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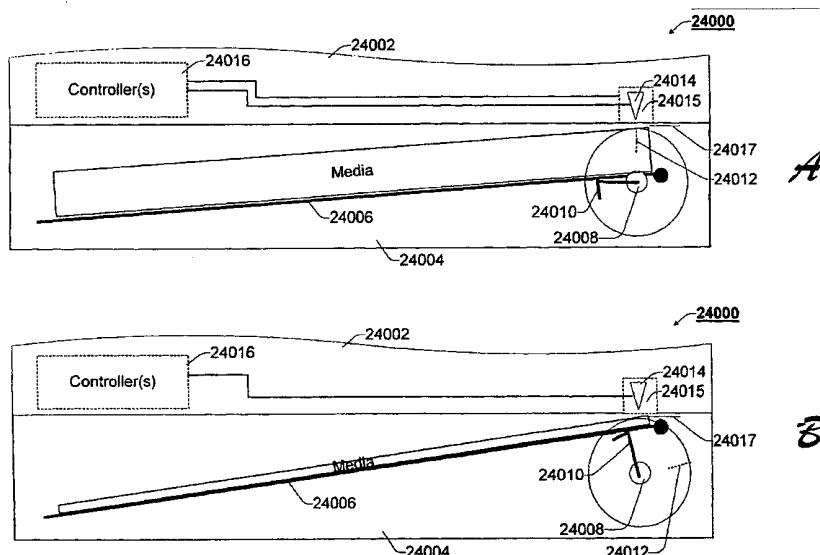
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(54) Title: **A SYSTEM AND RELATED METHODS FOR AUTOMATICALLY DETERMINING MEDIA TYPE IN A PRINTING DEVICE MEDIA TRAY**



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(57) **Abstract:** A system and related methods for automatically identifying media type in a printing device media tray is presented. The system comprises a controller (24016), and an optical sensor (24015), communicatively coupled to the controller, wherein the sensor, is positioned to locate and identify a code containing media type information from a next available piece of print media, and to generate a signal to the controller based, at least in part, on the identified code. Modifications to the printing device and subsidies to the user may occur as a result of the code.

**A SYSTEM AND RELATED METHODS FOR AUTOMATICALLY DETERMINING MEDIA TYPE  
IN A PRINTING DEVICE MEDIA TRAY**

**RELATED INVENTIONS**

5        The present invention is a continuation-in-part of U.S. Application No. 09/325,040 filed on June 7, 1999 entitled *Document Delivery System for Automatically Printing a Document on a Printing Device*, by Brewster, et al.

**TECHNICAL FIELD**

10      This invention generally relates to the printing field and, more particularly, to a system and related methods for automatically determining media type in a printing device media tray.

**BACKGROUND**

15      In the mid-1400's, Johann Gutenberg revolutionized how information is disseminated through his invention of the movable type press. With the publication of the Mazarin Bible, documents which were once held in the exclusive domain of a chosen few were now widely available to the masses. Nearly 550 years later, the mass media revolution that Gutenberg started is alive and well, complete with newspapers such as the  
20      New York Times and the Washington Post, magazines such as Newsweek and Sports Illustrated, and literally thousands upon thousands of other publications.

While these thousands of publications cover a wide range of interests, from news to sports to fashion to model rocketry, they have one thing in common: they are intended to be read by a mass market. Unlike the pre-Gutenberg days, where a document would  
25      literally be read by only one person of a very small number of people, it is not economically viable for today's publications to have such a small readership, due at least in part to high marketing, production and distribution costs. In fact, many of today's publications are funded to a very large extent by the advertising contained within them. These advertisers are attracted to publications that can consistently deliver a large,  
30      reliable audience of consumers that will be exposed to their advertising.

While this mass-market publication model has worked well for hundreds of years, it is not without its problems. One such problem is that a typical reader of a publication has a wide variety of interests, and no single mass market publication will be able to satisfy all of these interests. For example, a reader who is interested in international

news, golf, fly-fishing, Genealogy, and computers may have to subscribe to several different publications to satisfy these interests. Of course, since these publications are intended for the mass market, they will also contain a significant amount of material that our reader is not interested in and will not read. It goes without saying that if there is a significant amount of material a reader isn't reading, there is a significant amount of advertising that the reader isn't reading either – as well as a significant amount of paper that is wasted. Advertisers know this, and agree to pay considerably less to a mass market magazine or newspaper per 1000 exposures to their ad than they would pay to a direct-mail generator that can provide a more specific guarantee that the people exposed to their ad are of a demographic group that will be much more likely to read their ad and be interested in it.

In addition, it is neither cost-effective nor time effective for most readers to subscribe to and/or read a large number of publications. Generally, the typical reader will only subscribe to a few publications that are of the most interest to them. The reduced readership level of the publications our typical reader chooses not to subscribe to, even though she might be interested in at least some of the editorial and advertising content contained inside, means that the publication receives less subscription and advertising revenue than they otherwise would. If many other readers make the same decision, the continued health of the publication may be in jeopardy, and the publication may be forced out of business. In fact, many publications do go out of business yearly for failing to attract a sustaining number of advertisers and readers – even if there are a large number of readers that would be interested in reading their publication, and a corresponding number of advertisers anxious to have these readers exposed to their ads. Indeed, advertising rates are often determined by the size of a publication's readership, thus readership retention is vital to the survival of a publication. In general, publications that fail to attract a substantial mass market of people willing to pay for and/or read them cease publication. This is a shame, since many of these publications would enrich the diversity of information available to all readers, and would provide an avenue for lesser known writers and artists to practice their wares.

In more recent years, a new type of publication has emerged: the electronic publication. Readers of these publications typically access the Internet through their computer, and read the publications online. Some of these publications, such as CNN.com and pointcast.com, allow users to state personal preference on what type of

material they would like to read. Often, these personalized publications include advertising, usually in the form of a banner ad that is placed on along a periphery of the visual display (top, bottom, side, etc.).

While these electronic publications have been an interesting development in the 5 distribution of information, they still represent only a tiny fraction of the information that is published under the more traditional post-Gutenberg model. Many readers of these electronic publications complain that they are very difficult to read (on the video display), especially for long periods of time. While it might be convenient for a reader to sign onto the Internet to look at the CNN.com web site for a brief summary of late breaking news, 10 this reader would most likely only spend a few minutes at the site, and would likely still subscribe to the more traditional print media such as Newsweek or the Washington Post. They would also likely spend significantly more time reading the more traditional printed publication than they would spend reading the electronic publication, and 15 correspondingly, spend more time being exposed to the ads in the traditional printed publication. Accordingly, printed publications continue to flourish today – more than five centuries after Gutenberg made them possible – and after more than a decade after the innovation of the electronic publication.

While these printed publications have certainly benefited modern society, no 20 significant attempt has been made thus far to solve the underlying problems with these publications discussed above. Just such a solution is provided herein.

## SUMMARY

In accordance with the teachings of the present invention, an apparatus comprises 25 a controller and a sensor coupled to the controller. The sensor is positioned to locate and identify a code containing media type information from a next available piece of media in a printing device media receptacle. The sensor generates a signal to the controller based, at least in part, on the identified code.

## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a block diagram of a document delivery system of one embodiment 30 of the invention;

Figs. 2-4 illustrate flowcharts detailing the operation of the transmission module and the printing module of the document delivery system of one embodiment of the invention;

**Fig. 5** illustrates how user profile information is acquired from a user in one embodiment of the invention;

**Fig. 6** shows how user profile information is acquired from a user in one embodiment of the invention;

5 **Fig. 7** shows a print schedule for the delivery of documents in one embodiment of the invention;

**Fig. 8** shows how the print schedule of Fig. 7 can be modified by the user;

**Figs. 9A-9B** shows a document printed by the printing device according to one embodiment of the invention;

10 **Fig. 10** shows a document printed by the printing device according to one embodiment of the invention;

**Figs. 11A-11D** show a document printed by the printing device according to one embodiment of the invention;

15 **Fig. 12** shows a document printed by the printing device according to one embodiment of the invention;

**Fig. 13** illustrates a block diagram of an example edit module incorporating the teachings of the present invention;

**Fig. 14** illustrates a block diagram of an example knowledge module including user profile information and content provider information;

20 **Fig. 15** graphically illustrates a data structure for maintaining user profile information;

**Fig. 16** graphically illustrates a data structure for maintaining content provider information;

25 **Fig. 17** illustrates a flow chart of an example method generating a custom document, according to one aspect of the present invention;

**Fig. 18** illustrates a flow chart of an example method of operation for a client component of the document delivery system, according to one aspect of the present invention;

30 **Fig. 19** illustrates a flow chart of an example method for laying out a custom document of otherwise disparate content objects, according to one aspect of the present invention;

**Fig. 20** illustrates a flow chart of an example method for scheduling delivery of custom document(s), according to one aspect of the present invention;

**Fig. 21** illustrates a flow chart of an example method for tracking the distribution of content objects and accounting to content providers, in accordance with one aspect of the present invention;

5 **Figs. 22A and 22B** graphically illustrate cross-sectional side views of an innovative media feed system incorporating the teachings of the present invention;

**Fig. 23** graphically represents a personalized publication printed on media with media identification marks, according to one aspect of the present invention.

**Fig. 24** graphically illustrates a top-down cross-sectional view of the innovative media feed system of Fig. 22;

10 **Fig. 25** is a flow chart of an example method for accurately identifying the type and quantity of media available to the printing device of Fig. 22; and

**Fig. 26** illustrates a flow chart of an example method of generating print stock, according to one aspect of the present invention.

15 **DETAILED DESCRIPTION**

**Fig. 1** illustrates a block diagram of an innovative document delivery system, according to one embodiment of the invention. Document delivery system 10 contains document server 100. In a preferred embodiment, document server 100 is operatively coupled via network 200 to a variety of personal computers, printing devices, and other electronic devices, collectively referred to devices 300. As will be described more fully below, document server 100 contains an innovative edit module 120, transmission module 150 and knowledge module 170 to dynamically generate personalized publications from otherwise disparate content objects for requesting users/subscribers. According to another aspect of the invention, one or more of the printing devices includes an innovative media feed system which enables the printing device to determine the type and media available in a printing device, thereby enabling the innovative edit module 120 to further optimize publication scheduling, the media used for particular parts of the publication, etc.

25 Edit module 120 receives content object input from one or more content providers 50, and/or one or more advertising providers 80 to generate personalized documents based, at least in part, on a number of key criteria including, for example, user interests, seasonality, content provider and advertising provider distribution criteria, and the like. As used herein, content providers 50 are intended to include all providers of publication

content non-inclusive of advertising, while advertising providers 80 provide advertising material. From a financial business model, these two sources of publication material differ significantly (content providers are paid a royalty from the operator of the document server, while advertisers pay to advertise in the generated publications), from 5 the standpoint of the end-user they both provide content to the publication. Consequently, when used without a reference numeral the general term "content providers" is intended to include both content providers 50 and advertising providers 80. If a distinction is intended, the appropriate reference numeral will be specifically denoted.

10 Distribution module 400 is operatively coupled to document server 100 and, as will be discussed, optionally distributes product and/or product subsidies to users based, at least in part, on the source and quantity of content provided to the users.

15 In a preferred embodiment, document server 100 is a minicomputer/server, such as an HP 9000 server sold by the Hewlett-Packard Company, although those skilled in the art will appreciate that document server 100 could be any type of other computing or electronic device(s) that performs the functions described herein and still fall within the spirit and scope of the invention. Network 200 is preferably the Internet, although an Intranet, local area network, or other type of public or private network, either wired (e.g., telephone, cable TV, etc.) or wireless (e.g., satellite, radio, cell phone, etc.), could also or additionally be used.

20 Devices 300 are shown in Fig. 1 as being capable of being configured in a wide variety of ways. For example, personal computer 310 is shown connected to printing device 320, which prints document 10320 for user 20320. Personal computer 310 is operatively coupled to network 200. In contrast, printing device 330, which prints document 10330 for user 20330, is operatively coupled to network 200 without an 25 intervening personal computer or other electronic device. Printing device 350, which prints document 10350 for user 20350, is shown connected to electronic device 340, which could be a set top box, television set, palmtop personal digital assistant (PDA) or other type of electronic device that is operatively coupled to network 200. Finally, 30 printing device 370, which prints document 10370 for user 20370, is connected to electronic device 360, which is operatively connected to network 200.

The printing devices shown in Fig. 1 could be printers, such as the HP DeskJet 890 printer, HP LaserJet V printer, or other models of printers manufactured by HP or others; so-called "mopiers" or other multi-function printing devices that can print, fax,

scan, and/or copy, or any other device capable of transferring information to a printable media such as plain paper, specialty paper, transparencies, or other media capable of tangibly receiving such information and which can be easily carried about by the user.

According to one aspect of the invention, to be described more fully below (Figs. 22-25),

5 one or more of the printing devices of Fig. 1 include an innovative media feed system. This innovative media feed system automatically identifies the media available to the printing device, and determines an accurate count for each type of available media. This information is provided to edit module 120 from the printing device through, for example, an associated printing module 380 and network 200.

10 Transmission module 150 is preferably located with document server 100. As Fig. 1 shows, printing module 380 could be located in any of the devices 300, such as in personal computer 310, printing device 330, or electronic device 340, operatively coupled via network 200 to document server 100, or it could be located within document server 100 itself, such as in knowledge module 170. According to one embodiment of the

15 invention, transmission module 150 and printing module 380 represent software functions that execute on suitably programmed microprocessor(s) within a device 300 and/or document server 100. It will be appreciated, however, that special purpose hardware or other mechanisms could be employed to implement the innovative features and functions described below.

20 Fig. 13 illustrates a block diagram of edit module 120 incorporating the teachings of the present invention. As shown, edit module 120 comprises one or more controller(s) 502, an innovative publishing agent 504, an innovative virtual editor 506, memory space 508 and one or more input/output (I/O) interface(s) 510, each coupled as depicted.

According to one implementation of the invention, edit module 120 may well contain one  
25 or more application(s) 512 executable by controller(s) 502. It will be appreciated that although depicted as separate and distinct functional entities, one or more functional blocks 502-510 may well be combined into common functional entities. Moreover, although depicted in accordance with a hardware paradigm, those skilled in the art will appreciate that edit module 120 and its constituent elements 502-510 may well be

30 embodied as a series of executable instructions which, when executed by a host processor, implement the features and functions of edit module 120 to be discussed below. In this regard, Fig. 13 is merely illustrative of the scope and spirit of the claimed invention.

As shown, controller(s) 502 selectively invoke one or more of the virtual editor 506 to generate a custom document for a requesting and/or subscribing user, or publishing agent 504 to complete the layout and optimize the delivery schedule of such custom documents. Controller(s) 502 may initiate construction and/or delivery of a custom document in response to user interaction with a user interface (e.g., a web page), or to accommodate a user-selected delivery schedule. In this regard, controller 502 communicates with external applications (e.g., web page) or other elements (e.g., a user profile) via input/output (I/O) interface(s) 510. In an alternate embodiment, controller 502 provides a user with a user interface with which to request/build a custom document using one or more of applications 512. But for implementation of the teachings of the present invention, controller(s) 502 are intended to represent any of a broad range of control devices known in the art including, but not limited to, a programmable logic array (PLA), microprocessor, special purpose controller, application specific integrated circuit (ASIC), and the like. In an alternate embodiment, controller(s) 502 are embodied as a series of executable instructions which, when executed, implement the control logic described herein.

Memory device 508 and I/O interface(s) 510 are each intended to represent such devices commonly known in the art. I/O interface(s) 510, in particular, are intended to include one or more of any of a number of communication interfaces known in the art including, but not limited to, a direct connect communication interface (e.g., a serial interface, a parallel interface, a Universal Serial Bus (USB), an Advanced Graphic Port (AGP), etc.), a local area network interface (e.g., an Ethernet interface, a Token Ring interface, etc.), or a wide area network interface. In this regard, edit module 120 may communicate with any of a number of external and remote devices using an appropriate one of a plurality of wired and/or wireless I/O interfaces 510.

According to one aspect of the present invention, virtual editor 506 personalizes publications for a unique, composite publication based on a number of factors. As shown, virtual editor 506 includes a content manager 518 and a construction agent 520. The content manager 518 includes an analysis(wrapper agent 522, a contract administrator function 524 and a transaction agent 526. As editor module 120 receives content from one or more content providers, content manager 518 is selectively invoked by controller(s) 502. The analysis(wrapper agent 522 analyzes the received content and categorizes it based on any one or more of a number of attributes including, source,

subject matter, length, cost, etc. In addition, analysis/wrapper agent 522 encapsulates the content object in a wrapper with a unique identifier. It will be appreciated, based on the description to follow, that the encapsulating wrapper enables virtual sensors (not shown) in the document distribution system to accurately track distribution, receipt and 5 disposition of content objects. According to one embodiment, virtual sensors are embedded within printing modules 380 to track distribution, receipt and disposition of encapsulated content objects.

According to one implementation, the contract administrator 524 is a database driven component that manages all of the contractual obligations of the users 10 (subscribers, content providers, etc.) of the document delivery system. According to one implementation, contract administrator 524 maintains royalty calculation and display agreements for select content providers (e.g., artists), the advertising rates for other content providers (e.g., advertisers), subscription information for select users, and the like. Periodically, contract administrator 524 accesses one or more content provider 15 databases to identify content object distribution, to compute royalty payments, advertising bills and subscription bills for distribution to appropriate users via the transaction agent 526. In this regard, contract administrator 524 ensures that contractual obligations of the document delivery system are adhered to.

Transaction agent 526 is the primary interface between the document delivery 20 system and a public/private e-commerce financial system (e.g., the CheckFree™ financial network offered by CheckFree Corporation). As introduced above, the transaction agent 526 is responsible for executing payments and account credit/debit transactions with user accounts based, at least in part, on the distribution of content objects in accordance with the terms and conditions maintained in contract administrator 524. It should be noted that 25 although depicted as an element of edit module 120, those skilled in the art will appreciate that content manager 518 may well be deployed as an separate and independent functional entity without deviating from the spirit and scope of the present invention.

The construction agent 520 of virtual editor 506 extracts content objects to 30 generate a custom document according to one or more key contributors. As used herein, the key contributors include one or more of a requesting/subscribing user's interests, demographics, seasonality, document server requirements, and content provider usage criteria, and the like. As will be described in greater detail below, construction agent 520

extracts content objects which are likely to be of interest to a particular user and generates a personalized publication for that user. The construction agent 520 utilizes information received via overt and covert processes of document delivery system 10 to log a user's interaction and disposition of received material, as well as soliciting feedback from the 5 user, to improve the user's satisfaction with subsequent personalized publications.

Information gathered as a result of these overt/covert processes are used by construction agent 520 to update a user profile associated with the user, which is accessed when generating a personalized publication. In this regard, construction agent 520 performs functions commonly associated with a physical editor of, say, a magazine: publication 10 content decisions, layout and format decisions, advertising and the like, yet it factors in other key information such as personal preferences to generate personalized publications for up to millions of individuals. Once construction agent 520 has extracted content objects to generate the publication, it is passed to publishing agent 504, to finalize layout and schedule delivery of the personalized publication to the intended recipient(s).

15        In accordance with the illustrated example embodiment, publishing agent 504 is presented comprising schedule manager 514 and layout manager 516. As will be described in greater detail below, layout manager 516 receives the content objects from construction manager 506 and finalizes at least a partial layout of the personalized publication. According to one aspect of the invention, layout manager 516 maintains a 20 record of the time required to complete at least a partial layout of the publication in order to determine the complexity of the personalized publication. This indicator of complexity is subsequently used by publishing agent 504 in estimating the time required to layout future publications containing one or more of the same content objects, and to aid schedule manager 514 in estimating the time required to complete publication.

25        Once layout manager 516 has completed at least a partial layout of the publication, schedule manager 514 completes the publication layout (e.g., with last minute content objects, or updates to such objects), and schedules delivery of the personalized publication. According to one embodiment, to be described more fully below, schedule manager 514 utilizes information from a number of available sources to 30 schedule delivery of the publication. More particularly, schedule manager 514 utilizes information from the user's personal profile, a complexity measure from layout manager 516, and an indication from printing devices associated with the user confirming that an adequate amount and type of media is available for printing the publication. Based, at

least in part, on such information, schedule manager 514 works to establish an optimum publication schedule for one or more personalized publications.

Fig. 14 illustrates an example knowledge module 170, according to one embodiment of the present invention. As shown, knowledge module 170 comprises user profile information 602, content provider information 620, contract administration information 630, and optionally printing module 380 and printing schedule 390. As will be described more fully below, user profile information database 602 is utilized to collect information and develop a profile for users of system 10. Content provider information database 620 is employed to track content provider usage and disposition. Contract administration information database 630 is utilized to maintain information regarding licensing terms, rates, etc. By maintaining user profile information, content provider information and contract administration information, document server 100 is able to provide individualized service to user's and content providers alike. By dynamically acquiring and maintaining accurate information on the distribution, receipt and user disposition of publications at the content object level, document delivery server 100 is able to provide a personalized publication to the user accurately targeting the user's interests, while at the same time providing an accurate accounting to content providers for royalty and/or licensing fee purposes. In this regard, document delivery system 10 represents a revolutionary advance in the publishing industry, i.e., the ability to provide individually targeted publications on a scale heretofore available only to mass-media enterprises.

Fig. 15 graphically illustrates an example user profile data structure 602, suitable for use by the innovative document delivery system. According to the illustrated example implementation, user profile information data structure 602 includes a user\_name field 604, a user\_id field 606, a contact information field 608, an interest information field 610, a subscription information field 612, a disposition information field 614, and a feedback information field 616. As introduced above, some of the information maintained in user profile data structure 602 is overtly obtained, e.g., by asking the user for such information during a registration period. Other information such as, for example, disposition information, is covertly obtained by monitoring the disposition of trace wrappers by the user, e.g., how much time did the user spend with certain information, did the user forward certain information to others, etc. In this way, the user profile data structure 602

is a continuously evolving, continuously improving, set of information reflecting the current interests of the users of the document delivery system.

Fig. 16 illustrates an example data structure comprising content provider information, according to one embodiment of the present invention. In accordance with 5 the illustrated example embodiment, content provider information data structure 620 includes a content provider name field 622, a content provider ID field 624, a wrapper ID field 626 for each of the content objects provided by the content provider, a rate schedule field 628, a monthly usage field 630 and feedback information field 630. As alluded to above, data structures of greater or less complexity may well be utilized to maintain user 10 profile information and/or content provider information without deviating from the spirit and scope of the present invention.

Turning to Figs. 2-4, flowcharts detailing the operation of transmission module 150 and a first mode of operation of printing module 380 are presented, according to one embodiment of the invention. In Figs. 2-4, the flow diagram shown in the left column is 15 executed by transmission module 150 of document server 100, and the flow diagram in the right column is executed by printing module 380.

Referring now to Fig. 2, the flow diagram for transmission module 150 starts in block 1000, and the flow diagram for printing module 380 starts in block 2000. Since there is a great deal of interaction between these two flow diagrams, as represented by 20 dashed lines connecting the two columns, the operation of the two flow diagrams will be described simultaneously.

In block 2100, user profile data is sent to document server 100 to be stored in the user profile. This user profile data can take on many different forms, from simple to very detailed. Fig. 5 shows a very simply acquisition of user profile data, such as that used in 25 HP's Instant Delivery Program, the first version of which was generally available to the public less than one year from the filing date of this patent application. In this program, only three pieces of information are stored in the user profile: type of printer, email address, and whether HP can contact the user. Fig. 6 shows a more complicated user profile than that currently used in HP's Instant Delivery Program, which includes the 30 user's name, email address, company name, city, state, country, zip or postal code, phone number, printer information, and areas of interest. Those skilled in the art will appreciate that more or less user profile data from those shown in Figs. 5 and 6 could be sent to transmission module 150 in block 2100 and still fall within the spirit and scope of the

invention, and that at least some of this information could come from a source other than a user. For example, the user profile data could also include household income, age, and sex of the user, among other things. In any event, block 1100 receives the user profile data sent by block 2100. Block 1200 stores the user profile data, preferably in knowledge module 170. Alternately, the user profile data could be stored in device 300 or in some other local or remote location.

Block 2200 checks to see whether a document should be received from document server 100. This is done by checking print schedule 390 which is preferably stored on a device 300 or document server 100, but may be stored in some other local or remote location. Printing schedule 930 preferably contains information that can be used to determine when documents should be printed by the printing device, such as upon document creation, user requested time, lapse of specified time period, and/or occurrence of one or more external events (e.g., a stock price or index reaching a specified value, a final score of a sporting event, etc.). Printing schedule 390 may be associated with an individual user, a device or a group of users and/or devices. In addition, each entry of printing schedule 390 could result in the printing of one or more documents.

Fig. 7 shows one example of printing schedule 390, of the type that might be used in an enhanced version of HP's Instant Delivery program. In this example, the title of delivery, delivery schedule, next delivery date and time, and the last deliver status are shown. Preferably, the user can select what time a document should be printed, whether it should be printed on a specific day of the week or month, weekdays, or weekends, and whether the printing schedule should expire after a specific period of time or continue indefinitely.

Referring again to Fig. 2, printing module 380 monitors printing schedule 390 to see if a document should be requested from document server 100 or from another source. When block 2200 determines that a document should be requested from document server 100 or from another source, block 2200 is answered affirmatively, and block 2300 automatically requests the document without user intervention from server 100 or from another source, as will be described in greater detail below. Note that if printing module 380 is located on device 300, block 2200 operates in a "pull" mode – where the document is "pulled" from document server 100 or another source to device 300. However, if printing module 380 is located remotely from device 300, such as in document server 100, block 2200 operates in a "push" mode – where the document is "pushed" from

document server 100 or another source to device 300. If block 2300 determines that the document is located on document server 100 or at another source accessible via network 200, and if device 300 is currently in a disconnected state where it is not operatively coupled to the network 200, block 2300 will sign on to or otherwise enter a connected state with network 200, so that device 300 is operatively coupled to network 200.

Meanwhile, block 1300 checks to see if a document has been requested from printing module 380 in block 2300. Once it determines that such a document has been requested, block 1400 generates the document for printing module 380. Block 1500 then sends the document to printing module 380. Block 2400 checks to see whether a document has been received from document server 100 via block 1500. Once such a document has been received, block 2500 automatically prints the document, without user intervention, on a printing device. The term "without user intervention" means that a user is not directly involved in the printing operation; the document is sent automatically to a device 300 to be printed out by a printing device. According to this mode of operation, the user does not press "any" print buttons or otherwise be directly involved in the printing process; in fact, the user may not even be present in the same room, city, state, or country as device 300 during the printing operation. The printing operation automatically occurs in an unattended state – regardless of whether the user is present or not. In addition, if print schedule 390 is stored in a device-independent manner, such as on document server 100, a travelling user could "log in" to document server 100 and have his or her customized document sent to a device 300 that is convenient to the user's current location.

Referring now to Fig. 3, block 2600 checks to see whether the document printed successfully. If not, block 2800 performs error handling, such as attempting to print the document again, notifying the user that the printing device is out of paper or has some other error condition, or simply deciding not to print the document. When the document prints successfully, block 2900 informs document server 100 that the document printed successfully. Block 1600 waits for an indication from printing module 380 that the document did print successfully. When such an indication is received, block 1700 updates the user profile with this information.

It will be appreciated that not all of the blocks in Figs. 2-4 need be implemented, or implemented according to the order denoted, to fall within the spirit and scope of the present invention. More specifically, according to one implementation, flow of control

moves from block 2600 to block 4100 of Fig. 4, as will be discussed later, and from block 1500 back to block 1300 of Fig. 2.

An alternate embodiment has been contemplated where other information is transmitted back to document server 100 in block 2900 to update the user profile 5 preferably stored in knowledge module 170. This other information could be ink usage (total usage or usage broken out by ink color), printable media usage (number of pages printed, type of media used, etc.), or other types of information. In addition, another alternate embodiment has been contemplated where some or all of the information contained in the user profile stored in knowledge module 170 came from a source other 10 than the user via printing module 380. For example, publicly or privately available information about the user, and/or the devices 300 he/she/they use, could be acquired from a wide variety of different sources and inserted into the user profile preferably stored in knowledge module 170.

Block 1800 examines the user profile preferably stored in knowledge module 170 15 to determine whether a product subsidy should be provided to the user. For example, if the information in the user profile indicates that this user has printed off his 1000<sup>th</sup> document, such as a “preferred” document that contains advertising from advertising providers 80 or is otherwise under the control of edit module 120, providing a product subsidy to the user may be warranted. For purposes of this invention, a “product subsidy” 20 could be a print consumable or other product. A “print consumable” is an inkjet cartridge for an inkjet printer, ink for such an inkjet cartridge, a toner cartridge for a laser printer, toner for such a toner cartridge, or any other product or substance that is depleted when a document gets printed, including printer ribbons, etc. Note that the “ink” referred to above would typically be of a permanent variety, but erasable ink, such as that sold by the 25 Eink Company, could also be used.

Note that the product subsidy referred to herein is preferably funded at least in part by advertising revenue received from advertising providers 80 (Fig. 1), but an embodiment has been contemplated where the product subsidy is funded at least in part from the distribution revenue received from content providers 50 (Fig. 1). In either case, 30 information (such as statistical information) about what was printed by whom is preferably provided to content providers 50 and/or advertising providers 80 – preferably as a document that is automatically sent to one or more printing devices according to the teachings of this invention.

Other forms of products that are contemplated to be subsidized by this invention include printable media, such as plain paper, specialty paper, transparencies, and the like, and may also include devices 300 such as printing devices, electronic devices, and personal computers. In fact, alternate embodiments have been contemplated where other 5 products, such as a subscription price to a document, or even a product not directly related to the document delivery system shown herein, such as soap or dog food, are subsidized. If block 1800 determines that such a subsidy is warranted, block 1900 requests that distribution module 400 provides such a subsidy to the user. In one embodiment, distribution module 400 simply mails a product such as a print consumable 10 or other product such as the type described above to a user at the address specified in the user profile. In another embodiment, distribution module 400 mails or electronically generates a coupon that the user can use to receive a free or discounted product of the type described above. Regardless of whether block 1800 is answered affirmatively or negatively, flow of control then returns back to block 1300 (Fig. 2) to see if another 15 document has been requested from the printing module 380.

Referring again to Fig. 3, after block 2900 informs document server 100 that the document printed successfully, flow of control moves to block 4100 (Fig. 4), which checks with document server 100 to see what the current version of printing module 380 is. Block 3100 checks to see whether such a request has been received, and when it is, 20 block 3200 sends information concerning the current version of the printing module to printing module 380. Block 4200 compares this information from document server 100 with its own version and determines whether an updated version of printing module is available. For example, if printing module 380 is running version 4.0, and document server 100 indicates that version 4.1 is the current version of printing module 380, block 25 4200 would determine that an updated version of printing module 380 is available, and flow control would move to block 4300. Block 4300 checks to see whether this updated version of printing module 380 should be requested to be downloaded. While a user would typically be asked whether such a download should be requested or not, and would typically perform this download at a convenient time, such a step could also be performed 30 automatically without user intervention. If such a download is requested, block 4400 is answered affirmatively, and block 3500 downloads the updated printing module, which is then installed in block 4500. Regardless of how blocks 4200 and 4300 are answered, flow of control moves to block 4600, which checks to see if a disconnected state should

be entered. If block 2300 (Fig. 2) determined that device 300 was in a disconnected state when the document was requested, as discussed above (i.e., not operatively coupled to network 200), block 4600 is answered affirmatively, and block 4700 reenters the disconnected state. In any event, flow of control returns to block 2200 of Fig. 2.

5 Referring again to print schedule 390 shown in Fig. 7, it can be seen that many different types of documents can be requested to be printed. For example, the title of document 11000 specifies a network address, such as an Internet uniform resource locator (URL) that contains the network location of a document to be printed. Note that this URL may be partially or completely hidden from the user, as is the case with the URL for 10 document 15000. In this scenario, edit module 120 of document server 100 merely goes out to the Internet at the URL indicated (which would be shown in Fig. 1 as one of the content providers 50), and captures the indicated document, which is then transmitted to a printing device via transmission module 150 and printing module 380, as has been discussed. Alternatively, device 300 could go directly out to the URL itself without 15 assistance from document server 100; in this case, block 2300 (Fig. 2) requests document 11000 from another source – directly from the content provider 50 (at the indicated URL) via network 200.

In contrast, document 12000 is not a document that originates with a content provider 50 via the Internet, but instead is stored directly on device 300, such as a printing 20 device, personal computer, or other electronic device. An example of such a document could be a daily calendar from a program such as Microsoft Outlook, which the user has requested be printed automatically to his printer, without any user intervention, at 7:00 a.m. every weekday morning. In such an embodiment, printing module 380 does not 25 need to request the document from document server 100, since it can access the documents without going through network 200. In this embodiment, block 2300 of Fig. 2 requests the document from another source – device 300. While block 2900 would still 30 preferably indicate that the document was printed, and while block 1700 would still preferably update the user profile in knowledge module 170, printing such a document would preferably not generate any type of credit towards a product subsidy, since such a document would not be considered a “preferred” document, e.g., not a document under the control of edit module 120.

Referring again to Fig. 7, a print schedule of document 13000 is shown. Document 13000 is referred to as a “personalized document”. A “personalized

“document” is a document that is assembled by edit module 120 of document server 100 from a variety of content providers 50 and advertising providers 80, based on information contained in the user profile stored in knowledge module 170. For example, document 13000 is a “personalized document”. Our user has requested that document 13000 – his 5 personalized newspaper – be printed at 6:00 a.m. every day. Edit module 120 examines the user’s interests as specified in the user profile stored in knowledge module 170 to assemble the document from selected content providers 50 in which the user has indicated an interest. Edit module 120 also inserts advertising from selected advertising providers 80 – again based on the user profile stored in knowledge module 170.

10 Fig. 8 shows how the print schedule 390 of Fig. 7 can be edited by the user. The user can use the publisher’s recommended schedule, use a default schedule the user has set, or use a custom schedule for delivery. If a custom schedule is selected, the user can select a daily, weekly, or monthly delivery, or select a delivery once every specified number of days, or specify every weekday. In addition, the time of day can also be 15 specified: once at a designated time, multiple times during the day, or multiple times separated by a specified period of time. While not shown here, the user could also edit print schedule 390 to request that a document be sent upon creation, or upon the occurrence of an external event.

20 Figs. 9A-9B show document 11000 printed by the printing device according to one embodiment of the invention. Note that this document came from one content provider 50 via network 200 (either through document server 100 or directly), and contains no advertising. While document 11000 is preferably formatted by content provider 50 such that the information contained in the document is optimized to be printed, such formatting is not necessary.

25 Fig. 10 shows document 12000 printed by the printing device according to one embodiment of the invention. Note that this document is a user’s daily calendar which came directly from device 300 and not from document server 100 via network 200.

30 Figs. 11A-D show document 1300 printed by the printing device according to one embodiment of the invention. Note that this document is a user’s personalized newspaper which contains information in which the user has indicated a specific interest in, as stored in the user profile in knowledge module 170. Note also that this document contains advertising that edit module 120 determined the user would also be interested in, again based on the information contained in the user profile stored in knowledge module 170.

As has already been discussed, when the user prints a sufficient number of such “preferred” documents, the user may receive a product subsidy of a print consumable or other product(s).

Fig. 12 shows document 14000 printed by the printing device according to one embodiment of the present invention. Note that document 14000 is the HP Instant Delivery Times – a document located on document server 100. While this document does not contain advertising per se, it is still considered to be a “preferred document”, since it is under the control of edit module 120. Document 14000 informs users of Instant Delivery of new releases or new information about the Instant Delivery Program.

Having introduced the basic operation of document delivery system 10, above, Figs. 17-21 provide additional operational information regarding select aspects of the present invention.

Accordingly, turning to Fig. 17, a flow chart illustrating an example method for generating a personalized document is presented. As shown, the method begins with block 1010, wherein editor module receives content objects from content providers 50 and /or advertising providers 80, and selectively invokes an instance of content manager 518. In response, content manager 518 classifies, wraps and stores each of the received content objects in one or more content stores (not shown), block 1015. More specifically, as introduced above, content manager 518 invokes an instance of analysis(wrapper agent 522 to analyze and encapsulate the received content object in a trace wrapper having a unique identifier. According to one implementation, analysis agent 522 identifies meta data within the received content object to classify the content object. Once the analysis agent 522 has classified and encapsulated the received content object in a wrapper, content manager 518 updates the content provider information data structure 620 associated with the provider of the content object to denote the wrapper identifier for the received content object.

In block 1300, edit module 120 identifies whether an indication for construction of a personalized document has been received. As introduced above, such an indication may be generated by a requesting user via a user interface (e.g., a web page), or in response to an indication received from, for example, print schedule 390. In either case, if an indication is received, edit module 120 invokes an instance of the innovative virtual editor 506 to generate a personalized publication for delivery to the identified user. In this regard, virtual editor 506 invokes an instance of construction agent 520, which

obtains information from a user profile associated with the identified user to determine user interests, block 1410. In block 1415, construction agent 520 obtains information from the user profile 602 to determine the medium of choice (e.g., send the publication electronically via email, send via fax, send to a local printer of the user, etc.), interests, 5 preferences and/or a history of received information.

In block 1420, construction agent 520 determines whether the publication request is unique to an individual user, or whether the information has already been retrieved for another user. If content objects identified for publication have already been retrieved to satisfy another user request, construction agent 520 access local memory 508 to quickly 10 retrieve the identified content objects, block 1425. Otherwise, in block 1430, construction agent 520 extracts the appropriate ones of the categorized content objects with which to generate a personalized publication.

In block 1435, construction agent 520 generates an initial layout of the personalized document using the extracted information. According to one 15 implementation, construction agent 520 identifies additional content objects based, at least in part, on the already extracted content objects and other key contributor criteria (e.g., seasonality, locality, etc.) introduced above. Moreover, construction agent 520 may also leave room in the layout for inclusion of content by a local content provider (e.g., an ISP), through which the personalized publication will be transmitted en route to the 20 identified user.

In block 1440, the construction agent 520 further optimizes document layout, updating the content provider information database 620 with an indication of which content objects have been utilized in construction of the personalized document. The personalized document created by construction agent 520 of virtual editor 506 is then sent 25 to publishing agent 504, block 1445. As will be described below (Figs. 19 and 20), layout manager 516 of publishing agent finalizes the layout and content (except for last minute, time sensitive content objects), while scheduling manager 514 optimally schedules delivery of the publication to include such last minute, time sensitive content objects. Publishing agent 504 then issues the personalized document for delivery to the user via 30 transmission module 150 and a printing module 380 associated with the user.

Turning to Fig. 18, a flow chart illustrating an example method of operation of an innovative printing module 380 is presented, according to one embodiment of the present invention. As introduced above, printing module 380 may be located throughout

document delivery system 10, and include a virtual sensor (not shown) which detects and identifies trace wrappers for content objects comprising received personalized publications, providing document server 100 with confirmation of receipt and user disposition of the content objects.

5 According to the illustrated example embodiment of Fig. 18, the method begins with block 2695, wherein printing module 380 informs the publication server that the publication was successfully printed. In block 2900, the document server 100 is informed that the publication was successfully printed. In response, content manager 518 updates the usage fields of the content objects comprising the received personalized document, for  
10 accurate accounting to content providers 50 and advertising providers 80. In block 2905, printing module 380 covertly monitors user interaction with the received publication. As introduced above, this covert monitoring (via sensors, client application(s), etc.) records one or more of the distribution of content objects to a user, user receipt of content objects, whether the object(s) were printed or viewed on a display terminal, the duration viewed  
15 (if by terminal), whether any editing of the content object(s) occurred, and any other user interaction with the content object(s).

In parallel, according to one embodiment of the present invention, printing module 380 overtly queries the user for feedback on the received publication in general, and on one or more of the content objects in particular, block 2910. In block 2915,  
20 printing module determines whether the user has provided feedback.

In block 2920, printing module 380 weighs user satisfaction based, at least in part, on observed user interaction with the received publication and any received feedback from the user. In block 1695, printing module 380 notes any further distribution of the content objects comprising the personalized publication, and provides such information to  
25 edit module 120 to update user profile and content provider information data structures 602 and 620, respectively.

Turning next to Figs. 19 and 20, the operation of the innovative publishing agent 504 will be described. As introduced above, once construction agent 520 has compiled the components of a personalized publication, the construct of content objects is provided  
30 to publishing agent 504, block 1445. In block 1447, publishing agent 504 invokes an instance of layout manager 516 and an internal clock (not shown) is engaged to monitor the compilation time associated with at least the partial layout of the publication.

According to one implementation, more complex measures are developed and maintained

such as, for example, compilation time at a particular time of day, day of the week, etc. By maintaining this measure of compilation time, however complex or rudimentary, enables publishing agent 504 to improve publication and delivery scheduling.

In block 1448, layout manager 516 determines whether the publication contains  
5 any time sensitive material. If so, a further determination is made of whether the delivery  
schedule must include time to obtain information (content objects) immediately prior to  
delivery of the publication, block 1451. If the publication does not contain time sensitive  
information (1449), or the delivery schedule does not require obtaining information  
immediately prior to delivery (1451), layout manager 516 receives the content objects  
10 from the virtual editor 506 to finalize the layout of the publication, block 1453. In block  
1455, layout manager analyzes the content objects in light of the key contributor  
information and generates a final layout of the document.

If the publication is to include last minute, time sensitive information (identified  
in blocks 1449 and 1451, respectively), layout manager 516 receives the content objects  
15 from the virtual editor and performs a partial final layout of the publication, leaving  
layout completion to the schedule manager 514 once the last minute content objects have  
been retrieved, block 1454.

In block 1457, upon completion of the final or partial-final layout of the  
publication, layout manager 516 disengages the internal clock, calculates the compilation  
20 time and updates a set of records regarding compilation time. According to one  
implementation, layout manager 516 generates a measure of publication complexity and  
maintains a measure of estimated compilation time for varying degrees of publication  
complexity. The estimated compilation time may then be used to optimally schedule  
publication based, at least in part, on the complexity of the jobs.

25 In block 1459, a layout manager 516 determines whether the publication is a  
unique document intended for one user, or whether it is to be “broadcast” to multiple  
recipients. If it is destined for a single user, layout manager forwards it to schedule  
manager 514. If, it is to be broadcast to multiple recipients, layout manager 516 first  
tabulates publication quantities in block 1461 before sending the publication to schedule  
30 manager 514, block 1460.

Fig. 20 provides a flow chart of an example method for optimally scheduling  
publication, according to one aspect of the present invention. As shown, the process  
begins with block 1465, wherein schedule manager 514 receives the content objects for

the personalized publication from layout manager 516 and performs an initial load balancing calculation. According to one implementation, layout manager 516 provides schedule manager 514 with an estimate of compilation time, which schedule manager 514 references to optimally utilize the resources of publishing agent 504. The estimate of 5 compilation time may be a quantitative value (e.g., the compilation time of layout manager 516 to layout the publication), or a qualitative value (e.g., an indication that the publication is of low, medium or high complexity).

According to another implementation, schedule manager 514 identifies the intended recipient (and a related printing device) to determine print status, print media, 10 media count, etc. According to one aspect of the invention, to be described more fully below (Figs. 22-25), this information is retrieved from printing module 380 associated with the user and/or identified printer. In an alternate embodiment, this information is provided by querying the printing device directly. Using this information, along with the compilation time information, schedule manager 514 can best identify which jobs can be 15 completed in a certain time-frame, and further optimize the publication schedule.

Schedule manager 516 then identifies an optimal publication start time based on, for example, the relative complexity of the received publication versus other scheduled publications. According to one embodiment, schedule manager 514 maintains a queue of 20 publication jobs denoting the start time and estimated processing time for each publication.

In block 1469, schedule manager 514 determines whether it is time to complete publication and delivery of a queued publication. If so, schedule manager 514 engages an internal clock to monitor compilation time, block 1471. As above, the measure of compilation time is useful for making future estimates of schedule manager 514 25 processing time for jobs of similar complexity, thereby iteratively developing a more accurate schedule manager 514.

In block 1473, schedule manager 514 retrieves any last minute, time sensitive information for inclusion in the publication, and finalizes the layout of the publication including such content.

30 In block 1475, schedule manager 514 continuously monitors whether the publisher agent 504 is on schedule to complete the publication within the allocated time. This is particularly important during, for example, publication of multiple quantities of a document. In such an instance, schedule manager continuously determines whether

publication of all the documents is likely to occur. Assuming that publisher is currently on schedule, schedule manager 514 further determines in block 1477 whether publication is complete.

Once publication is complete, schedule manager 514 disengages the internal clock 5 measuring compilation time and records this information for use in future publication estimation and scheduling, block 1479. In block 1481, schedule manager 514 generates the document for delivery to printing module 380, and sends the document to transmission module 150 for delivery to the printing modules 380, block 1495.

If, in block 1475, above, schedule manager 514 determines that the publisher is 10 not likely to complete the publication according to schedule, schedule manager 514 defaults on the publication in block 1483, so that it can maintain its publication schedule by moving on to the next publication job. In such an implementation, schedule manager 514 notifies system management to adjust the heuristic data and report the failed publications, block 1485. In block 1487, a default publication is generated and provided 15 to printing module(s) 380, block 1481. In an alternate implementation, rather than defaulting the current publication (1483), schedule manager 514 re-optimizes the publication schedule, shifting publication jobs in the queue as necessary to ensure publication of the current document.

Turning next to Fig. 21, a flow chart of an example method for tracking 20 distribution, receipt and disposition of individual content objects comprising a personalized publication is presented, according to one aspect of the present invention. As introduced above, whenever edit module 120 receives content (artistic or advertising) it categorizes the content objects and encapsulates the object in a trace wrapper. The trace 25 wrappers are uniquely identifiable markers associated with objects in the document delivery system. Virtual sensors embedded throughout the document delivery system (e.g., in printing modules) identify receipt and interaction with objects encapsulated in such wrappers, covertly providing document delivery system with valuable feedback on which objects are of interest to particular users, the amount of distribution of content objects, and the like. An example of a personalized publication 6000 comprised of 30 content objects embedded in trace wrappers 6002(A)...(N) is provided with reference to Fig. 22. As shown, content object 6004 is encapsulated within a trace wrapper 6002(A) with a “tag”, or “marker” 6006 which is stored in content provider information data structure to uniquely identify the content object.

As shown, the method of Fig. 21 begins with block 5002, wherein the content manager 518 of virtual editor 506 receives a report from one or more virtual sensor(s) that content objects have been sent through, or received by, identified users. In response, appropriate content manager 518 updates appropriate user profile(s) (block 5004) and 5 content provider information data structures (block 5006) to reflect the distribution, receipt and/or disposition of content objects. In block 5008, contract administrator 524 of content manager 518 periodically initiates financial transactions with content providers 50, advertising providers 80 and subscribing users.

More specifically, contract administrator 524 initiates royalty payments for the 10 distribution and receipt of content objects provided by select content providers, in accordance with contractual obligations established between the document delivery system and such content providers. In this regard, contract administrator identifies the usage of content objects associated with the content providers 50 to determine an accurate royalty payment, and instructs transaction agent 526 to complete the financial transaction, 15 preferably via one of a number of electronic financial service networks. In such an instance, transaction agent 526 initiates a payment to the financial service network account associated with the content providers 50 in the amount identified by contract administrator 524. Alternatively, transaction agent 526 may initiate printing of checks payable to the content providers 50 in a denomination indicated by contract administrator 20 524, wherein such printed checks are then mailed to the content providers 50.

Similarly, contract administrator 524 periodically calculates advertising usage for advertising providers 80, instructing transaction agent 526 to bill the identified advertising providers 80 based on advertising usage, placement, associations, and the like. As above, transaction agent 526 preferably carries this billing out via an electronic 25 financial network, but may alternatively (or in addition) initiate the printing and mailing of physical bills to the advertising providers 80.

Referring to Figs 22(A) and 22(B), cross-sectional side views of a printing device incorporating an innovative media feed system is presented, according to one aspect of the present invention. As will be described below, the innovative media feed system of 30 the present invention identifies the count and type of media available to a printing device. This information is then presented to edit module 120 of document delivery system 10 for purposes of scheduling, media selection, content object selection, and/or generating a warning regarding media availability. Moreover, it is to be appreciated that printing

devices of greater or lesser complexity incorporating the media handling system may well be implemented without deviating from the spirit and scope of the present invention. In one implementation, for example, a printing device incorporating the media handling system also includes a media cutting system that enables the printing device to alter the 5 size and/or shape of print media to a desired size. Such a media cutting system may well be integrated within the media drawer and/or the media handling system. Thus, while prior art printing devices are able to discern whether a media tray is empty, the innovative media handling system of the present invention determines the count and type of media available to a printing device and, in select implementations, altering the size and/or 10 shape of the print media to facilitate the advanced editing and publishing features introduced above. In this regard, the advanced media handling system of the present invention represents a significant improvement in automated imaging systems.

Turning to Fig. 22A, the innovative media feed system includes a media “drawer” (or tray) element 24004, a printer element 24002, and a media element (Fig. 25), each of 15 which will be described in turn. As shown, the media drawer 24004 includes a media handling tray 24006, a media height gauge 24008 operatively coupled to a lift member 24010, and a media stop 24017, functionally related as depicted. In accordance with the illustrated example embodiment, media handling tray 24006 (also called a media lift tray) is lifted by member 24010, which is sprung to rotate and present the media resting on the 20 tray to a preferred media feed position dictated by media stop 24017.

According to one aspect of the invention, lift member 24010 is coupled to a media gauge disk 24008. Lift member 24010 rotates to lift media handling tray 14006 until stopped by the media hitting the media stop 24017, wherein the media gauge disk 24008 is rotated in proportion to the amount of media left in the media tray 14006. For purposes 25 of illustration only, the rotation of media gauge disk 24008 is illustrated in Figs. 22A and 22B by following an indicator (24012) on media gauge disk 24008 as it rotates from a full media tray (Fig. 22A) to an emptier media tray (Fig. 22B). It should be appreciated that the indicator need not appear on the actual device, but is simply used herein to illustrate the movement of the disk in proportion to the height of the media tray 14006.

30 As used herein, the media gauge disk 24008 is constructed to provide a sensor (24014) in the printer element 24002 with an indication of the amount of rotation required to present the media to the media stop 24017. According to one embodiment, media gauge disk 24008 is constructed using any of a number of visual indicators, e.g., a

physically tapered disk, a disk having a tapered pattern which contrasts with the rest of the disk, a disk having graduated color differences along the circumference, a monolithic digital pattern or any of a number of alternate visual cues, which are perceptible to an optical sensor. In a preferred embodiment, a disk which is gradually tapered inward along 5 its circumference is employed, wherein the width of the disk provides an indication of the amount of rotation of the disk and, therefore the amount of media resting in the media handling tray 24006. Alternate embodiments utilizing proportional resistance, magnetic, audio or other appropriate cues and sensors may also/alternatively be used without deviating from the spirit and scope of the present invention.

10 The printer element 24002 of the innovative media feed system is illustrated comprising a media count sensor 24014, and, optionally, a media identification sensor 24015, communicatively coupled to one or more controller(s) 24016. As introduced above, the media count sensor 24014 is an optical sensor that identifies the width of a media gauge disk 24008 located in the media drawer 24004. It is to be appreciated, 15 however, that any of a number of alternative optical sensors may be utilized without deviating from the spirit and scope of the present invention.

According to one implementation, a user may calibrate controller 24016 for a particular media type by inputting information regarding the type, size and quantity of media loaded on media tray 14006. Controller 24016 associates the current height of the 20 media tray 24016 (denoted by the width of the media gauge disk) to the user-identified type and quantity of media. In alternate embodiments, controller 24016 may access data stores for information regarding media types and, thus, may be self-calibrating using a media identification sensor (24015), described more fully below. In this regard, media handling system of the present invention provides for automated and manual calibration 25 of the system.

According to one implementation of the innovative media feed system, a media identification sensor 24015 is deployed within printer element 24002. In accordance with this example implementation, the media identification sensor 24015 locates and reads information from an innovative piece of media populating media drawer 24004. In a 30 preferred embodiment, media identification sensor 24015 is an optical sensor that reads small identifying marks from, for example, an edge of the next available piece of media in the media handling drawer 24004. According to one implementation, the media identification sensor 24015 may also be used for additional purposes, e.g., detecting jams,

or miss-feeds within the innovative media handling system. An example of the innovative media and the identification marks are illustrated with reference to Fig. 23.

As shown, the innovative media 6000 presented in Fig. 23 includes identifying marks 6001 located on one or more edges of the media 6000. In accordance with the 5 teachings of the present invention, one or more sets of unique identification markings may be employed such as, for example, notches physically cut from the media, colored markings, etc. In the case of colored markings, invisible ink may be employed such that the markings are eliminated over time, or when exposed to the heat of the printing process. In a preferred embodiment, the markings (be they notches, colored marks, etc.) 10 are intended to be very small, almost imperceptible to the human eye, but readily apparent to the media identification sensor. The markings represent a code containing information regarding one or more attributes of the media such as, for example, media weight, media dimensions (height, width, thickness), media grain and coarseness, media color, etc. This information, when decoded by controller 24016, is then used to further optimize the 15 printing function. Given media type information (e.g., thickness), and the relative height of the media on the media handling tray 24006, controller 24016 can accurately calculate the amount of remaining media available to the printing device from the media drawer 24004.

Turning to Fig. 24, a top-down, cross-sectional view of the innovative media feed 20 system is presented. The top-down view of Fig. 24 provides an improved view to illustrate the tapered characteristic of media gauge disk 24008. In accordance with the illustrated example embodiment of Fig. 24, two sets of media gauge disk/sensor combinations are illustrated, along with two media identification sensors (24015). It is to be appreciated that alternate embodiments employing more or less sensor(s) and/or media 25 gauge disks, or alternate arrangements thereof, may well be used without deviating from the scope of the present invention.

With reference to Fig. 25, a flow chart of an example method for determining type and amount of media available to a printing device is presented, in accordance with the teachings of the present invention. As shown, the method begins with block 26002, 30 wherein the media handling tray 24006 is lifted by member 24010 until the media resting thereon (if any) reaches media stop 24017. As introduced above, media gauge disk 24008 is functionally coupled to lift member 24010, such that changes in the height of media handling tray 24006 (to accommodate more or less media) are directly translated into a

rotation of the media gauge disk 24008. In block 26004, media count sensor 24014 identifies the relative height of the media handling tray 24006 from the media gauge disk 24008. In accordance with the illustrated example embodiment, above, the relative height is determined from the width of the media gauge disk 24008 as measured optically by 5 media count sensor 24014. As introduced above, in the exemplary embodiment, media gauge disk 24008 is tapered such that as the disk rotates in response to the addition/removal of media to/from media handling tray, the effective width of the disk from the perspective of media count sensor 24014 increases or decreases, respectively. The width of the media gauge disk 24008, as measured by media count sensor 24014 is 10 provided to controller 24016 using a wired/wireless communication interface.

In block 26006, controller 24016 determines whether the media type is known. If controller 24016 does not know the media type, controller 24016 estimates the remaining media count based, at least in part, on default media size information. According to one implementation, the default media size is that of twenty-pound (20#) paper stock. In 15 block 26012, this media count information is provided to printing module 380, for transmission to one or more document servers for use in publication scheduling, and media type selection.

If, in block 26006 the media type is known, controller 24016 utilizes the relative height of the media handling tray 24006, translated from media gauge disk 24008, and the 20 dimensional information of the identified media type to accurately calculate the remaining media count, which is provided to printing module in block 26012. A representative process of determining media type is presented with reference to block 26020 through 26026.

In block 26020, media type sensor 24015 attempts to locate and read marks from 25 the top piece of media in media handling tray 24006. This code represented by the identifying marks is sent from sensor 24015 to controller 24016, which accesses a data store (not shown). If the marks are not located, additional sensors (if available) may be used to check the media orientation within the drawer (e.g., if the stock is in backwards, etc.), block 26022. If the media is not properly oriented within the media handling 30 system, controller 24016 makes a determination of whether the media orientation is, nonetheless, acceptable. According to one implementation, the printing device includes the ability to print on both sides of a sheet of paper and, thus, could re-orient the media

within the printing device. Additionally, in certain instances the orientation of the media may not make a substantial difference in the printed result.

If controller 24016 determines that the media is not properly oriented within the media handling system to provide for the proper printed result, controller 24016 issues a 5 warning message denoting that the media is improperly oriented within the media handling system. According to one implementation, this message is displayed on a printing device control panel, enabling a user to re-orient the media to continue the print job. In addition, controller 24016 may also issue the message to a document delivery server sending the print job, whereupon edit module 120 may instruct controller 24016 to 10 continue with alternate media (identified by media handling system), to re-orient the media using the media handling system, or may elect to cancel publication delivery. In block 26028, controller 24016 awaits any external indication (e.g., user re-orienting the media and clearing the error, an indication from edit module 120, etc.) to continue with publication delivery. If, after some time, no further indication is received, controller 15 24016 cancels publication delivery.

If, however, controller 24016 determines that the media properly oriented, or otherwise receives an indication to continue with publication delivery, controller 24016 accesses a data store of media identification marks to attempt to identify the media in the media drawer, block 26030. In block 26032, controller 24016 accurately identifies the 20 media type corresponding to the code read from the media by sensor 24015. Once identified, media attribute information associated with the media type is retrieved (e.g., from the same data store) enabling controller 24016 to optimize printer settings and to accurately determine the remaining media count, block 26034.

Fig. 26 provides but one example of a method of generating print stock (also 25 referred to as print media) for use with the present invention. As shown, the method begins with block 27002 wherein the print stock is received and, if necessary, cut down to the proper size. In block 27004, a code is generated which uniquely identifies the print stock based, at least in part, on print stock attributes. According to one implementation, the code is generated in accordance with an accepted industry standard coding scheme. 30 In alternate implementations, proprietary coding schemes may well be employed. In block 27006, the print stock is marked, cut and/or stamped with the unique code to identify the print stock to the innovative printing device 24000. According to certain implementations, the method of Fig. 26 is implemented by a manufacturer of the print

stock during the manufacturing process. As introduced above, however, select printing devices 300 may also include a media cutting system to alter the shape and/or size of the available print stock. In this regard, one or more process steps of Fig. 26 may well be implemented by one other than the manufacturer of the print stock without deviating from the spirit and scope of the invention.

Although presented in the context of the innovative document delivery system 10, those skilled in the art will appreciate that individual aspects of the present invention may well be advantageously implemented outside of an automated document delivery system, within the scope of the present invention. In this regard, the innovative media feed system may well be used within a stand-alone printing device to optimize print settings for detected media, enabling a user to place mixed media types in a media drawer. Moreover, the media count sensor would enable controller 24016 to warn a user of such a printing device that insufficient media exists to complete a requested print job – before the print job begins. In alternate implementations, controller 24016 maintains a record of the type and manufacturer of the media used by a particular printing device, and causes product subsidies to be issued based, at least in part, on the record of media type usage in the printing device. Such alternate embodiments and implementations are anticipated within the scope and spirit of the present invention.

20                   What is claimed is:

CLAIMS

1. An apparatus comprising:
  - a controller; and
  - 5 sensor, coupled to the controller, wherein the sensor is positioned to locate and identify a code containing media type information from a next available piece of media in a printing device media receptacle, and to generate a signal to the controller based, at least in part, on the identified code.
- 10 2. An apparatus according to claim 1, wherein the controller identifies the media type based on the signal received from the optical sensor.
- 15 3. An apparatus according to claim 1, wherein the code is comprised of one or more markings made to print media, by including one or more of the following: colored ink, self-dissolving, temporary ink and/or notches cut from an edge of the media.
4. An apparatus according to claim 1, wherein a location of the markings is indicative of media type.
- 20 5. An apparatus according to claim 1, wherein the controller maintains a record of media type usage by the apparatus.
- 25 6. An apparatus according to claim 5, wherein the controller causes a product subsidy to be issued to an end-user of the apparatus based, at least in part, on the record of media type usage.
7. An apparatus according to claim 1, wherein the controller modifies one or more operating parameters of the apparatus in response to the identified media type.
- 30 8. An apparatus according to claim 7, wherein the controller invokes a media cutting system to alter one or more physical attributes of the print media to accommodate the publication based, at least in part, on the identified media type.

9. A method comprising:

locating strategic marks on at least a next available media item populating a media drawer of a printing device; and

identifying a media type of the next available media item based, at least in part, 5 on the located strategic marks.

10

10. A method according to claim 9, further comprising:

adjusting one or more print settings of the printing device based, at least in part, on the identified media type.

15

11. A method according to claim 9, further comprising:

altering one or more physical attributes of the identified print media based, at least in part, on the identified media type.

12. A method according to claim 9, further comprising:

identifying a manufacturer of the next available media item based, at least in part, on the located strategic marks.

13. A method according to claim 12, further comprising:

20 maintaining a record of media type usage by manufacturer; and

soliciting a product subsidy on behalf of an end-user of the printing device based, at least in part, on the record of media type usage by manufacturer.

14. A method according to claim 9, further comprising:

25 generating an indication denoting the next available media type to an inquiring document delivery server.

15. A method according to claim 9, further comprising:

receiving media handling instructions from a document delivery server in 30 response to the generated indication.

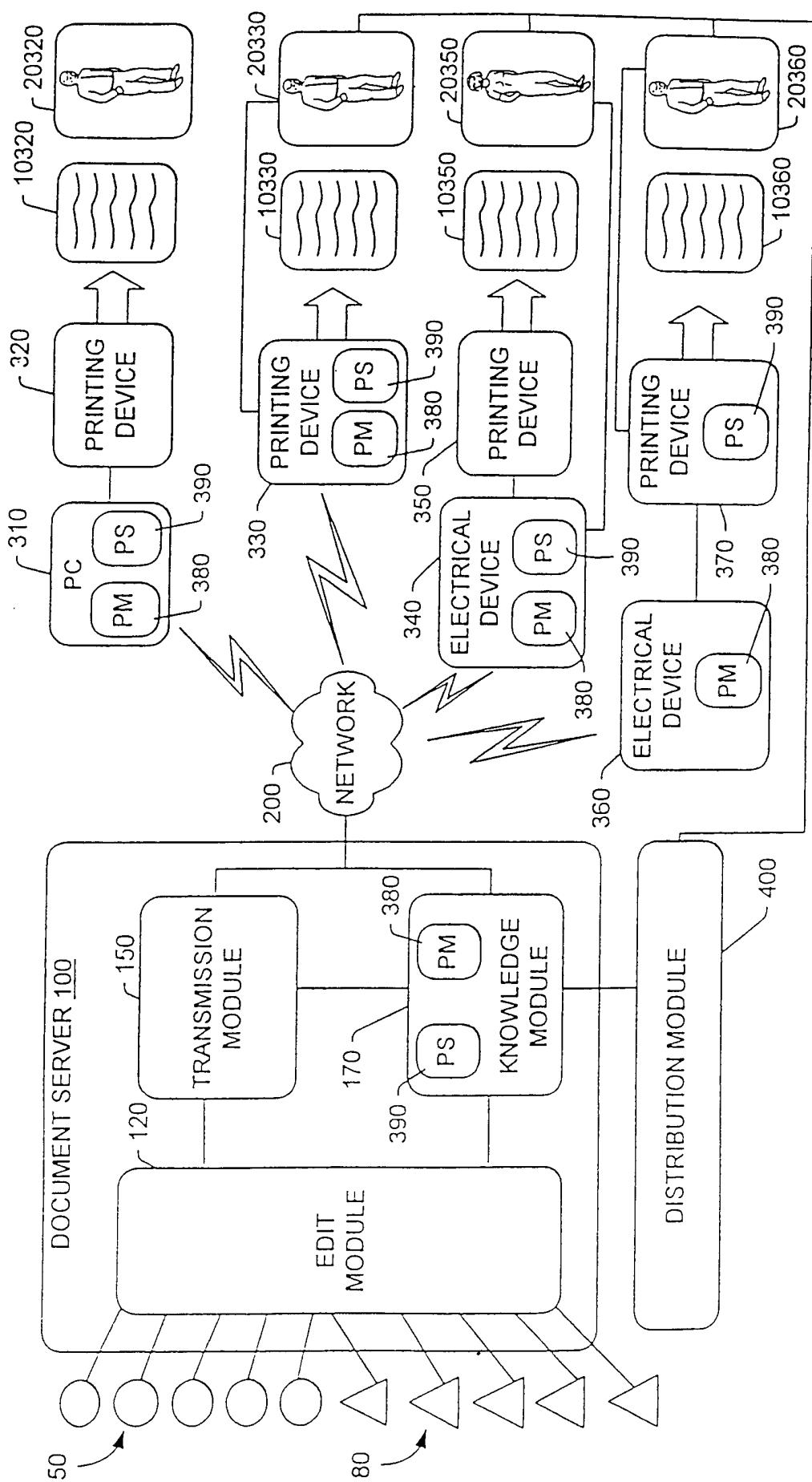
34

16. A method according to claim 9, further comprising:  
determining that the next available media item is not properly oriented within the media drawer; and  
issuing a message denoting improper media orientation.

FIG.

DOCUMENT DELIVERY SYSTEM 10

1/28



**SUBSTITUTE SHEET (RULE 26)**

2/28

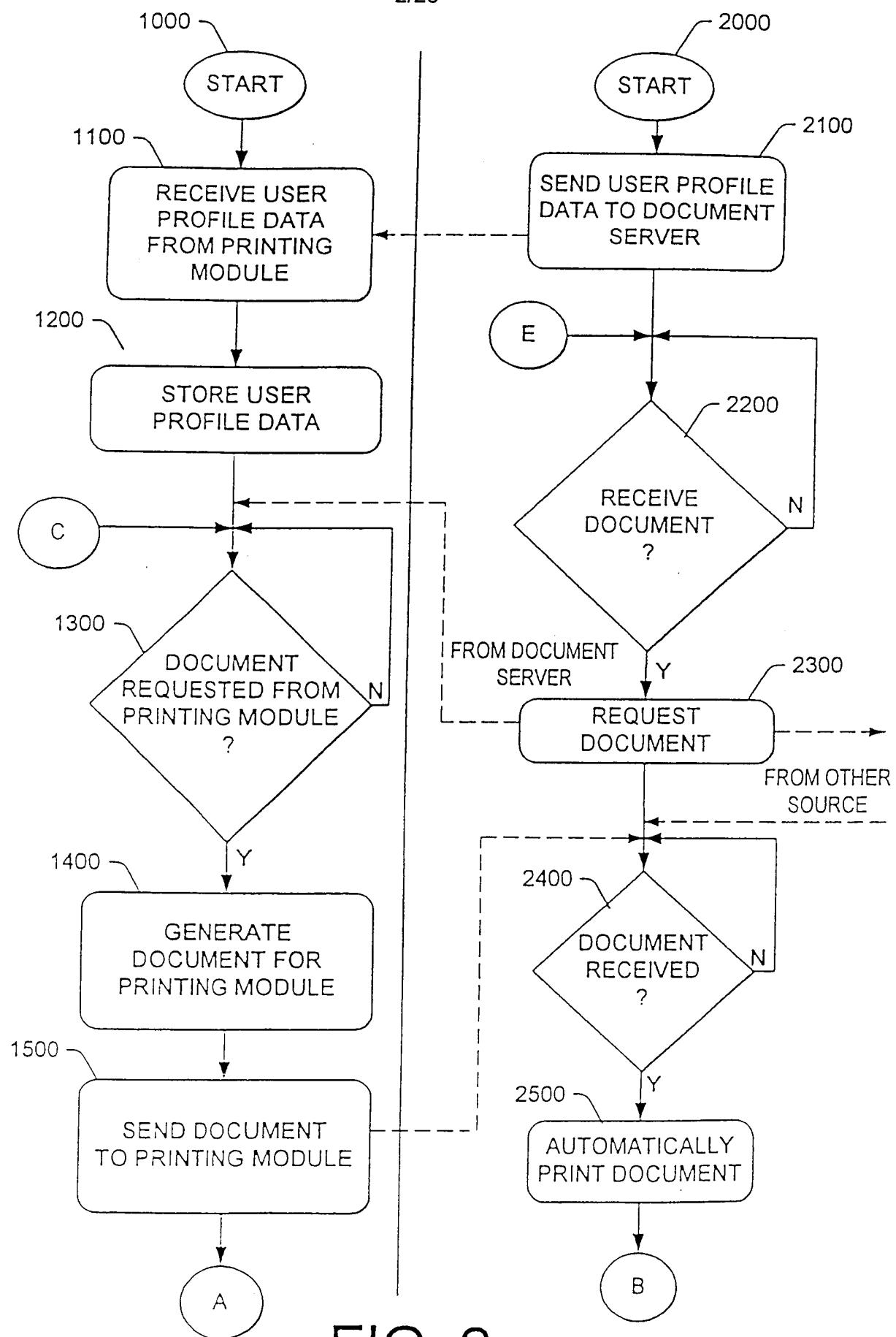


FIG. 2

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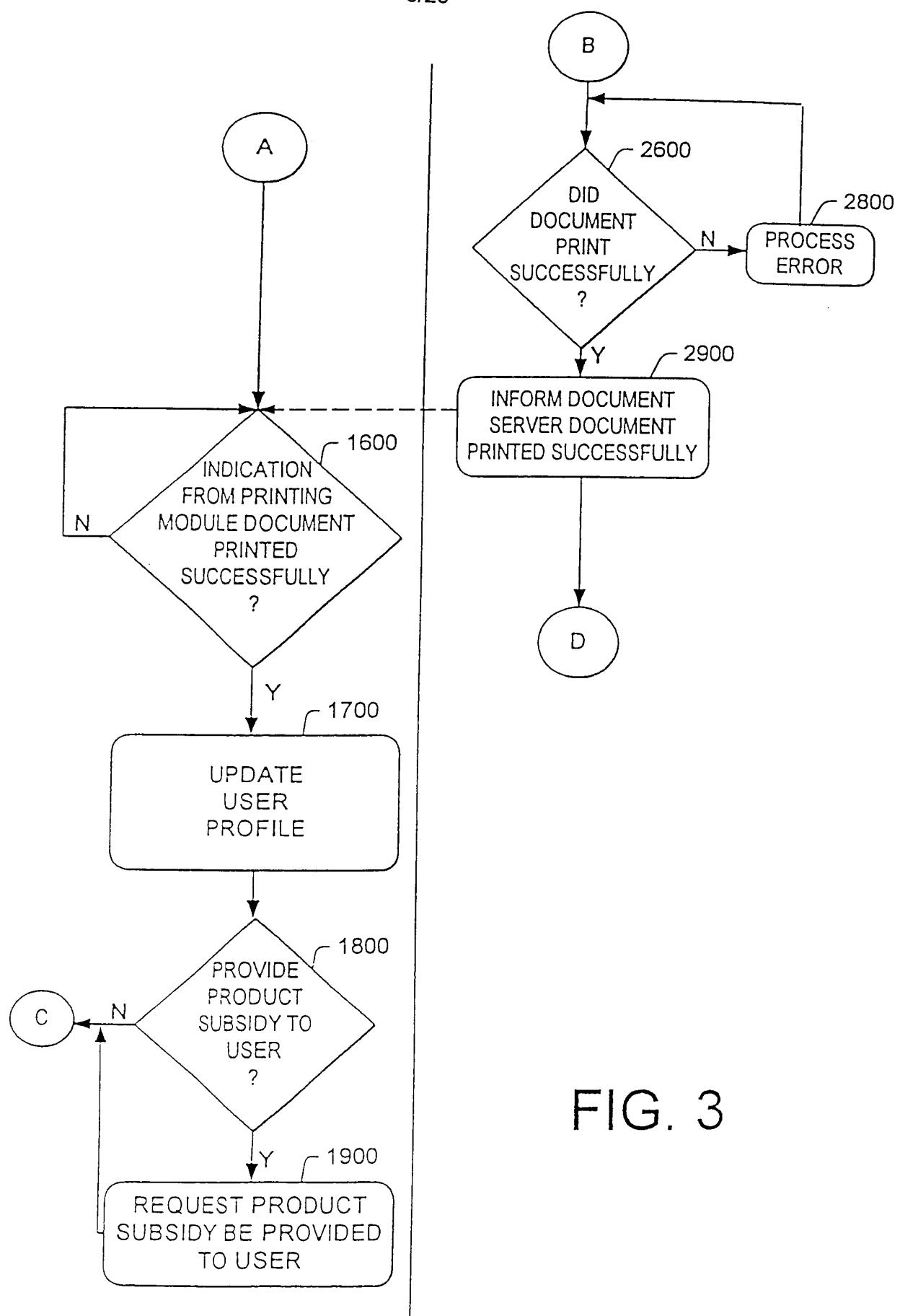


FIG. 3

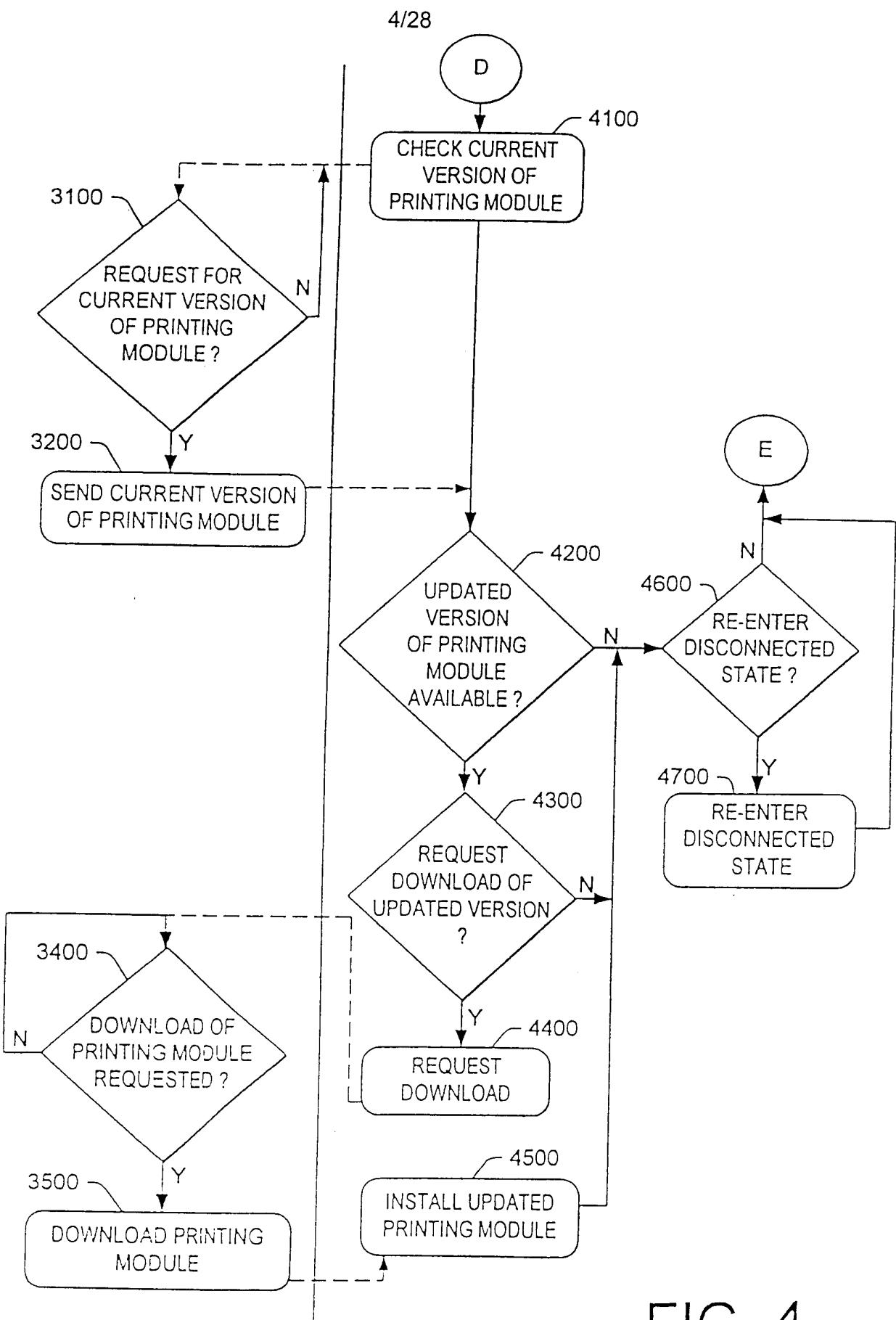


FIG. 4

5/28

HP INSTANT DELIVERY

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SYSTEM REQUIREMENTS  
VIEW README FILE  
REVISION HISTORY

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FIG.5

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TELL US ABOUT YOURSELF—MICROSOFT INTERNET EXPLORER

FILE EDIT VIEW GO FAVORITES HELP

BACK FORWARD STOP REFRESH HOME SEARCH FAVORITES HISTORY CHANNELS LINKS

TELL US ABOUT YOURSELF

FIELDS MARKED WITH RED LABELS ARE REQUIRED TO BE COMPLETED.

NAME:

FIRST, MI:

LAST

E-MAIL ADDRESS:

WHERE WILL YOU USE THIS PRODUCT?

COMPANY/INSTITUTION:

COMPANY

NAME:

STREET ADDRESS:

CITY:  STATE:  ZIP:

VOICE PHONE:  (  )  EXT.

PRINTER INFORMATION

PRINTER TYPE:  PRINTER MODEL:

COMPUTER INFORMATION

WHAT TYPE OF PC DO YOU USE?  INTERNET CONNECTION

AREAS OF INTEREST

BUSINESS/FINANCE  ENTERTAINMENT  
 HOME/SELF IMPROVEMENT  KIDS  
 NEWS  SPECIAL INTEREST

DONE     MY COMPUTER

FIG.6

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HP INSTANT DELIVERY		DELIVERY		SELECT		VIEW		SETTINGS		HELP	
											
<input type="checkbox"/>	TIME.COM AFTERNOON UPDATE	AT 2:30pm	WEEKDAYS	<input type="checkbox"/>	PRINTED THU. MAY 27 1999, AT 2:40pm	<input type="checkbox"/>	11000	<input type="checkbox"/>	PRINTED THU. MAY 27 1999, AT 7:10am	<input type="checkbox"/>	12000
<input type="checkbox"/>	FILE: DAILYCALENDAR.DOC	AT 7:00am	WEEKDAYS	<input type="checkbox"/>	PRINTED THU. MAY 27 1999, AT 7:00am	<input type="checkbox"/>	13000	<input type="checkbox"/>	PRINTED THU. MAY 27 1999, AT 1:33pm	<input type="checkbox"/>	14000
<input type="checkbox"/>	MY PERSONALIZED NEWSLETTER	AT 1:30pm	WEEKDAYS	<input type="checkbox"/>	PRINTED THU. MAY 28 1999, AT 1:30pm	<input type="checkbox"/>	15000	<input type="checkbox"/>	NONE (NEW ITEM)	<input type="checkbox"/>	
<input type="checkbox"/>	HP INSTANT DELIVERY TIMES	AT 5:00pm	MONTHLY ON THE FIRST MONDAY...	<input type="checkbox"/>	MON. JUN 7 1999, AT 5:00am	<input type="checkbox"/>		<input type="checkbox"/>	PRINTED TUE. MAY 25 1999, AT 8:00pm	<input type="checkbox"/>	
<input type="checkbox"/>	BELOIT DAILY NEWS HOME PAGE	AT 8:00pm	EVERY 2 DAYS	<input type="checkbox"/>	THU. MAY 27 1999, AT 8:00pm	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	

FIG. 7

390

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HP INSTANT DELIVERY - CNET News.com

DOCUMENT SUMMARY   SCHEDULE   START/END DATE   PRINTER

DELIVERY TIME AND FREQUENCY

USE THE PUBLISHER RECOMMENDED SCHEDULE  
 USE MY DEFAULT SCHEDULE (AVAILABLE VIA THE SETTINGS MENU)  
 USE THE CUSTOM SCHEDULE FOR THIS DELIVERY

DELIVERY DAYS

DAILY    WEEKLY    MONTHLY  
 EVERY    DAY(S)  
 EVERY WEEKDAY (MON THROUGH FRI)

DELIVERY DAYS

ONCE AT  SELECT OR TYPE A DELIVERY TIME  
 MULTIPLE TIME  
    
 MULTIPLE TIMES AT A GIVEN FREQUENCY  
FROM  TO   
EVERY  MINUTES

OK   CANCEL   HELP

FIG.8

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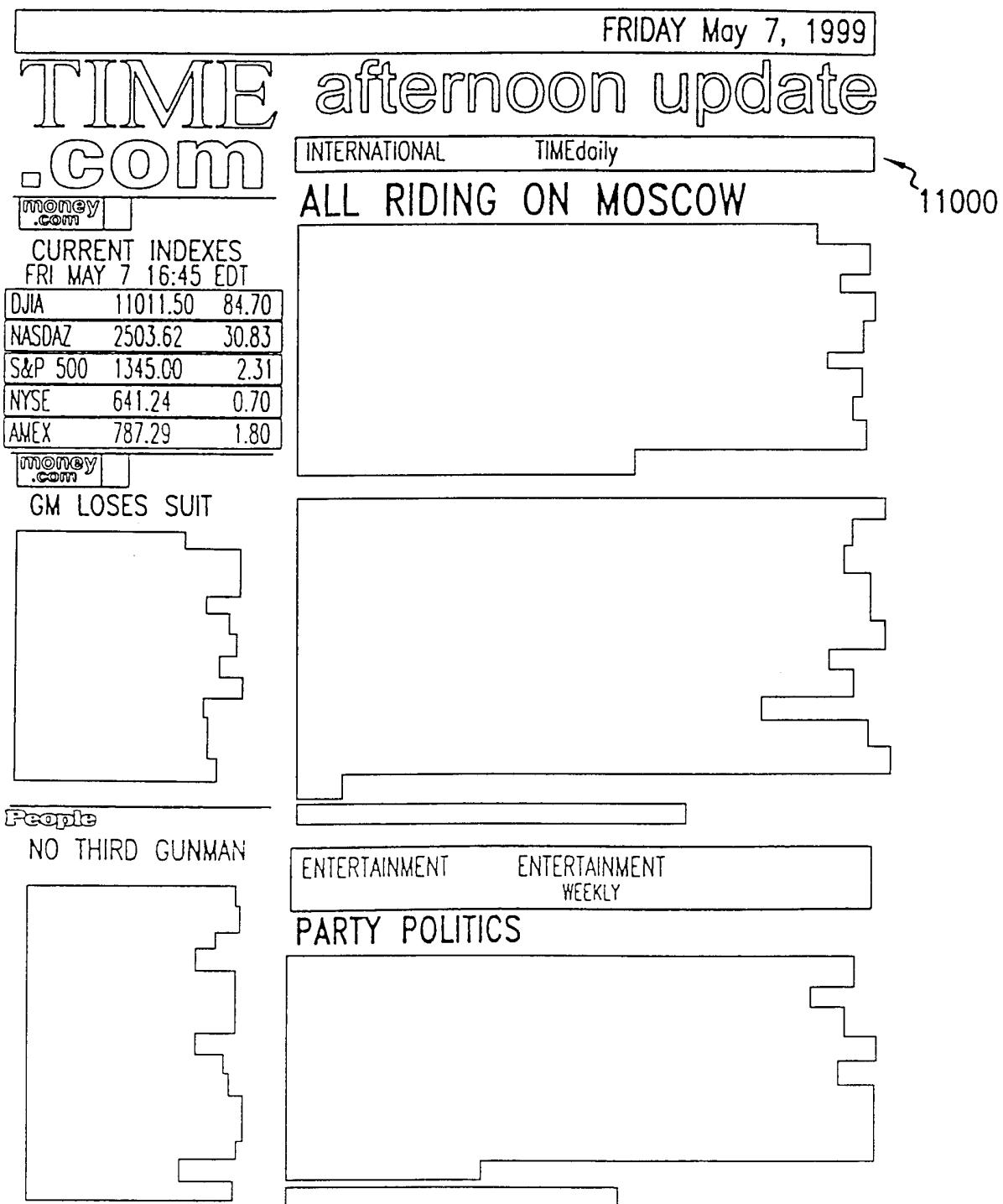


FIG.9A

10/28

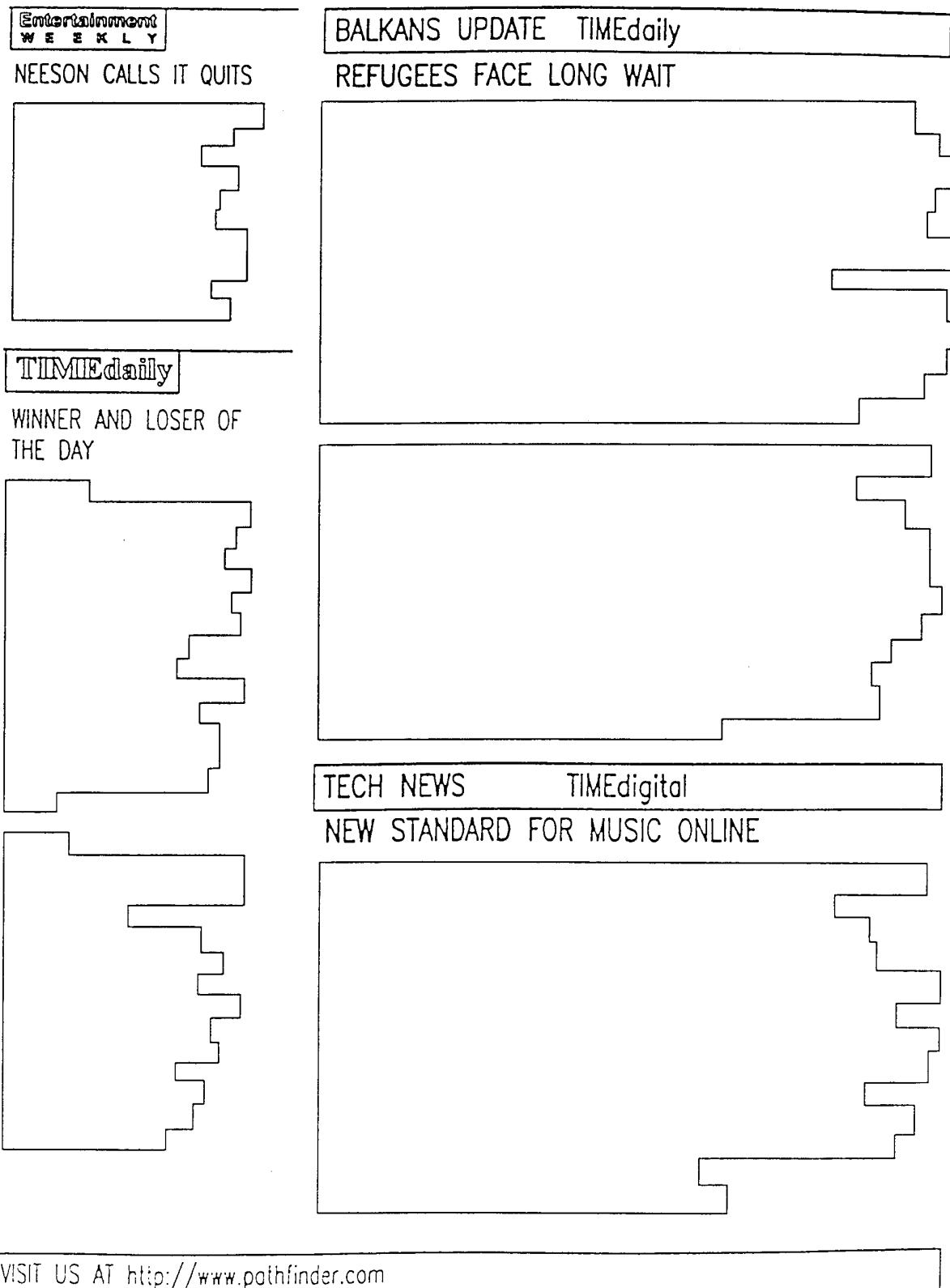


FIG.9B

11/28

MAY 14, 1999  
FRIDAY

FIG. 10

12/28

*Joe's Personalized Newspaper*

INSTANT DELIVERY EDITION      FEBRUARY 11, 1999

 CLINTON IMPEACHMENT  
TRIAL

MAJORITY VOTE TO CONVICT ON  
PERJURY SEEMS TO BE IN DOUBT

By ERIC SCHMITT  
WASHINGTON --

CONTINUED ON PAGE 7

INSIDE THIS ISSUE

1 FRONT PAGE	_____
2 SCIENCE TIMES	_____
3 TECHNOLOGY	_____
4 OPINION	_____
5 BOOKS	_____
6 ARTS	_____

MIAMI'S  
GENERATIONS OF  
EXILES, SIDE BY  
SIDE, YET  
WORLDS APART

SPECIAL REPORT BY MIREYA NAVARRO  
MIAMI --

CONTINUED ON PAGE 8

FIG.11A

13/28

**Science/Health**

**Pluto Is Again Most Distant Planet**

By The Associated Press

WASHINGTON (AP) —

[Redacted text blocks]

**Childbirth: Fertility Clinics' Boom in Babies**

By THE ASSOCIATED PRESS

[Redacted text blocks]

**IN BRIEF**

**Study Links Scars to Breast Cancer**

By THE ASSOCIATED PRESS

(February 11) [Redacted text block]

**Anti-Cancer Drug To Be Tested**

By THE ASSOCIATED PRESS

(February 11) [Redacted text block]

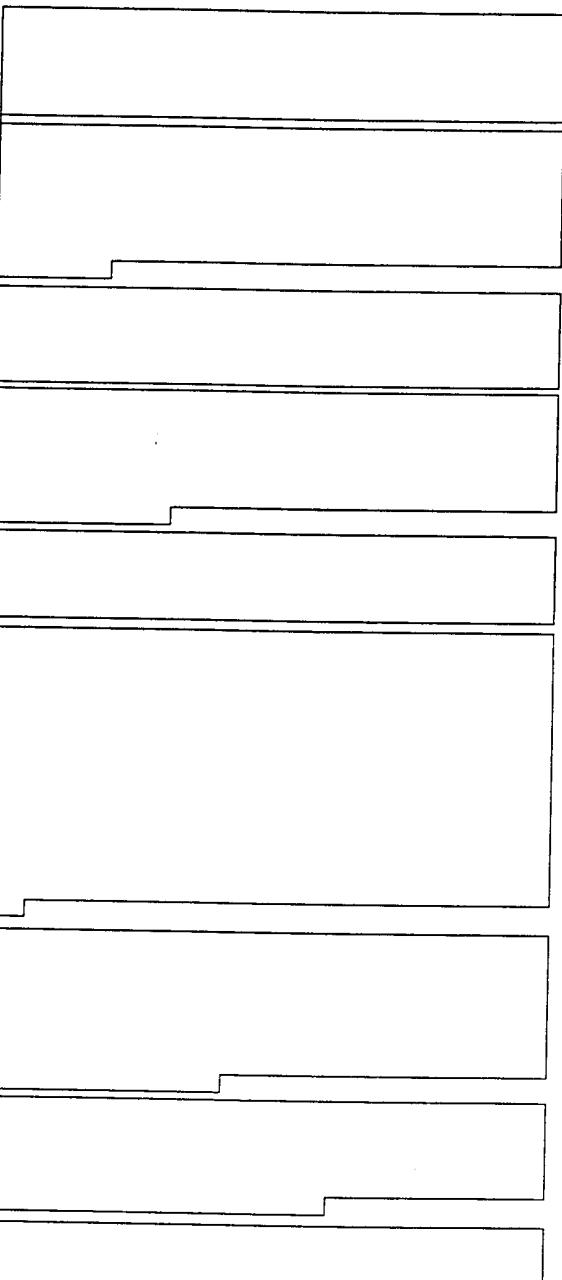


FIG.11B

14/28

TECHNOLOGY  
MORE STATES CONSIDER LAWS  
RESTRICTING JUNK E-MAIL

By JERI CLAUSING



## IN BRIEF

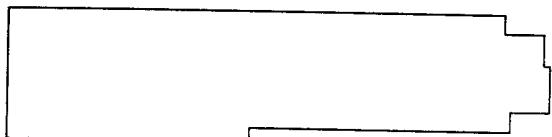
## COURT UPHOLDS INTERNET OFFICE BAN

By THE ASSOCIATED PRESS



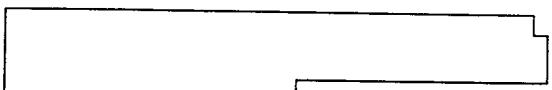
## NATIONAL SECURITY AND THE NET

By JERI CLAUSING



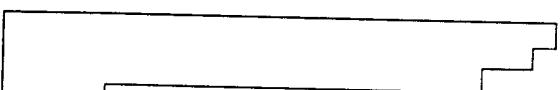
## Shareholders Sell E\*Trade

By DAVID CAY JOHNSTON

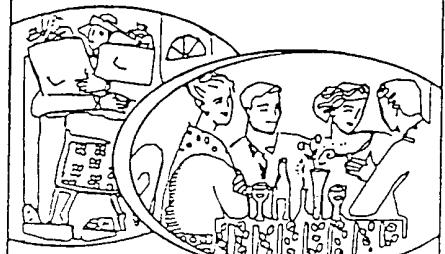


## SUN IN DEAL WITH AOL

By BLOOMBERG NEWS



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CONTINUED ON PAGE 9

FIG.11C

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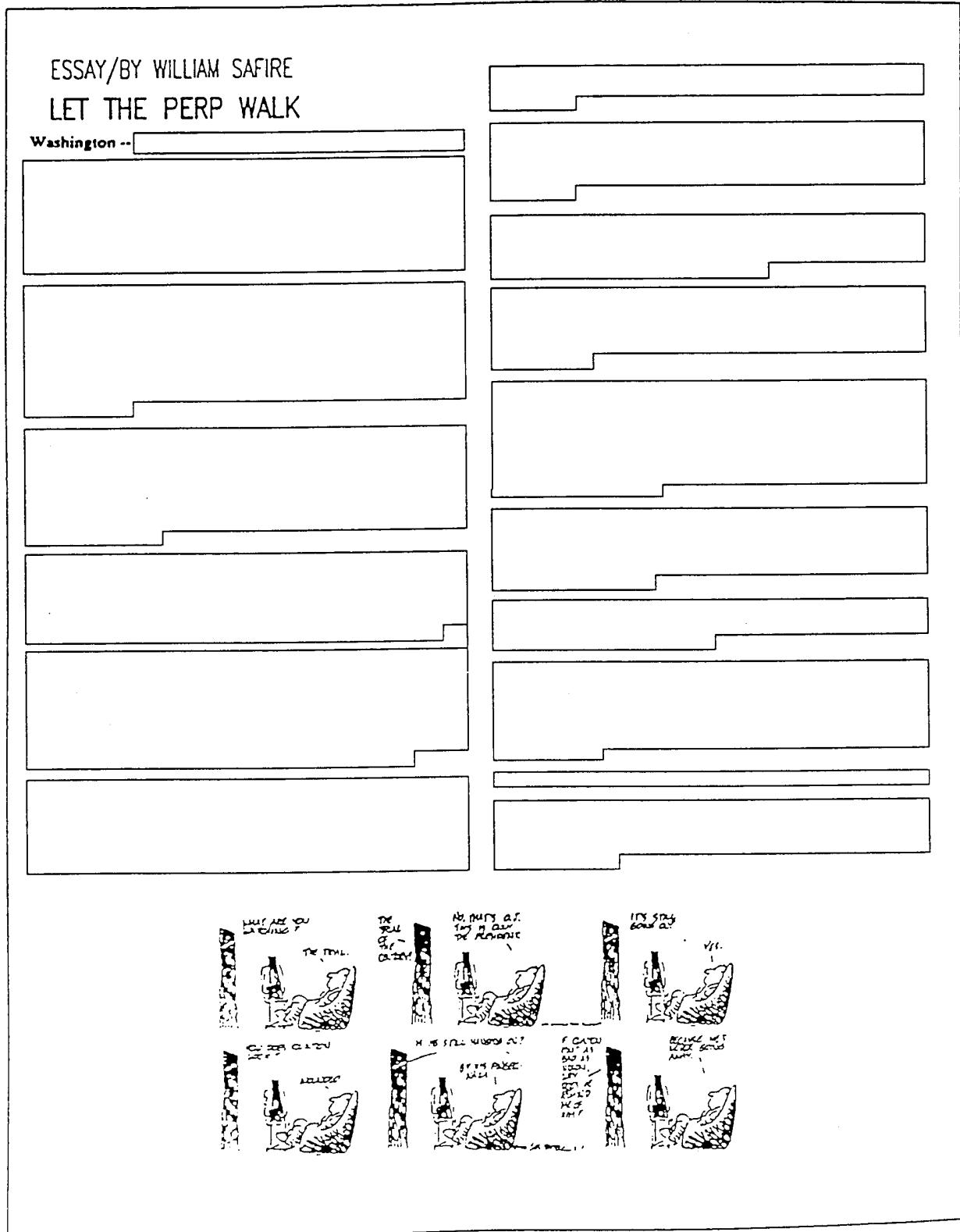


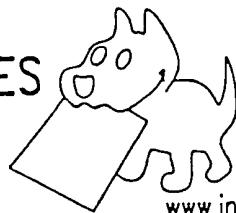
FIG.11D

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# HP INSTANT DELIVERY TIMES

SHORTCUTS, SOLUTIONS AND MORE

MAY 1999



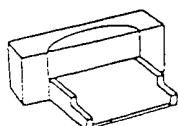
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[www.instant-delivery.com](http://www.instant-delivery.com)

TIME



Slate



HP INSTANT DELIVERY-  
DESIGNED FOR HP PRINTER

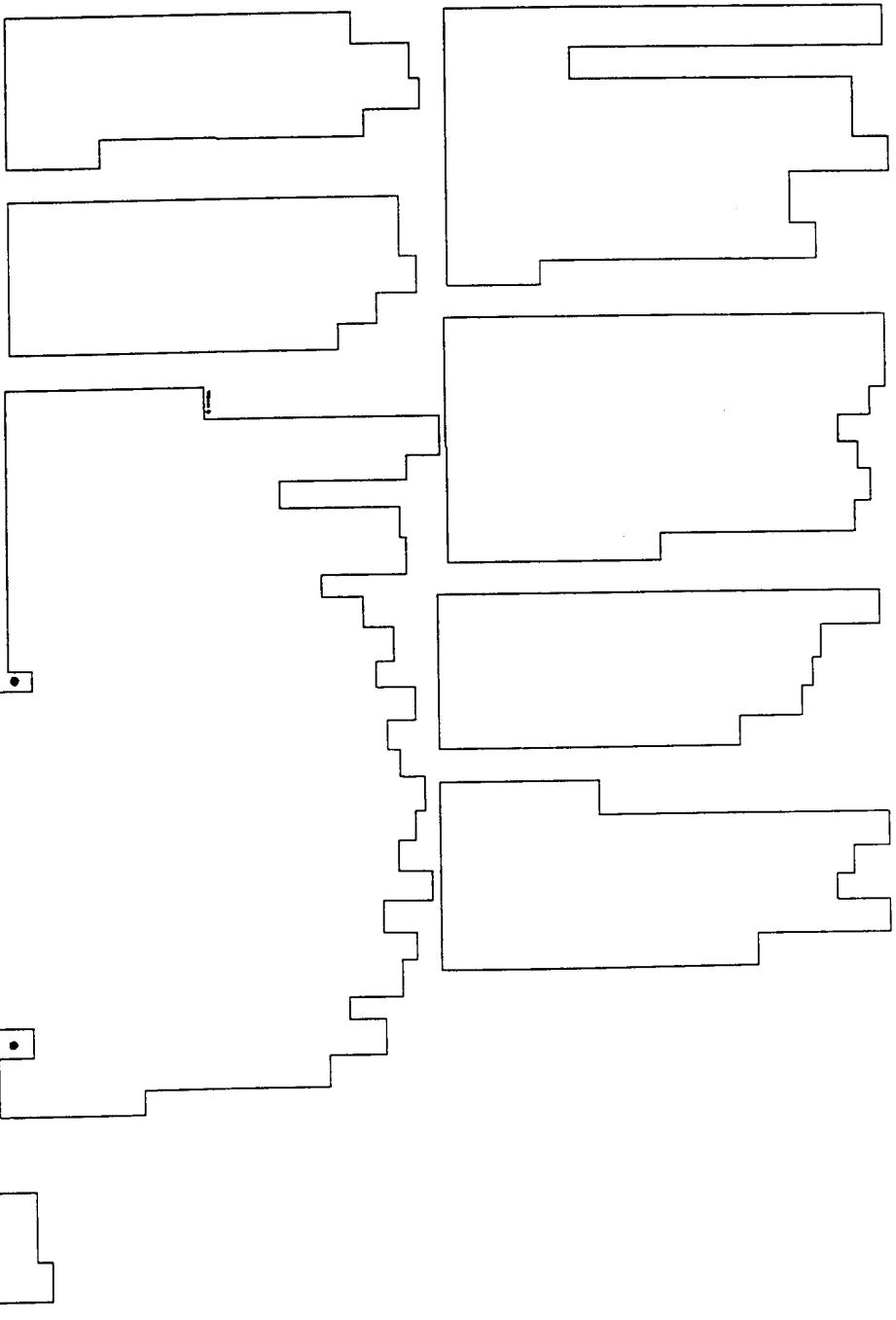


FIG.12

Fig. 13

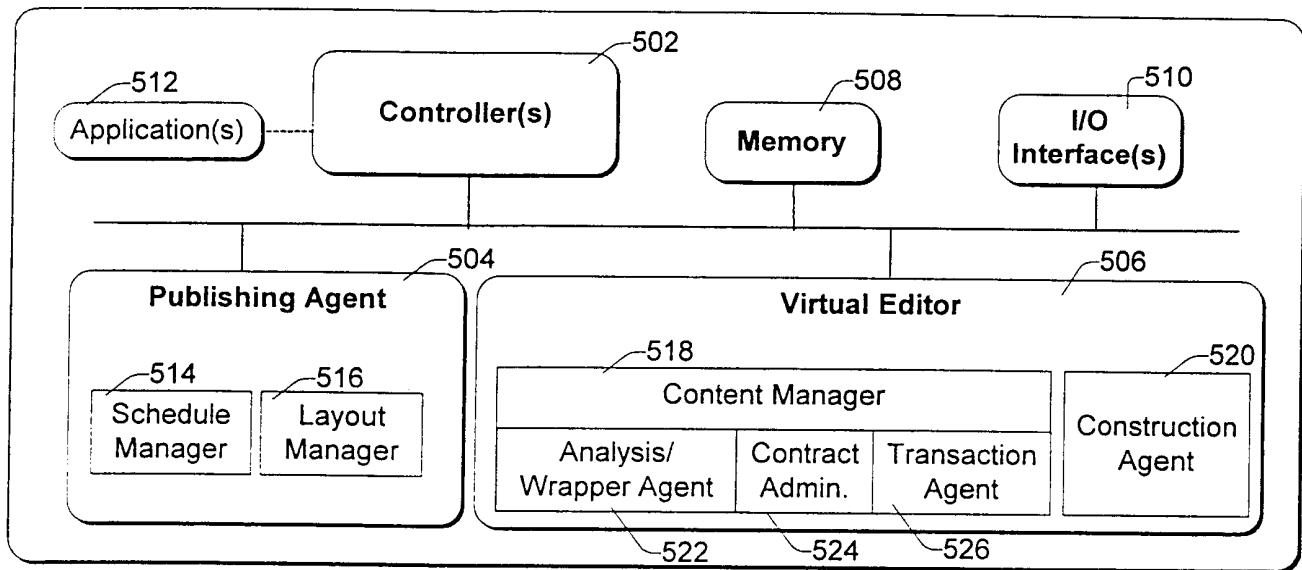


Fig. 14

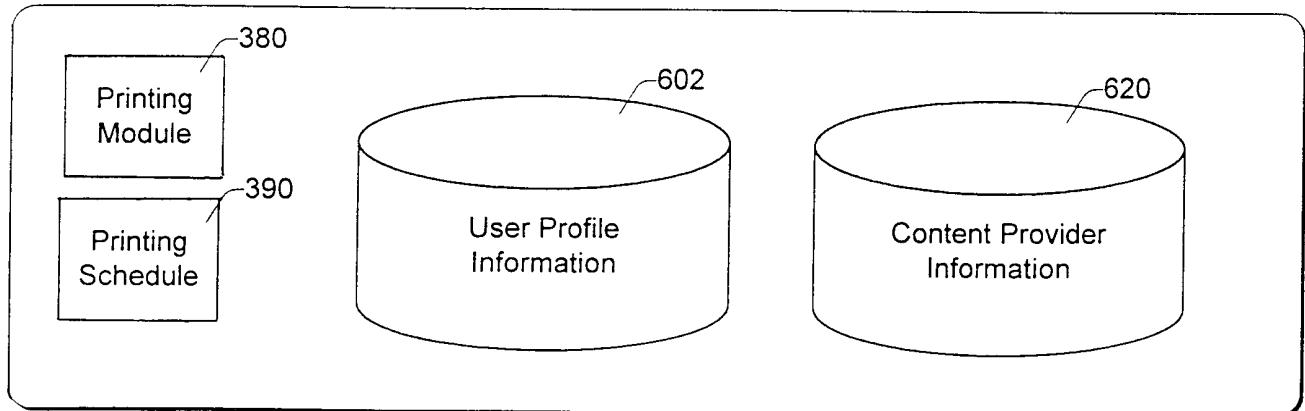


Fig. 15

User_name	User_ID	Contact_info	Interest_info	Subscription_info	Disposition_info	Feedback_info
Gerry Smith	223157	Home Info Office Info Payment Info	NFL Coverage NY Politics ...	Sports Illustrated New York Times ...	Dwnld Print Read Online ...	Forwards Sports ...
Johnny W. Doe	223151	...	...	...	...	...

Fig. 16

Content_prvdr	Prvdr_ID	Wrapper_ID	Rate_schedule	Monthly_usage	Feedback_info
Sports Illustrated	221	132 133 134	.02 .04 .04	10000 1500000 1980000	Feedback_Info
NY Times	223	310 311 312	.03 .05 .05	50000 2250000 2490000	Feedback_info

Fig. 17

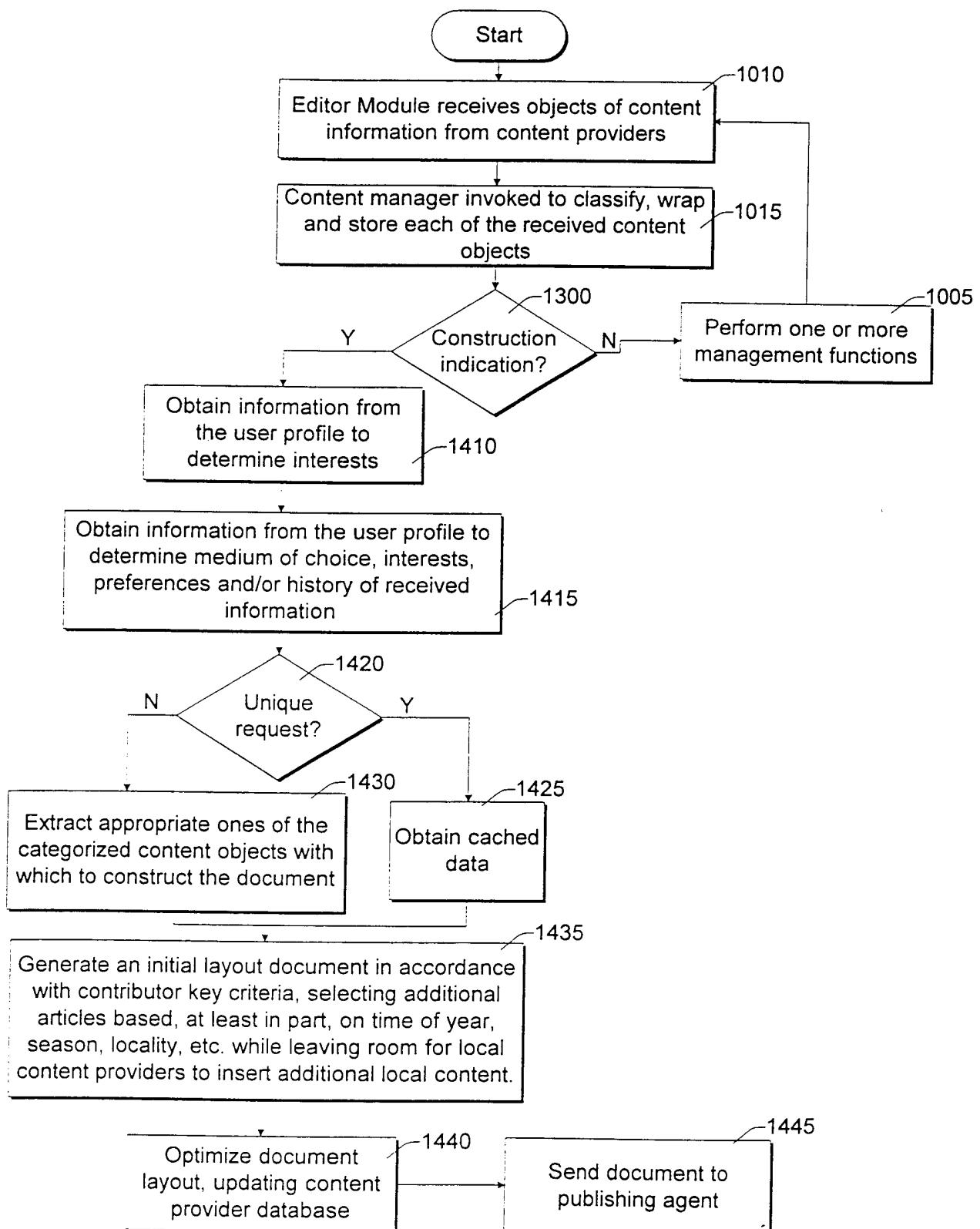


Fig. 18

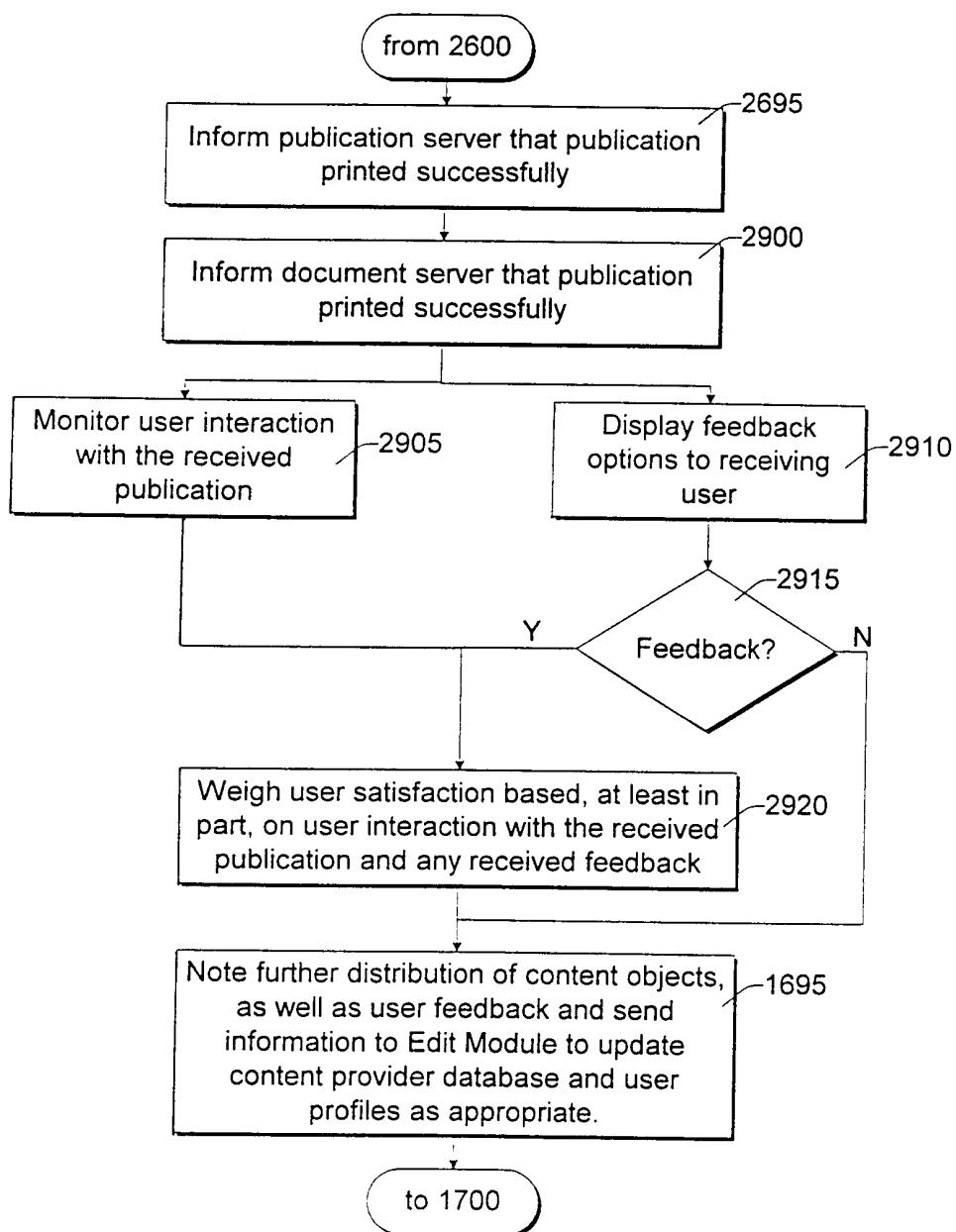


Fig. 19

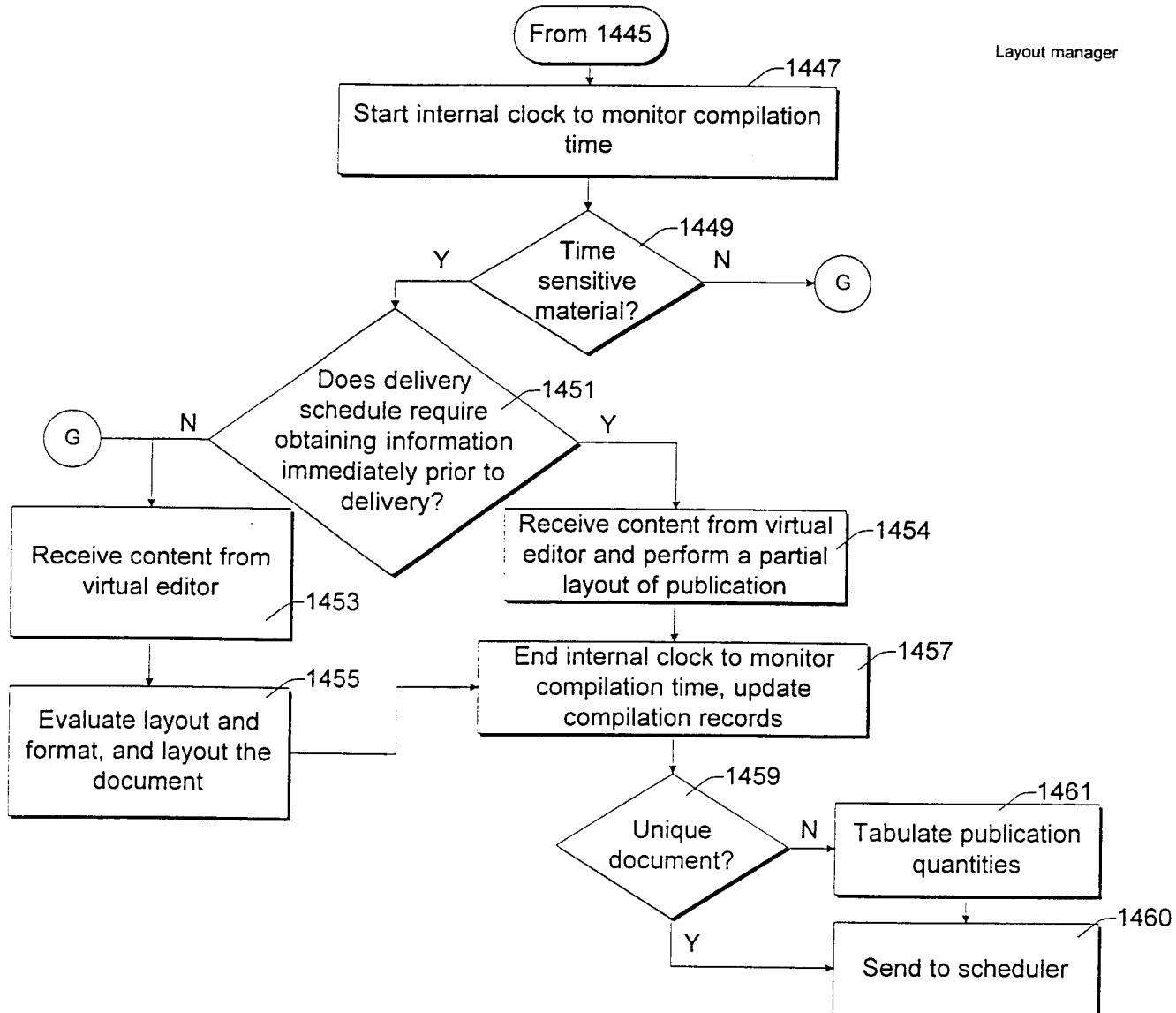
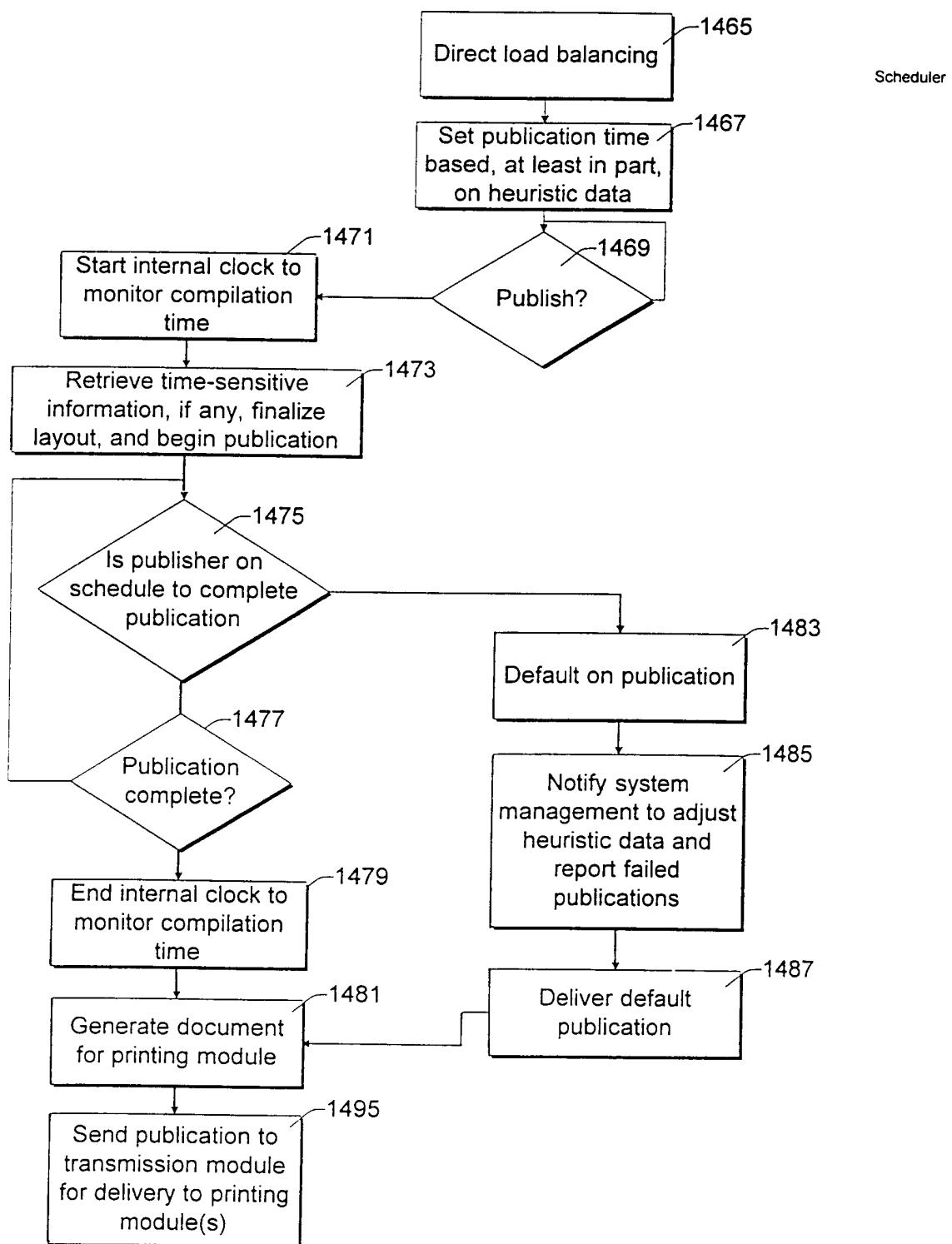


Fig. 20



*Fig. 21*

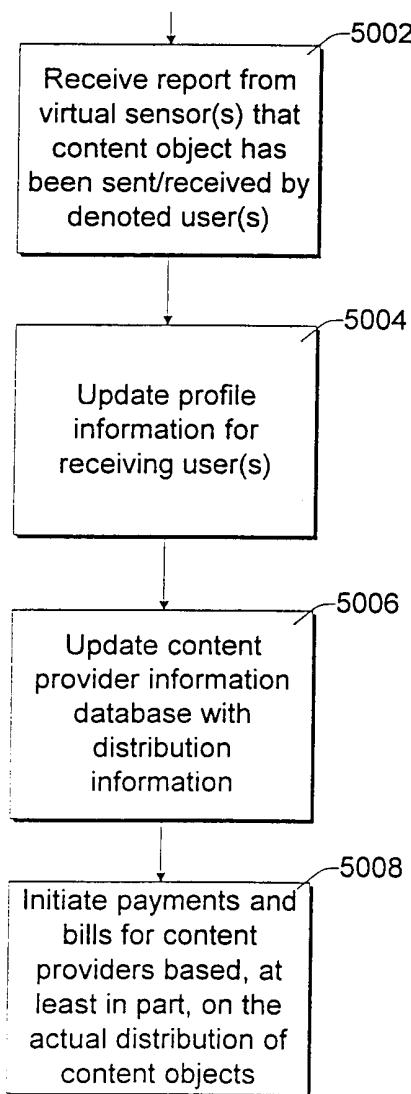


Fig. 22(A)

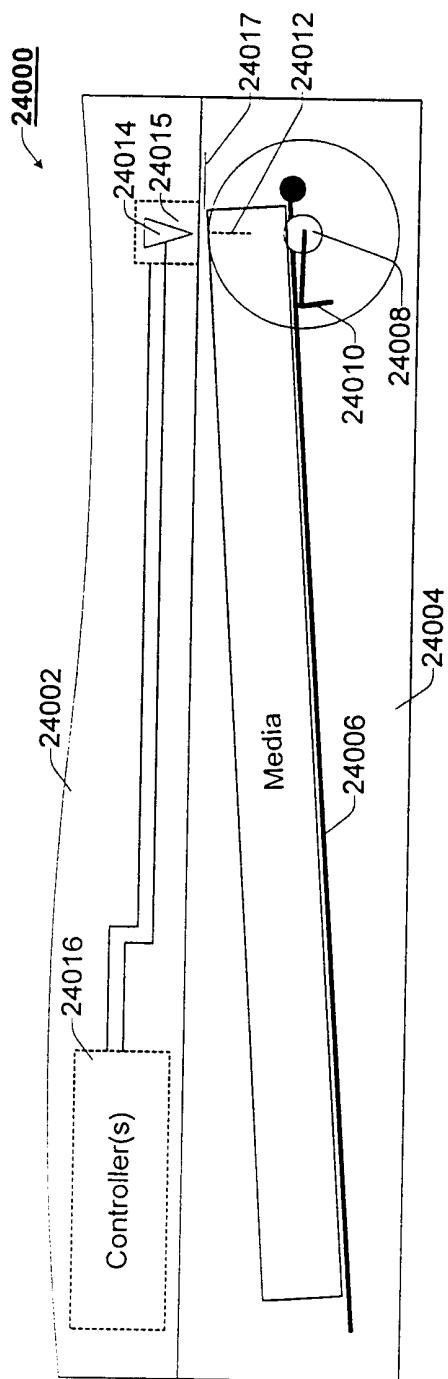
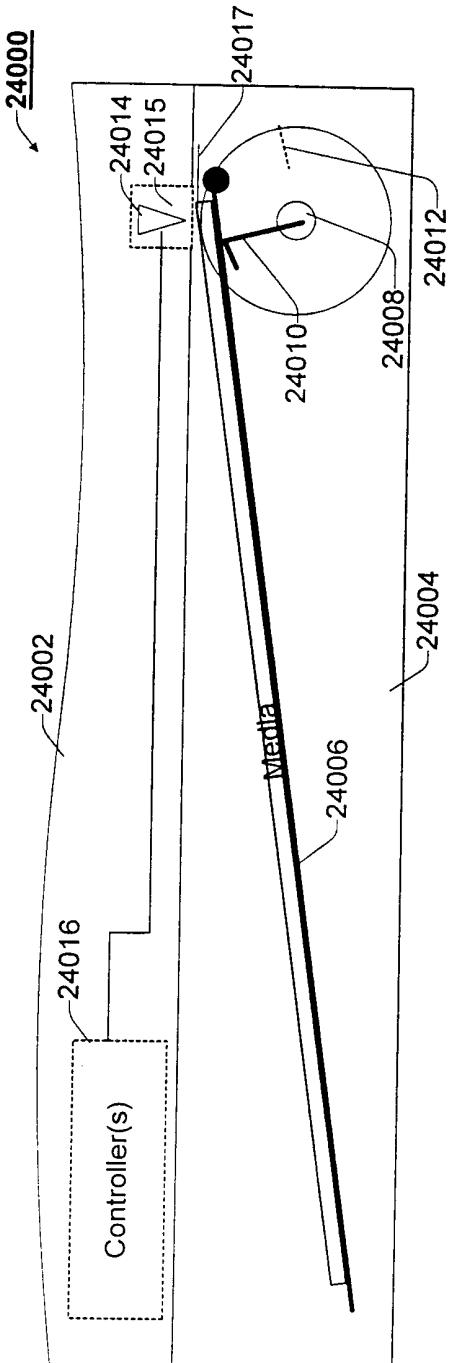
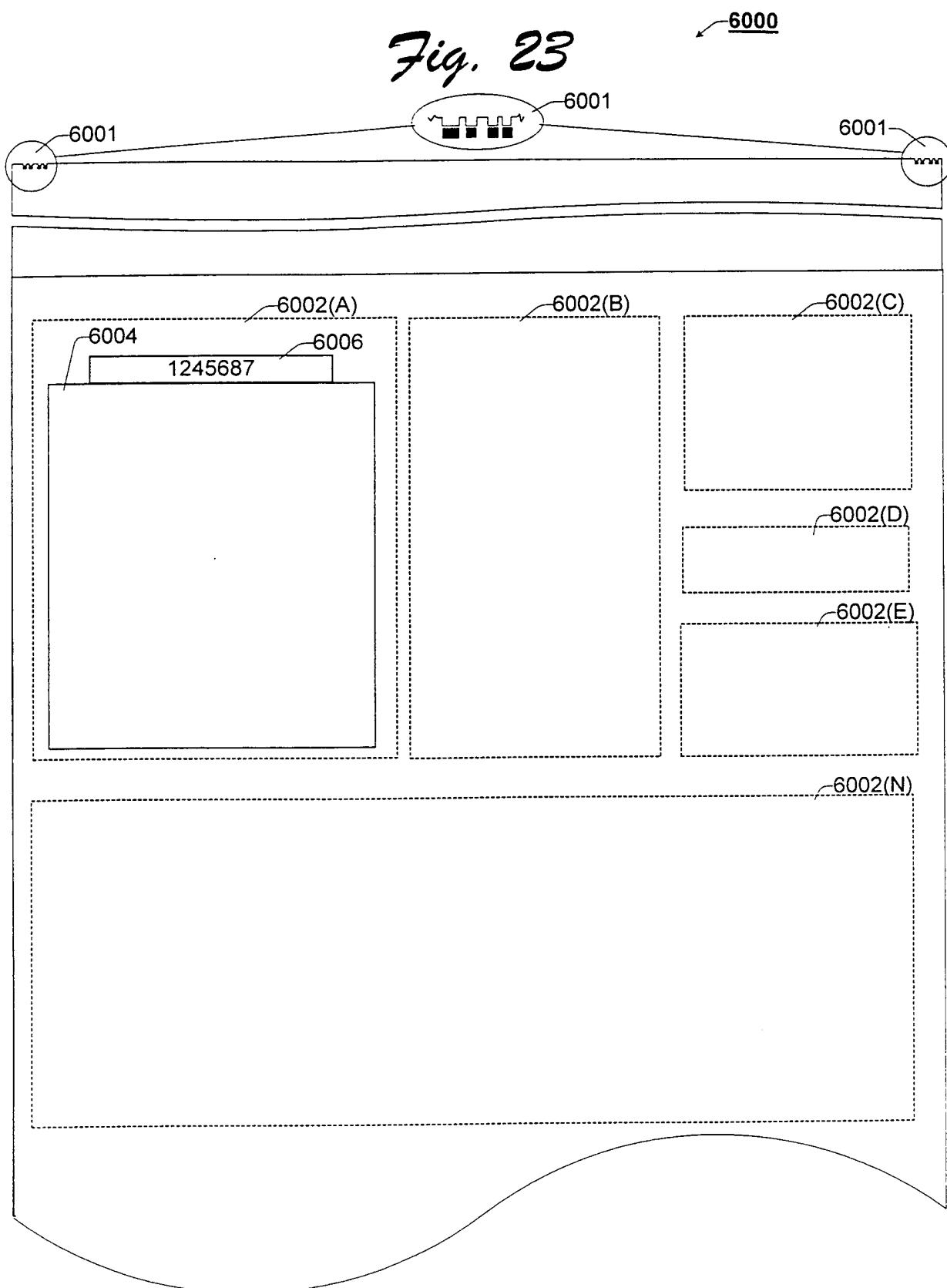


Fig. 22(B)

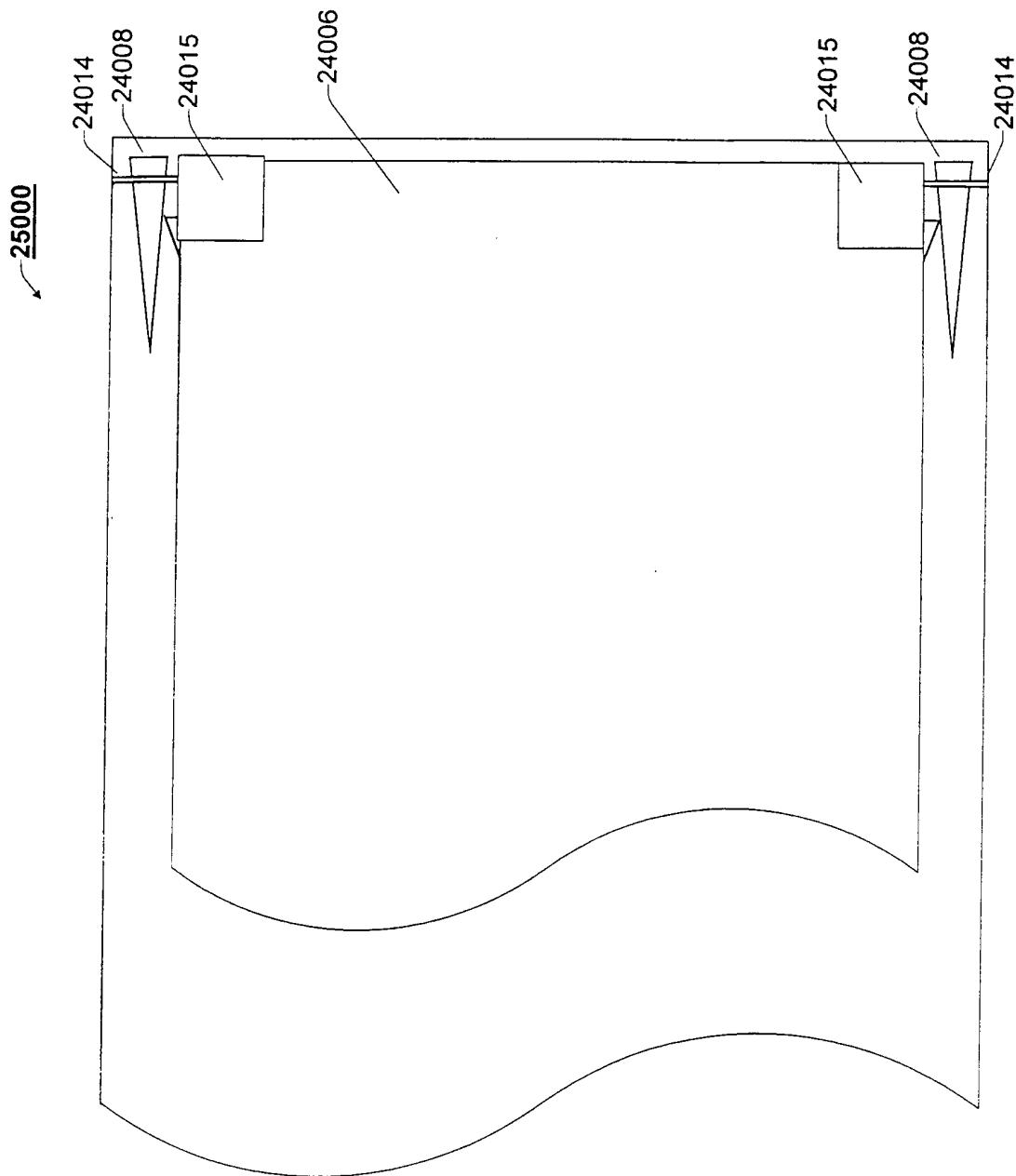


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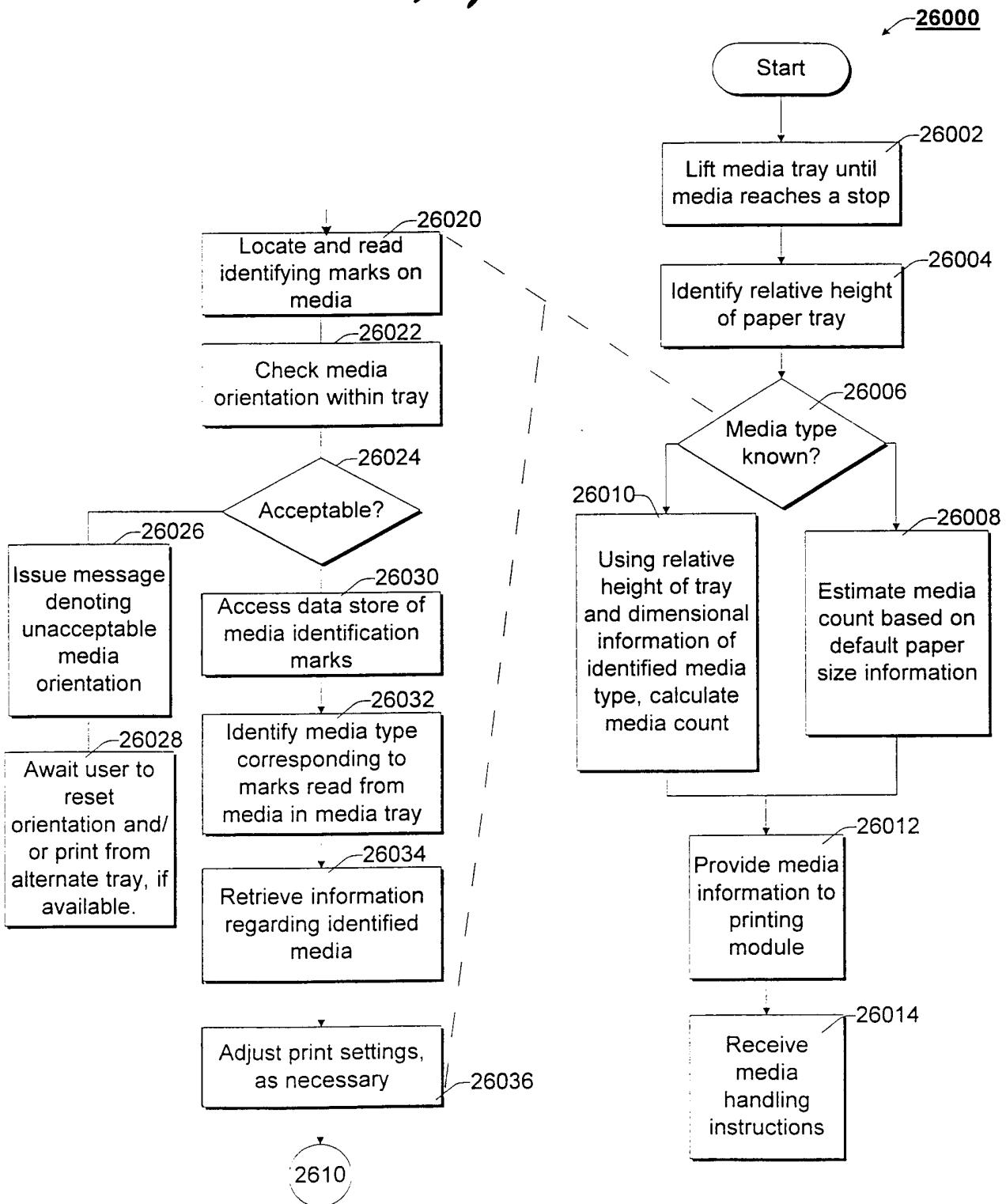
26/28

Fig. 24

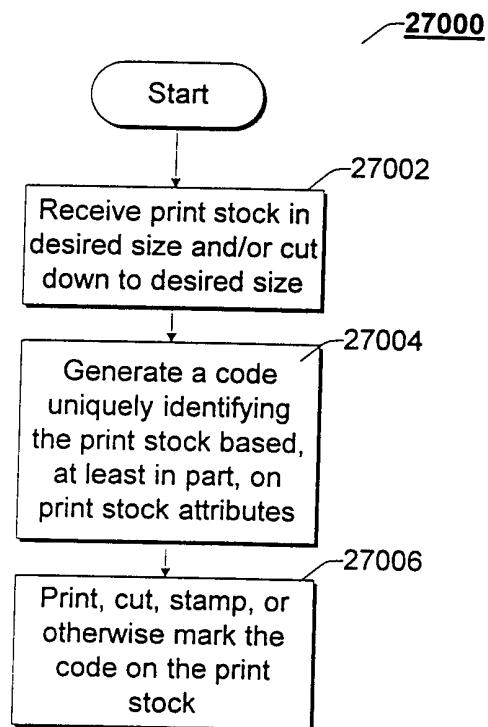


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Fig. 25



*Fig. 26*



## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/15128

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04N1/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 642 260 A (SONY CORP) 8 March 1995 (1995-03-08) abstract	1,2,5, 7-11,15
A	column 2, line 12 - line 47 -----	3,4,6, 12-14,16



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## \* Special categories of cited documents :

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- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

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

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search

3 October 2000

Date of mailing of the international search report

10/10/2000

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/15128

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP 0642260	A 08-03-1995	JP 7061044	A	07-03-1995