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United States Patent [19]

Anabuki

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[45] **Date of Patent: Jul. 18, 2000**

[54] **IMAGE TRANSFER APPARATUS, IMAGE TRANSMITTER, PROFILE INFORMATION TRANSMITTER, IMAGE RECEIVER/ REPRODUCER, STORAGE MEDIUM, IMAGE RECEIVER, PROGRAM TRANSMITTER, AND IMAGE COLOR CORRECTION APPARATUS**

[75] Inventor: **Tetsushi Anabuki**, Ebina, Japan

[73] Assignee: **Fuji Xerox Co., Ltd.**, Tokyo, Japan

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[22] Filed: **Jun. 25, 1997**

[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**[7] **H04N 1/46**; H04N 1/32; G03F 3/08

[52] **U.S. Cl.** **358/500**; 358/442; 358/518

[58] **Field of Search** 358/500, 518, 358/527, 529, 442, 468, 1.1, 1.6, 1.15, 1.13

[56] **References Cited**

U.S. PATENT DOCUMENTS

5,349,452	9/1994	Maeda et al.	358/527
5,720,013	2/1998	Uda et al.	395/114
5,754,184	5/1998	Ring et al.	395/109
5,754,774	5/1998	Bittinger et al.	395/200.33
5,781,909	7/1998	Logan et al.	707/200
5,793,414	8/1998	Shaffer	348/13
5,815,642	9/1998	Kumada	395/109
5,822,507	10/1998	Uda et al.	395/114
5,835,243	11/1998	Mori	358/518
5,933,580	8/1999	Uda et al.	395/112

FOREIGN PATENT DOCUMENTS

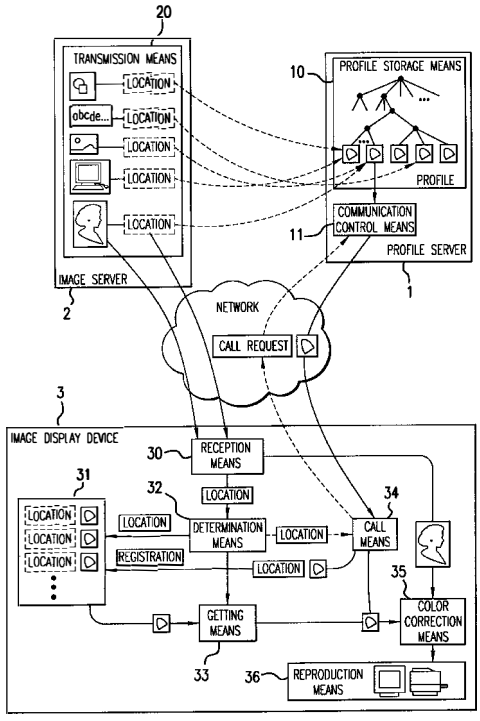
579224	1/1994	European Pat. Off. .
6-038032	2/1994	Japan .
7-203175	8/1995	Japan .
7-312694	11/1995	Japan .

Primary Examiner—Kimberly A. Williams
Attorney, Agent, or Firm—Oliff & Berridge, PLC

[57] **ABSTRACT**

An image transfer apparatus cooperates with an image reception and reproduction means to reduce network burden while transferring profile information. Specifically, a profile storage device is connected to a network. The profile storage device stores profile information for a color correction made to color image information on color image information prepared from object information. An image transmission device transmits profile specification information specifying the profile information corresponding to the color image information or the object information together with the color image information or the object information. A receiving device receives the color image information or the object information and the profile specification information transmitted by the image transmission means. A call device requests profile information specified by the profile specification information received by the reception device from the profile storage device. A color correction device then uses the profile information to make a color correction in the color image information or color image information prepared from the object information. A reproducing device then reproduces the color corrected color image information.

15 Claims, 15 Drawing Sheets



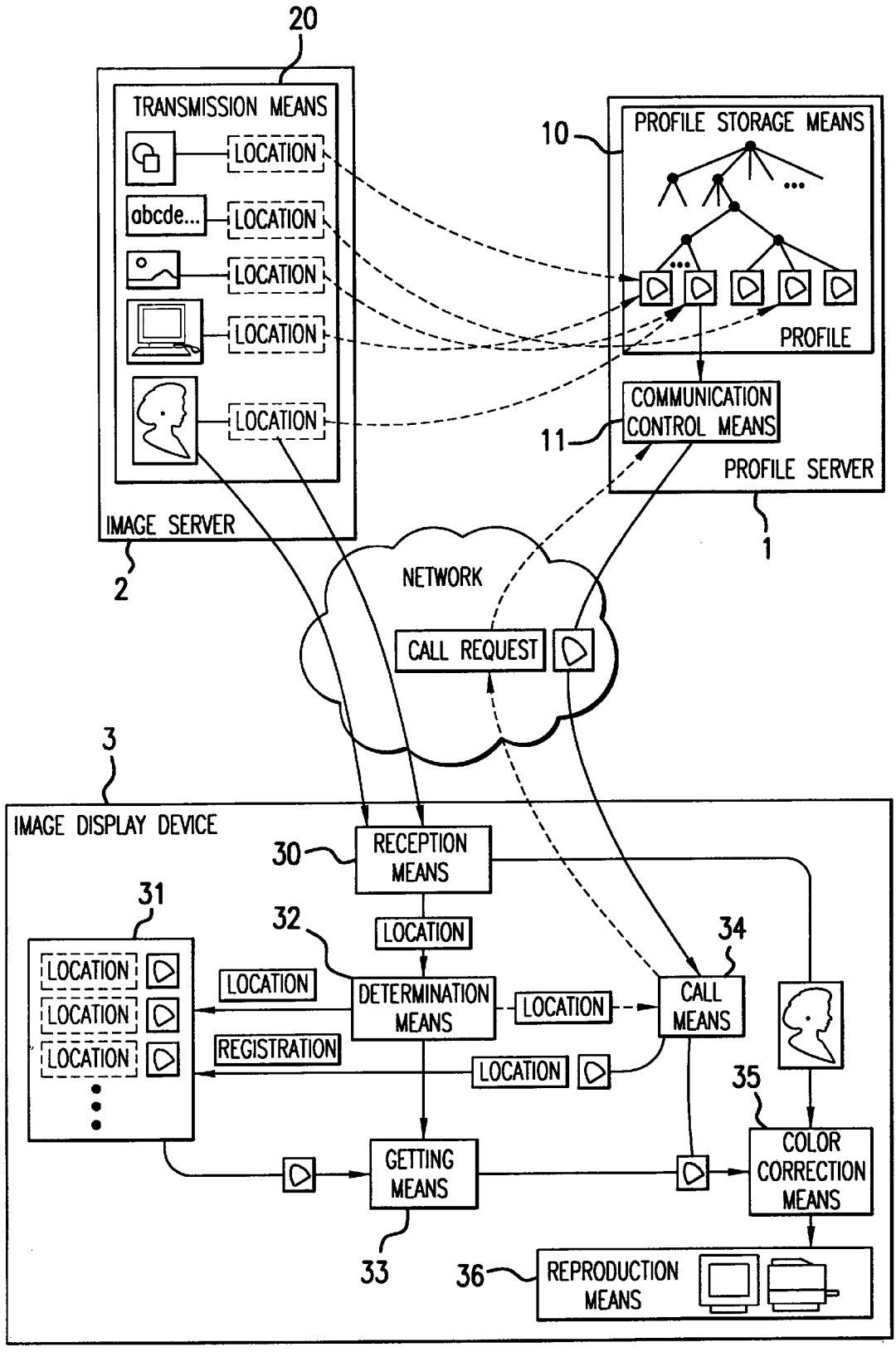

20
TRANSMISSION MEANS
LOCATION
abcde...
LOCATION
LOCATION
LOCATION
LOCATION
IMAGE SERVER
2
10
PROFILE STORAGE MEANS
PROFILE
COMMUNICATION CONTROL MEANS
11
PROFILE SERVER
1
NETWORK
CALL REQUEST
3
IMAGE DISPLAY DEVICE
30
RECEPTION MEANS
31
32
LOCATION
34
LOCATION
LOCATION
LOCATION
DETERMINATION MEANS
LOCATION
CALL MEANS
REGISTRATION
LOCATION
35
GETTING MEANS
COLOR CORRECTION MEANS
33
36
REPRODUCTION MEANS

FIG.1

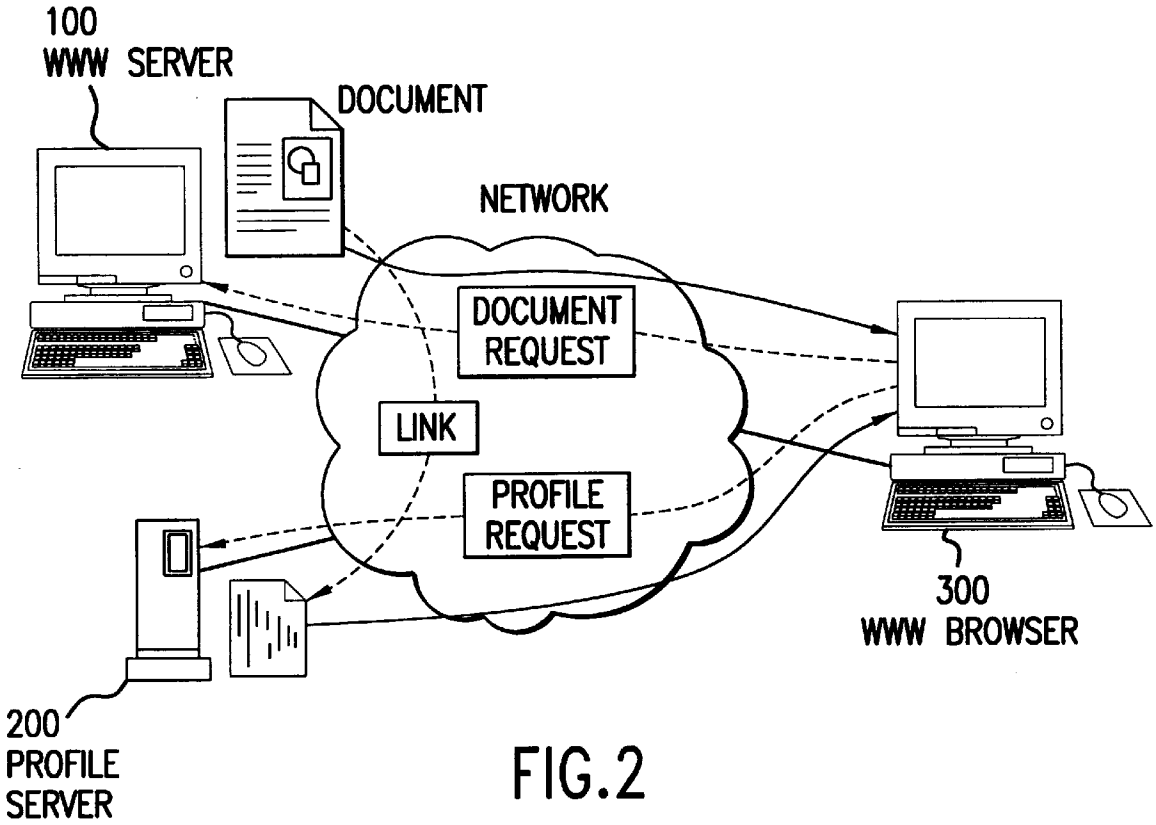

100
WWW SERVER
DOCUMENT
NETWORK
DOCUMENT REQUEST
LINK
PROFILE REQUEST
300
WWW BROWSER
200
PROFILE SERVER

FIG.2

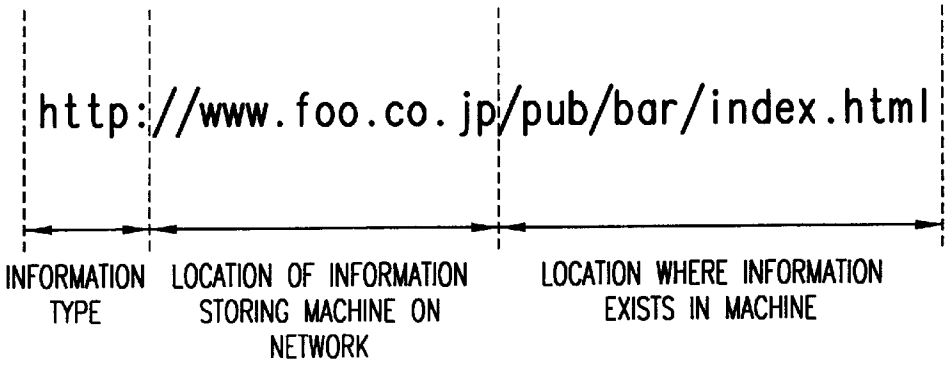

http://www.foo.co.jp/pub/bar/index.html
INFORMATION TYPE
LOCATION OF INFORMATION STORING MACHINE ON NETWORK
LOCATION WHERE INFORMATION EXISTS IN MACHINE

FIG.3

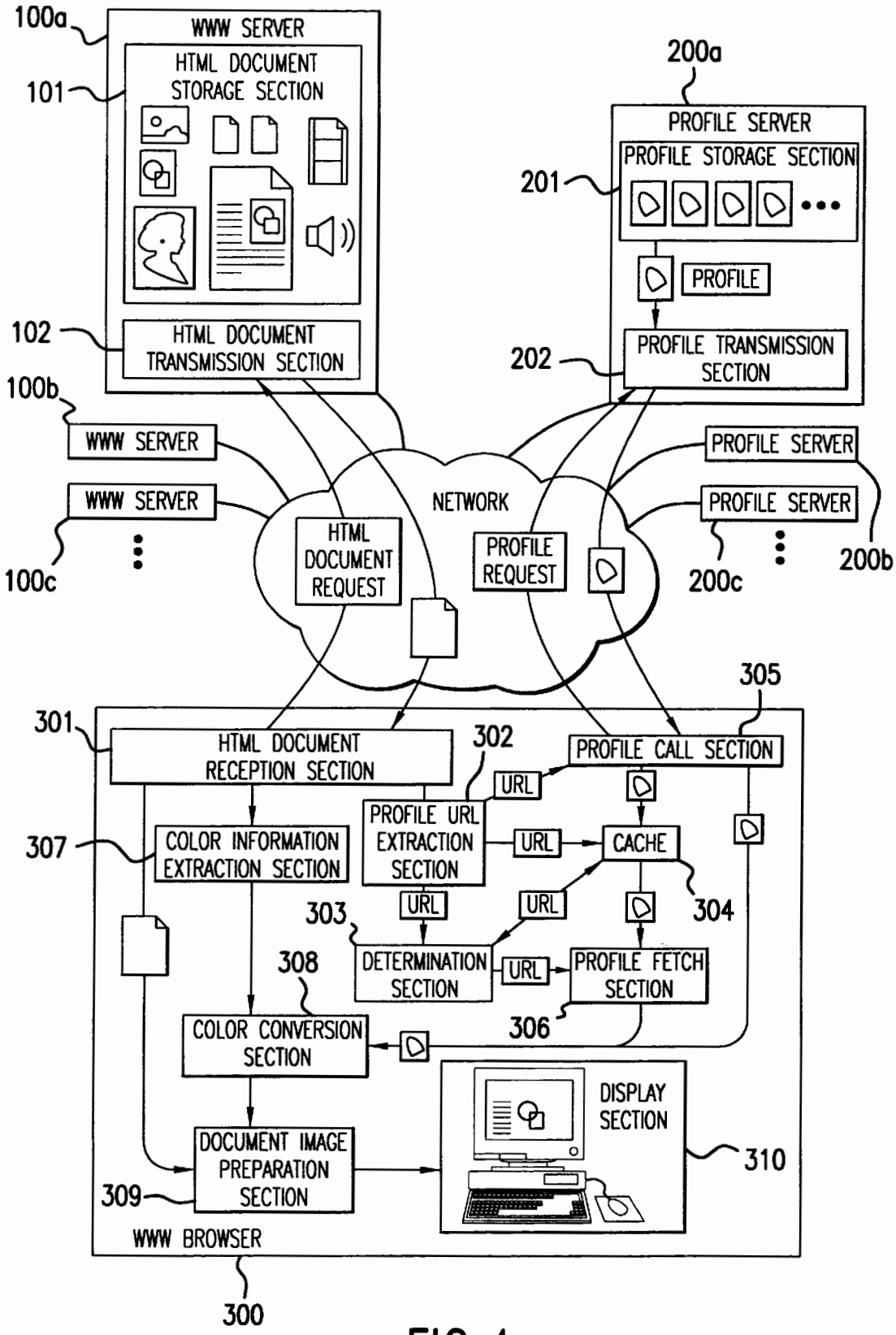

100a
WWW SERVER
HTML DOCUMENT STORAGE SECTION
101
102
HTML DOCUMENT TRANSMISSION SECTION
200a
PROFILE SERVER
PROFILE STORAGE SECTION
201
PROFILE
202
PROFILE TRANSMISSION SECTION
100b
WWW SERVER
WWW SERVER
100c
NETWORK
HTML DOCUMENT REQUEST
PROFILE REQUEST
PROFILE SERVER
PROFILE SERVER
200c
200b
305
301
HTML DOCUMENT RECEPTION SECTION
302
PROFILE CALL SECTION
URL
PROFILE URL EXTRACTION SECTION
URL
CACHE
307
COLOR INFORMATION EXTRACTION SECTION
URL
URL
304
303
DETERMINATION SECTION
URL
PROFILE FETCH SECTION
308
306
COLOR CONVERSION SECTION
DISPLAY SECTION
310
DOCUMENT IMAGE PREPARATION SECTION
309
WWW BROWSER
300

FIG.4

HTML NOTATION EXAMPLE

```
<HTML>
<BODY COLORSPACE="RGB" PROFILE="fille://ftp. xx
xxx. co. jp/pub/profile/fx-std-rab.prf" TEXT="#F0000">
. . . . .
. . . . .
<FONT COLOR= "#00FF00">
. . . . .
. . . . .
</FONT>
. . . . .
. . . . .
<IMG SRC="portrait. img">
. . . . .
. . . . .
<IMG SRC="digital-x.img" COLORSPACE="CMYK" PRO
FILE="fille://ftp.xxxxx.co. jp/pub/profile/xxxxx-logo.prf">
. . . . .
. . . . .
<BLOCK COLORSPACE="CMYK" PROFILE="fille://ftp.
xxxxx.com/pub/profile/swop.prf" TEXT="#FF000000">
. . . . .
. . . . .
<IMG SRC="swopn1.img">
. . . . .
. . . . .
</BLOCK>
. . . . .
. . . . .
</BODY>
</HTML>
```

FIG.5

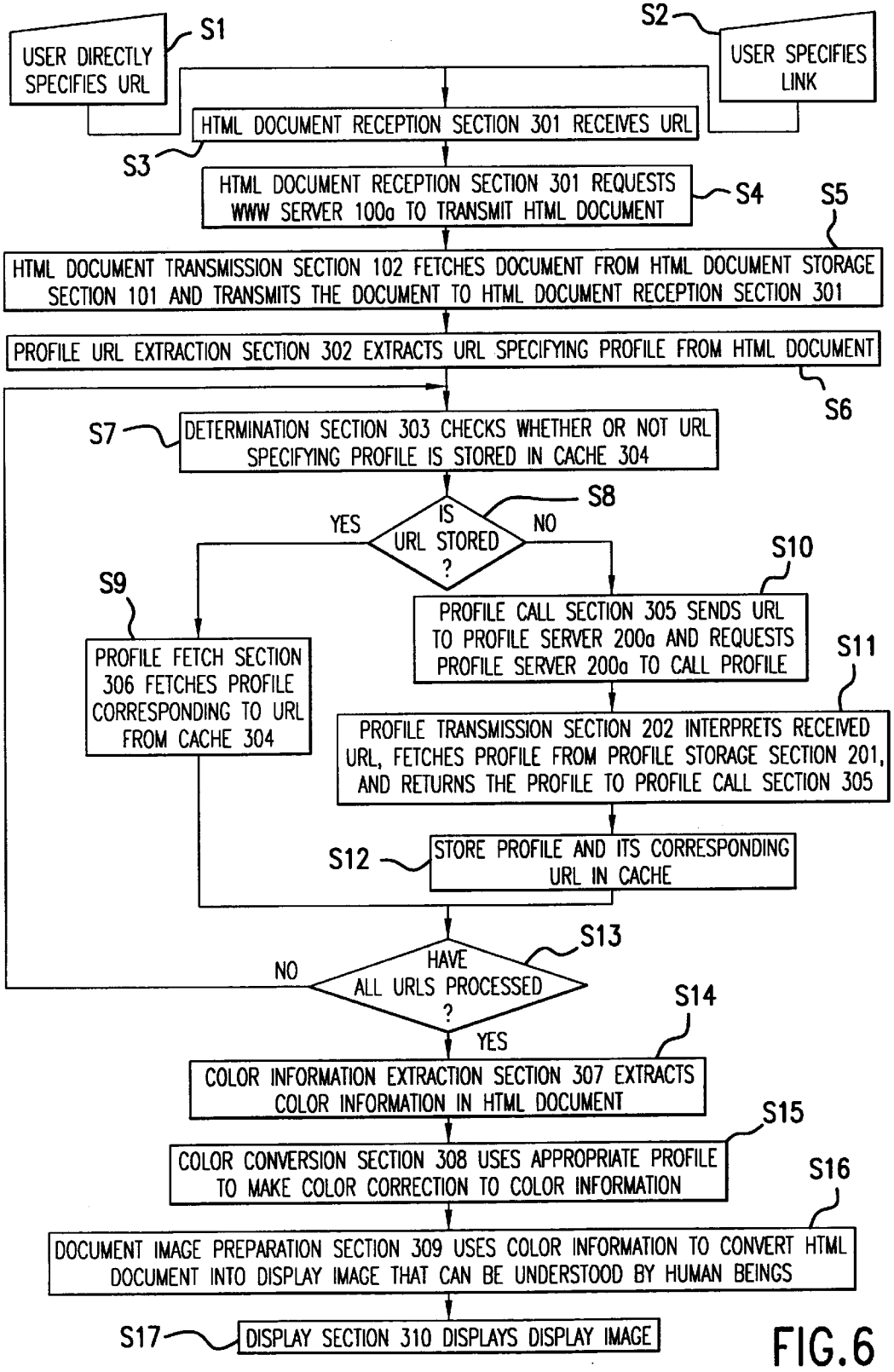

S1
USER DIRECTLY SPECIFIES URL
S2
USER SPECIFIES LINK
HTML DOCUMENT RECEPTION SECTION 301 RECEIVES URL
S3
HTML DOCUMENT RECEPTION SECTION 301 REQUESTS WWW SERVER 100a TO TRANSMIT HTML DOCUMENT
S4
S5
HTML DOCUMENT TRANSMISSION SECTION 102 FETCHES DOCUMENT FROM HTML DOCUMENT STORAGE SECTION 101 AND TRANSMITS THE DOCUMENT TO HTML DOCUMENT RECEPTION SECTION 301
PROFILE URL EXTRACTION SECTION 302 EXTRACTS URL SPECIFYING PROFILE FROM HTML DOCUMENT
S6
S7
DETERMINATION SECTION 303 CHECKS WHETHER OR NOT URL SPECIFYING PROFILE IS STORED IN CACHE 304
S8
IS URL STORED ?
YES
NO
S9
PROFILE FETCH SECTION 306 FETCHES PROFILE CORRESPONDING TO URL FROM CACHE 304
S10
PROFILE CALL SECTION 305 SENDS URL TO PROFILE SERVER 200a AND REQUESTS PROFILE SERVER 200a TO CALL PROFILE
S11
PROFILE TRANSMISSION SECTION 202 INTERPRETS RECEIVED URL, FETCHES PROFILE FROM PROFILE STORAGE SECTION 201, AND RETURNS THE PROFILE TO PROFILE CALL SECTION 305
S12
STORE PROFILE AND ITS CORRESPONDING URL IN CACHE
S13
HAVE ALL URLS PROCESSED ?
NO
YES
S14
COLOR INFORMATION EXTRACTION SECTION 307 EXTRACTS COLOR INFORMATION IN HTML DOCUMENT
S15
COLOR CONVERSION SECTION 308 USES APPROPRIATE PROFILE TO MAKE COLOR CORRECTION TO COLOR INFORMATION
S16
DOCUMENT IMAGE PREPARATION SECTION 309 USES COLOR INFORMATION TO CONVERT HTML DOCUMENT INTO DISPLAY IMAGE THAT CAN BE UNDERSTOOD BY HUMAN BEINGS
S17
DISPLAY SECTION 310 DISPLAYS DISPLAY IMAGE

FIG.6

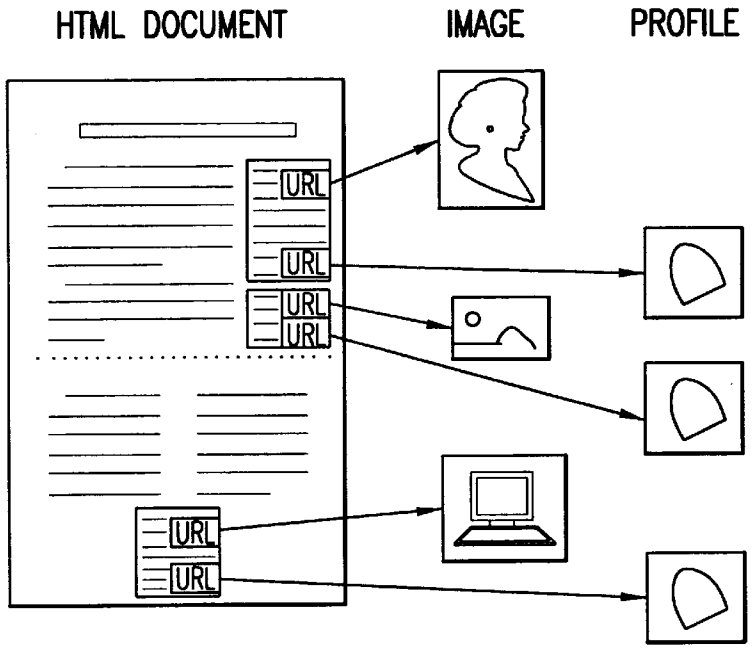

HTML DOCUMENT
IMAGE
PROFILE
URL
URL
URL
URL
URL
URL

FIG.7

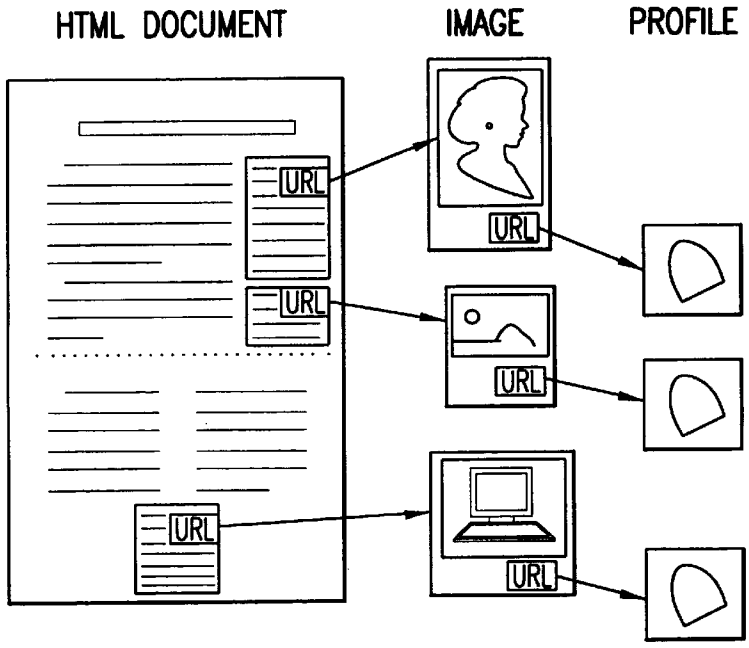

HTML DOCUMENT
IMAGE
PROFILE
URL
URL
URL
URL
URL
URL

FIG.8

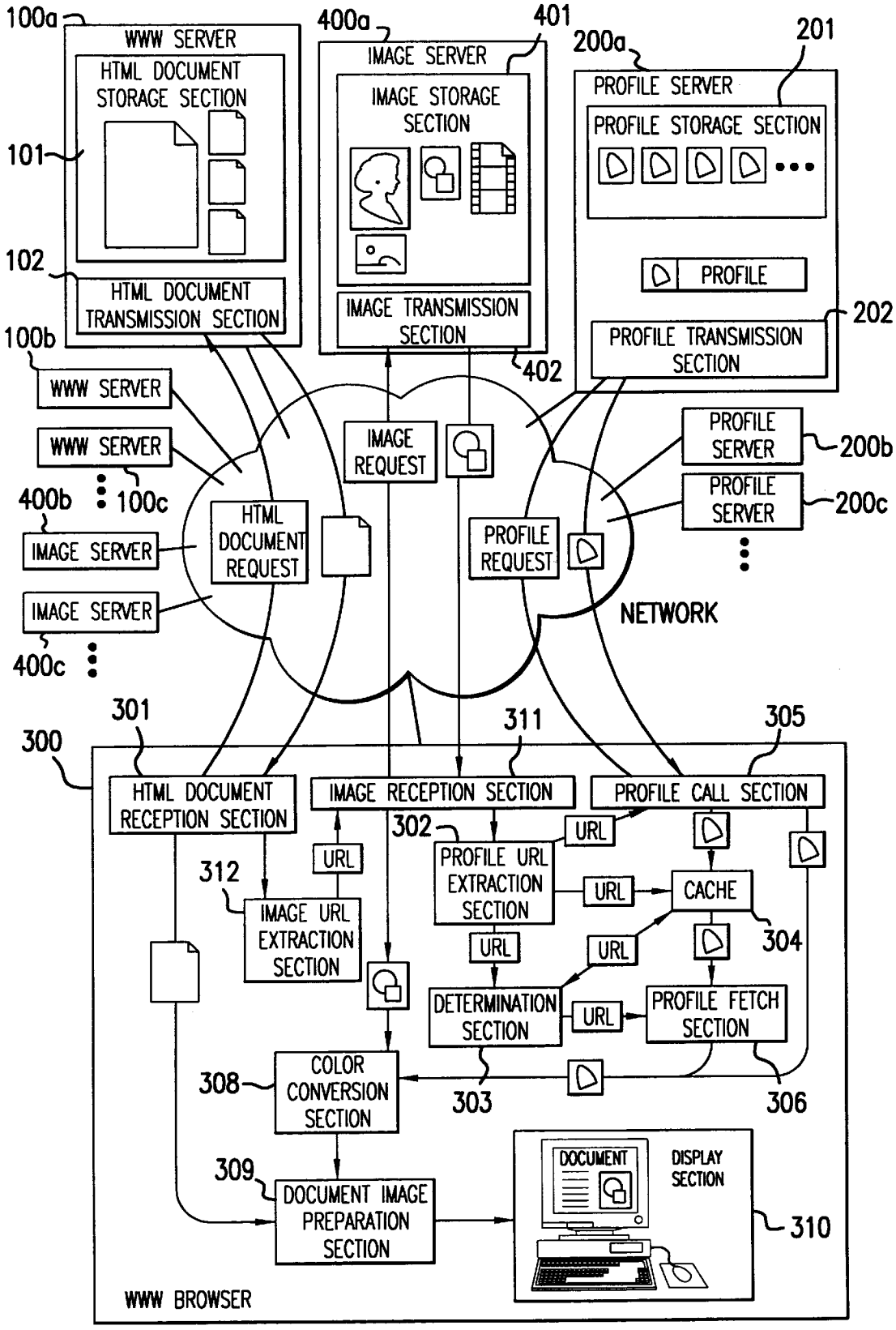

100a
WWW SERVER
HTML DOCUMENT STORAGE SECTION
101
102
HTML DOCUMENT TRANSMISSION SECTION
400a
401
IMAGE SERVER
IMAGE STORAGE SECTION
IMAGE TRANSMISSION SECTION
402
200a
201
PROFILE SERVER
PROFILE STORAGE SECTION
PROFILE
202
PROFILE TRANSMISSION SECTION
100b
WWW SERVER
WWW SERVER
100c
400b
IMAGE SERVER
IMAGE SERVER
400c
HTML DOCUMENT REQUEST
IMAGE REQUEST
PROFILE REQUEST
PROFILE SERVER
200b
PROFILE SERVER
200c
NETWORK
300
301
311
305
HTML DOCUMENT RECEPTION SECTION
IMAGE RECEPTION SECTION
PROFILE CALL SECTION
302
URL
PROFILE URL EXTRACTION SECTION
312
IMAGE URL EXTRACTION SECTION
CACHE
304
DETERMINATION SECTION
PROFILE FETCH SECTION
308
COLOR CONVERSION SECTION
303
306
309
DOCUMENT IMAGE PREPARATION SECTION
DOCUMENT
DISPLAY SECTION
310
WWW BROWSER

FIG.9

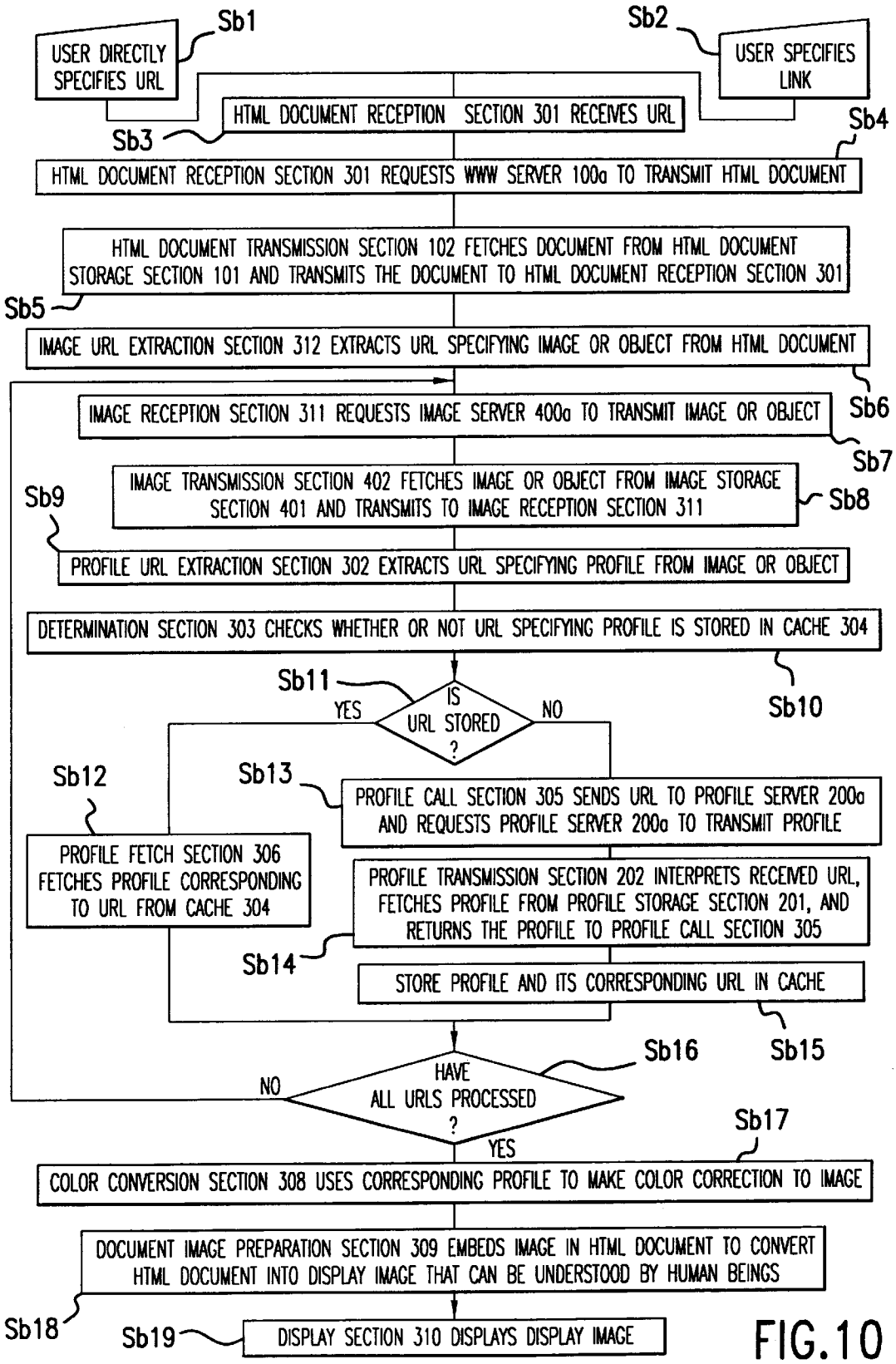

Sb1
USER DIRECTLY SPECIFIES URL
Sb2
USER SPECIFIES LINK
HTML DOCUMENT RECEPTION SECTION 301 RECEIVES URL
Sb3
Sb4
HTML DOCUMENT RECEPTION SECTION 301 REQUESTS WWW SERVER 100a TO TRANSMIT HTML DOCUMENT
HTML DOCUMENT TRANSMISSION SECTION 102 FETCHES DOCUMENT FROM HTML DOCUMENT STORAGE SECTION 101 AND TRANSMITS THE DOCUMENT TO HTML DOCUMENT RECEPTION SECTION 301
Sb5
IMAGE URL EXTRACTION SECTION 312 EXTRACTS URL SPECIFYING IMAGE OR OBJECT FROM HTML DOCUMENT
Sb6
IMAGE RECEPTION SECTION 311 REQUESTS IMAGE SERVER 400a TO TRANSMIT IMAGE OR OBJECT
Sb7
IMAGE TRANSMISSION SECTION 402 FETCHES IMAGE OR OBJECT FROM IMAGE STORAGE SECTION 401 AND TRANSMITS TO IMAGE RECEPTION SECTION 311
Sb8
Sb9
PROFILE URL EXTRACTION SECTION 302 EXTRACTS URL SPECIFYING PROFILE FROM IMAGE OR OBJECT
DETERMINATION SECTION 303 CHECKS WHETHER OR NOT URL SPECIFYING PROFILE IS STORED IN CACHE 304
Sb10
Sb11
IS URL STORED ?
YES
NO
Sb12
Sb13
PROFILE CALL SECTION 305 SENDS URL TO PROFILE SERVER 200a AND REQUESTS PROFILE SERVER 200a TO TRANSMIT PROFILE
PROFILE FETCH SECTION 306 FETCHES PROFILE CORRESPONDING TO URL FROM CACHE 304
PROFILE TRANSMISSION SECTION 202 INTERPRETS RECEIVED URL, FETCHES PROFILE FROM PROFILE STORAGE SECTION 201, AND RETURNS THE PROFILE TO PROFILE CALL SECTION 305
Sb14
STORE PROFILE AND ITS CORRESPONDING URL IN CACHE
Sb15
Sb16
HAVE ALL URLS PROCESSED ?
NO
YES
Sb17
COLOR CONVERSION SECTION 308 USES CORRESPONDING PROFILE TO MAKE COLOR CORRECTION TO IMAGE
DOCUMENT IMAGE PREPARATION SECTION 309 EMBEDS IMAGE IN HTML DOCUMENT TO CONVERT HTML DOCUMENT INTO DISPLAY IMAGE THAT CAN BE UNDERSTOOD BY HUMAN BEINGS
Sb18
Sb19
DISPLAY SECTION 310 DISPLAYS DISPLAY IMAGE

FIG.10

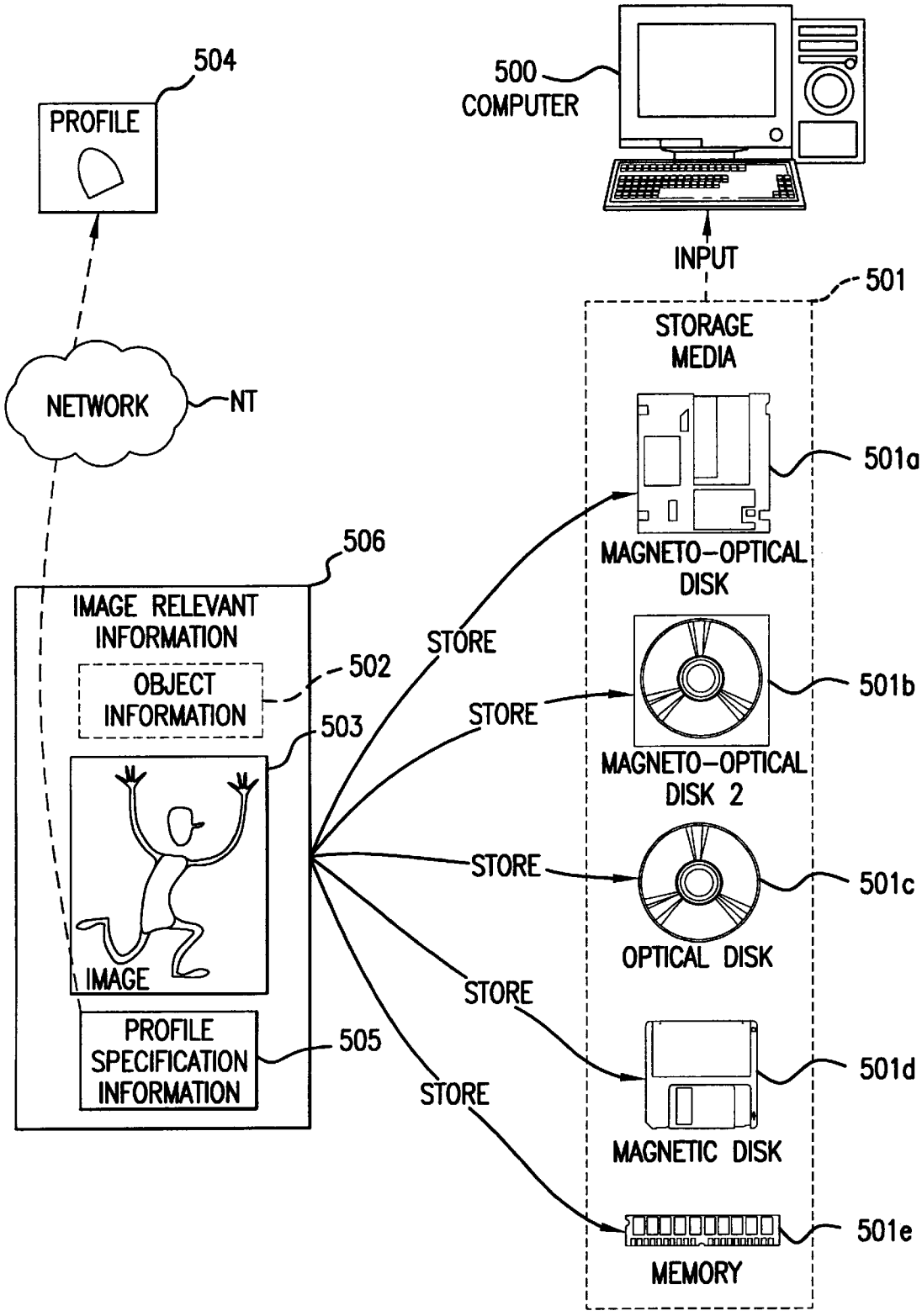

504
PROFILE
500
COMPUTER
INPUT
501
STORAGE MEDIA
NETWORK
NT
501a
MAGNETO-OPTICAL DISK
506
IMAGE RELEVANT INFORMATION
OBJECT INFORMATION
502
503
STORE
STORE
501b
MAGNETO-OPTICAL DISK 2
STORE
501c
OPTICAL DISK
IMAGE
STORE
PROFILE SPECIFICATION INFORMATION
505
501d
STORE
MAGNETIC DISK
501e
MEMORY

FIG.11

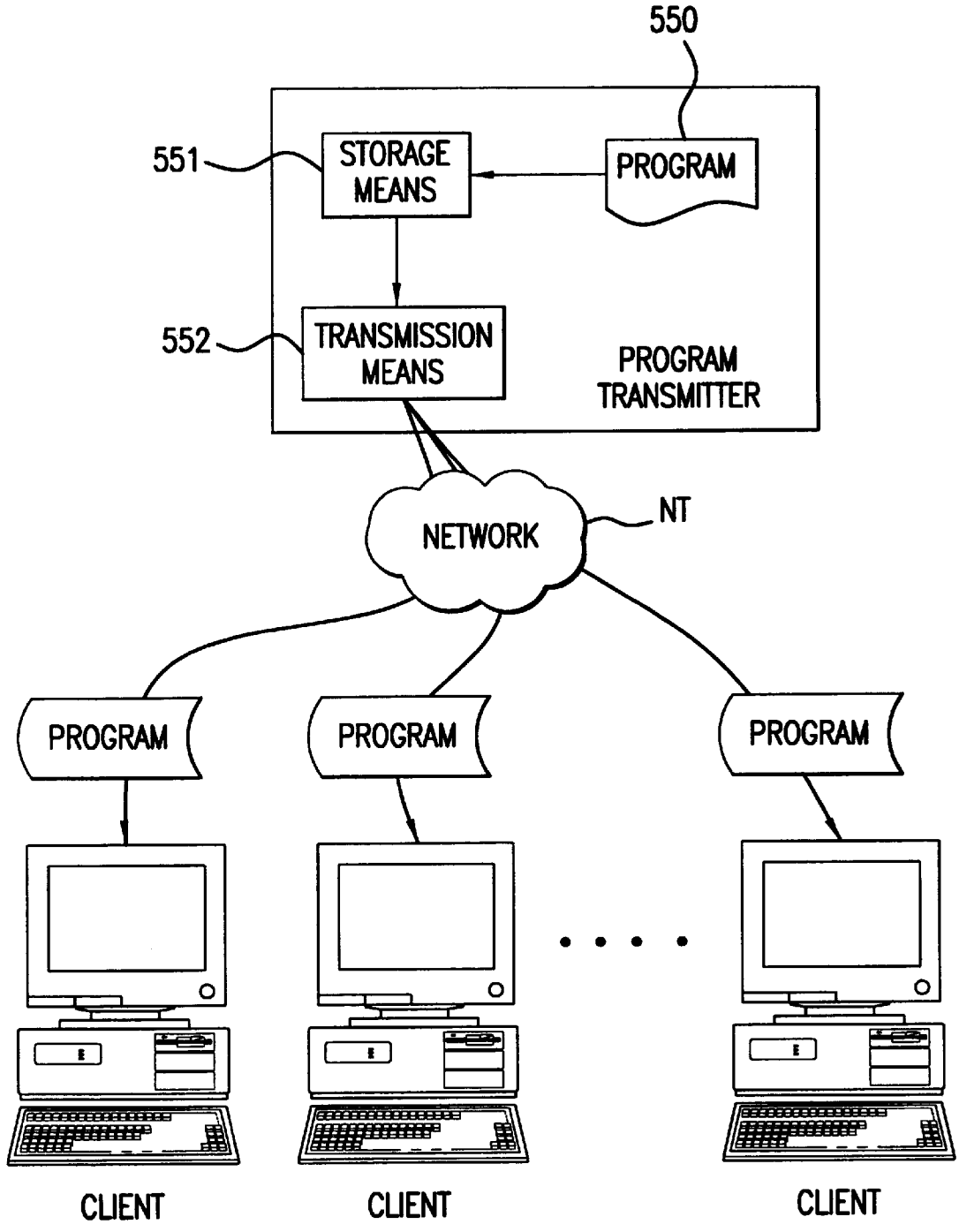

550
551
STORAGE MEANS
PROGRAM
552
TRANSMISSION MEANS
PROGRAM TRANSMITTER
NETWORK
NT
PROGRAM
PROGRAM
PROGRAM
CLIENT
CLIENT
CLIENT

FIG.12

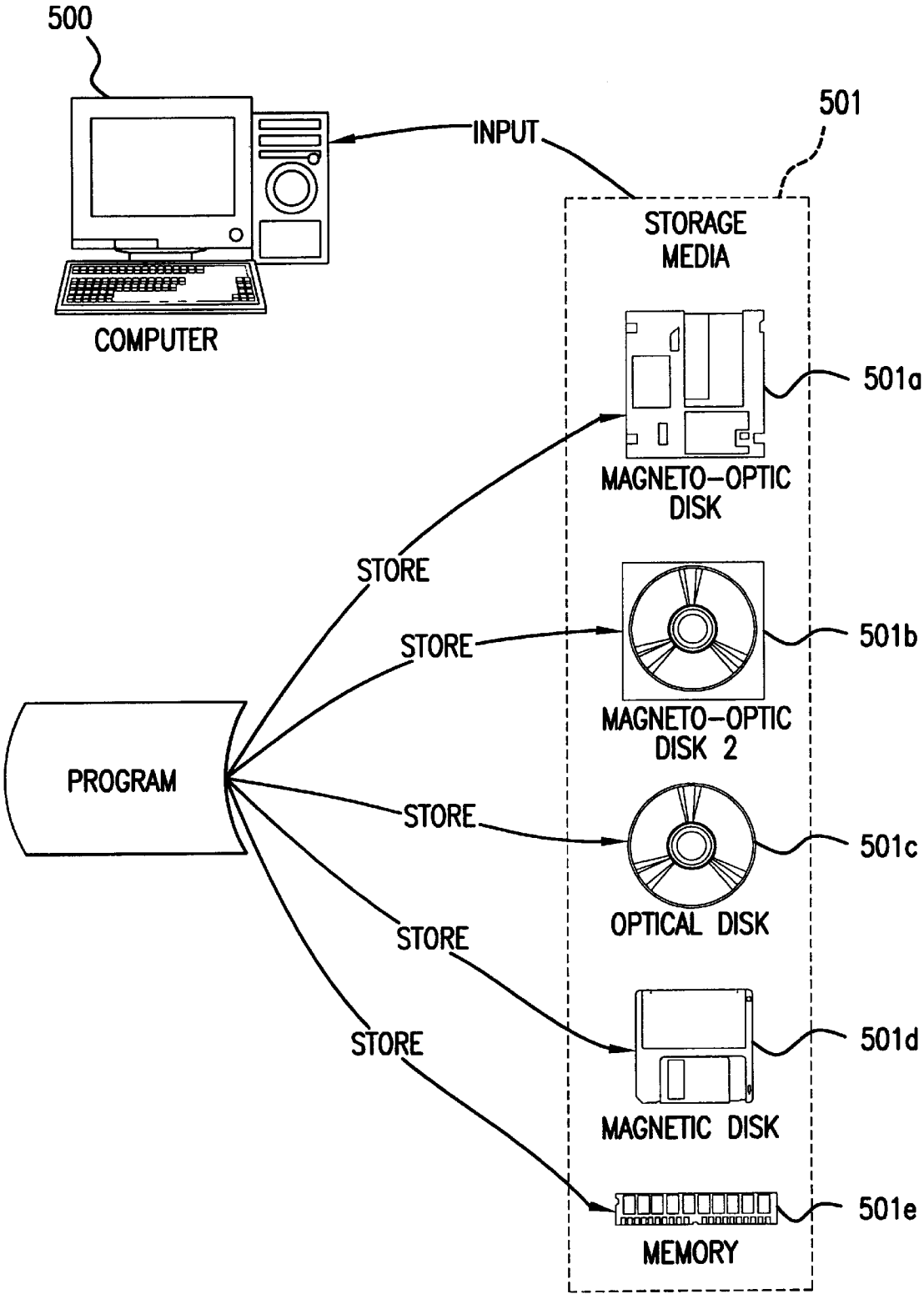

500
COMPUTER
INPUT
501
STORAGE MEDIA
501a
MAGNETO-OPTIC DISK
STORE
STORE
501b
MAGNETO-OPTIC DISK 2
PROGRAM
STORE
501c
OPTICAL DISK
STORE
STORE
501d
MAGNETIC DISK
501e
MEMORY

FIG.13

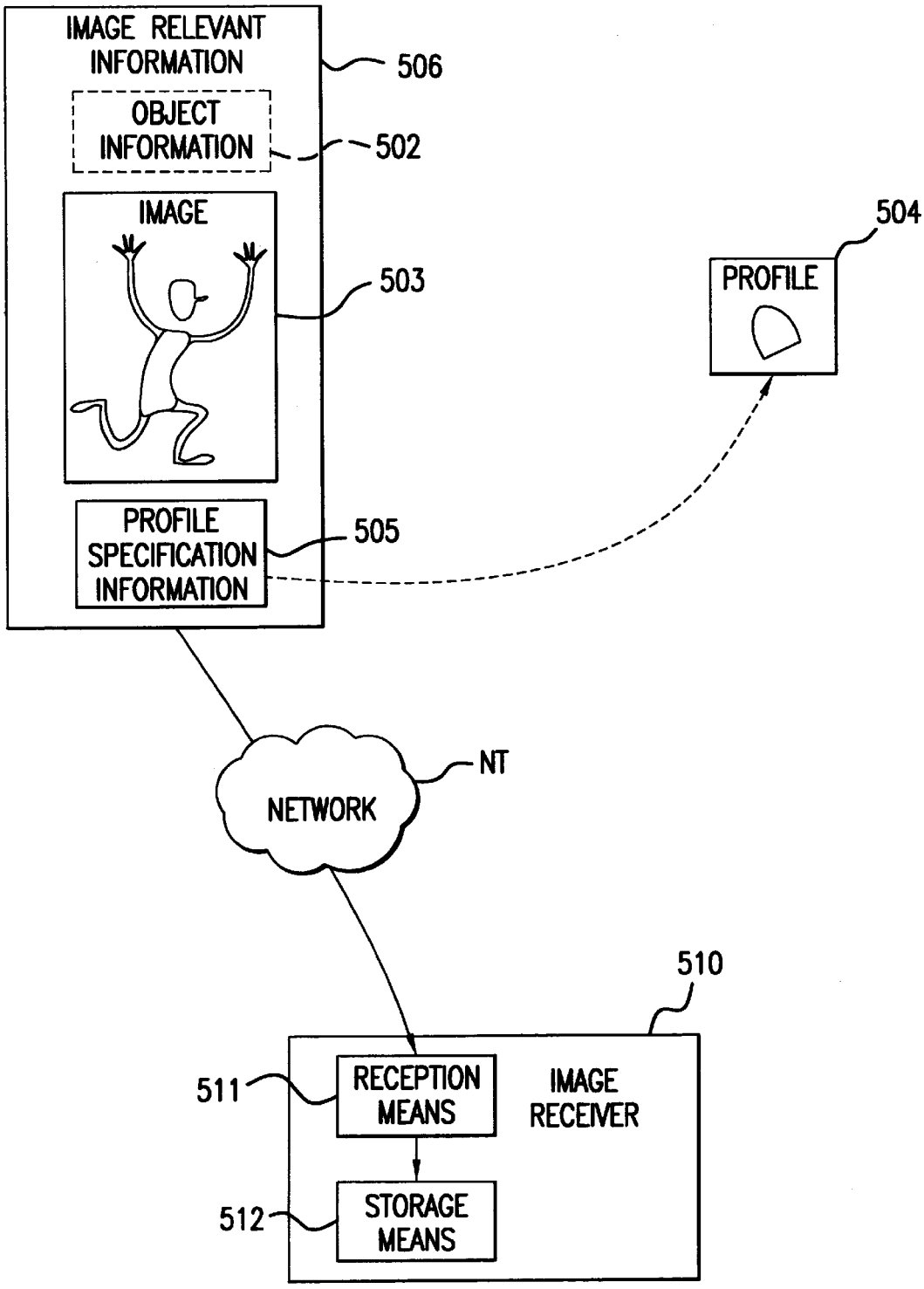


IMAGE RELEVANT INFORMATION
506
OBJECT INFORMATION
502
IMAGE
503
PROFILE
504
PROFILE SPECIFICATION INFORMATION
505
NETWORK
NT
510
511
RECEPTION MEANS
IMAGE RECEIVER
512
STORAGE MEANS

FIG.14

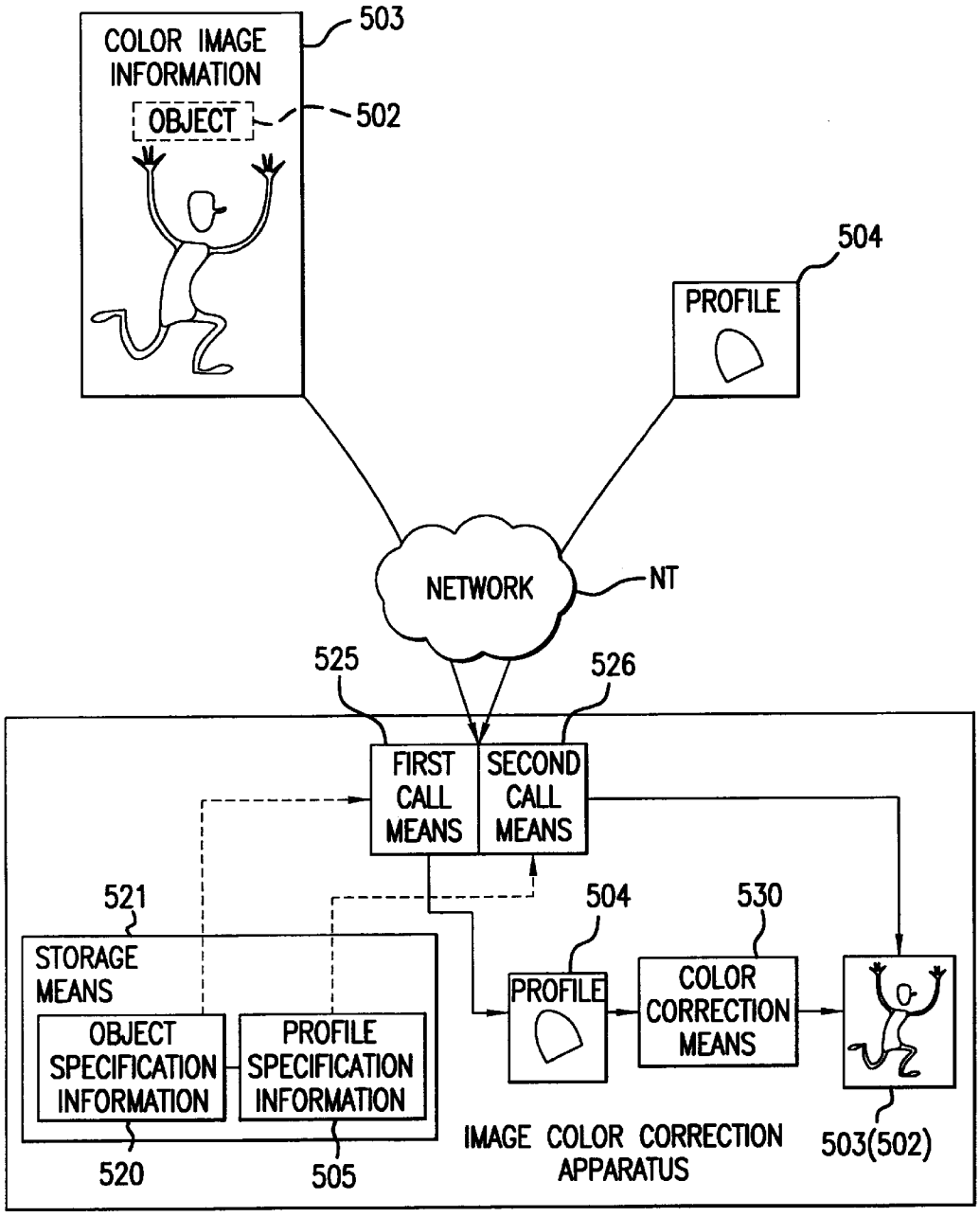

COLOR IMAGE INFORMATION
OBJECT
503
502
504
PROFILE
NETWORK
NT
525
526
FIRST CALL MEANS
SECOND CALL MEANS
521
STORAGE MEANS
OBJECT SPECIFICATION INFORMATION
PROFILE SPECIFICATION INFORMATION
520
505
504
PROFILE
530
COLOR CORRECTION MEANS
IMAGE COLOR CORRECTION APPARATUS
503(502)

FIG.15

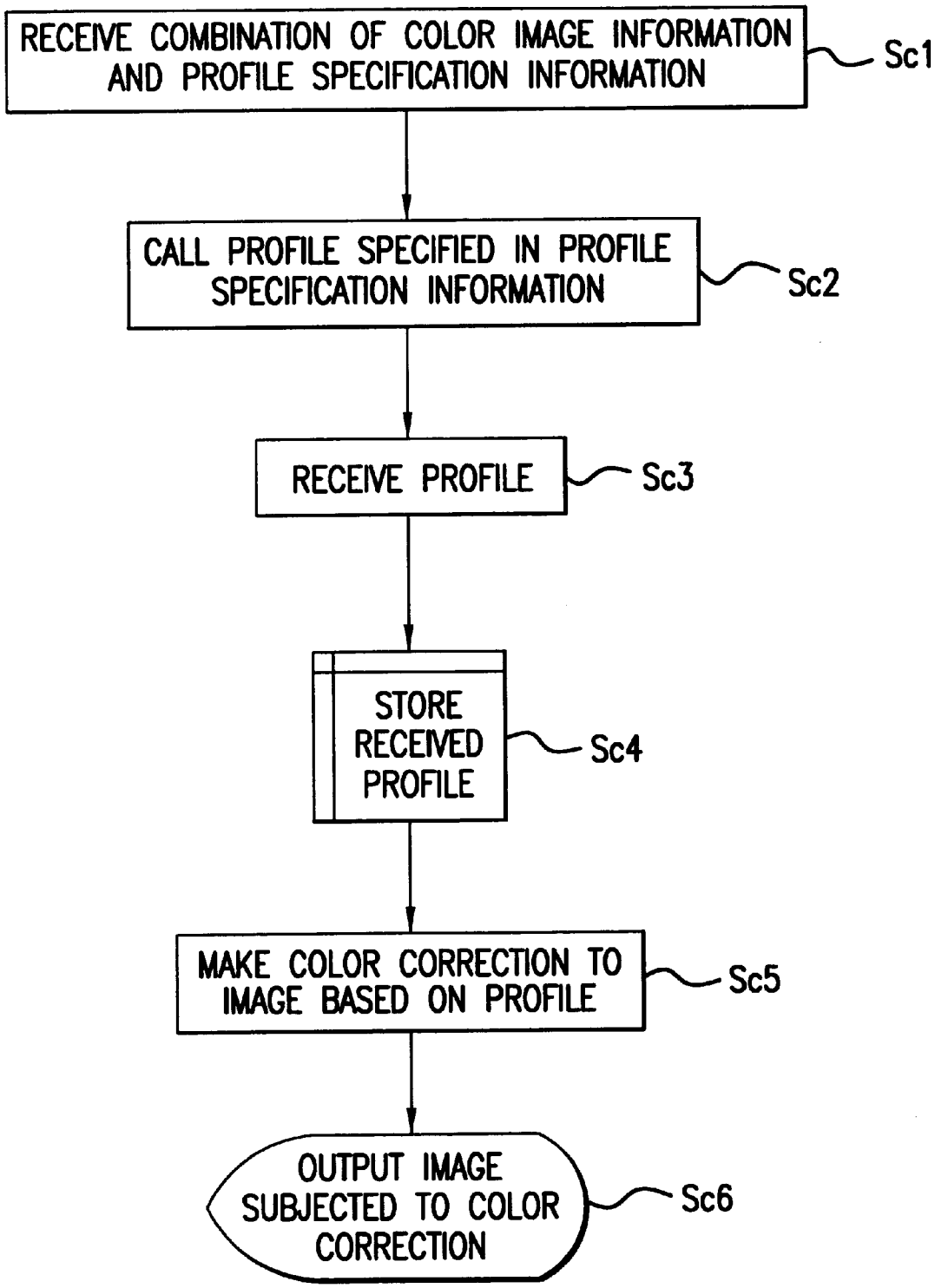

RECEIVE COMBINATION OF COLOR IMAGE INFORMATION AND PROFILE SPECIFICATION INFORMATION
Sc1
CALL PROFILE SPECIFIED IN PROFILE SPECIFICATION INFORMATION
Sc2
RECEIVE PROFILE
Sc3
STORE RECEIVED PROFILE
Sc4
MAKE COLOR CORRECTION TO IMAGE BASED ON PROFILE
Sc5
OUTPUT IMAGE SUBJECTED TO COLOR CORRECTION
Sc6

FIG.16

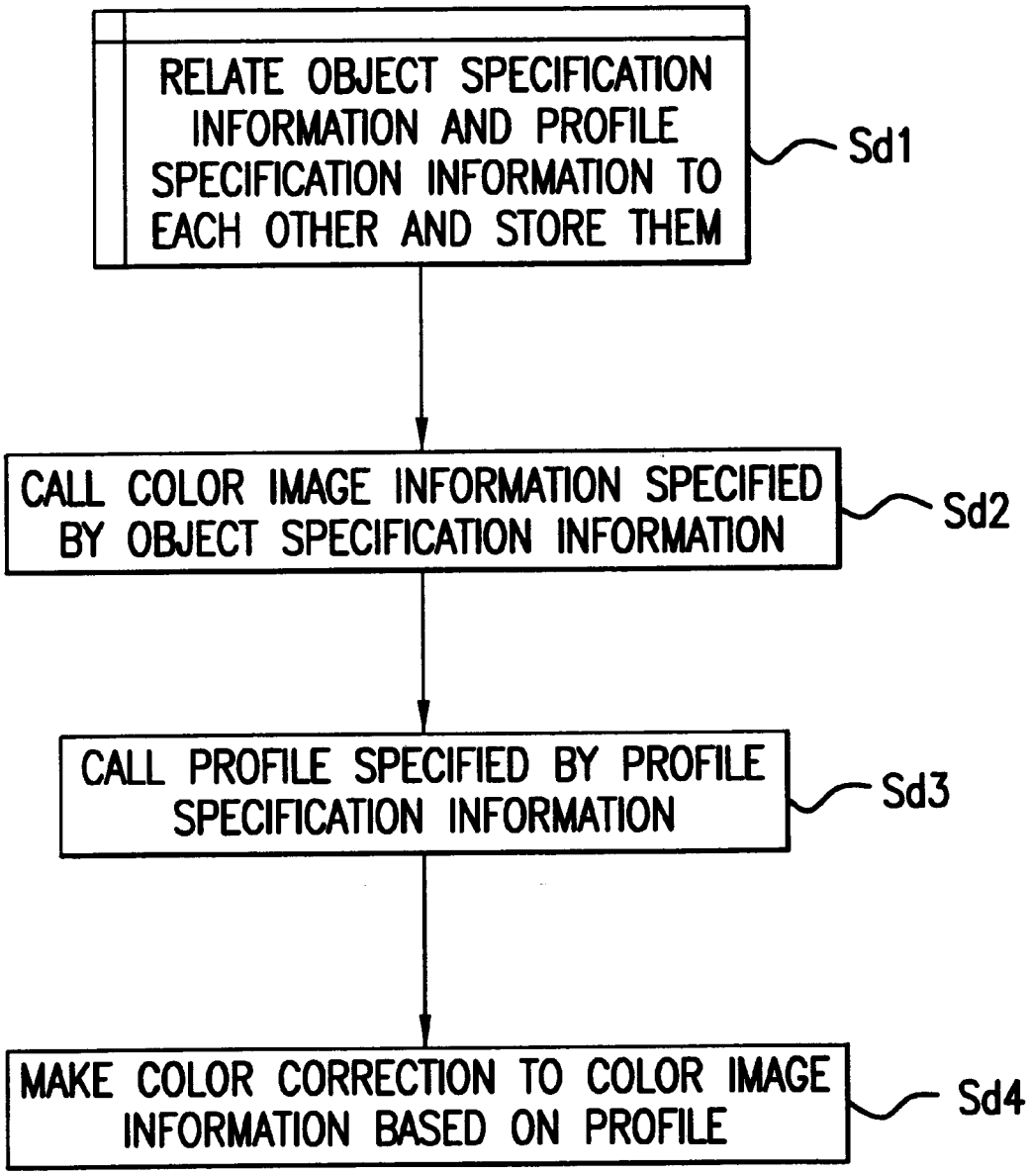

RELATE OBJECT SPECIFICATION INFORMATION AND PROFILE SPECIFICATION INFORMATION TO EACH OTHER AND STORE THEM
Sd1
CALL COLOR IMAGE INFORMATION SPECIFIED BY OBJECT SPECIFICATION INFORMATION
Sd2
CALL PROFILE SPECIFIED BY PROFILE SPECIFICATION INFORMATION
Sd3
MAKE COLOR CORRECTION TO COLOR IMAGE INFORMATION BASED ON PROFILE
Sd4

FIG.17

IMAGE TRANSFER APPARATUS, IMAGE TRANSMITTER, PROFILE INFORMATION TRANSMITTER, IMAGE RECEIVER/ REPRODUCER, STORAGE MEDIUM, IMAGE RECEIVER, PROGRAM TRANSMITTER, AND IMAGE COLOR CORRECTION APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to color image transfer techniques for distributing or transferring a color image and an object for preparing a color image over a network and in particular to an image transfer apparatus, an image transmitter, a profile information transmitter, an image receiver/reproducer, a storage medium, an image receiver, a program transmitter, and an image color correction apparatus which enable a receiving party to display an image with original image colors held.

As information processing and communication technologies have become advanced, various techniques for connecting various devices for handling color image information, such as scanners, facsimiles, and color printers, and transferring color images between the devices have been proposed.

By the way, the transferred color image is reproduced by reproduction means such as a display device of the receiving party. At the time, the characteristics of the image input device at the transmitting party (for example, a scanner) do not necessarily match those of the reproduction means at the receiving party (for example, a color printer), thus it becomes necessary to execute color conversion in the color image transfer process.

Disclosed as one of the color conversion techniques, for example, in the Unexamined Japanese Patent Application Publication Nos. Hei 7-203175 and 7-312694 is a technique wherein the transmitting party has a color conversion function and the receiving party transfers profile information to the transmitting party, which then executes color conversion and transmits the resultant image to the receiving party, which will be hereinafter referred to as first prior art. The profile information is information defining the characteristics of a color space used to describe colors used in color image information; generally, color spaces defined based on perception of human beings, such as CIE XYZ and CIE L*a*b*, and information describing the mathematical relationship between the color spaces of color image information are used. In addition to the first prior art, a technique wherein the receiving party has a color conversion function and the transmitting party transfer profile information and an image to the receiving party, which then executes color conversion, which will be hereinafter referred to as second prior art, is disclosed in the Unexamined Japanese Patent Application Publication No. Hei 7-312694.

By the way, to apply the conventional techniques described above to an image transfer apparatus using a large-scale network environment such as the Internet, an undesired situation occurs on efficiency of communication lines or administration of the system. That is, if the first prior art is applied, the color conversion function at the transmitting party must deal with color conversion requests from a large number of receivers. Thus, the transmitting party requires a large processing capability and if it has an insufficient processing capability, processing takes time. On the other hand, if the second prior art is applied, when the receiving party receives images from a number of transmitters, even if the received images have the same color

space, profile information needs to be transmitted each time the transmitting party changes. Thus, fruitless communication becomes necessary and efficient use of the communication line capacity cannot be made. If either of the first and second prior arts is applied, it becomes necessary to transfer profile information between the transmitting and receiving parties each time one image transfer is executed. Thus, it cannot be avoided to bear the communication costs to transfer the profile information.

SUMMARY OF THE INVENTION

It is therefore an object of the invention to provide an image transfer apparatus, an image transmitter, a profile information transmitter, and an image receiver/reproducer whereby color image information or object information for preparing color image information can be transferred without putting a large load on a specific transmitter or executing fruitless communication and the receiving party can reproduce an image with original image colors held.

Means for solving the problems will be discussed with reference to FIG. **1**.

First, an image transfer apparatus of aspect 1 is provided according to the configuration shown in FIG. **1** and comprises:

- a profile server **1** being connected to a network for storing profile information for a color correction made to color image information or color image information prepared from object information and outputting profile information in response to a call from an image display device **3** (described later);
- an image server **2** (image transmission means) for transmitting profile specification information specifying the profile information corresponding to the color image information or the object information together with the color image information or the object information;
- an image display device **3** (image reception and reproduction means) comprising reception means **30** for receiving the color image information or the object information and the profile specification information transmitted by the image transmission means, call means **34** for calling profile information specified by the profile specification information received by the reception means from the profile storage means, color correction means **35** using the profile information for making a color correction to the color image information or color image information prepared from the object information, and reproduction means **36** for reproducing the color image information to which a color correction has been made by the color correction means.

According to the image transfer apparatus, the image server **2** is released from the load for transferring profile information itself as well as the color correction load and can raise processing efficiency accordingly. Since the profile information itself is not transferred, congestion of the communication line connected to the image server **2** can be relieved. On the other hand, the image display device **3** can receive necessary profile information from the profile server **1** based on the profile specification information provided by the image server **2**, so that an image color correction can be made without a hitch.

The profile information may be information defining a color space used to describe the color image information or color image information prepared from the object information. (Aspect 2)

The profile specification information may be any if it can specify necessary profile information; preferably, it is loca-

tion information specifying a location of storage means on the network where the profile information exists and a storage location of the profile information in the storage means for the image display device **3** to obtain necessary profile information promptly. (Aspect 3)

The invention of aspects 4 to 7 provides main components making up the image transfer apparatus.

That is, an image transmitter of aspect 4, which is provided as the image server **2** in FIG. **1**, comprises transmission means **20** for transmitting through a network, color image information or object information for preparing color image information and profile specification information (location information in the example in FIG. **1**) specifying profile information for a color correction made to the color image information or color image information prepared from the object information.

A profile information transmitter of aspect 5, which is provided as the profile server **1** in FIG. **1**, comprises profile storage means **10** for storing profile information for a color correction made to color image information or color image information prepared from object information; and

communication control means **11** for transmitting the profile information to a calling party when the profile information is called through a network.

An image receiver/reproducer of aspect 6, which is provided as the image display device **3** in FIG. **1**, comprises reception means **30** for receiving color image information or object information for preparing color image information and profile specification information specifying profile information for a color correction made to the color image information or color image information prepared from the object information, sent through a network;

call means **34** for calling through the network, profile information corresponding to the profile specification information received by the reception means;

color correction means **35** using the profile information for making a color correction to the color image information or color image information prepared from the object information; and

reproduction means **36** for reproducing the color image information to which a color correction has been made by the color correction means.

The invention of aspect 7 introduces the so-called cache storage technique for raising the processing efficiency of the image reproducer **3**. That is, as shown in FIG. **1**, the image display device **3** comprises:

reception means **30** for receiving color image information or object information for preparing color image information and profile specification information (location information in the example in FIG. **1**) specifying profile information for a color correction made to the color image information or color image information prepared from the object information, sent through a network;

registration means **31** for registering profile information received through the network together with the profile specification information for specifying the profile information;

determination means **32** for determining whether or not the same information as the profile specification information received by the reception means is registered in the registration means;

getting means **33** for getting profile information corresponding to the profile specification information from the registration means if a determination that the same information as the profile specification information received by the reception means is registered in the registration means is obtained from the determination means;

call means **34** for calling profile information through the network if a determination that the same information as the profile specification information received by the reception means is not registered in the registration means is obtained from the determination means;

color correction means **35** using the profile information obtained by the getting means or the call means for making a color correction to the color image information or color image information prepared from the object information; and

reproduction means **36** for reproducing the color image information to which a color correction has been made by the color correction means.

According to the image display device **3**, only if new profile specification information not received in the past is received, the corresponding profile information is called through the network. If the same information as already received profile specification information is received, the profile information received in the past is reused. Therefore, the frequency calling profile information through the network can be lessened, fruitless communication can be prevented, and the processing efficiency of the image display device **3** can be raised.

According to the invention of aspect 8, as shown in FIG. **11**, there is provided a storage medium **501** for storing data accessed by a program executed by a computer **500** and having a predetermined data structure in a format that can be input to the computer, the storage medium for storing color image information **503** or object information **502** for preparing color image information and profile specification information **505** for specifying profile information **504** for a color correction made to the color image information **503** or color image information prepared from the object information **502** in relation to each other. In this case, the profile specification information **505** is read into the computer **500** for interpretation, whereby the profile information **504** is specified through the network NT.

The storage medium **501** causes a change state of energy of magnetism, light, electricity, etc., in response to the program description contents for a reader provided as a hardware resource of the computer and can transfer the program description contents to the reader in the form of signal responsive to the energy change state. For example, as shown in FIG. **11**, the storage medium is a magneto-optic disk **501***a*, **501***b*, an optical disk (CD-ROM, etc.,) **501***c*, a magnetic disk **501***d*, a memory **501***e* contained in the computer, or the like. In the specification, the "storage medium" is used to mean the same.

An image receiver of aspect 10 comprises reception means **511** for receiving image relevant information **506** consisting of color image information **503** or object information **502** for preparing color image information and profile specification information **505** for specifying profile information **504** for a color correction made to the color image information or color image information prepared from the object information, and storage means **512** for storing the image relevant information **506** received by the reception means **511**, as shown in FIG. **14**.

In this case, the image receiver **510** can read and use the image relevant information **506** stored in the storage means **512** appropriately, whereby the profile information **504** can be specified, thus an image can be reproduced with the original image colors held.

A program transmitter of aspect 11 comprises storage means **551** for storing a program **550** for causing a computer to perform a step of receiving color image information or object information for preparing color image information

and profile specification information specifying profile information for a color correction made to the color image information or color image information prepared from the object information, sent through a network NT, a step of calling profile information corresponding to the profile specification information received in the reception step, a color correction step of using the profile information called in the call step for making a color correction to the color image information or color image information prepared from the object information, and a step of reproducing the color image information to which a color correction has been made in the color correction step, and transmission means **552** for reading the program **550** stored in the storage means **551** and transmitting the program **550**, as shown in FIG. **12**. The program **550** executes the processing contents like the flowchart shown in FIG. **16**, for example. First, a combination of the color image information and the profile specification information is received at step Sc**1** shown in FIG. **16**. Next, the profile specified by the profile specification information received at step Sc**1** is called at step Sc**2** and is received at step Sc**3**. The received profile is stored at step Sc**4**, an image color correction is made based on the stored profile at step Sc**5**, and an image resulting from the color correction is output at step Sc**6**.

A storage medium of aspect **12** stores a program for causing a computer to perform a step of receiving color image information **503** or object information **502** for preparing color image information and profile specification information **505** specifying profile information **504** for a color correction made to the color image information or color image information prepared from the object information **502**, sent through a network NT as shown in FIG. **14**, a step of calling profile information **504** corresponding to the profile specification information **505** received in the reception step, a color correction step of using the profile information **504** called in the call step for making a color correction to the color image information **503** or color image information prepared from the object information **502**, and a step of reproducing the color image information to which a color correction has been made in the color correction step, in a format that can be input to the computer. The program becomes as shown in FIG. **16**.

An image color correction apparatus of aspect **13** comprises storage means **521** for storing object specification information **520** specifying color image information **503** or object information **502** for preparing color image information and profile specification information **505** for specifying profile information **504** for a color correction made to the color image information **503** or color image information prepared from the object information **502** specified by the object specification information **520** in relation to each other, first call means **525** for calling the color image information **503** or object information **502** corresponding to the object specification information **520** stored in the storage means **521**, second call means for calling the profile information corresponding to the profile specification information stored in the storage means in relation to the color image information or object information called by the first call means, and color correction means **530** using the profile information called by the second call means for making a color correction to the color image information or color image information prepared from the object information called by the first call means, as shown in FIG. **15**.

A storage medium of aspect **14** stores a program P for causing a computer to perform a step of storing object specification information **520** specifying color image information **503** or object information **502** for preparing color image information and profile specification information for specifying profile information for a color correction made to the color image information **503** or color image information prepared from the object information **502** specified by the object specification information **520** in relation to each other, a first call step of calling the color image information **503** or object information **502** corresponding to the object specification information **520** stored in the storage step, a second call step of calling the profile information **504** corresponding to the profile specification information **505** stored in the storage step in relation to the color image information **503** or object information **502** called in the first call step, and a color correction step of using the profile information **504** called in the second call step for making a color correction to the color image information **503** or color image information prepared from the object information **502** called in the first call step, in a format that can be input to the computer. The program P is recorded on media **501***a*–**501***e* as shown in FIG. **13** and is as shown in the flowchart in FIG. **17**; it is a program for accomplishing the image color correction apparatus shown in FIG. **15**.

In the flowchart shown in FIG. **17**, first the object specification information and the profile specification information are stored in relation to each other at step Sd**1**. The color image information specified by the object specification information is called at step Sd**2** and the profile specified by the profile specification information is called at step Sd**3**. Next, a color correction is made to the color image information based on the profile at step Sd**4**.

A program transmitter of aspect 15 comprises storage means **551** for storing a program P for causing a computer to perform a step of storing object specification information specifying color image information or object information for preparing color image information and profile specification information for specifying profile information for a color correction made to the color image information or color image information prepared from the object information specified by the object specification information in relation to each other, a first call step of calling the color image information or object information corresponding to the object specification information stored in the storage step, a second call step of calling the profile information corresponding to the profile specification information stored in the storage step in relation to the color image information or object information called in the first call step, and a color correction step of using the profile information called in the second call step for making a color correction to the color image information or color image information prepared from the object information called in the first call step, in a format that can be input to the computer, and transmission means **552** for reading the program P stored in the storage means **551** and transmitting the read program, as shown in FIG. **12**. The program P becomes as shown in the flowchart in FIG. **17**; it is a program for accomplishing the image color correction apparatus shown in FIG. **15**.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is an illustration to show the basic configuration of the invention;

FIG. **2** is an illustration to show the configuration of an image transfer apparatus of a first embodiment of the invention;

FIG. **3** is an illustration of the contents of a URL used in the first embodiment of the invention;

FIG. **4** is an illustration to show the configuration of an image transfer apparatus of a second embodiment of the invention;

FIG. **5** is an illustration to show an extended notation example of HTML in the second embodiment of the invention;

FIG. **6** is a flowchart to show the operation of the second embodiment of the invention;

FIG. **7** is an illustration to show positions where URLs are embedded in the second embodiment of the invention;

FIG. **8** is an illustration to show positions where URLs are embedded in a third embodiment of the invention;

FIG. **9** is an illustration to show the configuration of an image transfer apparatus of the third embodiment of the invention;

FIG. **10** is a flowchart to show the operation of the third embodiment of the invention;

FIG. **11** is an illustration to show how image relevant information is stored on storage media;

FIG. **12** is an illustration to show how a program is stored on storage media;

FIG. **13** is an illustration to show how a program is transmitted through a network;

FIG. **14** is an illustration to show the configuration of an image receiver for receiving image relevant information;

FIG. **15** is an illustration to show the configuration of an image color correction apparatus;

FIG. **16** is a flowchart provided by simplifying the flowchart shown in FIG. **10**; and

FIG. **17** is a flowchart provided by simplifying the flowchart shown in FIG. **6**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the accompanying drawings, there are shown preferred embodiments of the invention.

A. First Embodiment

FIG. **2** is an illustration to show the configuration of a color image transfer apparatus of a first embodiment of the invention. The first embodiment is provided by applying the invention to a distributed information system World Wide Web (WWW) widely used in various network environments including the Internet.

The WWW is made up of devices called servers for providing documents through a network and devices called browsers for receiving the documents from the servers and displaying them in a format that can be understood by human beings. For example, an extremely large number of servers and browsers exist in a large-scale network such as the Internet. The servers and the browsers often are installed as computers in which software products for executing their functions are built.

The documents provided by the WWW server are described in the notation of an HTML (hyper text markup language). The HTML is a technique wherein tags indicating a document structure, a document display method, locations of images, moving pictures, voice, objects, programs, etc., embedded in the document, a link pointing to another document, and the like are embedded in the text document, thereby making up the document; it enables multimedia documents to be prepared and documents stored in different files and servers to be related to each other.

Here, general WWW operation will be discussed. First, to command the browser to display an HTML document existing in one server, the user gives the address at which the HTML document exists in the format called a URL (universal resource location) to the browser. The URL is defined in the notation having a combination of three entries of the information type, the location of the machine storing the information on the network, and the location where the information exists in the machine. This URL enables unique specification of the location of information in the network. The browser finds out the location where the HTML document exists from the URL specified by the user and requests the server storing the document to transmit the HTML document and the data embedded in the document. Such data includes images, moving pictures, voice, objects, programs, etc. When receiving the request from the browser, the server returns the requested HTML document and data to the browser. Upon reception of the HTML document and data, the browser analyzes the HTML document, converts the document into the format that can be understood with eyes of human beings, and displays the result on a display device such as a CRT or a printer.

As described above, a link pointing to another document is embedded in the HTML document. This link is also represented as a URL. If the user commands the browser to display the document pointed to by the link with means such as a pointing device, the browser finds out the location of the new document from the URL and calls the document from the server storing the document. Documents can be thus traced in order across a number of servers.

By the way, in existing WWWs, when colors are represented in HTML documents and images, the color space difference for each device is not considered and the color space is assumed to be an RGB space of a display device for representing colors. Thus, there is a disadvantage in that the display colors differ depending on the display device used by the browser.

A technique called a CMS (color management system) is available to prevent such display color difference from occurring. In this technique, profile information describing the mathematical relationship between the color space used for documents and images and the color space defined based on perception of human beings, such as CIE XYZ or CIE L*a*b*, is added to documents and images. To display a document or an image, an algorithm is prepared for converting the document or image color space into the display device color space from the profile added to the document or the image and the information describing the color characteristics of the display device, and is used to convert the document or image colors. In doing so, the document or image can be displayed in the colors at the preparation time regardless of the display device.

However, the documents or images prepared in the same environment (for example, the images read through the same scanner) generally use the same color space, thus the number of profile types is fewer by far than the total number of documents or images transferred in the network. However, if profiles are simply added to documents and images in the network environment, as many identical profiles as documents and images using the same color space are transmitted; resultantly, fruitless communication occurs. Particularly to raise accuracy of color correction, the profile data amount increases, thus the fruitless communication amount also grows.

To solve such a problem, improvements are made to an image transmission/reception apparatus in existing WWWs as shown in FIG. **15**. The improved apparatus relates color image information or object information preparing color image information to profile specification information,

stores them in a format like HTML documents, calls the information as required through a network, and uses the called profile information to make a color correction to the called color image information, etc. FIG. **17** is a flowchart of the processing. The processing represented by the flowchart as shown in FIG. **17** can be described as a program, which can be stored on storage media for distribution, as shown in FIG. **13**. Such a program can also be transmitted for distribution through a network, as shown in FIG. **12**.

FIG. **2** shows the configuration of such an improved apparatus in more detail. Next, the first embodiment will be discussed in detail with reference to FIG. **2**.

a. A profile server **200** is installed aside from a WWW server **100** for providing documents and images for a WWW browser **300** and provides a profile in response to a request from the WWW browser **300**.

b. The WWW server **100** does not add the profile itself to a document or an image and describes profile specification information, specifically the location on the network where the profile exists, namely, information specifying the profile server storing the profile and the location of the profile in the profile server in the URL format and adds the profile specification information (URL) to the document or image.

c. When receiving the document or image to which the URL is added from the WWW server **100**, the WWW browser **300** requests the profile server **200** to send the profile required for color correction based on the URL.

In doing so, at least the WWW server **100** is released from the load of transferring the profile itself to the WWW browser **300**. Thus, the communication line usage rate of the WWW server **100** can be decreased as much as the required traffic for transferring the profile.

On the other hand, the WWW browser **300** can receive the necessary profile from the profile server **200** based on the URL provided by the WWW server **100**, so that color correction is made to the document or image without any trouble. If the same URL as specified in the past is specified, it is considered that the same profile is specified, of course. Therefore, for example, profiles together with the URLs thereof are stored in the WWW browser **300** and when the same URL is received from the WWW server **100**, the WWW browser **300** can reuse the profile stored corresponding to the URL, whereby fruitless communication can also be avoided in the WWW browser **300**.

If profiles can be specified by information other than locations in the color image transfer apparatus according to the embodiment, such information may be used instead of the locations. For example, if headers are assigned to profiles in a unified manner in the color image transfer apparatus for uniquely specifying the profiles, such headers may be used instead of the locations. However, to use such headers, it becomes necessary to provide the system with a table for managing the correspondence between the profiles specified by the headers and the storage locations of the profiles in the system.

B. Second Embodiment

FIG. **4** is an illustration to show the configuration of a color image transfer apparatus of a second embodiment of the invention. The second embodiment introduces a cache storage technique into a WWW browser of a receiving party for reducing fruitless communication.

In the example shown in FIG. **4**, the user uses a WWW browser **300** to reference documents stored in WWW servers **100***a*, **100***b*, **100***c*, etc., connected to a network. The color spaces of the documents and images stored in the WWW servers are defined by profiles stored in profile servers **200***a*, **200***b*, **200***c*, etc., connected to the network.

In the WWW server **100***a* shown in FIG. **4**, an HTML document storage section **101** stores HTML documents and data embedded in the documents. Such data includes images, moving pictures, voice, objects, programs, etc. All locations of the documents and data stored in the HTML document storage section **101** can be specified uniquely by URLs. When a request for transmitting an HTML document and its attached data comes through the network, an HTML document transmission section **102** transmits the requested document and data to the requester. The WWW server **100***b*, **100***c*, etc., has a similar configuration to that of the WWW server **100***a*.

In the profile server **200***a*, a profile storage section **201** stores profiles. All locations of the profiles stored in the profile storage section **201** can also be specified uniquely by URLs. When a request for transmitting a profile comes through the network, a profile transmission section **202** transmits the requested profile to the requester. The profile server **200***b*, **200***c*, etc., has a similar configuration to that of the profile server **200***a*.

In the WWW browser **300**, an HTML document reception section **301** requests through the network a given server to send the HTML document indicated by the URL specified by the user and data attached to the HTML document. A profile URL extraction section **302** searches the HTML document received by the HTML document reception section **301** for a tag specifying a profile and extracts the URL pointing to the profile. A determination section **303** searches a cache **304** and determines whether or not the URL extracted by the profile URL extraction section **302** already exists in the cache **304**, namely, whether the URL is previously received and the profile corresponding to the URL is stored in the cache **304**. The cache **304** stores the profiles received by a profile call section **305** and the URLs of the profiles in pairs. If the profile is not stored in the cache **304**, the profile call section **305** requests the corresponding server to send the profile through the network. A profile fetch section **306** fetches the profile corresponding to the specified URL from the cache **304**.

A color information extraction section **307** extracts color information and color images from the HTML document received by the HTML document reception section **301**. A color conversion section **308** uses the profile gotten by the profile call section **305** or the profile fetch section **306** to convert the color information and color images extracted by the color information extraction section **307** into the color space used in a display section **310**. A document image preparation section **309** converts the HTML document into the format that can be understood by human beings by using the color space into which the color information and color images are converted by the color conversion section **308**. The display section **310** displays the document image prepared by the document image preparation section **309** for the user.

In the second embodiment, some extensions are added to the HTML notation. Next, the extensions will be discussed.

The HTML document is described by embedding specifically defined marks called tags in a simple text. The tags can specify a document structure, a document display method, locations of images, moving pictures, voice, objects, programs, etc., embedded in the document, a link pointing to another document, comments, etc. The tag is described as a character string enclosed in angle brackets "<>" and a name

indicating the tag type and attributes used by the tag are contained in "<>." For example, the attributes include character size, character style, locations of colors, images, etc., the URL of the document pointed to by a link, etc.

In the embodiment, the HTML notation is extended in order to indicate the locations of the profiles of color information and color images in the HTML documents. In the extended HTML notation, as shown in FIG. **7**, the URLs indicating images, color space types, and the URLs specifying profiles are embedded in a document. Thus, tags specifying color spaces used by documents, images, objects, etc., and profile URLs are provided. A use example will be discussed with reference to FIG. **5**.

First, a <BODY> tag representing the beginning of a document body specifies a COLORSPACE attribute specifying a color space and a PROFILE attribute specifying the profile URL. These two attributes are added in the embodiment. The portion enclosed in the <BODY> tag and a </BODY> tag is the document body. When a tag specifying a color or image display appears between the <BODY> and </BODY> tags, if a color space or a profile is not specified, the color space and profile specified in the tag are used.

An attribute in a tag specifying a color and image display can also be used to specify a color space or a profile. In this case, the color space or profile specified in the attribute is used in the scope of the tag. In FIG. **5**, in a tag <IMG> specifying display of image "digital-x.img," COLORSPACE and PROFILE attributes are used to specify a color space and a profile.

Further, <BLOCK> and </BLOCK> tags are added in order to specify a color space and a profile for a specific area of the document. COLORSPACE and PROFILE attributes specified in the <BLOCK> tag are applied only if another color space or profile is not specified in the area between the <BLOCK> and </BLOCK> tags. In FIG. **5**, the tags are used to change the color space to CMYK and specify an appropriate profile at an intermediate point.

In the example in FIG. **5**, both the color space and the profile are specified as attributes. However, if a color space is defined in a profile, a color space need not be specified as an attribute. For images, color space information may be embedded in the image depending on the format. Also in this case, a color space need not be specified as an attribute.

Of course, if tags to specify a color space or a profile exist in addition to the tags shown in FIG. **5**, attribute specification may also be made in the tags. For example, executable objects for preparing characters, color moving pictures, and color images are named.

Next, how such an extended HTML document is processed will be discussed with reference to the block diagram shown in FIG. **4** and a flowchart shown in FIG. **6**.

When the user requests the WWW browser **300** to display an HTML document existing in a specific WWW server, the URL specifying the location where the HTML document exists is passed to the WWW browser **300**. To give the URL, the user directly specifies the URL or specifies a link to the HTML document. Here, assume that the user requests the WWW browser **300** to display an HTML document stored in the WWW server **100***a* at step S**1** or S**2**.

In the WWW browser **300**, the received URL is passed to the HTML document reception section **301** at step S**3**.

The HTML document reception section **301** interprets the received URL and gets the address of the specified WWW server (in this case, **100***a*), then sends the URL to the WWW server **100***a* through the network and requests the WWW server **100***a* to transmit the HTML document specified by the URL at step S**4**.

In the WWW server **100***a*, the HTML document transmission section **102** receives the transmission request from the HTML document reception section **301**. It interprets the received URL, knows where the requested HTML document exists in the HTML document storage section **101**, fetches the HTML document from the HTML document storage section **101**, and returns the HTML document to the HTML document reception section **301** of the WWW browser **300** through the network. The HTML document reception section **301** also finds the URL and the address of data of images, voice, etc., embedded in an HTML document and requests an appropriate WWW server to send the data through the network. Also in this case, the HTML document transmission section **102** of the WWW server receives the request, determines the data storage location from the URL and address, fetches the data from the HTML document storage section **101**, and returns the data to the HTML document reception section **301** through the network at step S**5**.

In the WWW browser **300**, the HTML document reception section **301** receives the HTML document thus returned. If the HTML document contains the attribute specifying a profile, the profile URL extraction section **302** extracts the URL specifying the profile at step S**6**. If the profile specification attribute does not exist, the WWW browser **300** performs normal processing although the step is not shown in the flowchart.

The extracted URL is sent to the determination section **303**, which then searches the cache **304** and checks whether or not the extracted URL is stored in the cache **304** at step S**7**.

If the extracted URL is stored in the cache **304** at step S**8**, it is determined that the profile existing in the URL is already received, and the profile fetch section **306** fetches the profile corresponding to the URL from the cache **304** at step S**9**.

If the extracted URL is not stored in the cache **304**, the profile call section **305** interprets the URL and determines the profile server storing the profile (in this case, profile server **200***a*). It sends the URL to the profile server **200***a* through the network and requests the profile server **200***a* to call the corresponding profile.

In the profile server **200***a*, the profile transmission section **202** receives the call request from the profile call section **305**. It interprets the received URL, finds where the requested profile exists in the profile storage section **201**, fetches the profile from the profile storage section **201**, and returns the profile to the profile call section **305** of the WWW browser **300** through the network at step Sll. Then, the profile received by the profile call section **305** from the profile server **200***a* and the URL extracted by the profile URL extraction section **302** are stored in the cache **304** at step S**12**.

The profile corresponding to the URL extracted by the profile URL extraction section **302** is thus provided by the profile fetch section **306** or the profile call section **305**. After this, steps S**7** to S**12** are repeated for all URLs extracted by the profile URL extraction section **302** at step.

If it is determined at step S**13** that all URLs have been processed, then the color information extraction section **307** extracts color information in the HTML document received by the HTML document reception section **301** (color values, color images, etc., specified by tags). At this time, information describing which profile is applied to which color information is also extracted at step S**14**.

The color conversion section **308** uses an appropriate profile to make a color correction to the color information extracted by the color information extraction section **307**. In fact, color matching is executed by using the profile provided by the profile fetch section **306** or the profile call section **305** as an input profile and the profile describing the color characteristics of the display section **310** as an output profile at step S**15**.

Last, the document image preparation section **309** uses the color information converted by the color conversion section **308** to convert the HTML document into such a display image that can be understood by human beings at step S**16**, and the display section **310** displays the display image at step S**17**.

The processing is performed each time the user makes a request for displaying a new HTML document.

Thus, an HTML document and images and objects embedded in the document can be distributed over the network for display with the original colors held. In the system, the profile required for document display needs to be transmitted to the browser only once, so that fruitless communication does not occur and the effective use of the network can be made. In the system, profiles can be gotten for making a color correction by the same method regardless of the number of servers storing HTML documents and profiles or the locations. Thus, a number of servers are provided as required, whereby traffic to the servers can be distributed.

C. Third Embodiment

FIG. **14** shows the configuration of an image color correction apparatus of a third embodiment of the invention. This configuration is described in FIG. **9** in more detail. The third embodiment does not embed a URL specifying a profile in an HTML document and describes profile specification information specifying a profile (for example, a URL) together with an image as shown in FIG. **8**, thereby specifying profile information required for color correction of the image. FIG. **11** shows a concept of storing image relevant information comprising the image and profile specification information on storage media that can be read by computers. Storage of the image relevant information on the storage media as shown in the figure enables the image relevant information to be distributed with media rich in possibility and to be used in programs.

For a method of describing a URL specifying a profile in an image, generally an image file contains a header part describing the image size, color space, compression method, etc., thus the profile specification URL can be embedded by changing the header format. If a tag structure or a directory structure is adopted as a file internal structure as in TIFF and FlashPix, a tag, a new storage location, etc., for describing such a URL is provided, whereby the URL can be embedded.

Of course, a URL specifying a profile can be described not only for still images, but also for executable projects for preparing color moving pictures and color images.

Next, how such an image is processed will be discussed. FIG. **16** is a flowchart to represent a processing flow. FIG. **10** describes the processing shown on the flowchart in more detail. A program can be described according to such a processing flow; such a processing program can be stored on storage media for distribution, as shown in FIG. **18**. Such a program can also be transmitted through a network for distribution.

Subsequently, an actual processing flow will be discussed with reference to the flowchart in FIG. **10**.

When the user requests a WWW browser **300** to display an HTML document existing in a specific WWW server, the URL specifying the location where the HTML document exists is passed to the WWW browser **300**. To give the URL, the user directly specifies the URL or specifies a link to the HTML document. Here, assume that the user requests the WWW browser **300** to display an HTML document stored in a WWW server **100***a* at step Sb**1** or Sb**2**.

In the WWW browser **300**, the received URL is passed to an HTML document reception section **301** at step Sb**3**. The HTML document reception section **301** interprets the received URL and gets the address of the specified WWW server (in this case, **100***a*), then sends the URL to the WWW server **100***a* through the network and requests the WWW server **100***a* to transmit the HTML document specified by the URL at step Sb**4**.

In the WWW server **100***a*, an HTML document transmission section **102** receives the transmission request from the HTML document reception section **301**. It interprets the received URL, finds where the requested HTML document exists in an HTML document storage section **101**, reads the HTML document, and returns the read HTML document to the HTML document reception section **301** of the WWW browser **300** through the network at step Sb**5**.

Next, an image URL extraction section **312** extracts the URL of an image embedded in the HTML document returned to the HTML document reception section **301** and transfers the image URL to the HTML document reception section **301** at step Sb**6**.

On the other hand, the HTML document reception section **301** interprets the URL received from the image URL extraction section **312** and requests an appropriate server to send the image through the network. Here, as an example, assuming that the image existing in an image server **400***a* is requested, an image transmission section **402** of the image server **400***a* receives the request from the image reception section **311** at step Sb**7**. The image transmission section **402** interprets the URL and checks where the requested image exists in an image storage section **401**. It reads the image and returns the read image to the image reception section of the WWW browser **300** through the network at step Sb**8**.

If the image contains the URL specifying a profile, the profile URL extraction section **302** extracts the URL at step Sb**9**. If the profile specification URL does not exist, the WWW browser **300** performs normal processing although the step is not shown in the flowchart.

The URL thus extracted is sent to a determination section **303**, which then searches a cache **304** and checks whether or not the extracted URL is stored in the cache **304** at step Sb**10**.

If the extracted URL is stored in the cache **304** at step Sb**11**, the profile corresponding to the URL is already received and need not be read from a profile server. In this case, a profile fetch section **306** fetches the profile corresponding to the URL from the cache **304** at step Sb**12**.

On the other hand, if the URL extracted at step Sb**9** is not stored in the cache **304**, a profile call section **305** interprets the URL and determines the profile server storing the profile. If a profile server **200***a* is specified as an example, the profile call section **305** sends the URL to the profile server **200***a* and requests the profile server **200***a* to call the profile at step Sb**13**.

A profile transmission section **202** of the profile server **200***a* receives the call request from the profile call section **305**. It interprets the received URL, finds where the requested profile exists in a profile storage section **201**,

fetches the profile, and returns the profile to the profile call section **305** of the WWW browser **300** through the network at step Sb**14**.

Then, the profile received by the profile call section **305** from the profile server **200***a* and the URL extracted by the profile URL extraction section **302** are stored in the cache **304** at step Sb**15**.

The profile corresponding to the URL extracted by the profile URL extraction section **302** is thus provided by the profile fetch section **306** or the profile call section **305**.

Steps Sb**7** to Sb**15** are repeated for all URLs extracted by the image URL extraction section **312**.

If it is determined at step Sb**16** that all URLs have been processed, then a color conversion section **308** uses an appropriate profile to make a color correction to the color information extracted by the color information extraction section **307**. In fact, color matching is executed by using the profile provided by the profile fetch section **306** or the profile call section **305** as an input profile and the profile describing the color characteristics of a display section **310** as an output profile at step Sb**17**.

Last, a document image preparation section **309** uses the color information converted by the color conversion section **308** to convert the HTML document into such a display image that can be understood by human beings at step Sb**18**, and the display section **310** displays the display image at step Sb**19**.

The processing is performed each time the user makes a request for displaying a new HTML document.

In the third embodiment, the URL specifying a profile can be specified without extending the HTML format in the second embodiment. The profile specified by the URL is used to execute color conversion, whereby images and objects can be distributed over the network for display with the original colors held.

Since information concerning the profile corresponding to an image file is embedded, the corresponding image and profile can be managed in a unified manner and management of images and profiles is facilitated.

The second and third embodiments can also be combined in such a manner that the third embodiment is applied to images and objects containing the URL specifying a profile and that the second embodiment is applied to images and objects not containing any URL and color values specified directly in HTML documents.

D. Modified Examples

(1) In the embodiment, we have discussed the WWW servers, the profile servers, the WWW browsers, and the image servers as different machines, but the functions equivalent to two or more types of machines may be installed in one machine. In the example, the user specifies a URL from the beginning for requesting an HTML document to be displayed. However, if the WWW server prepares an HTML document dynamically, the HTML document can also be displayed by performing similar processing.

(2) The invention can be applied to networks of various sizes from world-wide networks like the Internet to in-house LANs (local area networks).

A color correction can also be made to color documents other than HTML documents by a similar method by adding means for describing locations of profiles. Available as examples of such documents are document format PDF (portable document format) developed by Adobe Systems Corporation, format VRML for describing three-dimensional images, and the like.

(3) The processing contents in the first, second, or third embodiment can be represented by a program that can be executed by computers, and the program can be stored on storage media for use. (See FIG. **13**.) Further, the program may be transferred through a network. In this case, storage means having an area for storing the program and transmission means for reading the program from the storage area and sending the program may be provided. (See FIG. **12**.)

A color image or an object for preparing a color image and profile specification information specifying a profile corresponding to the image or an image prepared by the object can also be stored on a storage medium in a pair for use. (See FIG. **11**.) That is, the color images, profile specification information, etc., can be used not only through a network, but also with storage media.

(4) In the first to third embodiments, a color image or an object for preparing a color image and profile specification information specifying a profile corresponding to the image or an image prepared by the object may be received in a pair through a network, stored on a storage medium such as hard disk, then used. (See FIGS. **14** and **15**.)

As we have discussed, according to the invention, color image information or object information for preparing color image information is transferred without putting a large load on a specific transmitter or executing fruitless communication on a network and the receiving party can reproduce an image with original image colors held.

For color image information or object information for preparing color image information stored on storage media, an image can also be reproduced with original image colors held in a similar manner to that described above.

What is claimed is:

1. An image transfer apparatus comprising:

profile storage means being connected to a network, for storing profile information for a color correction made to color image information or color image information prepared from object information;

image transmission means for transmitting profile specification information specifying the profile information corresponding to the color image information or the object information together with the color image information or the object information; and

image reception and reproduction means comprising;

means for receiving the color image information or the object information and the profile specification information transmitted by said image transmission means,

means for calling profile information specified by the profile specification information received by said reception means from said profile storage means,

color correction means using the profile information for making a color correction to the color image information or color image information prepared from the object information, and

means for reproducing the color image information to which a color correction has been made by said color correction means.

2. The image transfer apparatus of claim **1**, wherein

the profile information is information defining a color space used to describe the color image information or color image information prepared from the object information.

3. The image transfer apparatus of claim **1**, wherein

the profile specification information is location information specifying a location of storage means on the network where the profile information exists, and a

storage location of the profile information in said storage means.

4. An image transmitter comprising:

means for transmitting through a network, color image information or object information for preparing color image information, and profile specification information specifying profile information for a color correction made to the color image information or color image information prepared from the object information.

5. A profile information transmitter comprising:

profile storage means for storing profile information for a color correction made to color image information or color image information prepared from object information; and

communication control means for transmitting the profile information to a calling party when the profile information is called through a network.

6. An image receiver/reproducer comprising:

means for receiving color image information or object information for preparing color image information, and profile specification information specifying profile information for a color correction made to the color image information or color image information prepared from the object information, sent through a network;

means for calling through the network, profile information corresponding to the profile specification information received by said reception means;

color correction means using the profile information for making a color correction to the color image information or color image information prepared from the object information; and

means for reproducing the color image information to which a color correction has been made by said color correction means.

7. An image receiver/reproducer comprising:

means for receiving color image information or object information for preparing color image information and profile specification information specifying profile information for a color correction made to the color image information or color image information prepared from the object information, sent through a network;

means for registering profile information received through the network together with the profile specification information for specifying the profile information;

means for determining whether or not the same information as the profile specification information received by said reception means is registered in said registration means;

means for getting profile information corresponding to the profile specification information from said registration means if a determination that the same information as the profile specification information received by said reception means is registered in said registration means is obtained from said determination means;

means for calling profile information through the network if a determination that the same information as the profile specification information received by said reception means is not registered in said registration means is obtained from said determination means;

color correction means using the profile information obtained by said getting means or said call means for making a color correction to the color image information or color image information prepared from the object information; and

means for reproducing the color image information to which a color correction has been made by said color correction means.

8. A storage medium for storing data accessed by a program executed by a computer, and having a predetermined data structure in a format that can be input thereto,

wherein said storage medium stores

color image information or object information for preparing color image information, and

profile specification information for specifying profile information for a color correction made to the color image information or color image information prepared from the object information in relation to each other.

9. The storage medium of claim **8**, wherein

the profile information is information defining a color space used to describe the color image information or color image information prepared from the object information.

10. An image receiver comprising:

means for receiving image relevant information consisting of color image information or object information for preparing color image information, and profile specification information for specifying profile information for a color correction made to the color image information or color image information prepared from the object information; and

means for storing the image relevant information received by said reception means.

11. A program transmitter comprising:

means for storing a program for causing a computer to perform; and

transmission means for reading the program stored in said storage means and transmitting the program,

wherein the steps of:

receiving color image information or object information for preparing color image information, and profile specification information specifying profile information for a color correction made to the color image information or color image information prepared from the object information, sent through a network;

calling profile information corresponding to the profile specification information received in said reception step;

correcting color with using the profile information called in said calling step for making a color correction to the color image information or color image information prepared from the object information; and

reproducing the color image information to which a color correction has been made in said color correction step, are performed.

12. A storage medium for storing a program for causing a computer to perform the steps of:

receiving color image information or object information for preparing color image information and profile specification information specifying profile information for a color correction made to the color image information or color image information prepared from the object information, sent through a network;

calling profile information corresponding to the profile specification information received in said reception step;

correction color with using the profile information called in said calling step for making a color correction to the

color image information or color image information prepared from the object information; and

reproducing the color image information to which a color correction has been made in said color correction step,

in a format that can be input to said computer.

13. An image color correction apparatus comprising:

means for storing object specification information specifying color image information or object information for preparing color image information, and profile specification information for specifying profile information for a color correction made to the color image information or color image information prepared from the object information specified by the object specification information in relation to each other;

first call means for calling the color image information or object information corresponding to the object specification information stored in said storage means;

second call means for calling the profile information corresponding to the profile specification information stored in said storage means in relation to the color image information or object information called by said first call means; and

color correction means using the profile information called by said second call means for making a color correction to the color image information or color image information prepared from the object information called by said first call means.

14. A storage medium for storing a program for causing a computer to perform the steps of:

storing object specification information specifying color image information or object information for preparing color image information, and profile specification information for specifying profile information for a color correction made to the color image information or color image information prepared from the object information specified by the object specification information in relation to each other;

a first call the color image information or object information corresponding to the object specification information stored in said storage step;

a second call the profile information corresponding to the profile specification information stored in said storage step in relation to the color image information or object information called in said first call step; and

correcting color with using the profile information called in said second call step for making a color correction to the color image information or color image information prepared from the object information called in said first call step,

in a format that can be input to said computer.

15. A program transmitter comprising:

means for storing a program for causing a computer to perform the steps of:

storing object specification information specifying color image information or object information for preparing color image information, and profile specification information for specifying profile information for a color correction made to the color image information or color image information prepared from the object information specified by the object specification information in relation to each other;

a first call the color image information or object information corresponding to the object specification information stored in said storage step;

a second call the profile information corresponding to the profile specification information stored in said storage step in relation to the color image information or object information called in said first call step; and

correction color with using the profile information called in said second call step for making a color correction to the color image information or color image information prepared from the object information called in said first call step,

in a format that can be input to said computer; and

transmission means for reading the program stored in said storage means and transmitting the read program.

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