



(86) Date de dépôt PCT/PCT Filing Date: 2002/10/10
(87) Date publication PCT/PCT Publication Date: 2003/04/17
(45) Date de délivrance/Issue Date: 2012/01/24
(85) Entrée phase nationale/National Entry: 2004/03/29
(86) N° demande PCT/PCT Application No.: US 2002/032129
(87) N° publication PCT/PCT Publication No.: 2003/032640
(30) Priorité/Priority: 2001/10/12 (US09/975,312)

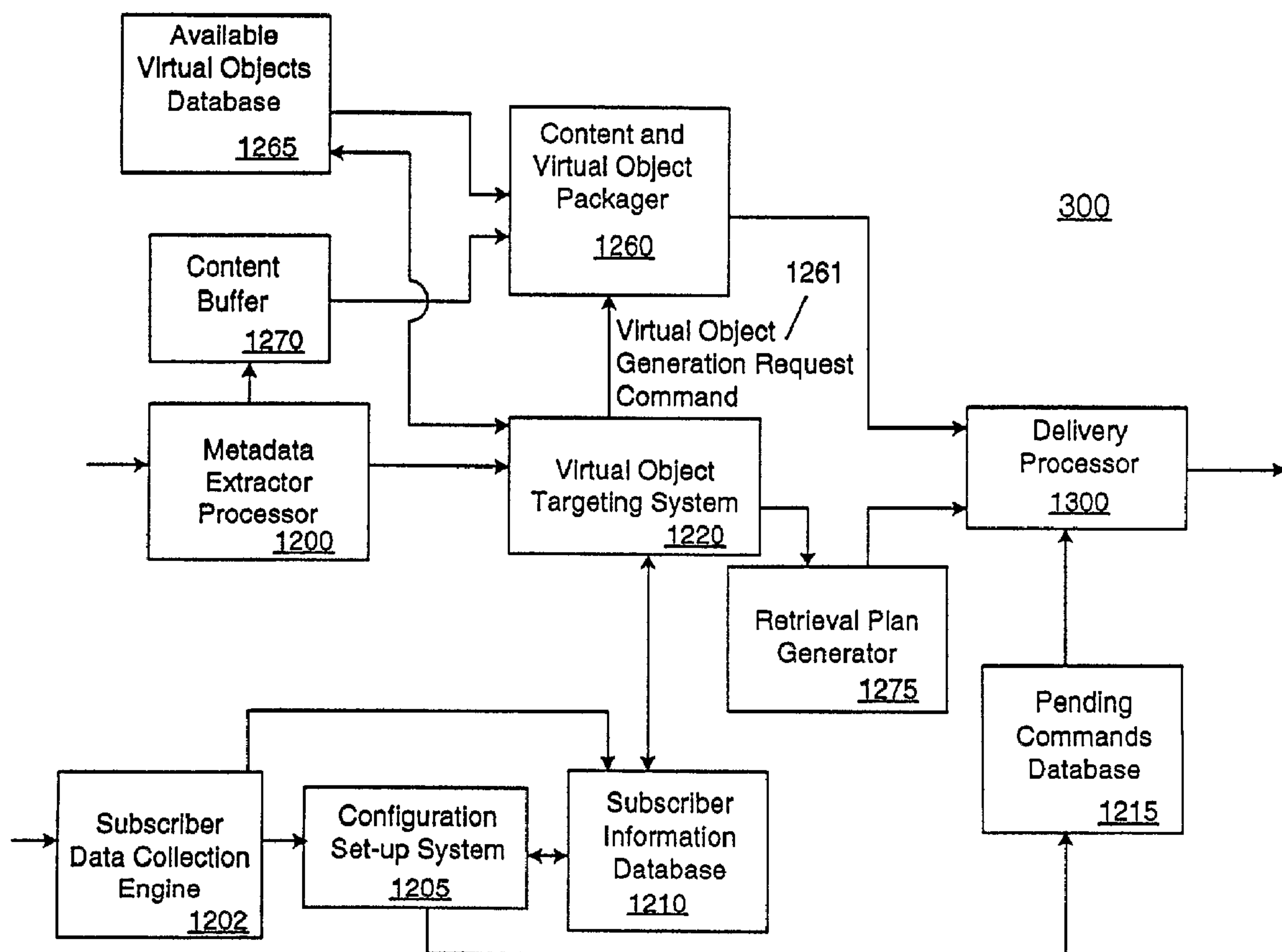
(51) Cl.Int./Int.Cl. *H04N 21/458* (2011.01),
H04N 5/445 (2011.01), *H04N 7/24* (2011.01)

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(54) Titre : PROCÉDE ET APPAREIL PERMETTANT DE CIBLER DES OBJETS VIRTUELS INTERACTIFS
(54) Title: METHOD AND APPARATUS FOR TARGETING OF INTERACTIVE VIRTUAL OBJECTS



(57) Abrégé/Abstract:

A method and an apparatus are used to target interactive virtual objects to subscribers in a television delivery system. Programs are selected and virtual object locations are defined in the selected programs. The virtual objects (1265) available for targeting



(57) **Abrégé(suite)/Abstract(continued):**

categorized and categories are correlated to subscriber information (1210) to determine the optimum targeting of the virtual objects (1260). The virtual objects may be targeted (1220) based on individual subscriber information (1210) or on information related to a group of subscribers. When a frame of program includes a virtual object location, a default or an alternate virtual objects is displayed. The virtual object location may change over space or time. The virtual object may be interactive, and may be used to link a subscriber to a remote location, such as an Internet web site. The television terminals record which virtual objects were displayed and report this information back to the headends and the operations center. The reported information is used to generate billing for commercial advertisers and to analyze viewer watching habits.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

CORRECTED VERSION

(19) World Intellectual Property Organization
International Bureau(43) International Publication Date
17 April 2003 (17.04.2003)

PCT

(10) International Publication Number
WO 03/032640 A1(51) International Patent Classification⁷: **H04N 7/16,**
7/10, 7/025, 7/173(74) Agents: **HARROP, John, K.** et al.; Dorsey & Whitney
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Washington, DC 20004 (US).

(21) International Application Number: PCT/US02/32129

(22) International Filing Date: 10 October 2002 (10.10.2002)

(25) Filing Language: English

(26) Publication Language: English

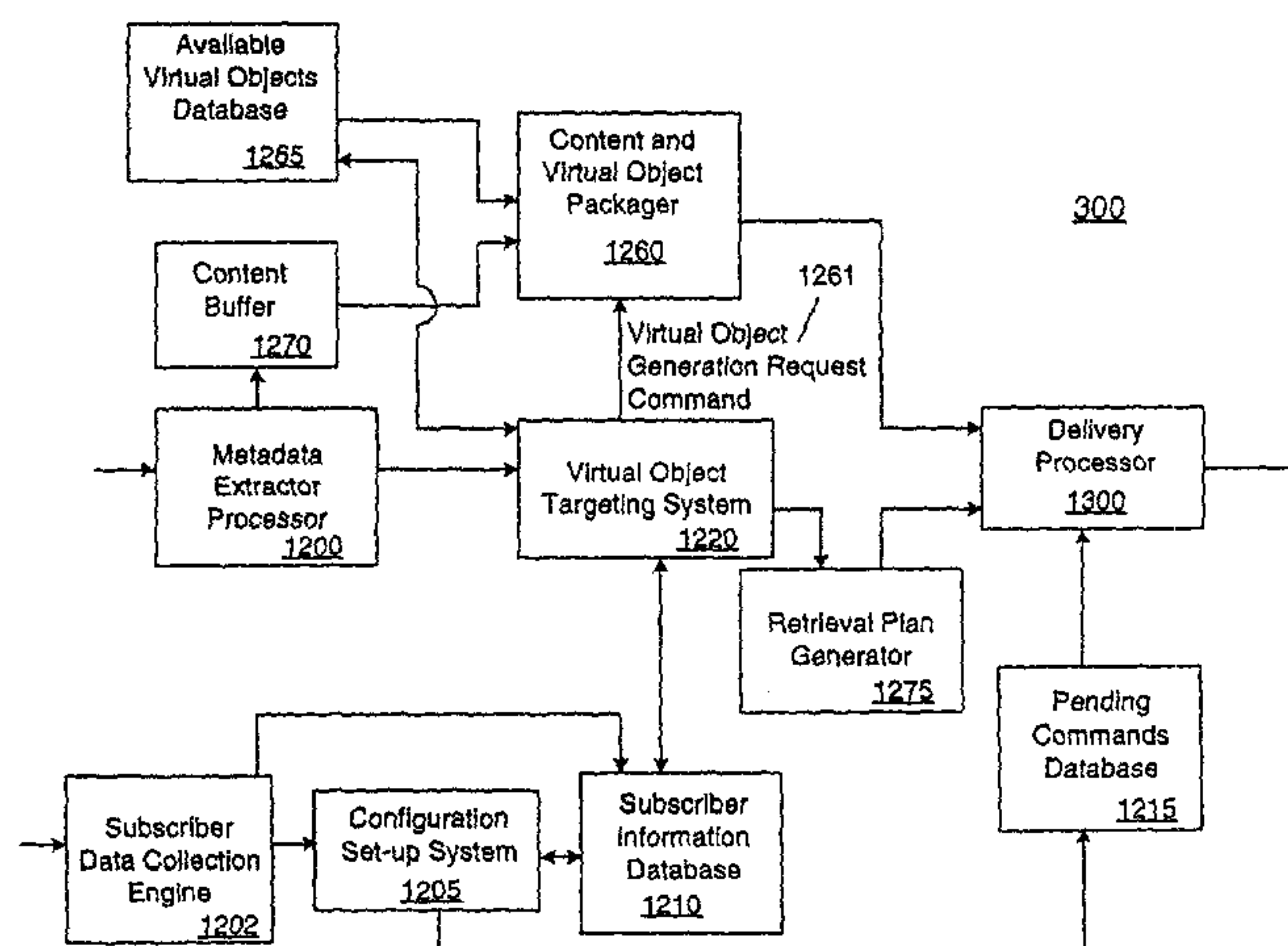
(30) Priority Data:
09/975,312 12 October 2001 (12.10.2001) US(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG,
SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN,
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(US).(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK,
TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, ML, MR, NE, SN, TD, TG).(72) Inventors: **HENDRICKS, John, S.**; 8273 Persimmon
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Published:

— with international search report

[Continued on next page]

(54) Title: METHOD AND APPARATUS FOR TARGETING OF INTERACTIVE VIRTUAL OBJECTS



(57) **Abstract:** A method and an apparatus are used to target interactive virtual objects to subscribers in a television delivery system. Programs are selected and virtual object locations are defined in the selected programs. The virtual objects (1265) available for targeting categorized and categories are correlated to subscriber information (1210) to determine the optimum targeting of the virtual objects (1260). The virtual objects may be targeted (1220) based on individual subscriber information (1210) or on information related to a group of subscribers. When a frame of program includes a virtual object location, a default or an alternate virtual objects is displayed. The virtual object location may change over space or time. The virtual object may be interactive, and may be used to link a subscriber to a remote location, such as an Internet web site. The television terminals record which virtual objects were displayed and report this information back to the headends and the operations center. The reported information is used to generate billing for commercial advertisers and to analyze viewer watching habits.

WO 03/032640 A1

WO 03/032640 A1



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(48) Date of publication of this corrected version:

15 May 2003

(15) Information about Correction:

see PCT Gazette No. 20/2003 of 15 May 2003, Section II

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

METHOD AND APPARATUS FOR TARGETING OF INTERACTIVE VIRTUAL OBJECTS

1 **Technical Field**

2 The technical field relates to a method and apparatus for providing interactive virtual
3 objects that are targeted to subscribers. The method and apparatus specifically relate to
4 monitoring, controlling and managing a content delivery network including an operations
5 center, a local insertion center, or a subscriber's local terminal for the delivery of interactive
6 virtual objects and the management of the respective responses to interactive requests.

7 **Background**

8 Television as an advertising medium has undergone significant advances since its
9 inception in 1939. Modern advances in digital technology now allow viewers to be very
10 selective in choosing programs to watch. Other advances in digital technology have led to
11 such programming enhancements as a "tail" on a hockey puck, or an overlaid first down
12 marker on a football field. The same technological advances allow improvements in the way
13 advertisements are currently presented. Many sporting events are now presented with virtual
14 object advertisements included in the video. For example, the broadcast of a major league
15 baseball game may include one or more virtual object spots in which an advertisement is
16 displayed. The advertisements are then seen by television viewers, but not by fans who
17 attend the game. However, the advertisements are fixed, and are not varied according to
18 individual viewers.

19 **Summary**

20 A system and a method delivers interactive targeted virtual objects to reception sites.
21 A virtual object is a realistic, synthetic replica of an actual object. The virtual object is
22 viewable within video programming and may be combined with original video and audio to
23 supplement or replace portions of the original video and audio content. Virtual objects may
24 be overlaid on video, partially or entirely obscuring the underlying video. An overlaid object
25 may be static in nature, such as a graphical icon or the like, or alternatively may be dynamic,
26 such as a video clip, animation, or scrolling alphanumeric characters, for example. Overlaid
27 objects may be limited spatially to a fixed portion of the video screen, limited temporally to a
28 given time for display, limited by a combination of both location and time, or tied to a
29 spatially changing portion of the screen that is moving with time. Alternatively, virtual
30 objects may be added to and embedded within the actual video. Multiple virtual objects may
31 be embedded in the video in a multi-layer fashion. The virtual object is indistinguishable
32 from the other video content sharing the field of view. Virtual objects may be interactive in

1 nature. That is, a viewer may select an object and the selection will initiate a process
2 whereby a reception site takes some action based on the interactive virtual object or the
3 reception site sends a command to a location designated by the interactive virtual object to
4 initiate some action.

5 An interactive virtual object management center defines interactive objects, and
6 provides the interactive objects to the operations center for delivery, and the interactive
7 virtual objects response management guidelines to an interactive object servicing center. An
8 operations center may process the video signal to allow for the insertion of virtual objects
9 into the video. An object delivery center serves as a standalone or supplemental system to
10 the operations center to deliver virtual objects independently of the video with which the
11 virtual objects are to be associated. A delivery network includes any of a number of different
12 delivery systems to support the delivery of video and virtual objects from the operations
13 center and the object delivery center to a local insertion center, or directly to a reception site.

14 The delivery network is also used to deliver video and virtual objects from the local insertion
15 center to the reception site. The reception site receives the video and virtual objects and
16 associates the appropriate virtual objects with the video based on targeting algorithms.

17 The reception site collects virtual object viewing information and makes the viewing
18 information available to a local data collection center or a central data collection center using
19 the delivery network. The local data collection center provides information collected from
20 the reception site to the local insertion center to assist in the targeting of the virtual objects.
21 The central data collection center provides information collected from the reception site to
22 the operations center to assist in the targeting of virtual objects. Alternatively, the reception
23 site may use the virtual object viewing information and other information stored at the
24 reception site to locally target the virtual objects at the reception site. The reception site may
25 provide interactive requests, which are driven by the selection of interactive virtual objects,
26 to an interactive object servicing center using the delivery network. Interactive responses are
27 returned by the interactive object servicing center to the requesting reception site based on
28 the interactive virtual object response guidelines provided to the interactive object servicing
29 center by the interactive virtual object management center.

30 A targeting routine makes use of a viewer's demographic information and viewing
31 habits to determine those virtual objects that may be most effective when displayed to that
32 particular viewer. In so doing, the targeting routine generates packages of virtual objects
33 targeted to each viewer, or to groups of viewers.

1 The process of managing the content and the virtual objects to be included in the
2 content begins with a number of configuration and set-up steps. Individual reception site
3 address information can be collected at the operations center. This information is used to
4 uniquely identify each reception site and to associate with that identifier necessary
5 information to aid in the targeting process. The reception site address information may be
6 provided to the operations center upon installation or activation of the reception site in the
7 viewer's home. Other information may be collected from various sources, including viewer
8 surveys and marketing databases correlated by address, zip code+4, Nielsen or Arbitron
9 program rating services, for example.

10 Next, reception site groups are determined. This is needed if the management of
11 information and targeting to individual reception sites is not practical initially, either due to
12 lack of availability of information to the appropriate level of detail, or lack of technology to
13 control and deliver virtual objects to an individual reception site. For a number of target
14 categories, groups are defined. Examples of target categories include demographic targeting
15 (age/sex/income) and location, such as Area of Dominant Influence (ADI), for example.
16 Each target category is then segmented into appropriate groups. For example, the ADI may
17 include Los Angeles, CA and Washington D.C. New target categories can be added and the
18 groups redefined after their initial establishment. Anywhere from one to all reception sites
19 may be assigned to a single group.

20 For each target category, each reception site is assigned to a group based on the
21 information collected about the reception site. Once the reception site is assigned to a group,
22 the group assignment is conveyed to the reception site and stored therein. Alternatively, the
23 reception site may use information collected locally to assign the reception site to groups.

24 The group assignment information that is stored at the reception site is able to survive
25 power cycling of the reception site, and other normal service interruptions. Finally, as groups
26 are modified or group assignments change, reception sites are notified of the changes.
27 Additionally, the group assignment information may be periodically resent to the reception
28 sites to ensure that newly added reception sites and those that have accidentally lost their
29 information are up-to-date.

30 A virtual object location definer system determines where in the content the virtual
31 objects are to be placed and the rules associated with their placement. Content may be video
32 programming, commercials and advertisements, or electronic program guide (EPG)
33 information, for example. A virtual object selector system determines those available virtual
34 objects suitable for placement in a virtual object location. A targeted virtual object

1 management system determines which reception sites or reception site groups should
2 receive and display which virtual object for a given virtual object location. The virtual
3 objects and targeting information are then distributed to reception sites.

4 After reception sites receive and store the virtual objects and targeting
5 information, the reception site will place the most appropriate virtual object into virtual
6 object locations based on the targeting information, and will display the combined content
7 with the overlaid or embedded virtual object.

8 The reception site stores information indicating that a virtual object was inserted.
9 The accumulated history information may be collected from the reception site at a later
10 time for review purposes. The unique reception site identification information may also
11 be provided with the collected data. As mechanisms become available to identify specific
12 viewers in a household, the system will allow for individual identification information to
13 also be provided with collected data. Finally, after collection of the reception site viewing
14 history data, the reception site returns used reception site memory space to the reception
15 site.

16 A centralized operations center can determine virtual object locations available for
17 virtual object placement. Alternatively, a local insertion center can determine the virtual
18 object locations. The operations center can determine the specific virtual objects to be
19 placed in a virtual object location. Alternatively, the local insertion center may determine
20 the specific virtual object to be placed in a virtual object location. The reception site itself
21 can determine which virtual object is to be placed in a virtual object location based on its
22 own internal routines.

23 Content, virtual objects, and associated targeting/virtual object placement control
24 can be relayed to reception sites and information extracted from the reception site. The
25 reception site may reside within a digital cable set top box that has access to a delivery
26 network. Alternately, the reception site may be components of digital television satellite
27 receivers. The reception site may be incorporated into the circuitry of a television,
28 thereby eliminating the need for a separate control device attached to the television.
29 Alternatively, the reception site may be incorporated into a personal computer, personal
30 data device, smart phone with a display, or electronic book device

31 Accordingly, in one aspect, the present invention provides a method for targeting
32 interactive virtual advertisements, comprising: assigning a plurality of interactive spots to

1 a program; ranking a plurality of interactive virtual objects by a measure of effectiveness
2 for each one of said plurality of interactive virtual objects in different spots of said
3 plurality of interactive spots; assigning one or more of the interactive virtual objects to
4 one of the interactive spots based on the ranking; generating a retrieval plan; and
5 providing the retrieval plan to a terminal, wherein the retrieval plan instructs the terminal
6 to display one of the one or more interactive virtual objects according to the assigning of
7 the one or more interactive virtual objects.

8 In a further aspect, the present invention provides a method of targeting
9 interactive virtual objects, comprising: providing a program containing a plurality of
10 object locations to a terminal; ranking a plurality of interactive virtual objects by a
11 measure of effectiveness for each one of said plurality of interactive virtual objects in
12 different object locations of said plurality of object locations; providing one or more of
13 the interactive virtual objects for each one of the object locations based on the ranking;
14 and generating a retrieval plan, wherein the retrieval plan designates which of the one or
15 more provided interactive virtual objects to display in each of the object locations.

16 In a still further aspect, the preset invention provides a method of targeting
17 interactive virtual objects to terminals, comprising: creating a package of targeted
18 interactive virtual objects; providing the package to one or more of the terminals;
19 generating a group assignment matrix, wherein the group assignment matrix assigns
20 terminals to groups; generating a retrieval plan; and providing a program, retrieval plan,
21 and group assignment matrix to the one or more of the terminals, the program including at
22 least one interactive virtual object location, wherein, for a group identified in the group
23 assignment matrix, the retrieval plan designates interactive virtual objects to be displayed
24 during a display of the program in the at least one interactive virtual object location based
25 on a ranking of the interactive virtual objects, the ranking is determined by a measure of
26 effectiveness for each one of the interactive virtual objects in the at least one interactive
27 virtual object location.

28 In a further aspect, the present invention provides a terminal for targeting
29 interactive virtual objects, comprising: a network interface configured to receive a
30 plurality of interactive virtual objects and program content including a plurality of object
31 locations; an interactive virtual objects extractor processor coupled to the network
32 interface and configured to extract the plurality of interactive virtual objects, and program
33 content including the plurality of object locations; a storage processor coupled to the
34 extractor and configured to determine which of the extracted interactive virtual objects

1 are targeted to the terminal and save the targeted interactive virtual objects in a memory;
2 and an interactive virtual object selector processor coupled to the storage processor and
3 configured to determine an interactive virtual object placement for one or more stored
4 interactive virtual objects in one or more of the object locations based on a ranking of the
5 stored interactive virtual objects, the ranking determined by a measure of effectiveness
6 for each one of the stored interactive virtual objects in different object locations of the
7 plurality of object locations.

8 In a still further aspect, the present invention provides a system comprising: an
9 operations center including a network interface and one or more processors configured to:
10 provide, through a network, a program containing a plurality of interactive virtual object
11 locations to a terminal; provide one or more of a plurality of interactive virtual objects for
12 each one of the plurality of the interactive virtual object locations to the terminal, wherein
13 said one or more of the plurality of interactive virtual objects are selected from a ranked
14 list of the plurality of interactive virtual objects, and wherein said ranked list is
15 determined at least by a measure of effectiveness for each one of said plurality of
16 interactive virtual objects in different ones of said plurality of interactive virtual object
17 locations; provide a retrieval plan to the terminal, wherein the retrieval plan designates,
18 for one or more of the plurality of interactive object locations, which of the provided one
19 or more interactive virtual objects to display; and a terminal comprising: one or more
20 terminal network interfaces configured to receive the program, the plurality of interactive
21 virtual objects, and the retrieval plan; an interactive virtual objects extractor processor
22 coupled to the terminal network interfaces and configured to extract the plurality of
23 interactive virtual objects, the plurality of interactive virtual object locations and the
24 retrieval plan; a storage processor coupled to the extractor configured to determine which
25 of the extracted plurality of interactive virtual objects are targeted to the terminal and save
26 the extracted targeted interactive virtual objects in a memory; and an interactive virtual
27 object selector processor coupled to the storage processor configured to determine an
28 interactive virtual object placement for the one or more stored interactive virtual objects.

29 In a further aspect, the present invention provides a method of targeting
30 interactive virtual objects to terminals, comprising: creating a package of interactive
31 virtual objects; providing the package to one or more of the terminals; generating a
32 retrieval plan; and providing a program to the one or more of the terminals, the program
33 including a plurality of interactive virtual object locations, wherein the retrieval plan
34 designates one or more of the interactive virtual objects to be displayed during a display

1 of the program in the plurality of interactive virtual object locations based on a ranking
2 of the interactive virtual objects, the ranking determined by a measure of effectiveness
3 for each one of the interactive virtual objects in different ones of the plurality of
4 interactive virtual object locations, wherein each of the plurality of interactive virtual
5 object locations is a different spatial location within a scene of the program.

6 In a further aspect, the present invention provides a method comprising:
7 assigning a plurality of interactive virtual advertisement spots to a program; generating
8 a retrieval plan; and providing the retrieval plan to a terminal, wherein the retrieval plan
9 instructs the terminal to display in one of the virtual advertisement spots an interactive
10 virtual object selected from a ranked list of a plurality of interactive virtual objects,
11 wherein said ranked list is determined at least by a measure of effectiveness for each
12 one of said plurality of interactive virtual objects in each one of said plurality of
13 interactive virtual advertisement spots, wherein each one of the plurality of interactive
14 virtual advertisement spots is in a different spatial location in said program.

15 In a still further aspect, the present invention provides a method of targeting
16 interactive virtual objects, comprising: providing a program containing a plurality of
17 interactive virtual object locations to a terminal; providing one or more of a plurality of
18 interactive virtual objects for each one of the plurality of the interactive virtual object
19 locations to the terminal, wherein said one or more of the plurality of interactive virtual
20 objects are selected from a ranked list of the plurality of interactive virtual objects, said
21 ranked list is determined at least by a measure of effectiveness for each one of said
22 plurality of interactive virtual objects in each one of said plurality of interactive virtual
23 object locations, and each one of the plurality of interactive virtual object locations is in
24 a different spatial location in said program; providing a retrieval plan to the terminal,
25 wherein the retrieval plan designates, for one or more of the plurality of interactive
26 object locations, which of the provided one or more interactive virtual objects to
27 display.

28 In a further aspect, the present invention provides a method comprising:
29 receiving a program, a plurality of interactive virtual objects, and a retrieval plan at a
30 terminal, wherein the program includes a plurality of interactive virtual object
31 locations, the retrieval plan designates one or more of said plurality of interactive
32 virtual objects to be displayed during a display of the program selected from a ranked

1 list of said plurality of interactive virtual objects, the ranked list is determined at least
2 by a measure of effectiveness for each one of said plurality of interactive virtual objects
3 in each one of said plurality of interactive virtual object locations, and each one of the
4 plurality of interactive virtual object locations is in a different spatial location in said
5 program; and displaying one or more of the interactive virtual objects in one or more of
6 the interactive virtual object locations of the program according to the retrieval plan

7 In a still further aspect, the present invention provides a terminal comprising: a
8 network interface configured to receive a plurality of interactive virtual objects and a
9 plurality of interactive virtual object locations and metadata an interactive virtual
10 objects extractor processor coupled to the network interface and configured to extract
11 the plurality of interactive virtual objects, the plurality of interactive virtual object
12 locations and the metadata; a storage processor coupled to the extractor configured to
13 determine which of the extracted plurality of interactive virtual objects are targeted to
14 the terminal and save the extracted targeted interactive virtual objects in a memory; and
15 an interactive virtual object selector processor coupled to the storage processor and
16 configured to determine an interactive virtual object placement for one or more saved
17 interactive virtual objects selected from a ranked list of said plurality of interactive
18 virtual objects, wherein said ranked list is determined at least by a measure of
19 effectiveness for each one of said plurality of interactive virtual objects in each one of
20 said plurality of interactive virtual object locations, and each one of the plurality of
21 interactive virtual advertisement object locations is in a different spatial location in a
22 program.

23 In a further aspect, the present invention provides a system comprising: an
24 operations center including a network interface and one or more processors configured
25 to: provide, through a network, a program containing a plurality of interactive virtual
26 object locations to a terminal; provide one or more of a plurality of interactive virtual
27 objects for each one of the plurality of the interactive virtual object locations to the
28 terminal, wherein said one or more of the plurality of interactive virtual objects are
29 selected from a ranked list of the plurality of interactive virtual objects, wherein said
30 ranked list is determined at least by a measure of effectiveness for each one of said
31 plurality of interactive virtual objects in each one of said plurality of interactive virtual
32 object locations, and each one of the plurality of interactive virtual object locations is in

1 a different spatial location in said program; and provide a retrieval plan to the terminal,
2 wherein the retrieval plan designates, for one or more of the plurality of interactive
3 object locations, which of the provided one or more interactive virtual objects to
4 display; a terminal comprising: one or more terminal network interfaces configured to
5 receive the program, the plurality of interactive virtual objects, and the retrieval plan;
6 an interactive virtual objects extractor processor coupled to the terminal network
7 interfaces and configured to extract the plurality of interactive virtual objects, the
8 plurality of interactive virtual object locations and the retrieval plan; a storage
9 processor coupled to the extractor configured to determine which of the extracted
10 plurality of interactive virtual objects are targeted to the terminal and save the extracted
11 targeted interactive virtual objects in a memory; and an interactive virtual object
12 selector processor coupled to the storage processor configured to determine an
13 interactive virtual object placement for the one or more stored interactive virtual
14 objects.

15 **Description Of The Drawings**

16 The detailed description will refer to the following drawings in which like
17 numerals refer to like items, and in which:

18 Figure 1 is an overview of the virtual object targeting delivery system;

1 Figure 2 provides a pictorial representation of virtual objects and virtual object
2 locations;

3 Figure 3 is an example of an overlaid virtual object;

4 Figure 4 is an example of an embedded virtual object;

5 Figure 5 depicts an operations center;

6 Figure 6 depicts a virtual object definer;

7 Figure 7 is a pictorial representation of a virtual object location matte;

8 Figure 8 depicts a virtual object selector;

9 Figure 9 depicts a targeted virtual object management system;

10 Figure 10 shows configuration and set-up steps associated with targeting virtual
11 objects;

12 Figure 11 shows a subscriber information database system;

13 Figure 12 shows a configuration set-up system;

14 Figure 13 shows a virtual object targeting system;

15 Figure 14 presents an embodiment of the overall process for assigning targeted virtual
16 objects;

17 Figure 15 presents an embodiment of a process used by the virtual object placement
18 engine to assign virtual objects to virtual object locations;

19 Figure 16 presents an alternate embodiment used by the virtual object placement
20 engine to assign virtual objects to virtual object locations;

21 Figure 17 presents yet another embodiment used by the virtual object placement
22 engine to assign virtual objects to virtual object locations;

23 Figure 18 shows functions of an alternate virtual object targeting routine;

24 Figure 19 shows an embodiment of a matrices processing subroutine that is called by
25 the virtual objects targeting sequence;

26 Figure 20 shows a subroutine used to select the final groupings of virtual objects to be
27 sent to the reception sites or group of reception sites;

28 Figure 21 shows a representation of reception site groupings;

29 Figure 22 shows an example of a division of available bandwidth;

30 Figure 23 shows an alternative software program flow for an object targeting routine;

31 Figure 24 depicts an object delivery center;

32 Figure 25 presents embodiments associated with the delivery of virtual objects over a
33 coaxial or fiber cable system to a reception site;

1 Figure 26 presents embodiments associated with the delivery of virtual objects over a
2 wireless broadcast system to a reception site;

3 Figure 27 presents embodiments associated with the delivery of virtual objects over a
4 satellite broadcast system to a reception site;

5 Figure 28 presents embodiments associated with the delivery of virtual objects over a
6 wired data network to a reception site;

7 Figure 29 presents embodiments associated with the delivery of virtual objects using
8 the public switched telephony network (PSTN) to a reception site;

9 Figure 30 presents embodiments associated with the delivery of virtual objects using
10 wireless personal communications system (PCS) to a reception site;

11 Figure 31 depicts several embodiments associated with the delivery of virtual objects
12 using a national or local television broadcaster's signal;

13 Figure 32 depicts a local insertion center;

14 Figure 33 depicts an example of a reception site;

15 Figure 34 depicts a local data collection center;

16 Figure 35 depicts a central data collection center;

17 Figure 36 depicts an embodiment of the process performed by the interactive object
18 process upon receipt of a trigger;

19 Figure 37 presents an interactive object example;

20 Figure 38 depicts an interactive virtual object management center;

21 Figure 39 depicts an interactive object servicing center; and

22 Figure 40 presents processing performed by an interactive object servicing center.

23 Detailed Description

24 An overview of the interactive virtual object delivery and targeting system is depicted
25 in Figure 1. An operations center 10 performs the processing of a video content signal to
26 allow for the insertion of virtual objects into the content 36. An object delivery center 15
27 serves as a standalone or supplemental system to the operations center 10 to deliver virtual
28 objects independent of the content with which the virtual objects are to be associated. A
29 delivery network 11 includes any of a number of different delivery systems to support the
30 delivery of the content 36 and virtual objects from the operations center 10 and the object
31 delivery center 15 to a local insertion center 20 or directly to a reception site 30. A delivery
32 network 12 is used to deliver content and virtual objects from a local insertion center 20 to
33 the reception site 30. The reception site 30 may be any device or terminal capable of
34 receiving video, including a set top terminal, a television, a personal computer, a wireless

1 telephone, a wired telephone, a PDA device, an electronic book, a digital satellite television
2 receiver, or any similar device or terminal.

3 The reception site 30 receives the content 36 and virtual objects and associates the
4 appropriate virtual objects with the content 36 based on targeting algorithms. The reception
5 site 30 may collect virtual object viewing information and make the viewing information
6 available to a local data collection center 40 or a central data collection center 50 using a
7 delivery network 13. Alternatively, the reception site 30 may retain all virtual object viewing
8 information and use the information to target virtual objects locally without control from the
9 operations center 10. The local data collection center 40 provides information collected from
10 the reception site 30 to the local insertion center 20 to assist in the targeting of virtual objects.

11 The central data collection center 50 provides information collected from the reception site
12 30 to the operations center 10 to assist in the targeting of virtual objects. The interactive
13 virtual object management center 55 provides for the creation and definition of interactive
14 virtual objects. An interactive virtual object, discussed in more detail below, contains virtual
15 object identifying information, the actual virtual object, an interactive virtual object trigger
16 action 56, and virtual object response management guidelines 57. An interactive virtual
17 object trigger action 56 defines those actions which the reception site 30 takes once an
18 interactive virtual object is selected at the reception site. An interactive virtual object
19 response management guideline 57 may be provided to the interactive object servicing center
20 60 by the interactive virtual object management center 55 and used by the interactive object
21 servicing center 60 to determine the appropriate response upon receipt of an interactive
22 request from a reception site 30. The reception site 30 provides interactive requests, which
23 are driven by the selection of interactive virtual objects, to an interactive object servicing
24 center 60 using a delivery network 14. Interactive responses are returned by the interactive
25 object servicing center 60 to the requesting reception site 30.

26 Virtual objects may be realistic, synthetic replicas of actual objects. Virtual objects
27 may also be caricatures of actual individuals, photographs or other life-like renderings of
28 actual individuals, cartoon figures, text objects, graphical renderings, or icons, for example.
29 The virtual objects may be animated or fixed. The virtual objects are combined with video
30 and audio to supplement or replace portions of video and audio in original content 36. As
31 shown in Figure 2, the reception site 30 may contain or be connected to a display 35 on
32 which the content 36 may be displayed. An opportunity, advertisement spot, or location, in
33 the content 36 that is available for the placement of the virtual object will be denoted as a
34 virtual object location 37 henceforward. Within the virtual object location 37, one or more

1 individual virtual objects may be assigned, each denoted as a virtual object 38 henceforward.
2 Multiple virtual object locations, shown as virtual object locations 37 and 39 may be present
3 in the content 36. Multiple virtual objects, shown as virtual objects 38 and 40 may be present
4 within the virtual object locations.

5 As shown in Figure 3, virtual objects may be overlaid on video, partially or entirely
6 obscuring the underlying video. An overlaid virtual object may be static in nature, like a
7 graphical icon, as shown by virtual object 42. Alternatively the overlaid virtual object may
8 be dynamic, like a video clip, animation, or scrolling alphanumeric characters as shown by
9 virtual object 44. Overlaid virtual objects may be limited spatially to a fixed portion of the
10 video, limited temporally to a given time for display, or limited by a combination of both
11 location and time. Overlaid virtual objects may also be tied to a spatially changing portion of
12 the video that is moving with time.

13 Alternatively, as shown in Figure 4, virtual objects may be added to and embedded
14 within video. In this alternative, the synthetic virtual object 38 could be indistinguishable
15 from the other video content 36 sharing the field of view as shown by virtual object 46 and
16 virtual object 48. For instance, today's technology allows for the virtual placement of a
17 billboard at televised sports events and the placement of a virtual first down marker in
18 televised football games.

19 In an embodiment, virtual reality and animation technologies are combined with
20 advanced digital video techniques to provide realistic interaction of virtual objects within
21 video. Combining these technologies, a soda can may be synthetically placed in the video,
22 and may then be made to change over time. This placement and subsequent modification can
23 occur at the video's source, at an intermediate point within the distribution and delivery path,
24 or at the reception site 30. Combining the placement of virtual objects with the ability to
25 target specific virtual objects to specific viewers or groups of viewers allows one household
26 to see a scene with the soda can for cola, while the next door neighbor sees a root beer soda
27 can, for example.

28 Virtual objects may be interactive in nature, where a viewer can select a virtual object
29 35 and this selection will initiate a process whereby the reception site 30 initiates some action
30 or the reception site 30 sends a command to the location designated by the interactive virtual
31 object 38 to initiate some action. Actions may include linking to a Web site to display
32 content related to the interactive virtual object 38, initiating a purchase transaction, or
33 initiating a request for more information about the selected virtual object 38.

1 The operations center 10 shown in Figure 1 may include a number of systems that act
2 together in processing the content 36 for the inclusion of virtual objects, for the selection of
3 appropriate virtual objects to be placed in the content 36, for the targeting of virtual objects to
4 individual reception sites, and for the packaging and delivery of the content 36 and virtual
5 objects to reception sites.

6 Placement of virtual objects can be explicitly selected by the operations center 10,
7 resulting in the specific selection and placement of virtual objects into content 36.
8 Alternatively, the placement may be generically defined by the operations center 10. In this
9 alternative, the reception site 30 performs all the processing associated with selecting the
10 appropriate virtual object 38 to be placed in the content 36 based on basic guidelines
11 provided by the operations center 10 and algorithms operating at the reception site 30.

12 As shown in Figure 5, the operations center 10 includes a virtual object location
13 definer 100, a virtual object selector 200, and a targeted virtual object management system
14 (TVOMS) 300.

15 Figure 6 presents the virtual object location definer 100. A video capture processor
16 110 processes video and audio content 36 on a frame by frame basis, converting the original
17 content 36 into a corresponding digitized representation. The processed content 36' is then
18 stored in content buffer 120 for future access. A pre-viewer subsystem 130 allows for the
19 viewing of a video frame of the processed content 36'. Frame N 141, for example, (shown in
20 Figure 7) associated with the processed content 36', may be retrieved from the content buffer
21 120, viewed, and passed to a location selector processor 140. The location selector processor
22 140 allows for the selection of where in the frame N 141 the virtual object 38 may be placed.

23 When the frame N 141 is retrieved by the location selector processor 140, either a static area
24 may be selected, or alternatively, a dynamic area, which is tied to an area within the frame of
25 the processed content 36', may be selected. An overlay matte 16 (see Figure 7) may be used
26 in the virtual object insertion process to identify where and how a virtual object location 37 is
27 to be placed in the processed content 36'.

28 Techniques for pattern recognition used by the location selector processor 140 to
29 facilitate the creation of the matte 16 and the identification of the pixels within the frame that
30 the matte 16 is to be associated with for that frame are described in detail in US Patent
31 5,808,695, to Rosser, Roy J.; Das, Subhudev; and Tan, Yi; entitled Method of Tracking
32 Scene Motion for Live Video Insertion; US Patent 5,903,317, to Sharir, Avi; and Tamir,
33 Michael; entitled Apparatus and method for Detecting, Identifying, and Incorporating
34 Advertisements in a Video; US Patent 5,524,065, to Yagasaki, Toshiaki; entitled Method and

1 Apparatus for Pattern Recognition; US Patent 5,627,915, to Rosser, Roy J.; Das,
 2 Subhudev; and Tan, Yi; von Kaenel, Peter; entitled Pattern Recognition System
 3 Employing Unlike Templates to Detect Objects Having Distinctive Features in a Video
 4 Field; and US Patent 4,817,171, to Stentiford, Frederick; entitled Pattern Recognition
 5 System.

6 When the area is selected by the location selector processor 140 and the overlay
 7 matte 16 for the initial video frame N 141 is created, a video object marker processor 160
 8 creates the transparent overlay matte that is associated with the selected area for
 9 subsequent frames, for example frame N+1 142 and frame N+2 143 of the processed
 10 content 36', for the duration of frames designated, as shown in Figure 7. This selected
 11 area defines the virtual object location 37. Pattern recognition technology may then be
 12 applied to each subsequent frame of the processed content 36' in the video object marker
 13 processor 160, creating a sequence of mattes to be applied to each frame of the processed
 14 content 36', moving and transforming as needed to match the temporal movement and
 15 transformations of the virtual object location 37 within the processed content 36' to which
 16 the virtual object is to be tied. The pattern recognition technology handles transitions,
 17 cutaways, and cutbacks within the processed content 36', and any visual blocking or
 18 occlusions that may occur as other objects within the processed content 36' appear in front
 19 of the dynamic area selected for virtual object location 37.

20 Simultaneously with the selection of the virtual object location 37 and the creation
 21 of the mattes, a virtual object rules processor 170 allows for the entry of rules that govern
 22 the types of virtual objects and other relevant placement guidelines associated with the
 23 virtual object location 37. These rules allow for the selection of characteristics such as the
 24 duration of the virtual object location 37, and viewing overlay characteristics such as
 25 transparency of the overlay virtual object, and whether the virtual object location 37 is
 26 suitable for an interactive virtual object. The operations center 10 processes the stored,
 27 non-realtime processed content 36' and the real-time (live) processed content 36'. For
 28 real-time processed content 36' the content buffer 120 serves as a short buffer, and
 29 predefined rules are pre-loaded into the virtual object rules processor 170. Additionally,
 30 the video object marker processor 160 is pre-loaded with the directions as to which
 31 locations within the processed content 36' are to be treated as virtual object locations. The
 32 video object marker processor 160 then automatically searches the real-time processed
 33 content 36' using pattern recognition technologies presented above, or other technologies,
 34 and automatically creates the mattes required for each virtual object location. Once the
 35 video object marker processor 160 creates

1 the mattes and the associated controls, the mattes are associated with the actual processed
2 content 36' in the content buffer 120. The processed content 36', along with the mattes are
3 then optionally processed using the optional video processor 150, which performs any
4 necessary content encoding (e.g., MPEG4, or digitalization), and makes the content 36'
5 available to a rules application processor 180. The rules application processor 180 creates
6 metadata packets that carry the virtual object placement rules information and mattes and
7 associates these packets with the processed content 36' for each virtual object location 37
8 selected in the virtual object location definer 100.

9 Figure 8 is a block diagram of the virtual object selector 200. Processed content 36',
10 along with the metadata packets carrying the virtual object placement rules information
11 associated with each virtual object location 37 and the mattes 16 are provided by the virtual
12 object location definer 100 to the virtual object selector 200. An object selector processor
13 210 extracts the placement rules and stores the processed content 36' in a content buffer 240.

14 Using the placement rules, along with any operator entered object placement guidance, the
15 object selector processor 210 queries an object matcher processor 230 to initiate the selection
16 of virtual objects that match the requisite rules. The object matcher processor 230 can be
17 commanded by the object selector processor 210 to match a virtual object 38 in at least three
18 manners: 1) automatically, 2) with manual placement, and 3) with pre-selected virtual
19 objects. For automatic matching, the object matcher processor 230 searches an available
20 virtual objects database 220 to find virtual objects that meet the placement rules provided by
21 the object selector processor 210. The matching virtual objects are then marked in the
22 available virtual objects database 220 as suitable for that virtual object location 37. For
23 manual matching, the operator of the object matcher processor 230 manually selects the
24 desired virtual objects to be associated with a virtual object location 37, and marks the
25 selected virtual objects as suitable for the virtual object location 37 in the available virtual
26 objects database 220. For pre-selected objects, the placement rules will indicate the
27 pre-defined virtual objects to be associated with the processed content 36'. The object
28 matcher processor 230 marks the pre-determined virtual objects in the available virtual
29 objects database 220 as being associated the particular processed content 36' and virtual
30 object location 37.

31 Virtual objects may be processed and stored in the available virtual objects database
32 220 before they are used. Processing of the virtual objects includes digitizing the virtual
33 object 38 and associating the virtual object with those virtual object 38 placement guidelines
34 and rules that must be followed to place the virtual object 38 within virtual object locations.

1 The rules and guidelines may include product categories with which the virtual object 38
2 should be associated, or in contrast, cannot be associated with, the type of virtual object
3 38, the duration that the virtual object 38 is valid to be used, the number of times the
4 virtual object 38 may be used, and whether the virtual object 38 is interactive and any
5 interactive virtual object trigger action 56 or optional virtual object software applets 152
6 associated with an interactive virtual object 38.

7 In a non-realtime environment, an optional post viewer processor 260, which is
8 preceded by a virtual object insertion processor 250, is used to view the content 36 and
9 insert each virtual object 38 that was matched to the content 36 by the object matcher
10 processor 230 in the corresponding virtual object location 37. Techniques for insertion of
11 overlaid virtual objects are described in detail in U.S. Patents 4,319, 266 to Bannister,
12 Richard S.; entitled Chroma Keying System; 4,999,709 to Yamazaki, Hiroshi; and
13 Okazaki, Sakae; entitled Apparatus for Inserting Title Pictures; 5,249,039, to Chaplin,
14 Daniel J.; entitled Chroma Key Method and Apparatus; and 5,233,423 to Jernigan, Forest
15 E.; and Gingham, Joseph; entitled Embedded Commercials within a Television Receiver
16 using an Integrated Electronic Billboard.

17 Techniques for the insertion of embedded virtual objects are described in detail in
18 U.S. Patents 5,953,076, to Astle, Brian; and Das, Subhudev; titled System and Method of
19 Real Time Insertions into Video Using Adaptive Occlusion with a Synthetic Reference
20 Image; 5,892,554, to DiCicco, Darrell; and Pant, Karl; entitled System and Method for
21 Inserting Static and Dynamic Images into a Live Video Broadcast; 5,515,485, to Luquet,
22 Andre; and Rebuffet, Michel; entitled Method and Device for Modifying a Zone in
23 Successive Images; 5,903,317, to Sharir, Avi; and Tamir, Michael; entitled Apparatus and
24 Method for Detecting, Identifying and Incorporation Advertisements in a Video; and the
25 MPEG) standard.

26 In a realtime environment, the optional post viewer processor 260 is bypassed, and
27 the default virtual object 38 is placed in the virtual object location 37 by a default virtual
28 object insertion processor 270, which includes (not shown) a virtual object insertion
29 processor 250.

30 The targeted virtual object management system (TVOMS) 300 shown in Figure 9
31 allows for virtual objects, including virtual object-based advertisements, to be directed to
32 subscribers based on, for example, the use of subscriber data, programs watched data, past
33 virtual objects viewing data, past interactive virtual objects selected data, and/or mood
34 indicators entered by the subscriber. Alternatively, input from subscribers collected through

1 form-based questionnaires (hard copy, electronic, and telephone, for example) may be used
2 to further define a subscriber's potential likes, wants, and needs. Advertisers wanting to
3 optimize their advertising expenditures may direct virtual objects to the appropriate viewing
4 audiences to ensure that the desired audience views specific virtual objects. Specifically,
5 advertisers can display specific virtual objects in content 36 that is being viewed by those
6 subscribers most likely to be influenced to buy the advertised product, or otherwise respond
7 in a desired fashion to the virtual objects.

8 Virtual objects may also be targeted to reception sites on various levels. At a highest
9 level, virtual objects can be delivered to all reception sites viewing content 36, with no
10 targeting of the virtual objects to the subscriber, but with the virtual objects displayed in the
11 content 36 that are determined to be most relevant to the content 36. That is, the virtual
12 objects are placed in the virtual object location 37 without the use of an individual or group
13 targeting algorithm. Alternatively, some level of targeting may occur based on, for example,
14 ADI, zip code +4, geographical data and other similar criteria known about a reception site
15 30. In this alternative embodiment, the virtual objects are sent to a reception site 30, and a
16 local insertion routine in the reception site 30 controls placement of the virtual objects into
17 the virtual object locations 37 in the content 36. The virtual objects may be stored at the
18 reception site 30 and may be periodically refreshed. To account for reception sites that do
19 not have virtual objects available for insertion, the content 36 may be provided with a default
20 virtual object 38 embedded in the content 36. Upon receipt of the content 36 at a reception
21 site 30, the reception site 30, using the local insertion routine, determines if the default virtual
22 object 38 should be replaced with another virtual object 38 residing in the reception site's
23 memory or being delivered concurrently with the content 36.

24 Alternatively, virtual objects may be targeted to groups of reception sites, with the
25 groups of reception sites categorized based on some other common subscriber characteristics
26 such as programs watched data or interactive virtual objects selected data, for example.
27 Finally, virtual objects may also be targeted to specific subscribers that share the use of a
28 reception site 30 based on their unique subscriber characteristics.

29 To target virtual objects, the TVOMS 300 may make use of information from
30 numerous sources. These sources include collected programs watched data that are stored in
31 the reception site 30, and periodically uploaded to the central data collection center 50 or the
32 local data collection center 40, and from past virtual objects viewed information or past
33 interactive virtual objects selected that is stored in the reception site 30 and periodically
34 uploaded to the data collection centers. Additionally, these sources may include information

1 from marketing databases and past television programs watched data, as described in U.S.
2 Patent No.5,798,785, entitled TERMINAL FOR SUGGESTING PROGRAMS
3 OFFERED ON A TELEVISION PROGRAM DELIVERY SYSTEM, filed December 2,
4 1993.

5 The TVOMS 300 provides the management of information required to support
6 each of the following: (1) delivery of targeted virtual objects along with content 36 being
7 broadcast; (2) delivery of targeted virtual objects to subscribers independent of any
8 content 36 being broadcast; and (3) delivery of TVOMS-related subscriber-specific
9 information and commands.

10 Figure 9 shows the TVOMS 300 supporting the targeting of virtual objects to
11 subscribers. Broadcast information can be destined for the entire population of
12 subscribers receiving the content 36, groups of subscribers, and individual subscribers.
13 Broadcast information can include actual content 36, metadata packets with virtual object
14 insertion control information, virtual objects for placement within the content 36, and
15 command information required by the subscriber's reception site 30 to configure the
16 reception site 30 and retrieval plans to guide the reception site 30 in placing the
17 appropriate virtual object 38 within the content 36. Broadcasting may be supported over a
18 variety of broadcast-capable communication systems, such as the Internet, cable
19 television systems, terrestrial broadcast systems, satellite broadcast systems, and wireless
20 communications systems, and other systems described below.

21 A subscriber information database 1210 contains subscriber information collected
22 from numerous sources for each subscriber or reception site 30. The subscriber
23 information may then be used by a virtual object targeting system 1220 to determine the
24 best virtual objects to be distributed for inclusion in the content 36. Additionally, the
25 information collected may be used to determine if the subscriber information has changed
26 to the point that refreshed virtual objects should be delivered to a subscriber or,
27 alternatively, whether a subscriber's group assignments should be updated. The virtual
28 object targeting system 1220 determines the optimum subset of virtual objects to be
29 associated with the content 36 based on the selected object metadata provided by the
30 virtual object selector 200 (Figure 5) and subscriber information from the subscriber
31 information database 1210. A content and virtual object packager 1260 is directed to
32 retrieve the appropriate virtual objects from an available virtual objects database 1265.
33 The content and virtual object package 1260 then, along with the content 36, from a
34 content buffer 1270, addresses the virtual objects with the appropriate group addressing
35 information, and packages the virtual objects with the content 36. A

1 delivery processor 1300 then delivers the combined package of virtual objects, content 36,
2 and metadata to subscribers.

3 As an alternative to delivering virtual objects with associated content 36, virtual
4 objects can be delivered independently to individual subscribers or groups of subscribers
5 based on updated subscriber information, modified group assignments, or the need for
6 refreshed virtual objects at the reception site 30. Initiation could be automatic based on a
7 scheduled cycle or by TVOMS operator direction. Upon delivery initiation, the virtual object
8 targeting system 1220 uses subscriber information from the subscriber information database
9 1210, information about available virtual objects from the available virtual objects database
10 1265, and information about previously delivered virtual objects from the subscriber
11 information database 1210, to select the appropriate virtual objects to be packaged and
12 delivered to a reception site 30. Once the virtual object targeting system 1220 determines the
13 appropriate virtual objects, the content and virtual object packager 1260 retrieves the
14 appropriate virtual objects, packages the virtual objects with reception site configuration
15 information, addresses the information either to a single subscriber or group of subscribers,
16 and delivers the information to the appropriate reception site 30 using a delivery processor
17 1300. This delivery can be done in broadcast fashion or by communicating to reception sites
18 directly. Virtual objects may be broadcast to all reception sites, and a reception site 30 may
19 store only the virtual objects that are associated with groups to which the reception site 30
20 belongs. Alternatively content 36, virtual objects, and other information destined to
21 reception sites may be provided to the object delivery center 15 (Figure 1) for delivery to
22 reception sites.

23 The databases addressed in Figure 9 may be configured to support a variety of
24 information necessary for the TVOMS 300 to manage the targeting process. Below are
25 tables that present typical data that may be tracked by these individual databases.

26 Subscriber Information Database 1210

27 Reception system identification information

28 Reception site type

29 Date of system set-up

30 Date of last communication with operations center

31 Household income

32 User data (for each registered subscriber), including:

33 Name

34 Sex

1 Age
 2 Place of birth
 3 Education
 4 Profession
 5 TV program preferences
 6 Demographic information.
 7 Past advertising viewed data, which virtual objects, time spent viewing,
 8 Past products ordered, along with time, date, and method of order
 9 Past billing information
 10 Imputed subscriber data from marketing databases
 11 Past TV programs watched data, along with time and date
 12 Past PPV programs ordered data, along with time and date
 13 Mood indicators
 14 Form based questionnaire results
 15 Communication methods available (available options for both return and
 16 delivery)
 17 Group assignments per subscriber for each category
 18 Past virtual objects delivered to subscriber, date of delivery, method of
 19 delivery
 20 Past selected interactive virtual objects
 21 Zip+4 information
 22 Available Virtual Objects Database 1265
 23 Virtual object identifier with actual digital version of virtual object Display
 24 options (e.g., text, audio, graphics, video, link, HTML, XML, interactive)
 25 Static vs. dynamic virtual object indicator,
 26 If an interactive virtual object, interactive virtual object trigger action
 27 information
 28 If an interactive virtual object, optional interactive virtual object software
 29 applet
 30 Pricing subsidy information
 31 Run through completion status mode indication
 32 Date of valid use
 33 Virtual object placement controls, acceptable frequency
 34 Category and group preferences (as virtual object ranking percentages)

Pending Commands Database 1215

For each pending command:

Destination address

Actual command

Date generated

Date of confirmed receipt

Within the TVOMS 300, the virtual object targeting system 1220 is responsible for the intelligent and rapid selection of virtual objects for placement in content 36. Category and group targeting is managed in a manner similar to that described in co-pending U.S. Application Serial No. 09/597,893 entitled METHOD AND APPARATUS FOR TARGETING VIRTUAL OBJECTS, filed June 19, 2000, and in co-pending U.S. Application Serial No. 09/054,419 entitled TARGETED ADVERTISEMENT USING TELEVISION DELIVERY SYSTEM, filed April 3, 1998, and in co-pending U.S. Application Serial No. 09/328,672 entitled ELECTRONIC BOOK SELECTION AND DELIVERY SYSTEM WITH TARGETED ADVERTISING, filed on June 9, 1999.

Careful management of the virtual objects within the content 36, based on information known about the demographics and viewing habits of subscribers, for example, can greatly increase both the advertisers' likelihood of reaching an interested subscriber, and the likelihood a subscriber will be interested in a specific virtual object 38. Each virtual object location 37 within the content 36 is assigned a series of virtual objects by the TVOMS 300, and when multiple virtual objects are delivered for a given virtual object location 37 in the content 36, a retrieval plan is developed that directs which virtual objects should be displayed for a given subscriber or reception site 30, a group of subscribers or reception sites, or the entire subscriber population.

The process of managing the targeted virtual objects may consist of a number of configuration and set-up steps shown in Figure 10 that begins with the start step shown in block 7010 and ends with the end step shown in block 7017. First, individual reception site address information is collected by a subscriber data collection engine 1202 in the address information collection block 7011. This address information uniquely identifies each reception site 30 subscriber and associates necessary address information about each subscriber with the reception site identifier to aid in the virtual objects targeting process. This address information includes subscriber profile information, programs viewed information, past virtual objects delivered and viewed, and responses to menu-based

1 questionnaires or other questionnaires completed by the subscriber. In block 7012, other
2 subscriber information may be collected from various sources, including surveys and
3 marketing databases correlated by address or zip code+4, for example.

4 Next, a number of target categories are defined as shown in block 7013. Examples
5 of target categories include demographic targeting (age/sex/income) and location, such as
6 Area of Dominant Influence (ADI). Next, as shown in block 7014, each target category is
7 then segmented into appropriate groups. For example, the ADI may include Los Angeles,
8 CA and Washington D.C. New target categories can be added and the groups comprising
9 the target category redefined after their initial establishment.

10 Next, as shown in block 7015, for each target category, each reception site 30 is
11 assigned to a group based on the information collected about the subscriber. Once each
12 subscriber is assigned to a group, the group assignments are conveyed to the reception
13 site 30 and stored therein, as shown in block 7016. As groups are modified or group
14 assignments change, the reception sites are provided with the changes. Additionally, the
15 group assignment information is periodically resent to the reception sites to ensure that
16 newly added reception sites and those reception sites that have accidentally lost their
17 information are up-to-date. Alternatively, the reception site 30 may perform the
18 processing of information about the characteristics of the subscriber, and generation of
19 the group assignment information internal to the reception site as presented in co-pending
20 U.S. Application Serial No. 09/628,805 entitled METHOD AND APPARATUS FOR
21 LOCALLY TARGETING VIRTUAL OBJECTS WITHIN A TERMINAL, filed July 28,
22 2000.

23 Returning to Figure 9, the virtual object targeting system 1220 determines the
24 optimum types of virtual objects to be placed in the content 36 from the selected virtual
25 objects provided by the virtual object selector 200 (Figure 5). The virtual object targeting
26 system 1220 takes into account subscribers who will likely view the content 36, the
27 desirability of providing available virtual objects to those subscribers, target categories,
28 the number of virtual objects locations available for the content 36, and the number of
29 virtual objects available for assignment for a given virtual object location 37.

30 Once specific virtual objects are selected for one or more available virtual
31 object locations 37, the groups that should view each virtual object 38 are
32 determined, based on the target category of interest. The selected virtual object
33 locations 37 may include all virtual object locations, or a subset of all the
34 virtual object locations. A retrieval plan is generated by the retrieval plan
35 generator 1275 that provides information concerning which target

1 category and groups are assigned to each virtual object 38 associated with each virtual object
2 location 37. The retrieval plan may provide information for one virtual object location 37 or
3 multiple virtual object locations within content 36, where one or more virtual objects, target
4 categories, and the groups to which each virtual object 38 is targeted within each virtual
5 object location 37 is also provided. An example retrieval plan is provided in Table C below.

6 Alternatively, the retrieval plan providing virtual object assignments to virtual object
7 locations may be sent independently from the retrieval plan providing virtual objects, target
8 categories, and the groups to which each virtual object 38 may be targeted. Retrieval plans
9 may be distributed along with the virtual objects and the associated content 36 directly to the
10 reception sites by the delivery processor 1300 or using the object delivery center 15.
11 Alternatively, a retrieval plan may be distributed by the delivery processor 1300 or using the
12 object delivery center 15 independent of the associated content 36 or virtual objects.

13 After the reception site 30 receives and stores the virtual objects and the retrieval
14 plan, the reception site 30 inserts those virtual objects into the appropriate virtual object
15 locations in the content 36 based on the retrieval plan. The reception site 30 may retrieve and
16 store only those virtual objects associated with that reception site's group assignment for that
17 virtual object location 37. Alternatively, the reception site 30 may retrieve and store all
18 virtual objects but only insert those virtual objects into virtual object locations as dictated by
19 the retrieval plan.

20 When the virtual objects are displayed within the content 36, the reception site 30 will
21 store virtual objects viewed data indicating that a virtual object 38 was shown. In an
22 embodiment, the reception site 30 will store this virtual object viewed data only if the virtual
23 objects are displayed for a predetermined time, or only if the subscriber takes an action to
24 indicate the virtual object 38 has been viewed, such as by selecting an interactive virtual
25 object 38, for example. Accumulated virtual objects viewed data may be collected from a
26 reception site 30 at a later time for review purposes. Unique reception site identification
27 information also may be provided with the collected virtual objects viewed data. Upon
28 collection of the virtual objects viewed data, the reception site 30 may return the used
29 memory space to available pools for future use.

30 The virtual object targeting system 1220 receives requests from the metadata
31 extractor processor 1200 to initiate the determination of virtual objects to be placed. The
32 metadata extractor processor 1200 receives content 36 and associated virtual object
33 information from the virtual object selector 200 (Figure 5). The virtual object targeting

1 system 1220 provides outputs to the content and virtual object packager 1260 and the
2 retrieval plan generator 1275.

3 A part of the TVOMS 300 operation is the retrieval of subscriber data, and the
4 assimilation of the subscriber data into the virtual objects selection method. This operation
5 typically includes two steps. First, subscriber data is retrieved from the reception sites by the
6 central data collection center 50 or the local data collection center 40 (Figure 1). The
7 subscriber data is compiled and sent to the data collection engine 1202 in the operations
8 center 10. Once assembled at the TVOMS 300, the data is filtered for each application of the
9 TVOMS 300. In an embodiment, the subscriber information database 1210 receives inputs
10 from the subscriber data collection engine 1202 and a configuration set-up system 1205. The
11 subscriber information database 1210 provides outputs to the configuration set-up system
12 1205, and the virtual object targeting system 1220.

13 The data gathered includes:

14 What products a subscriber purchased and when they were purchased,
15 What Pay Per View (PPV) TV programs a subscriber purchased and when
16 they were purchased,
17 What television programming a subscriber has viewed,
18 What interactive virtual objects have been selected,
19 What virtual objects a subscriber viewed and for how long, and
20 Subscriber profile information.

21 Subscriber profile information may be collected and stored for one or more
22 subscribers for the purposes of virtual objects targeting. The subscriber profile may include
23 demographic information that may be gathered in a number of ways. The reception site 30
24 builds the subscriber profile for each subscriber and stores the information in a memory file
25 by subscriber name. The file may be uploaded to the central data collection center 50 or the
26 local data collection center 40 and provided to subscriber data collection engine 1202
27 periodically. Subscriber preference information may be collected using on screen menus at
28 the reception site 30, including information such as name, sex, age, place of birth, place of
29 lower school education, employment type, level of education, amount of television program
30 viewing per week, and the number of television shows in particular categories that the
31 subscriber watches in a given week such as, sports, movies, documentaries, sitcoms, amount
32 of Internet use and favorite web sites, etc. Any demographic information that will assist the
33 TVOMS 300 in targeting virtual objects may be used.

1 In addition to demographic information gathered at the reception site 30, the
 2 subscriber profile can be compiled using other methods. For instance, subscriber information
 3 can be gathered using questionnaires sent by mail and subsequently entered in the subscriber
 4 information database 1210.

5 As an alternative to gathering demographic data, a simulated subscriber profile can be
 6 generated using an algorithm that analyzes subscriber access history and subscriber habits.
 7 Using test information generated from a statistically significant number of subscribers, the
 8 simulated subscriber profile algorithm estimates the subscriber's age, education, sex and
 9 other relevant information. The analysis then compares information about the subscriber, for
 10 example the subscriber's programs watched information, with that of the test group. An
 11 example of the type of information maintained for a subscriber profile is presented below.

12 The subscriber profile data fields are an example of typical fields that can be used in
 13 the databases. Definitions of various fields are listed below. The primary purpose of
 14 profiling the subscriber is to acquire marketing information on the subscriber's likely
 15 response to available virtual objects. Ancillary information may be available including actual
 16 program selections or interactive virtual objects selections. Information tracked within the
 17 subscriber's profile includes:

18	Subscriber ID	A unique identifier generated by the system, one for
19		each subscriber using a specific reception site.
20	Reception site types	Boolean field that identifies the type of reception site
21		used.
22	Reception site ID	ID of the reception site.
23	Hookup Date	Date physical hardware is connected.

24 A demographic profile may be constructed for each subscriber from questionnaires or
 25 other sources. The following fields represent this demographic information:

26	Subscribers Age 2-5	Boolean field if the household has subscribers
27		between 2 and 5 years of age.
28	Subscribers Age 6-11	Boolean field if the household has subscribers
29		between 6 and 11 years of age.
30	Subscribers Age 12-17	Boolean field if the household has subscribers
31		between 12 and 17 years of age.
32	Subscribers Age N1-N2	Boolean field if household has subscribers between
33		N1 and N2 years of age.
34	Income	Annual household income.

1	Zip Code+4	Self-explanatory.
2	Occupancy	Number of subscribers in household.
3	Highest Education	Highest level of education of any subscriber in the
4		household.
5	Field of Use	Personal, professional, educational, other.
6	Profession	Self-explanatory.
7	Education Level	Self-explanatory.

8 These subscriber profile inputs may assist in the assignment of reception sites to
9 groups for each target category. There are numerous variations to the field definitions listed
10 above, such as different age groupings, for example. Other subscriber profile data fields may
11 also be specified.

12 Marketing information, such as the demographics of subscribers, may be received
13 from a central data collection center 50, a local data collection center 40, other external
14 sources, or directly from the reception sites using the subscriber data collection engine 1202.

15 To effectively manage the virtual objects targeting operations, marketing information, such
16 as the existence of markets for certain products, may be provided to the TVOMS 300. The
17 following examples of information may be maintained in the subscriber information database
18 1210: subscriber demographic profile, subscriber buy information, and correlation of
19 demographic information with buy information. The subscriber data collection engine 1202
20 gathers the marketing information from the various sources and indexes the information for
21 inclusion in the subscriber information database 1210.

22 To maintain the subscriber information database 1210 within the TVOMS 300, a
23 database server 1190, communications server 1191, subscriber workstation 1192 or stations,
24 or the suitable equivalents thereof, may be used, as depicted in Figure 11. The database
25 server 1190 supports saving database files, event logging, event scheduling, database server
26 services, and database security access.

27 The communications server 1191 performs the following functions on database data:
28 integrity check, filtering, processing, downloading to reception sites using the pending
29 commands database 1215, and uploading subscriber data from reception sites using the
30 subscriber data collection engine 1202. The subscriber workstation 1192 allows for operator
31 viewing and entry of subscriber data into the subscriber information database 1210.

32 Figure 12 shows an example of the configuration set-up system 1205 in more detail.
33 An interface 1206 receives individual addressing information unique to reception sites. The
34 interface 1206 can include a workstation, such as the workstation 1209, for example, from

1 which an operator manually enters reception site information. Alternately, reception site
2 information can be automatically entered at the interface 1206 by downloading from an
3 off-site database, the Internet, a storage medium, such as a CD-ROM or a floppy disk, or by
4 collecting the information directly from the individual reception sites using the subscriber
5 data collection engine 1202 or provided by a central data collection center 50 or local data
6 collection center 40. A processor 1207 processes the received reception site information and
7 organizes the information for use. For example, the processor 1207 may create a
8 Category/Group Definition Matrix as presented in Table A and a Group Assignment Matrix
9 as presented in Table B that can be used to target virtual objects to groups of reception sites
10 or to an individual reception site 30. In an alternative embodiment, if subscriber information
11 is available where multiple subscribers may share a reception site 30, a Group Assignment
12 matrix may be created for each subscriber who shares the reception site 30. The
13 Category/Group Definition Matrix and Group Assignment matrices will be described in more
14 detail later. The Category/Group Definition and Group Assignment matrices and organized
15 reception site information are then stored in a database 1208, and are periodically updated as
16 reception site information, for example, changes.

17 The information used by the processor 1207 to create a database of the
18 Category/Group Definition and Group Assignment matrices includes, for example, the
19 reception site identifier, subscriber identifier, zip code + 4 data, household income, and age
20 and sex of the subscribers, for example. The information gathered by the configuration
21 set-up system 1205 can come from a variety of sources including marketing databases, direct
22 inputs from the subscribers, data collected by the subscriber data collection engine 1202, a
23 central data collection center 50, a local data collection center 40, and other sources. The
24 processor 1207 will assign category numbers to target categories. For example, the ADI
25 could be assigned category 1 and household (HH) income could be assigned category 2.
26 Next, the configuration set-up system 1205 creates a number of non-overlapping groups for
27 each category. For example, ADI can be broken down into Seattle, WA, Washington D.C.,
28 Denver CO., Los Angeles CA, etc. Similarly, HH income can be broken down into a number
29 of income groups such as no income, 20-40K, 40-60K, 60-120K, and over 120K. Then, the
30 configuration set-up system 1205 assigns a "group mask representation" for each group
31 within every category. The group mask representation may be simply a binary number that
32 can be used to identify a particular group. Table A shows a completed Category/Group
33 Definition matrix that could be used by the virtual object targeting system 1220 to assign
34 targeted virtual objects to groups of reception sites or to individual reception sites.

1

Table A - Category/Group Definition Matrix

Category Number	Category Name	Group Number	Group Definition	Group Mask Representation
1	ADI			
2	HH income			
3	Category x			

2 The processor 1207 also creates the Group Assignment matrix. The Group
3 Assignment matrix, shown in Table B, assigns to each reception site 30, for each category, its
4 corresponding group number. Associated with each group number is the group definition
5 and the group mask representation. For example, the reception site 30 identified by the
6 address 12311 is assigned group number 2 (i.e., Washington D.C.) for ADI, and group
7 number 3 (i.e., 40-60K) for household income. The Group Assignment matrix is updated
8 periodically as categories and group definitions change, and as data related to individual
9 reception sites or groups of reception sites change. Many other ways of organizing the
10 information in a database for later use are possible.

11 The configuration set-up system 1205 also delivers the group configuration (i.e.,
12 information specific to an individual reception site 30, from the Group Assignment matrix) to

13

Table B Group Assignment Matrix

Address	Target Category	Group Number	Group Definition	Group Mask Representation
	ADI	2	Washington, D.C.	0100000000
	HH income	3	40-60K	0010000000

Address	Target Category	Group Number	Group Definition	Group Mask Representation
12311	Category x	5	Group d	00100000000
12312	ADI	4	LA	00100000000
	HH income	3	60-120K	00100000000
	Category x	2	Group a	10000000000
12313	ADI	3	Denver	00100000000
	HH income	4	60-80K	00010000000
	Category x	3	Group b	01000000000

each reception site 30. For example, the reception site 30 assigned the address 12311 is sent for category 1, group mask representation 01000000000, indicating group 2 assignment.

The group configuration information can be stored in the pending commands database 1215 to be transmitted directly to each reception site 30 periodically or the next time the reception site 30 establishes communications operations center 10. Each time a group configuration message is generated, the message is stored in the pending commands database 1215.

Alternatively to the TVOMS 300 assigning the reception site 30 to individual groups for each category, the TVOMS 300 could deliver the group definitions and category definitions to the all reception sites. Each reception site 30 could then assign itself to the appropriate groups for each category based on internal processing algorithms.

Figure 13 shows an embodiment of the virtual object targeting system 1220 in more detail. A resource management engine 1305 uses information from a metadata extractor processor 1200 and an available virtual object database 1265 (see Figure 9) to determine the number of virtual objects to be assigned to a given virtual object location 37. A virtual object placement engine 1307 decides which virtual objects to place in virtual object locations in the content 36. A group assignment engine 1309 determines which reception sites will view specific virtual objects. The virtual object placement engine 1307 receives information from the resource management engine 1305 related to the number of virtual objects available, how many virtual objects are to be provided for a given virtual object location 37, and the actual type of virtual objects available.

1 The resource management engine 1305 functions to divide available delivery
2 bandwidth among multiple virtual objects for a given virtual object location 37 in the content
3 36. Because there may be a limited amount of resources on the delivery network 11 to
4 deliver virtual objects with the content 36, the resource management engine 1305 may assign
5 the available bandwidth optimally for the virtual objects associated with the individual virtual
6 object locations within the content 36 being delivered over the communication channels.
7 Some virtual object locations may be assigned multiple virtual objects, each targeted to a
8 different group or groups, whereas other virtual object locations may be assigned only a
9 single virtual object 38.

10 Referring to Table A, four group numbers (i.e., 1-4) are shown for the category of
11 targeted virtual objects, ADI. For a particular virtual object location 37 in the content 36, the
12 four groups can be divided into two, one for each available virtual object 38 of two total, with
13 groups 1 and 2 receiving virtual object A and groups 3 and 4 receiving virtual object B, as
14 shown for virtual object location 1. A retrieval plan for this later example is shown in Table
15 C.

1

Table C - Retrieval Plan

Virtual Object Location	Target Category	Virtual Object To Retrieve	Groups Assigned to Specific Virtual Object	Group Mask Assignment
Virtual Object Location 1	ADI	Virtual Object A	1, 2	1100000000
		Virtual Object B	3, 4	0011000000
Virtual Object Location 2	HH Income	Virtual Object A	1, 2, 3	1110000000
		Virtual Object B	4	0001000000
Virtual Object Location 3	Category x	Virtual Object A	1, 2	1100000000
		Virtual Object B	3	0010000000
		Virtual Object C	4	0001000000
		Virtual Object D	5	0000100000
		Virtual Object E	6	0000010000
Virtual Object Location 4	All	Virtual Object A	All	1111111111

2 After determining how many virtual objects will be needed for each virtual object
3 location 37 within the content 36, the resource management engine 1305 may also account
4 for the type of available targeted virtual objects for display and the variety of subscribers
5 (according to group assignment numbers) who may be viewing the content 36. An advertiser
6 or content provider may provide this information when forwarding virtual objects for
7 insertion.

8 In an embodiment, the virtual object placement engine 1307 determines which
9 specific virtual objects are to be placed in each available virtual object location 37 within the
10 content 36. The virtual object placement engine 1307 first receives the list of selected
11 available virtual objects from the metadata extractor processor 1200 (Figure 9). In
12 cooperation with the resource management engine 1305, the virtual object placement engine
13 1307 then determines which of the available virtual objects should be placed in each virtual
14 object location 37 within the content 36. For example, if the preferred target category for
15 virtual object location 1 is ADI, the virtual object placement engine 1307 will select one or

1 more targeted virtual objects determined by the metadata extractor processor 1200 to place in
2 that virtual object location 37. If the demographic or other data assembled by the
3 configuration set-up system 1205 indicates that more than one targeted virtual object 38
4 should be placed, depending on the ADI, then the virtual object placement engine 1307 will
5 select the appropriate number of targeted virtual objects, and will assign each targeted virtual
6 object 38 to the specific virtual object location 37. The operation of the virtual object
7 placement engine 1307 to assign the targeted virtual objects will be described in more detail
8 later.

9 In an embodiment, the group assignment engine 1309 receives inputs from the
10 resource management engine 1305 and the virtual object placement engine 1307 and then
11 determines which reception sites and target category groups will view specific targeted
12 virtual objects. Thus, for each virtual object location 37, the group assignment engine 1309
13 assigns the reception sites to one of the virtual objects. The reception sites can be assigned
14 based on their placement within a group (i.e., based on their group assignment number) or
15 based on their individual reception site unit address. In tables B and C, the assignments are
16 shown based on the group assignment numbers. As also shown in Table C, the group
17 addressing for a virtual object location 37 may be based on a single category of targeting.
18 This may avoid a conflict regarding which virtual object 38 a reception site 30 may retrieve.

19 The group assignment engine 1309 provides an output to the retrieval plan generator
20 1275. The output indicates which group assignment numbers (i.e., which groups of reception
21 sites) are assigned to a virtual object 38 for a given virtual object location 37 in the content
22 36. The retrieval plan generator 1275 then generates a bit word, or group mask assignment,
23 that is used to assign the groups to virtual objects. Once generated, the retrieval plan is
24 provided to the delivery processor 1300 for distribution along with the content 36 and the
25 actual virtual objects to reception sites by object delivery center 15.

26 In an embodiment, the virtual object targeting system 1220 provides a virtual object
27 generation request command 1261 to the content and virtual object packager 1260. The
28 virtual objects generation request command 1261 specifies which particular virtual objects
29 are to be displayed in a particular virtual object location 37, and the actual location of the
30 virtual objects. The virtual object 38 is then retrieved from the available virtual object
31 database 1265. The virtual objects, along with the retrieval plan, and content 36 and
32 associated metadata packets are provided to the delivery processor 1300 for delivery to the
33 appropriate reception sites.

1 When a reception site 30 receives the content 36 that contains targeted virtual objects,
2 software instructions operating on the reception site 30 analyze the contents of the retrieval
3 plan. Then, based on the groups assigned for each virtual object 38, the reception site 30
4 retrieves those virtual objects that match its own group assignments for the target category
5 being used for the virtual object location 37. The reception site 30 then associates those
6 virtual objects retrieved with the appropriate virtual object location 37 where the virtual
7 object 38 will be placed, so that when the content 36 is viewed, the virtual object 38 assigned
8 to that virtual object location 37 is displayed.

9 An embodiment of the process for assigning targeted virtual objects using the virtual
10 object placement engine 1307 is presented in Figure 14. The process begins with block 2360.
11 In block 2362, the virtual object placement engine 1307 assigns reception sites to groups. In
12 block 2364, the virtual object placement engine 1307 ties or relates virtual object locations in
13 content 36 to the groups. In block 2366, the virtual object placement engine 1307 ties or
14 relates virtual objects to groups. In block 2368, the virtual object placement engine 1307
15 determines how many virtual objects to assign to a virtual object location 37. In block 2370,
16 the virtual object placement engine 1307 determines which target category to use for one or
17 more virtual object locations 37. In block 2372, the virtual object placement engine 1307
18 determines specific virtual objects to be placed in the virtual object locations 37. In block
19 2374, the virtual object placement engine 1307 determines which groups to assign to the
20 virtual objects 38 for the selected virtual object locations 37. The process ends with block
21 2376.

22 As discussed above, virtual object targeting uses target categories and groups within
23 each target category to tie or relate three entities together: 1) the reception site 30; 2) virtual
24 objects; and 3) virtual object locations in content 36. In one embodiment of block 2362 in
25 Figure 14, the reception sites are assigned to groups for each target category by the
26 configuration set-up system 1205 based on numerous factors as described below. One
27 method to assign the reception sites to groups is to use the zip code+4 as an index into one of
28 the available demographic marketing databases. From the zip code+4 data, a distinct
29 demographic cluster can be determined. The demographic cluster can then be mapped
30 directly to the specific group within each target category. Manual assignment of groups to
31 reception sites would be a daunting task for a large population of reception sites (approaching
32 several million). Therefore, the processor 1207 in the configuration set-up system 1205 may
33 perform this function automatically, using its installed software routines. Alternative
34 methods can also be devised to automatically map individual reception sites to groups within

1 target categories. Once each reception site 30 is mapped to one group for each target
2 category, the group assignments may be delivered to the reception site 30 for storage.

3 In one embodiment of block 2364 in Figure 14, virtual object locations in content 36
4 are tied or related to groups as described below. For each virtual object location 37, a group
5 breakdown percentage can be defined for each group that represents the likely compatibility
6 of the content 36 surrounding that virtual object location 37 with each group. Breakdown
7 percentages for each virtual object location 37 are defined within the virtual object selector
8 200 (see Figure 8) and passed to the TVOMS 300. Table D shows a sample breakdown of
9 these group breakdown percentages for five example virtual object locations for three
10 example target categories.

11 The group breakdown percentage data may be derived from a number of sources
12 including surveys, ratings services, and virtual objects viewed data collected by the reception
13 sites, for example. In this example, the three target categories are the same as those
14 presented in Table B, and the group assignment numbers are the same as those presented in
15 Table A. Thus, target categories 1 and 2 each have four groups associated with them, and
16 target category 3 has six groups associated with it. For virtual object location 1, the target
17 category 1 refers to ADI and under group 1, a group breakdown percentage of 25 percent is
18 assigned for group 1 from the target category ADI since 25 percent of the subscribers reside
19 in the Seattle, WA ADI. The group breakdown percentages for each target category for each
20 virtual object location 37 may sum to 100 percent.

21 In an embodiment of the subroutine represented by block 2366 of Figure 14, virtual
22 objects may be ranked according to their potential revenue generation for each group within
23 one and up to all possible target categories, again using percentages. This information may
24 be provided by an advertiser, programmer, or content provider responsible for the virtual
25 objects and may reside in the available virtual objects database 1265. Table E shows a
26 sample assignment of virtual object ranking percentages for eight sample virtual objects
27 using the same target categories and group numbers as in Table D. Not all virtual objects
28 may be assigned to groups for a target category if an advertiser or programmer does not wish
29 its virtual objects to be targeted in the manner required by that target category. For example,
30 an advertiser or programmer may want the same virtual object to be displayed at all reception
31 sites 30, regardless of subscriber group information or characteristics.

1

Table D - Virtual Object Location Group Breakdown Percentages

Virtual object location	Target Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Virtual object location 1	1	25	25	25	25	N/A	N/A
“	2	30	10	20	40	N/A	N/A
“	3	10	20	30	40	N/A	N/A
Virtual object location 2	1	10	20	30	40	N/A	N/A
“	2	25	25	25	25	N/A	N/A
“	3	10	15	25	25	15	10
Virtual object location 3	1	40	30	20	10	N/A	N/A
“	2	80	10	5	5	N/A	N/A
“	3	25	25	10	10	15	25
Virtual object location 4	1	50	0	50	0	N/A	N/A
“	2	0	40	40	20	N/A	N/A
“	3	10	10	25	25	15	15
Virtual	1	20	30	30	20	N/A	N/A

Virtual object location	Target Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
object location 5							
"	2	30	30	10	30	10	10
"	3	10	30	10	30	10	10

1 Referring to Table E, the data indicates that for virtual object 1, and target category 1
2 (ADI), the advertiser believes that virtual object 1 is appropriate for the subscribers in groups
3 1 and 2 and is not appropriate for the subscribers in groups 3 and 4. The advertiser also
4 believes that virtual object 1 is equally appropriate for both the group 1 and the group 2
5 subscribers. However, if the group 1 subscribers are determined to be more likely to respond
6 to virtual object 1 than the group 2 subscribers, then group 1 could be given a higher
7 percentage than group 2. Table E also shows that virtual object 1 is not applicable to groups
8 5 and 6 because only four groups are defined for the target category ADI. Thus, all the
9 reception sites will be grouped into one of groups 1 through 4.

Table E - Virtual Object Ranking Percentages

Virtual Object	Target Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Virtual object 1	1	50	50	0	0	N/A	N/A
"	2	30	10	20	40	N/A	N/A
"	3	0	0	0	0	0	0
Virtual object 2	1	0	0	50	50	N/A	N/A
"	2	0	0	0	0	N/A	N/A
"	3	0	0	0	0	0	0
Virtual object 3	1	0	0	0	0	N/A	N/A
"	2	25	25	25	25	N/A	N/A
"	3	0	0	0	0	0	0
Virtual object 4	1	50	0	50	0	N/A	N/A
"	2	0	40	40	20	N/A	N/A
"	3	10	30	10	30	10	10
Virtual object 5	1	40	20	20	40	N/A	N/A
"	2	10	30	30	30	N/A	N/A
"	3	30	30	30	5	5	0
Virtual object 6	1	0	0	0	0	N/A	N/A
"	2	0	0	0	0	N/A	N/A
"	3	10	10	10	10	30	30
Virtual object 7	1	20	40	40	20	N/A	N/A
"	2	25	25	25	25	N/A	N/A
"	3	0	30	20	30	0	20
Virtual object 8	1	30	40	0	30	N/A	N/A
"	2	30	30	10	30	N/A	N/A
"	3	20	0	20	20	20	20

Using this paradigm, virtual objects can be targeted using at least two methods. The first is a designated multi-virtual object campaign where specific unique sets of groups are assigned for each virtual object 38 of the campaign. In the second method, each virtual object 38 provided by an advertiser is independently associated with groups. Virtual objects from several different advertisers are then used together to optimize use of virtual object locations.

As depicted in Figure 14, blocks 2368, 2370, 2372, and 2374, the virtual object placement engine 1307 determines: 1) how many virtual objects are assigned to which virtual object location; 2) which target category is used for which virtual object location; 3) which virtual objects to place in each virtual objects location; and 4) which groups are assigned to which virtual objects, respectively. To limit the need for excessive distribution bandwidth to distribute virtual objects to reception sites, the algorithm in the virtual object placement engine 1307 that assigns targeted virtual objects to the virtual objects assumes that there is a total number of virtual objects available [TOTAL_VIRTUAL_OBJECTS] for a segment of content 36 (across all virtual object locations), and assumes that no more than some

1 maximum number of the virtual objects can be or are desired to be assigned to a given virtual
 2 object location 37. This amount is denoted as [MAX_VIRTUAL OBJECTS].

3 Figure 15 presents an embodiment of a process used by the virtual object placement
 4 engine 1307 to execute the functions listed in blocks 2368, 2370, 2372, and 2374 depicted in
 5 Figure 14. The process begins with the start ellipse, 2318. In block 2320, the virtual object
 6 placement engine 1307 determines the virtual object 38 best suited for each virtual object
 7 location 37 for all target categories. In block 2322, the virtual object placement engine 1307
 8 determines the best virtual object/target category combination for each virtual object location
 9 37. In block 2324, the virtual object placement engine 1307 compares virtual object/target
 10 category combinations for all virtual object locations. In block 2326, the virtual object
 11 placement engine 1307, for a virtual object location 37 and target category, determines the
 12 best virtual objects to associate with the virtual object location 37. In block 2328, the virtual
 13 object placement engine 1307 repeats block 2326 for each target category. In block 2330, the
 14 virtual object placement engine 1307 determines the target category that yields the optimum
 15 placement of virtual objects for a virtual object location 37. In block 2332, the virtual object
 16 placement engine 1307 repeats blocks 2326, 2328, and 2330 for all virtual object locations.
 17 In block 2334, the virtual object placement engine 1307 determines the best combination of
 18 multiple virtual objects for each virtual object location 37. In block 2336, for the remaining
 19 virtual object locations, the virtual object placement engine 1307 assigns the best matching
 20 virtual object 38. The process ends with block 2338.

21 A further embodiment of a virtual objects targeting algorithm presented in Figure 15
 22 will be described with reference to the example values shown in Tables A-E. Various other
 23 prioritizing or ranking schemes may be used as described later.

24 Step 1: In block 2320 in Figure 15, the virtual object placement engine 1307, for a
 25 virtual object location 37, determines the virtual objects with the highest overall ranking if
 26 that virtual object 38 were the only virtual object 38 to be placed in a virtual object location
 27 37 in the content 36. This step compares the data in Tables D and E. Figure 16 and the
 28 description that follows below present a more detailed embodiment of several of the blocks
 29 presented in Figure 15. In step 1a, as an embodiment of block 2421 in Figure 16, the virtual
 30 object placement engine 1307 selects the first virtual object location 37 and as an
 31 embodiment of block 2421 in Figure 16, selects the first virtual object 38 to be analyzed. As
 32 Step 1b, for that virtual object selected in Step 1a, the virtual object placement engine 1307
 33 selects the first category, as an embodiment of block 2423 in Figure 16. Then, the virtual
 34 object placement engine 1307 multiplies the virtual object's Group Ranking Percentage by

1 the virtual object location's Group Breakdown Percentage for each group as an embodiment
 2 of block 2424 in Figure 16 and sums the result, as an embodiment of block 2425 in Figure
 3 16. As Step 1c, the virtual object placement engine 1307 repeats Step 1b for the next target
 4 category, as an embodiment of block 2426 in Figure 16. As Step 1d, the virtual object
 5 placement engine 1307 repeats steps 1b and 1c for each virtual object 38, as an embodiment
 6 of block 2427 in Figure 16. As Step 1e, for the virtual object location 37 under
 7 consideration, the virtual object placement engine 1307 selects the virtual object/target
 8 category that yields the highest summed value, as an embodiment of block 2428 in Figure 16.
 9 Then, for Step 1f, the virtual object placement engine 1307 repeats Steps 1b-1e for all virtual
 10 object locations, as an embodiment of block 2429 in Figure 16.

11 For example, using virtual object location 1, virtual object 1:

12 target category 1: $50*25 + 50*25 + 0*25 + 0*25 = 25\%$

13 target category 2: $30*30 + 10*10 + 20*20 + 40*40 = 30\%$

14 target category 3: $0*10 + 0*10 + 0*20 + 0*20 + 0*20 + 0*20 = 0\%$

15 The cross-multiplied result then shows a measure of effectiveness for each virtual
 16 object 38 if displayed in the corresponding virtual object location 37. Table F below presents
 17 the results of Step 1 above for virtual object location 1

1

Table F

Virtual object location / Virtual object	Target Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Sum- mation
1 / 1	1	12.5	12.5	0	0	0	0	25
	2	9	1	4	16	0	0	30
	3	0	0	0	0	0	0	0
1 / 2	1	0	0	12.5	12.5	0	0	25
	2	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0
1 / 3	1	0	0	0	0	0	0	0
	2	7.5	2.5	5	10	0	0	25
	3	0	0	0	0	0	0	0
1 / 4	1	12.5	0	12.5	0	0	0	25
	2	0	4	8	8	0	0	20
	3	1	3	2	6	2	2	16
1 / 5	1	10	5	5	5	0	0	25
	2	3	3	6	12	0	0	24
	3	3	3	6	1	1	0	14
1 / 6	1	0	0	0	0	0	0	0

Virtual object location / Virtual object	Target Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Sum- mation
	2	0	0	0	0	0	0	0
	3	1	1	2	2	6	6	18
1 / 7	1	5	5	10	5	0	0	25
	2	7.5	2.5	5	10	0	0	25
	3	0	3	4	6	0	4	17
1 / 8	1	7.5	10	0	7.5	0	0	25
	2	9	3	2	12	0	0	26
	3	2	0	4	4	4	4	18

Step 2: Returning to Figure 15, for each virtual object location 37, the virtual object placement engine 1307, in block 2322, determines the virtual object/target category combination that results in the highest overall ranking. In one embodiment the virtual object placement engine 1307, lists the virtual object locations, the overall ranking, the corresponding virtual object 38, and the corresponding target category. In case of a tie, the virtual object placement engine 1307 selects any virtual object 38 with the overall highest ranking. Table G shows the results. Thus, from Table G, virtual object 4, a virtual object 38 displayed within virtual object location 4 yields a measure of effectiveness of 50 (highest) and virtual object 8 along within virtual object location 5 yields a measure of effectiveness of 28.

Table G

Virtual Object Location	Highest Overall Ranking	Corresponding Virtual Object	Corresponding Target Category
Virtual object location 1	30	Virtual Object 1	2
Virtual object location 2	35	Virtual Object 2	1
Virtual object location 3	35	Virtual Object 1	1
Virtual object location 4	50	Virtual Object 4	1
Virtual object location 5	28	Virtual Object 8	2

Step 3: In one embodiment of block 2324 in Figure 15, the virtual object placement engine 1307 orders the resulting list of virtual object locations from Step 2 from lowest overall ranking to highest overall ranking to compare virtual object/target category combinations for virtual object locations. Table H shows the results.

Table H

Virtual Object Location	Overall Ranking	Corresponding Virtual Object	Corresponding Target Category
Virtual object location 5	28	Virtual Object 8	2
Virtual object location 1	30	Virtual Object 1	2
Virtual object location 2	35	Virtual Object 2	1
Virtual object location 3	35	Virtual Object 1	1
Virtual object location 4	50	Virtual Object 4	1

Step 4: In one embodiment of block 2326 in Figure 15, the virtual object placement engine 1307 uses the process shown in Figure 17 to determine the best virtual objects to associate with a virtual object location 37. The block begins with ellipse 2440. In block 2441 in Figure 17, the virtual object placement engine 1307 selects the virtual object location 37 from Step 3 resulting in the lowest overall ranking. As Step 4a, for the selected virtual object location 37, the virtual object placement engine 1307 selects the first target category, as an embodiment of block 2442 in Figure 17. As Step 4b, the virtual object placement engine 1307 assembles a table showing the product of each virtual object Group Ranking Percentage and virtual object location Group Breakdown Percentage combination. Table I below provides an example for virtual object location 5 and target category 1.

Table I

Virtual Object Location / Virtual Object	Target Category	Group 1	Group 2	Group 3	Group 4	Sum- mation
5 / 1	1	10	15	0	0	25
5 / 2	1	0	0	15	10	25
5 / 3	1	0	0	0	0	0
5 / 4	1	10	0	15	0	25
5 / 5	1	8	6	6	4	24
5 / 6	1	0	0	0	0	0
5 / 7	1	4	6	12	4	26
5 / 8	1	6	12	0	6	24

As Step 4c, as an embodiment of block 2443 in Figure 17, the virtual object placement engine 1307 finds the product that is the highest. In case of a tie, the virtual object placement engine 1307 selects the product that corresponds to the highest summation value for that virtual object location / virtual object combination. In case a tie still persists, the virtual object placement engine 1307 selects any of the cells with an equivalent value. Table J below shows the previous example continued where group 2 for virtual object location / virtual object combination 5/1 is selected.

Table J

Virtual Object Location / Virtual Object	Target Category	Group 1	Group 2	Group 3	Group 4	Sum- mation
5 / 1	1	10	*15*	0	0	25
5 / 2	1	0	0	15	10	25
5 / 3	1	0	0	0	0	0
5 / 4	1	10	0	15	0	25
5 / 5	1	8	6	6	4	24
5 / 6	1	0	0	0	0	0
5 / 7	1	4	6	12	4	26
5 / 8	1	6	12	0	6	24

Step 5: As an embodiment of block 2444 in Figure 17, the virtual object placement engine 1307 finds the product that is next highest (or the same value as in Step 4), but that is associated with a group not yet selected. Again, in case of a tie, the virtual object placement engine 1307 selects the product that corresponds to the highest summation value for that virtual object location / virtual object combination. In case a tie still persists, the virtual object placement engine 1307 selects any of the cells with an equivalent value. Table K below shows the previous example continued.

1

Table K

Virtual Object Location /Virtual Object	Target Category	Group 1	Group 2	Group 3	Group 4
5 / 1	1	*10*	*15*	0	0
5 / 2	1	0	0	*15*	*10*
5 / 3	1	0	0	0	0
5 / 4	1	10	0	15	0
5 / 5	1	8	6	6	4
5 / 6	1	0	0	0	0
5 / 7	1	4	6	12	4
5 / 8	1	6	12	0	6

2 Step 6: As an embodiment of block 2446 in Figure 17, the virtual object
3 placement engine 1307 repeats Step 5 until a product has been selected for all groups.
4 Table L below continues the example.

Table L

Virtual Object Location / Virtual Object	Target Category	Group 1	Group 2	Group 3	Group 4
5 / 1	1	*10*	*15*	0	0
5 / 2	1	0	0	*15*	*10*
5 / 3	1	0	0	0	0
5 / 4	1	10	0	15	0
5 / 5	1	8	6	6	4
5 / 6	1	0	0	0	0
5 / 7	1	4	6	12	4
5 / 8	1	6	12	0	6

Step 7: As an embodiment of block 2448 in Figure 17, for all virtual objects with products cells selected in Step 6, the virtual object placement engine 1307 calculates the summed products of those selected cells for each virtual object 38. Table M below shows the results.

Table M

Virtual Object Location / Virtual Object	Target Category	Group 1	Group 2	Group 3	Group 4	Sum- mation
5 / 1	1	*10*	*15*	0	0	25
5 / 2	1	0	0	*15*	*10*	25
5 / 3	1	0	0	0	0	0
5 / 4	1	10	0	15	0	0
5 / 5	1	8	6	6	4	0
5 / 6	1	0	0	0	0	0
5 / 7	1	4	6	12	4	0
5 / 8	1	6	12	0	6	0

Step 8: As an embodiment of block 2450 in Figure 17, the virtual object placement engine 1307 orders the virtual objects in Step 7 from highest summed value to lowest. In case of equal summed values, the virtual object placement engine 1307 arbitrarily orders those virtual objects with the same summed value. Table N presents the example results.

Table N

Virtual Object Location / Virtual Object	Target Category	Group 1	Group 2	Group 3	Group 4	Sum- mation
5 / 1	1	10	15	0	0	25
5 / 2	1	1	0	15	10	25

Step 9: As Step 9a, if the number of virtual objects selected in Step 8 exceeds [MAX_VIRTUAL OBJECTS], the virtual object placement engine 1307 selects the first [MAX_VIRTUAL OBJECTS] virtual objects with the summed value as an embodiment of

block 2452 in Figure 17. For example, if it is desired to assign at most two virtual objects to a virtual object location 37, the virtual object placement engine 1307 selects the two virtual objects with the highest virtual object Group Ranking Percentage and virtual object location Group Breakdown Percentage products. Next, as Step 9b, for the unselected virtual objects, the virtual object placement engine 1307 determines those groups that were associated with these omitted virtual objects, as an embodiment of block 2454 in Figure 17.

Step 10: As an embodiment of block 2456 in Figure 17, for the virtual objects associated with the groups determined in Step 9b, the virtual object placement engine 1307 selects the product within that group that is the highest for the [MAX_VIRTUAL OBJECT] selected virtual objects from Step 9a. The virtual object placement engine 1307 recalculates the summed products of those selected groups cells for each of the virtual objects. Table O below provides a new example, assuming [MAX_VIRTUAL OBJECTS] = 2; therefore, groups 5 and 6, which are associated with virtual object 6, may be reallocated to virtual objects 7 & 5, respectively.

Table O

Result before Step 10 is shown below:

Virtual object location / Virtual object	Target Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Summation
5 / 7	3	0	*9*	2	*9*	0	2	18
5 / 5	3	*3*	9	*3*	1.5	0.5	0	6
5 / 6	3	1	3	1	3	*3*	*3*	6

1 Result after Step 10 is shown below:

Virtual object location / Virtual object	Target Category	Group 1	Grou p 2	Group 3	Group 4	Group 5	Group 6	Sum- mation
5 / 7	3	0	*9*	2	*9*	0	*2*	20
5 / 5	3	*3*	9	*3*	1.5	*0.5*	0	6.5
5 / 6	3	1	3	1	3	3	3	0

2 Step 11: As an embodiment of block 2458 in Figure 17, the virtual object placement
 3 engine 1307 calculates the total summed product value for all virtual objects selected in Step
 4 10. From Table P, this value is 26.5. The resultant groups selected for each virtual object 38
 5 will serve as the group assignments if this virtual object location / target category ultimately
 6 results in the best match, as determined in the remaining steps of the algorithm.

7 Table P

Virtual object location / Virtual object	Target Category	Grou p 1	Group 2	Group 3	Group 4	Group 5	Group 6	Sum- mation
5 / 7	3	0	*9*	2	*9*	0	*2*	20
5 / 5	3	*3*	9	*3*	1.5	0.5	0	6.5
Total summed product values								26.5

8 Step 12: The virtual object placement engine 1307 repeats steps 4-11 above for the
 9 same selected virtual object location 37 of Step 4 using the remaining target categories, as an
 10 embodiment of block 2328 in Figure 15. The Table Q example below provides the output
 11 results for each of the three example target categories.

1

Table Q

Virtual object location / Virtual object	Target Category	Group 1	Group 2	Group 3	Group 4	Sum-mation		
5 / 1	1	*10*	*15*	0	0	25		
5 / 2	1	0	0	*15*	*10*	25		
Total summed product values						50		
Virtual object location / Virtual object	Target Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Sum-mation
5 / 1	2	*9*	3	2	*12*	0	0	21
5 / 4	2	0	*12*	*4*	6	0	0	16
Total summed product values								37
Virtual object location / Virtual object	Target Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Sum-mation
5 / 7	3	0	*9*	2	*9*	0	*2*	20
5 / 5	3	*3*	9	*3*	1.5	*0.5*	0	6.5
Total summed product values								26.5

1 Step 13: As an embodiment of block 2330 in Figure 15, the virtual object
2 placement engine 1307 selects the target category that yields the highest total summed
3 product amount. The virtual object placement engine 1307 assigns this as the Maximum
4 Back for that virtual object location 37. In the case above, the virtual object placement
5 engine 1307 would assign target category 1, with a value of 50 that is selected.

6 Step 14: As an embodiment of block 2332 in Figure 15, the virtual object
7 placement engine 1307 repeats Steps 4-13 for the virtual object location 37 selected in
8 Step 4 with the next lowest overall ranking, computing the Maximum Rank for each
9 virtual object location 37.

10 Step 15: As an embodiment of block 2334 in Figure 15, the virtual object
11 placement engine 1307 uses the available [MAX_VIRTUAL OBJECTS]; virtual objects
12 for the virtual object locations up to the maximum number of [TOTAL_VIRTUAL
13 OBJECTS]; that yield the largest Maximum Rank. The virtual object placement engine
14 1307 makes use of the relevant target category determined in Step 13, with virtual objects
15 as determined in Step 10, with group assignments as determined in Step 11.

16 Step 16: As an embodiment of block 2336 in Figure 15, for all other virtual object
17 locations, the virtual object placement engine 1307 assigns the single virtual objects that
18 yielded the highest Overall Ranking as determined in Step 2.

19 The above algorithm performed by the virtual object placement engine 1307 is
20 meant to be illustrative and not limiting. Other algorithms are possible for assigning
21 targeted virtual objects to groups of reception sites or to individual reception sites. Other
22 targeted virtual object routines can also be used by the virtual object placement engine
23 1307.

24 The above algorithm can be simplified in the case where virtual objects are being
25 selected to be delivered with the content 36 to be received by a single subscriber or
26 reception site 30. In this case, prior to initiating the steps in the algorithm, the virtual
27 object location Group Breakdown Percentages table may be modified to display a group
28 breakdown percentage of 0 for all groups that the subscriber does not belong to for each
29 target category.

30 An alternate virtual object targeting routine 1374 is described in U.S. Patent
31 5,600,364, to Hendricks, John S. entitled NETWORK CONTROLLER FOR CABLE 30
32 TELEVISION DELIVERY SYSTEM. In this alternative, software in the virtual object
33 targeting system 1220 generates packages of virtual objects geared towards particular
34 subscribers and makes use of a subscriber's demographic information and viewing habits
35 to determine those virtual objects that are of most interest to

1 that particular subscriber. The routine 1374 then outputs packages of virtual objects targeted
2 towards each subscriber or group of subscribers.

3 Figure 18 shows the seven primary functions of an alternate virtual object targeting
4 routine 1374. The function of the routine 1374 is to target virtual objects for reception sites
5 based on historical programs watched data and other data that is available at the TVOMS
6 300. In the discussion that follows, the alternate virtual object targeting routine 1374 is
7 described as executed at the TVOMS 300.

8 The process may be initiated as shown at initiation ellipse 1420. In the first
9 subroutine, identified at block 1422, the virtual object targeting system 1220 determines the
10 programs watched matrices stored in the subscriber information database 1210. The
11 determine programs watched matrices subroutine 1422 uses a unique reception site ID to
12 access a specific matrix for one reception site. These matrices are maintained and updated by
13 periodic collections by the operations center 10 of accumulated information from the
14 reception sites.

15 In the second subroutine, shown at block 1424, the virtual object targeting system
16 1220 develops other matrices based on other available information. To develop other
17 matrices based on other available information subroutine 1424 is an optional subroutine not
18 required for the functioning of the system. For groups of reception sites or for each
19 individual reception site, matrices may be developed based on the demographic information,
20 billing information, pricing information, age information and other information that may be
21 stored in the subscriber information database 1210.

22 In the process matrices through correlation algorithms subroutine, block 1426, the
23 virtual object targeting system 1220 processes all matrices through a set of correlation
24 algorithms. In particular, the virtual object targeting system 1220 takes matrices developed
25 in the first two subroutines 1422 and 1424 and processes the matrices until reaching a final
26 matrix.

27 Figure 19 shows an embodiment of the matrices processing subroutine 1426 that is
28 called by the virtual objects targeting sequence 1374 shown in Figure 18. As shown in
29 Figure 19, the virtual object targeting system 1220 initiates the matrices processing
30 subroutine 1426 at initiation ellipse 1427 and then accesses or queries, at block 1420, the
31 programs watched file and gathers information regarding either an individual subscriber or a
32 group of subscribers. The virtual object targeting system 1220 can gather the programs
33 watched information in this way for individual subscribers or a group of subscribers.

1 Once the programs watched information has been gathered in the database, the
2 virtual object targeting system 1220 selects and groups, at block 1430, programs watched
3 categories and time periods. The software initially takes each program category (e.g., sports,
4 news, mysteries, etc.) and determines the number of programs watched for a given time. The
5 periods may be set to any length of time, including, for example, one, two, three or four
6 weeks. The virtual object targeting system 1220 will loop through such a counting process
7 for each group and period and then proceed to build a programs watched matrix, at block
8 1432, based on the program categories and periods. Essentially, all programs watched in a
9 particular category and time period will be entered into the programs watched matrix. Once
10 the matrix has been built, the virtual object targeting system 1220, using matrices processing
11 subroutine 1426, will process the matrix for a given subscriber or group of subscribers
12 through the correlation algorithms.

13 A number of correlation algorithms may be used to weight each selected program
14 category. For example, as shown at block 1434, the virtual object targeting system 1220 may
15 use a sum of squares algorithm to determine the weighting. Once weighted, the weighted
16 categories will be correlated by the virtual object targeting system 1220 at block 1436, with
17 various virtual objects stored in the available virtual objects database 1265. The virtual
18 object targeting system 1220 then selects a set of the most heavily weighted virtual objects
19 for inclusion within the content 36 to be delivered to individual subscribers or groups of
20 subscribers. Having determined the weightings of each group and prioritizing the groups
21 accordingly, the virtual object targeting system 1220 returns, block 1438, to the virtual
22 objects targeting sequence 1374 of Figure 18.

23 Referring back to Figure 18, in the fourth subroutine, as represented at block 1428,
24 the virtual object targeting system 1220 uses the final matrix developed by the correlation
25 and weighing algorithm described above, to select a grouping (or selective filter) for each
26 reception site 30. The final groupings of virtual objects that may be sent to the reception
27 sites or group of reception sites may use a subroutine as diagramed in Figure 20.

28 The fourth subroutine 1428, depicted in Figure 20, is called or initiated by the virtual
29 objects targeting sequence 1374 of Figure 18 in order to determine the final groupings. In the
30 subroutine shown at block 1444, the virtual object targeting system 1220 selects a set of
31 virtual objects that will be used in the chosen groupings. This selection process may involve
32 virtual objects from various virtual objects categories. Each virtual object 38 may
33 subsequently be assigned a number of times that it will be shown in a given segment of
34 content 36. The frequency of display may be based on various factors, including the number

1 of requests and cost paid by the respective advertisers to have the virtual objects displayed, as
2 shown in block 1446. Such factors may be used by the virtual object targeting system 1220
3 in the next step of the subroutine, at block 1448, at which the virtual object targeting system
4 1220 assigns a weighting to specific virtual objects in each virtual objects category. These
5 weightings are used to prioritize the virtual objects that will be sent to individual reception
6 sites or group of reception sites.

7 Once the virtual objects have been weighted, the virtual object targeting system 1220
8 executes a correlation algorithm, at block 1450, using selected criteria (i.e., the various
9 factors used to weight the virtual objects) as well as the output of each programs watched
10 matrix. Any number of correlation algorithms and weighting algorithms may be used,
11 including the sum of squares weighting algorithm described above.

12 The results from the correlation algorithm subsequently determine the virtual objects
13 and program content 36 that is sent to the virtual object targeting system 1220 for
14 distribution. Once the virtual object targeting system 1220 at the fourth subroutine 1428
15 completes these steps, the subscriber information database 1210 updates the subscriber
16 record based on the virtual objects that are sent, as shown at block 1454. The database
17 update allows the advertisers to track the costs and frequency of the virtual objects targeted to
18 specific reception sites or groups of reception sites. Following the updates, the virtual object
19 targeting system 1220 returns to the virtual objects targeting sequence shown in Figure 18,
20 block 1456.

21 Referring to Figure 21, reception site groupings (1 through 5) 1460 are shown. The
22 number of reception site groupings available may be determined by the bandwidth available
23 to transmit virtual objects along with content 36. The available bandwidth or resources
24 provided by the delivery network 11 may limit the number of virtual objects that are
25 available to distribute to the reception site 30.

26 Referring back to Figure 18, the virtual object targeting system 1220 at the fifth
27 subroutine, represented at block 1466, prepares reception site group information for
28 transmission to the reception sites along with the requested content 36.

29 In the sixth subroutine, block 1468, the virtual object targeting system 1220 selects
30 the targeted virtual objects. The sixth subroutine 1468 is the last decision making process in
31 displaying a targeted virtual objects for a subscriber. As shown in block 1469, the reception
32 site 30 then displays the targeted virtual objects with the content 36.

33 As noted above, targeted advertising can be based on viewing a specific program or
34 a category of programming content 36. In an embodiment, the reception site 30 performs this

1 last step by correlating (or matching) the program being watched by the subscriber with the
2 reception site group information that has been previously transmitted by the TVOMS 300.
3 Figure 21 shows an exemplary table matching reception site groups 1460 and program
4 categories 1470 with specific virtual objects. The virtual objects are shown in Figure 22 at
5 1474 and are assigned Roman numerals I through X, for example. The number of reception
6 site groupings and virtual objects can vary. Figure 22 shows a division of available
7 bandwidth to carry ten virtual objects. In this example, the virtual objects 1474 are numbered
8 1101-1110.

9 The TVOMS 300 will transmit group information to a reception site 30 shown as
10 row names 1460 on Figure 21. The TVOMS 300 will also transmit data that informs the
11 reception site 30 which of the multiple virtual objects 1474 is assigned to a program category
12 shown as columns 1470 on Figure 21. Each reception site 30 only requires the data related to
13 that reception site's assigned group (or row). For example, in Figure 21, the reception site 30
14 in group 1 (row 1) is provided with data on the virtual objects which are assigned for sports
15 program as I, children's program as IV and mystery category program as III. In this manner,
16 each reception site 30 is only required to store information related to its own grouping.
17 Therefore, a reception site 30 that is in group 1 only needs to store the information related to
18 group 1 that is found in row 1 of Figure 21.

19 Figure 23 shows a software program flow 1490 that is an alternative to the virtual
20 object targeting system 1220 targeting routine 1374, depicted in Figure 18. The alternative
21 routine 1490 allows each reception site 30 to be individually targeted with specific virtual
22 objects. Preferably, it is initiated automatically, as shown at block 1492, by the TVOMS 300
23 upon receipt of a program request from a reception site, for example, for a pay per view
24 program. Thus, once the TVOMS 300 receives program request information from a
25 reception site, the TVOMS 300 begins the process of selecting a package of virtual objects
26 that may be based on, among other things, that subscriber's demographic information and
27 viewing history.

28 Upon receipt of a program request from a reception site, the virtual object targeting
29 system 1220 reads the reception site identifier, as shown at block 1494, and the program
30 requested. The subscriber data collection engine 1202 writes information on the program
31 requested to the subscriber information database 1210, updating the subscriber record that
32 contains listings of all programs requested within the past week, month or year.

33 With continued reference to Figure 23, the virtual object targeting system 1220 then
34 calls a subroutine that sorts the programs requested by program category, block 1498. In

1 turn, the program categories are sorted, as shown at block 1500, based on the number of
2 times that program appearing in each particular category is requested. In so doing, virtual
3 object targeting system 1220, using the sorting subroutine as shown at block 1500,
4 determines and ranks those programs and program categories that are most frequently viewed
5 at that reception site.

6 All rankings of programs and program categories for that reception site 30 are
7 written to the subscriber information database 1210, as shown at block 1502.

8 Next, the virtual object targeting system 1220 calls a subroutine, shown at block
9 1504, that correlates the updated subscriber record with the available virtual objects database
10 1265. By correlating these two with one another, the subroutine assigns or correlates various
11 categories of virtual objects to each ranking of programs and program categories. The
12 categories of virtual objects that may be so assigned are found in the available virtual objects
13 database 1265 and may include: (1) Household Goods/Products, (2) Home Improvement and
14 Maintenance, (3) Personal Hygiene, (4) Entertainment Items and Events, (5) Sporting Goods
15 and Events, (6) Motor Vehicles and Related Products, (7) Foodstuffs and Beverages, and (8)
16 Miscellaneous, for example. Where, for example, the subscriber has watched a sporting
17 program, the Sporting Goods and Events, Home Improvement and Maintenance categories
18 may be assigned to that particular sporting event/ program and Sports program category, for
19 example.

20 Once the programs and program categories are correlated with the virtual objects
21 categories in the available virtual objects database 1265, the virtual object targeting system
22 1220 calls a sorting subroutine 1506 that ranks the correlated virtual objects categories based
23 on other information in the database files. In one embodiment, this ranking is primarily
24 based on data in the updated subscriber information database 1210, as shown at block 1506.
25 By using data on the subscriber's past program selections and demographic information, the
26 virtual object targeting system 1220 ranks the correlated categories of virtual objects
27 according to those likely to be of most interest to that subscriber.

28 After the virtual object categories have been sorted and ranked, the virtual object
29 targeting system 1220 selects the top three virtual objects categories as the targeted
30 categories for a given program and subscriber, block 1508. Individual virtual objects are
31 then chosen from the available virtual objects database 1265, with all selections made from
32 the targeted categories, at block 1510. The virtual objects that are selected are written to the
33 subscriber information database 1210 and to the content and virtual object packager 30, from
34 where packages can be generated, at block 1512, for ultimate delivery to the reception site.

Figure 24 depicts the object delivery center 15. The object delivery center 15 receives content 36, virtual objects, retrieval plans, and other information from the operations center 10 that is to be transmitted to reception sites. The communication processor 16 in the object delivery center 15 may determine the delivery network and communications methods appropriate for each item to be delivered, may combine items to be delivered to common destinations, may format the items for delivery, and provide the formatted items to the processing router 17. The processing router 17 may then route each item to the appropriate modular connector 700, for example modular connector 700', modular connector 700'', or modular connector 700''', depending on the required delivery network 11 and communication method.

A number of embodiments of delivery networks 11, 12, and 14 are presented below. The embodiments presented below may use the object delivery center 15, which inserts the virtual objects into the signal for delivery over the delivery network 11 or 12. The embodiments presented below use a modular connector 700 in the reception site 30, that receives the delivered signal with virtual objects, extracts the virtual objects, and provides the virtual objects to the storage management processor 710. The modular connector 700 supports the receive functionality for each unique delivery network communication method embodiment.

Figure 25 presents embodiments associated with the delivery of virtual objects over a coaxial or fiber cable system 2701 to a reception site 30. Virtual objects are provided to the delivery network 11 by the object delivery center 15 or directly by the operations center 10. Alternatively, content 36 and virtual objects may be provided to the reception site 30 from the object delivery center 15 or from the local insertion center 20 using delivery network 12. The signal is delivered over the cable system 2701 delivery network. The signal may provide for the delivery of virtual objects, content 36 containing virtual object locations, and reception site configuration and control information. The signal may also provide for virtual object viewing data and interactive virtual object requests from the reception site 30 to the local data collection center 40, to the central data collection center 50, or to the interactive object service center 60 using delivery network 14 or the signal may be a means to provide access to the Internet or other public network through which virtual objects or content 36 are delivered (not shown). The cable system 2701 may be a coaxial cable network, totally fiber network, hybrid fiber coax network, fiber to the curb network, or any other cable distribution technology. The signal over the cable system may be generated by a cable modem, in which an external cable modem 2702 is used to receive the signal and provide the embedded virtual

1 objects to the modular connector 700 in the reception site 30 for processing. Alternatively,
2 the reception site 30 may contain an internal cable modem 2705, which receives the signal
3 and provides the virtual objects to the modular connector 700 for processing.

4 In another embodiment, the signal delivered over the cable system is a video signal.
5 In one embodiment, the video signal is an analog video signal. In another embodiment, the
6 video signal is a digital video signal. The reception site 30 may contain an internal cable
7 receiver/tuner/demodulator 2706 to process the signal, and provide the embedded virtual
8 objects to the modular connector 700. A set top terminal 2703, or other device capable of
9 receiving a cable video signal, such as a cable ready TV, or PC with cable tuner (not shown),
10 may process the video signal and deliver the video signal to the connector 700 in the
11 reception site 30, which extracts the embedded virtual objects. Alternately, the set top
12 terminal 2703, or other such device, may extract the embedded virtual objects from the video
13 signal and provide the virtual objects to the modular connector 700 in the reception site 30

14 In another embodiment, virtual objects may be embedded within the audio signal,
15 requiring an appropriate audio-capable modular connector 700 in the reception site 30 to
16 extract the virtual objects from the audio signal. In one embodiment, the audio signal is an
17 analog audio signal. In another embodiment, the audio signal is a digital audio signal.

18 In yet another embodiment, the signal is a spread spectrum signal containing a
19 digital data stream, requiring an appropriate spread spectrum receiver and modular connector
20 700 in the reception site 30 to extract the virtual objects. In this embodiment, the spread
21 spectrum signal is transmitted in the same bandwidth as the video or audio signal, but below
22 the noise level.

23 Figure 26 presents embodiments associated with the delivery of virtual objects over
24 a wireless broadcast system 2801 to a reception site 30. Virtual objects are provided to the
25 delivery network 11 by the object delivery center 15 or directly by the operations center 10.
26 Alternatively, content 36 and virtual objects may be provided to the reception site 30 from
27 the object delivery center 15 or from the local insertion center 20 using delivery network 12.
28 The signal is delivered over the wireless broadcast system 2801 delivery network. The signal
29 may provide for the delivery of virtual objects, content 36 containing virtual object locations,
30 and reception site configuration and control information. The signal may also provide for
31 virtual object viewing data and interactive virtual object requests from the reception site 30 to
32 the local data collection center 40, to the central data collection center 50, or to the
33 interactive object service center 60 using delivery network 14 or the signal may be a means
34 to provide access to the Internet or other public network through which virtual objects or

content 36 are delivered. The wireless broadcast system may be a microwave multipoint delivery system (MMDS), local multipoint distribution system (LMDS), Instructional Television Fixed Service (ITFS) system, or any other wireless data, video, or telephony broadcast system, including point-to-point and point-to-multipoint microwave broadcast systems like those provided by Teligent, Winstar digital wireless network, and ATT's wireless system. The signal over the wireless broadcast system may be generated by a wireless modem, in which an external wireless modem 2802 is used to receive the signal and provide the embedded virtual objects to the modular connector 700 in the reception site 30 for processing. Alternatively, the reception site 30 may contain an internal wireless modem 2805, which receives the signal and provides the virtual objects to the modular connector 700 in the reception site 30 for processing.

In another embodiment, the signal delivered over the wireless broadcast system is a video signal. In one embodiment, the video signal is an analog video signal. In another embodiment, the video signal is a digital video signal. The reception site 30 may contain an internal wireless receiver/tuner/demodulator 2806 to process the signal, and provide the embedded virtual objects to the modular connector 700. A wireless set-top terminal 2803, or other device capable of receiving a wireless video signal, such as a TV, or PC with a wireless receiver and tuner, may process the video signal and deliver the video signal to the modular connector 700 in the reception site 30, which extracts the embedded virtual objects. Alternately, the set top terminal 2803, or other such device, may extract the embedded virtual objects from the video signal and provide the data to the modular connector 700 in the reception site 30.

In another embodiment, virtual objects may be embedded within the audio signal, requiring an appropriate audio-capable modular connector 700 in the reception site 30 to extract the virtual objects from the audio signal. In one embodiment, the audio signal is an analog audio signal. In another embodiment, the audio signal is a digital audio signal.

In yet another embodiment, the signal is a spread spectrum signal containing a digital data stream, requiring an appropriate spread spectrum receiver modular connector 700 in the reception site 30 to extract the virtual objects. In this embodiment, the spread spectrum signal is transmitted in the same bandwidth as the video or audio signal, but below the noise level.

Figure 27 presents embodiments associated with the delivery of virtual objects over a satellite broadcast system 2901 to a reception site 30. Virtual objects are provided to the delivery network 11 by the object delivery center 15 or directly by the operations center 10.

1 Alternatively, content 36 and virtual objects may be provided to the reception site 30 from
2 the object delivery center 15 or from the local insertion center 20 using delivery network 12.
3 The signal is delivered over the satellite broadcast system 2901 delivery network. The signal
4 may provide for the delivery of virtual objects, content 36 containing virtual object locations,
5 and reception site configuration and control information. The signal may also provide for
6 virtual object viewing data and interactive virtual object requests from the reception site 30 to
7 the local data collection center 40, to the central data collection center 50, or to the
8 interactive object service center 60 using delivery network 14 or the signal may be a means
9 to provide access to the Internet or other public network through which virtual objects or
10 content 36 are delivered. The satellite broadcast system 2901 can be a direct broadcast
11 system like DirecTV and EchoStar, a direct to home satellite broadcast system, video
12 network distribution broadcast system, a point-to-point or point-to-multipoint data VSAT
13 system, a digital audio broadcast system like WorldSpace, Sirius – formerly CD Radio, or
14 XM, or a mobile data and telephony satellite broadcast system like Iridium, Teledesic, or
15 Globalstar. Alternatively, the satellite broadcast system can be regionalized broadcast
16 services or store and forward communication services hosted on high flying balloons or on
17 airplanes that provide communication repeater services to an small geographic region. The
18 signal over the satellite broadcast system may be generated by a satellite data modem, in
19 which an external satellite data receiver 2902 is used to receive the signal and provide the
20 embedded virtual objects to the reception site 30 modular connector 700 for processing.
21 Alternatively, the reception site 30 may contain an internal satellite receiver 2905, which
22 receives the signal and provides the virtual objects to the modular connector 700 in the
23 reception site 30 for processing.

24 In another embodiment, the signal delivered over the satellite broadcast system is a
25 video signal. In one embodiment, the video signal is an analog video signal. In another
26 embodiment, the video signal is a digital video signal. The reception site 30 may contain an
27 internal satellite video receiver 2906 to process the signal, and provide the embedded virtual
28 objects to the modular connector 700. A satellite receiver 2903, or other device capable of
29 receiving a satellite video signal, such as a TV, or PC with satellite receiver, may process the
30 video signal and deliver the video signal to the modular connector 700 in the reception site
31 30, which extracts the embedded virtual objects. Alternately, the satellite receiver 2903, or
32 other such device, may extract the embedded virtual objects from the video signal and
33 provide the data to the modular connector in the reception site 258.

1 In another embodiment, virtual objects may be embedded within the audio signal,
2 requiring an appropriate audio-capable modular connector 700 in the reception site 30 to
3 extract the virtual objects from the audio signal. In one embodiment, the audio signal is an
4 analog audio signal. In another embodiment, the audio signal is a digital audio signal.

5 In yet another embodiment, the signal is a spread spectrum signal containing a
6 digital data stream, requiring an appropriate spread spectrum receiver modular connector 700
7 in the reception site 30 to extract the virtual objects. In this embodiment, the spread
8 spectrum signal is transmitted in the same bandwidth as the video or audio signal, but below
9 the noise level.

10 Figure 28 presents embodiments associated with the delivery of virtual objects over
11 a wired data network 3001 to a reception site 30. Virtual objects are provided to the delivery
12 network 11 by the object delivery center 15 or directly by the operations center 10.
13 Alternatively, content 36 and virtual objects may be provided to the reception site 30 from
14 the object delivery center 15 or from the local insertion center 20 using delivery network 12.
15 The signal is delivered over the wired data network 3001 delivery network. The signal may
16 provide for the delivery of virtual objects, content 36 containing virtual object locations, and
17 reception site configuration and control information. The signal may also provide for virtual
18 object viewing data and interactive virtual object requests from the reception site 30 to the
19 local data collection center 40, to the central data collection center 50, or to the interactive
20 object service center 60 using delivery network 14 or the signal may be a means to provide
21 access to the Internet or other public network through which virtual objects or content 36 are
22 delivered. The wired data network 3001 can be metallic wire or fiber, supporting any of a
23 number of communication standards including HDSL, ADSL, DSL, ISDN, T1, T3, SONET,
24 ATM, X.25, frame relay, Switched MultiMegabit Data Service (SMDS), or others. The
25 signal sent over the wired data network may be generated by a data modem or transmission
26 device, in which the appropriate modem, interface device, or Data Terminating Equipment
27 (DTE) device is used to receive the signal and provide the embedded virtual objects to the
28 reception site 30 modular connector 700 for processing. Embodiments of such receiving
29 devices are shown in Figure 28 as HDSL modem 3002, ADSL modem 3003, DSL modem
30 3003, ISDN Terminal equipment (TE) device 3005, T1 Digital service unit (DSU) 3006, T3
31 DSU 3007, Fiber user network interface device (UNI) 3008, ATM UNI 3009, X.25 DTE
32 3010, Frame relay assembler/disassembler (FRAD) 3011, and SMDS subscriber network
33 interface device (SNI) 3012. Alternatively, the reception site 30 may contain an internal
34 modem or DTE 3013, which receives one or more signal types and provides the received

1 signal with embedded virtual objects to the modular connector 700 in the reception site 30 for
2 processing. Finally, the reception site 30 may be attached to a wired LAN using a
3 transceiver. In this embodiment, virtual objects may be delivered over the LAN at any time.

4 Figure 29 presents embodiments associated with the delivery of virtual objects using
5 the public switched telephony network (PSTN) 3101 to a reception site 30. Virtual objects
6 are provided to the delivery network 11 by the object delivery center 15 or directly by the
7 operations center 10. Alternatively, content 36 and virtual objects may be provided to the
8 reception site 30 from the object delivery center 15 or from the local insertion center 20 using
9 delivery network 12. The signal is delivered over the PSTN 3101 delivery network. The
10 signal may provide for the delivery of virtual objects, content 36 containing virtual object
11 locations, and reception site configuration and control information. The signal may also
12 provide for virtual object viewing data and interactive virtual object requests from the
13 reception site 30 to the local data collection center 40, to the central data collection center 50,
14 or to the interactive object service center 60 using delivery network 14 or the signal may be a
15 means to provide access to the Internet or other public network through which virtual objects
16 or content 36 are delivered. The signal sent over the PSTN may be generated by a data
17 modem or transmission device, in which the appropriate modem 3102 is used to receive the
18 signal and provide the embedded virtual objects to the modular connector 700 in the
19 reception site 30 for processing. Alternatively, the reception site 30 may contain an internal
20 modem 3103, which receives the signal and provides the received signal with embedded
21 virtual objects to the modular connector 700 in the reception site 30 for processing.

22 Figure 30 presents embodiments associated with the delivery of virtual objects using
23 wireless personal communications system (PCS) 3201 to a reception site 30. Virtual objects
24 are provided to the delivery network 11 by the object delivery center 15 or directly by the
25 operations center 10. Alternatively, content 36 and virtual objects may be provided to the
26 reception site 30 from the object delivery center 15 or from the local insertion center 20 using
27 delivery network 12. The signal is then delivered over the PCS network 3201 delivery
28 network. The wireless PCS system may be, for example a wireless LAN, digital cellular
29 telephony network, analog cellular telephony network, digital cellular radio system, analog
30 cellular radio system, digital pager network, analog pager network, or Personal
31 Communication Network (PCN). The signal may provide for the delivery of virtual objects,
32 content 36 containing virtual object locations, and reception site configuration and control
33 information. The signal may also provide for virtual object viewing data and interactive
34 virtual object requests from the reception site 30 to the local data collection center 40, to the

1 central data collection center 50, or to the interactive object service center 60 using delivery
2 network 14 or the signal may be a means to provide access to the Internet or other public
3 network through which virtual objects or content 36 are delivered. A wireless PCS receiver
4 3202 is used to receive the signal and provide the embedded virtual objects to the modular
5 connector 700 in the reception site 30 for processing. Alternatively, the reception site 258
6 may contain an internal wireless PCS receiver 3203, which receives the signal and provides
7 the received signal with embedded virtual objects to the modular connector 700 in the
8 reception site 30 for processing.

9 Figure 31 depicts several embodiments associated with the delivery of virtual objects
10 using a national or local television broadcaster's signal. Virtual objects are provided to the
11 either the national broadcaster 1110, the broadcast affiliate 1112, or the local cable system
12 1114 by the object delivery center 15 or directly by the operations center 10. The signal from
13 the national broadcaster 1110 can be delivered to reception site 30', 30" or 30''' using a
14 satellite system 1122, using a broadcast affiliate 1112 terrestrially, or using a local cable
15 system 1114. Alternatively, the local television broadcast affiliate 1112 can originate the
16 signal which can be delivered to the reception site 30', 30" or 30''' terrestrially, or using a
17 local cable system 1114. The signal may provide for the delivery of virtual objects, content
18 36 containing virtual object locations, and reception site configuration and control
19 information. The signal may also provide for virtual object viewing data and interactive
20 virtual object requests from the reception sites 30', 30", and 30''' to the local data collection
21 center 40, to the central data collection center 50, or to the interactive object service center 60
22 using delivery network 14 or the signal may be a means to provide access to the Internet or
23 other public network through which virtual objects or content 36 are delivered. In one
24 embodiment, the video signal is an analog video signal and the virtual objects is embedded in
25 the video signal. In another embodiment, the video signal is a digital video signal and the
26 virtual objects are carried as an independent data stream. In another embodiment, virtual
27 objects may be embedded within the audio signal. In one embodiment, the audio signal is an
28 analog audio signal. In another embodiment, the audio signal is a digital audio signal.

29 In yet another embodiment, the signal is a spread spectrum signal containing a
30 digital data stream, requiring an appropriate spread spectrum receiver modular connector,
31 such as the connector 700 of Figure 33, in the reception site 30', 30" or 30''' to extract the
32 virtual objects. In this embodiment, the spread spectrum signal is transmitted in the same
33 bandwidth as the video or audio signal, but below the noise level.

1 Alternatively, several embodiments are associated with the delivery of virtual objects
2 using a national or local radio broadcaster's signal. The signal from the national radio
3 broadcaster can be delivered to the reception site 30', 30" or 30''' using the satellite system
4 1122, or using a broadcast affiliate 1122. Alternatively, the radio broadcast affiliate 1122 can
5 originate the signal, which can be delivered to the reception site 30', 30" or 30''', terrestrially.

6 In one embodiment, the audio signal is an analog audio signal and the virtual objects is
7 embedded in the audio signal. In another embodiment, the audio signal is a digital audio
8 signal and the virtual objects are carried as an independent data stream. In yet another
9 embodiment, the virtual objects are embedded in a sub-carrier of the analog audio broadcast.

10 In another embodiment, the signal is a spread spectrum signal containing a digital data
11 stream, requiring an appropriate spread spectrum receiver modular connector 700 in the
12 reception site 30', 30" or 30''' to extract the virtual objects. In this embodiment, the spread
13 spectrum signal is transmitted in the same bandwidth as the audio signal, but below the noise
14 level.

15 A local insertion center 20 or multiple local insertion centers may optionally be used
16 to insert virtual objects into content 36 provided by an operations center 10 or another local
17 insertion center 20, and any other content source. A local insertion center 20 may perform
18 the same functions as an operations center 10. Figure 32 depicts a local insertion center 20.
19 As shown in Figure 32, the local insertion center 20 includes a virtual object location definer
20 100', a virtual object selector 200', and a targeted virtual object management system 300'
21 (TVOMS) which are identical to the virtual object location definer 100, a virtual object
22 selector 200, and a targeted virtual object management system 300 (TVOMS) of an
23 operations center 10. A local insertion center 20 may detect existing virtual object locations
24 in content 36 and replace existing virtual objects with new virtual objects, delete existing
25 virtual objects, or add new virtual objects in existing virtual object locations and target the
26 virtual objects to reception sites or groups of reception sites. Alternatively, a local insertion
27 center 20 may create new virtual object locations and insert and target virtual objects within
28 these new virtual object locations using the processes defined for the operations center 10.
29 The local insertion center 20 may modify an existing or generate a new retrieval plan or
30 generate a new or modify an existing group assignment matrix for distribution to reception
31 sites.

32 Figure 33 depicts an example of a reception site 30 in more detail. The modular
33 connector 700 may handle all interactions with a reception site 30. Programming content 36
34 with virtual object locations and metadata packets containing placement guidelines, mattes,

1 and retrieval plans are received by the reception site modular connector 700 and passed to the
2 virtual object extractor processor 780. The virtual object extractor processor 780 removes
3 any virtual objects from the received signal and the retrieval plan information and routes the
4 virtual objects and retrieval plan to the storage management processor 710. The storage
5 management processor 710 uses the retrieval plan to determine which virtual objects are
6 destined to the reception site 30 and saves the required virtual objects in virtual object storage
7 720. In an alternative embodiment, virtual objects may be received by the reception site 30
8 independent of the programming content 36.

9 The programming content 36 with virtual object locations is then passed to the
10 virtual object location detector processor 750. Information received about virtual object
11 locations is extracted from the programming content 36 and passed to the selector processor
12 740 which coordinates with the storage management processor 710 to determine the
13 appropriate virtual object 38 to place into each virtual object location 37 based on placement
14 guidelines and available virtual objects stored in the virtual object storage 720. The storage
15 management processor 710 retrieves the appropriate virtual object 38 for one or more virtual
16 object locations contained in the content 36 from the virtual object storage 720. Virtual
17 objects are passed from the storage management processor 710 to the virtual object insertion
18 processor 760.

19 Programming content 36 with virtual object locations is passed from the virtual
20 object location detector processor 750 to the content buffer 790 where the programming
21 content 36 is stored for a fixed period of time and then played out of the content buffer 790 to
22 the virtual object insertion processor 760. If a virtual object 38 is available for placement in
23 a virtual object location 37, the virtual object 38 is inserted into the appropriate virtual object
24 location 37 by the virtual object insertion processor 760.

25 In one embodiment, the virtual object location 37 may require that an embedded
26 virtual object 38 be placed within the content 36. The virtual object insertion processor 760
27 may use techniques for the insertion of embedded virtual objects which are described in
28 detail in U.S. Patents 5,953,076, to Astle, Brian; and Das, Subhudev; titled System and
29 Method of Real Time Insertions into Video Using Adaptive Occlusion with a Synthetic
30 Reference Image; 5,892,554, to DiCicco, Darrell; and Fant, Karl; entitled System and
31 Method for Inserting Static and Dynamic Images into a Live Video Broadcast; 5,515,485, to
32 Luquet, Andre; and Rebuffet, Michel; entitled Method and Device for Modifying a Zone in
33 Successive Images; 5,903,317, to Sharir, Avi; and Tamir, Michael; entitled Apparatus and

1 Method for Detecting, Identifying and Incorporation Advertisements in a Video; and the
2 MPEG4 standard.

3 In another embodiment, when the virtual object location 37 may require that an
4 overlaid virtual object 38 be placed within the content 36. The virtual object insertion
5 processor 760 may use techniques for the overlaying of virtual objects which are
6 described in detail in U.S. Patents 4,319,266 to Bannister, Richard S.; entitled Chroma
7 Keying System; 4,999,709 to Yamazaki, Hiroshi; and Okazaki, Sakae; entitled Apparatus
8 for Inserting Title Pictures; 5,249,039, to Chaplin, Daniel J.; entitled Chroma Key
9 Method and Apparatus; and 5,233,423 to Jernigan, Forest E.; and gingham, Joseph;
10 entitled Embedded Commercials within a Television Receiver using an Integrated
11 Electronic Billboard. Programming content 36 with embedded and overlaid virtual
12 objects is passed to an optional interactive object processor 770.

13 Preferably, when a virtual object 38 is placed into a virtual object location 37, the
14 selector processor 740 records the event in the placement log 730. The placement log 730
15 provides viewing data to the local data collection center 40 or the central data collection
16 center 50, where the information can be used for future virtual object targeting or billing
17 of virtual object providers, for example, advertisers. The selector processor 740 can be
18 provided targeting algorithm updates from external sources.

19 A local data collection center 40 is depicted in Figure 34. The local data collection
20 center 40 collects, processes, and stores data from reception sites, from a central data
21 collection center 50, or other sources. The data collected about reception sites may be
22 provided to a local insertion center 20 to be used in targeting virtual objects in content 36.
23 Alternatively, the data collected from receptions site may be provided to a central data
24 collection center 50 to be used in targeting virtual objects in content 36 by an operations
25 center 10. As shown in Figure 34, communications to and from the local data collection
26 center 40 over a delivery network may be done using modular connector 700. An
27 interface 41 receives information from reception sites. The interface 41 can include a
28 workstation, such as the workstation 44, for example, from which an operator manually
29 enters reception site information. Alternately, reception site information can be
30 automatically entered at the interface 41 by downloading from an off-site database, the
31 Internet, a storage medium, such as a CD-ROM or a floppy disk, and by collecting the
32 information directly from the individual reception sites using modular connector 700. A
33 processor 42 processes the received reception site information and organizes the
34 information for use and stores information in database 43.

1 A central data collection center 50 is depicted in Figure 35. The central data
2 collection center 50 collects, processes, and stores data from reception sites, from local data
3 collection centers, or other sources. The data collected about reception sites may be provided
4 to a local insertion center 20 or local data collection center 40 to be used in targeting virtual
5 objects in content 36. Alternatively, the data collected from reception site may be provided
6 to an operations center 10 to be used in targeting virtual objects in content 36. As shown in
7 Figure 34, communications to and from the central data collection center 50 over a delivery
8 network may be done using modular connector 700. An interface 51 receives information
9 about reception sites. The interface 51 can include a workstation, such as the workstation 54,
10 for example, from which an operator manually enters reception site information. Alternately,
11 reception site information can be automatically entered at the interface 51 by downloading
12 from an off-site database, the Internet, a storage medium, such as a CD-ROM or a floppy
13 disk, and by collecting the information directly from the individual reception sites using
14 modular connector 700. A processor 52 processes the received reception site information
15 and organizes the information for use and stores information in database 53.

16 Returning to Figure 33, an external trigger may be received by the interactive object
17 processor 770 indicating the subscriber has selected an interactive virtual object 38.
18 Alternatively, the interactive object processor 770 may be capable of being configured to
19 automatically process all interactive virtual objects received. Figure 36 depicts the steps the
20 interactive object processor 770 performs upon receipt of an external trigger related to an
21 interactive virtual object 38. The process begins with the start ellipse 550. The interactive
22 object processor 770 receives the trigger as shown in block 551. The interactive object
23 processor 770 then retrieves the interactive virtual object trigger action 56 from the
24 interactive virtual object 38, as shown in block 552. The interactive object processor 770
25 determines if the interactive virtual object trigger action 56 requires initiation of an
26 interactive request to a remote site, as shown in block 553. As shown in block 554, if only
27 local action at the reception site 30 is required, the interactive object processor 770 initiates
28 any local processing required by the interactive virtual object trigger action 56 associated
29 with the interactive virtual object 38. After initiation of any actions required by the
30 interactive virtual object trigger action 56, the process ends with ellipse 559. If, in block 553,
31 the interactive object processor 770 determines that the interactive virtual object trigger
32 action 56 requires initiation of an interactive request to a remote site, the interactive object
33 processor 770 initiates the sending of the interactive request with the virtual object identifier
34 58, as shown in block 555. The interactive object processor 770 passes the interactive

1 request to the modular connector 700. The modular connector 700, in turn, passes the
2 interactive request to the interactive object servicing center 60. The interactive object
3 processor 770 awaits for any interactive response, as shown in block 556. The interactive
4 object servicing center 60 may process the interactive request and may respond back to the
5 reception site 30 with an interactive response. The interactive object processor 770 receives
6 and processes any interactive response received from the interactive object servicing center
7 60, as shown in block 557. The interactive object processor 770 then initiates any further
8 actions required by the interactive response or the initial interactive virtual object trigger
9 action 56 received, as shown in block 558. The process ends with ellipse 559.

10 A diagrammatic representation of an interactive virtual object 38 is presented in
11 Figure 37. Each interactive virtual object 38 is identified by a unique virtual object identifier
12 58. This virtual object identifier 58 may be assigned by the virtual object management center
13 55, and provided to the interactive object servicing center 60, with the interactive virtual
14 object response management guidelines 57 associated with the interactive virtual object 38.
15 Virtual object placement rules and guidelines 151 may be delivered with the virtual object 38
16 to provide guidance to the reception site 30 in managing the insertion of virtual objects into
17 content 36. The virtual object digital module 59 is the actual digital representation of the
18 virtual object 38 that is created and stored at the operations center 10 and stored by the
19 storage management processor 710 at the reception site 30 for use by the virtual object
20 insertion processor 760 in recreating a visual representation of the virtual object 38. The
21 interactive virtual object trigger action 56 associated with an interactive virtual object 38
22 provides a definition of the action required to be taken by the interactive object processor 770
23 upon subscriber selection of an interactive virtual object 38. The interactive virtual object
24 trigger action 56 may result in the initiation of processing by the interactive object processor
25 770. Alternatively, or in addition, the interactive virtual object trigger action 56 may result in
26 the initiation of an interactive request to an interactive virtual object servicing center 60.
27 Alternatively, or in addition, the interactive virtual object trigger action 56 may result in the
28 interactive object processor 770 providing interactive virtual object control 153 commands or
29 providing an optional virtual object software applet 125 to an device external to the reception
30 site 30 for additional processing therein. The external device may consist of a television set-
31 top terminal, computer with Internet access, digital television receiver, or other device
32 capable of processing the interactive virtual object control 153 commands or optional virtual
33 object software applet 152. The optional virtual object software applet 152 provides software
34 that may be initiated by the interactive object processor 770 or provided to an external device

1 to be initiated. A difference between an interactive virtual object 38 and a virtual object 38
2 that is not interactive is the placement of information in the interactive virtual object trigger
3 action 56 field of a virtual object 38 and the placement of information in the optional virtual
4 object software applet 152 field of a virtual object 38.

5 An interactive virtual object management center 55 is depicted in Figure 38. The
6 interactive virtual object management center 55 generates interactive virtual objects and
7 provides them to the operations center 10 or any other location where interactive object
8 insertion or delivery may take place. The interactive virtual object management center 55
9 provides interactive virtual object response management guidelines 57 to an interactive
10 object servicing center 60 which may be used by the interactive object servicing center 60 to
11 determine the appropriate response upon receipt of an interactive request from a reception
12 site 30. As shown in Figure 38, communications to the interactive object servicing center 60
13 and to the operations center 10, or to any other location placing virtual objects into content
14 36, may be done using modular connector 700. An interface 161 provides interactive virtual
15 objects to the operations center 10 and provides the interactive virtual object response
16 management guidelines 57 to an interactive object servicing center 60. The interface 161 can
17 include a workstation, such as the workstation 164, for example, from which an operator
18 manually enters interactive virtual object definition information used to create the interactive
19 virtual object 38. A processor 162 processes the interactive virtual object definition,
20 performs the appropriate action, and stores interactive virtual object information in database
21 163.

22 Interactive virtual objects may be used for a variety applications resulting in the
23 initiation of processing at the reception site 30 or initiation of processing by an external
24 device accessible by the reception site 30. In one embodiment, selection of an interactive
25 virtual object 38 may result in the interactive object processor 770 retrieving an optional
26 virtual object software applet 152 from the interactive virtual object 38 and initiating the
27 optional virtual object software applet 152 at the interactive object processor 770, or storing
28 the optional virtual object software applet 152 in an interactive object processor storage 154
29 for future initiation at the reception site 30, or providing the optional virtual object software
30 applet 152 to an external device. In another embodiment, selection of an interactive virtual
31 object 38 may result in the interactive object processor 770 initiating an optional virtual
32 object software applet 152 that may have been previously received and stored in an
33 interactive object processor storage 154 or resident elsewhere at the reception site 30. In yet
34 another embodiment, selection of an interactive virtual object 38 may result in the interactive

1 object processor 770 generating an interactive virtual object control command 153 to be
2 provided to a device external to the reception site 30. In one embodiment, the interactive
3 virtual object control command 153 may notify the external device to select a different
4 language of audio to be associated with the content 36. In another embodiment, the
5 interactive virtual object control command 153 may notify the external device to initiate the
6 printing of a coupon or document associated with the interactive virtual object 38. In yet
7 another embodiment, the interactive virtual object control command 153 may notify the
8 external device to cause the selection of a different source for content 36, a different channel
9 of content, or different camera angle for the video content 36 being viewed.

10 Alternatively, in one embodiment, selection of an interactive virtual object 38 may
11 result in the interactive object processor 770 providing interactive virtual object selection
12 data 155 to the selector processor 740 to control which virtual objects are to be displayed at
13 the reception site 30. In this embodiment, the selector processor 740 may control which
14 virtual object 38 is placed in a virtual object location 37 based on the interactive virtual
15 object 38 being selected or past interactive virtual objects selected. Virtual objects associated
16 with a virtual object location 37 may have different fonts or font sizes, allowing the
17 subscriber to zoom in or zoom out from textual information displayed as a virtual object 38
18 by selecting the appropriate interactive virtual object 38. Virtual objects associated with a
19 virtual object location 37 may have different orientations, allowing the subscriber to select
20 the desired orientation to display by selecting the appropriate interactive virtual object 38.
21 Virtual objects associated with a virtual object location 37 may have multiple layers,
22 allowing the subscriber to peel away layers one by one by selecting the appropriate
23 interactive virtual object 38. Virtual objects associated with a virtual object location 37 may
24 be opaque in the nature, allowing the subscriber to select whether to make the virtual object
25 38 transparent, displaying the underlying image by selecting the appropriate interactive
26 virtual object 38. Selection of such an interactive virtual object 38 may be password
27 protected, to allow, for example, a parental control feature, where an opaque virtual object 38
28 is not removable, exposing the content underneath, unless the appropriate password is
29 entered by the subscriber when selecting the interactive virtual object 38.

30 In another embodiment, selection of an interactive virtual object 38 may result in the
31 interactive object processor 770 providing interactive virtual object selection data 155 to the
32 placement log 730 to record which interactive virtual objects have been viewed or selected
33 by a subscriber. The viewing information may then be provided to the local data collection

center 40 or the central data collection center 50 to be used for future virtual object targeting purposes.

In yet another embodiment, selection of an interactive virtual object 38 may result in the interactive object processor 770 providing placement control 156 to the virtual object insertion processor 760, affecting the location of placement of a virtual object 38 in content 36.

In another embodiment, selection of an interactive virtual object 38 may result in the interactive object processor 770 accessing an Internet website and displaying a Webpage on display 35 at the reception site 30 or on an external device.

An interactive object servicing center 60 is depicted in Figure 39. The interactive object servicing center 60 processes interactive requests and formulates responses to such requests. Figure 40 presents the process the interactive object servicing center 60 performs. The process begins with block 4500. In block 4501, the interactive object servicing center 60 receives interactive requests from reception sites. In block 4502, the interactive object servicing center 60 determines the appropriate action to be performed based on the received interactive request. In block 4503, the interactive object servicing center 60 performs the appropriate action based on the received interactive request and the interactive virtual object response management guidelines 57 previously provided by the interactive virtual object management center 55. In block 4504, the interactive object servicing center 60 replies to the requesting reception site with an interactive response. Interactive virtual objects may be used for a variety applications resulting in the generation of an interactive request. In one embodiment, an interactive virtual object 38 may result in the generation of an interactive request whereby the interactive object servicing center 60 logs that an interactive virtual object was selected by a reception site 30. This logged information may be used in refining the virtual object targeting algorithm, as this logged information provides a positive indication that a particular segment of content was viewed by a subscriber at the reception site 30. This logged information may alternatively be used by the content provider to bill an advertiser, as the interactive request serves as a positive indication that an advertisement was actively viewed by a subscriber and solicited an action on the part of the subscriber. In another embodiment, an interactive virtual object 38 may result in the generation of an interactive request whereby the interactive object servicing center 60 initiates an electronic transaction that is associated with the selected interactive virtual object 38. For example, the subscriber may have selected an interactive virtual object 38 in a video version of a product catalog and the selection of that interactive virtual object 38 initiates the purchase of the

1 product associated with the selected interactive virtual object 38. In yet another embodiment,
2 selection of an interactive virtual object 38, for example a short video clip on an electronic
3 program guide that is an interactive virtual object, may result in the generation of an
4 interactive request for a video on demand or pay per view purchase, whereby the interactive
5 object servicing center 60 processes the interactive request from the reception site 30 and
6 notifies a video server to begin playback of video on demand content to the requesting
7 reception site 30. In another embodiment, an interactive virtual object 38 may result in the
8 generation of an interactive request whereby the interactive object servicing center 60
9 responds to the interactive request with an interactive response that contains a software applet
10 to be run on a processor at the reception site 30. In yet another embodiment, an interactive
11 virtual object 38 may result in the generation of an interactive request whereby the interactive
12 object servicing center 60 responds to the interactive request with a webpage to be displayed
13 at the reception site 30.

14 As shown in Figure 39, communications to and from the interactive object servicing
15 center 60 over a delivery network may be done using modular connector 700. An interface
16 61 receives interactive requests from reception sites and receives the interactive virtual object
17 response management guidelines 57 from the interactive virtual object management center
18 55. The interface 61 can include a workstation, such as the workstation 64, for example,
19 from which an operator manually enters interactive request behavior for the interactive object
20 servicing center 60 or can modify the interactive virtual object response management
21 guidelines 57 received from the interactive virtual object management center 55. A
22 processor 62 processes the received interactive requests and received interactive virtual
23 object response management guidelines 57, performs the appropriate action, retrieving
24 information from database 63 to perform the actions and storing transaction information in
25 database 63 to record the transaction event.

26 A variety of interactive virtual object targeting delivery systems have been
27 described. One of ordinary skill in the art will recognize that the above description is that
28 of preferred embodiments of the invention and the various changes and modification may
29 be made thereto without departing from the spirit and scope of the invention as defined in
30 the following claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method for targeting interactive virtual advertisements, comprising:
 assigning a plurality of interactive spots to a program;
 ranking a plurality of interactive virtual objects by a measure of effectiveness for each one of said plurality of interactive virtual objects in different spots of said plurality of interactive spots;
 assigning one or more of the interactive virtual objects to one of the interactive spots based on the ranking;
 generating a retrieval plan; and
 providing the retrieval plan to a terminal, wherein the retrieval plan instructs the terminal to display one of the one or more interactive virtual objects according to the assigning of the one or more interactive virtual objects.
2. The method of claim 1, wherein generating the retrieval plan comprises:
 assigning the terminal to one or more groups; and
 assigning each of the one or more of the groups to one or more of the plurality of the interactive virtual objects.
3. The method of claim 2, wherein the step of assigning the terminal to one or more groups comprises:
 generating group assignment rules;
 delivering group assignment rules to the terminal;
 storing the group assignment rules at the terminal; and
 determining one or more group assignments based on the group assignment rules and data related to the terminal.
4. The method of claim 3, wherein the data related to the terminal includes one or more of Area of Dominant Influence (ADI), zip code+4, demographic data and programs watched data, virtual objects viewed, on-screen questionnaires and characteristics imported from marketing databases;

the method further comprising updating the group assignments to reflect changes in the ADI, zip code+4, demographic data, programs watched data, virtual objects viewed, on-screen questionnaires, and characteristics imported from marketing databases.

5. The method of claim 1, wherein the retrieval plan is sent periodically to the terminal.

6. A method of targeting interactive virtual objects, comprising:

providing a program containing a plurality of object locations to a terminal;

ranking a plurality of interactive virtual objects by a measure of effectiveness for each one of said plurality of interactive virtual objects in different object locations of said plurality of object locations;

providing one or more of the interactive virtual objects for each one of the object locations based on the ranking; and

generating a retrieval plan, wherein the retrieval plan designates which of the one or more provided interactive virtual objects to display in each of the object locations.

7. The method of claim 6, wherein the program is a television program.

8. The method of claim 6, wherein the program is one of an advertisement, an electronic program guide, and an Internet web page.

9. The method of claim 6, wherein at least one of the object locations is fixed in position across frames of the program.

10. The method of claim 6, wherein at least one of the object locations moves spatially in the program with time.

11. The method of claim 6, further comprising providing at least one non-interactive virtual object.

12. The method of claim 6 further comprising providing a group assignment matrix to the terminal, wherein:

the group assignment matrix classifies the terminal into one or more different predefined groups within each of one or more target user categories, and

the retrieval plan designates which of the one or more provided interactive virtual objects to display in each of the object locations by associating the target user categories and the predefined groups with the provided one or more interactive objects and each of the object locations.

13. The method of claim 12, wherein generating the retrieval plan comprises:
 - associating one of the target user categories with one of the object locations;
 - associating each predefined group within the associated one of the target user categories with a respective one of the interactive virtual objects.
14. The method of claim 6, wherein the ranking includes:
 - scoring a compatibility of program content surrounding a first object location of the plurality of object locations with a targeted group of users,
 - scoring compatibilities of each of the plurality of interactive virtual objects with the targeted group of users; and
 - ranking each of the plurality of interactive virtual objects displayed in the first one object location based on combining the scoring of the program content and the scoring of each interactive virtual object.
15. The method of claim 12, wherein the predefined groups are defined based on characteristics of users.
16. The method of claim 15, wherein the characteristics include user demographic information.
17. The method of claim 15, wherein the characteristics include user entered information.
18. The method of claim 15, wherein the characteristics include programs watched data.

19. The method of claim 15, wherein the characteristics include interactive virtual objects watched data.
20. The method of claim 15, wherein the characteristics include user activation of the interactive virtual objects.
21. The method of claim 6, wherein the terminal is a television set top terminal.
22. The method of claim 6, wherein the terminal is incorporated into one of a television, a personal computer and a PDA with video viewing capabilities.
23. The method of claim 6, wherein the television terminal is coupled to a satellite television receiver.
24. The method of claim 6, wherein the ranking is further determined by:
 - scoring a compatibility of program content surrounding a second object location of the plurality of object locations with the targeted group of users, and
 - ranking different pairs of the plurality of interactive virtual objects displayed in the first and second object locations and based on combining the scoring of the program content surrounding the first object location, the scoring of the program content surrounding the second object location, and the scoring of each interactive virtual object.
25. The method of claim 6, wherein the retrieval plan is periodically provided with the program in a transmission to the terminal, the terminal storing the retrieval plan in a memory.
26. A method of targeting interactive virtual objects to terminals, comprising:
 - creating a package of targeted interactive virtual objects;
 - providing the package to one or more of the terminals;
 - generating a group assignment matrix, wherein the group assignment matrix assigns terminals to groups;
 - generating a retrieval plan; and
 - providing a program, retrieval plan, and group assignment matrix to the one or more of the terminals, the program including at least one interactive virtual object

location, wherein, for a group identified in the group assignment matrix, the retrieval plan designates interactive virtual objects to be displayed during a display of the program in the at least one interactive virtual object location based on a ranking of the interactive virtual objects, the ranking is determined by a measure of effectiveness for each one of the interactive virtual objects in the at least one interactive virtual object location.

27. The method of claim 26, further comprising:
at the one or more of the terminals, receiving the program, and
retrieving one of the targeted virtual objects for display in the at least one virtual object location.
28. The method of claim 27, wherein the retrieval step, comprises:
comparing the group assignment matrix to the retrieval plan; and
selecting an interactive virtual object for display based on the comparison.
29. The method of claim 26, further comprising:
receiving a selection of one of the interactive virtual objects from one of the one or more terminals; and
linking the one of the one or more terminals selecting the one of the interactive virtual objects to an alternate program.
30. The method of claim 29, wherein the alternative program comprises an Internet web site.
31. The method of claim 26, wherein the step of generating the group assignment matrix, comprises:
generating group assignment rules;
delivering group assignment rules to the one or more terminals; and
determining one or more group assignments at one of the one or more terminals based on the group assignment rules and individual terminal data or terminal group data.
32. The method of claim 31, wherein the individual terminal data, comprises one or more of viewer demographic data, programs watched data, virtual objects viewed data, on- screen questionnaires, and characteristics imported from marketing databases, and

wherein the terminal group data, comprises one or more ADI, zip code, and geographical data.

33. The method of claim 31, wherein the group assignment rules are stored in the one or more of the terminals.

34. A terminal for targeting interactive virtual objects, comprising:

- a network interface configured to receive a plurality of interactive virtual objects and program content including a plurality of object locations;

- an interactive virtual objects extractor processor coupled to the network interface and configured to extract the plurality of interactive virtual objects, and program content including the plurality of object locations;

- a storage processor coupled to the extractor and configured to determine which of the extracted interactive virtual objects are targeted to the terminal and save the targeted interactive virtual objects in a memory; and

- an interactive virtual object selector processor coupled to the storage processor and configured to determine an interactive virtual object placement for one or more stored interactive virtual objects in one or more of the object locations based on a ranking of the stored interactive virtual objects, the ranking determined by a measure of effectiveness for each one of the stored interactive virtual objects in different object locations of the plurality of object locations.

35. The terminal of claim 34, wherein the interactive virtual objects are received with the programming content, and wherein the extractor processor is configured to extract the interactive virtual objects from the programming content.

36. The terminal of claim 34, wherein the interactive virtual objects are received independent of the programming content.

37. The terminal of claim 36, wherein the plurality of interactive virtual objects are received over the Internet.

38. The terminal of claim 34, wherein the terminal is a terminal in a television program delivery system.

39. The terminal of claim 34, wherein the terminal is a set top terminal.

40. The terminal of claim 34, wherein the terminal is a television.

41. The terminal of claim 34, wherein the terminal is one of a personal computer, a personal data assistant, and a wireless telephone.

42. The terminal of claim 34, wherein the interactive virtual object selector processor is further configured to:

log the placement of an interactive virtual object and an interactive response to the interactive virtual object in the memory, and

use the placement and the response in determining placements of future interactive virtual objects.

43. A system comprising:

an operations center including a network interface and one or more processors configured to:

provide, through a network, a program containing a plurality of interactive virtual object locations to a terminal;

provide one or more of a plurality of interactive virtual objects for each one of the plurality of the interactive virtual object locations to the terminal, wherein said one or more of the plurality of interactive virtual objects are selected from a ranked list of the plurality of interactive virtual objects, and wherein said ranked list is determined at least by a measure of effectiveness for each one of said plurality of interactive virtual objects in different ones of said plurality of interactive virtual object locations;

provide a retrieval plan to the terminal, wherein the retrieval plan designates, for one or more of the plurality of interactive object locations, which of the provided one or more interactive virtual objects to display; and

a terminal comprising:

one or more terminal network interfaces configured to receive the program, the plurality of interactive virtual objects, and the retrieval plan;

an interactive virtual objects extractor processor coupled to the terminal network interfaces and configured to extract the plurality of interactive virtual objects, the plurality of interactive virtual object locations and the retrieval plan;

a storage processor coupled to the extractor configured to determine which of the extracted plurality of interactive virtual objects are targeted to the terminal and save the extracted targeted interactive virtual objects in a memory; and

an interactive virtual object selector processor coupled to the storage processor configured to determine an interactive virtual object placement for the one or more stored interactive virtual objects.

44. The system of claim 43, wherein the selector processor is further configured to:
log the placement of an interactive virtual object and an interactive response to the interactive virtual object in the memory, and
communicate the placement and the response to the operation center.
45. The system of claim 43 wherein each of the plurality of interactive virtual object locations is a different spatial location within a scene of the program.
46. The system of claim 43, wherein the interactive virtual objects are provided to the terminal by one of a cable television system, a wireless broadcast system, a satellite broadcast system, a wired data network, a wireless PCS network, and a terrestrial television broadcast network.
47. The system of claim 43 wherein each of the plurality of interactive virtual object locations is a different spatial location within a frame of the program.
48. The system of claim 43, wherein the interactive virtual objects and the retrieval plan are delivered through the network with the program.
49. The system of claim 48, wherein the one or more terminal network interfaces are further configured to receive replacement interactive virtual objects and a replacement interactive virtual object retrieval plan, wherein the replacement interactive virtual objects and the replacement retrieval plan are delivered from the operations center.

50. The system of claim 43, wherein each interactive virtual object, comprises:
an interactive virtual object identifier;
interactive virtual object placement rules, wherein the rules provide guidance to the terminal in managing insertion of the interactive virtual object into the interactive virtual object locations;
a digital representation of the interactive virtual object; and
an interactive virtual object trigger action that defines an action to be taken upon triggering of the virtual object at the terminal.
51. The system of claim 50, wherein each interactive virtual object further comprises a virtual object applet that provides software capable of initiation by a source external to the terminal.
52. The system of claim 50, wherein the interactive virtual object trigger action initiates an interactive request to a location external to the terminal.
53. The system of claim 52, wherein the location external to the system further comprises:
an interactive virtual object management center; and
an interactive virtual object servicing center coupled to the interactive virtual object management center, wherein the management center provides interactive virtual object response management guidelines to the servicing center, and wherein the guidelines determine an appropriate response based on receipt of an interactive request from the terminal.
54. The system of claim 43, wherein the terminal further comprises:
an interactive virtual object location detector processor coupled to the interactive virtual object extractor processor and configured to determine allowable interactive virtual object locations for the interactive virtual objects; and
an interactive virtual object insertion processor coupled to the selector processor and configured to insert the selected interactive virtual objects into the allowable interactive virtual object locations.

55. The system of claim 43 wherein each of the plurality of interactive virtual object locations is a different temporal location within the program.
56. The system of claim 43, wherein the interactive virtual objects are selectable by a user at the terminal.
57. The system of claim 43, wherein an interactive selection received from a user at the terminal is processed automatically by the terminal.
58. The method of claim 1 wherein each of the plurality of interactive spots is a different spatial location within a scene of the program.
59. A method of targeting interactive virtual objects to terminals, comprising:
creating a package of interactive virtual objects;
providing the package to one or more of the terminals;
generating a retrieval plan; and
providing a program to the one or more of the terminals, the program including a plurality of interactive virtual object locations, wherein the retrieval plan designates one or more of the interactive virtual objects to be displayed during a display of the program in the plurality of interactive virtual object locations based on a ranking of the interactive virtual objects, the ranking determined by a measure of effectiveness for each one of the interactive virtual objects in different ones of the plurality of interactive virtual object locations, wherein each of the plurality of interactive virtual object locations is a different spatial location within a scene of the program.
60. The method of claim 59, wherein one of the virtual objects includes triggers that initiate a signal from a terminal, the method further comprising:
receiving a trigger from one of the terminals;
retrieving an interactive virtual object trigger action in response to receipt of the trigger; and
determining that the interactive virtual object trigger action requires initiation of an interactive request.
61. The method of claim 60, further comprising:

sending the interactive request to the one of the terminals which sent the trigger;
awaiting an interactive response from the one of the terminals which sent the trigger; and
initiating an interactive action based on the interactive response.

62. The method of claim 59, further comprising:

receiving a selection of the interactive virtual object from one of the terminals;
and

linking the terminal selecting the interactive virtual object to an alternate program.

63. The method of claim 62, wherein the alternative program comprises an Internet web site.

64. The method of claim 1 wherein each of the plurality of interactive virtual object locations is a different spatial location within a frame of the program.

65. The method of claim 1 wherein each of the plurality of interactive spots is a different temporal location within the program.

66. The method of claim 6 wherein each of the plurality of object locations is a different spatial location within a scene of the program.

67. The method of claim 6 wherein each of the plurality of object locations is a different spatial location within a frame of the program.

68. The method of claim 6 wherein each of the plurality of object locations is a different temporal location within the program.

69. The method of claim 26 wherein each of the at least one interactive virtual object location in said program is a different spatial location within a scene of the program.

70. The method of claim 26 wherein each of the at least one interactive virtual object location in said program is a different spatial location within a frame of the program.

71. The method of claim 26 wherein each of the at least one interactive virtual object location in said program is a different temporal location within the program.
72. The terminal of claim 34 wherein each of the plurality of object locations is a different spatial location within a scene of the program content.
73. The terminal of claim 34 wherein each of the plurality of object locations is a different spatial location within a frame of the program content.
74. The terminal of claim 34 wherein each of the plurality of object locations is a different temporal location within the program content.
75. The method of claim 59 wherein each of the plurality of interactive virtual object locations is a different spatial location within a frame of the program.
76. The method of claim 59 wherein each of the plurality of interactive virtual object locations is a different temporal location within the program.
77. A method comprising:
assigning a plurality of interactive virtual advertisement spots to a program;
generating a retrieval plan; and
providing the retrieval plan to a terminal, wherein the retrieval plan instructs the terminal to display in one of the virtual advertisement spots an interactive virtual object selected from a ranked list of a plurality of interactive virtual objects, wherein said ranked list is determined at least by a measure of effectiveness for each one of said plurality of interactive virtual objects in each one of said plurality of interactive virtual advertisement spots, wherein each one of the plurality of interactive virtual advertisement spots is in a different spatial location in said program.
78. The method of claim 77, wherein generating the retrieval plan comprises:
assigning the terminal to one or more groups; and

assigning each of the one or more of the groups to one or more of the plurality of interactive virtual objects.

79. The method of claim 78, wherein the step of assigning the terminal to one or more groups comprises:

generating group assignment rules;
 delivering group assignment rules to the terminal;
 storing the group assignment rules at the terminal; and
 determining one or more group assignments based on the group assignment rules and data related to the terminal.

80. The method of claim 79, wherein the data related to the terminal includes one or more of Area of Dominant Influence (ADI), zip code, demographic data and programs watched data, virtual objects viewed, on-screen questionnaires and characteristics imported from marketing databases;

the method further comprising updating the group assignments to reflect changes in the ADI, zip code the demographic data, the programs watched data the virtual objects viewed, the on-screen questionnaires, and the characteristics imported from marketing databases.

81. The method of claim 77, further comprising periodically sending the retrieval plan and group assignment rules to the terminal.

82. The method of claim 77 wherein each different spatial location in said program is a different location within a scene of the program.

83. The method of claim 77 wherein each different spatial location in said program is a different location within a frame of the program.

84. A method of targeting interactive virtual objects, comprising:
 providing a program containing a plurality of interactive virtual object locations to a terminal;

providing one or more of a plurality of interactive virtual objects for each one of the plurality of the interactive virtual object locations to the terminal, wherein said one or more of the plurality of interactive virtual objects are selected from a ranked list of the plurality of interactive virtual objects, said ranked list is determined at least by a measure of effectiveness for each one of said plurality of interactive virtual objects in each one of said plurality of interactive virtual object locations, and each one of the plurality of interactive virtual object locations is in a different spatial location in said program;

providing a retrieval plan to the terminal, wherein the retrieval plan designates, for one or more of the plurality of interactive object locations, which of the provided one or more interactive virtual objects to display.

85. The method of claim 84, wherein the program is a television program.

86. The method of claim 84, wherein the program is one of an advertisement, an electronic program guide, and an Internet web page.

87. The method of claim 84, wherein at least one of the plurality of interactive virtual object locations is fixed in position across frames of the program.

88. The method of claim 84, wherein at least one of the plurality of interactive virtual object locations moves spatially in the program with time.

89. The method of claim 84, further comprising providing at least one non-interactive virtual object.

90. The method of claim 84, wherein the terminal is a television set top terminal.

91. The method of claim 84, wherein the terminal is incorporated into one of a television, a personal computer and a PDA with video viewing capabilities.

92. The method of claim 84, wherein the terminal is coupled to a satellite television receiver.

93. The method of claim 84, wherein the retrieval plan is periodically provided with the transmission of the program in a transmission to the terminal.

94. The method of claim 84 further comprising providing a group assignment matrix to the terminal, wherein:

the group assignment matrix classifies the terminal into one or more different predefined groups within each of one or more target user categories, and

the retrieval plan designates which of the provided one or more interactive objects to display in the one or more interactive object locations by associating the target categories and the predefined groups with the one or more interactive objects and the one or more interactive object locations.

95. The method of claim 94, further comprising generating the group assignment matrix, wherein the predefined groups within one of the target categories are defined based on characteristics of users.

96. The method of claim 95, wherein the characteristics include user demographic information.

97. The method of claim 95, wherein the characteristics include user entered information.

98. The method of claim 95, wherein the characteristics include programs watched data.

99. The method of claim 95, wherein the characteristics include interactive virtual objects watched data.

100. The method of claim 95, wherein the characteristics include user activation of the interactive virtual objects.

101. The method of claim 94, wherein generating the retrieval plan comprises:
 associating one of the target user categories with one of the interactive object locations;
 associating each predefined group within the associated one of the target user categories with a respective one of the interactive objects.

102. The method of claim 84, wherein the ranked list is determined by:
 scoring a compatibility of program content surrounding a first interactive virtual object location of the interactive virtual object locations with a targeted group of users,
 scoring compatibilities of each of the plurality of interactive virtual objects with the targeted group of users; and
 ranking each of the plurality of interactive virtual objects displayed in the first one interactive virtual object location based on combining the scoring of the program content and the scoring of each interactive virtual object.

103. The method of claim 102, wherein the ranked list is further determined by:
 scoring a compatibility of program content surrounding a second interactive virtual object location of the interactive virtual object locations with the targeted group of users, and
 ranking different pairs of the plurality of interactive virtual objects displayed in the first and second interactive virtual object locations and based on combining the scoring of the program content surrounding the first interactive virtual object location, the scoring of the program content surrounding the second interactive virtual object location, and the scoring of each interactive virtual object.

104. The method of claim 84 wherein each different spatial location in said program is a different location within a scene of the program.

105. The method of claim 84 wherein each different spatial location in said program is a different location within a frame of the program.

106. A method comprising:

receiving a program, a plurality of interactive virtual objects, and a retrieval plan at a terminal, wherein the program includes a plurality of interactive virtual object locations, the retrieval plan designates one or more of said plurality of interactive virtual objects to be displayed during a display of the program selected from a ranked list of said plurality of interactive virtual objects, the ranked list is determined at least by a measure of effectiveness for each one of said plurality of interactive virtual objects in each one of said plurality of interactive virtual object locations, and each one of the plurality of interactive virtual object locations is in a different spatial location in said program; and

displaying one or more of the interactive virtual objects in one or more of the interactive virtual object locations of the program according to the retrieval plan.

107. The method of claim 106, wherein displaying, comprises:

comparing a group assignment matrix to the retrieval plan,

wherein the group assignment matrix assigns the terminal to a targeted user group; and

selecting an interactive virtual object for display based on the comparison.

108. The method of claim 107, further comprising generating the group assignment matrix including

receiving group assignment rules; and

determining one or more group assignments at the terminal based on the group assignment rules and individual terminal data or terminal group data.

109. The method of claim 108, wherein the individual terminal data, comprises one or more of viewer demographic data, programs watched data, virtual objects viewed data, on-screen questionnaires, and characteristics imported from marketing databases,

and wherein the terminal group data, comprises one or more ADI, zip code, and geographical data.

110. The method of claim 108, wherein the group assignment rules are stored in the terminal.

111. The method of claim 106, further comprising:
linking a terminal selecting the at least one displayed interactive virtual object to an alternate program.

112. The method of claim 111, wherein the alternate program comprises an Internet web site.

113. The method of claim 106 wherein each different spatial location in said program is a different location within a scene of the program.

114. The method of claim 106 wherein each different spatial location in said program is a different location within a frame of the program.

115. A terminal comprising:
a network interface configured to receive a plurality of interactive virtual objects and a plurality of interactive virtual object locations and metadata
an interactive virtual objects extractor processor coupled to the network interface and configured to extract the plurality of interactive virtual objects, the plurality of interactive virtual object locations and the metadata;
a storage processor coupled to the extractor configured to determine which of the extracted plurality of interactive virtual objects are targeted to the terminal and save the extracted targeted interactive virtual objects in a memory; and
an interactive virtual object selector processor coupled to the storage processor and configured to determine an interactive virtual object placement for one or more saved interactive virtual objects selected from a ranked list of said plurality of interactive virtual objects, wherein said ranked list is determined at least by a measure

of effectiveness for each one of said plurality of interactive virtual objects in each one of said plurality of interactive virtual object locations, and each one of the plurality of interactive virtual advertisement object locations is in a different spatial location in a program.

116. The terminal of claim 115, wherein the plurality of interactive virtual objects are received with programming content of the program, and wherein the extractor processor is configured to extract the plurality of interactive virtual objects from the programming content.

117. The terminal of claim 115, wherein the plurality of interactive virtual objects are received independently of programming content of the program.

118. The terminal of claim 117, wherein the plurality of interactive virtual objects are received over the Internet.

119. The terminal of claim 115, wherein the terminal is a terminal in a television program delivery system.

120. The terminal of claim 119, wherein the terminal is a set top terminal.

121. The terminal of claim 115, wherein the terminal is a television.

122. The terminal of claim 115, wherein the terminal is one of a personal computer, a personal data assistant, and a wireless telephone.

123. The terminal of claim 115, wherein the selector processor is further configured to:

log the placement of an interactive virtual object and an interactive response to the interactive virtual object in the memory, and

use the placement and the response in determining placements of future interactive virtual objects.

124. The terminal of claim 115 wherein each different spatial location in said program is a different location within a scene of the program.

125. The terminal of claim 115 wherein each different spatial location in said program is a different location within a frame of the program.

126. A method comprising:

creating a package of a plurality of interactive virtual objects, wherein said plurality of interactive virtual objects are dynamic;

providing the package to a plurality of terminals;

generating a group assignment matrix, wherein the group assignment matrix assigns the terminals to groups; generating a retrieval plan;

providing a program to one or more of the terminals, the program including a plurality of interactive virtual object locations, wherein the retrieval plan designates one or more of the plurality of interactive virtual objects to be displayed in the plurality of interactive virtual object locations during a display of the program, wherein said plurality of interactive virtual objects are selected from a ranked list of the plurality of interactive virtual objects, wherein said ranked list is determined at least by a measure of effectiveness for each one of said plurality of interactive virtual objects in each one of said plurality of interactive virtual object locations, and each one of the plurality of interactive virtual advertisement object locations is in a different spatial location in said program.

127. The method of claim 126, wherein at least one of said plurality of interactive virtual objects includes triggers that initiate a signal from the terminals the method further comprising:

receiving a trigger from one of the terminals; retrieving an interactive virtual object trigger action in response to receipt of the trigger; and

determining that the interactive virtual object trigger action requires initiation of an interactive request.

128. The method of claim 127, the method further comprising:
sending the interactive request to the terminal which sent the trigger;
awaiting an interactive response from the terminal which sent the trigger; and
initiating an interactive action based on the interactive response.
129. The method of claim 126, further comprising:
linking a terminal selecting the at least one designated interactive virtual object
to an alternate program.
130. The method of claim 129, wherein the alternative program comprises an
Internet web site.
131. The method of claim 126 wherein each different spatial location in said program
is a different location within a scene of the program.
132. The method of claim 126 wherein each different spatial location in said program
is a different location within a frame of the program.
133. A system comprising:
an operations center including a network interface and one or more processors
configured to:
provide, through a network, a program containing a plurality of interactive
virtual object locations to a terminal;
provide one or more of a plurality of interactive virtual objects for each one of
the plurality of the interactive virtual object locations to the terminal, wherein said one
or more of the plurality of interactive virtual objects are selected from a ranked list of
the plurality of interactive virtual objects, wherein said ranked list is determined at least
by a measure of effectiveness for each one of said plurality of interactive virtual objects
in each one of said plurality of interactive virtual object locations, and each one of the
plurality of interactive virtual object locations is in a different spatial location in said
program; and

provide a retrieval plan to the terminal, wherein the retrieval plan designates, for one or more of the plurality of interactive object locations, which of the provided one or more interactive virtual objects to display;

a terminal comprising:

one or more terminal network interfaces configured to receive the program, the plurality of interactive virtual objects, and the retrieval plan;

an interactive virtual objects extractor processor coupled to the terminal network interfaces and configured to extract the plurality of interactive virtual objects, the plurality of interactive virtual object locations and the retrieval plan;

a storage processor coupled to the extractor configured to determine which of the extracted plurality of interactive virtual objects are targeted to the terminal and save the extracted targeted interactive virtual objects in a memory; and

an interactive virtual object selector processor coupled to the storage processor configured to determine an interactive virtual object placement for the one or more stored interactive virtual objects.

134. The system of claim 133, wherein the selector processor is further configured to:

log the placement of an interactive virtual object and an interactive response to the interactive virtual object in the memory, and

communicate the placement and the response to the operation center.

135. The system of claim 133 wherein each different spatial location in said program is a different location within a scene of the program.

136. The system of claim 133 wherein each different spatial location in said program is a different location within a frame of the program.

137. The system of claim 133, wherein the plurality of interactive virtual objects are provided to the terminal by one of a cable television system, a wireless broadcast

system, a satellite broadcast system, a wired data network, a wireless PCS network, and a terrestrial television broadcast network.

138. The system of claim 133, wherein the plurality of interactive virtual objects and the retrieval plan are derived through the network with the program.

139. The system of claim 138, wherein the one or more terminal network interfaces are further configured to receive replacement interactive virtual objects and a replacement interactive virtual object retrieval plan, wherein the replacement interactive virtual objects and the replacement retrieval plan are delivered from the operations center.

140. The system of claim 139, wherein an interactive virtual object of the plurality of interactive virtual objects, comprises:

- an interactive virtual object identifier;

- interactive virtual object placement rules, wherein the rules provide guidance to the terminal in managing insertion of interactive virtual objects into the program content;

- a digital representation of the interactive virtual object; and

- an interactive virtual object trigger action that defines an action to be taken upon triggering of the virtual object at the terminal.

141. The system of claim 140, wherein the interactive virtual object further comprises a virtual object applet that provides software capable of initiation by a source external to the terminal.

142. The system of claim 140, wherein the interactive virtual object trigger action initiated an interactive request to a location external to the terminal.

143. The system of claim 142, wherein the location external to the system further comprises:

- an interactive virtual object management center; and

an interactive virtual object servicing center coupled to the interactive virtual object management center, wherein the management center provides interactive virtual object response management guidelines to the servicing center, and wherein the guidelines determine an appropriate response based on receipt of an interactive request from the terminal.

144. The system of claim 133, wherein the terminal further comprises:

an interactive virtual object extractor that extracts interactive virtual objects from data received at the terminal;

an interactive virtual object location detector processor, coupled to the extractor, that determines the allowable content locations for the plurality of interactive virtual objects; and

an interactive virtual object insertion processor, coupled to the selector processor, that inserts the selected interactive virtual objects into the allowable content locations.

145. The system of claim 144, wherein the terminal further comprises a storage management processor coupled to the extractor, wherein the management processor uses an interactive virtual object retrieval plan to determine which received interactive virtual objects are to be stored at the terminal.

146. The system of claim 133, wherein the plurality of interactive virtual objects are selectable by a user at the terminal.

147. The system of claim 146, wherein an interactive selection by the user is processed automatically by the terminal.

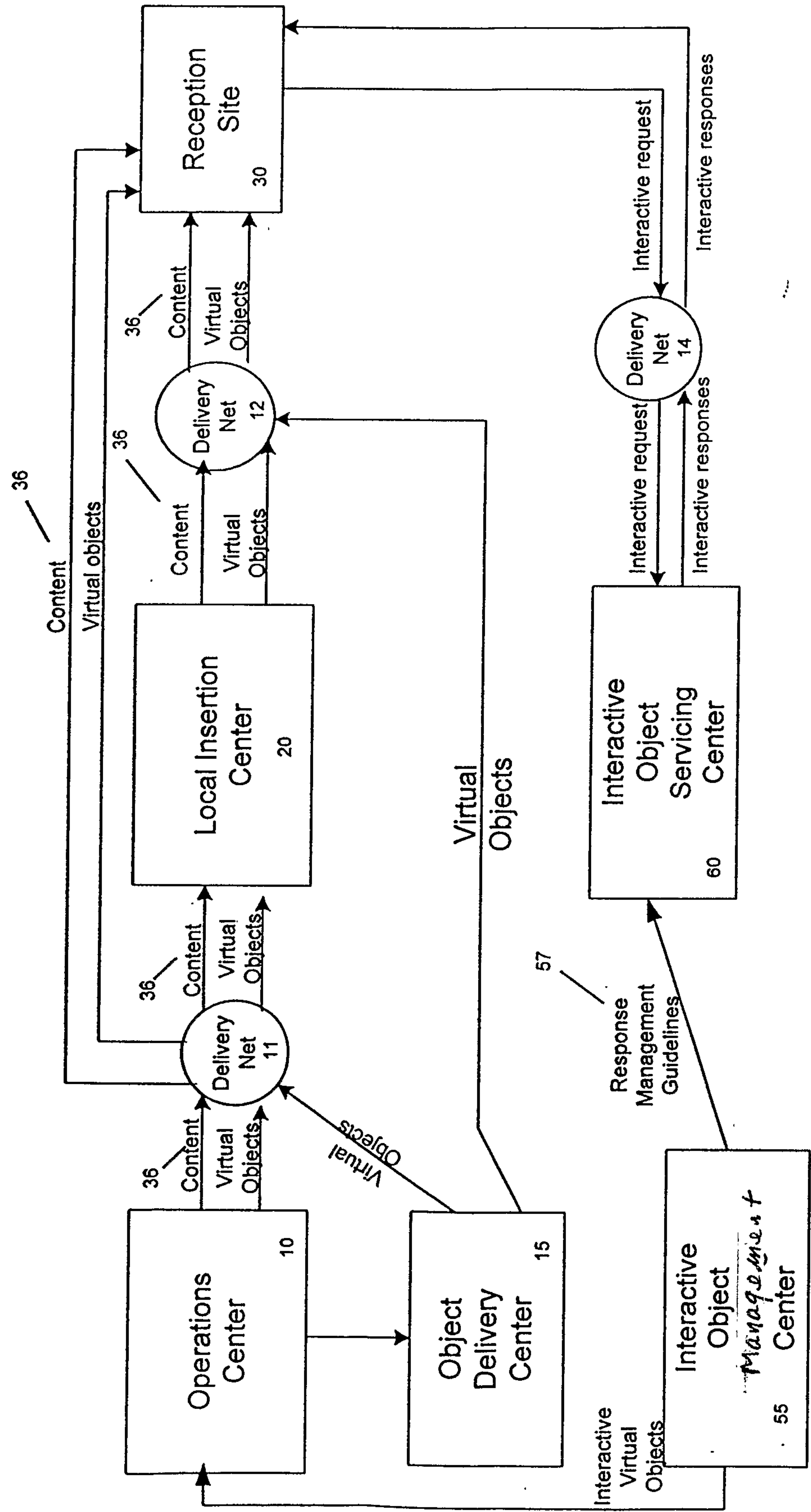
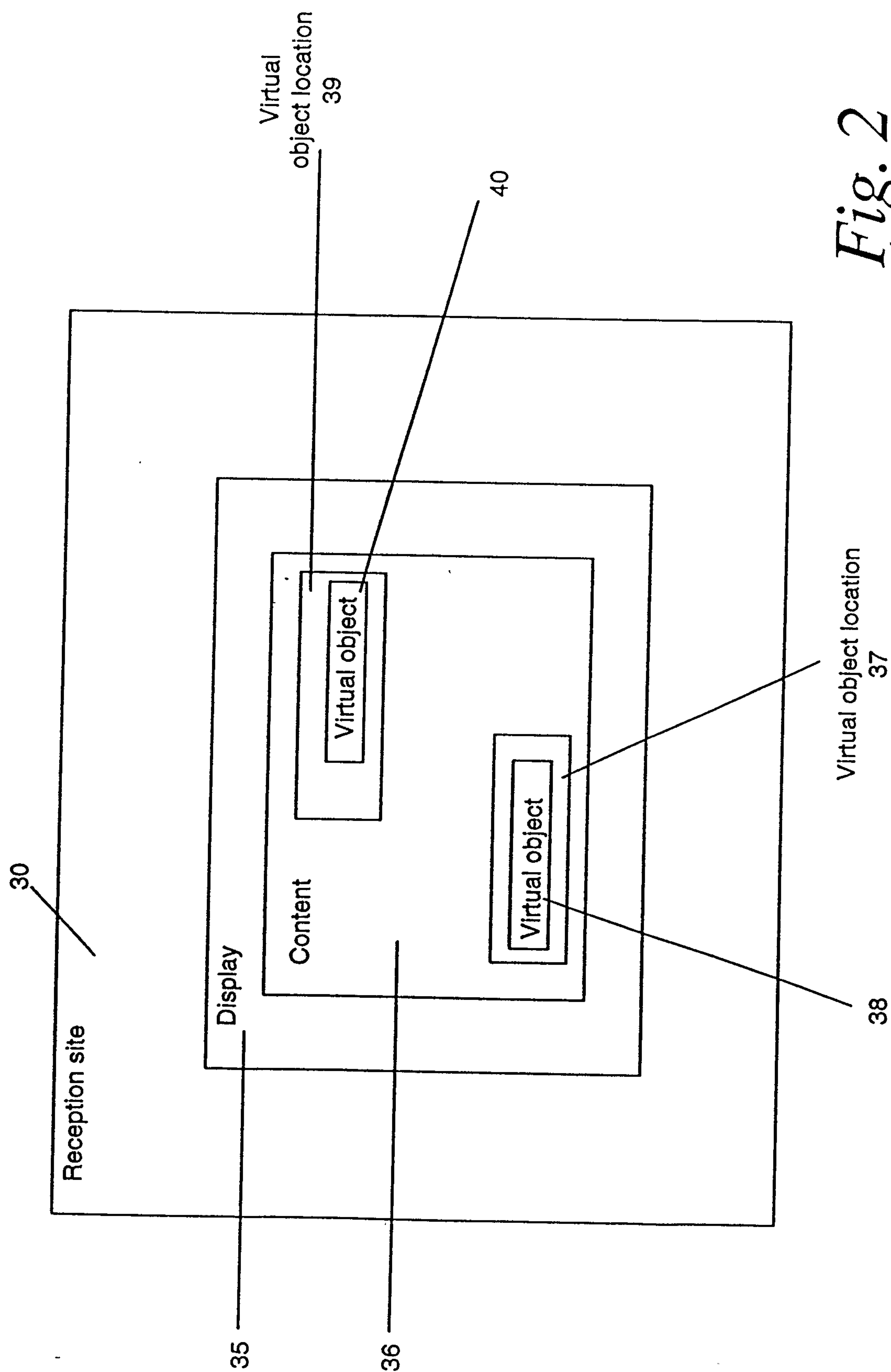
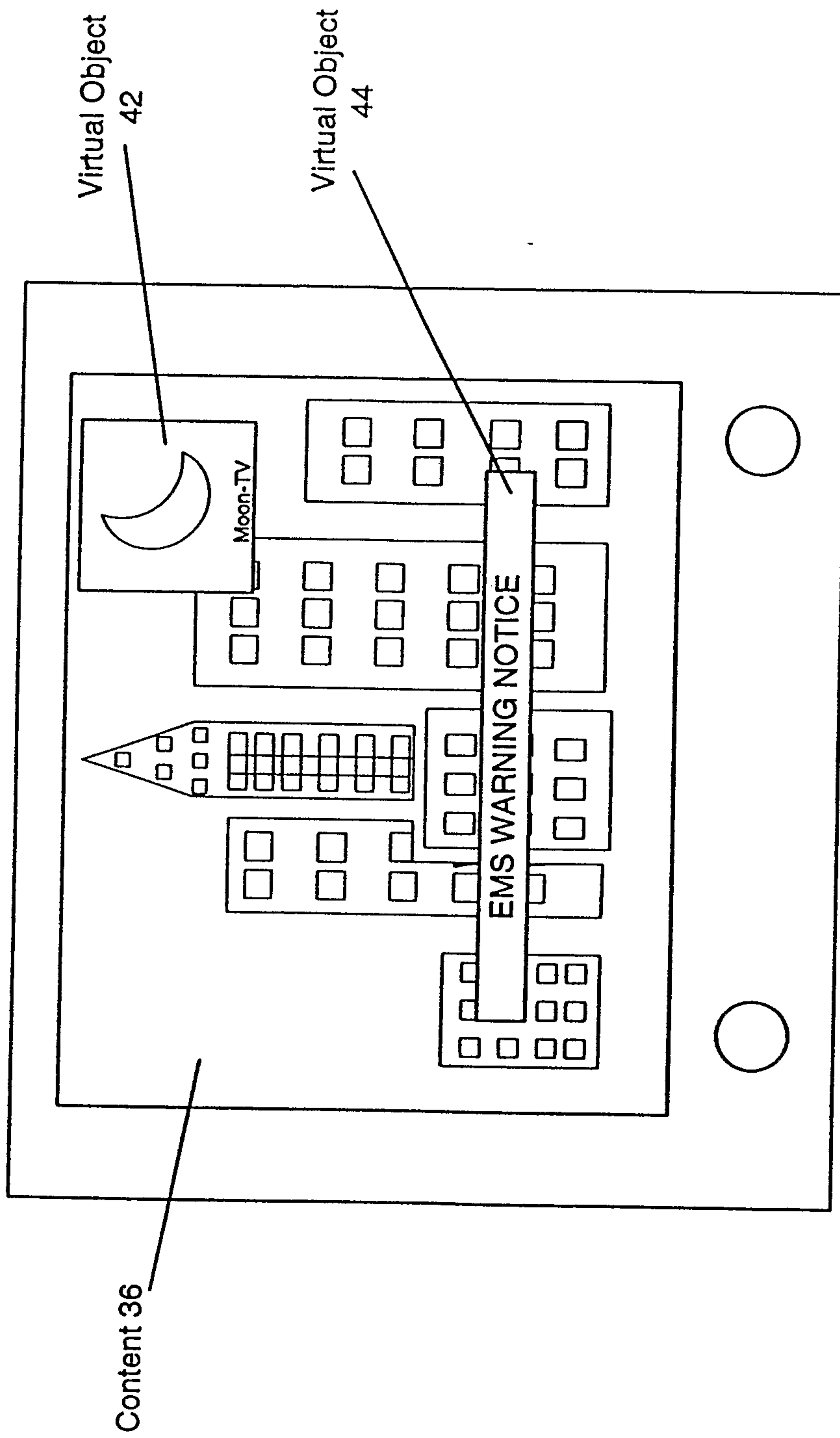
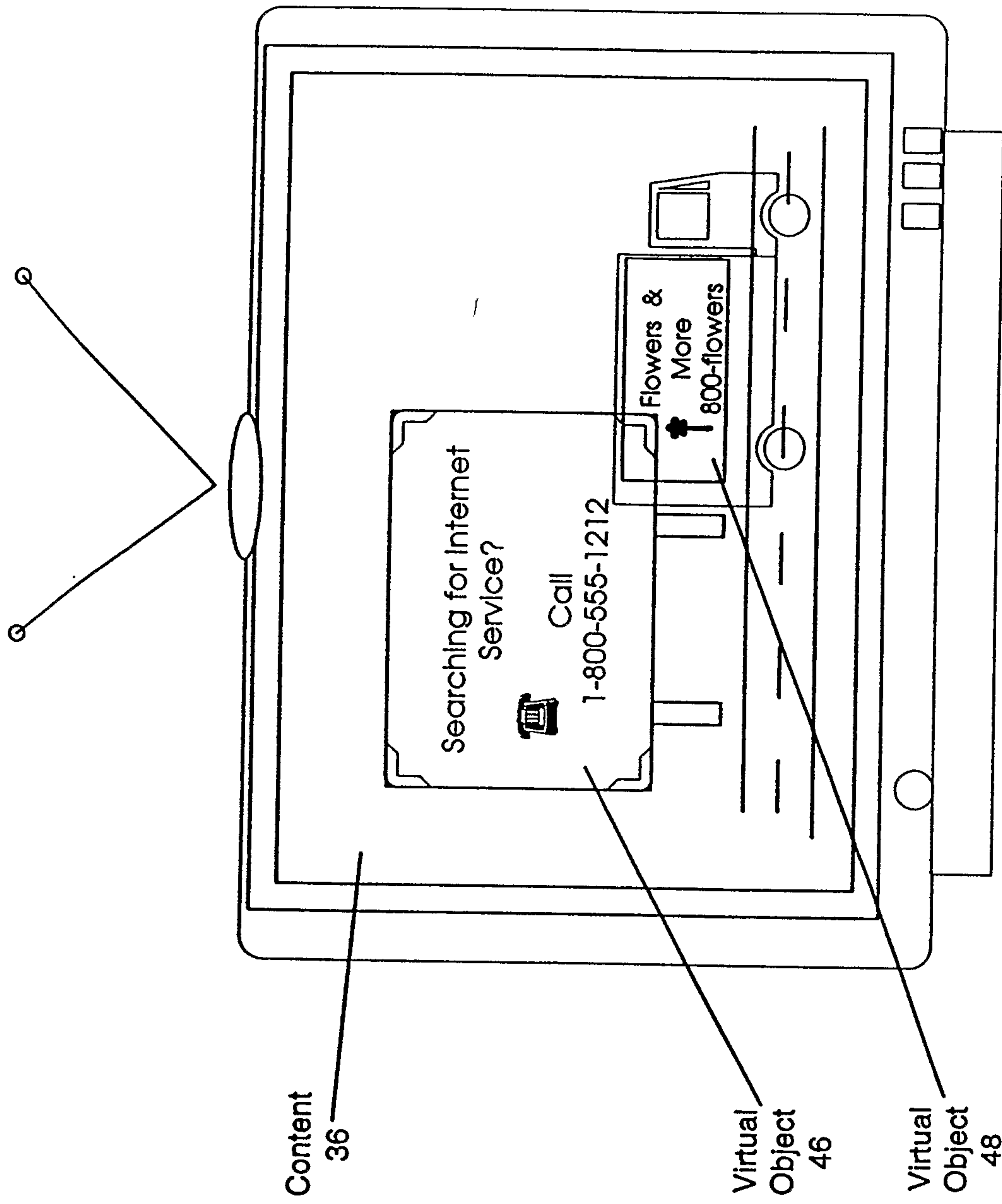
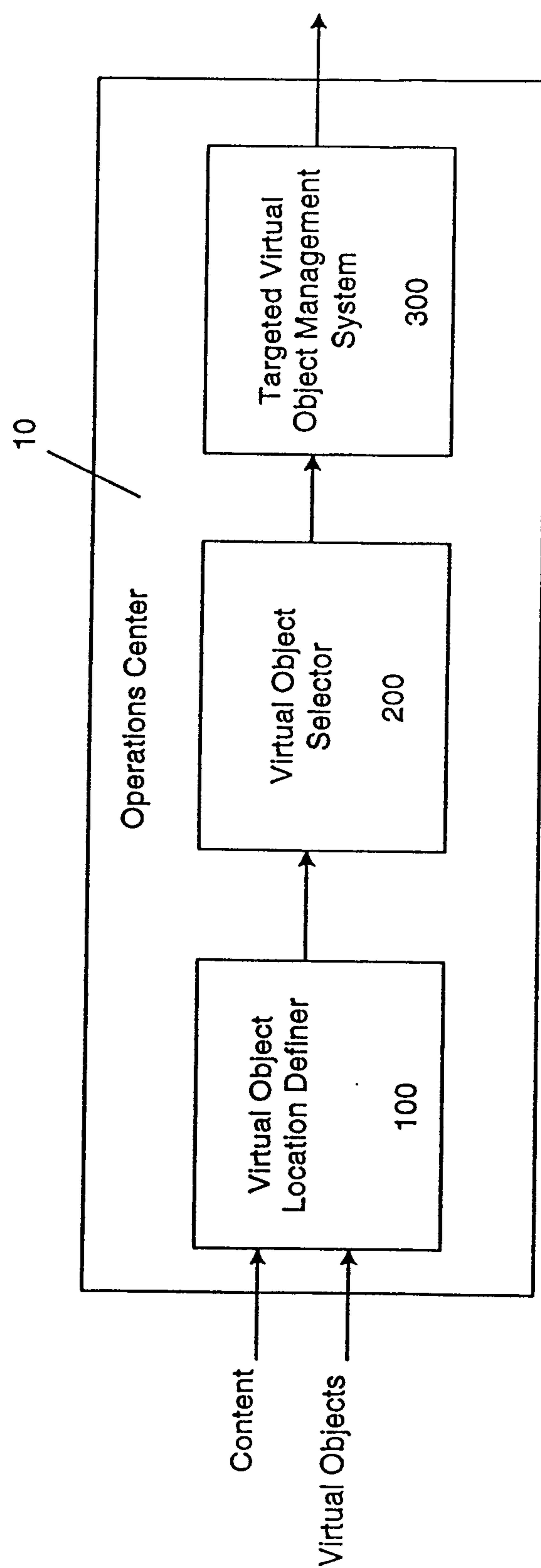


Figure 1

*Fig. 2*

*Fig. 3*

*Fig. 4*

*Fig. 5*

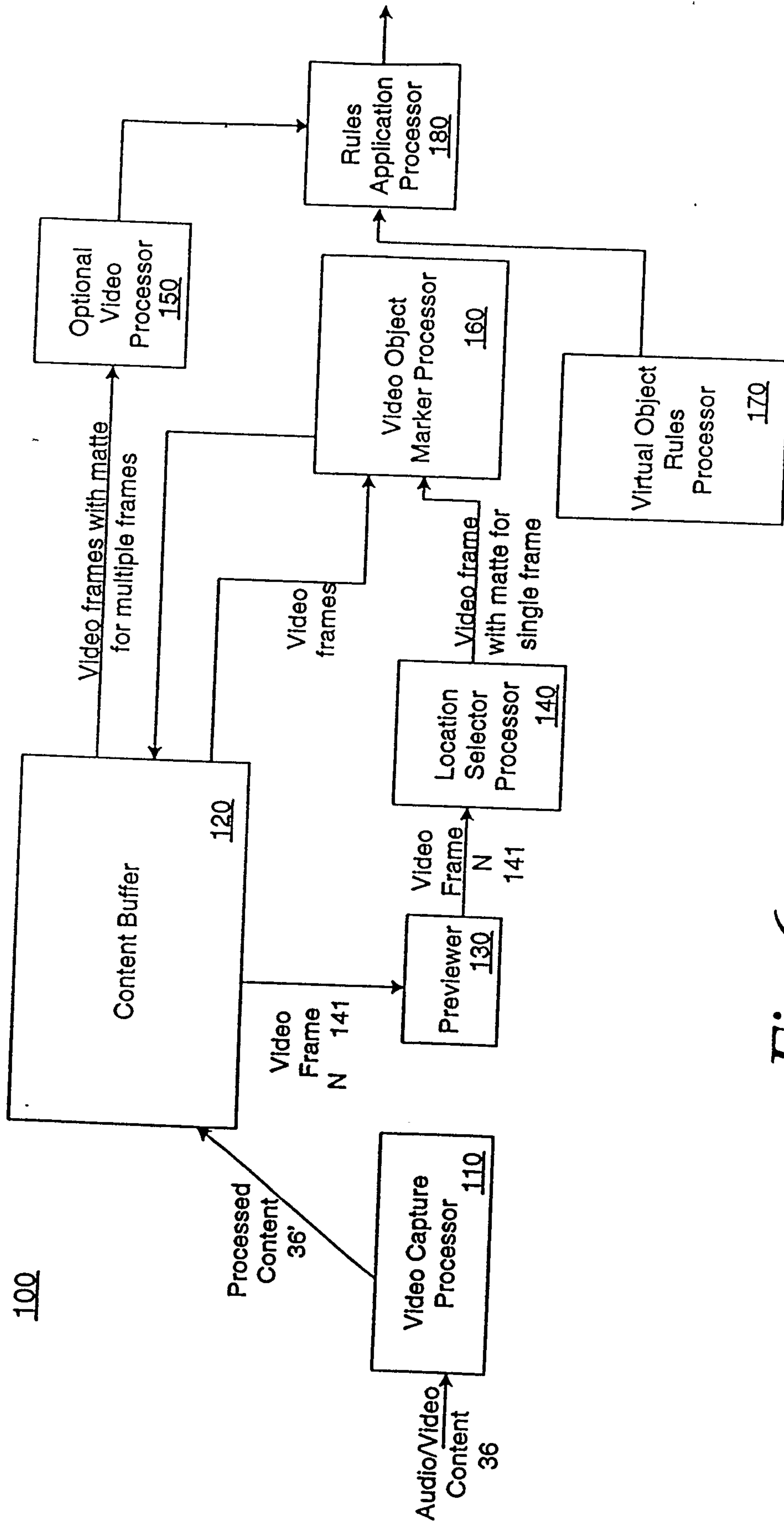
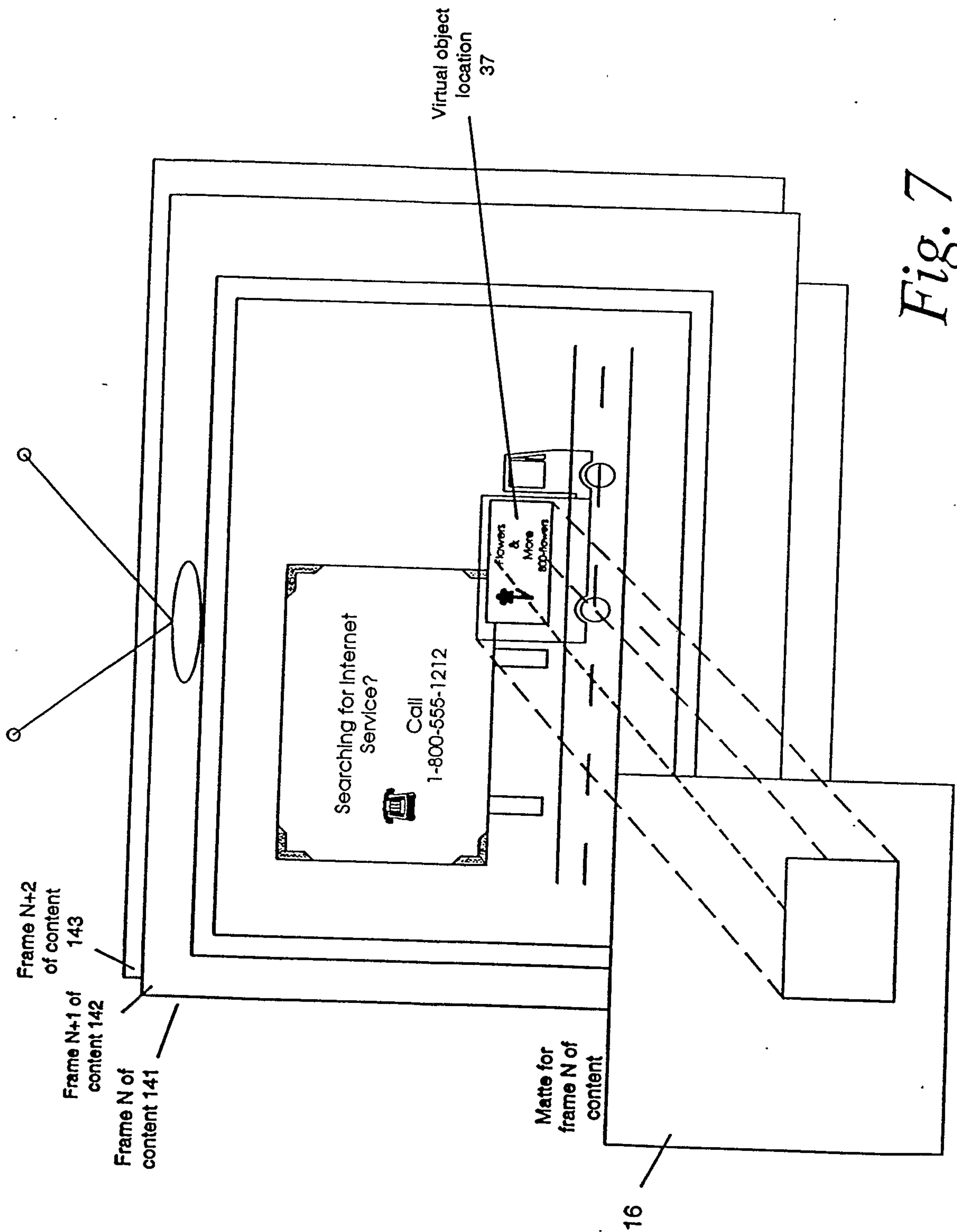


Fig. 6



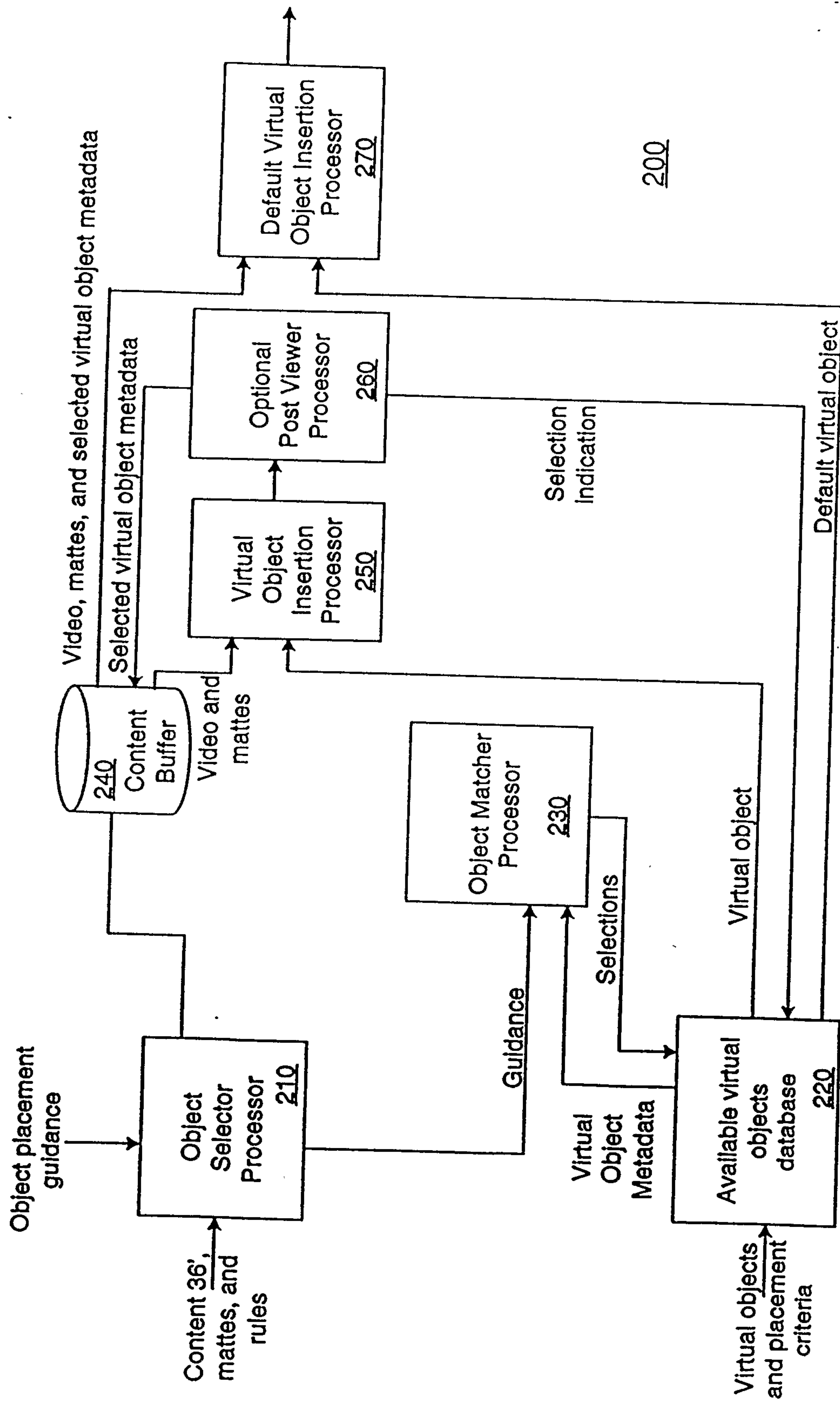


Fig. 8

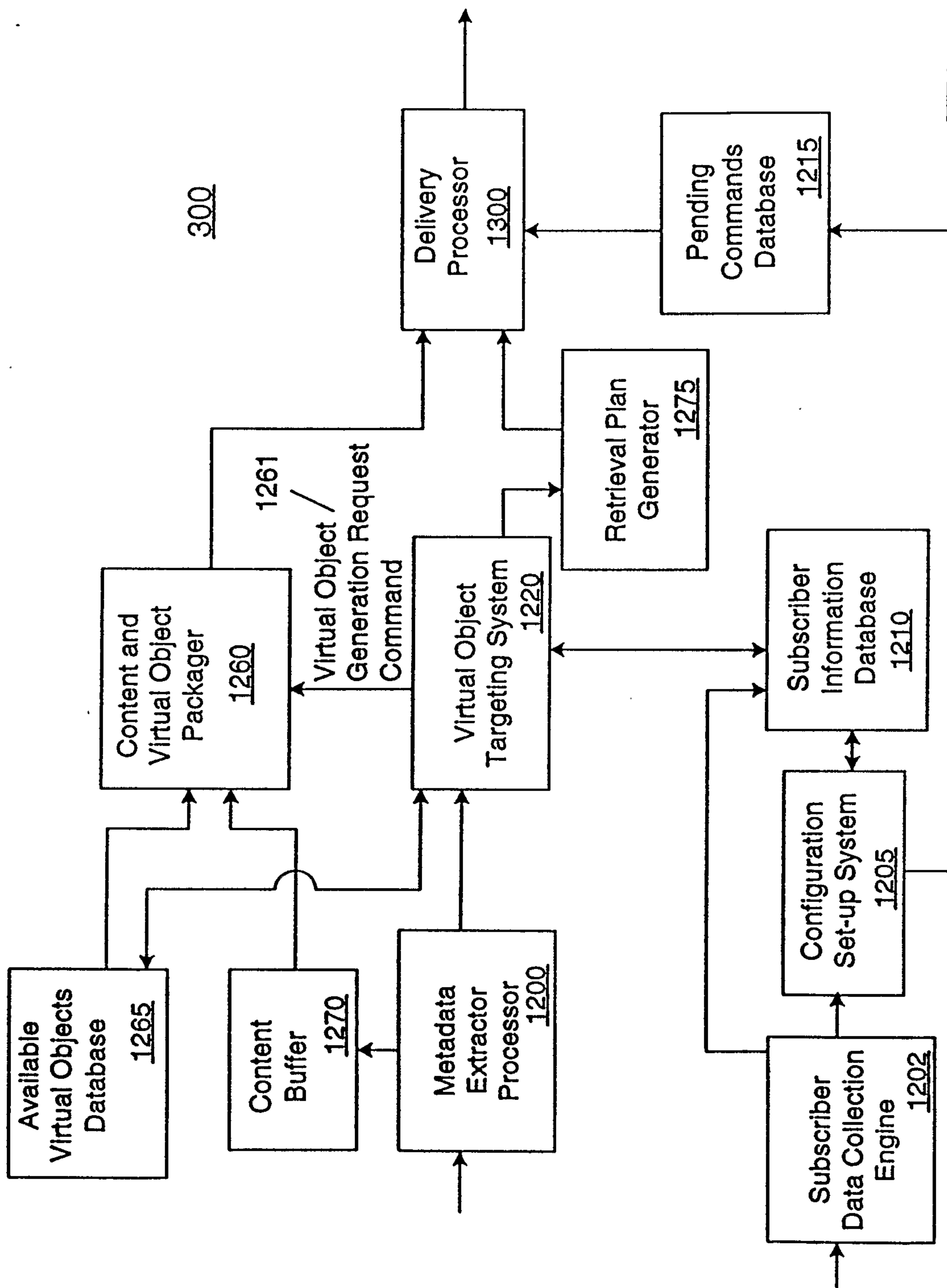
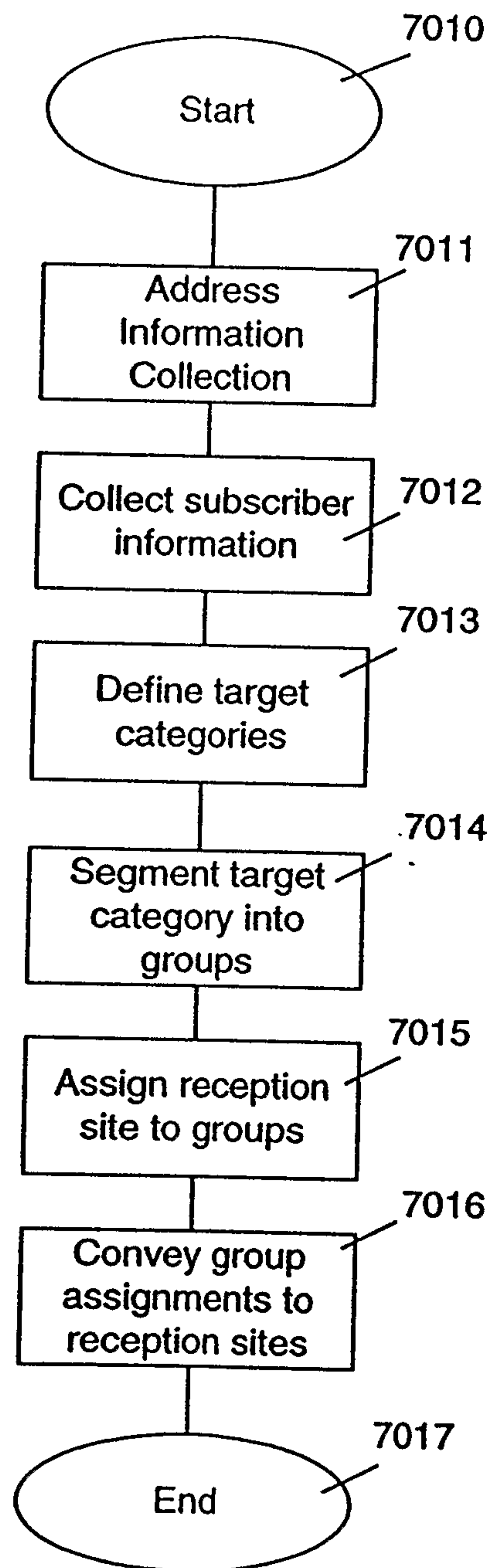
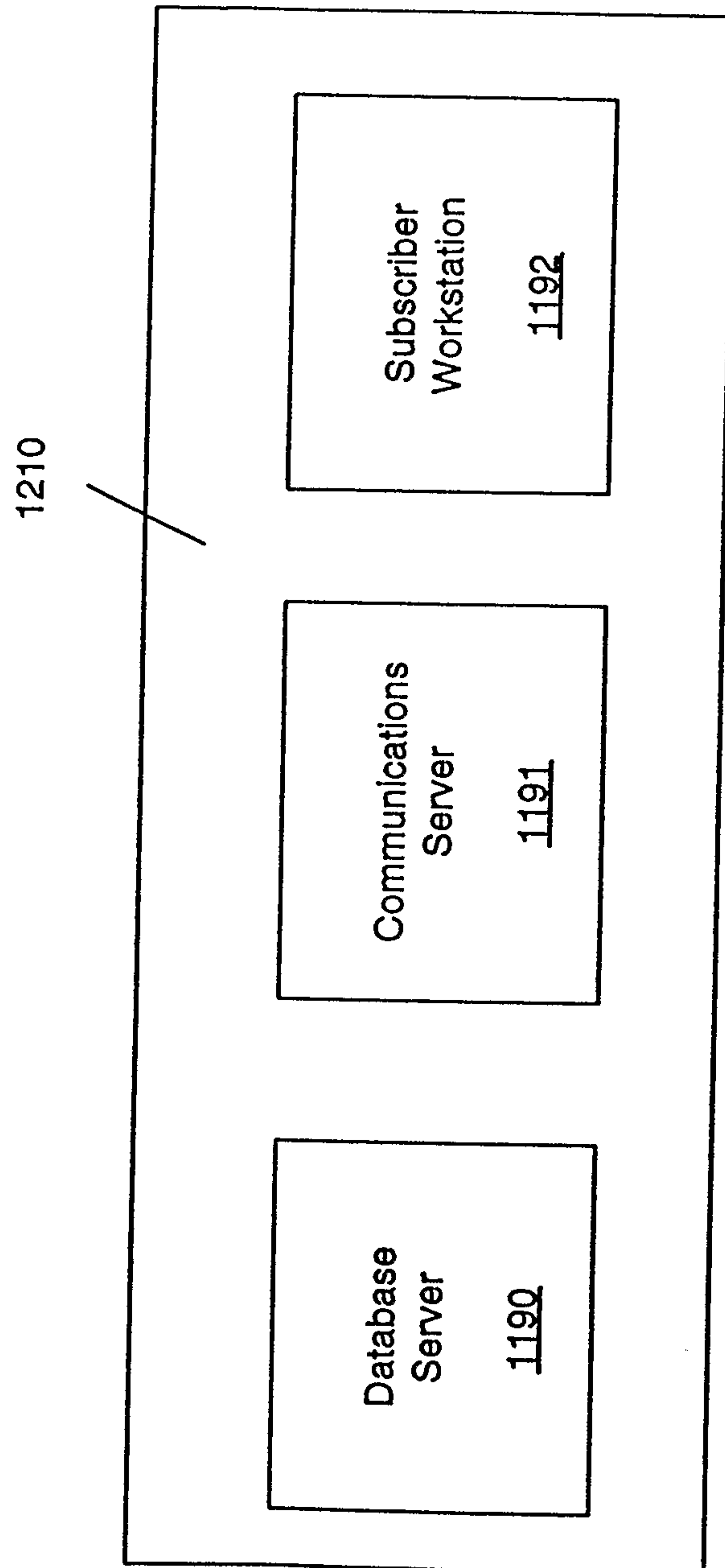


Fig. 9

*Fig. 10*

*Fig. 11*

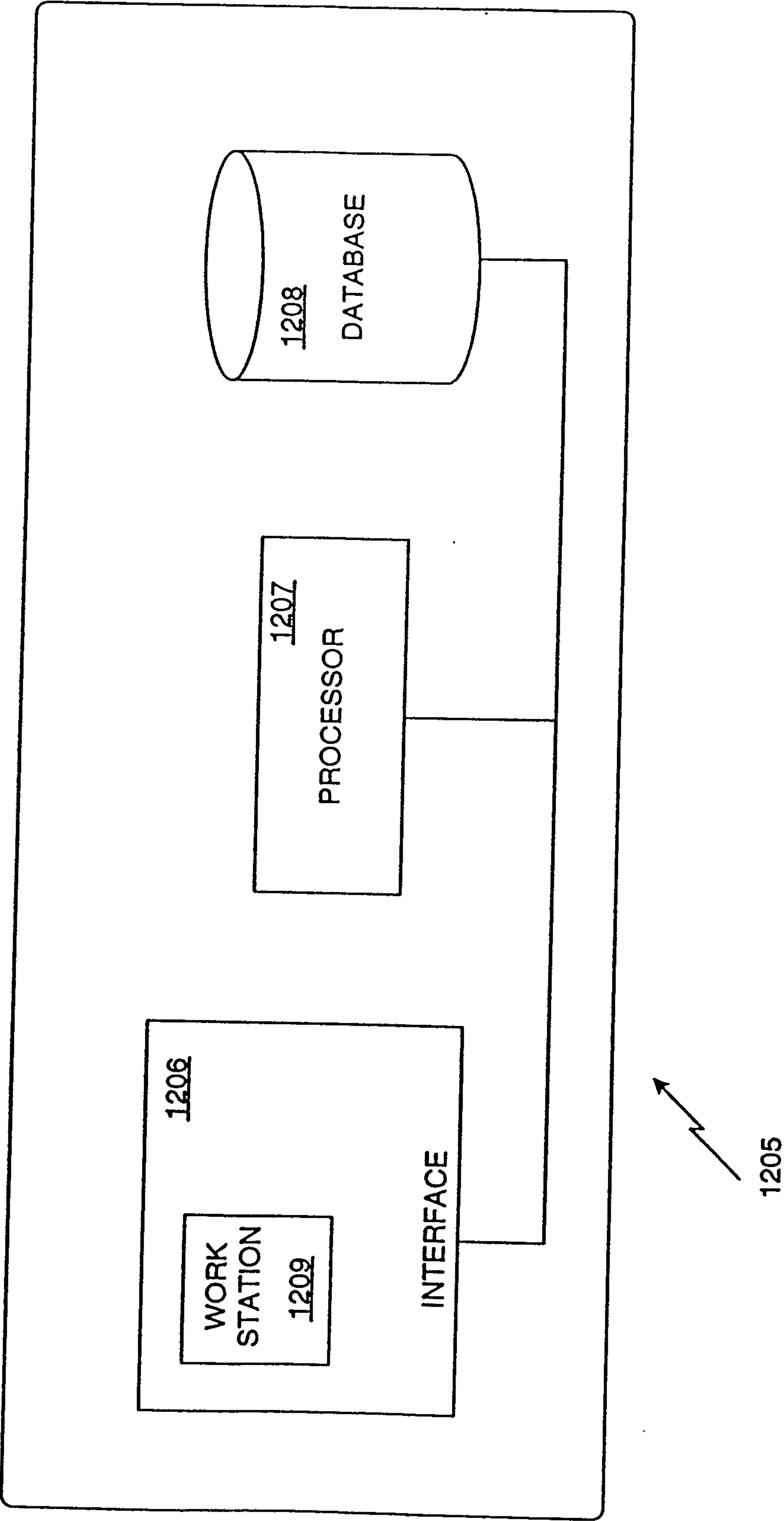
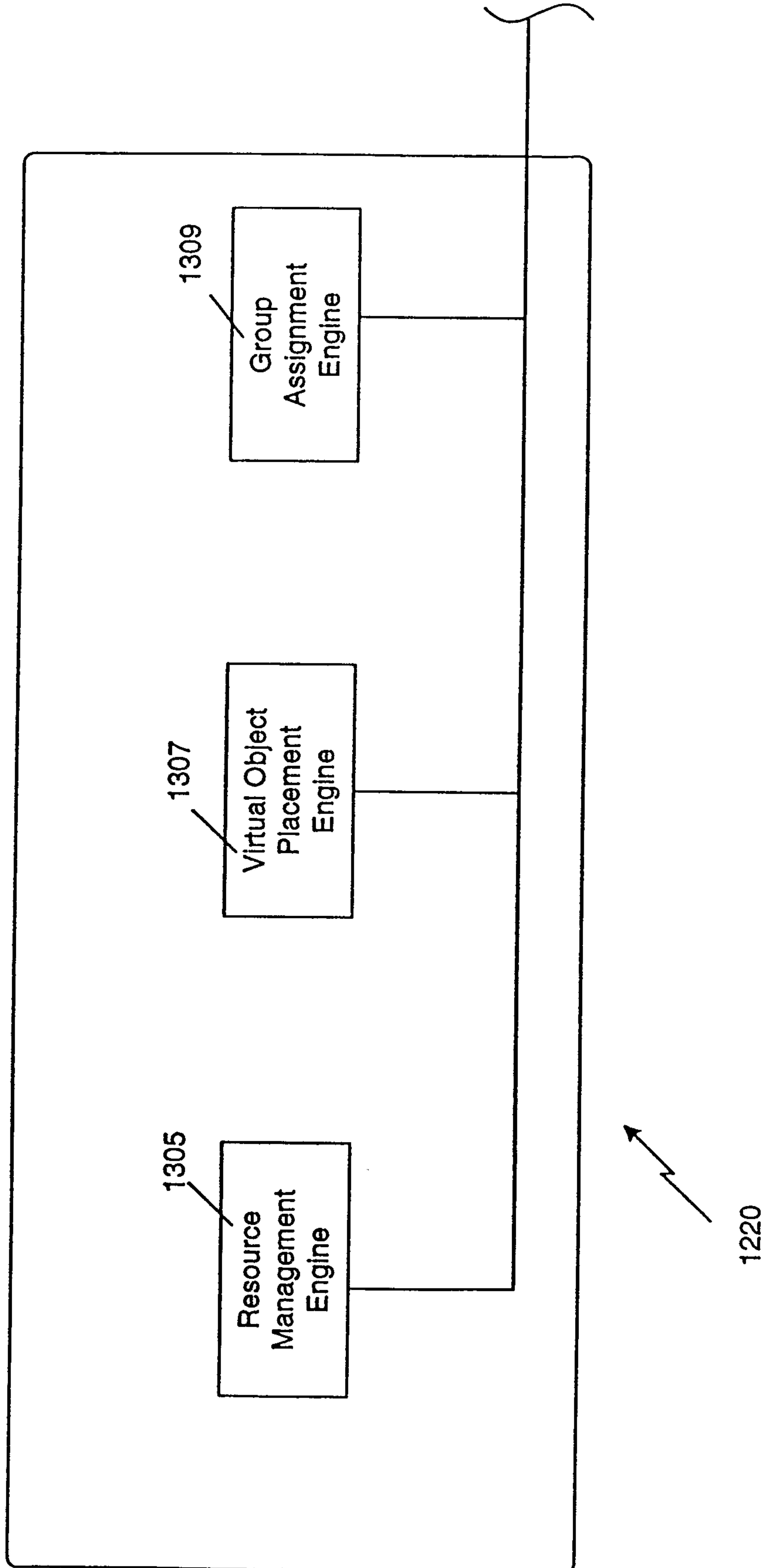
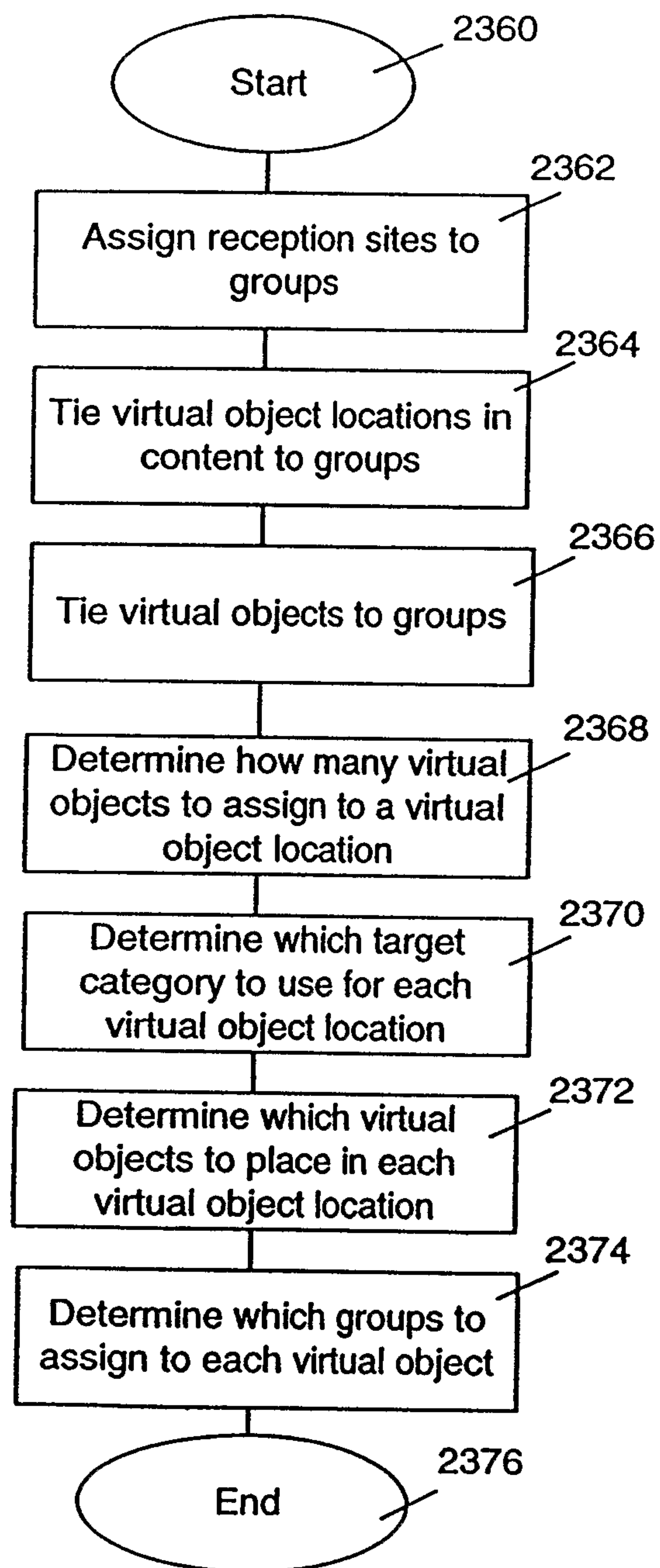
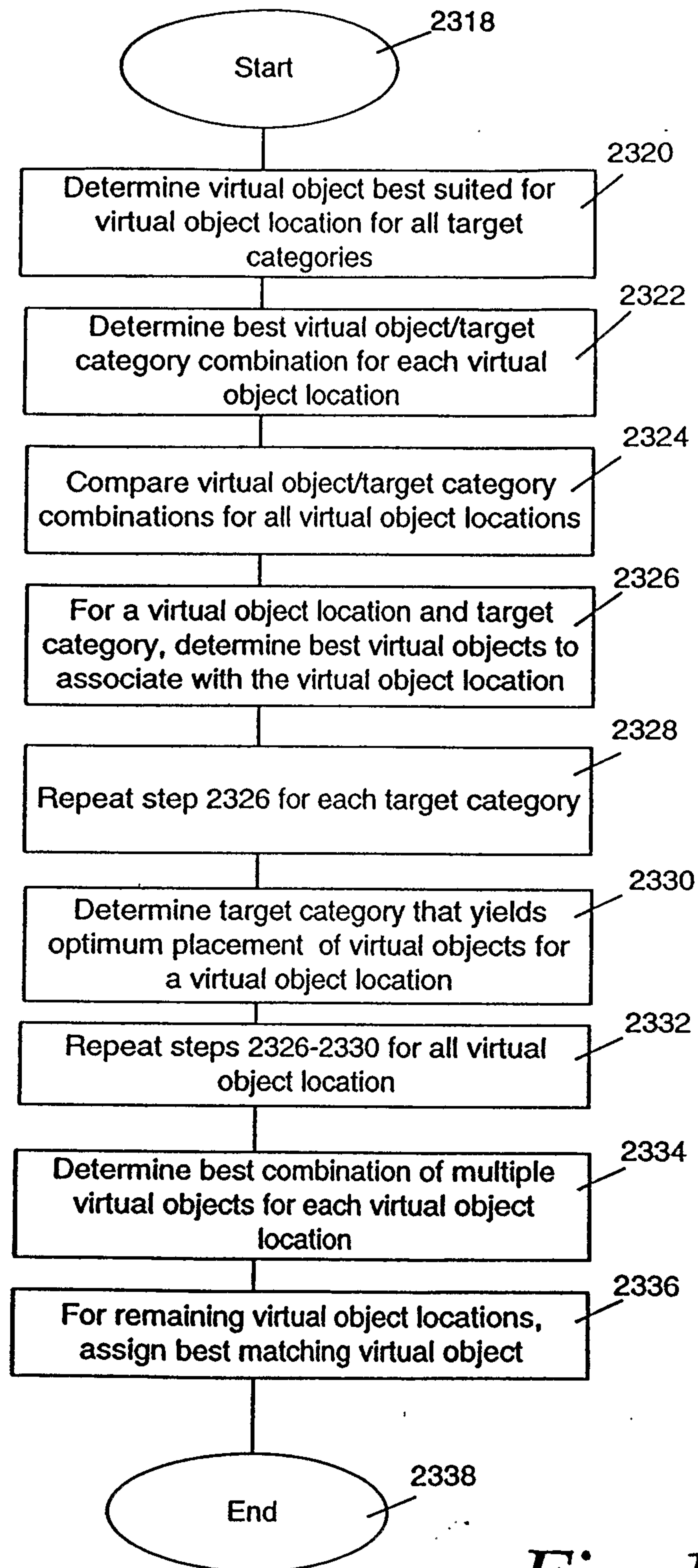
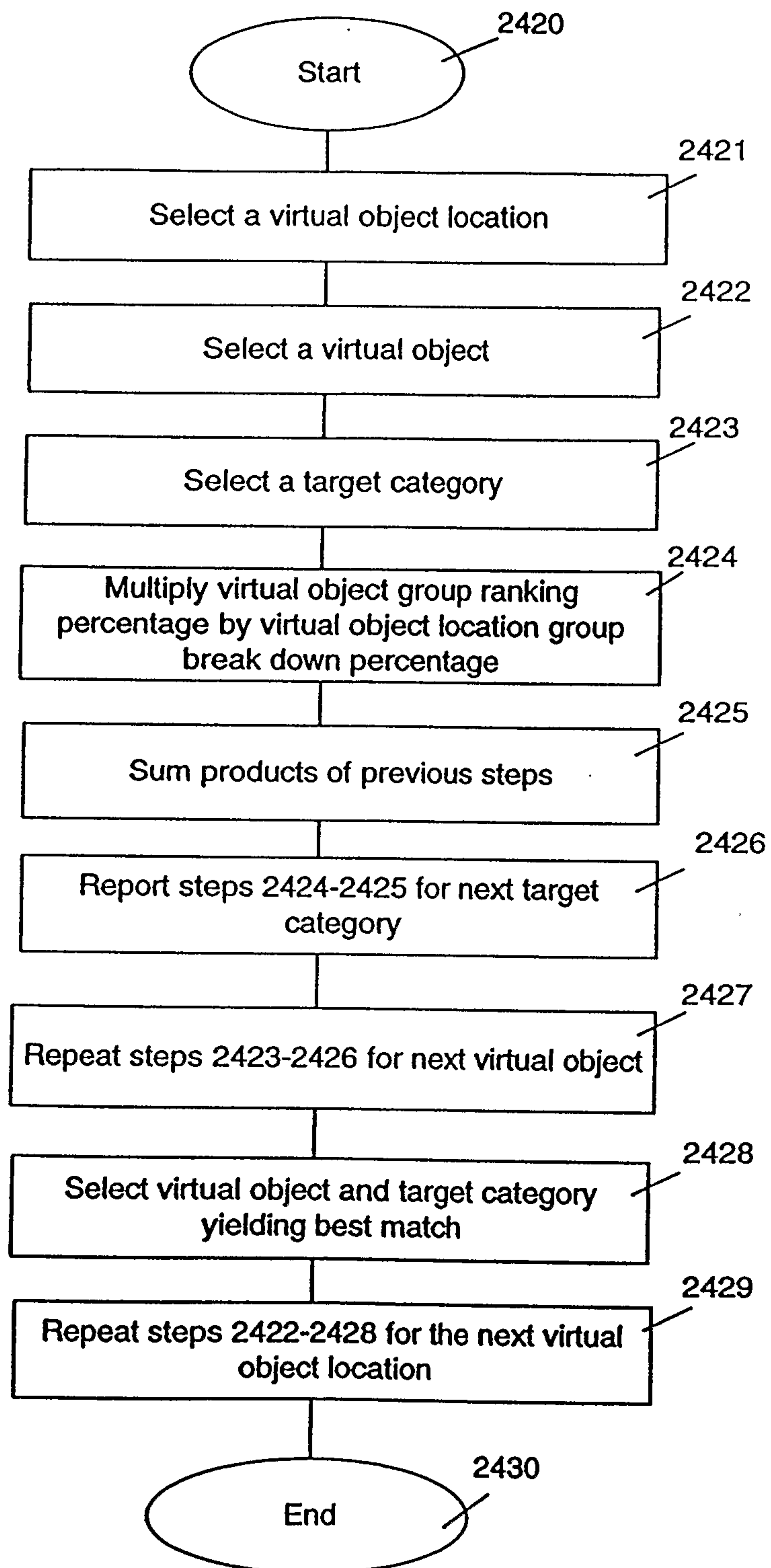


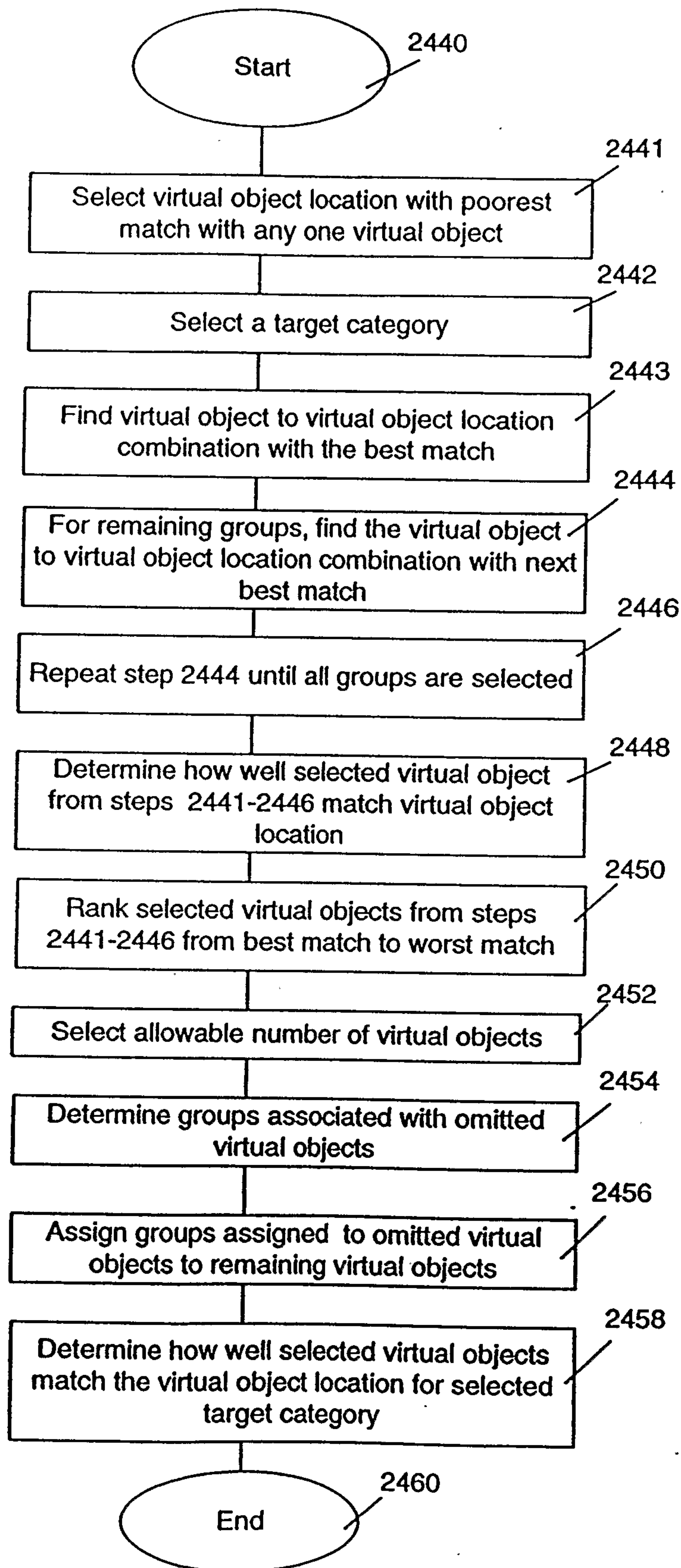
Fig. 12

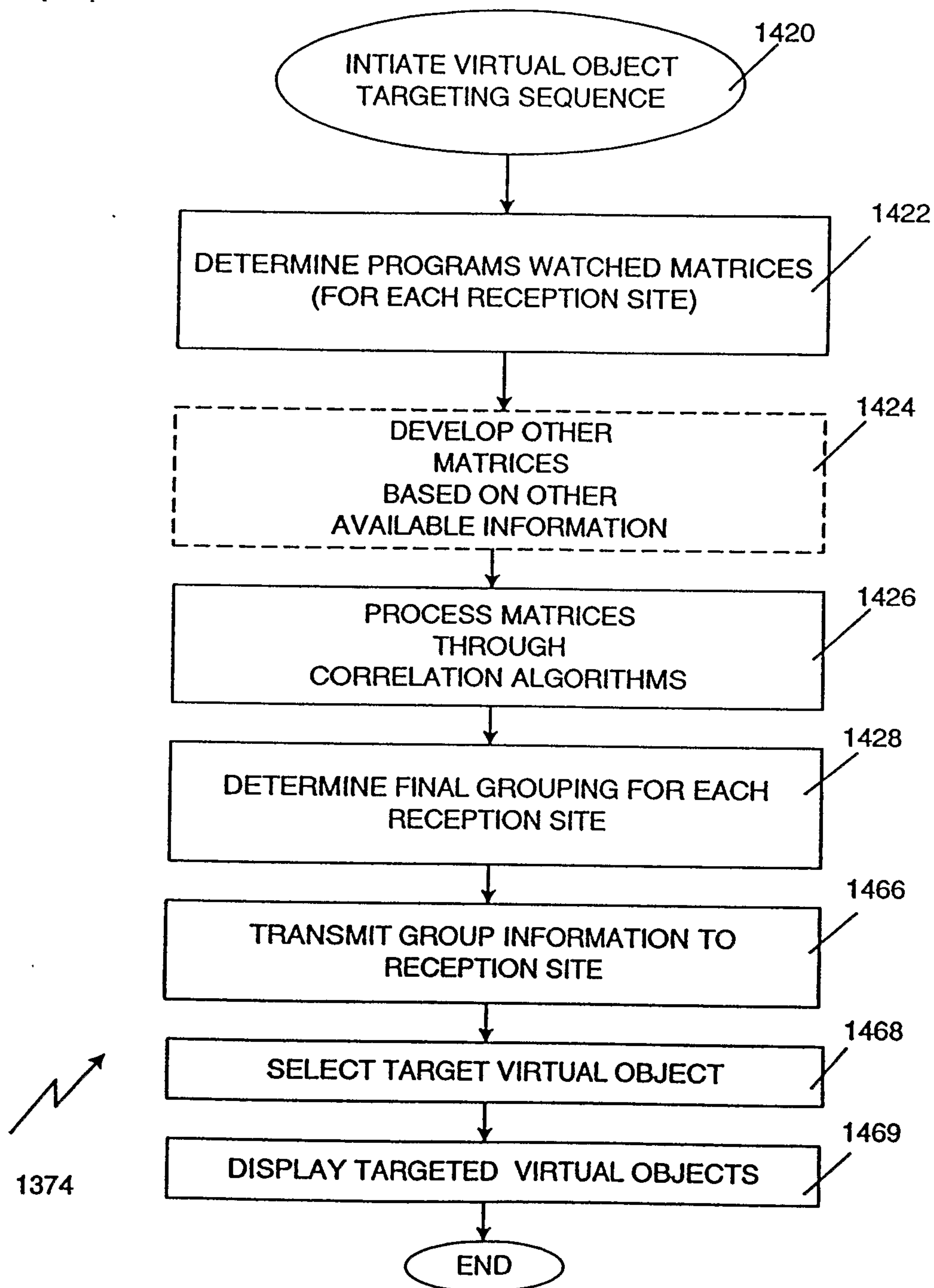
*Fig. 13*

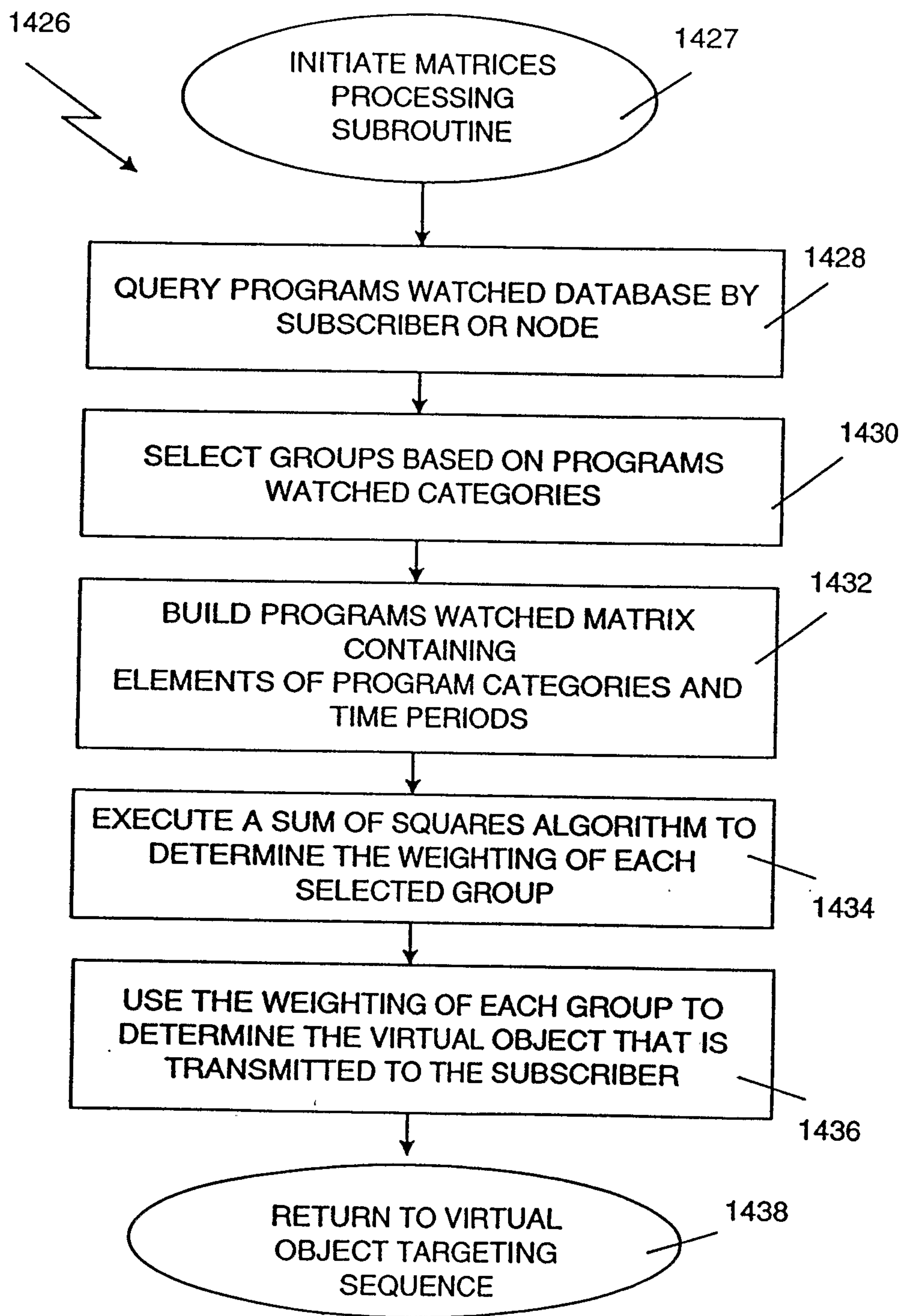
*Fig. 14*

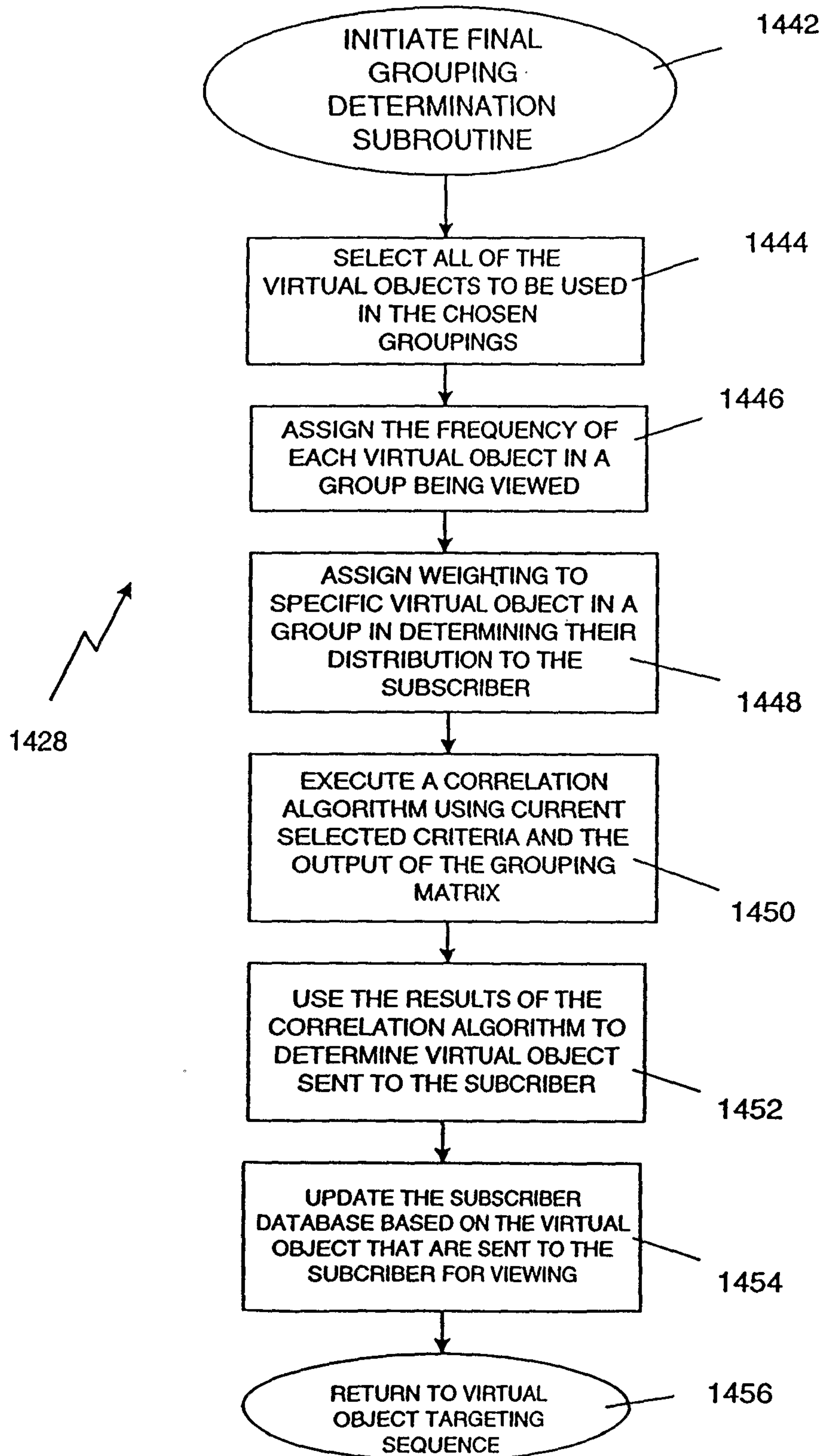
*Fig. 15*

*Fig. 16*

*Fig. 17*

*Fig. 18*

*Fig. 19*

*Fig. 20*

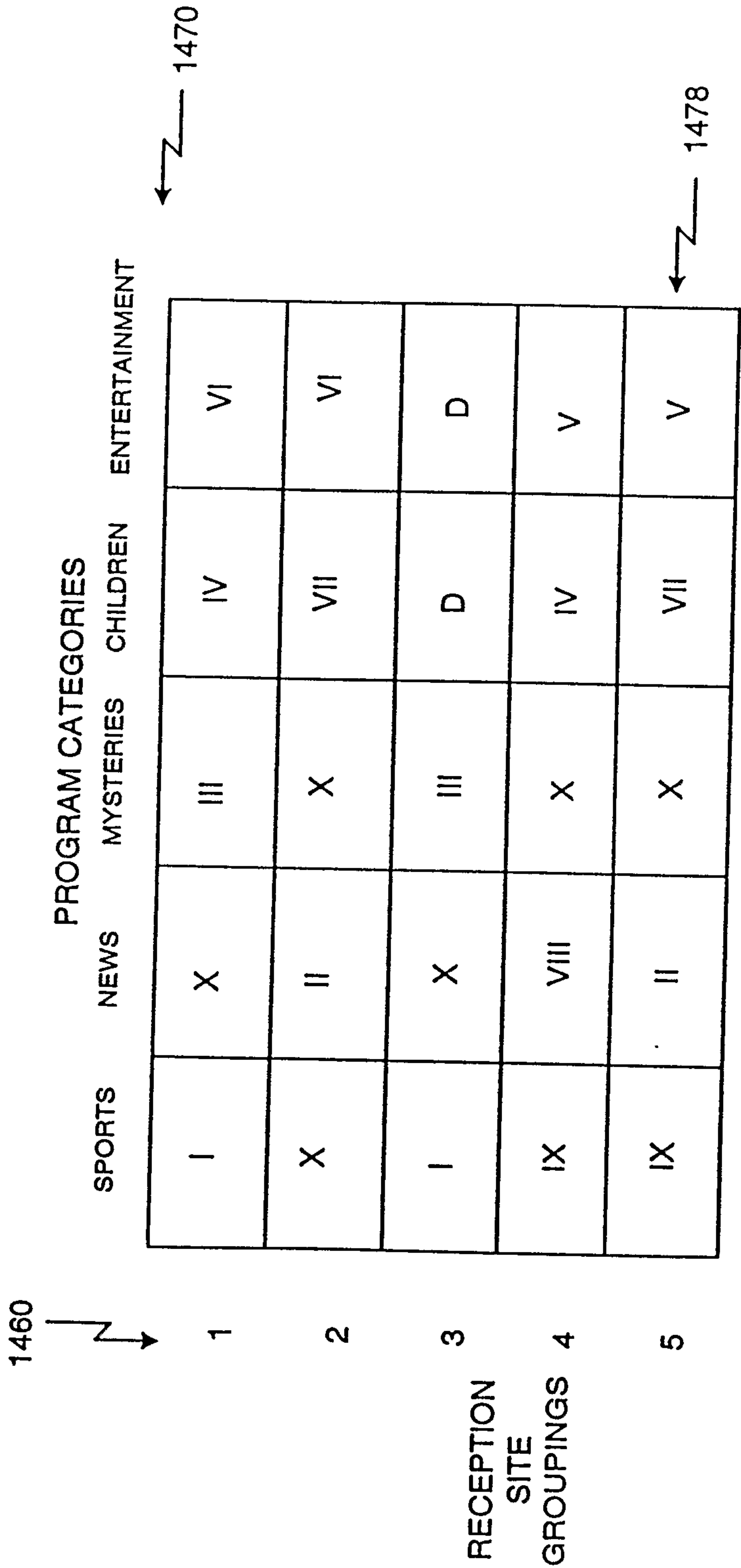


Fig. 21

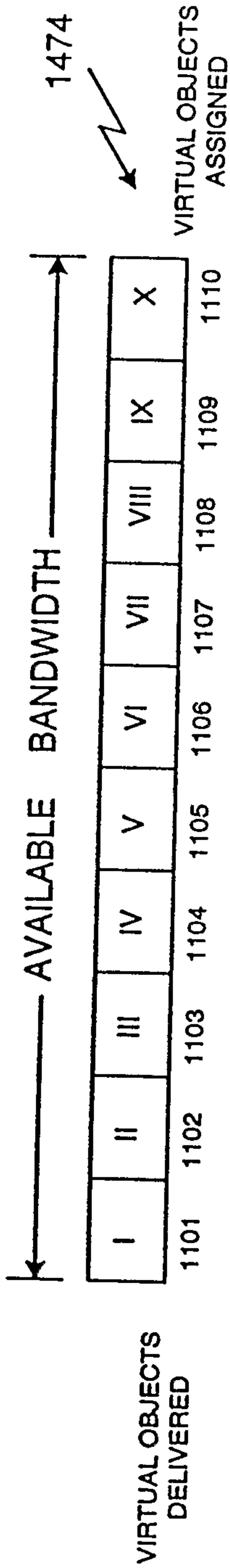
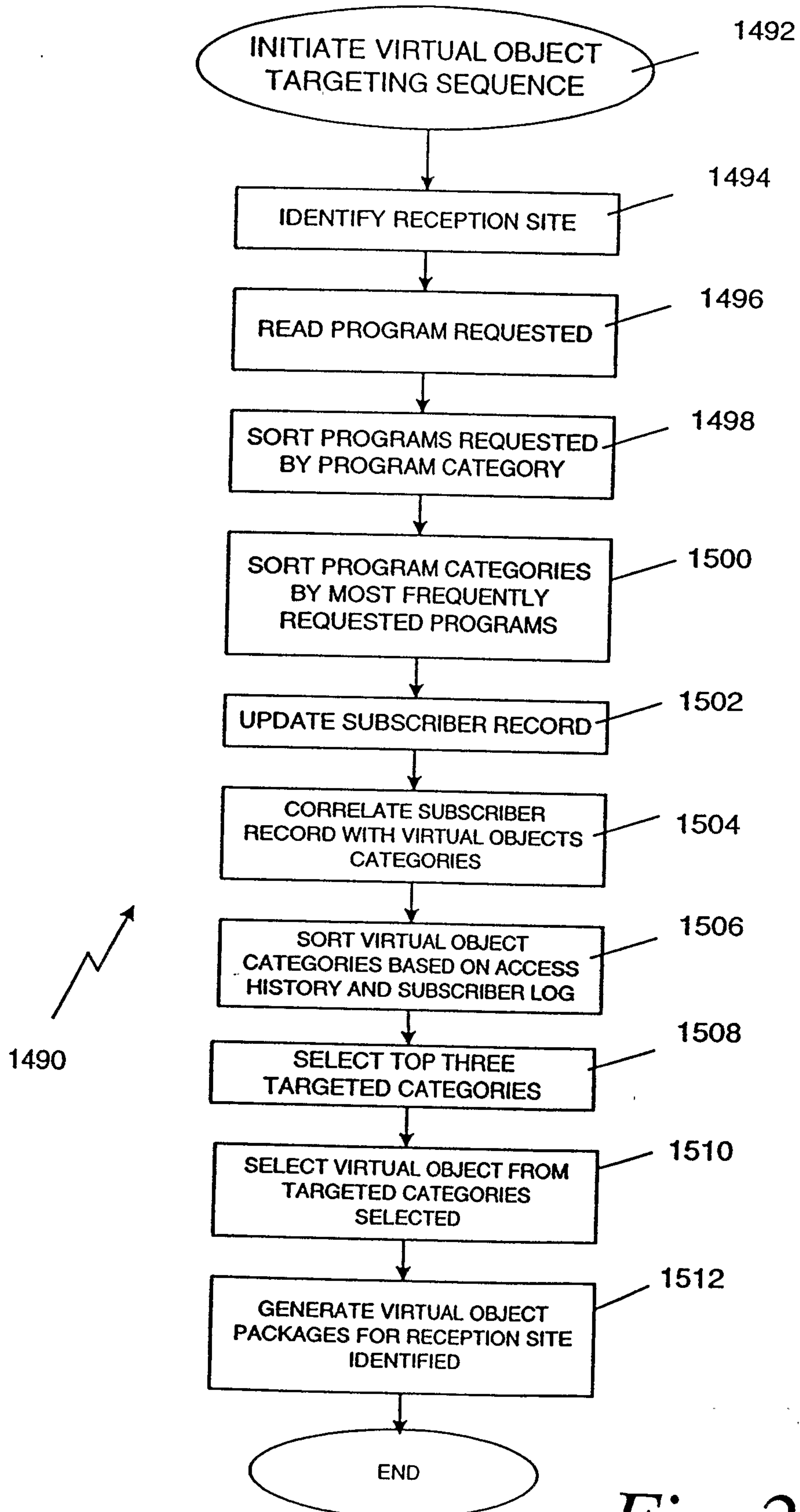
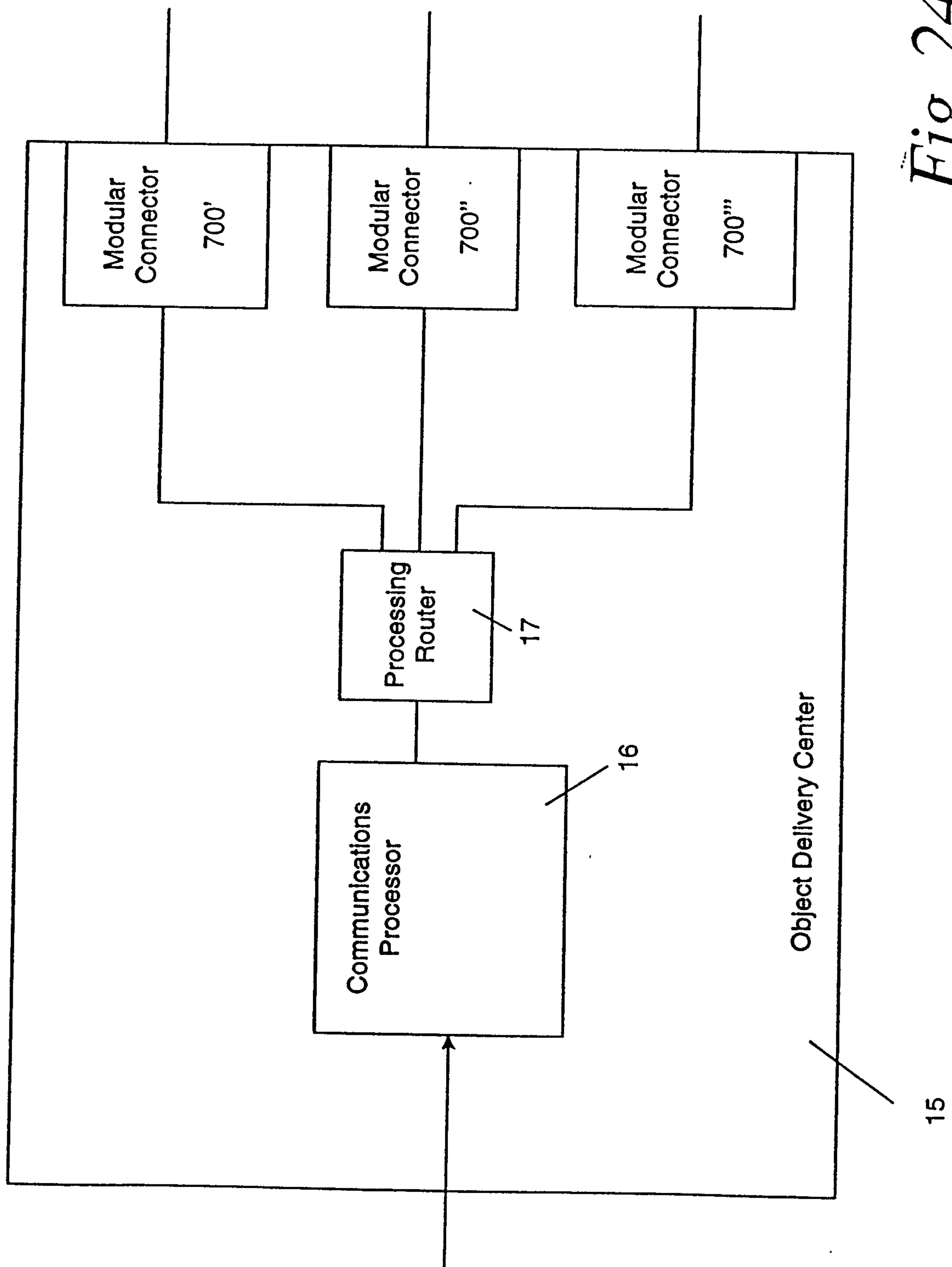
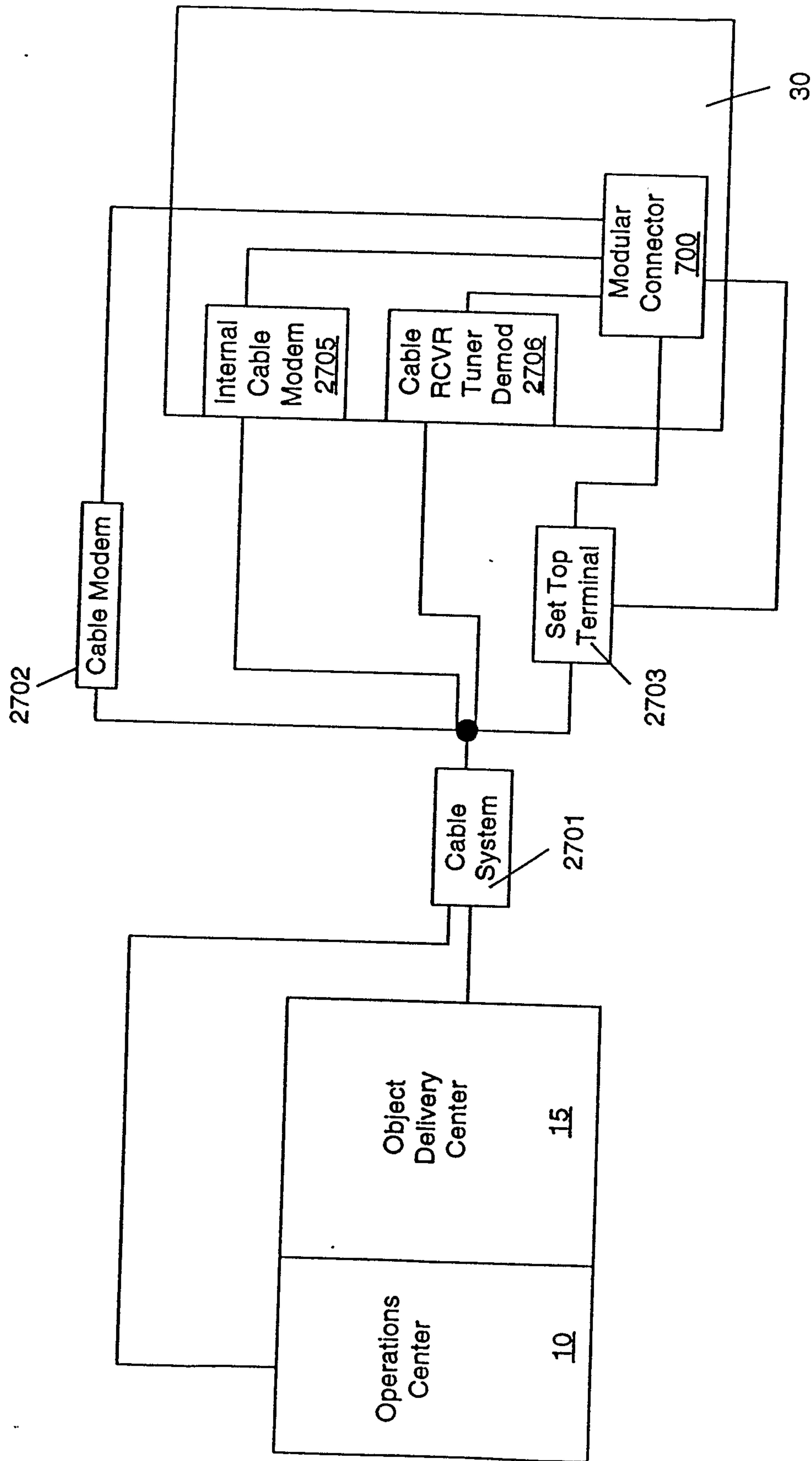
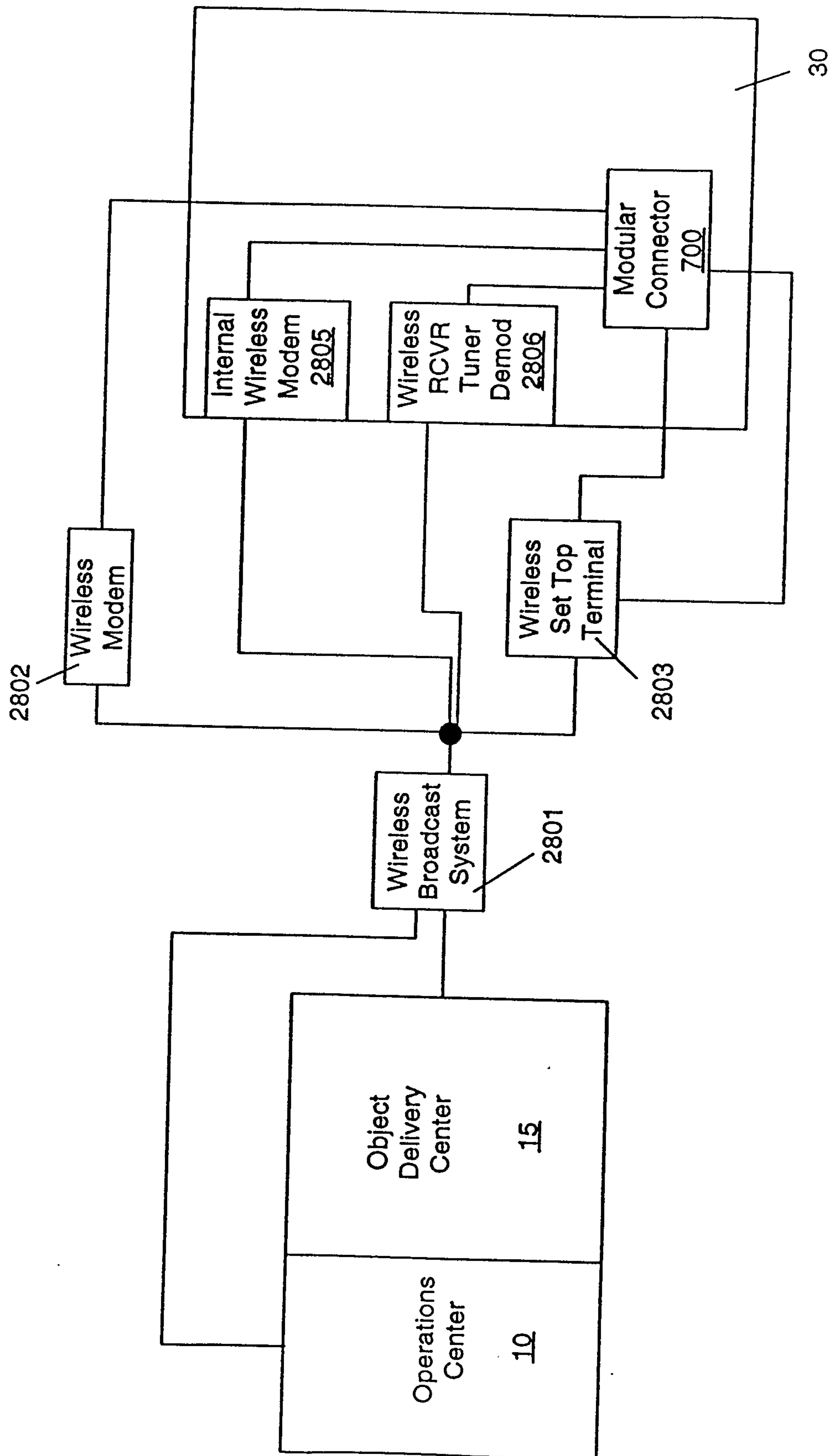


Fig. 22

*Fig. 23*

*Fig. 24*

*Fig. 25*

*Fig. 26*

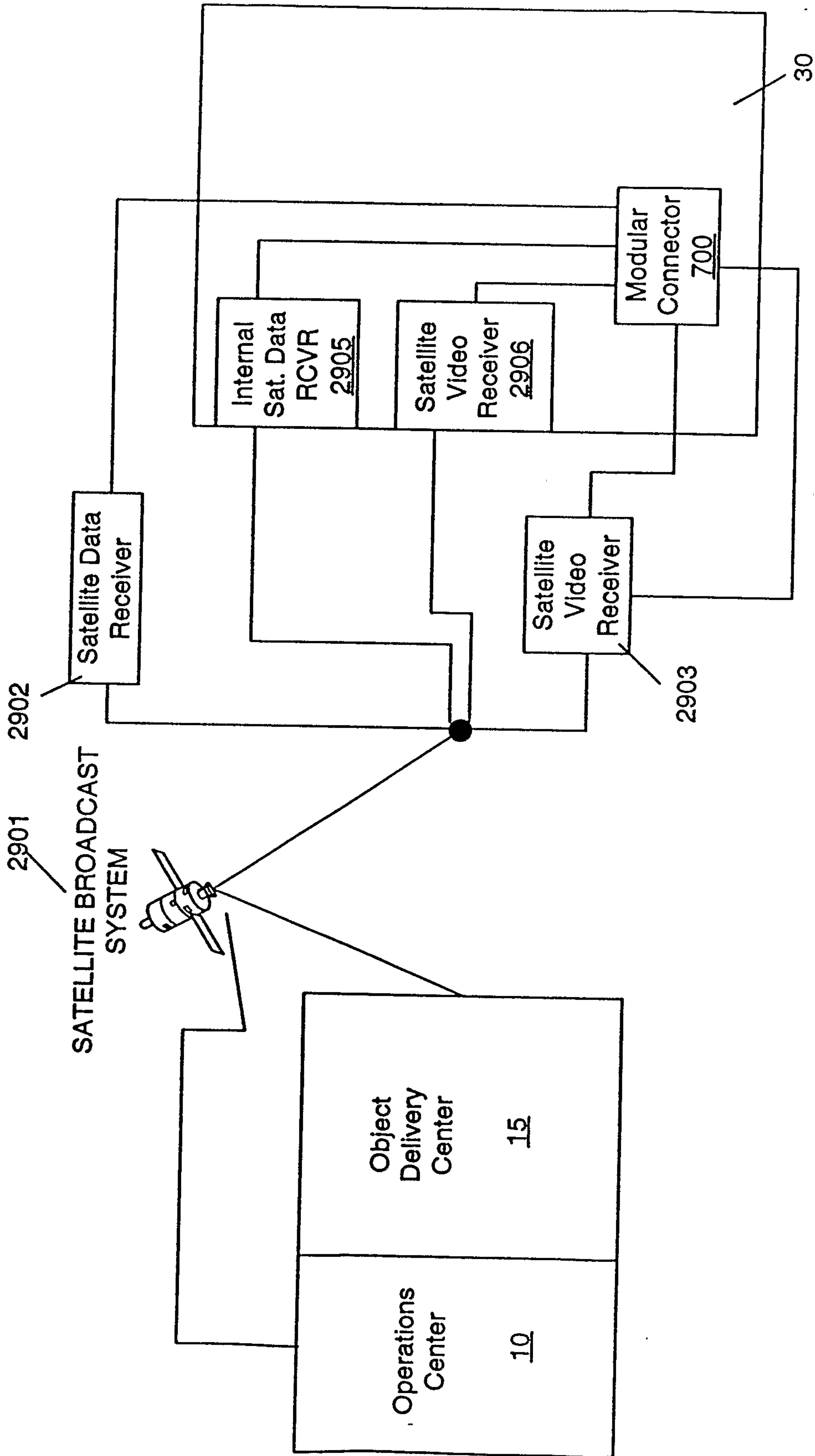
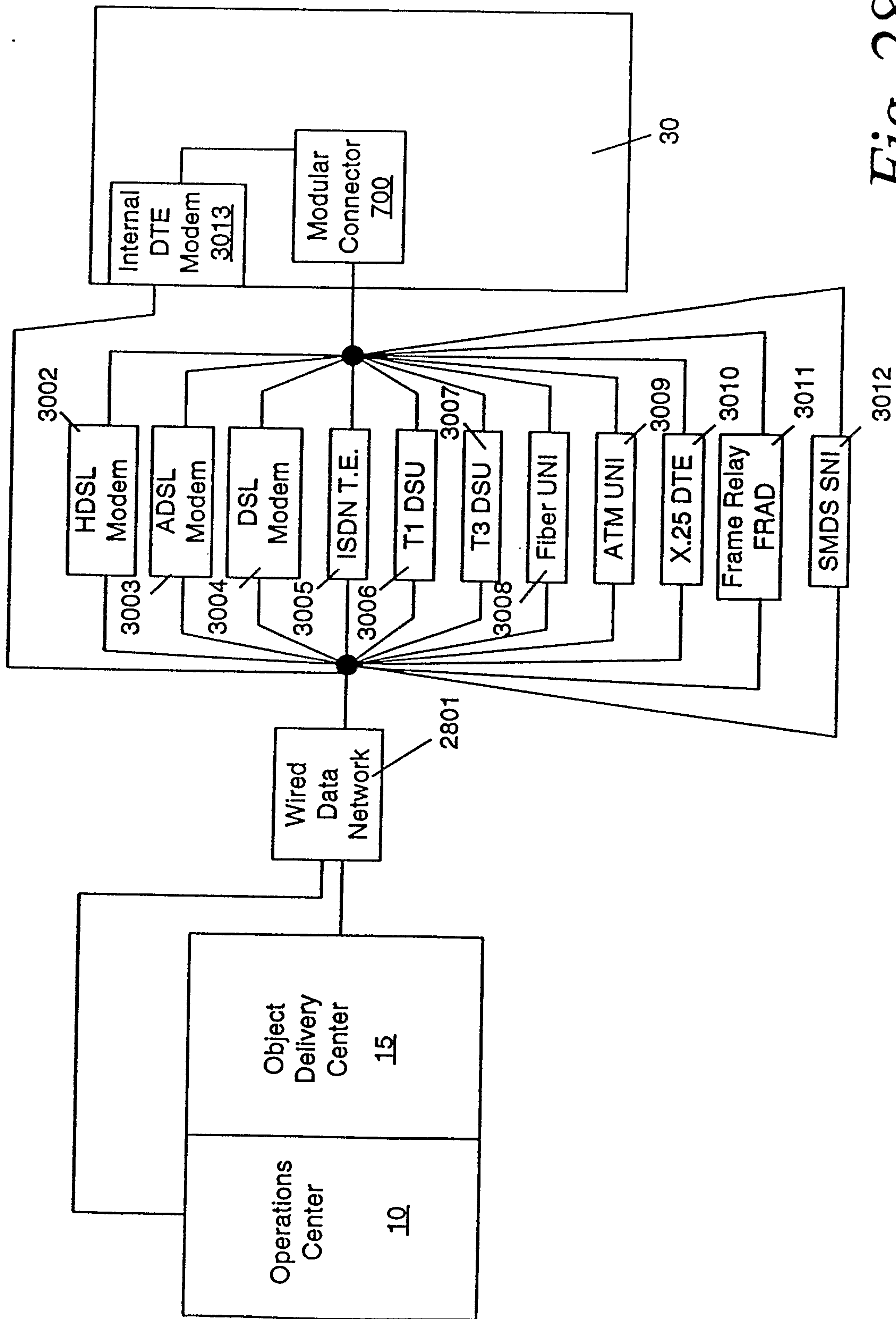
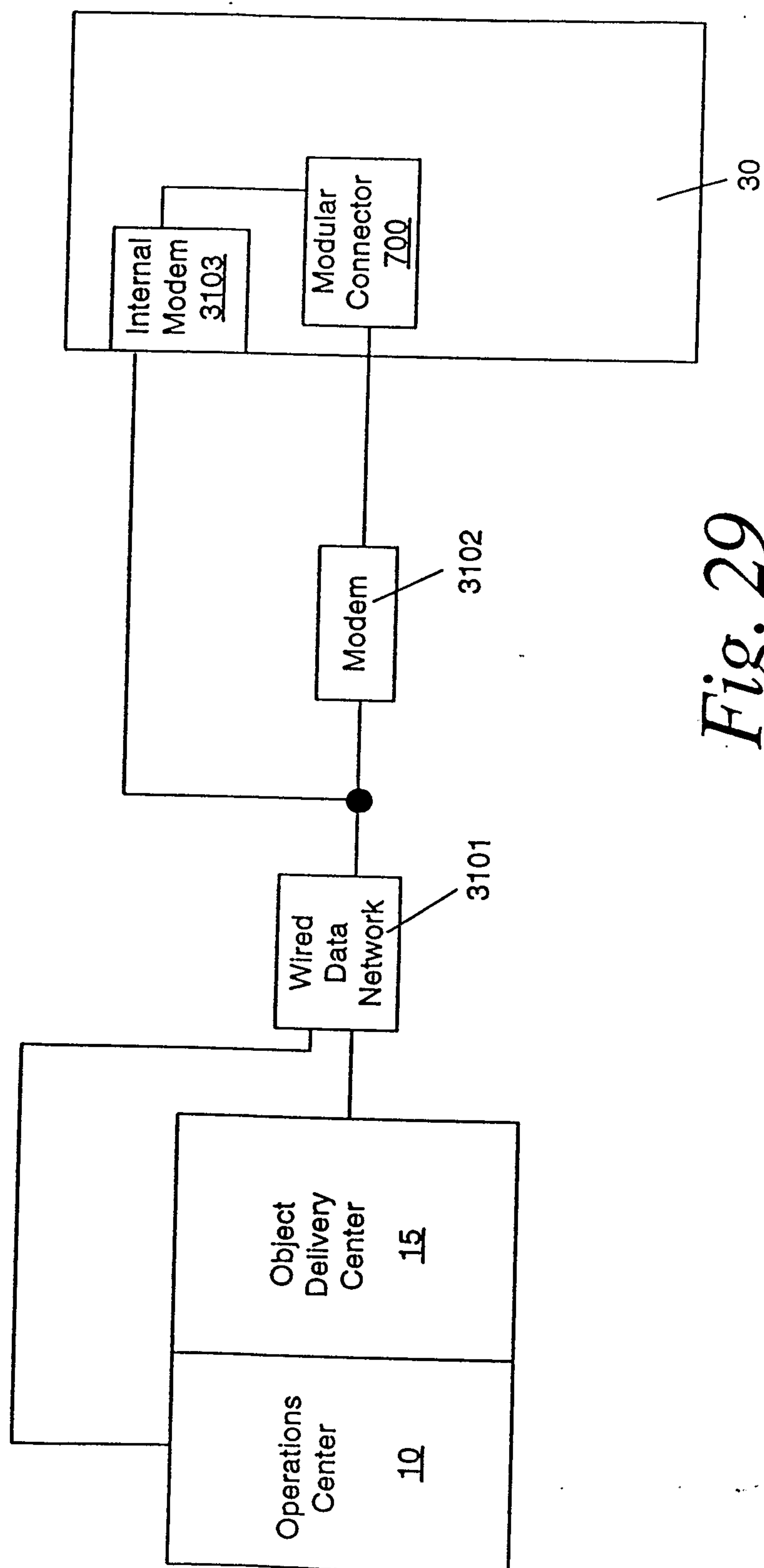
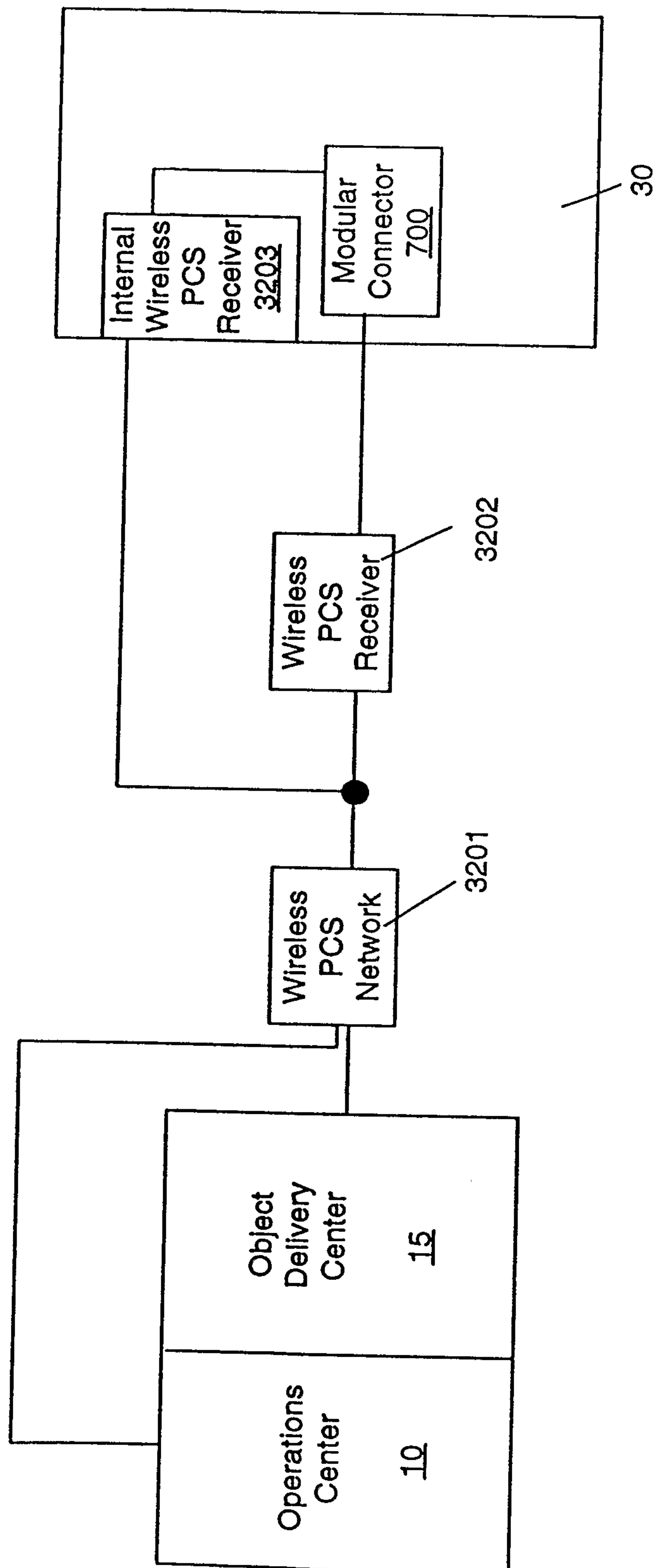


Fig. 27

*Fig. 28*

*Fig. 29*

*Fig. 30*

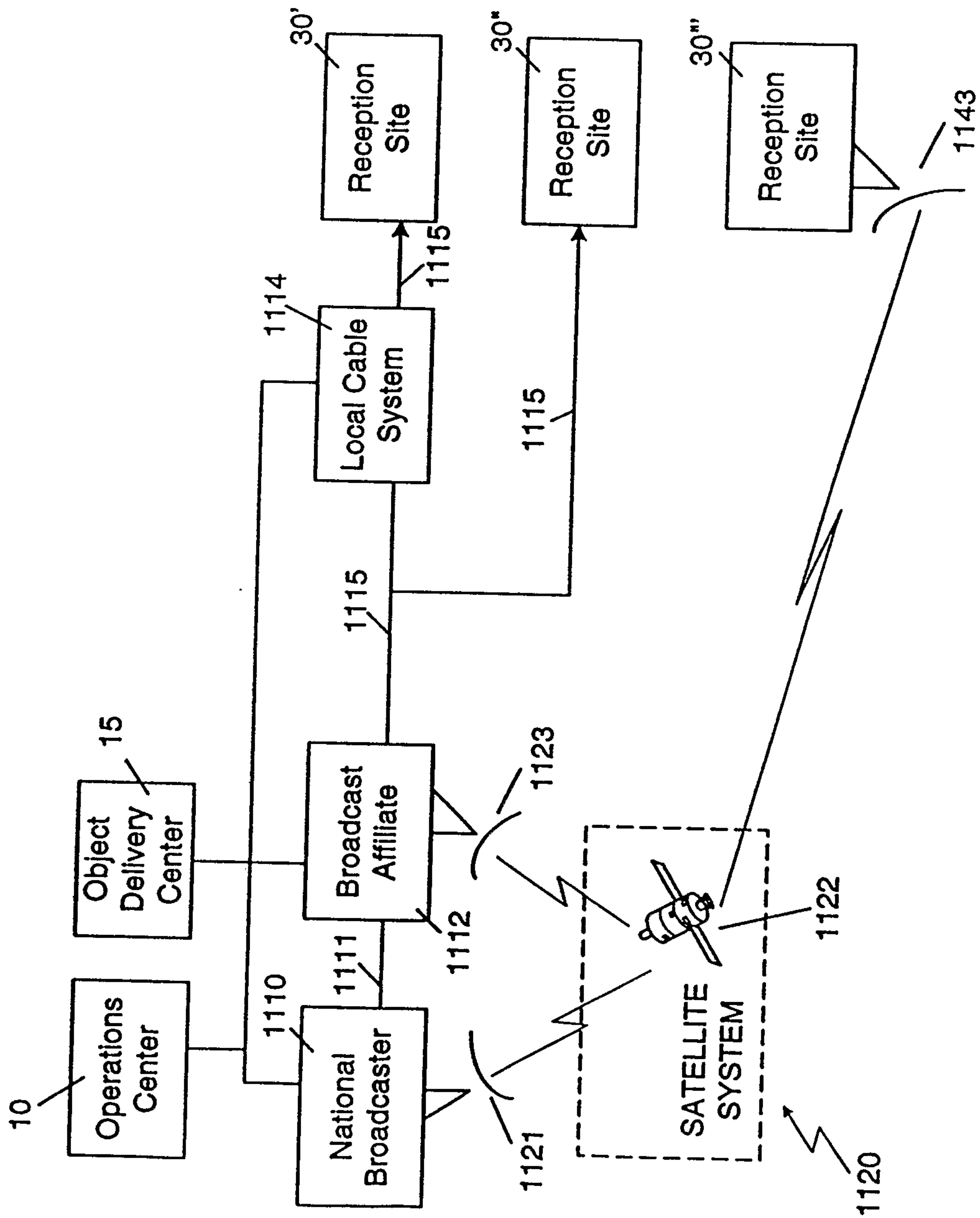
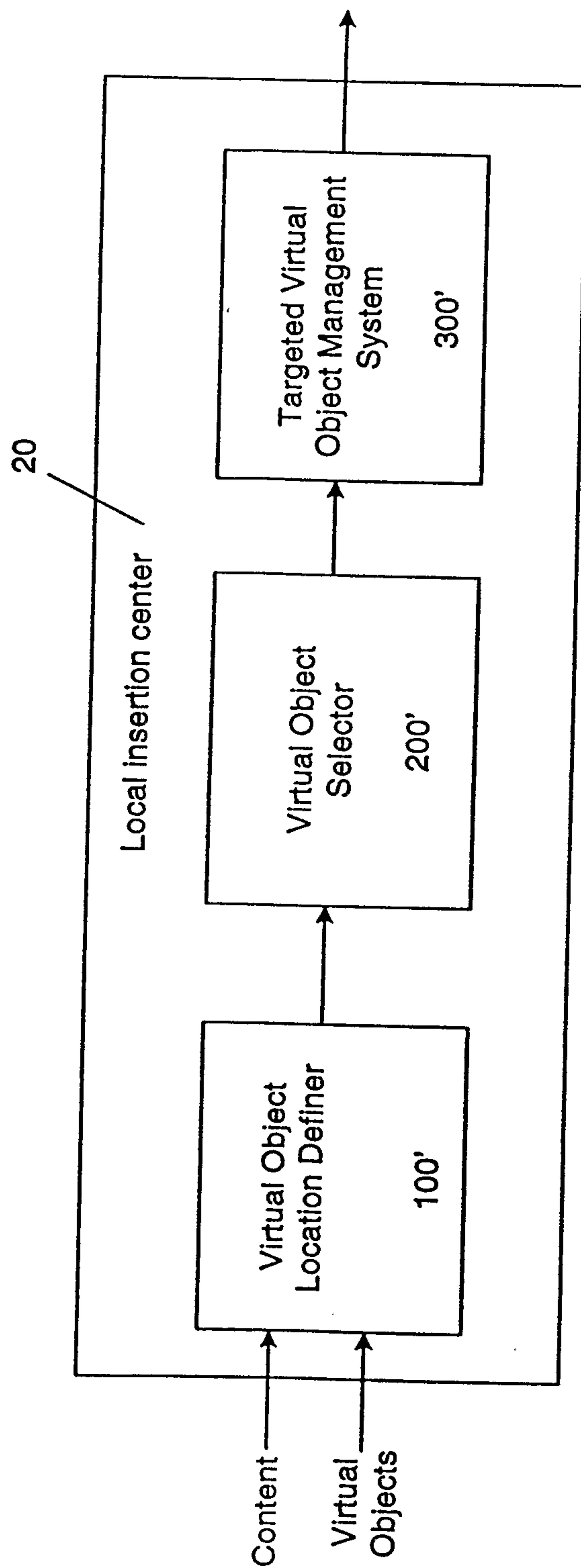


Fig. 31

*Fig. 32*

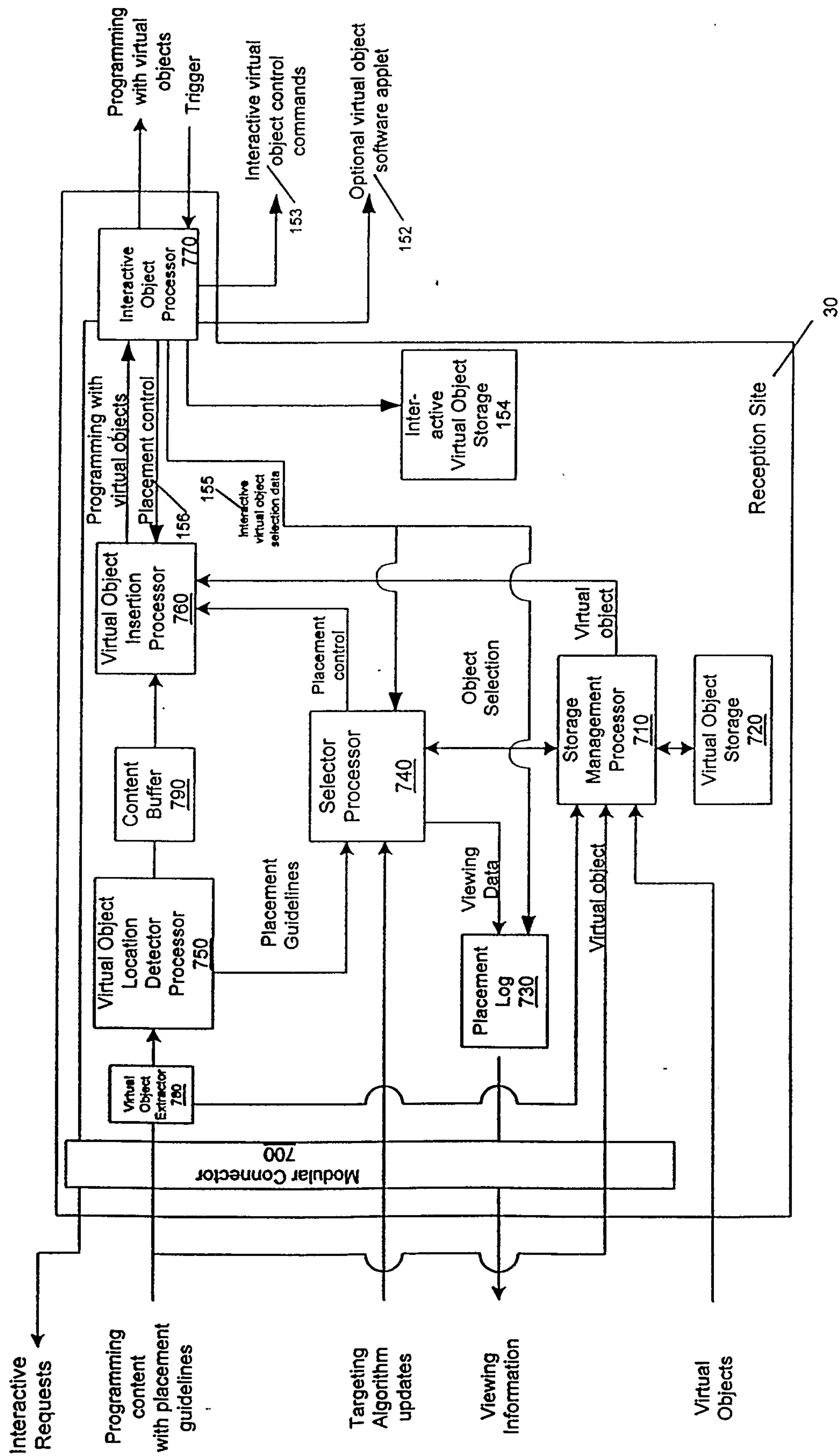


Figure 33

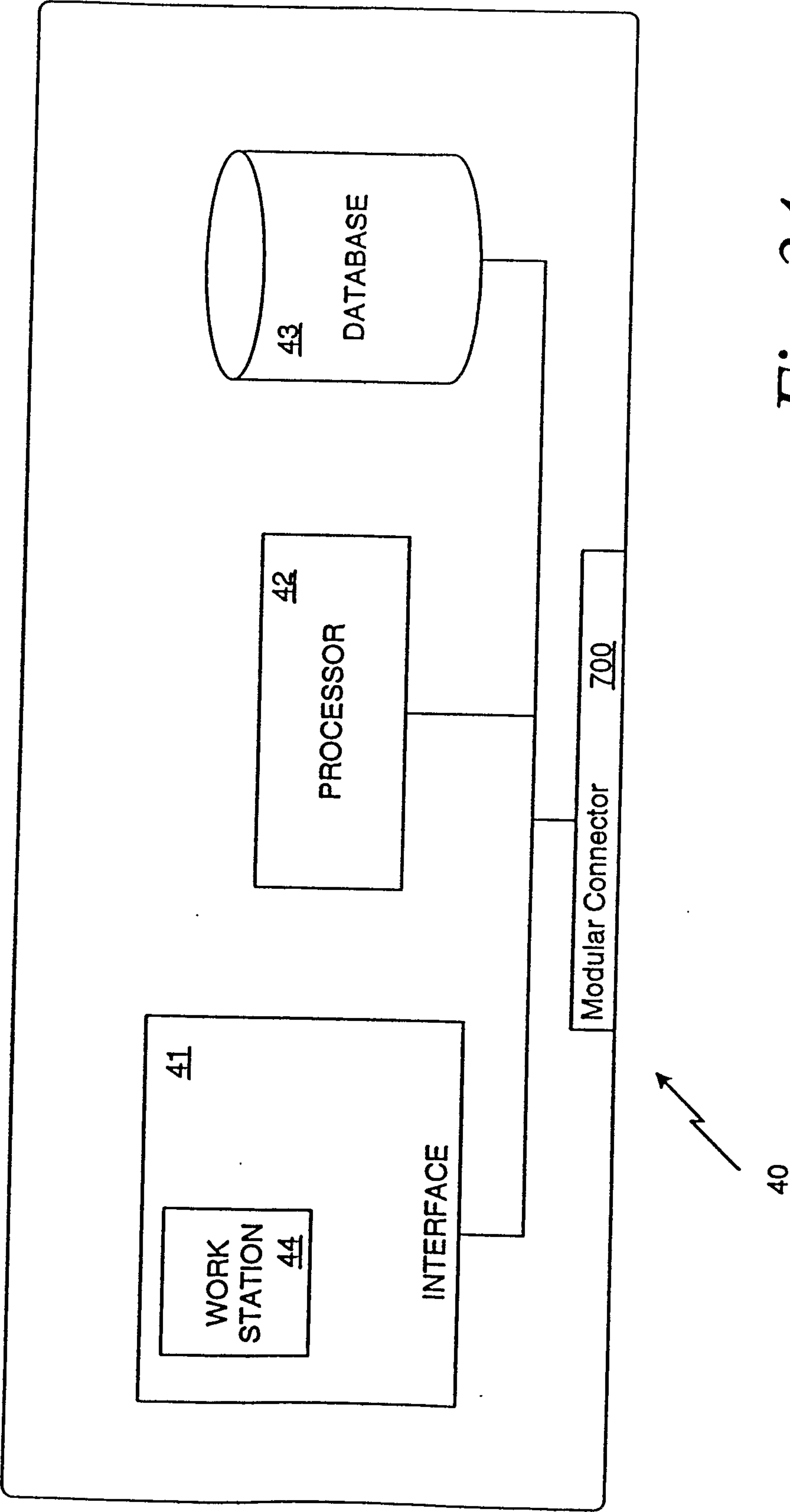
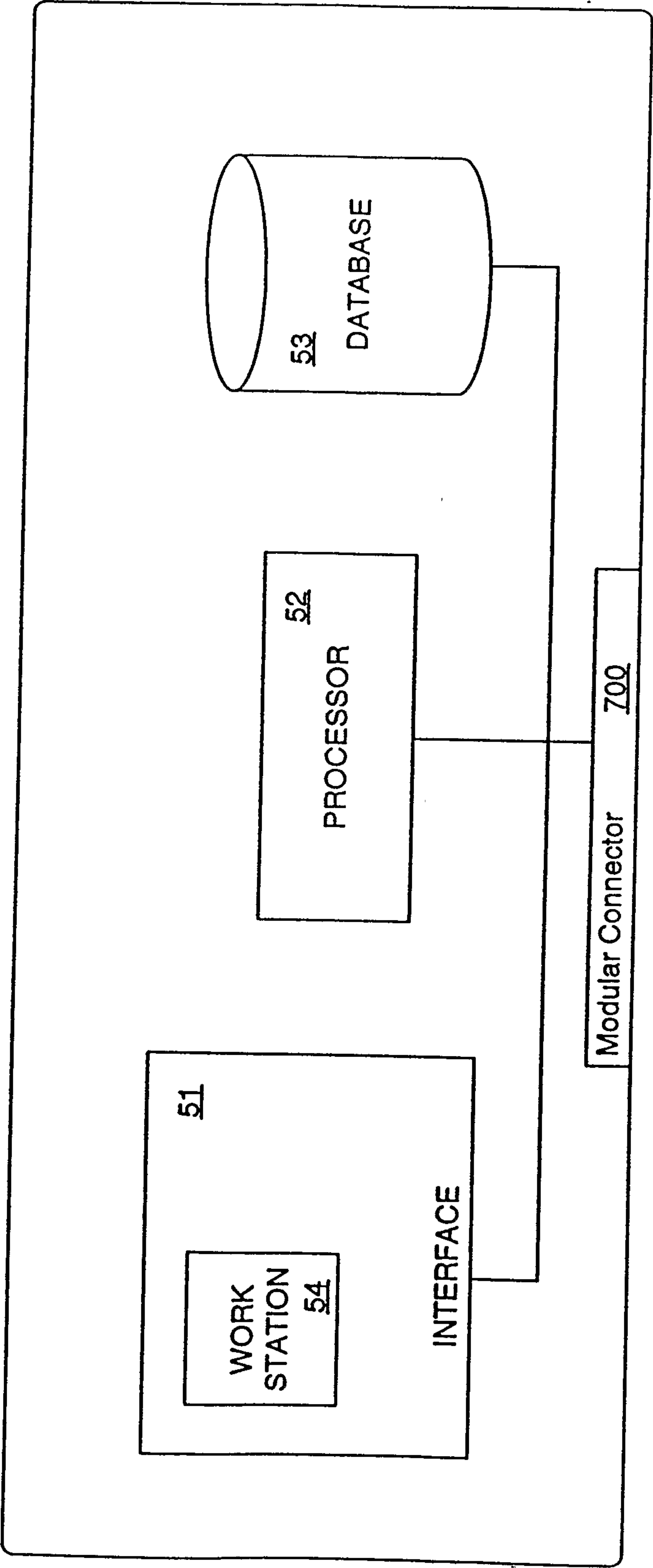


Fig. 34



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Fig. 35

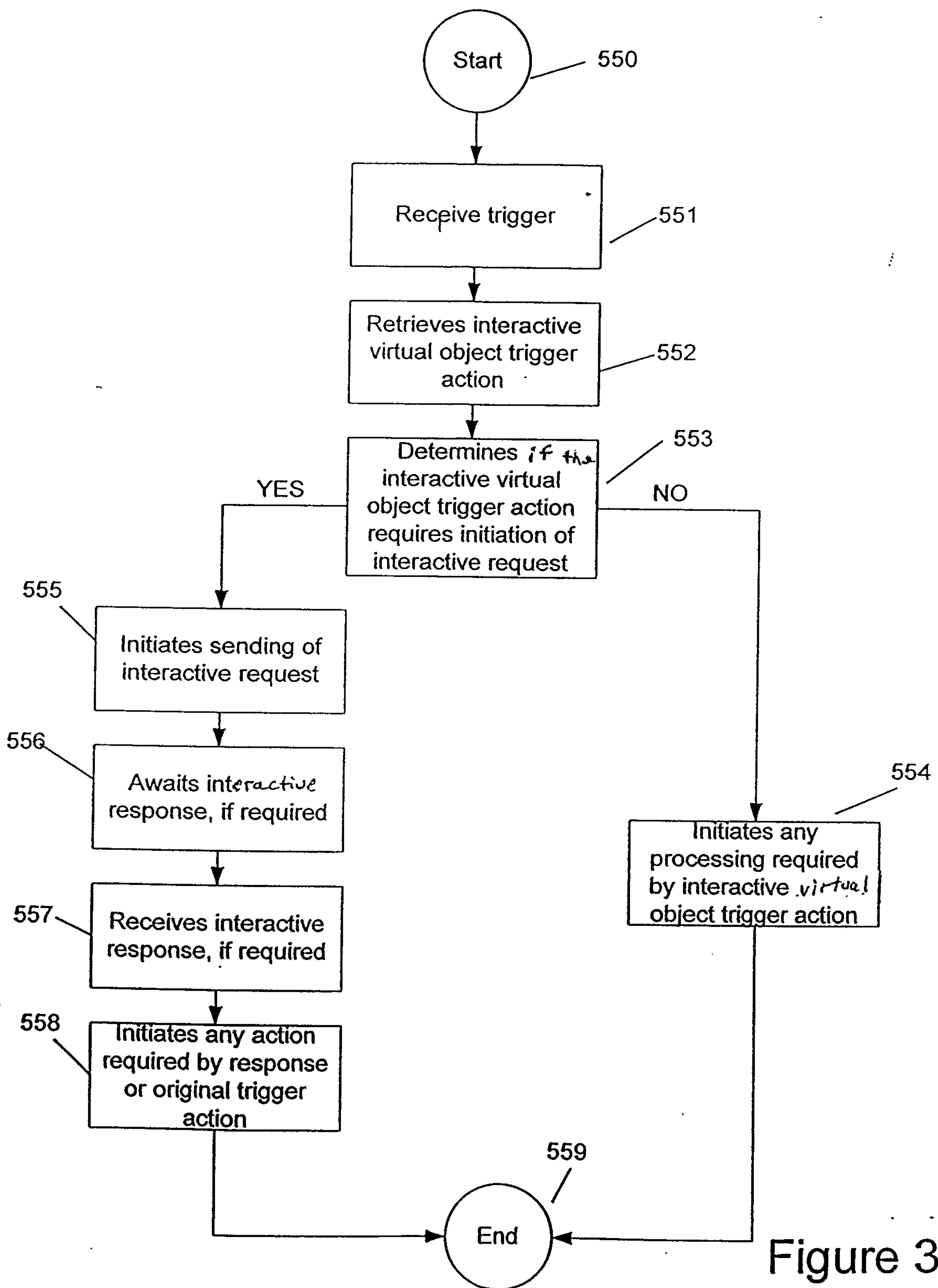


Figure 36

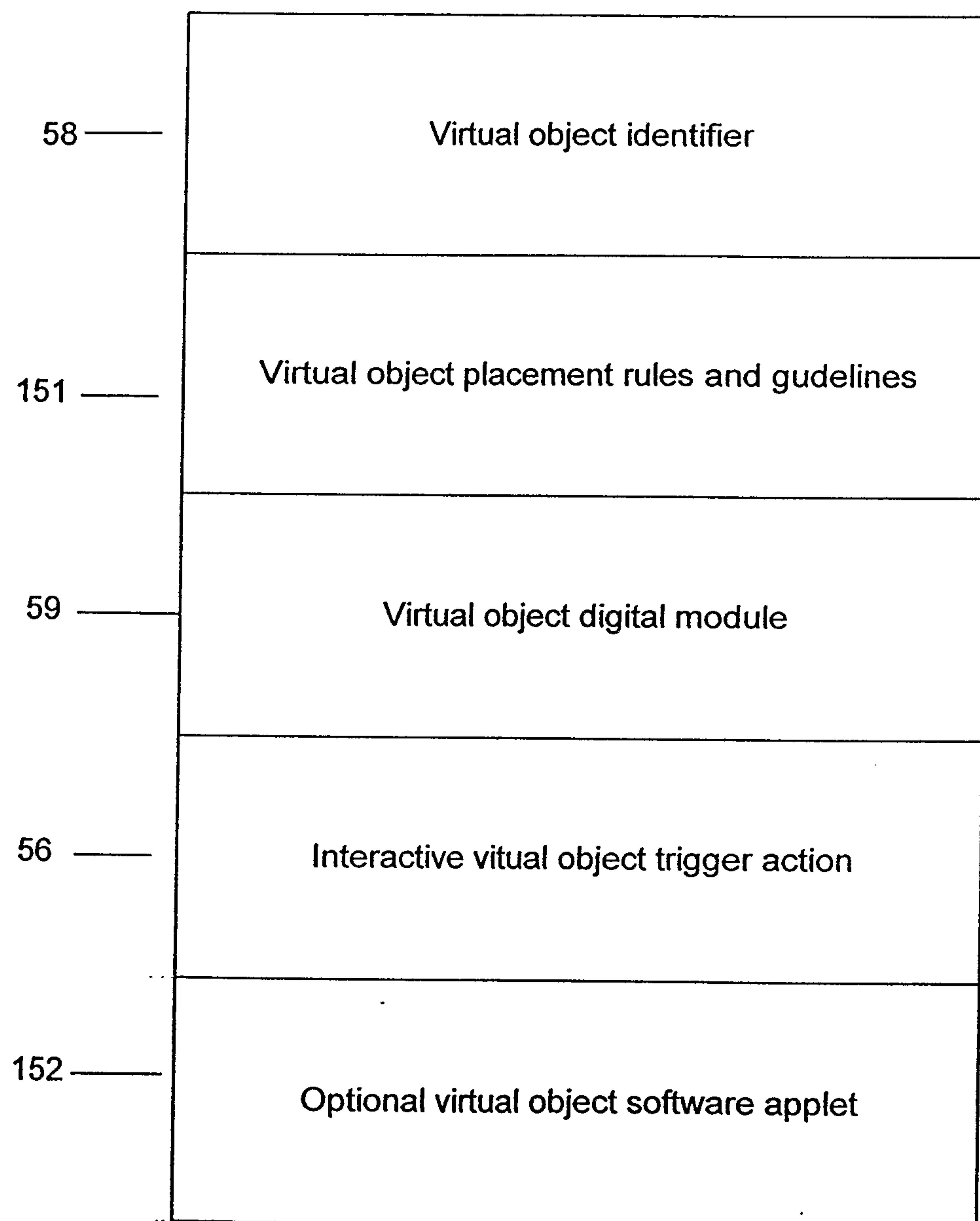


Figure 37

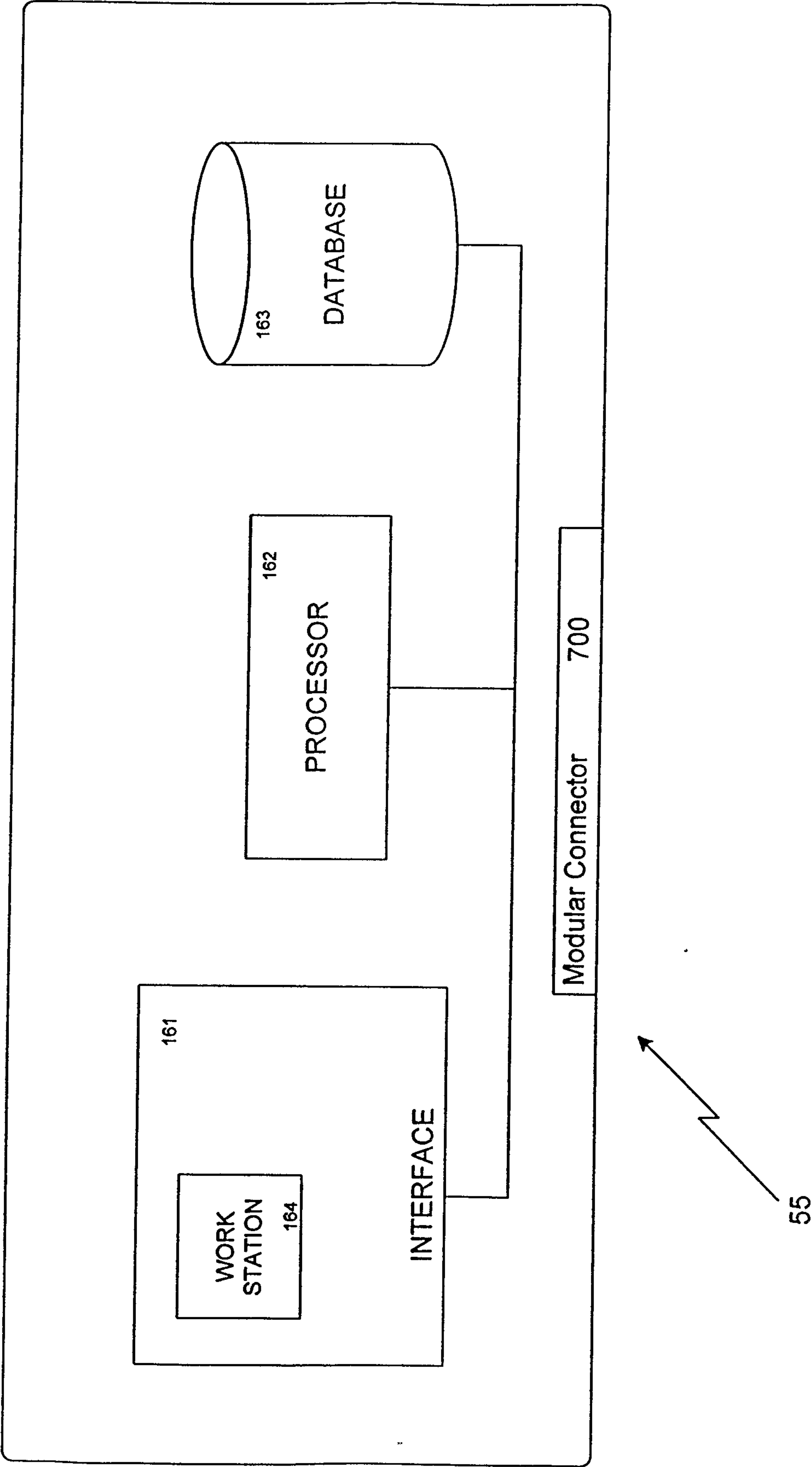
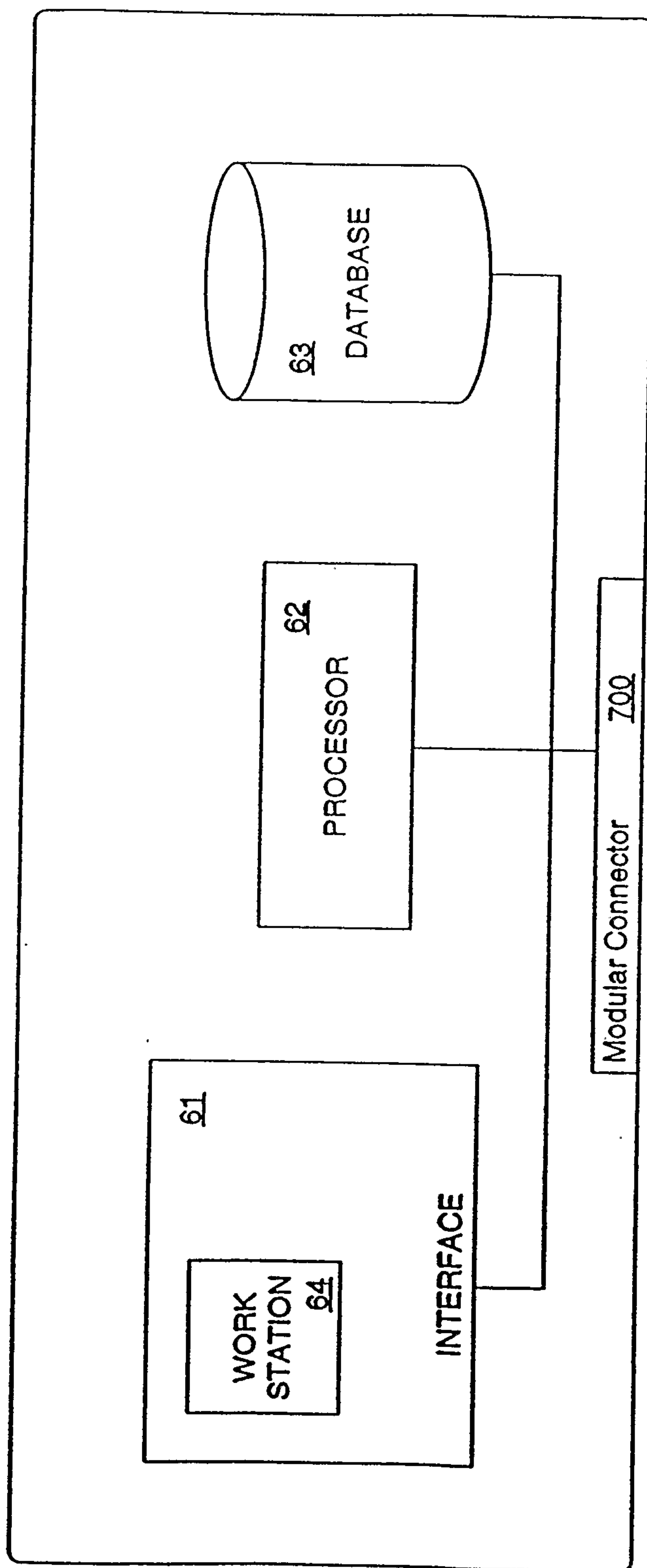
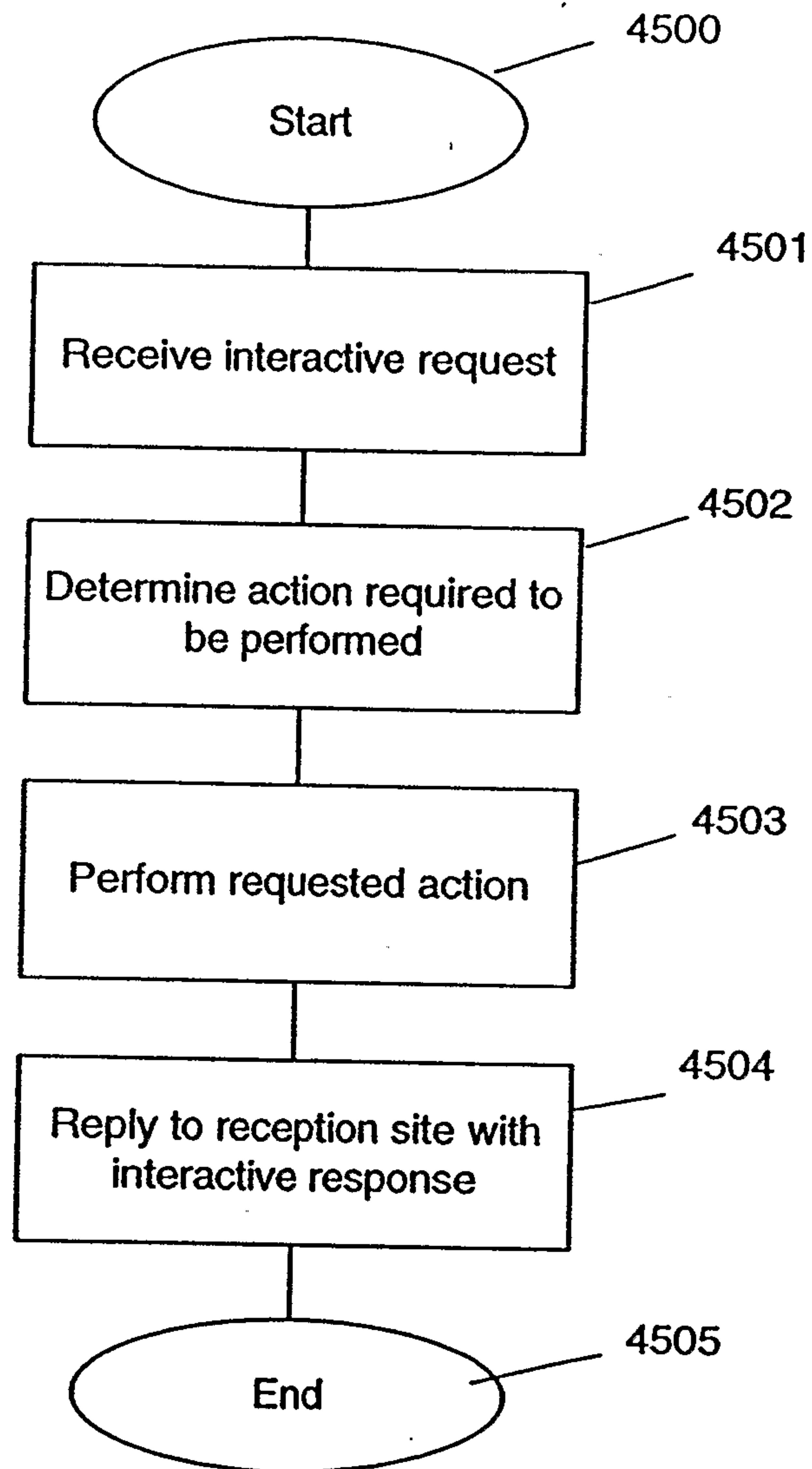


Figure 38

*Fig. 39*

*Fig. 40*

