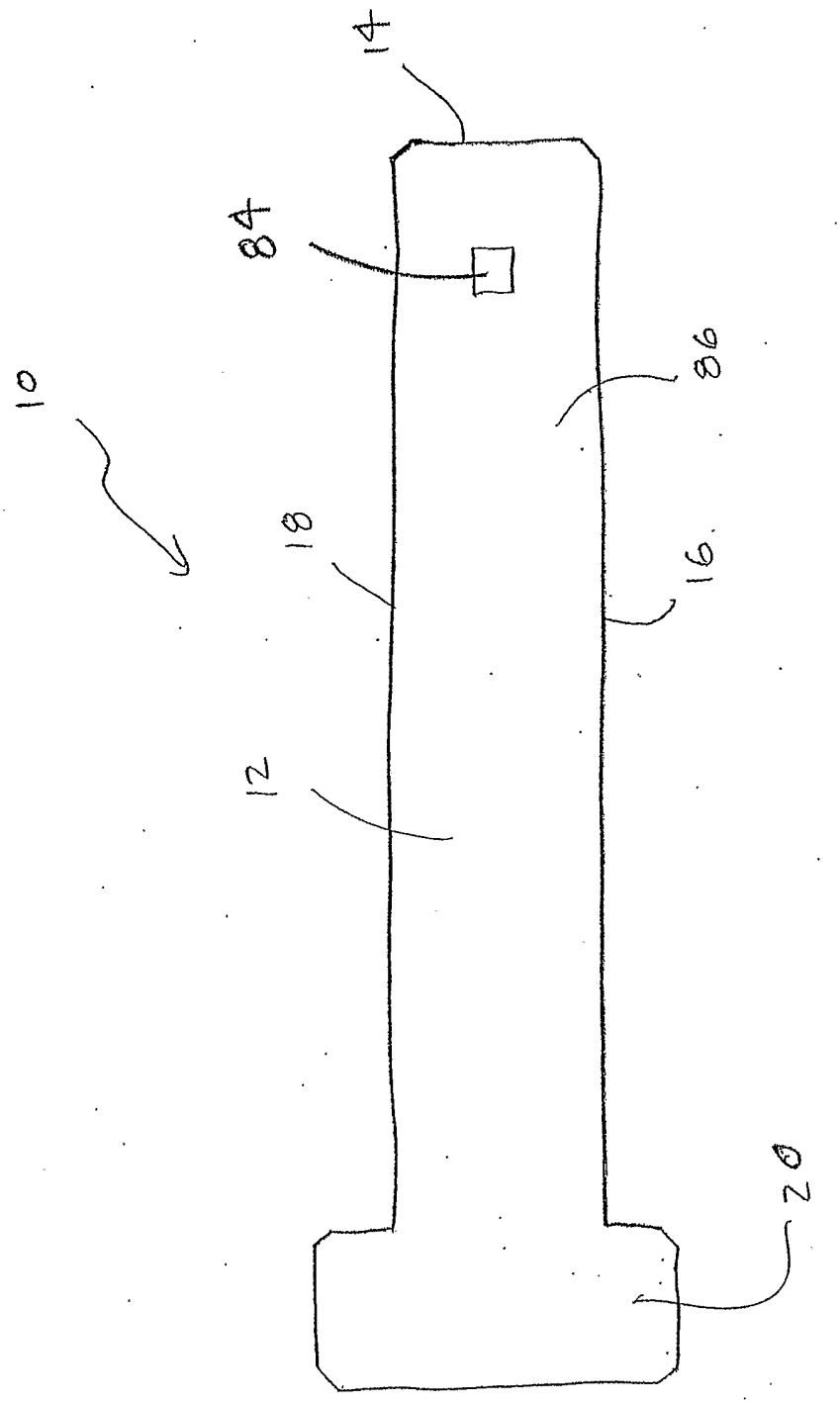

FIG 3

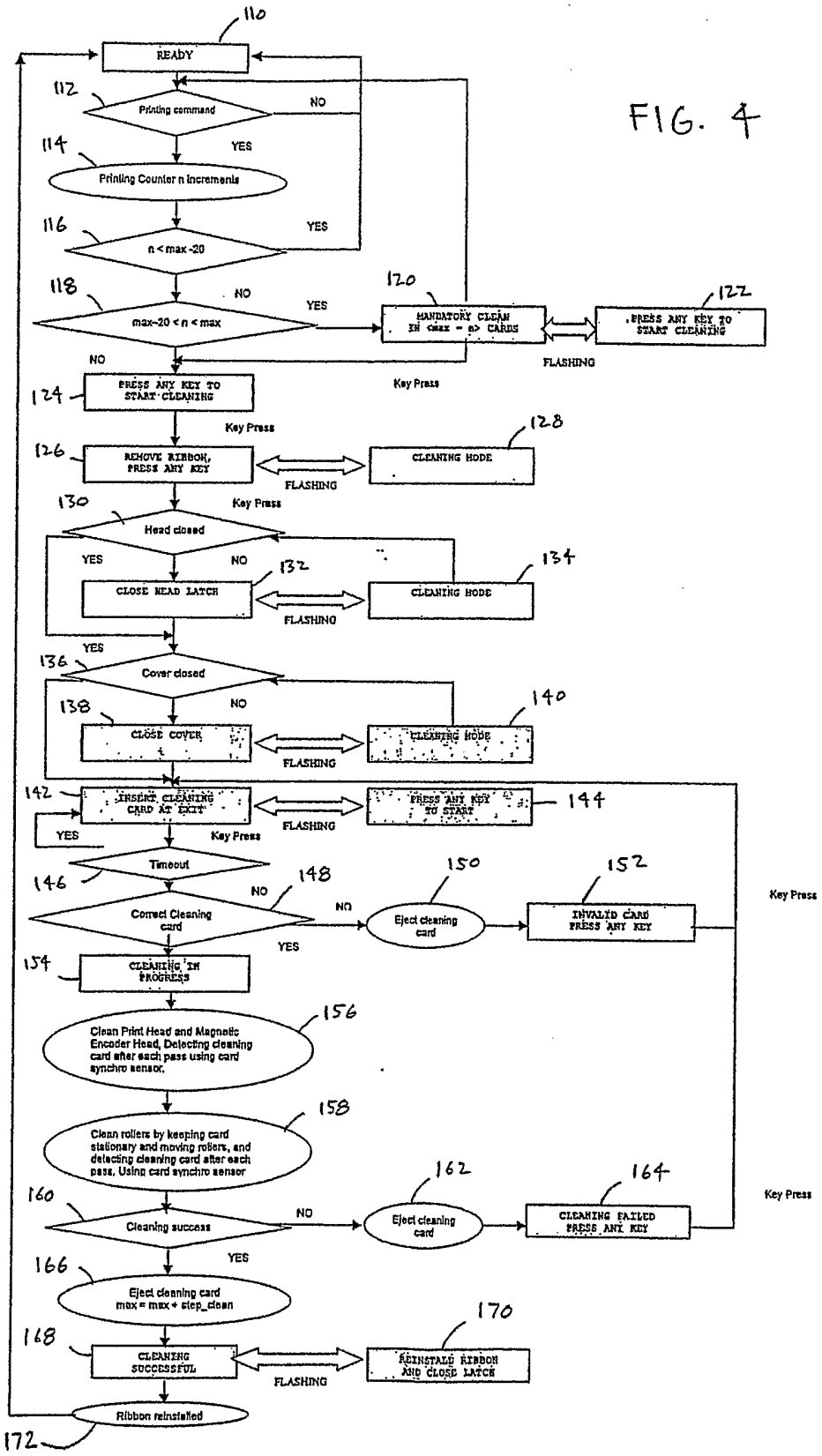
110
READY
112
Printing command
NO
YES
114
Printing Counter n incremenis
116
n < max -20
YES
118
max-20 < n < max
NO
YES
120
MANDATORY CLEAN
IN <max - n> CARDS
122
PRESS ANY KEY TO
START CLEANING
FLASHING
NO
Key Press
124
PRESS ANY KEY TO
START CLEANING
Key Press
126
REMOVE RIBBON,
PRESS ANY KEY
FLASHING
128
CLEANING MODE
130
Head closed
YES
NO
132
CLOSE HEAD LATCH
FLASHING
134
CLEANING MODE
YES
136
Cover closed
NO
138
CLOSE COVER
FLASHING
140
CLEANING MODE
142
INSERT CLEANING
CARD AT EXIT
FLASHING
144
PRESS ANY KEY
TO START
YES
Key Press
Timeout
146
148
NO
Correct Cleaning
card
NO
YES
150
Eject cleaning
card
152
INVALID CARD
PRESS ANY KEY
Key Press
154
CLEANING IN
PROGRESS
156
Clean Print Head and Magnetic
Encoder Head, Detecting cleaning
card after each pass using card
synchro sensor.
158
Clean rollers by keeping card
stationary and moving rollers, and
detecting cleaning card after each
pass, Using card synchro sensor
160
Cleaning success
NO
YES
162
Eject cleaning
card
164
CLEANING FAILED
PRESS ANY KEY
Key Press
166
Eject cleaning card
max = max + step_clean
168
CLEANING
SUCCESSFUL
FLASHING
170
REINSTALL RIBBON
AND CLOSE LATCH
Ribbon reinstalled
172

FIG. 4