US006510417B1

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Woods et al.

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(54) **SYSTEM AND METHOD FOR VOICE ACCESS TO INTERNET-BASED INFORMATION**

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(21) Appl. No.: **09/532,802**

(22) Filed: **Mar. 21, 2000**

(51) **Int. Cl.**[7] **G10L 15/00**

(52) **U.S. Cl.** **704/275**; 704/270; 704/246; 379/88.17

(58) **Field of Search** 704/246, 251, 704/260, 270, 275; 709/203, 216, 218, 219, 249; 705/26, 27, 354; 707/10, 5; 379/88.17, 88.23, 88.04

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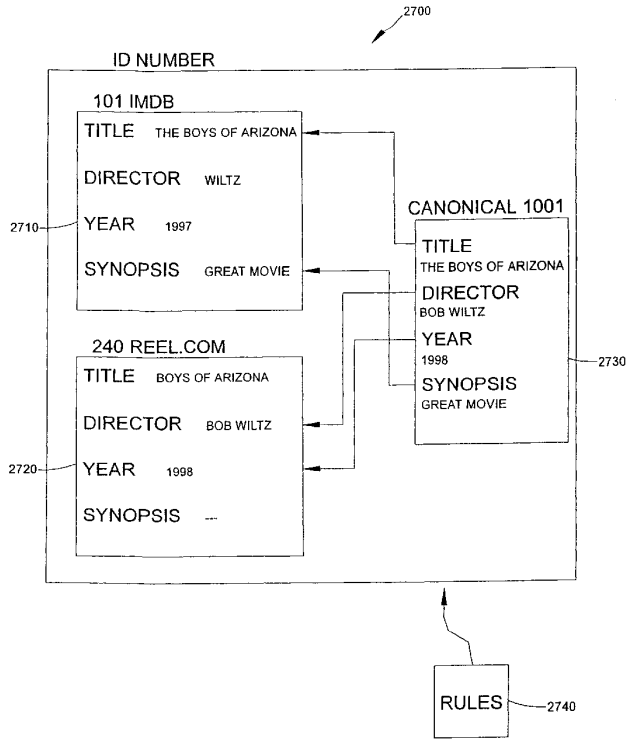
(57) **ABSTRACT**

A method of providing voice access to Internet-based information and services includes receiving a signal indicating a communication connection request in which the communication connection request is initiated by a user of a communication apparatus, establishing a communication connection with the communication apparatus of the user, receiving voice information from the user, and communicating voice information responsive to the voice information received from the user. The responsive voice information includes Internet-based information.

45 Claims, 38 Drawing Sheets



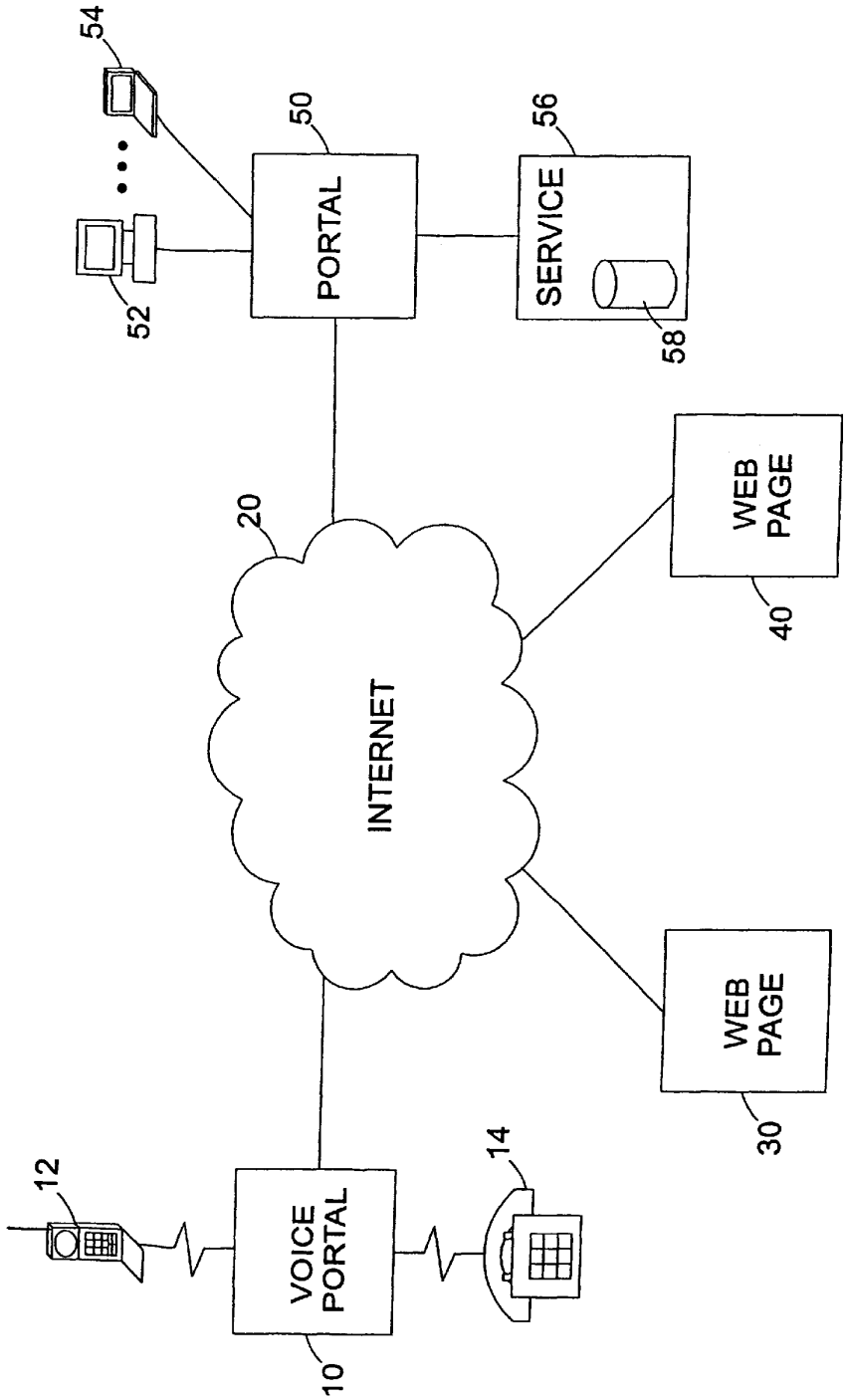

54
52
PORTAL
50
SERVICE
56
58
20
INTERNET
WEB PAGE
40
WEB PAGE
30
12
VOICE PORTAL
10
14

FIG. 1

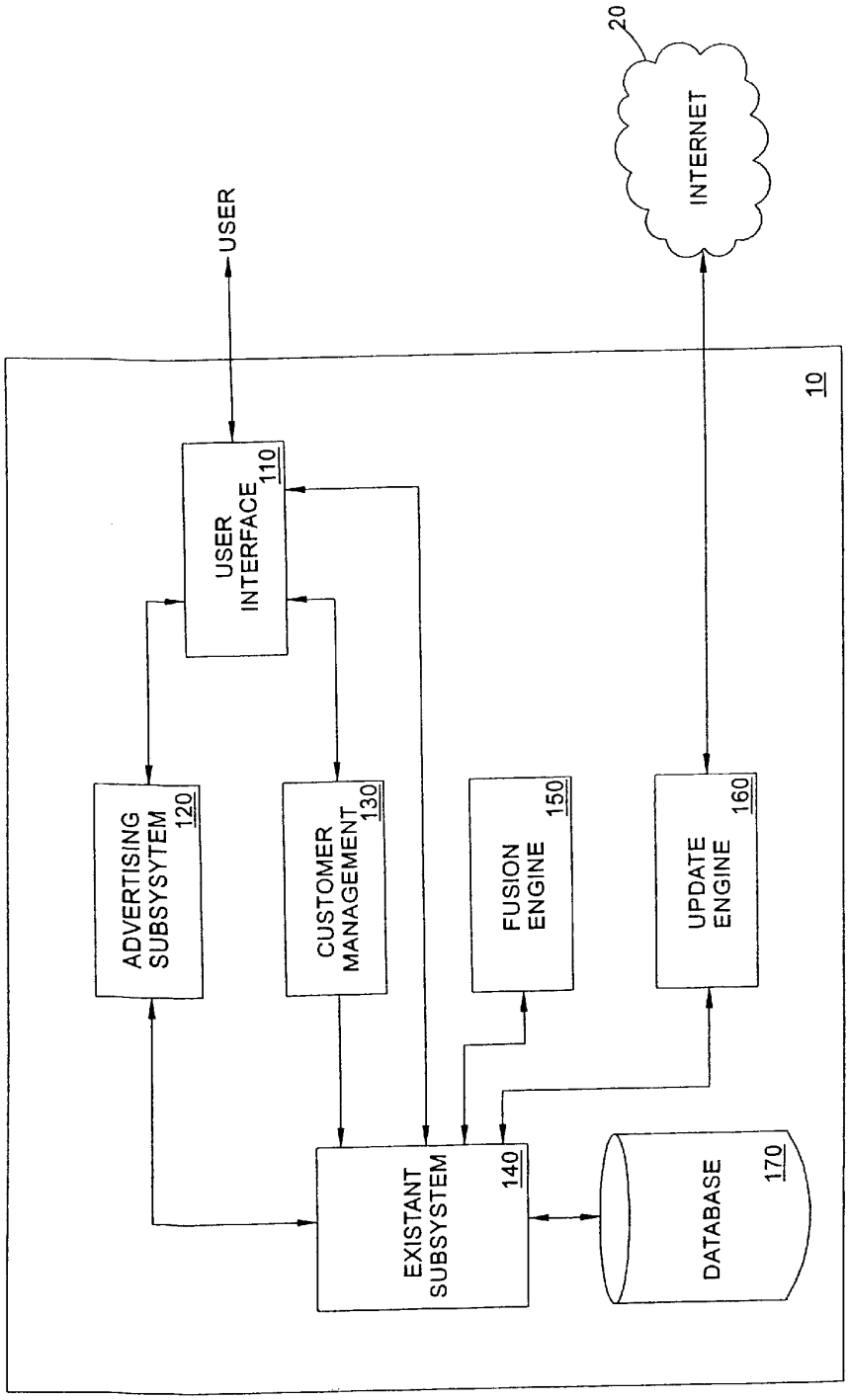

USER
USER INTERFACE 110
ADVERTISING SUBSYSTEM 120
CUSTOMER MANAGEMENT 130
EXISTANT SUBSYSTEM 140
FUSION ENGINE 150
UPDATE ENGINE 160
DATABASE 170
INTERNET
20
10

FIG. 2

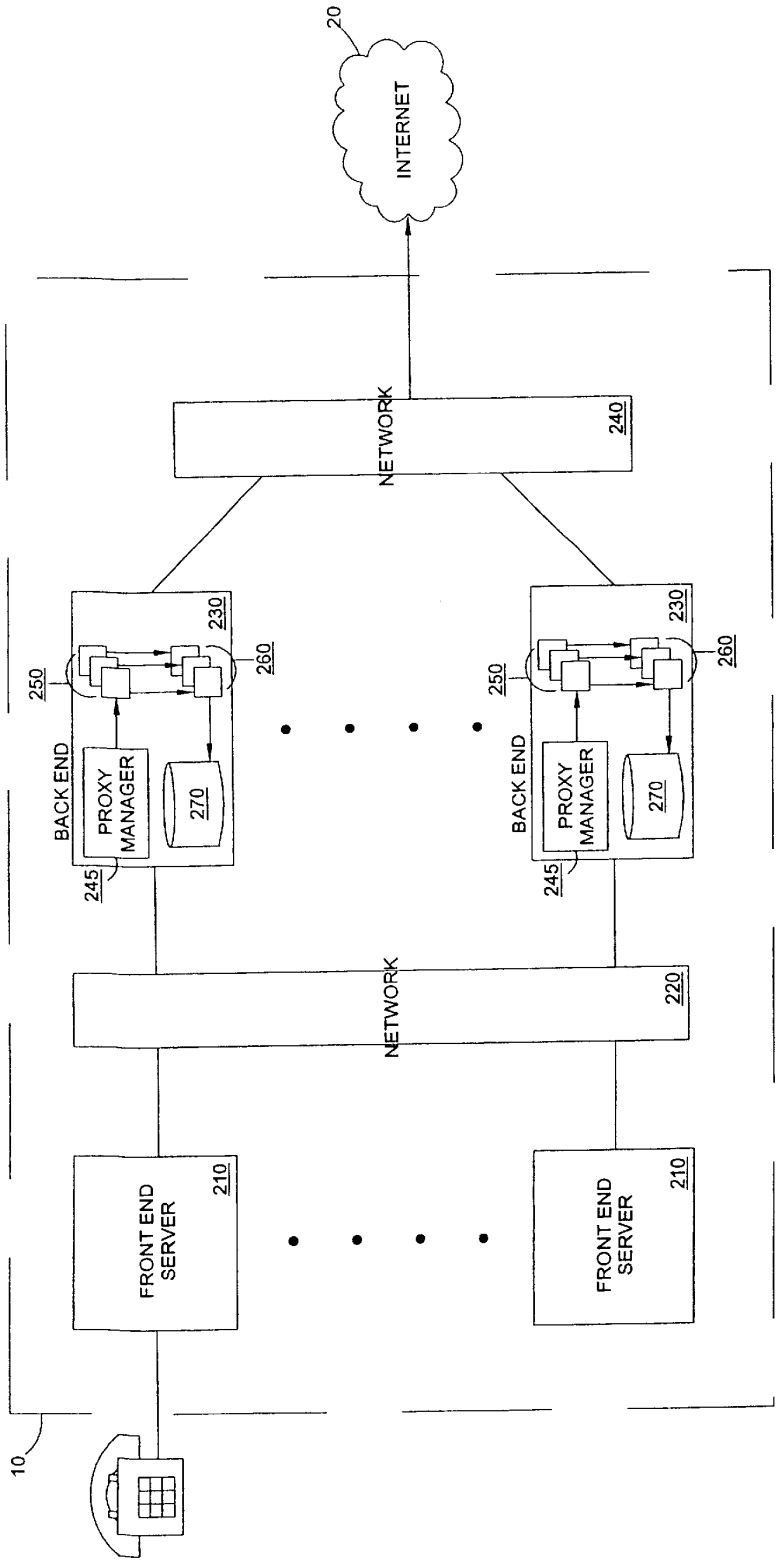

20
INTERNET
NETWORK
240
230
250
260
BACK END
PROXY MANAGER
270
245
NETWORK
220
FRONT END SERVER
210
10

FIG. 3

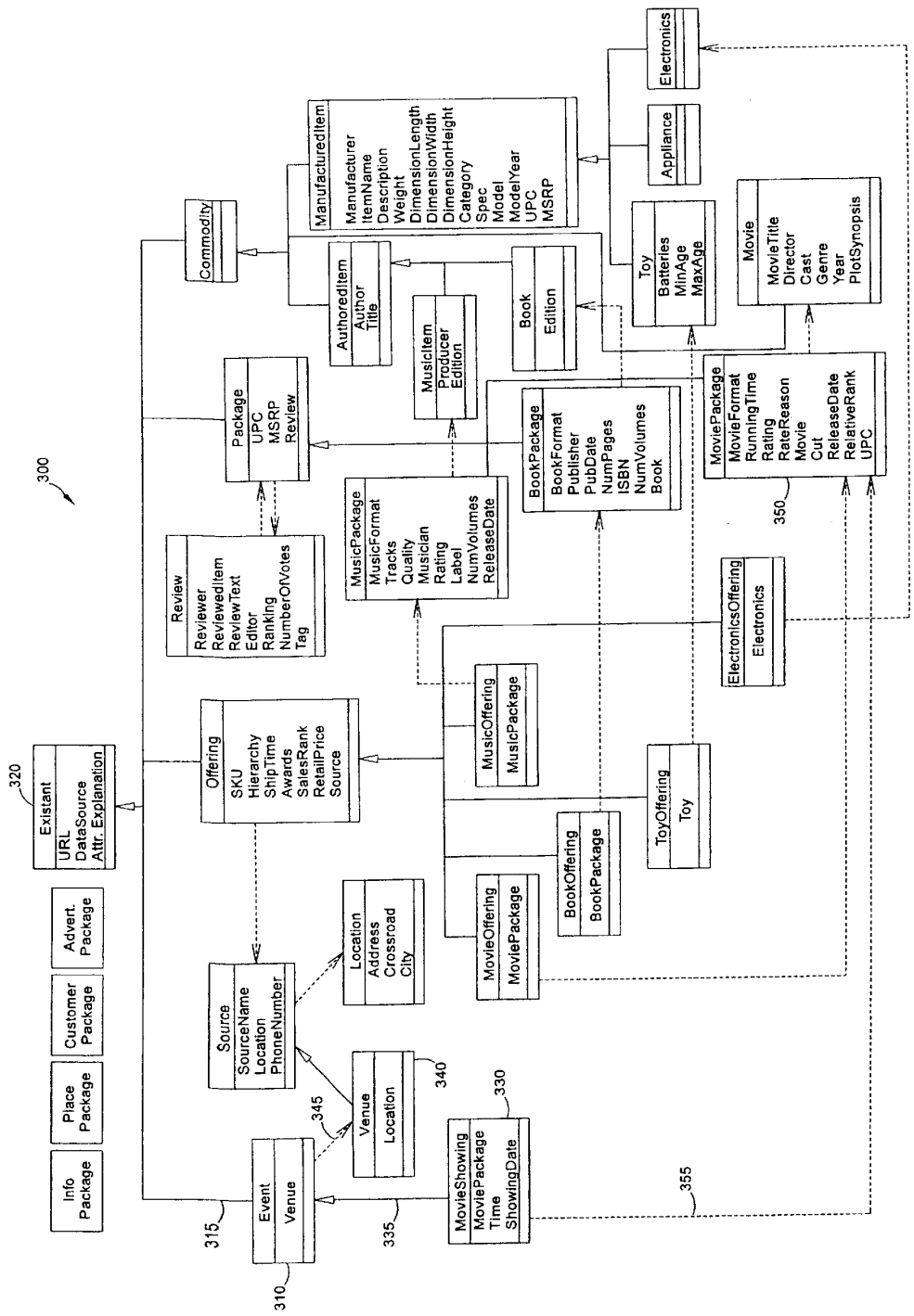

300
Commodity
ManufacturedItem
Manufacturer
ItemName
Description
Weight
DimensionLength
DimensionWidth
DimensionHeight
Category
Spec
Model
ModelYear
UPC
MSRP
Electronics
Appliance
AuthoredItem
Author
Title
MusicItem
Producer
Edition
Book
Edition
Toy
Batteries
MinAge
MaxAge
Movie
MovieTitle
Director
Cast
Genre
Year
PlotSynopsis
Package
UPC
MSRP
Review
BookPackage
BookFormat
Publisher
PubDate
NumPages
ISBN
NumVolumes
Book
MoviePackage
MovieFormat
RunningTime
Rating
RateReason
Movie
Cut
ReleaseDate
RelativeRank
UPC
350
MusicPackage
MusicFormat
Tracks
Quality
Musician
Rating
Label
NumVolumes
ReleaseDate
Review
Reviewer
ReviewedItem
ReviewText
Editor
Ranking
NumberOfVotes
Tag
ElectronicsOffering
Electronics
MusicOffering
MusicPackage
320
Existant
URL
DataSource
Attr. Explanation
Offering
SKU
Hierarchy
ShipTime
Awards
SalesRank
RetailPrice
Source
ToyOffering
Toy
BookOffering
BookPackage
Advert. Package
Location
Address
Crossroad
City
MovieOffering
MoviePackage
Customer Package
Source
SourceName
Location
PhoneNumber
Place Package
Venue
Location
340
345
330
Info Package
Event
Venue
315
335
MovieShowing
MoviePackage
Time
ShowingDate
310
355

FIG. 4

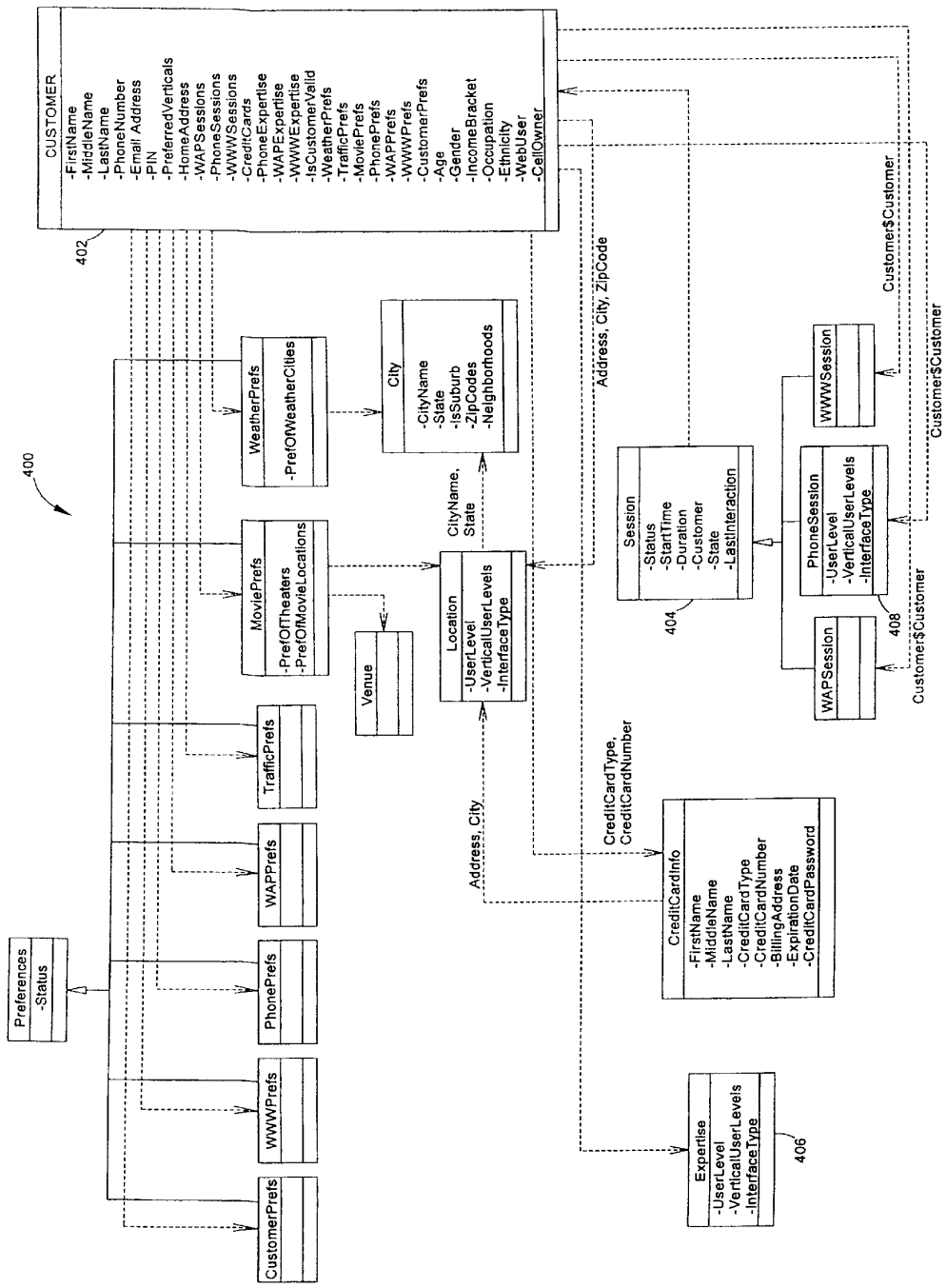

400
CUSTOMER
-FirstName
-MiddleName
-LastName
-PhoneNumber
-Email Address
-PIN
-PreferredVerticals
-HomeAddress
-WAPSessions
-PhoneSessions
-WWWSessions
-CreditCards
-PhoneExpertise
-WAPExpertise
-WWWExpertise
-IsCustomerValid
-WeatherPrefs
-TrafficPrefs
-MoviePrefs
-PhonePrefs
-WAPPrefs
-WWWPrefs
-CustomerPrefs
-Age
-Gender
-IncomeBracket
-Occupation
-Ethnicity
-WebUser
-CellOwner
402
WeatherPrefs
-PrefOfWeatherCities
City
-CityName
-State
-IsSuburb
-ZipCodes
-Neighborhoods
MoviePrefs
-PrefOfTheaters
-PrefOfMovieLocations
Venue
Location
-UserLevel
-VerticalUserLevels
-InterfaceType
CityName, State
Address, City, ZipCode
Session
-Status
-StartTime
-Duration
-Customer
-State
-LastInteraction
404
WWWSession
PhoneSession
-UserLevel
-VerticalUserLevels
-InterfaceType
408
WAPSession
Customer$Customer
Customer$Customer
Customer$Customer
TrafficPrefs
WAPPrefs
PhonePrefs
WWWPrefs
CustomerPrefs
Preferences
-Status
Address, City
CreditCardType, CreditCardNumber
CreditCardInfo
-FirstName
-MiddleName
-LastName
-CreditCardType
-CreditCardNumber
-BillingAddress
-ExpirationDate
-CreditCardPassword
Expertise
-UserLevel
-VerticalUserLevels
-InterfaceType
406

FIG. 5

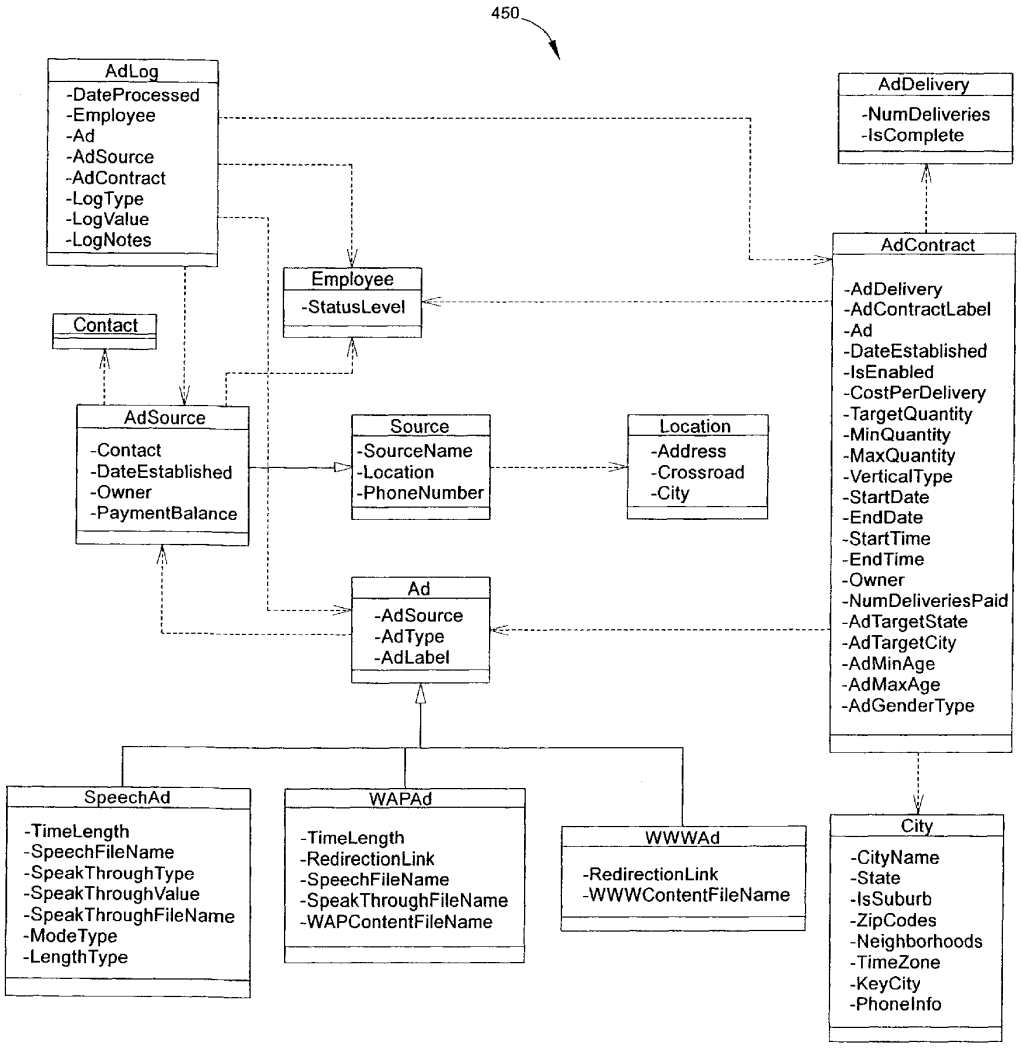

450
AdLog
-DateProcessed
-Employee
-Ad
-AdSource
-AdContract
-LogType
-LogValue
-LogNotes
AdDelivery
-NumDeliveries
-IsComplete
AdContract
-AdDelivery
-AdContractLabel
-Ad
-DateEstablished
-IsEnabled
-CostPerDelivery
-TargetQuantity
-MinQuantity
-MaxQuantity
-VerticalType
-StartDate
-EndDate
-StartTime
-EndTime
-Owner
-NumDeliveriesPaid
-AdTargetState
-AdTargetCity
-AdMinAge
-AdMaxAge
-AdGenderType
Employee
-StatusLevel
Contact
AdSource
-Contact
-DateEstablished
-Owner
-PaymentBalance
Source
-SourceName
-Location
-PhoneNumber
Location
-Address
-Crossroad
-City
Ad
-AdSource
-AdType
-AdLabel
SpeechAd
-TimeLength
-SpeechFileName
-SpeakThroughType
-SpeakThroughValue
-SpeakThroughFileName
-ModeType
-LengthType
WAPAd
-TimeLength
-RedirectionLink
-SpeechFileName
-SpeakThroughFileName
-WAPContentFileName
WWWAd
-RedirectionLink
-WWWContentFileName
City
-CityName
-State
-IsSuburb
-ZipCodes
-Neighborhoods
-TimeZone
-KeyCity
-PhoneInfo

FIG. 6

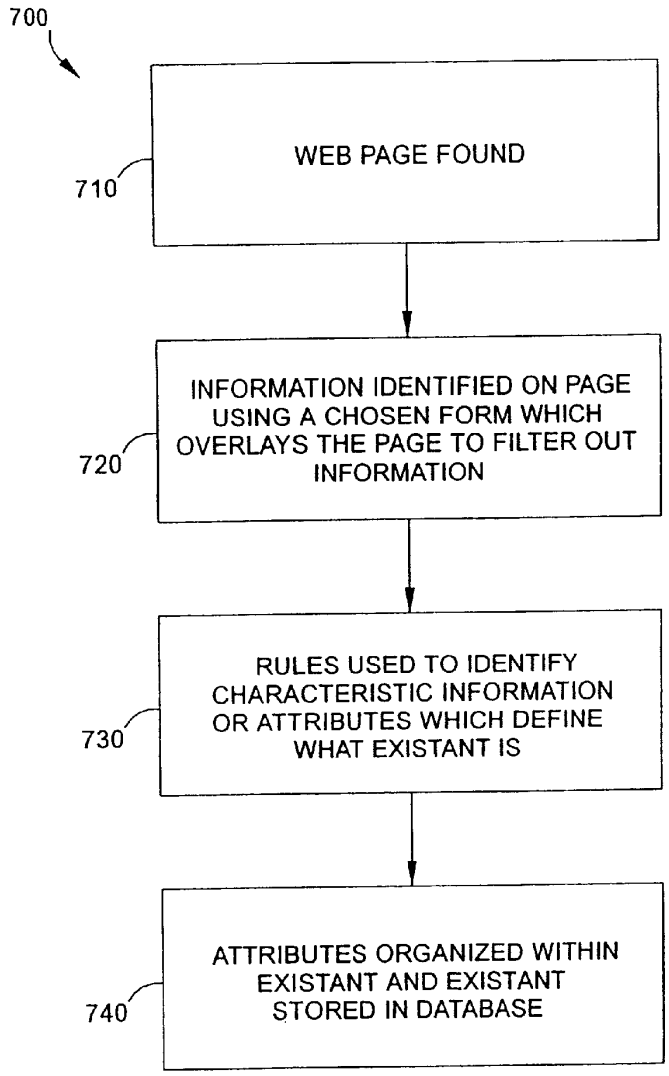

700
710
WEB PAGE FOUND
720
INFORMATION IDENTIFIED ON PAGE USING A CHOSEN FORM WHICH OVERLAYS THE PAGE TO FILTER OUT INFORMATION
730
RULES USED TO IDENTIFY CHARACTERISTIC INFORMATION OR ATTRIBUTES WHICH DEFINE WHAT EXISTANT IS
740
ATTRIBUTES ORGANIZED WITHIN EXISTANT AND EXISTANT STORED IN DATABASE

FIG. 7

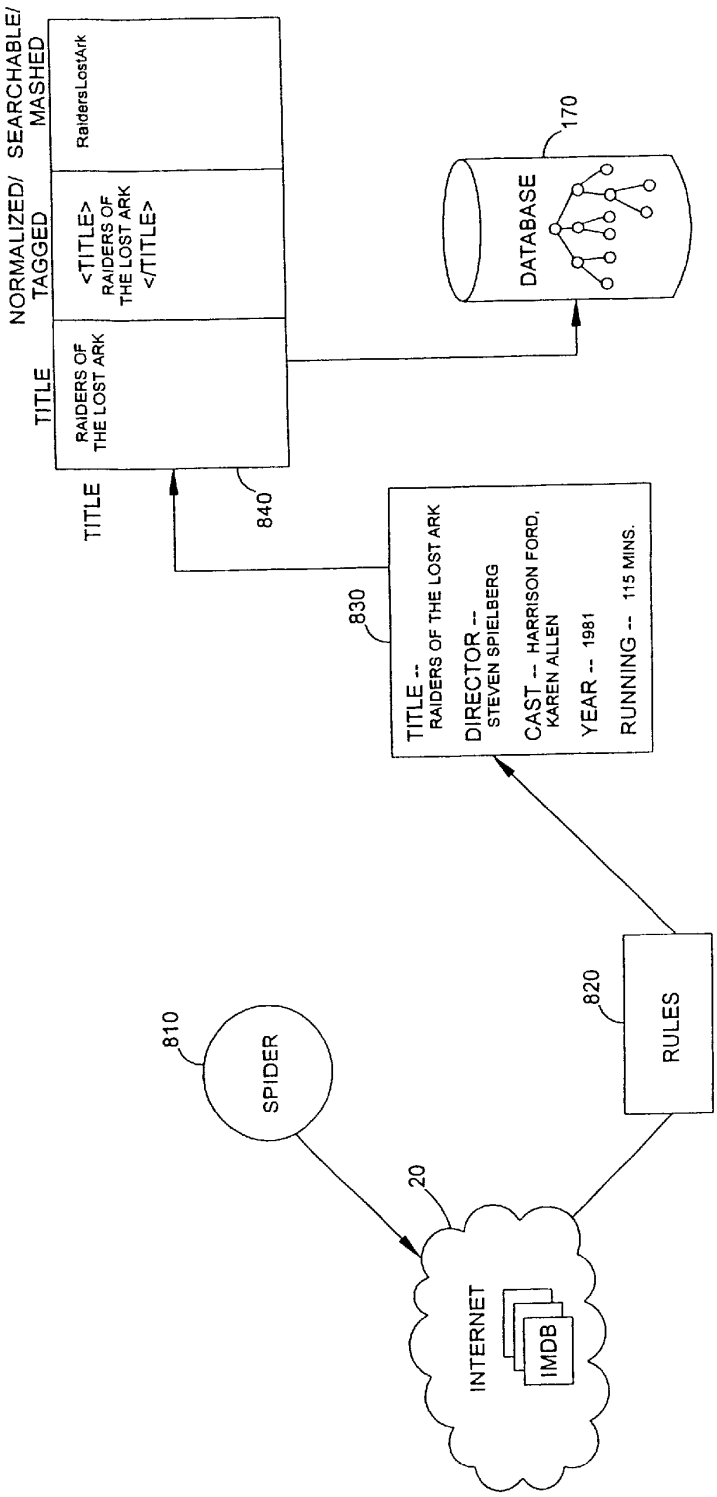

TITLE
NORMALIZED/ TAGGED
SEARCHABLE/ MASHED
RAIDERS OF THE LOST ARK
<TITLE> RAIDERS OF THE LOST ARK </TITLE>
RaidersLostArk
840
TITLE
830
TITLE -- RAIDERS OF THE LOST ARK
DIRECTOR -- STEVEN SPIELBERG
CAST -- HARRISON FORD, KAREN ALLEN
YEAR -- 1981
RUNNING -- 115 MINS.
170
DATABASE
810
SPIDER
20
INTERNET
IMDB
820
RULES

FIG. 8

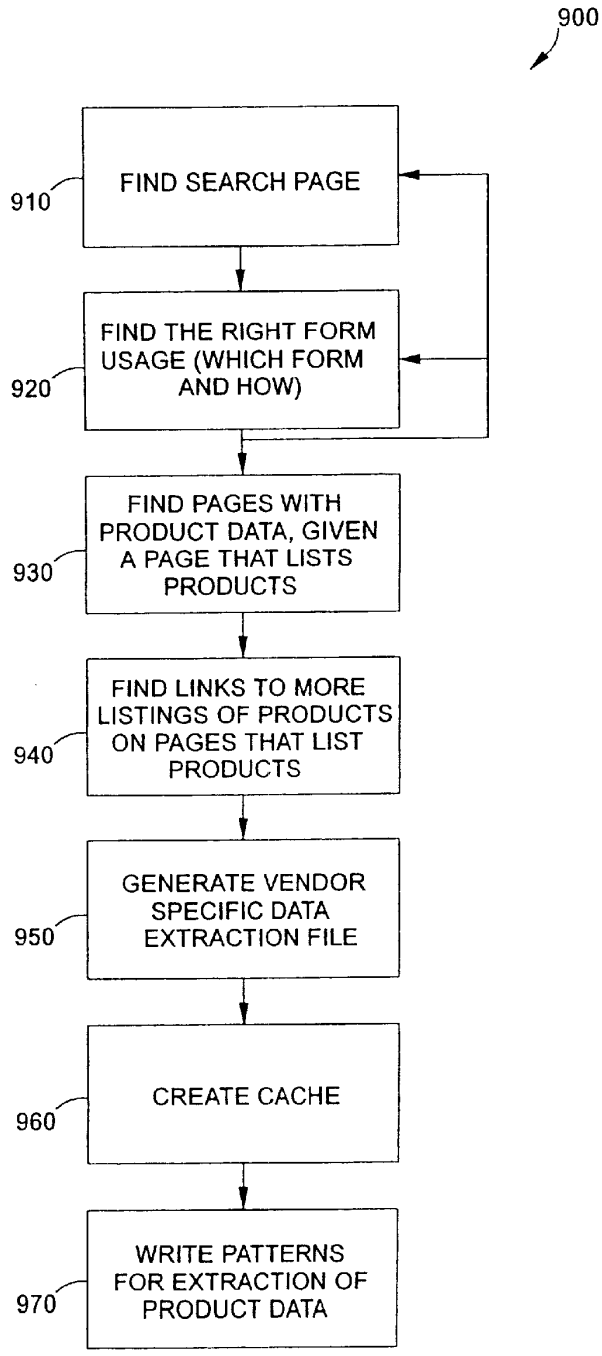

900
910
FIND SEARCH PAGE
920
FIND THE RIGHT FORM USAGE (WHICH FORM AND HOW)
930
FIND PAGES WITH PRODUCT DATA, GIVEN A PAGE THAT LISTS PRODUCTS
940
FIND LINKS TO MORE LISTINGS OF PRODUCTS ON PAGES THAT LIST PRODUCTS
950
GENERATE VENDOR SPECIFIC DATA EXTRACTION FILE
960
CREATE CACHE
970
WRITE PATTERNS FOR EXTRACTION OF PRODUCT DATA

FIG. 9

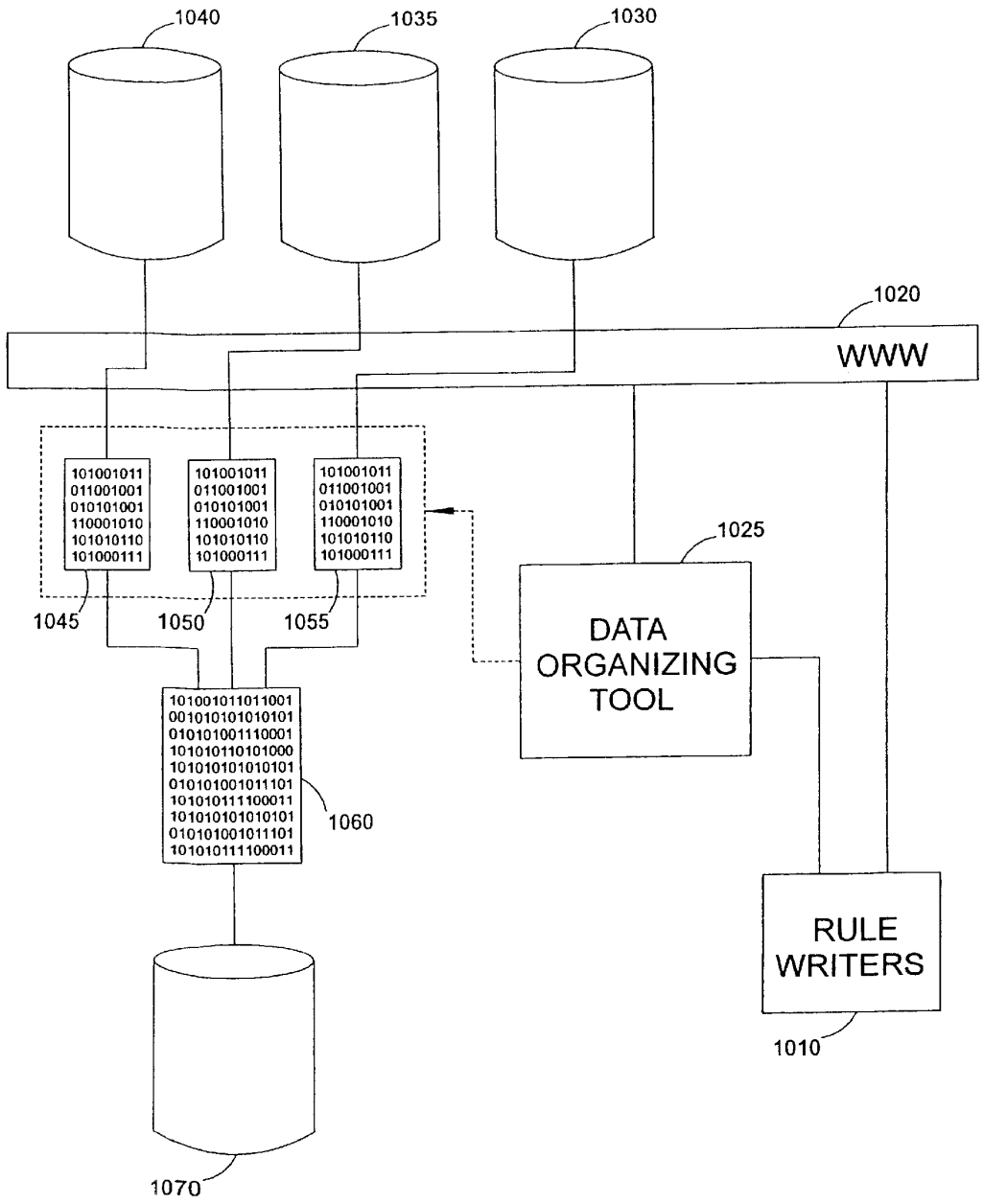

1040
1035
1030
1020
WWW
101001011
011001001
010101001
110001010
101010110
101000111
1045
1050
1055
1025
DATA ORGANIZING TOOL
101001011011001
001010101010101
010101001110001
101010110101000
101010101010101
010101001011101
101010111100011
1060
RULE WRITERS
1010
1070

FIG. 10

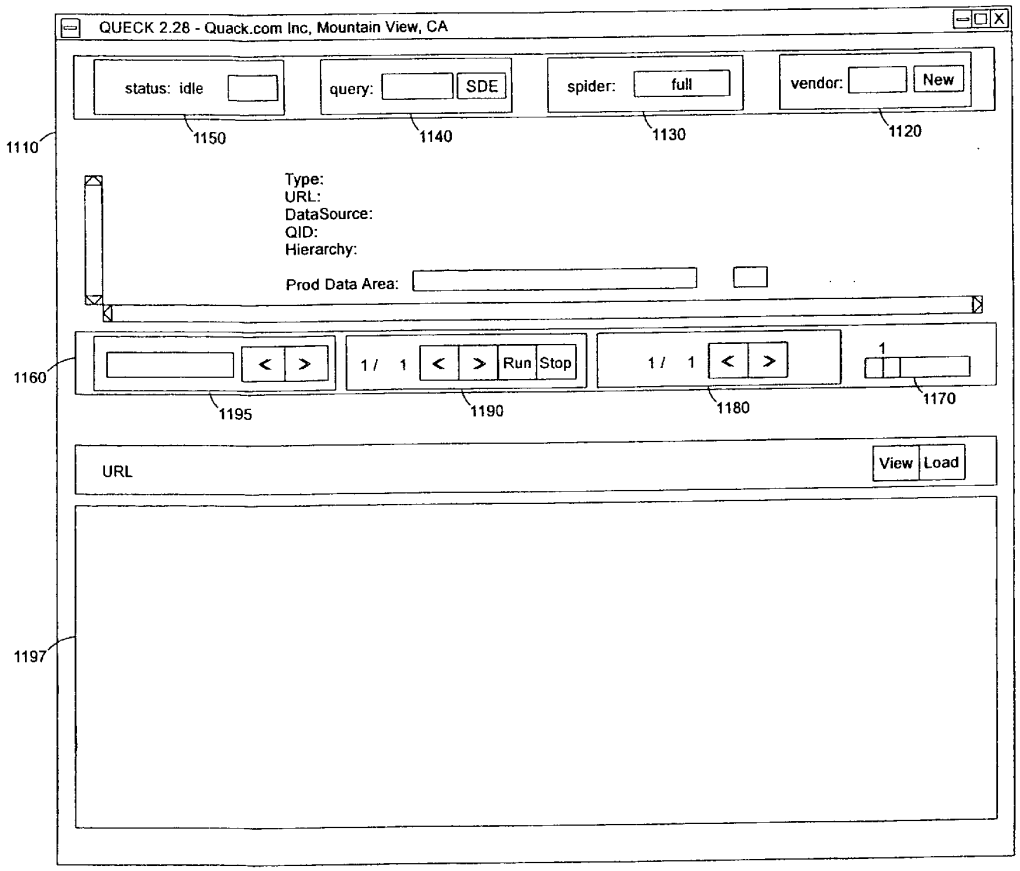

QUECK 2.28 - Quack.com Inc, Mountain View, CA
status: idle
query:
SDE
spider:
full
vendor:
New
1110
1150
1140
1130
1120
Type:
URL:
DataSource:
QID:
Hierarchy:
Prod Data Area:
1160
<
>
1 / 1
Run
Stop
1
1195
1190
1180
1170
URL
View
Load
1197

FIG. 11

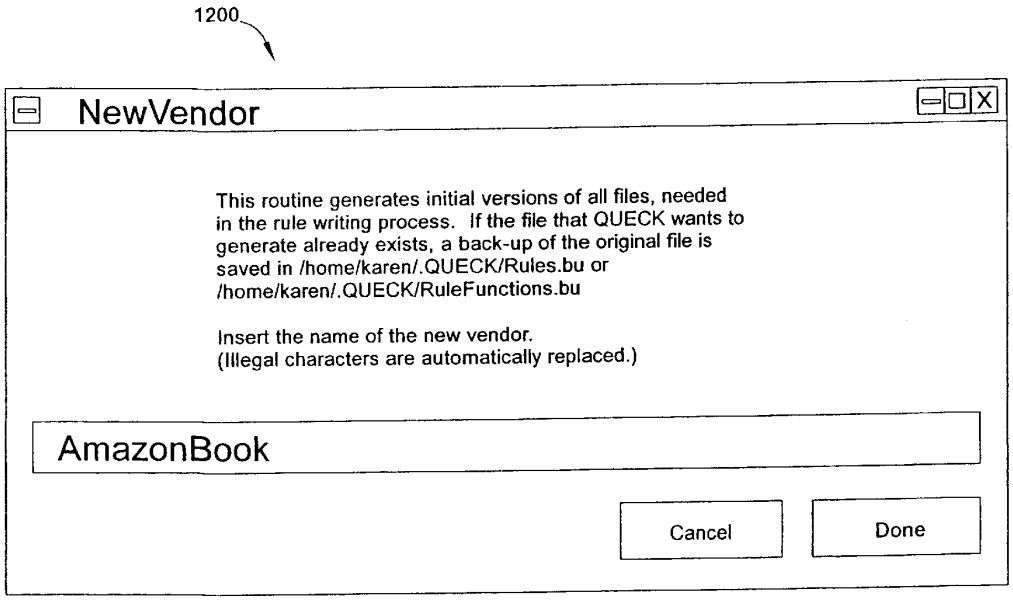

1200
NewVendor
This routine generates initial versions of all files, needed in the rule writing process. If the file that QUECK wants to generate already exists, a back-up of the original file is saved in /home/karen/.QUECK/Rules.bu or /home/karen/.QUECK/RuleFunctions.bu
Insert the name of the new vendor.
(Illegal characters are automatically replaced.)
AmazonBook
Cancel
Done

FIG. 12

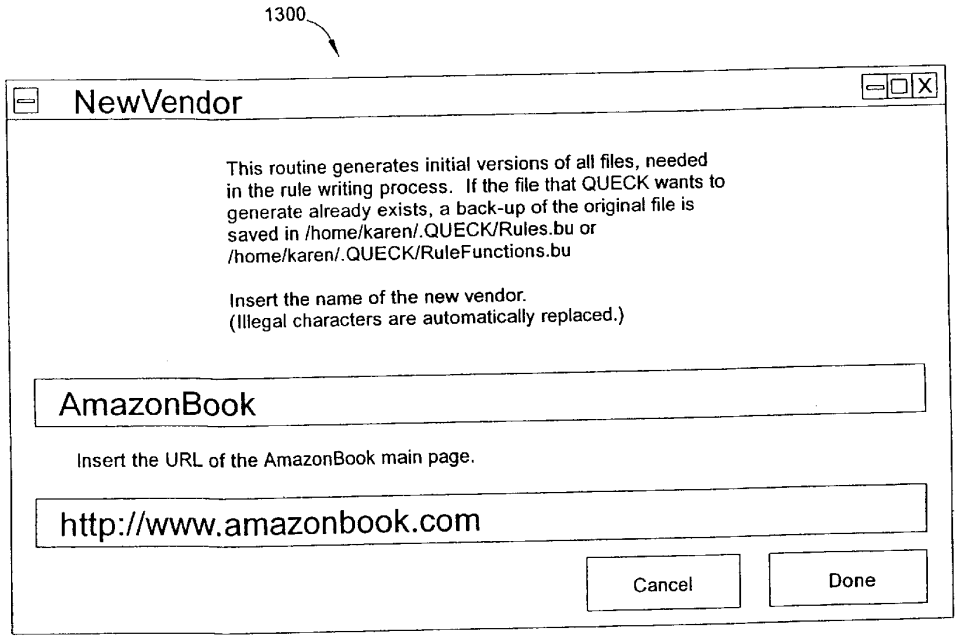

1300
NewVendor
This routine generates initial versions of all files, needed in the rule writing process. If the file that QUECK wants to generate already exists, a back-up of the original file is saved in /home/karen/.QUECK/Rules.bu or /home/karen/.QUECK/RuleFunctions.bu
Insert the name of the new vendor.
(Illegal characters are automatically replaced.)
AmazonBook
Insert the URL of the AmazonBook main page.
http://www.amazonbook.com
Cancel
Done

FIG. 13

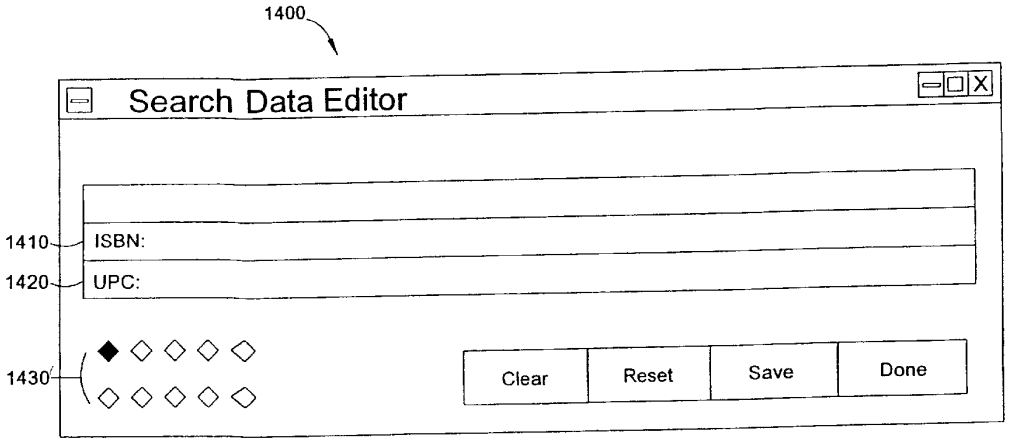

1400
Search Data Editor
1410
ISBN:
1420
UPC:
1430
Clear
Reset
Save
Done

FIG. 14

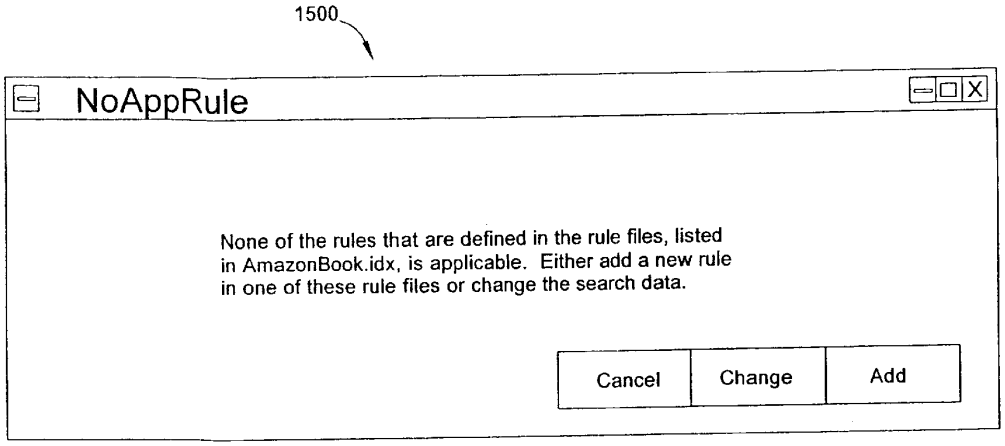

1500
NoAppRule
None of the rules that are defined in the rule files, listed in AmazonBook.idx, is applicable. Either add a new rule in one of these rule files or change the search data.
Cancel
Change
Add

FIG. 15

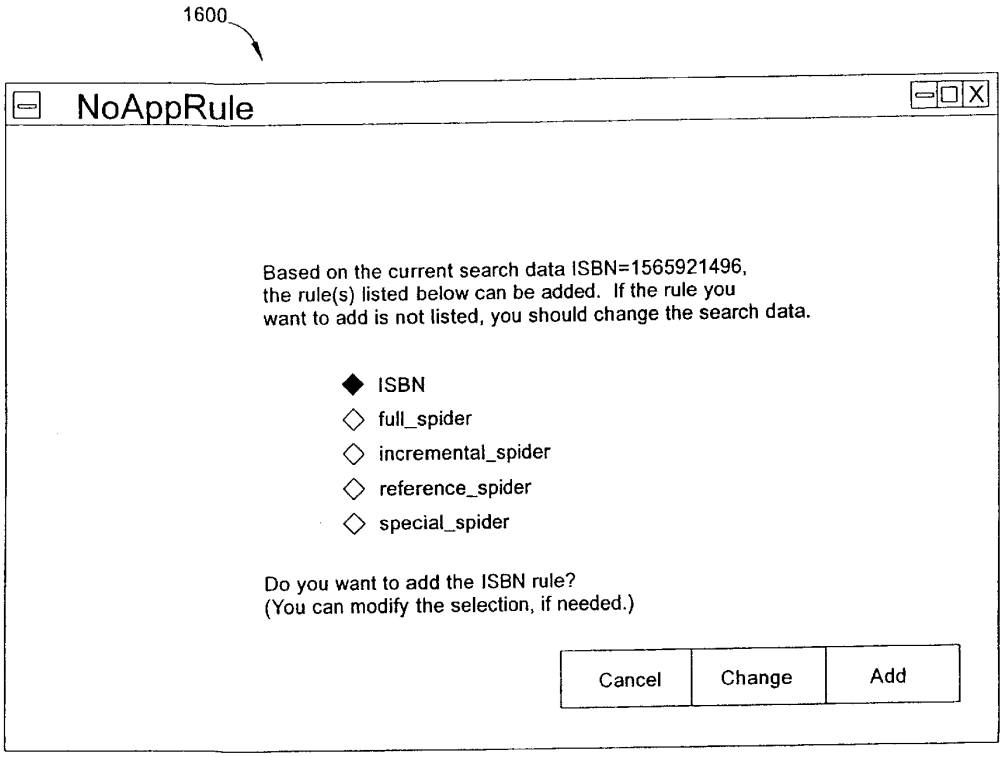

1600
NoAppRule
Based on the current search data ISBN=1565921496, the rule(s) listed below can be added. If the rule you want to add is not listed, you should change the search data.
ISBN
full_spider
incremental_spider
reference_spider
special_spider
Do you want to add the ISBN rule?
(You can modify the selection, if needed.)
Cancel
Change
Add

FIG. 16

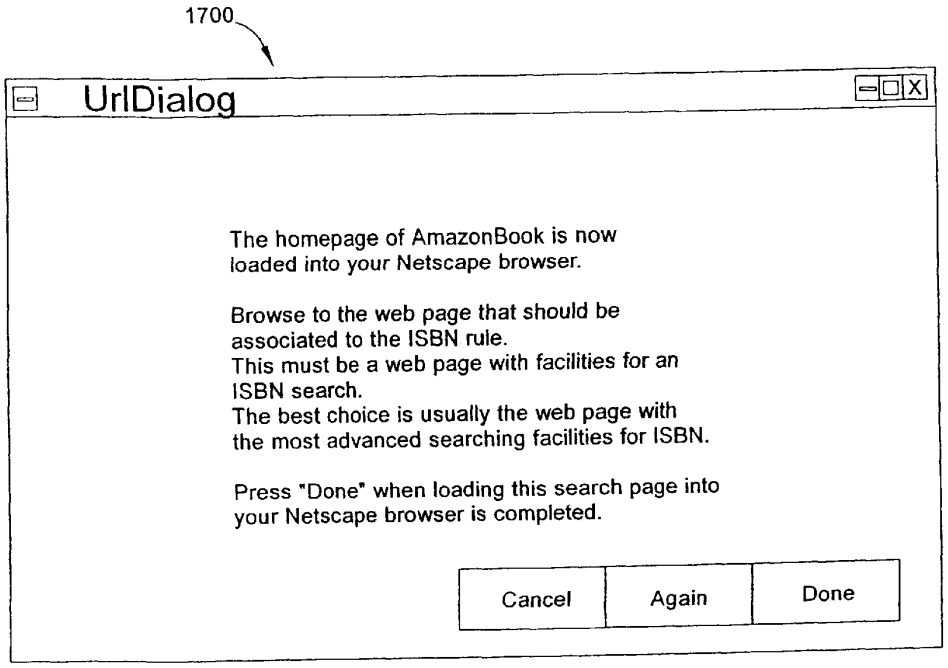

1700
UrlDialog
The homepage of AmazonBook is now loaded into your Netscape browser.
Browse to the web page that should be associated to the ISBN rule.
This must be a web page with facilities for an ISBN search.
The best choice is usually the web page with the most advanced searching facilities for ISBN.
Press "Done" when loading this search page into your Netscape browser is completed.
Cancel
Again
Done

FIG. 17

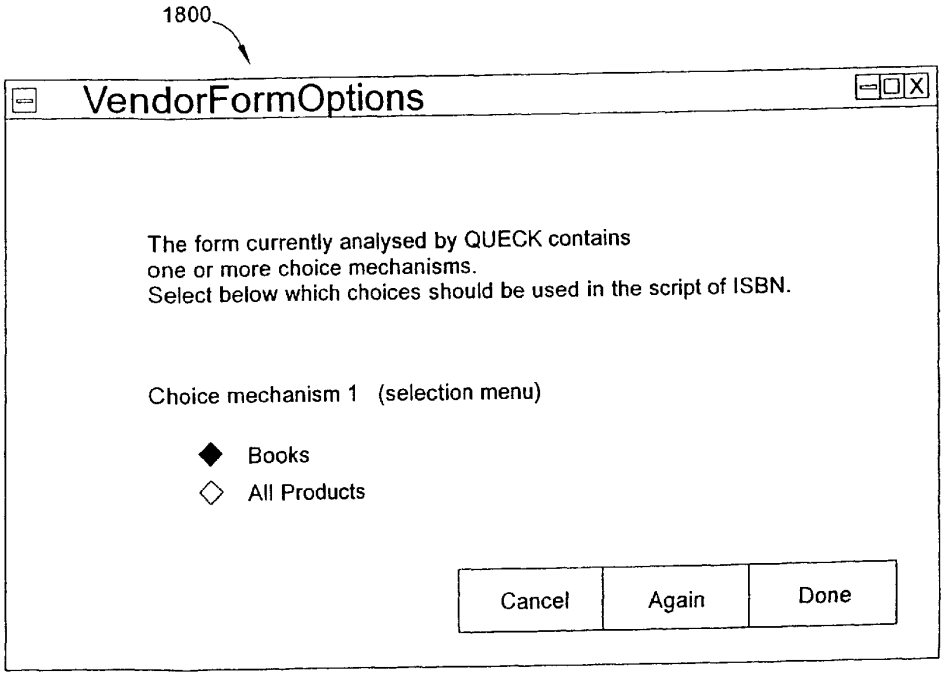

1800
VendorFormOptions
The form currently analysed by QUECK contains one or more choice mechanisms.
Select below which choices should be used in the script of ISBN.
Choice mechanism 1 (selection menu)
Books
All Products
Cancel
Again
Done

FIG. 18

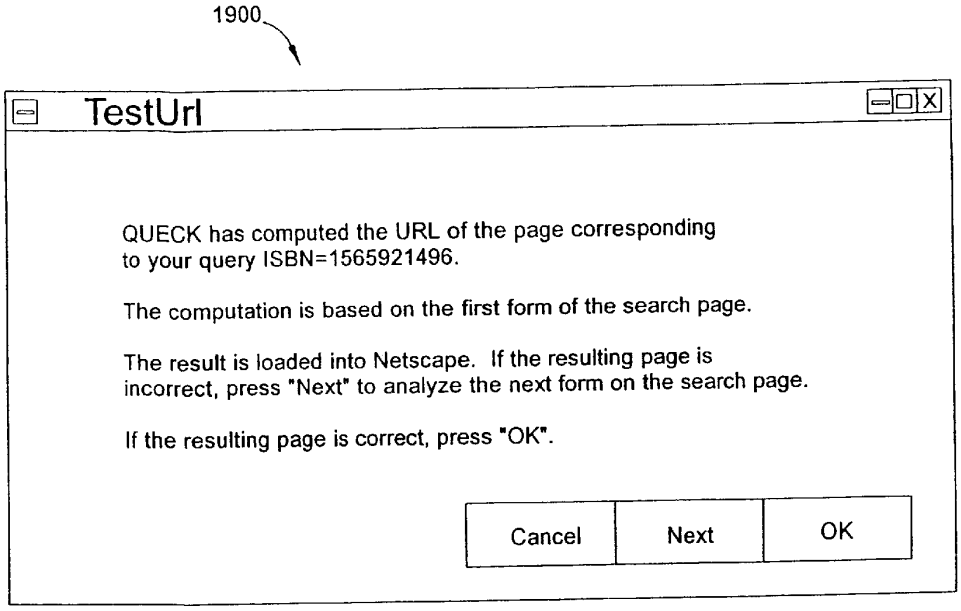

1900
TestUrl
QUECK has computed the URL of the page corresponding to your query ISBN=1565921496.
The computation is based on the first form of the search page.
The result is loaded into Netscape. If the resulting page is incorrect, press "Next" to analyze the next form on the search page.
If the resulting page is correct, press "OK".
Cancel
Next
OK

FIG. 19

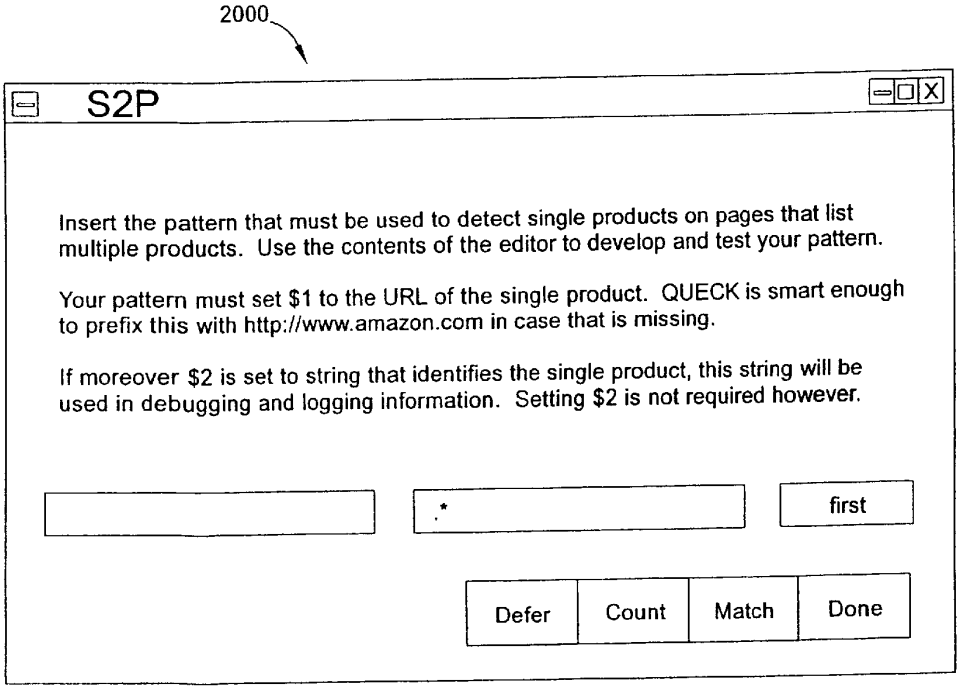

2000
S2P
Insert the pattern that must be used to detect single products on pages that list multiple products. Use the contents of the editor to develop and test your pattern.
Your pattern must set $1 to the URL of the single product. QUECK is smart enough to prefix this with http://www.amazon.com in case that is missing.
If moreover $2 is set to string that identifies the single product, this string will be used in debugging and logging information. Setting $2 is not required however.
.*
first
Defer
Count
Match
Done

FIG. 20

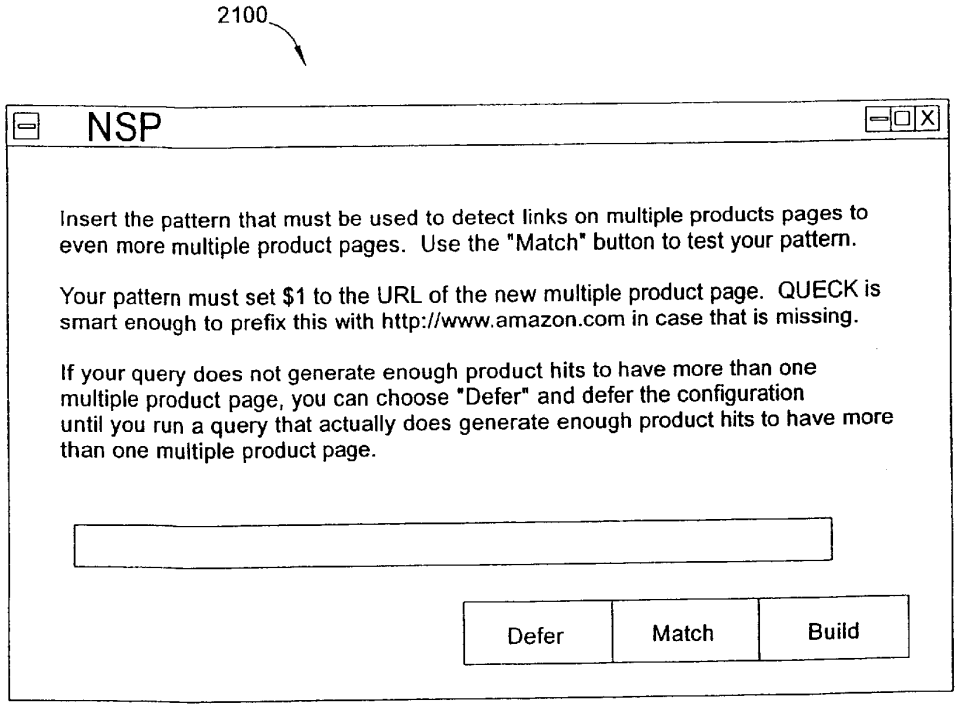

2100
NSP
Insert the pattern that must be used to detect links on multiple products pages to even more multiple product pages. Use the "Match" button to test your pattern.
Your pattern must set $1 to the URL of the new multiple product page. QUECK is smart enough to prefix this with http://www.amazon.com in case that is missing.
If your query does not generate enough product hits to have more than one multiple product page, you can choose "Defer" and defer the configuration until you run a query that actually does generate enough product hits to have more than one multiple product page.
Defer
Match
Build

FIG. 21

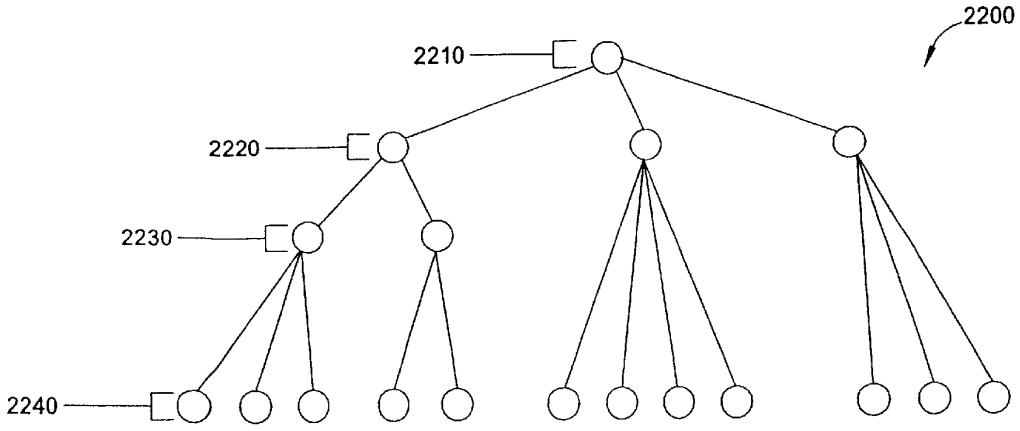

2200
2210
2220
2230
2240

FIG. 22

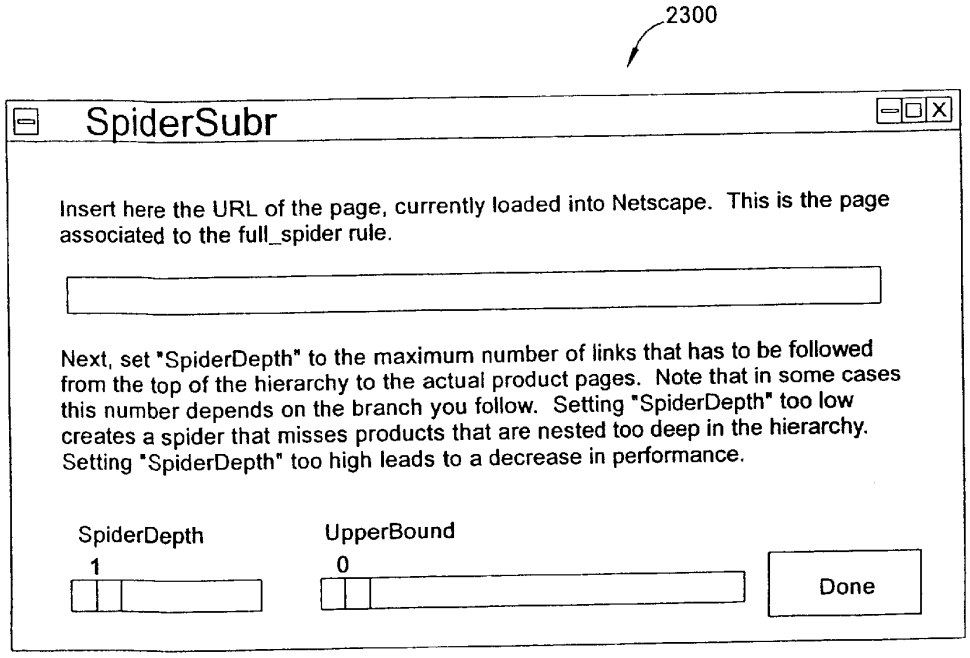

2300
SpiderSubr
Insert here the URL of the page, currently loaded into Netscape. This is the page associated to the full_spider rule.
Next, set "SpiderDepth" to the maximum number of links that has to be followed from the top of the hierarchy to the actual product pages. Note that in some cases this number depends on the branch you follow. Setting "SpiderDepth" too low creates a spider that misses products that are nested too deep in the hierarchy. Setting "SpiderDepth" too high leads to a decrease in performance.
SpiderDepth
1
UpperBound
0
Done

FIG. 23

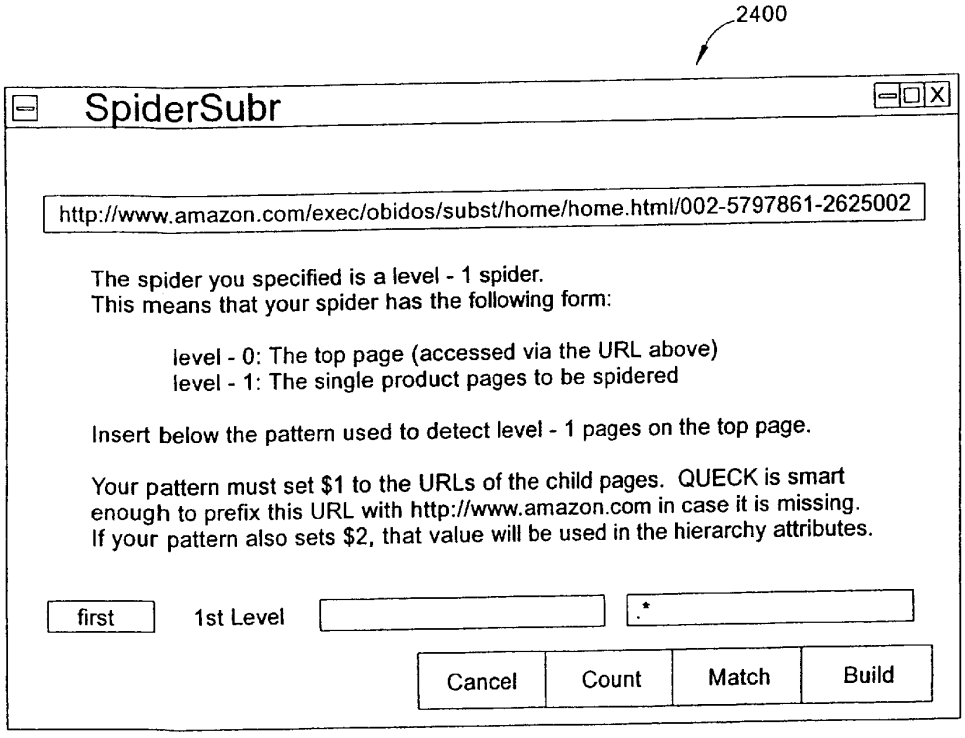

2400
SpiderSubr
http://www.amazon.com/exec/obidos/subst/home/home.html/002-5797861-2625002
The spider you specified is a level - 1 spider.
This means that your spider has the following form:
level - 0: The top page (accessed via the URL above)
level - 1: The single product pages to be spidered
Insert below the pattern used to detect level - 1 pages on the top page.
Your pattern must set $1 to the URLs of the child pages. QUECK is smart enough to prefix this URL with http://www.amazon.com in case it is missing.
If your pattern also sets $2, that value will be used in the hierarchy attributes.
first
1st Level
.*
Cancel
Count
Match
Build

FIG. 24

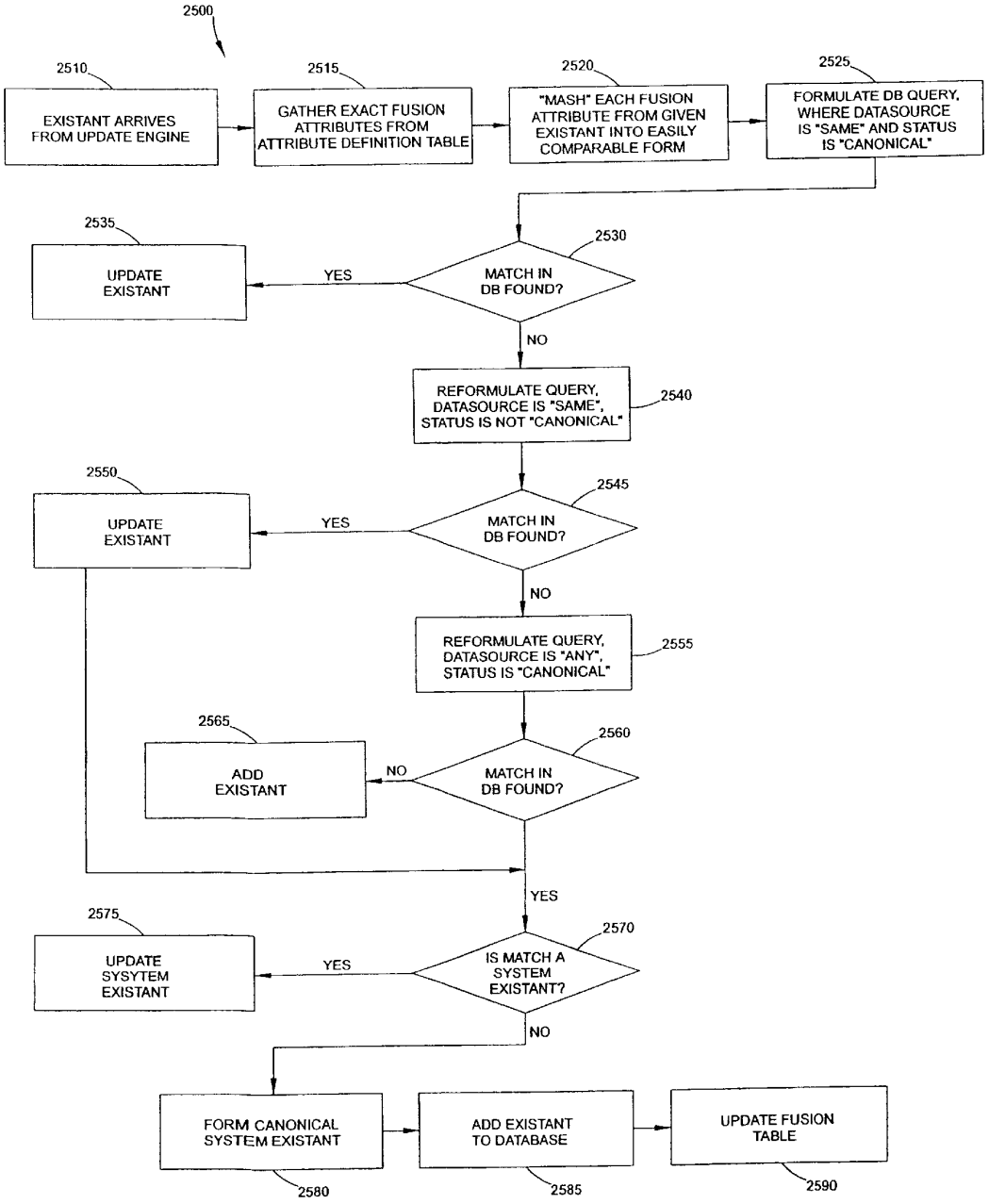

2500
2510
EXISTANT ARRIVES FROM UPDATE ENGINE
2515
GATHER EXACT FUSION ATTRIBUTES FROM ATTRIBUTE DEFINITION TABLE
2520
"MASH" EACH FUSION ATTRIBUTE FROM GIVEN EXISTANT INTO EASILY COMPARABLE FORM
2525
FORMULATE DB QUERY, WHERE DATASOURCE IS "SAME" AND STATUS IS "CANONICAL"
2530
MATCH IN DB FOUND?
YES
2535
UPDATE EXISTANT
NO
REFORMULATE QUERY, DATASOURCE IS "SAME", STATUS IS NOT "CANONICAL"
2540
2545
MATCH IN DB FOUND?
YES
2550
UPDATE EXISTANT
NO
REFORMULATE QUERY, DATASOURCE IS "ANY", STATUS IS "CANONICAL"
2555
2560
MATCH IN DB FOUND?
NO
2565
ADD EXISTANT
YES
2570
IS MATCH A SYSTEM EXISTANT?
YES
2575
UPDATE SYSYTEM EXISTANT
NO
FORM CANONICAL SYSTEM EXISTANT
2580
ADD EXISTANT TO DATABASE
2585
UPDATE FUSION TABLE
2590

FIG. 25

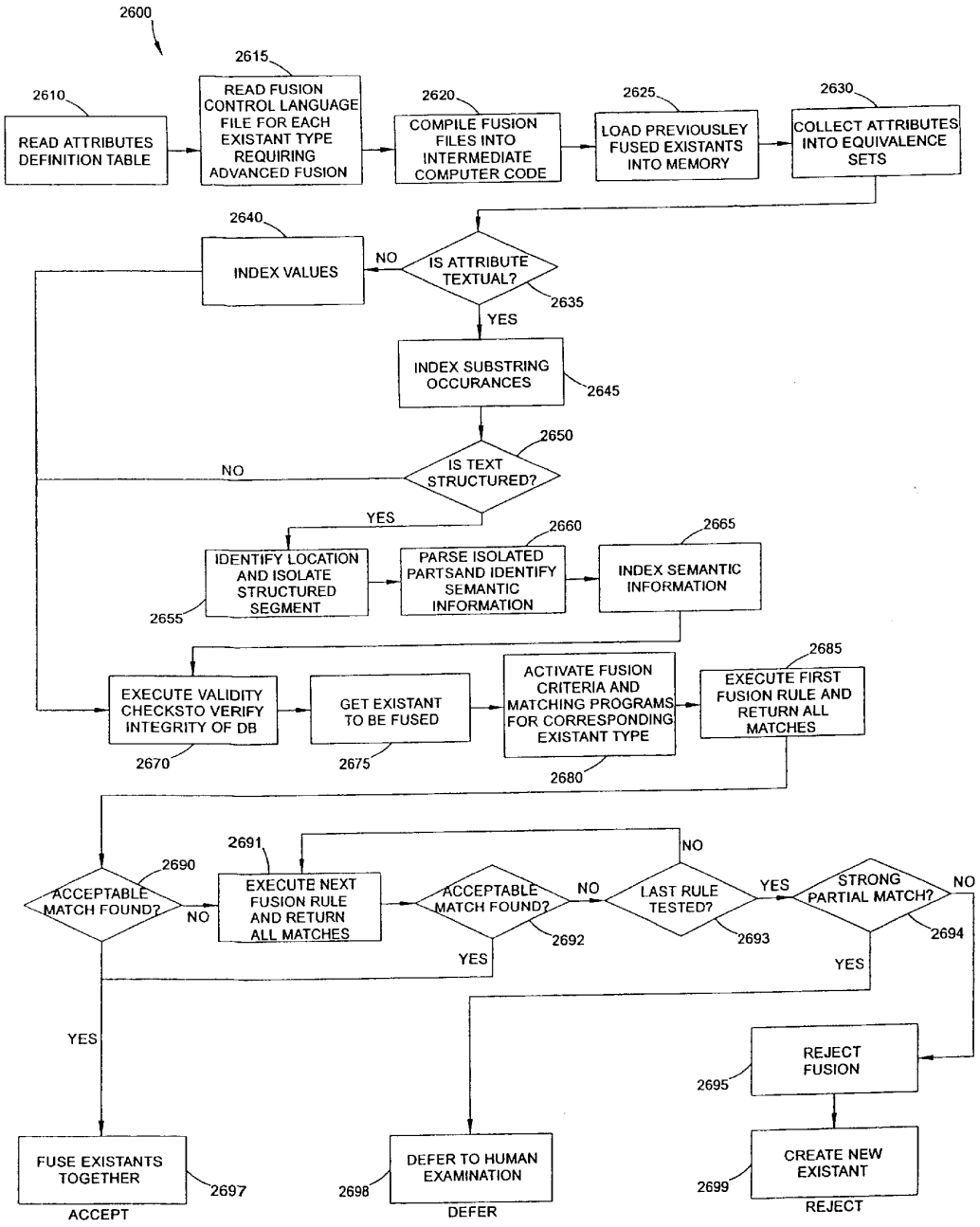

2600
2610
READ ATTRIBUTES DEFINITION TABLE
2615
READ FUSION CONTROL LANGUAGE FILE FOR EACH EXISTANT TYPE REQUIRING ADVANCED FUSION
2620
COMPILE FUSION FILES INTO INTERMEDIATE COMPUTER CODE
2625
LOAD PREVIOUSLEY FUSED EXISTANTS INTO MEMORY
2630
COLLECT ATTRIBUTES INTO EQUIVALENCE SETS
2640
INDEX VALUES
NO
IS ATTRIBUTE TEXTUAL?
2635
YES
INDEX SUBSTRING OCCURANCES
2645
2650
NO
IS TEXT STRUCTURED?
YES
2660
2665
IDENTIFY LOCATION AND ISOLATE STRUCTURED SEGMENT
2655
PARSE ISOLATED PARTSAND IDENTIFY SEMANTIC INFORMATION
INDEX SEMANTIC INFORMATION
2685
EXECUTE VALIDITY CHECKSTO VERIFY INTEGRITY OF DB
2670
GET EXISTANT TO BE FUSED
2675
ACTIVATE FUSION CRITERIA AND MATCHING PROGRAMS FOR CORRESPONDING EXISTANT TYPE
2680
EXECUTE FIRST FUSION RULE AND RETURN ALL MATCHES
2691
NO
2690
ACCEPTABLE MATCH FOUND?
NO
EXECUTE NEXT FUSION RULE AND RETURN ALL MATCHES
ACCEPTABLE MATCH FOUND?
2692
NO
LAST RULE TESTED?
2693
YES
STRONG PARTIAL MATCH?
2694
NO
YES
YES
YES
REJECT FUSION
2695
FUSE EXISTANTS TOGETHER
2697
ACCEPT
DEFER TO HUMAN EXAMINATION
2698
DEFER
CREATE NEW EXISTANT
2699
REJECT

FIG. 26

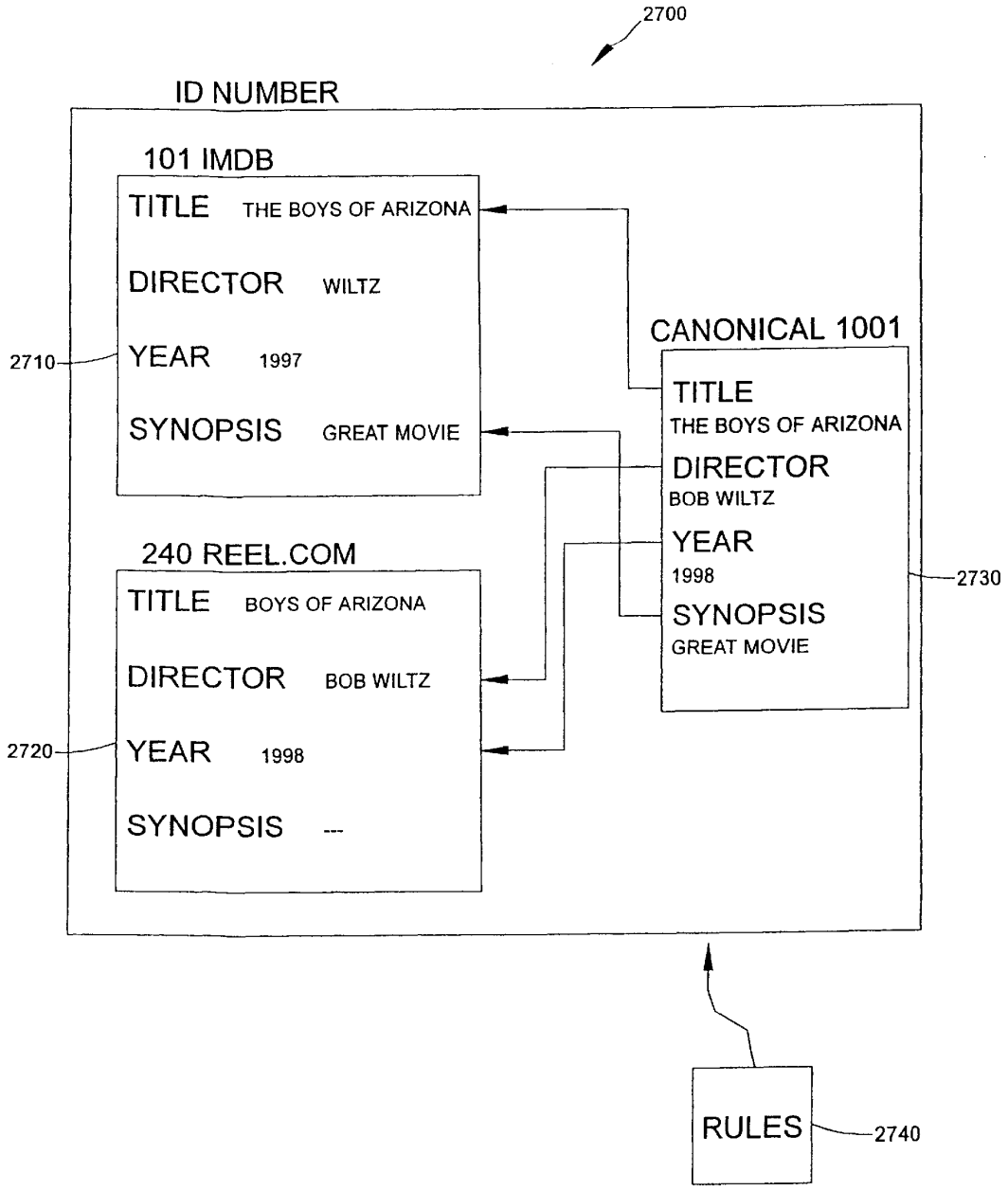

2700
ID NUMBER
101 IMDB
TITLE THE BOYS OF ARIZONA
DIRECTOR WILTZ
YEAR 1997
SYNOPSIS GREAT MOVIE
2710
240 REEL.COM
TITLE BOYS OF ARIZONA
DIRECTOR BOB WILTZ
YEAR 1998
SYNOPSIS ---
2720
CANONICAL 1001
TITLE
THE BOYS OF ARIZONA
DIRECTOR
BOB WILTZ
YEAR
1998
SYNOPSIS
GREAT MOVIE
2730
RULES
2740

FIG. 27

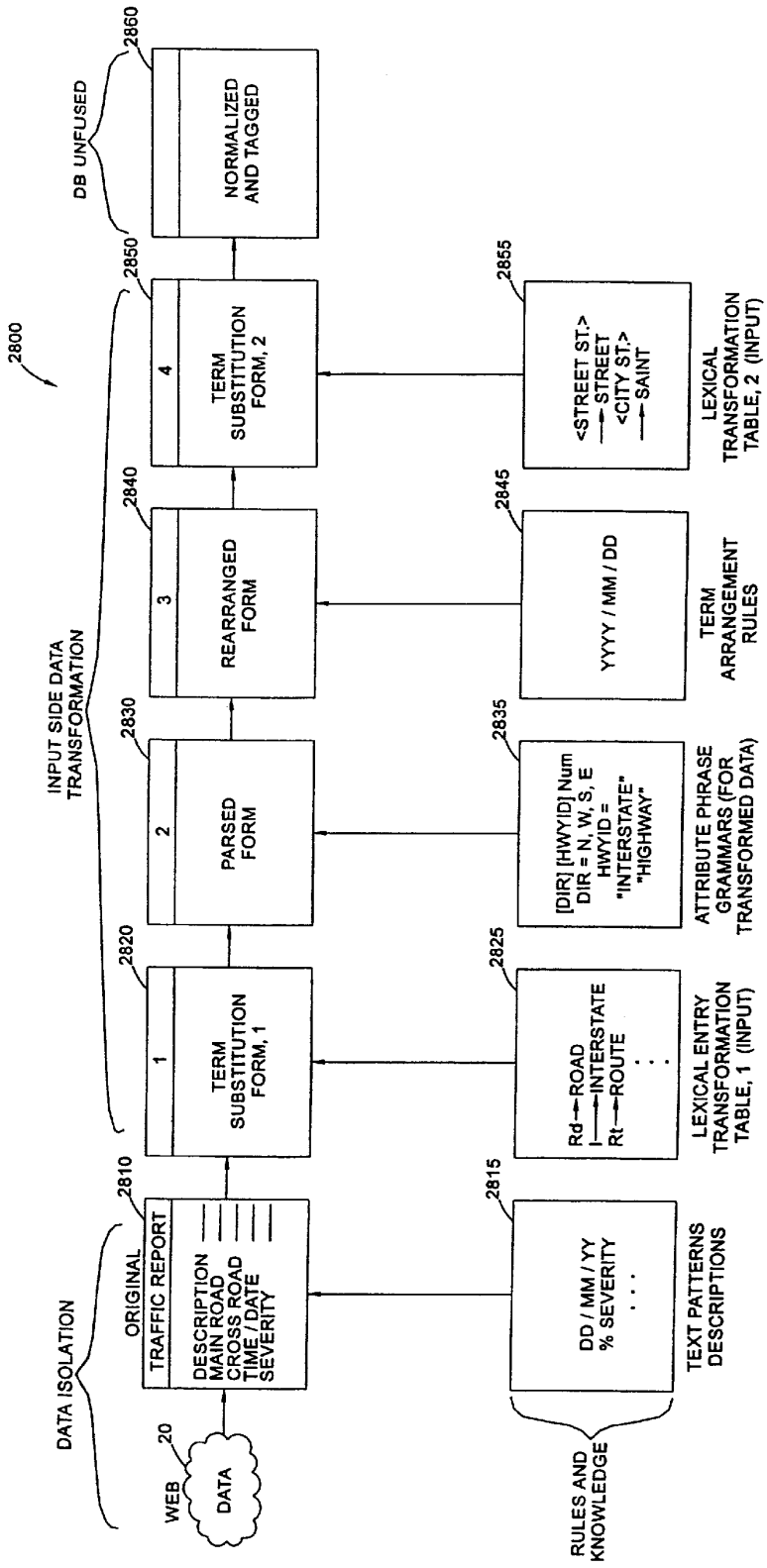

2800
DATA ISOLATION
WEB
20
DATA
ORIGINAL
TRAFFIC REPORT
DESCRIPTION
MAIN ROAD
CROSS ROAD
TIME / DATE
SEVERITY
2810
INPUT SIDE DATA TRANSFORMATION
1
TERM SUBSTITUTION FORM, 1
2820
2
PARSED FORM
2830
3
REARRANGED FORM
2840
4
TERM SUBSTITUTION FORM, 2
2850
DB UNFUSED
NORMALIZED AND TAGGED
2860
RULES AND KNOWLEDGE
2815
DD / MM / YY
% SEVERITY
. . .
TEXT PATTERNS DESCRIPTIONS
2825
Rd→ROAD
I→INTERSTATE
Rt→ROUTE
. . .
LEXICAL ENTRY TRANSFORMATION TABLE, 1 (INPUT)
2835
[DIR] [HWYID] Num
DIR = N, W, S, E
HWYID =
"INTERSTATE"
"HIGHWAY"
ATTRIBUTE PHRASE GRAMMARS (FOR TRANSFORMED DATA)
2845
YYYY / MM / DD
TERM ARRANGEMENT RULES
2855
<STREET ST.>
→ STREET
<CITY ST.>
→ SAINT
LEXICAL TRANSFORMATION TABLE, 2 (INPUT)

FIG. 28

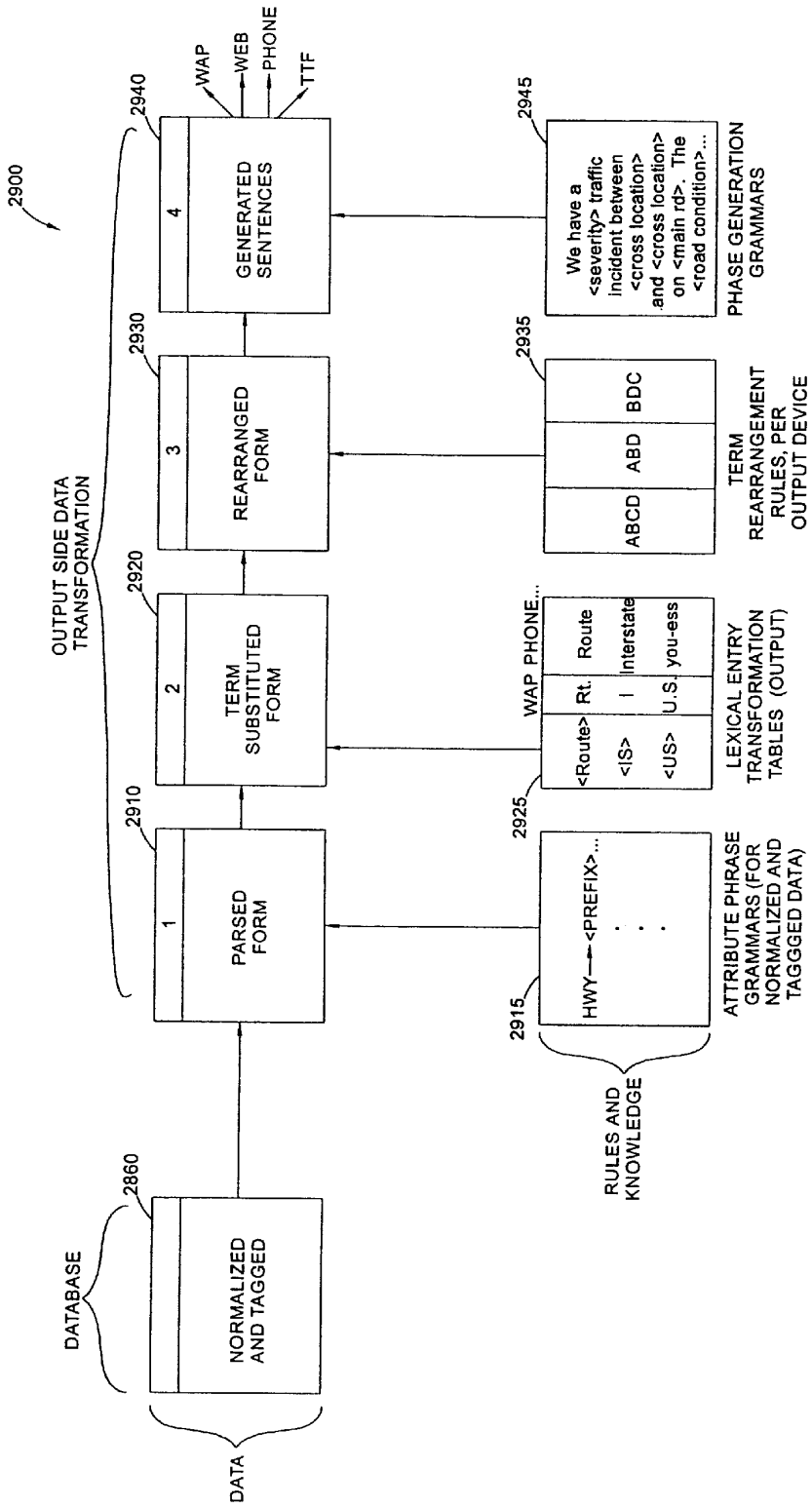

2900
OUTPUT SIDE DATA TRANSFORMATION
DATABASE
2860
NORMALIZED AND TAGGED
DATA
2910
1
PARSED FORM
2920
2
TERM SUBSTITUTED FORM
2930
3
REARRANGED FORM
2940
4
GENERATED SENTENCES
WAP
WEB
PHONE
TTF
2915
HWY
<PREFIX>...
2925
<Route>
Rt.
Route
<IS>
I
Interstate
<US>
U.S.
you-ess
WAP PHONE...
2935
ABCD
ABD
BDC
2945
We have a <severity> traffic incident between <cross location> and <cross location> on <main rd>. The <road condition>...
RULES AND KNOWLEDGE
ATTRIBUTE PHRASE GRAMMARS (FOR NORMALIZED AND TAGGED DATA)
LEXICAL ENTRY TRANSFORMATION TABLES (OUTPUT)
TERM REARRANGEMENT RULES, PER OUTPUT DEVICE
PHASE GENERATION GRAMMARS

FIG. 29

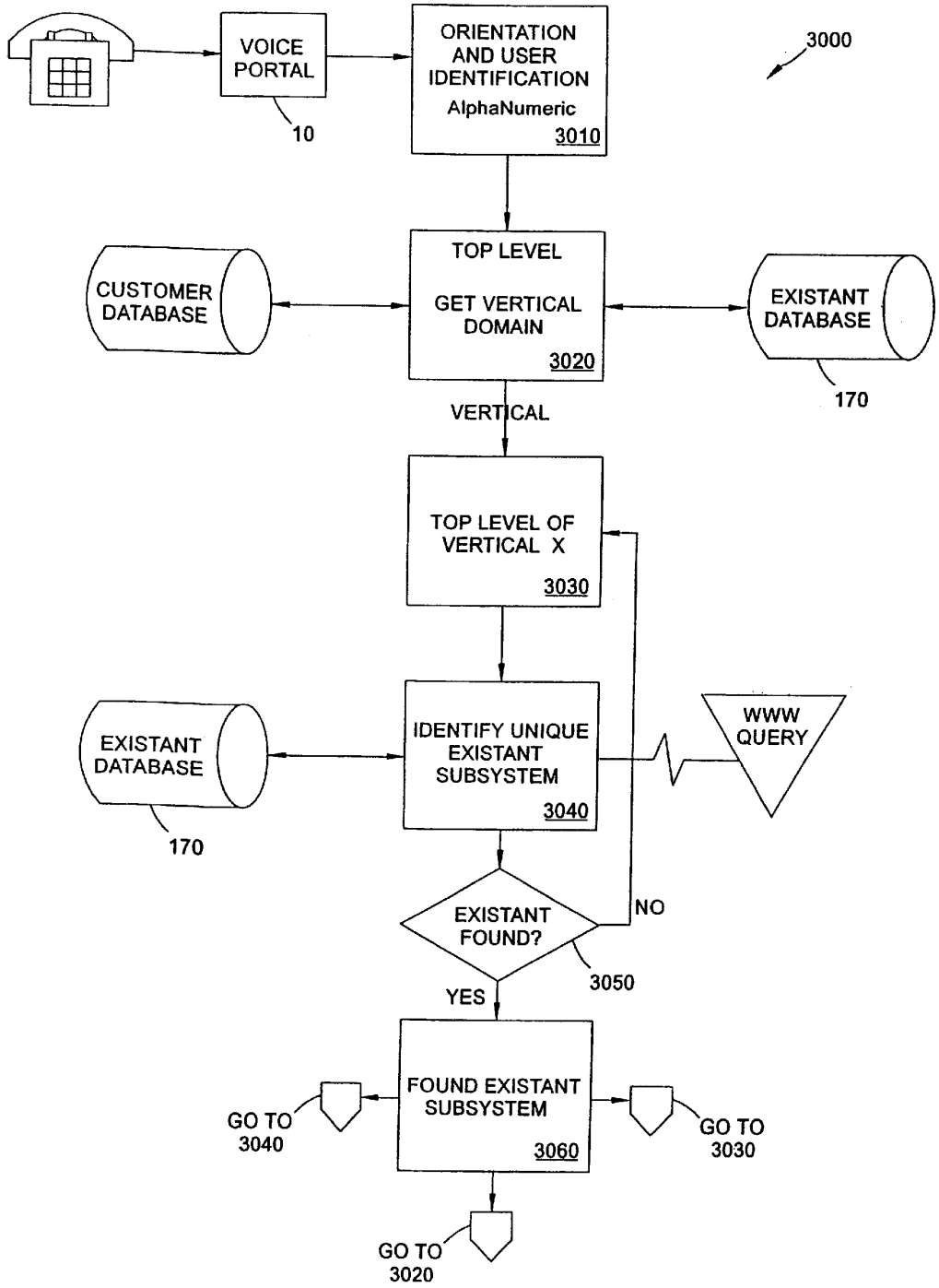

VOICE PORTAL
10
ORIENTATION AND USER IDENTIFICATION
AlphaNumeric
3010
3000
CUSTOMER DATABASE
TOP LEVEL
GET VERTICAL DOMAIN
3020
EXISTANT DATABASE
170
VERTICAL
TOP LEVEL OF VERTICAL X
3030
EXISTANT DATABASE
170
IDENTIFY UNIQUE EXISTANT SUBSYSTEM
3040
WWW QUERY
EXISTANT FOUND?
3050
NO
YES
FOUND EXISTANT SUBSYSTEM
3060
GO TO 3040
GO TO 3030
GO TO 3020

FIG. 30

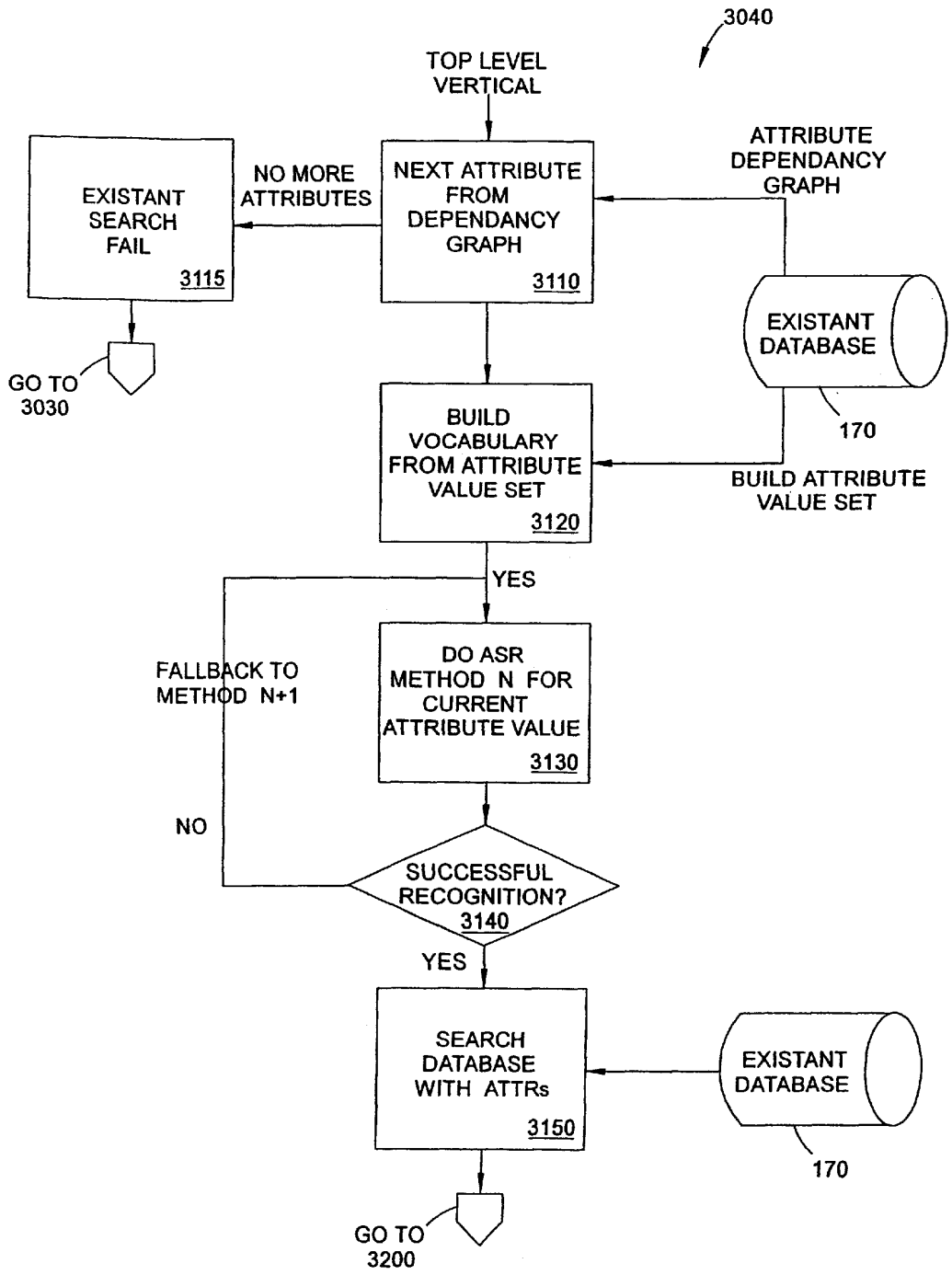

3040
TOP LEVEL VERTICAL
EXISTANT SEARCH FAIL
3115
NO MORE ATTRIBUTES
NEXT ATTRIBUTE FROM DEPENDANCY GRAPH
3110
ATTRIBUTE DEPENDANCY GRAPH
EXISTANT DATABASE
170
GO TO 3030
BUILD VOCABULARY FROM ATTRIBUTE VALUE SET
3120
BUILD ATTRIBUTE VALUE SET
YES
FALLBACK TO METHOD N+1
DO ASR METHOD N FOR CURRENT ATTRIBUTE VALUE
3130
NO
SUCCESSFUL RECOGNITION?
3140
YES
SEARCH DATABASE WITH ATTRs
3150
EXISTANT DATABASE
170
GO TO 3200

FIG. 31

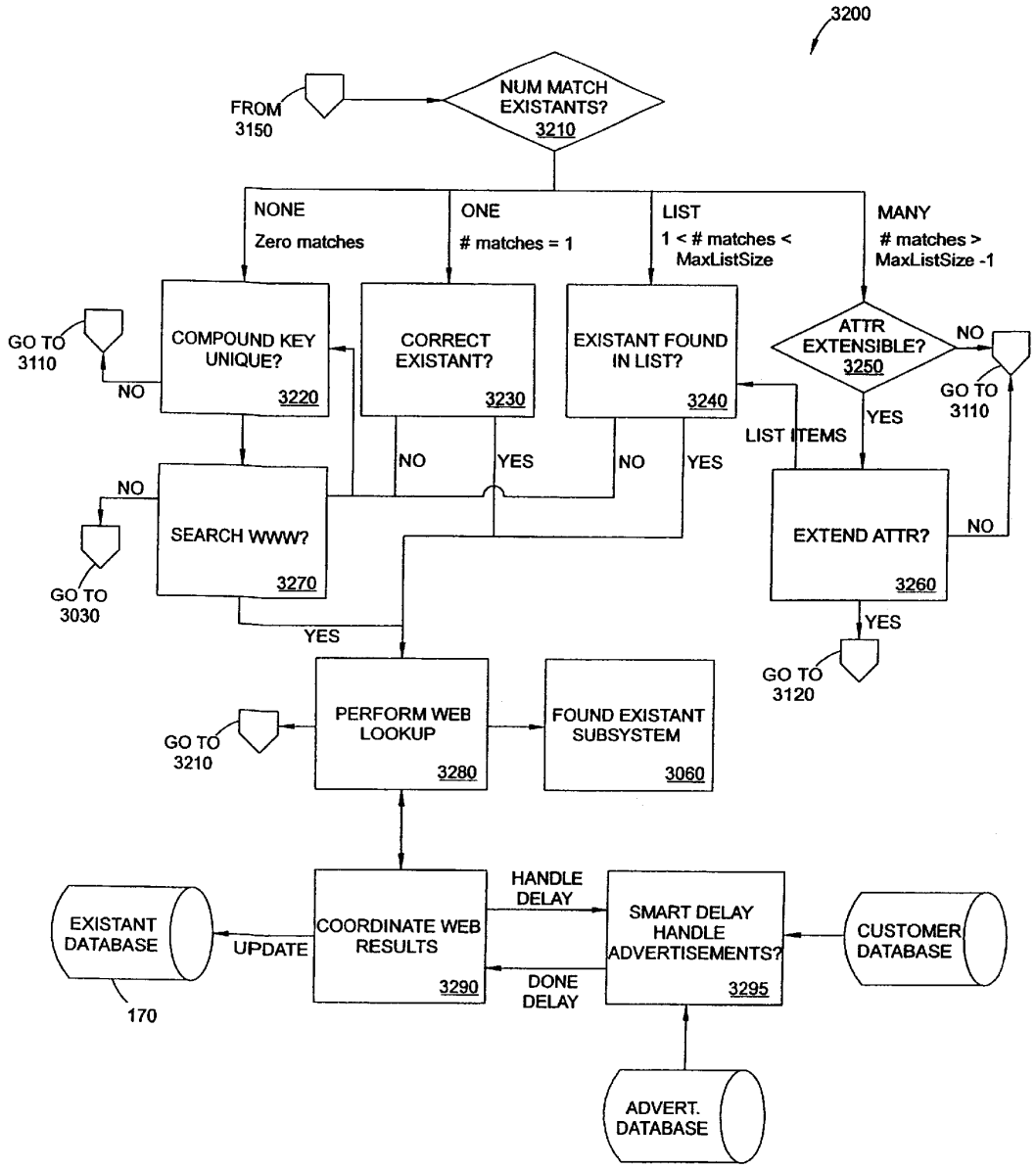

3200
FROM 3150
NUM MATCH EXISTANTS? 3210
NONE
Zero matches
ONE
matches = 1
LIST
1 < # matches < MaxListSize
MANY
matches > MaxListSize -1
GO TO 3110
COMPOUND KEY UNIQUE? 3220
NO
CORRECT EXISTANT? 3230
EXISTANT FOUND IN LIST? 3240
ATTR EXTENSIBLE? 3250
NO
GO TO 3110
YES
LIST ITEMS
NO
YES
NO
YES
NO
SEARCH WWW? 3270
GO TO 3030
YES
EXTEND ATTR? 3260
NO
YES
GO TO 3120
GO TO 3210
PERFORM WEB LOOKUP 3280
FOUND EXISTANT SUBSYSTEM 3060
EXISTANT DATABASE
UPDATE
COORDINATE WEB RESULTS 3290
HANDLE DELAY
DONE DELAY
SMART DELAY HANDLE ADVERTISEMENTS? 3295
CUSTOMER DATABASE
170
ADVERT. DATABASE

FIG. 32

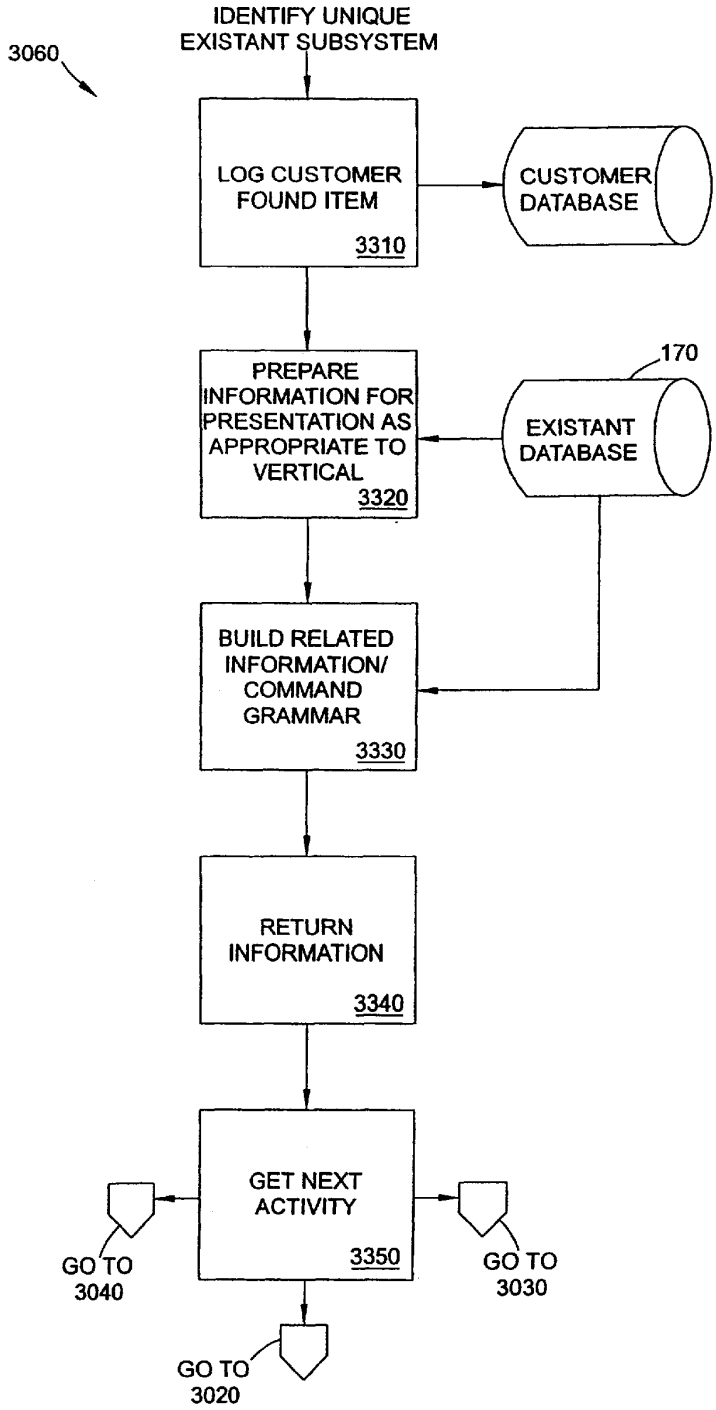

3060
IDENTIFY UNIQUE EXISTANT SUBSYSTEM
LOG CUSTOMER FOUND ITEM
3310
CUSTOMER DATABASE
PREPARE INFORMATION FOR PRESENTATION AS APPROPRIATE TO VERTICAL
3320
170
EXISTANT DATABASE
BUILD RELATED INFORMATION/ COMMAND GRAMMAR
3330
RETURN INFORMATION
3340
GET NEXT ACTIVITY
3350
GO TO 3040
GO TO 3030
GO TO 3020

FIG. 33

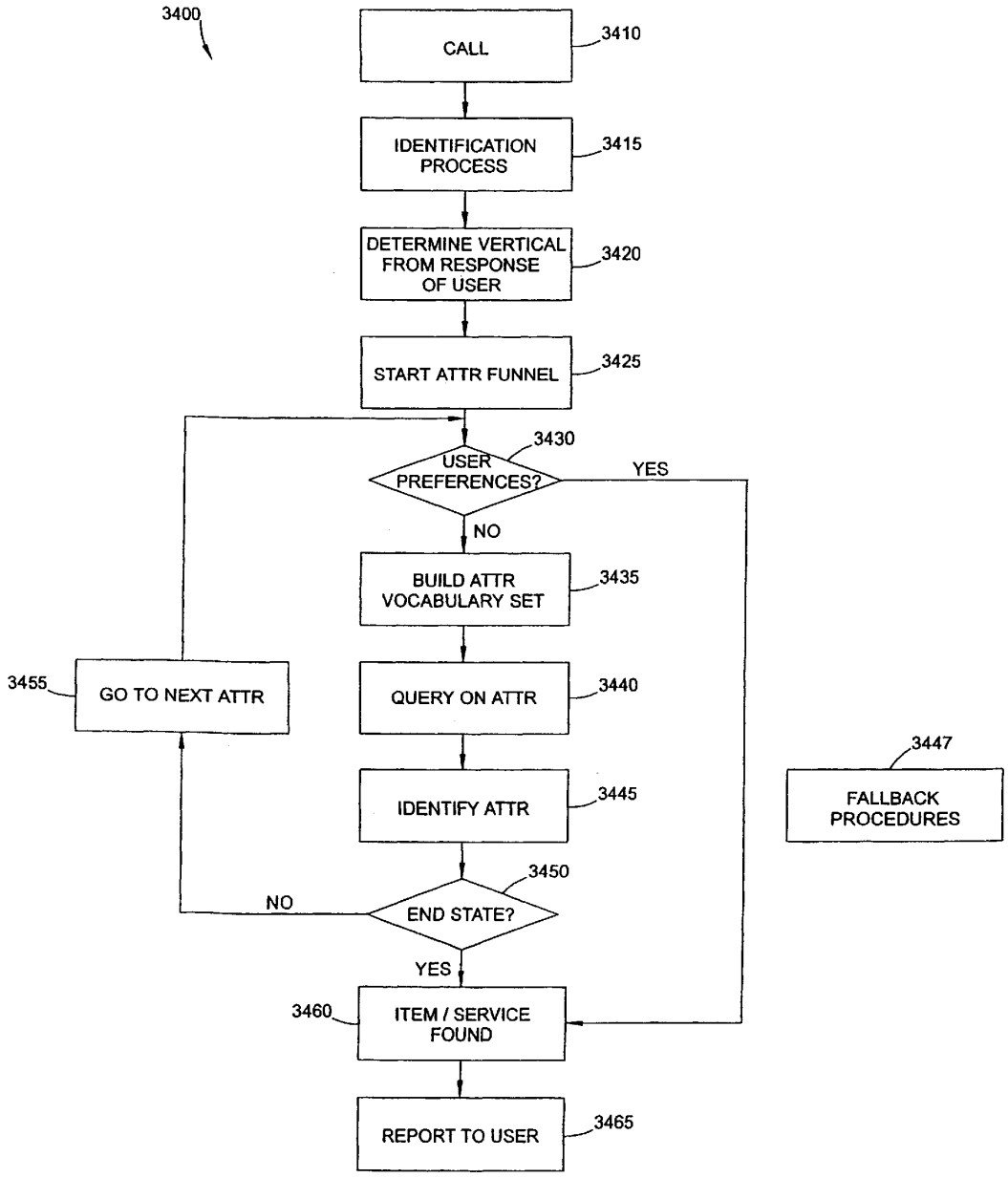

3400
CALL
3410
IDENTIFICATION PROCESS
3415
DETERMINE VERTICAL FROM RESPONSE OF USER
3420
START ATTR FUNNEL
3425
3430
USER PREFERENCES?
YES
NO
BUILD ATTR VOCABULARY SET
3435
3455
GO TO NEXT ATTR
QUERY ON ATTR
3440
3447
FALLBACK PROCEDURES
IDENTIFY ATTR
3445
3450
NO
END STATE?
YES
3460
ITEM / SERVICE FOUND
REPORT TO USER
3465

FIG. 34

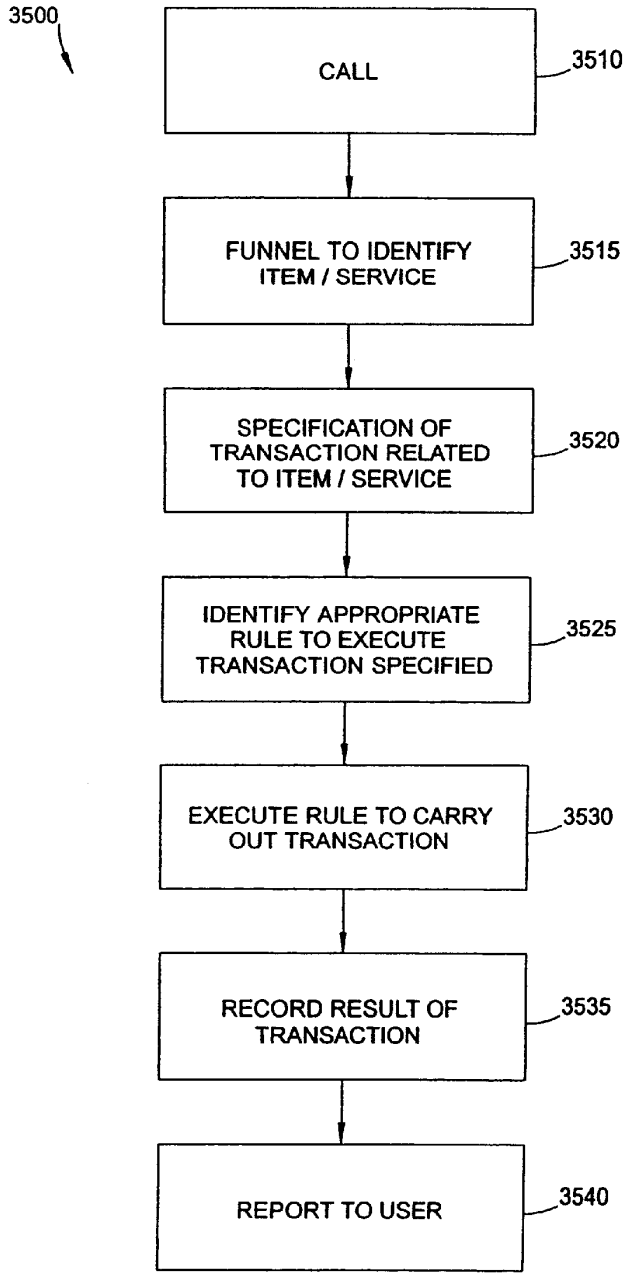

3500
CALL
3510
FUNNEL TO IDENTIFY ITEM / SERVICE
3515
SPECIFICATION OF TRANSACTION RELATED TO ITEM / SERVICE
3520
IDENTIFY APPROPRIATE RULE TO EXECUTE TRANSACTION SPECIFIED
3525
EXECUTE RULE TO CARRY OUT TRANSACTION
3530
RECORD RESULT OF TRANSACTION
3535
REPORT TO USER
3540

FIG. 35

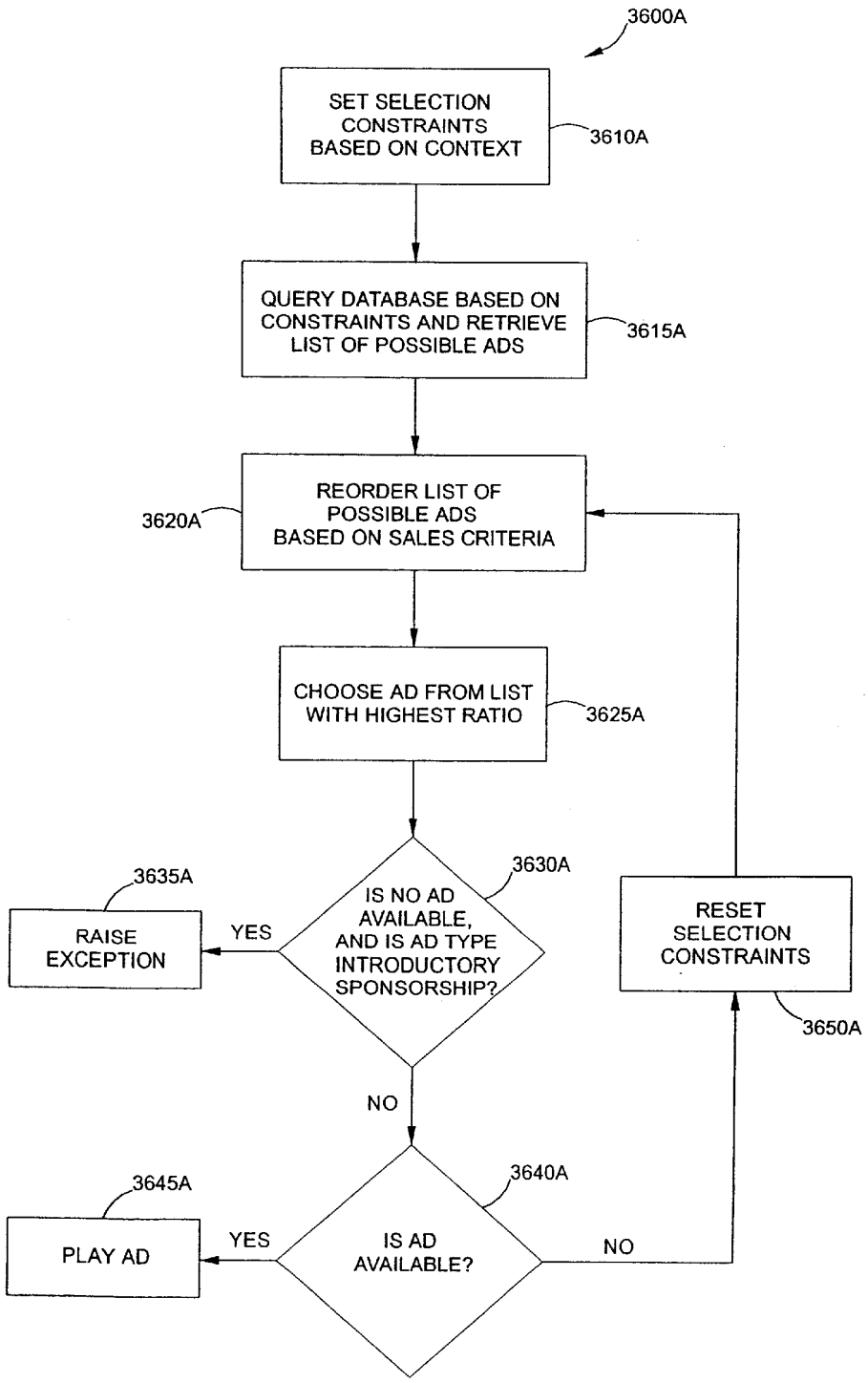

3600A
SET SELECTION CONSTRAINTS BASED ON CONTEXT
3610A
QUERY DATABASE BASED ON CONSTRAINTS AND RETRIEVE LIST OF POSSIBLE ADS
3615A
REORDER LIST OF POSSIBLE ADS BASED ON SALES CRITERIA
3620A
CHOOSE AD FROM LIST WITH HIGHEST RATIO
3625A
IS NO AD AVAILABLE, AND IS AD TYPE INTRODUCTORY SPONSORSHIP?
3630A
YES
RAISE EXCEPTION
3635A
NO
IS AD AVAILABLE?
3640A
YES
PLAY AD
3645A
NO
RESET SELECTION CONSTRAINTS
3650A

FIG. 36A

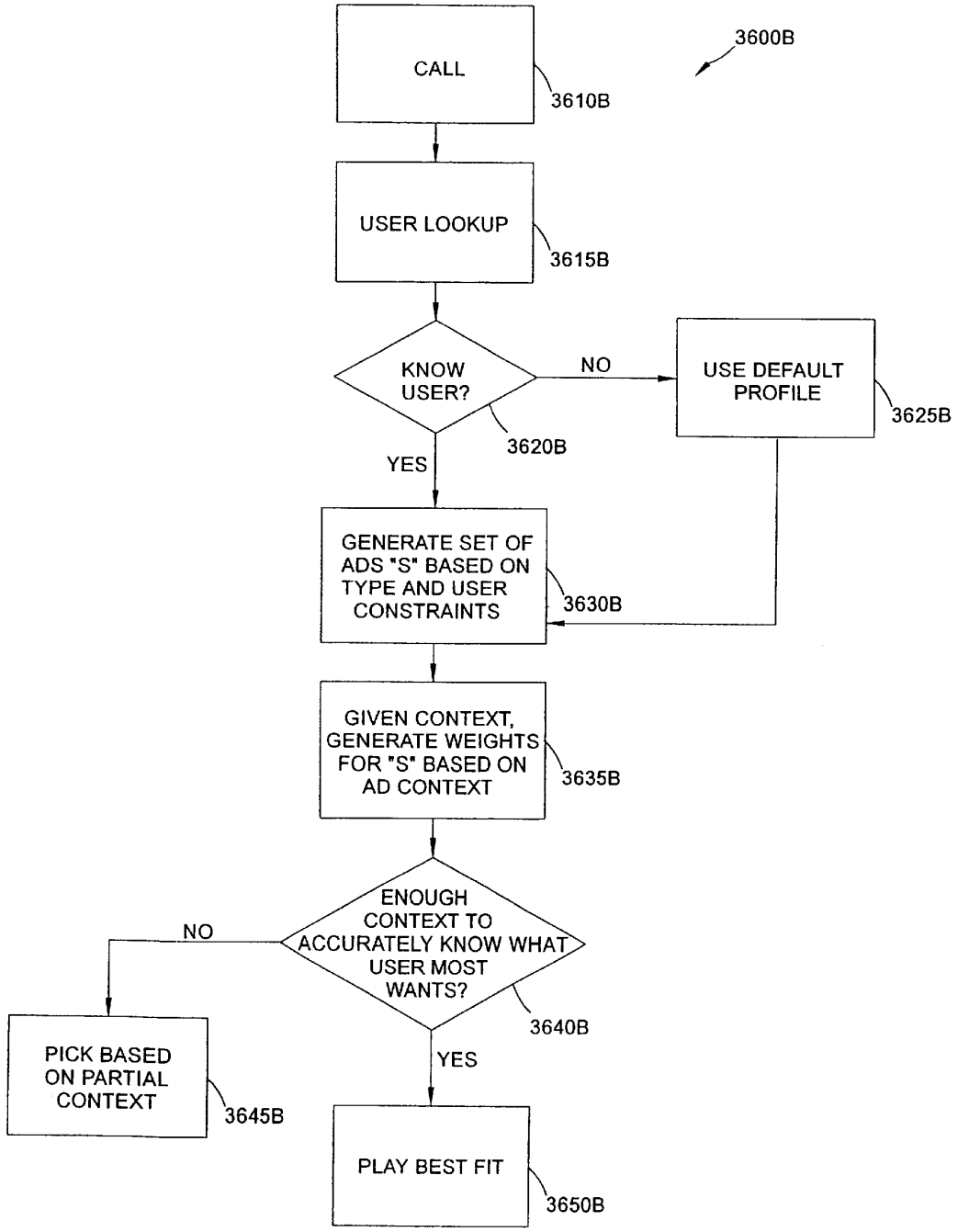

3600B
CALL
3610B
USER LOOKUP
3615B
KNOW USER?
NO
USE DEFAULT PROFILE
3625B
3620B
YES
GENERATE SET OF ADS "S" BASED ON TYPE AND USER CONSTRAINTS
3630B
GIVEN CONTEXT, GENERATE WEIGHTS FOR "S" BASED ON AD CONTEXT
3635B
ENOUGH CONTEXT TO ACCURATELY KNOW WHAT USER MOST WANTS?
NO
3640B
YES
PICK BASED ON PARTIAL CONTEXT
3645B
PLAY BEST FIT
3650B

FIG. 36B

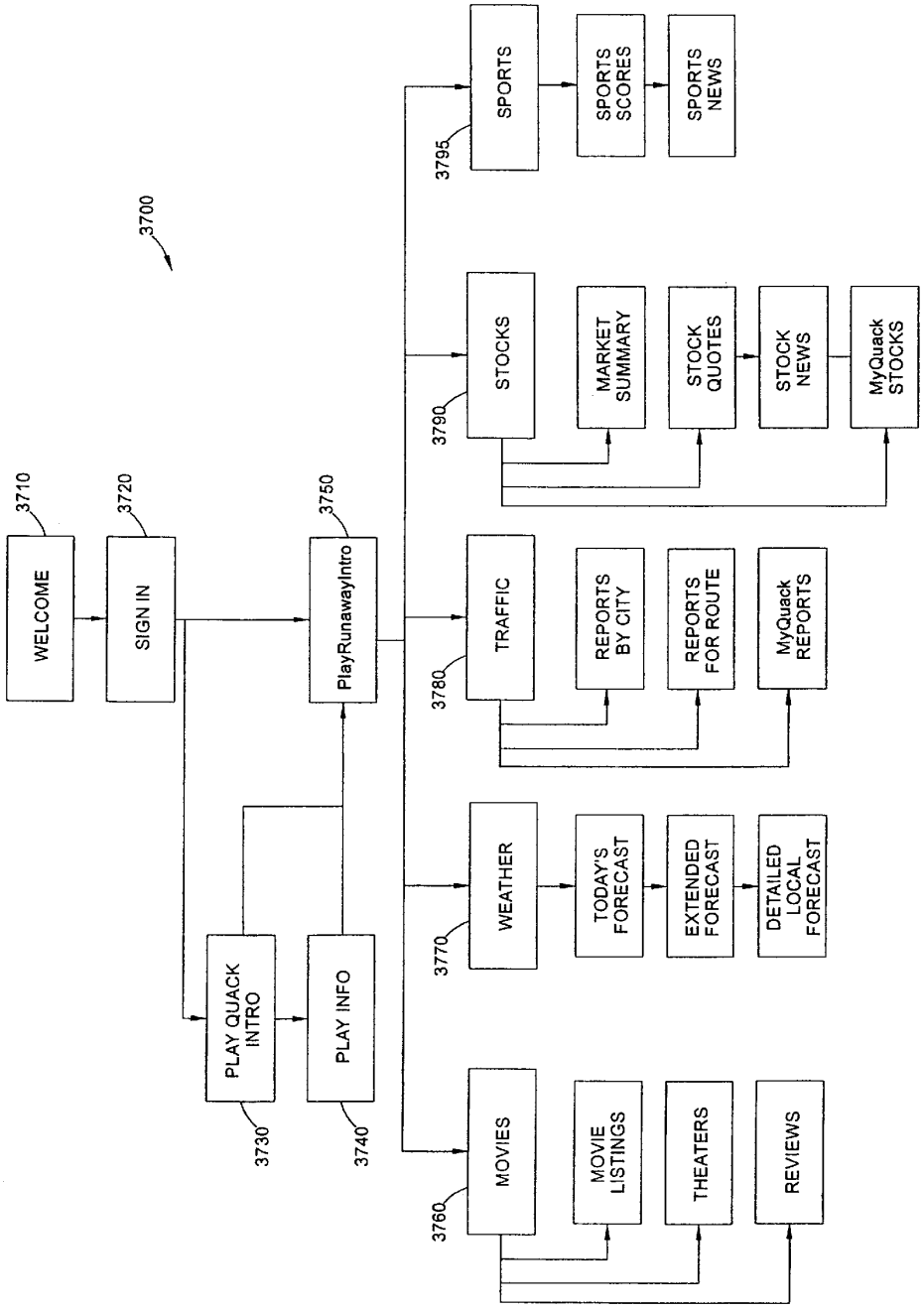

3700
3710
WELCOME
3720
SIGN IN
3730
PLAY QUACK INTRO
3740
PLAY INFO
3750
PlayRunawayIntro
3760
MOVIES
MOVIE LISTINGS
THEATERS
REVIEWS
3770
WEATHER
TODAY'S FORECAST
EXTENDED FORECAST
DETAILED LOCAL FORECAST
3780
TRAFFIC
REPORTS BY CITY
REPORTS FOR ROUTE
MyQuack REPORTS
3790
STOCKS
MARKET SUMMARY
STOCK QUOTES
STOCK NEWS
MyQuack STOCKS
3795
SPORTS
SPORTS SCORES
SPORTS NEWS

FIG. 37

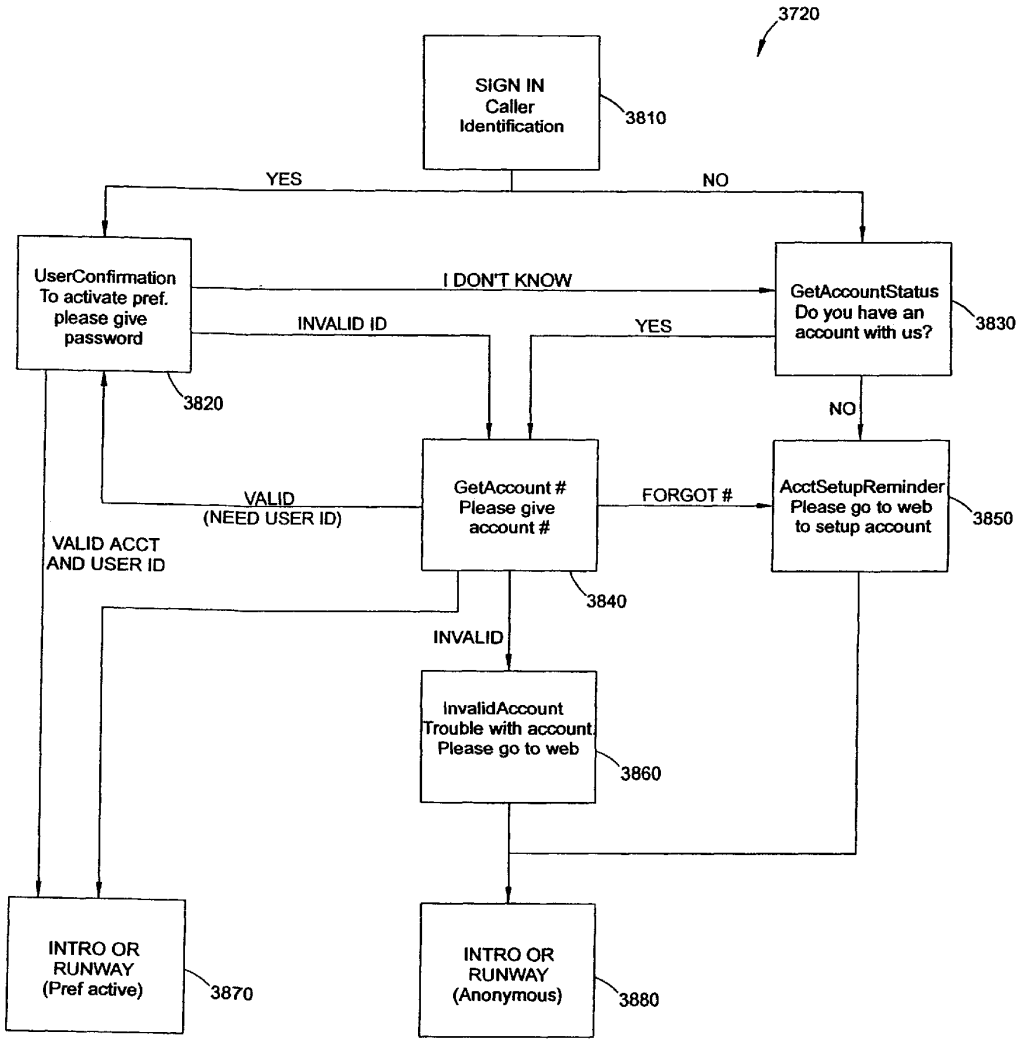

3720
SIGN IN
Caller
Identification
3810
YES
NO
UserConfirmation
To activate pref.
please give
password
I DON'T KNOW
GetAccountStatus
Do you have an
account with us?
3830
INVALID ID
YES
3820
NO
GetAccount #
Please give
account #
VALID
(NEED USER ID)
FORGOT #
AcctSetupReminder
Please go to web
to setup account
3850
VALID ACCT
AND USER ID
3840
INVALID
InvalidAccount
Trouble with account
Please go to web
3860
INTRO OR
RUNWAY
(Pref active)
3870
INTRO OR
RUNWAY
(Anonymous)
3880

FIG. 38

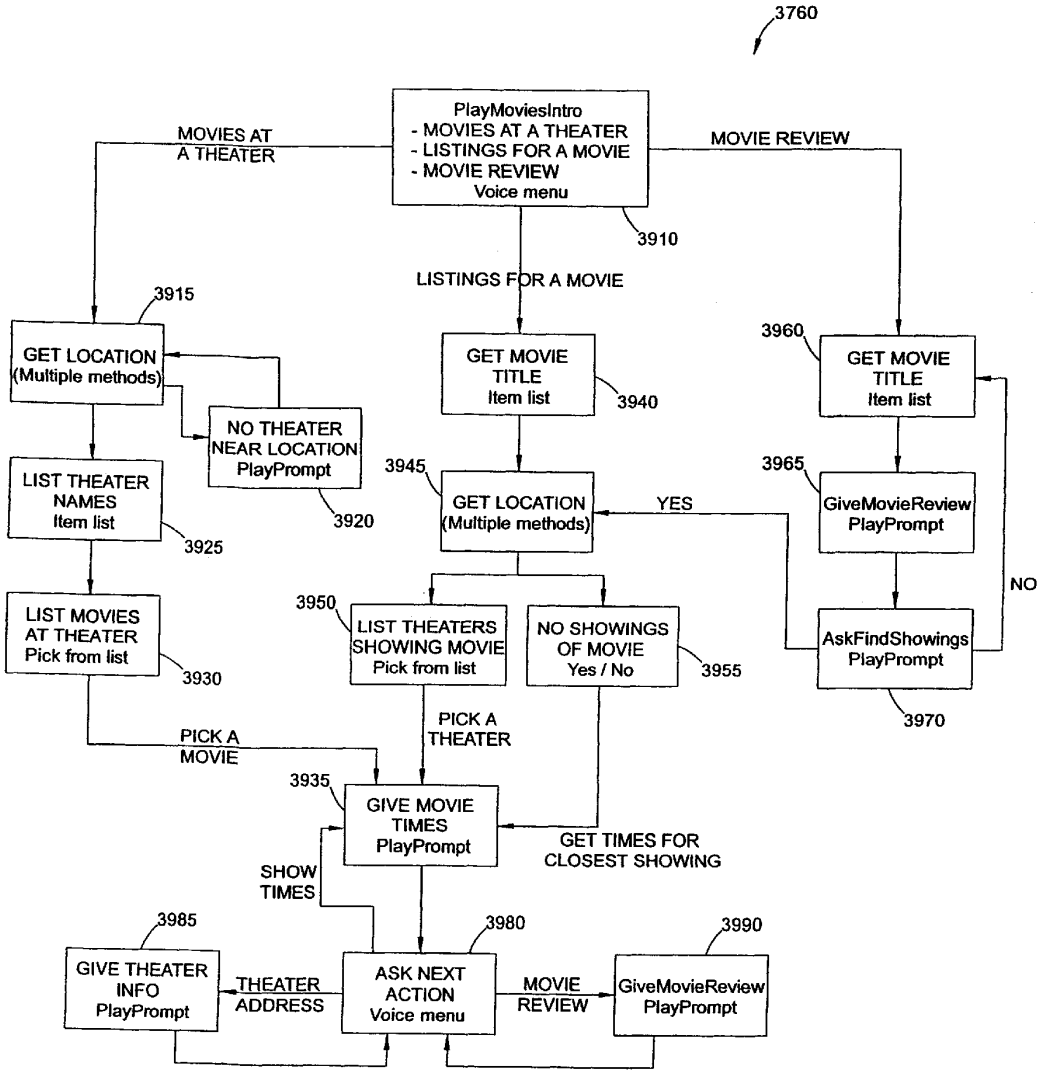

3760
PlayMoviesIntro
- MOVIES AT A THEATER
- LISTINGS FOR A MOVIE
- MOVIE REVIEW
Voice menu
3910
MOVIES AT A THEATER
MOVIE REVIEW
LISTINGS FOR A MOVIE
3915
GET LOCATION (Multiple methods)
NO THEATER NEAR LOCATION PlayPrompt
3920
LIST THEATER NAMES Item list
3925
LIST MOVIES AT THEATER Pick from list
3930
PICK A MOVIE
3935
GIVE MOVIE TIMES PlayPrompt
SHOW TIMES
3985
GIVE THEATER INFO PlayPrompt
THEATER ADDRESS
3980
ASK NEXT ACTION Voice menu
MOVIE REVIEW
3990
GiveMovieReview PlayPrompt
GET MOVIE TITLE Item list
3940
3945
GET LOCATION (Multiple methods)
YES
3950
LIST THEATERS SHOWING MOVIE Pick from list
NO SHOWINGS OF MOVIE Yes / No
3955
PICK A THEATER
GET TIMES FOR CLOSEST SHOWING
3960
GET MOVIE TITLE Item list
3965
GiveMovieReview PlayPrompt
AskFindShowings PlayPrompt
3970
NO

FIG. 39

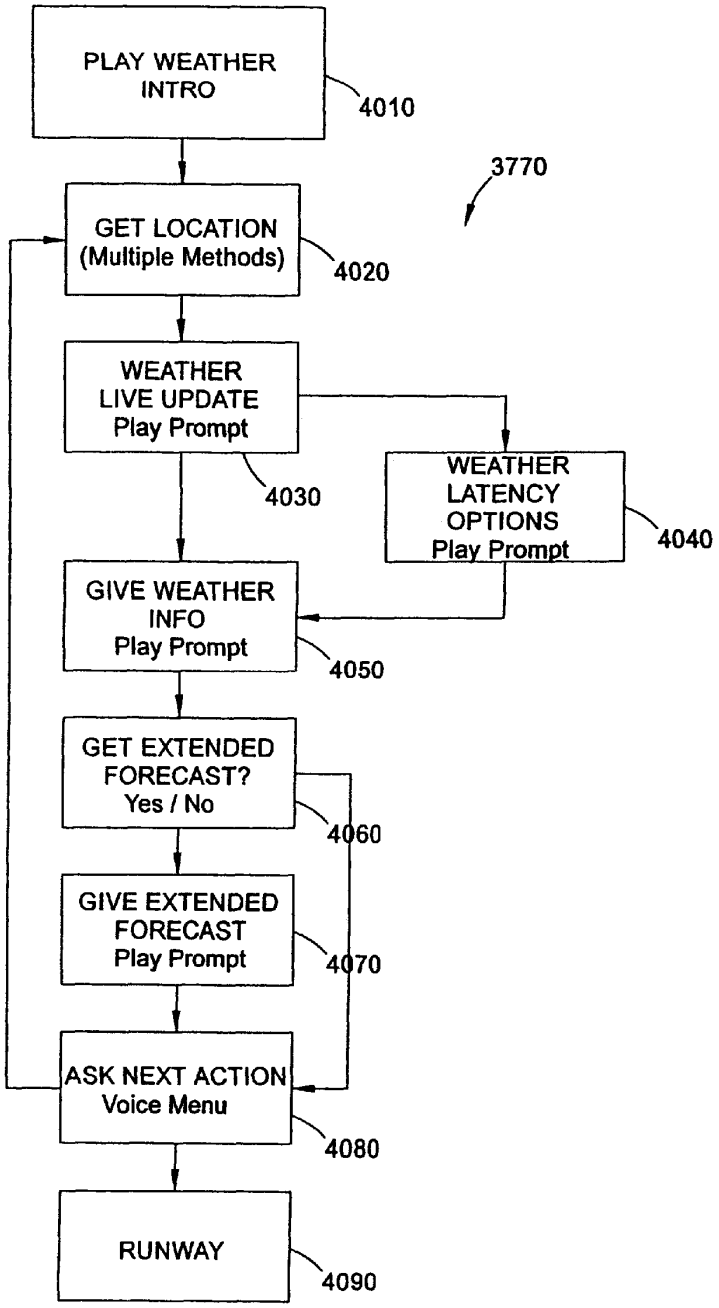

PLAY WEATHER INTRO
4010
3770
GET LOCATION (Multiple Methods)
4020
WEATHER LIVE UPDATE Play Prompt
4030
WEATHER LATENCY OPTIONS Play Prompt
4040
GIVE WEATHER INFO Play Prompt
4050
GET EXTENDED FORECAST? Yes / No
4060
GIVE EXTENDED FORECAST Play Prompt
4070
ASK NEXT ACTION Voice Menu
4080
RUNWAY
4090

FIG. 40

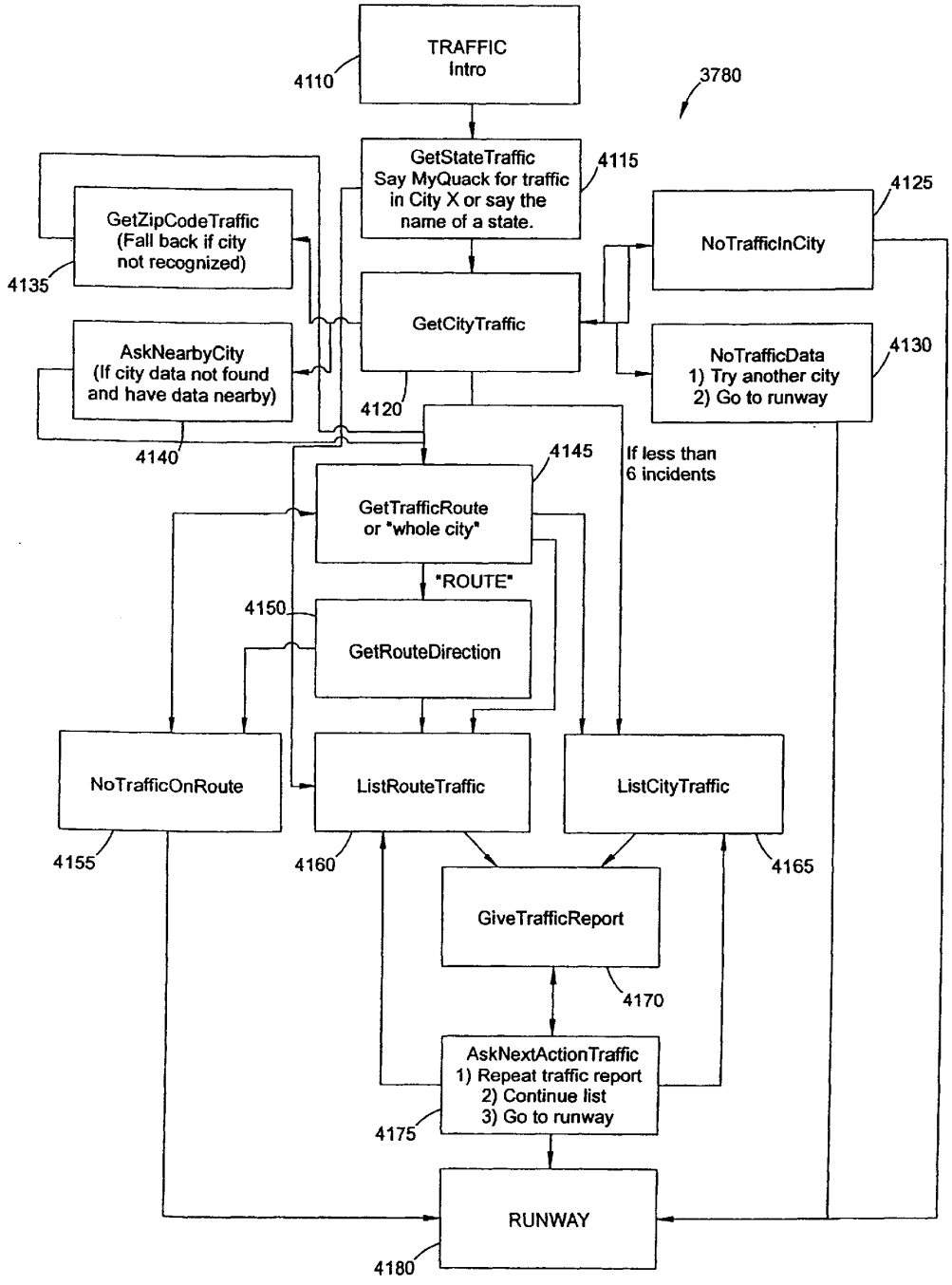

TRAFFIC
Intro
4110
3780
GetStateTraffic
Say MyQuack for traffic in City X or say the name of a state.
4115
GetZipCodeTraffic
(Fall back if city not recognized)
4135
NoTrafficInCity
4125
GetCityTraffic
AskNearbyCity
(If city data not found and have data nearby)
NoTrafficData
1) Try another city
2) Go to runway
4130
4120
4140
4145
If less than 6 incidents
GetTrafficRoute
or "whole city"
"ROUTE"
4150
GetRouteDirection
NoTrafficOnRoute
ListRouteTraffic
ListCityTraffic
4155
4160
4165
GiveTrafficReport
4170
AskNextActionTraffic
1) Repeat traffic report
2) Continue list
3) Go to runway
4175
RUNWAY
4180

FIG. 41

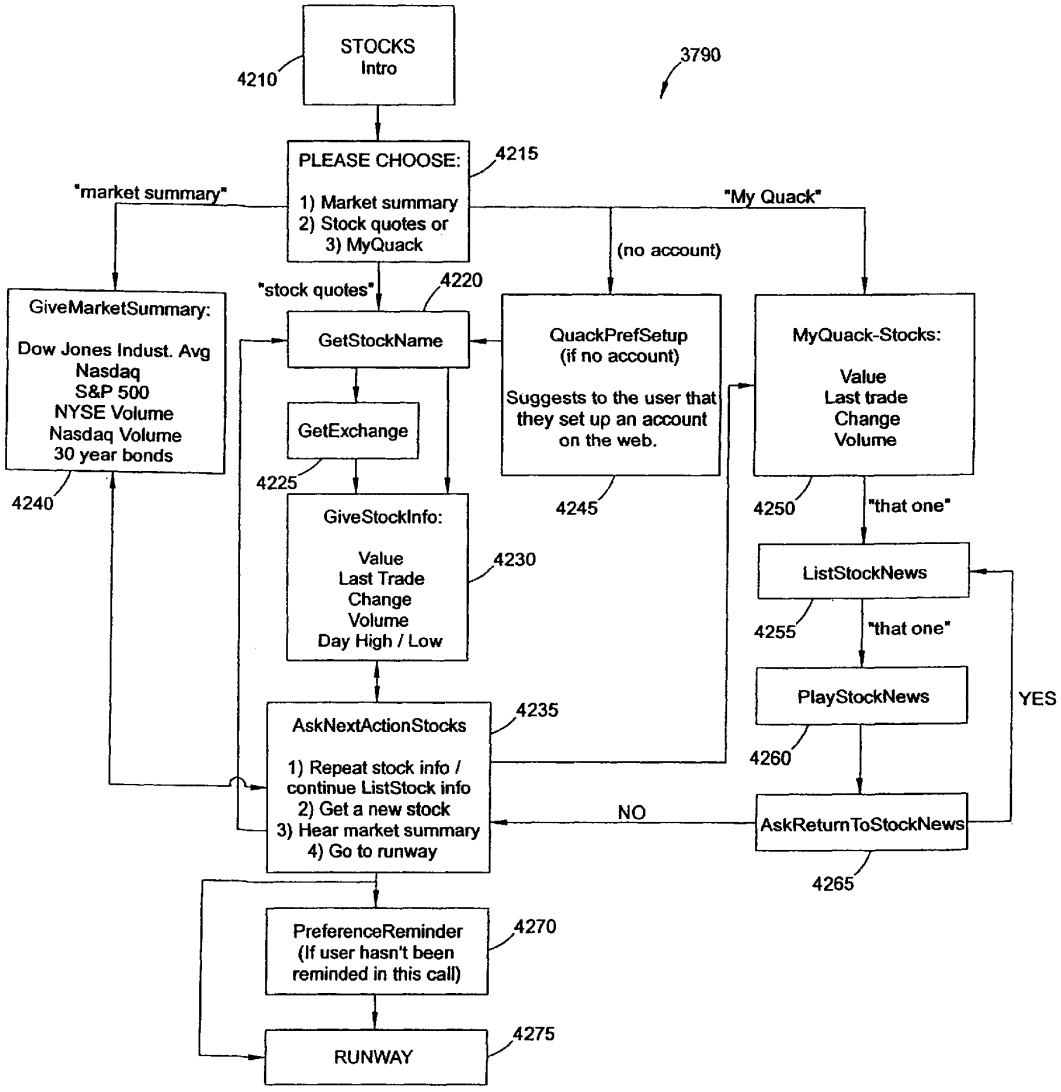

STOCKS
Intro
4210
3790
PLEASE CHOOSE:
1) Market summary
2) Stock quotes or
3) MyQuack
4215
"market summary"
"My Quack"
(no account)
"stock quotes"
4220
GiveMarketSummary:
Dow Jones Indust. Avg
Nasdaq
S&P 500
NYSE Volume
Nasdaq Volume
30 year bonds
4240
GetStockName
QuackPrefSetup
(if no account)
Suggests to the user that they set up an account on the web.
4245
MyQuack-Stocks:
Value
Last trade
Change
Volume
4250
GetExchange
4225
GiveStockInfo:
Value
Last Trade
Change
Volume
Day High / Low
4230
"that one"
ListStockNews
4255
"that one"
PlayStockNews
4260
YES
AskNextActionStocks
1) Repeat stock info / continue ListStock info
2) Get a new stock
3) Hear market summary
4) Go to runway
4235
NO
AskReturnToStockNews
4265
PreferenceReminder
(If user hasn't been reminded in this call)
4270
RUNWAY
4275

FIG. 42

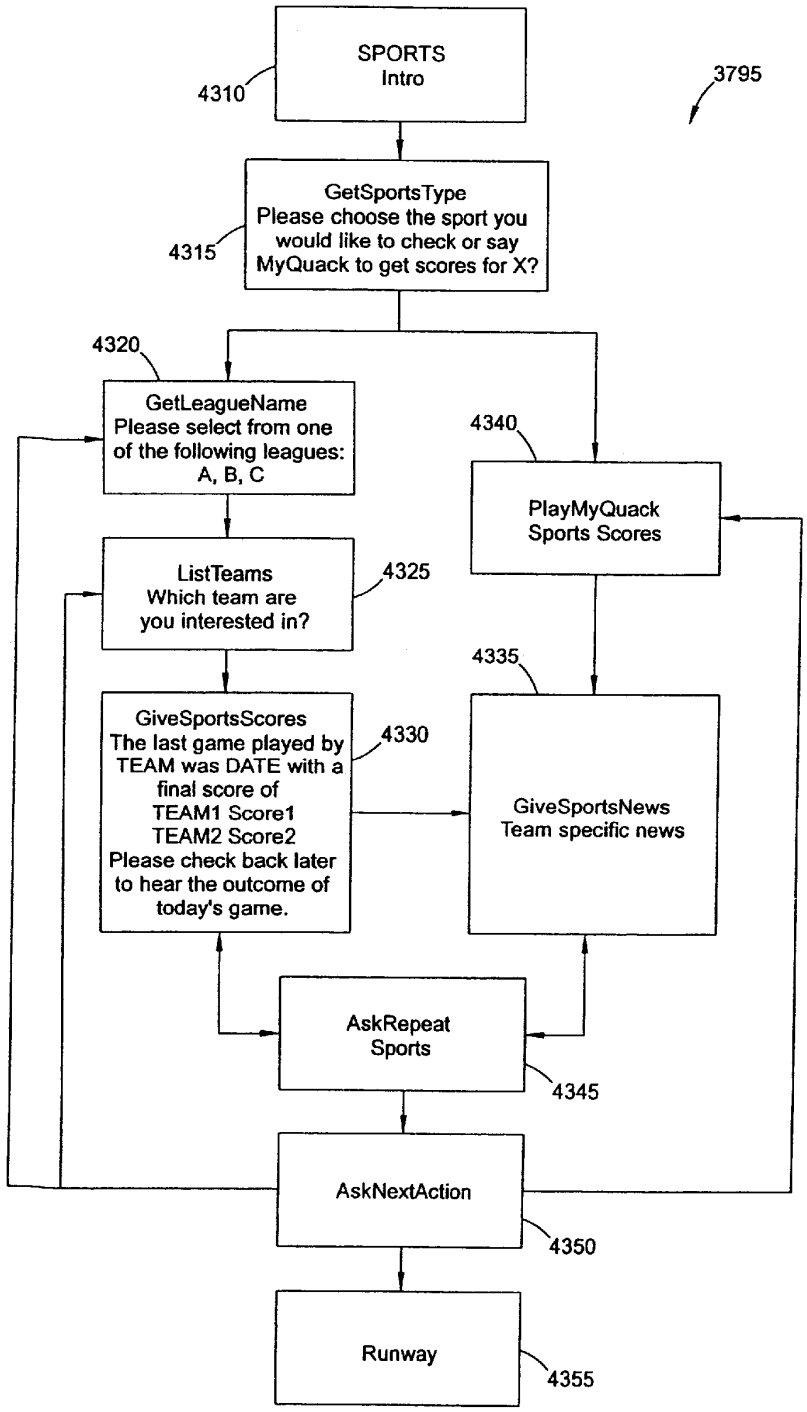

SPORTS
Intro
4310
3795
GetSportsType
Please choose the sport you would like to check or say MyQuack to get scores for X?
4315
4320
GetLeagueName
Please select from one of the following leagues: A, B, C
4340
PlayMyQuack
Sports Scores
ListTeams
Which team are you interested in?
4325
4335
GiveSportsScores
The last game played by TEAM was DATE with a final score of
TEAM1 Score1
TEAM2 Score2
Please check back later to hear the outcome of today's game.
4330
GiveSportsNews
Team specific news
AskRepeat
Sports
4345
AskNextAction
4350
Runway
4355

FIG. 43

SYSTEM AND METHOD FOR VOICE ACCESS TO INTERNET-BASED INFORMATION

BACKGROUND OF THE INVENTION

The present invention relates generally to the Internet. More particularly, the present invention relates to a system and method for voice access to Internet-based information.

The Internet has developed into a medium by which a person using a computer connected to the Internet can access a virtually limitless amount of information. The ability to access information via the Internet can be provided in a variety of different ways. Sometimes information is provided by Internet search engines, which typically search the Internet for key words or phrases and then provide a list of web sites which include the search words or phrases in the web page, such as, its text or embedded identifiers (e.g., metatags). Information is also accessible via the Internet by individual web sites. Individual web sites provide a wide variety of information and services which are both time-critical and not time dependent.

Unfortunately, while the Internet provides users with the potential to access a tremendous amount of information, finding useful Internet-based information is often time-consuming and cumbersome. Further, it is difficult to find and compare the same information available at multiple individual web sites because the same information can be organized in many different ways, described in many different forms, and changed at many different times. Added to these inherent difficulties with the Internet is the simple fact that a person cannot access the information available on the Internet without having a computer or other such electronic device which is connected to the Internet via an Internet Service Provider (ISP). Furthermore, to effectively find desired Internet-based information, a person must learn how to locate information via the Internet. As such, persons without computers, people without connections to ISPs, people without appropriate software, and people without experience or training on use of the Internet are limited from access to Internet-based information. These factors contribute to reasons why industry experts estimate that by the end of 1999, only 30% of the United States population has ever accessed the Internet, or "surfed the web." (Statistics from Forrester Research, October 1999).

Hence, it is desirable to provide a system and method by which people can access Internet-based information without directly using a computer, having a personal ISP connection, or gaining experience or training on use of the Internet. In addition, it is desirable to provide a system and method which allows people to obtain Internet-based information using convenient and readily available means, such as, by way of voice over a public telephone.

Many challenges have heretofore made such a system and method impossible. For example, people using such a system and method would want to have the information quickly or, at least, within some tolerable amount of time. Such speed is difficult. Even with conventionally high speed computers and fast communication connections, the delay required to access the Internet has made many people call it the "world wide wait" instead of the world wide web. Another challenge to such a system and method is the recognition of voice communications. Conventional voice recognition technology is slow and inaccurate. Convenient and meaningful access to Internet-based information by voice would require simple, quick, and accurate voice recognition. Yet another challenge to such a system and method is how to provide free access to Internet-based information while financially supporting the service. Conventional advertising on the Internet requires the ability to see advertising information, such as "banners", and make some manual selection, such as "clicking" the banner, to get more information on the advertised product or service.

Therefore, in addition to the above-mentioned capabilities, it is desirable to provide a system and method by which people can gain quick and accurate voice access to Internet-based information free of charge. It is further desirable to provide a system and method by which people can access a wide variety of Internet-based information by calling one telephone number.

BRIEF SUMMARY OF THE INVENTION

One aspect of an embodiment of the invention is a method of providing voice access to Internet-based information and services. The method includes receiving a signal indicating a communication connection request in which the communication connection request is initiated by a user of a communication apparatus, establishing a communication connection with the communication apparatus of the user, receiving voice information from the user, and communicating voice information responsive to the voice information received from the user. The responsive voice information includes Internet-based information.

Briefly, another aspect of an embodiment of the invention is a unitary voice portal to the Internet providing access to a wide variety of information and services available over the Internet. The voice portal includes a user interface, at least one database, and an update engine. The user interface coordinates voice communications with a user. The database is coupled to the user interface and stores information regarding users and Internet-based information. The update engine is coupled to the database and is in communication with the Internet and provides updated Internet-based information.

Briefly, another aspect of an embodiment of the invention is a system for providing voice access to Internet-based information and services. The system includes means for receiving a signal indicating a communication connection request, means for establishing a communication connection with the user, means for communicating information by voice to the user, means for receiving voice information from the user, and means for communicating voice information responsive to the voice information received from the user. The responsive voice information includes Internet-based information obtained from sources via the Internet.

Briefly, another aspect of an embodiment of the invention is a computer program product comprising computer readable program code for providing voice access to Internet-based information and services. The program code in the computer program product includes, first computer readable program code for receiving a signal indicating a communication connection request in which the communication connection request is initiated by a user of a communication apparatus, a second computer readable program code for establishing a communication connection with the communication apparatus of the user, a third computer readable program code for communicating information by voice to the user, a fourth computer readable program code for receiving voice information from the user, and a fifth computer readable code for communicating voice information responsive to the voice information received from the user. The responsive voice information includes Internet-based information which is information obtained from sources via the Internet.

Briefly, another aspect of an embodiment of the invention is a voice portal including a user interface and a database. The user interface coordinates voice communications with a user. The voice communications include Internet-based information.

Other features and advantages of embodiments of the present invention will become apparent to those skilled in the art upon review of the following drawings, the detailed description, and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated by way of example and not limitation in the figures of the accompanying drawings, in which like references indicate similar elements and in which:

FIG. **1** is a general diagrammatical representation of a voice portal connected to the Internet;

FIG. **2** is a general functional block diagram of an exemplary functional embodiment of the voice portal of FIG. **1**;

FIG. **3** is a more detailed block diagram of an exemplary physical embodiment of the voice portal of FIG. **1**;

FIG. **4** is a diagrammatical representation of an exemplary data structure model used by the voice portal of FIG. **1**;

FIG. **5** is a diagrammatical representation of the exemplary data structure model of FIG. **4** for user related information;

FIG. **6** is a diagrammatical representation of the exemplary data structure model of FIG. **4** for advertising related information;

FIG. **7** is a flow diagram illustrating an exemplary creation process of the exemplary data structure model of FIG. **4**;

FIG. **8** is a diagrammatical representation of the exemplary creation process of FIG. **7**;

FIG. **9** is a flow diagram illustrating an exemplary process of gathering Internet-based information using non-programming means;

FIG. **10** is a diagrammatical representation of an exemplary process of the non-programming development of rules associated with the voice portal of FIG. **1**;

FIG. **11** is an exemplary graphical user interface for the non-programming development of rules associated with the voice portal of FIG. **1**;

FIG. **12** is an exemplary graphical user interface window used in the non-programming development of rules associated with the voice portal of FIG. **1**;

FIG. **13** is an expanded form of the graphical user interface window of FIG. **12**;

FIG. **14** is an exemplary graphical user interface search data editor window used in the non-programming development of rules associated with the voice portal of FIG. **1**;

FIG. **15** is an exemplary graphical user interface window used in the non-programming development of rules associated with the voice portal of FIG. **1**;

FIG. **16** is an expanded form of the graphical user interface window of FIG. **15**;

FIG. **17** is an exemplary graphical user interface window used in the non-programming development of rules associated with the voice portal of FIG. **1**;

FIG. **18** is an exemplary graphical user interface window for vendor form options used in the non-programming development of rules associated with the voice portal of FIG. **1**;

FIG. **19** is an exemplary graphical user interface window for the testing of a URL in the non-programming development of rules associated with the voice portal of FIG. **1**;

FIG. **20** is an exemplary graphical user interface window for the selection of patterns in the non-programming development of rules associated with the voice portal of FIG. **1**;

FIG. **21** is an exemplary graphical user interface window used to identify patterns for the detection of links on multiple pages during the non-programming development of rules associated with the voice portal of FIG. **1**;

FIG. **22** is a diagrammatical representation of the hierarchical structure used in the programming of a spider;

FIG. **23** is an exemplary graphical user interface window for the programming of a spider used with the voice portal of FIG. **1**;

FIG. **24** is an expanded form of the exemplary graphical user interface window of FIG. **23**;

FIG. **25** is a flow diagram illustrating an exemplary process of fusing information into a unified database of the voice portal of FIG. **1**;

FIG. **26** is a flow diagram illustrating a second exemplary process of fusing information into a unified database of the voice portal of FIG. **1**;

FIG. **27** is a diagrammatical representation of the creation of a canonical existant from two existants for more complete information on a given item;

FIG. **28** is a diagrammatical representation of a first portion of an exemplary process of data isolation and transformation from an Internet source to a user of the voice portal of FIG. **1**;

FIG. **29** is a diagrammatical representation of a second portion of the exemplary process of FIG. **28** in which data is isolation and transformed from an Internet source to a user of the voice portal of FIG. **1**; and

FIG. **30** is a flow diagram illustrating an exemplary operational flow of the voice portal of FIG. **1**;

FIG. **31** is a flow diagram illustrating an exemplary operational subsystem of the flow diagram of FIG. **30**;

FIG. **32** is a flow diagram illustrating a second exemplary operational subsystem of the flow diagram of FIG. **30**;

FIG. **33** is a flow diagram illustrating a third exemplary operational subsystem of the flow diagram of FIG. **30**;

FIG. **34** is a flow diagram illustrating an exemplary process of funneling user responses in the voice portal of FIG. **1** to determine a desired item or service;

FIG. **35** is a flow diagram illustrating an exemplary process of carrying out a transaction using the voice portal of FIG. **1**;

FIG. **36**A is a flow diagram illustrating an exemplary process of advertising using the voice portal of FIG. **1**;

FIG. **36**B is a flow diagram illustrating a second exemplary process of advertising using the voice portal of FIG. **1**;

FIG. **37** is a flow diagram illustrating an exemplary dialog map of the voice portal of FIG. **1**;

FIG. **38** is a flow diagram illustrating an exemplary subsystem of the exemplary dialog map of FIG. **37**;

FIG. **39** is a flow diagram illustrating a second exemplary subsystem of the exemplary dialog map of FIG. **37**;

FIG. **40** is a flow diagram illustrating a third exemplary subsystem of the exemplary dialog map of FIG. **37**;

FIG. **41** is a flow diagram illustrating a fourth exemplary subsystem of the exemplary dialog map of FIG. **37**;

FIG. **42** is a flow diagram illustrating a fifth exemplary subsystem of the exemplary dialog map of FIG. **37**; and

FIG. **43** is a flow diagram illustrating a sixth exemplary subsystem of the exemplary dialog map of FIG. **37**.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

A system and method for voice access to Internet-based information are described. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be evident, however, to one skilled in the art that the present invention may be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form in order to facilitate description of the exemplary embodiments of the present invention.

One aspect of an exemplary embodiment of the present invention includes a system which provides voice access to Internet-based information and services by receiving a signal indicating a communication request in which the communication request is initiated by a user of a communication apparatus, establishing a communication connection with the communication apparatus of the user, receiving voice information from the user, and communicating voice information responsive to the voice information received from the user. The responsive voice information includes Internet-based information.

Another aspect of the present invention is related to a system and method for using voice over telephone to access, process, and carry out transactions over the Internet. Yet another aspect of the present invention is related to a system and method for determining if one web site has the same information as another web site. Even yet another aspect of the present invention relates to a system and method for advertising using an Internet voice portal. Still yet another aspect of the present invention relates to a system and method for non-programming development of rules used in the transformation of Internet-based information. Another aspect of the present invention is related to a system and method for funneling user responses in an Internet voice portal system in order to determine a desired item. Another aspect of the present invention is related to a system and method for the transformation and canonicalization of systematically structured data.

In one embodiment, a computer system is used which has a central processing unit (CPU) that executes sequences of instructions contained in a memory. More specifically, execution of the sequences of instructions causes the CPU to perform steps, which are described below. The instructions may be loaded into a random access memory (RAM) for execution by the CPU from a read-only memory (ROM), a mass storage device, or some other persistent storage. In other embodiments, hardwired circuitry may be used in place of, or in combination with, software instructions to implement the present invention. Thus, the embodiments described herein are not limited to any specific combination of hardware circuitry and software, nor to any particular source for the instructions executed by the computer system.

FIG. **1** illustrates a connection between a voice portal **10** and a network **20**. In an exemplary embodiment, network **20** is the Internet, a worldwide network of computer networks that use the TCP/IP network protocols to facilitate data transmission and exchange. In alternative embodiments, network **20** is any type of network, such as, a virtual private network (VPN). Network **20** preferably provides communication with Hypertext Markup Language (HTML) Web pages **30** and **40**. Web pages **30** and **40** include a variety of data on a variety of Web servers. Network **20** also provides communication with non-voice portal **50** which couples computers **52** and **54** and a service **56** including a database **58** to network **20**. Service **56** is any type of company, content or service provider with a connection to network **20**. Database **58** is a storage medium for data and may be an optical, magnetic, or any other suitable storage medium.

Generally, voice portal **10** is implemented as a network of servers. Servers can be configured by software. Preferably, the servers include a significant amount of read/write memory including disc drives and other storage. In general, users access voice portal **10** via telephones, such as, a cell phone **12** or a standard telephone **14** by calling a telephone number (using the plain old telephone service (POTS)) which initiates communication between the telephones and voice portal **10**. Alternatively, other types of telephone service can be utilized to communicate voice or voice data to portal **10**. The portal **10** can be connected to telephones **12** and **14** via a variety of lines, networks, and stations. Advantageously, voice portal **10** provides for voice communication with the user. Voice portal **10** allows the user access to information and services from web pages **30** and **40** as well as other sources available via network **20**. Such access is provided in a quick and efficient way by voice portal **10** continually retrieving, organizing, and storing information from a variety of web sites and Internet services. Other user interface platforms may also be provided for using voice portal **10**. Such user interface platforms include, for example, WAP (wireless application protocol) and web interfaces.

FIG. **2** illustrates exemplary functional operations carried out by voice portal **10**. These functions may be carried out in any variety of ways, including any number of physical structures. In an exemplary embodiment, voice portal **10** includes a user interface **110**, an advertising subsystem **120**, a customer management subsystem **130**, an existant subsystem **140**, a fusion engine **150**, an update engine **160**, and a database **170**.

User interface **110** coordinates voice communications between voice portal **10** and the user. User interface **110** can be either via speech, via the Internet or "world wide web" (WWW), via a wireless application protocol (WAP) interface, or any other platform interface. In an exemplary embodiment, user interface is speech oriented. In such a speech oriented embodiment, user interface **110** uses word-based automatic speech recognition (ASR) for accepting user input wherever possible. User interface **110** can use a speech recognition software package, such as, Speech Works provided by Speech Works International of Boston, Mass. For high rates of speech recognition, user interface **110** advantageously utilizes a funneling process which funnels user response to a set of recognizable answers. Funneling is described further with reference to FIG. **34**. User interface **110** also uses spelling-based ASR for accepting user input when word-based ASR is not possible. Finally, user interface **110** uses keypad entry for accepting user input only when advantageous to user. The key entry utilizes the keys on telephones **12** and **14** (FIG. **4**).

In an exemplary embodiment, user interface **110** performs one or more of the following tasks: (1) Identify a user with a phone number and other user-specific information. (2) Start a new session for a given user on a given platform. (3) Add a new interaction for a given user on a given platform. (4) Update a user's preference within the set of vertical domains of interest available in voice portal **10**. (5) Enable or disable user preferences for that vertical domain of interest. (6) Update a user's expertise level either generally

or within a specific vertical. (7) Update a user's demographic or personal information (as well as credit card information). (8) Update a user's session state with user interface-specific information. (9) Add a new credit card to the database. (10) Update an existing credit card with new information. (11) Identify a credit card with the credit card type and number and check if it is in the database already. (12) Set the list of vertical domains available to the user and its order. (13) End a user's session normally. (14) Notify customer management subsystem **130** that the user's session abnormally terminated into some defined status (e.g., call dropped, session timeout). (15) Determine the most recent session of a user given a certain platform, such that it is possible to resume a session if a session was abnormally terminated (e.g., dropped call, session time-out), and return the session state that was stored. User interface **110** can perform additional functions related to identification, session, user, and payment protocols.

Advertising subsystem **120** coordinates activities related to the advertisements to be presented to the user during a communication session. In an exemplary embodiment, advertising subsystem **120** includes advertisements, such as, sponsored advertisements, advertisements targeted to particular users, and permission-based advertisements which are presented only after an affirmative request from the user. In an exemplary embodiment, advertising subsystem **120** provides one or more of functions: (1) Choose an advertisement to play based on the user, session, location, content and item being explored. (2) Record that an advertisement was played and if it was completed or not. (3) Record that a speak-through (i.e., as described below, an advertisement where the user selectively chooses to hear more on an advertised subject) was made. (4) Store customer and session information within a bean so that repeated database calls are not needed. (5) Create a record for a company that provides advertisements, and be able to identify one. (6) Create an advertisement and an advertisement's contract to be stored in the database (as an advertisement may have different contracts for usage on the system). (7) Create a new sales employee or employer contact for Advertising sales purposes. (8) Update an advertisement and/or the contract of that advertisement. (9) Update an advertisement company to change contact information and address information. (10) Update sales employees and employer contacts. (11) Place/remove an advertisement in/from the active list. (12) Mark the advertisement's contract to be completed or incomplete based on external information. (13) Display a list of active advertisements based on the advertisement type. (14) Display a list of advertisements relating to a company based on criteria of either inactive, active, incomplete, complete or simply all the advertisements. (15) Display a list of contracts relating to an advertisement based on the above criteria. (16) Display a list of contracts relating to a sales' employee based on the above criteria. (17) Retrieve the completed listing of an employee, company, advertisement or advertisement contract by simply passing in a unique identifier. (18) Search the database for near string matches of employee, company, advertisement and advertisement contract existants. (19) Keep track of the deliveries paid for a company on a specific contract and be able to update the outstanding balance of the company. (20) Search the update logs to make sure that no data integrity errors are present. (21) Create and modify a playlist needed to store advertisements for a specific genre.

A variety of different methods may be used to carry out each of these operations. Advertising operations are described further with reference to FIG. **36**. Advertising subsystem **120** can perform additional functions related to identification, session, user, and payment protocols. The advertising techniques disclosed herein can also be used with a conventional personal computer (PC) interface web connection.

Customer management subsystem **130** coordinates the management of information related to the user and the user's use of voice portal **10**. In an exemplary embodiment, customer management subsystem **130** acquires information on the user, such as, preferences and demographics, which are selectively used by user interface **110**, advertising subsystem **120**, and other functions of voice portal **10**. Customer management subsystem **120** can perform additional functions related to identification, session, user, and payment protocols. Although subsystems **110**, **120** and **130** are described separately, the operations of each can be integrated in a single unit without departing from the principles of the invention.

User Interface (UI) **110** and customer management subsystem **130** interact to provide for the selection of vertical domains and the access of Internet-based information. Vertical domains categorize various fields or areas from which a user may select within voice portal **10**. In order for UI **110** to communicate effectively with a user, certain preferences and user facts must be ascertained and understood either passively or actively. Customer management subsystem **130** stores such information into database **170**. Alternatively, a separate customer database could maintain such information.

Customer management subsystem **130** acquires information needed to determine customer preferences and facts from UI **110**. UI **110** passes data into customer management subsystem **130**, which processes it, and then relays it to at least one database. Further, there are the updates of preferences in existant subsystem **140** for further parsing. Then, existant subsystem **140** passes information such as user preferences and facts back to UI **110**.

Advantageously, customer management subsystem **130** is modifiable and extensible without making response times appreciably longer. As such, the process to add new vertical domains to voice portal **110** is rapid and consistent. The type of customer facts and demographics can never be completely defined, as new vertical domains can always be added.

Customer management subsystem **130** records all transactions made by users that are subscribed and unsubscribed via a database. Customer management subsystem **130** also records items that the user locates in a formed history list and tracks the collections that the user looked at (on the web site and through WAP devices).

Customer management subsystem **130** identifies subscribed customers whenever possible, and as passively as possible. Thus, recognition of customers preferably takes place via some sort of identification key, such as, for example, a telephone number and an ID ("PIN") upon entering a system. This identification preferably leads to certain preferences associated with the customer and experience level of a customer within each set of preferences. Additionally, the system allows for an additional level of identification (e.g. password identification) before authorizing a purchase to be made against stored credit card information.

Customer management subsystem **130** maintains, within each of the vertical domains, a set of preferences to facilitate the user interactions via voice portal **10**. For example, in an exemplary embodiment, customer management subsystem **130** gathers information from the customer in order to

further help determine what type of advertising to give to the customer, and how to improve the customer's service. Customer management subsystem **130** maintains customer preferences appropriate to each supported domain and updates customer data from data sources dynamically. For example, in the Auctions domain of interest, current bid status updated on user request. Voice portal **10** advantageously presents user data with currency appropriate to the domain. For example, in the Auctions domain of interest, bids are always current to within seconds. In the e-commerce domain of interest, pricing information is current when purchase price is presented.

Advantageously, customer management subsystem **130** provides reporting and analysis to allow determination of which users are accessing which services. Further, customer management subsystem **130** provides reporting on session and transaction history by different demographic segment such as, for example, determining which services are accessed by users from a certain income bracket, gender, or age group. Customer management subsystem **130** also provides reporting of relatedness based on actual use (e.g., the ability to report what other services are accessed by users who are interested in movies).

In order to continually add value and transition with users from one platform to another (for example from the phone to the web, or from the phone to WAP), customer management subsystem **130** advantageously supports personalization features to improve customers experience with the services. In addition to personalization, other sources of "stickiness" (customers "sticking" with the service in light of competition) includes the support of community features such as networks of friends or of folks with common interests. Thus, customers tend to be more loyal to the particular service provider if personalization features and community features are included with customer management subsystem **130**.

To support any adaptation of service (or advertising) to customer behavior, customer management subsystem **130** advantageously tracks use of services. Further in the area of interface evaluation, typical user explorations of interface hierarchies may help identify problem areas or very useful areas, or correlated sets of sub-features in single sessions. Another example of an important attribute the services of voice portal **10** is timing. For example, the use of a "barge-in" (where a user can interrupt with an answer before a list or prompt is finished) can signify a more advanced user and a string of barge-in selections to a single sub-tree repeatedly for a specific user may advantageously be detected by customer management subsystem **130** and lead to an opportunity for a short-cut—either a general one, or possibly a customer-specific one.

An aspect of "stickiness" is adaptation of services to a customer's preferences. While this can include relatively simple features such as customer information retention in support of non-repetitive "sign-up" or "purchasing" data-entry requirements, it can also include preferences for navigation of particular sub-trees of interaction in different front-ends, and preferences for service/vendor ordering or selection. As an example of vendor preference or ordering, a user may select a "preferred vendor," allowing voice portal **10** to limit a list of vendors for a found product to two: cheapest and preferred.

Vertical preferences should be passively set based on user's actions That is, after requesting a particular attribute more than once, a passive preference would be set. Alternatively, preferences are dynamic, changing based on user's actions. Preferably, users are able to override all passive preferences, by setting or resetting them either through voice or web interfaces.

Customer management subsystem **130** can pull user preferences, such as stock information, weather preferences and (the like) from personalized web pages such as MyYahoo, and MyExcite. The personalized web pages can be previously created by the user via a conventional Internet connection. Alternatively, the personalized web pages can be built by customer management subsystem **130** in response to user voice commands. These pages can then be translated to be used with voice portal **10**. General preferences can advantageously be used as a default preference if specific vertical preferences or current call preferences do not exist.

The following is a listing of exemplary vertical preference requirements and their descriptions. Each preference is used differently throughout each interface. In an exemplary embodiment, the only preference for weather is the weather for the location that the customer requests. By default, the user's location is their ZIP code. The Most Commonly Used Location could be overridden by a current call location, if available.

In the Sports domain of interest, there are several different preferences to be looked at. First, favorite sports are an option. Certain sports scores, schedules, and standings can also be sent to the user. For web sites, exclusivity can be used to not send advertisements and information of certain sports. For example, one user may not want to hear information on hockey games, rather the user wants baseball information. Second, the preference granularity can be increased with certain teams being preferred over others. In each of these granularities, it is possible that a most-recently used (MRU) list of limited choices is used to determine the preference list. Besides type of sport and team preferences, preferred events may be used.

In the Movies domain of interest, needed preferences include locality of customer and locality of theaters, types of movies (e.g., thrillers, horror, action, etc . . .), ratings of movies (AA, G, R, etc . . .), and movies with a customer's favorite actors/actresses in the movies. Each of these preferences may be listed in an MRU list of limited choices.

In the Traffic domain of interest, the main preference used would be specific routes that the customer would like to use to reach a destination, with an attribute being the time (the current being the default). Thus, an MRU list of limited routes could make up the preference list of a customer.

In an exemplary embodiment, there is a two-level hierarchy of preferences for the Stocks domain of interest. First, there is a preference for a market list and second, within each market, there is a preference of which stocks and indices to look at. Again, an MRU list of TBD choices of markets and stocks may be tabulated. Other vertical domains of interest may include restaurants, concerts and live events, taxis, and airline reservations.

Referring still to FIG. **2**, existant subsystem **140** coordinates access by user interface **110**, advertising subsystem **120**, customer management subsystem **130**, fusion engine **150**, and update engine **160** to database **170**. Existant subsystem **140** manages the creation, adaptation, and manipulation of the data structures contained in database **170**. Data contained in database **170** is gathered from Internet sources by update engine **160**. In an exemplary embodiment, the data structure used in database **190** is based on a hierarchy of "existants" or things and their relationships and associations with each other. Advantageously, the ability to replicate and modify information in database **170** is more

easily done because database **170** interacts only with existant subsystem **140**. Existants and their creation are described further with reference to FIGS. **4–10**. Specifically, an exemplary data structure model for existants is described with reference to FIGS. **4–6** although various other structures for existants can be utilized. Creation and updating of existants are described with reference to FIGS. **7–10**.

Fusion engine **150** determines whether two existants are the same and, if so, fuses the existants to form a third canonical existant. As such, fusion engine **150** establishes whether information gathered from one source is related or the same as information gathered from another source. Functions of fusion engine **150** are described further with reference to FIGS. **25**, **26**, and **27**.

Update engine **160** retrieves information from the Internet to update information and attributes contained in database **170**. In an exemplary embodiment, update engine **160** utilizes "spiders" which retrieve information from the Internet in order to update information in database **170**. Operations of update engine **160** are described further with reference to FIGS. **7** and **8**.

Database **170** stores information used by voice portal **10**, such as, customer data, advertising information, and product and services information. Information in database **170** is stored into existants, existant attributes, existant relationships, and existant associations. What existants are, how they are formed, how they are related to each other, and how they relate to the functionalities of voice portal **10** are described further below. In alternative embodiments, multiple databases may be used for specific types of information, such as, customer data, advertising information, and operations records.

FIG. **3** illustrates an exemplary physical layout of voice portal **10**. These physical structures are by way of example only. Other structures may be used in combination with or in lieu of those shown. In an exemplary embodiment, voice portal **10** includes front end servers **210**, a front-to-back network **220**, back end servers **230**, and a back-end network **240**. Users communicate via telephone with one of the front end servers **210**, which is coupled to back end servers **230** by front-to-back network **220**.

In an exemplary embodiment, back end servers **230** include a proxy manager **245**, proxies **250**, beans **260**, and a database **270**. Proxy managers **245** receive requests for information from one of front end servers **210** via front-to-back network **220**. Proxy managers **245** communicate via back end network **240** to determine work load levels at each of proxy managers **245**. Once an appropriate proxy manager **245** is determined, the appropriate proxy manager **245** pulls a free proxy from a pool of free proxies **250** and assigns the proxy to a bean **260**. Bean **260** is associated with database **270** in order to retrieve information, insert information, search existants or existant relationships, or perform any other function possible with database **270**.

The virtual database structure described with reference to FIG. **3** is designed to deliver information garnered from Internet **20** to users of voice portal **10** in a timely and highly utilitarian way. People need and use information in a variety of settings and ways, and, advantageously, voice portal **10** supports this on a variety of platforms including, but not limited to, the phone (e.g., voice, WAP and both), the web, and portable connected computing devices (e.g., Palm® OS device, WinCE® device, RIM pager).

Back end servers **230** include a database service support with a variety of features, including data collection and fusion. Data collection includes the amassing of data from Internet sources at regular intervals to be scheduled for particular item types and/or sites, as described with reference to FIGS. **7** and **8**. Voice portal **10** detects changes to data source sites and notifies the appropriate site rule manager, as described with reference to FIGS. **9** and **10**. Voice portal **10** also supports non-expert definition of data extraction for data sources, as also described with reference to FIGS. **9** and **10**.

In the process of "fusion," voice portal **10** identifies identical items from different Internet vendors. During the fusion process, voice portal **10** retains meta data about the source of all information. Meta data includes data about data. For example, meta data may document data about data elements or attributes, (name, size, data type, etc.) and data about records or data structures (length, fields, columns, etc.) and data about data (where it is located, how it is associated, ownership, etc.). Further, voice portal **10** supports interactive clarification of fusion decisions or non-decisions by non-experts in cases where certainty cannot be determined automatically. Voice portal **10** also supports additions of new data types and data elements, without code change. Even further, voice portal **10** supports domain-specific concepts of relatedness that are identified through market research, trial, and opportunity. For example, in the e-commerce domain of interest, cheaper, better, often-bought-with, and most-popular are important relatedness concepts. In the movies domain of interest, related movies and products, and best movies in a category, most popular, best by reviewer, and cast, are important relatedness concepts. Voice portal **10** collects and retains related information necessary to provide additional detail about an item (e.g., product descriptions). The operation and functionalities of fusion are further described with reference to FIGS. **25–27**.

FIG. **4** illustrates an exemplary data structure model **300** used by database **170** of voice portal **10** in which "existants" (or things) are given attributes, associations, and relationships. An "inheritance" relationship between existants is depicted by a solid line with a triangle head. An "association" relationship between existants is depicted by a dashed line with an open head arrow. For example of an inheritance relationship, in the data structure model **300**, a block **310** is an "event". An "event" is an "existant" or thing, illustrated by a triangle headed arrow **315** to a block **320**. Similarly, a "movie showing" (block **330**) is an "event" (block **310**), illustrated by a triangle headed arrow **335**. For example of an association relationship, events are associated with "venues", as illustrated by an open headed arrow **345** to a block **340**. Similarly, a movie showing (block **330**) is associated with a "movie package" (block **350**), as shown by an open headed arrow **355**. Events can also be sporting events, dramas, concerts, comedy shows, fireworks presentations, dancing performances, or any other activity.

Data structure model **300** includes more existants, associations, and relationships which are illustrated in FIG. **4**, but not described here. Further, data structure model **300** may include more existants, associations, and relationships which are not included in the illustration. FIG. **4** is for illustration only.

Referring now to FIG. **5**, an exemplary data structure model **400** is illustrated to show the object oriented relationships between a user or customer object and the different vertical classes. Depictions of inheritance and association relationships are the same as in the depiction of data structure model **300** described with reference to FIG. **4**. In an exemplary embodiment, user information arranged in data structure model **400** is contained in database **170**.

However, in alternative embodiments, such user information may be contained in a separate customer database.

The customer is an Existant (Customer Existant Block **402**) and is a direct descendent of the top level, or the "Existant" existant, within the hierarchy, and thus inherits all of its properties and methods. The reason behind this structure is that database **170** and its methods are already created and the structure allows reuse of code.

The customer object contains various pieces of information. The generic Preferences class contains information on preferences, such as, "Traffic", "Weather", and "Movies". Each time a customer entered a new and different vertical domain of interest, an instance of the Preferences object to the vertical domain's name is created with preference data inserted. If the vertical domain already exists, then the object is modified with the updated information.

Session class records the information directly about a user's session (session block **404**). The session may be a call, a search through the website, or a call using the WAP. Data, such as, time of day and duration are general attributes but analysis on whether the user made a call from a landline or cell phone is specific to phone sessions. This type of data is useful for determining to whom voice portal **10** directs marketing (for advertising purposes), and improving both performance and service. As well, a customer object has a link to each of these session objects to determine what was the last session on that platform (in case a user terminated the session and would like to reconnect at that specific time).

A Phone Session block **408** records information relating to a communication session where a telephone is used to communicate with portal **10**. Phone Session block **408** includes information, such as, the current level of interaction, the current domain of interest, the type of interface platform (e.g., WWW, WAP, ASR), and previous levels visited. Advantageously, Phone Session block **408** allows the user to rejoin a session where he or she left off in a previous session or from an interrupted session. Other existant blocks, such as, credit card info existant, location existant, and preferences existant contain associated attributes and record information as needed.

The Expertise class (Expertise block **406**) serves the purpose of maintaining different levels of usability (generically, and for different preferences) across different platforms (i.e. Phone, WAP, WWW). The Customer has links to each of these class instances. These are not included in the Preferences class since preferences can cross platforms and user's capabilities cannot.

FIG. **6** illustrates an exemplary data structure model **450** used by database **170** of voice portal **110** for information related to advertising. Depictions of inheritance and association relationships are the same as in the depiction of data structure model **300** in FIG. **4**. In an exemplary embodiment, advertising information arranged in data structure model **450** is contained in database **170**. However, in alternative embodiments, such advertising information may be contained in a separate advertising database.

Advantageously, data structure models **300**, **400** and **450** provide for a continually expanding arrangement of information on existants, associations, and relationships. Furthermore, models **300**, **400**, and **450** allow for the creation of new vertical domains of interest quickly and without changing previously entered information. For example, model **300** includes information related to events, such as, movies and concerts as well as commodities, such as, books, toys, and electronics. Any event, such as, ballets can easily be added as an existant with an inheritance relationship with "event" and appropriate association relationships. Similarly, any commodity, such as, a vehicle can easily be added as an existant with an inheritance relationship to "manufactured item" and appropriate association relationships. The dynamic nature and expansive capabilities of data structure models **300**, **400**, and **450** allow voice portal **10** the advantage of being a unitary voice portal to a wide range of Internet-based information and services.

FIG. **7** illustrates a flow diagram **700** of an exemplary creation process of an existant, such as, existants shown in exemplary data structure model **300** (FIG. **4**), data structure model **400** (FIG. **5**), and data structure model **450** (FIG. **6**). In a step **710**, a web page on the Internet is found. In an exemplary embodiment, a spider is used to find particular web pages relating to a pre-determined category of items. A spider is a conventionally known program that automatically explores the World Wide Web (WWW) by retrieving a document and recursively retrieving some or all of the documents that are referenced in it. In contrast, a normal web browser operated by human does not automatically follow links other than in line images and URL redirection. After step **710** is performed, a step **720** is performed in which information is identified on the found web pages by using a chosen form which overlays the page to filter out particular information. After step **720**, a step **730** is performed in which rules are used to identify characteristic information or attributes from the information retrieved by the form overlay in step **720**. Characteristic information or attributes define what the existant is. Rules define the organization of existant attributes. For example, a movie existant may include the attributes of a title, a director, a cast, a release year, and a synopsis.

After step **730** is performed, a step **740** is performed in which attributes are organized within the existant and the existant is stored in database **170**. Preferably, the organization and arrangement of attributes within the existant are structured by pre-defined rules.

FIG. **8** illustrates the exemplary creation process of existants as described with reference to FIG. **7**. A spider **810** traverses Internet **20** for information stored on a wide variety of different web pages. Information retrieved by spider **810** is organized and arranged according to rules **820** in order to place information in a data structure **830**. In an exemplary embodiment, spider **810** retrieves information from Internet **20** regarding movies. For example, spider **810** may traverse the IMDB web site and retrieve information regarding the title, director, cast, year of release, and running time for a particular movie. Once movie information is stored in data structure **830**, data structure **830** is applied to a lexical table **840**. Lexical table **840** organizes attributes contained in data structure **830** and places the information in three columns. In an exemplary embodiment, the first column of lexical table **840** includes the original data, the second column includes the original data in a normalized and tagged format, and the third column includes the data in a searchable and mashed format. Lexical table **840** and data structure **830** are contained within memory structures in database **170**.

By way of an example, if spider **810** traverses Internet **20** for information related to the movie "Raiders of the Lost Ark," data retrieved from Internet **20** will be applied against a rule corresponding to movies and placed in data structure **830**. Such a rule for movies may include title, director, cast, and release year, all of which are attributes of movies. In this example, the title would be "Raiders of the Lost Ark," the director would be "Steven Spielberg," the cast would be "Harrison Ford and Karen Allen," the year would be "1981," and the running time would be "115 minutes." As such,

lexical table **840** would contain the title in its original format: "Raiders of the Lost Ark," the data in normalized and tagged format: <title> Raiders of the Lost Ark </title>, and in searchable mashed format: RaidersLostArk, without any spaces or identifying articles (e.g., the, a, an).

FIG. **9** illustrates a flow diagram **900** which depicts an exemplary process of gathering Internet-based information using non-programming means. In a step **910**, a search page is found and patterns are used to isolate the area on the page containing relevant information. After step **910** is performed, a step **920** is performed in which an appropriate form is found and special routines are invoked to extract actual data and information. After step **920**, a step **930** is performed in which multiple pages with related information is found given a particular page. Apart from the data specific patterns, there is an area pattern that defines where data specific patterns operate in the particular page. After step **930** is performed, a step **940** is performed in which links to more listings of products or services on the multiple pages are found. In an exemplary embodiment, a prediction routine is used to compute actual patterns of product listings from code samples.

In general, the prediction routine computes a pattern from a desired output given by a rule writer. Advantageously, the pattern prediction routine speeds up production because a rule writer simply has to paste from the HTML code the text fragments that he or she wants extracted, without having to develop the patterns to make that happen. The input fields currently used to write the patterns are used to insert this data.

By way of example, a prediction routine develops a pattern for Author data for web pages giving data on books by first having the rule writer copy a sample author name on the web page into the Author field. The algorithm then matches the sample data to its location on the web page. Characters or tags proximate the matched data are identified as a "prefix" and "suffix". Prefixes are characters before the matched data and suffixes are characters after the matched data. The prefix and suffix are used to construct a pattern.

The constructed pattern is applied to the web page to match against other data. If the constructed pattern picks up data which is not equal to the desired result, then the prefix and suffix used to develop the pattern are added to, for a more complete and accurate pattern. This procedure repeats to improve the pattern.

To further clarify this example, take the following HTML code from a web page giving product data on books:

```
<html>
<title> Programming Perl </title>
written by <b> Larry Wall</b>
</html>
<html>
<title> Learning Perl (<b> 2nd edition </b>)</title>
written by <b> Randal Schwartz </b>
</html>
```

The rule writer dumps "Larry Wall" in the Author field to indicate that this is the data to extract for Author.

The pattern prediction algorithm roughly works as follows:

```
n=1;
repeat
$page=~m / ({.}n) Larry \s+Wall ({.}n)/x;
$prefix=$1;
$suffix=$2;
$page=~m / $prefix (.*?) $suffix /x;
n=n+1;
until ($1 eq <desired_data>);
```

Starting with n=1 on the first page, the algorithm matches ">Larry Wall<" which means that $prefix gets value ">" and $suffix gets value "<". Next, the pattern prediction algorithm builds the pattern ">(. *?)<" using the values for $1 and $2 it got from the first step. Matching this pattern against the web page results in ">Programming Perl<" which is not equal to the desired result "Larry Wall". Therefore, n is incremented to n=2 and the pattern is refined to include another character in the prefix and suffix. Matching the web page with "({.}2) Larry \s+Wall ({.}2)" results in "b>Larry Wall</" which means that $prefix gets value "b>" and $suffix gets value "</". Next, the pattern prediction algorithm builds the pattern "b>(.*?)</" using the values for $1 and $2 it got from the first step. Matching this pattern against the web page results in "Larry Wall", the desired output.

Now, as the rule writer steps through web pages to apply the same pattern on different pages, he or she discovers that the pattern matches: "2nd edition" on the page about book "Learning Perl". The rule writer then improves the algorithm by giving a second example of a desired result, (i.e., he or she dumps "Randal Schwartz" into GUI input field), which triggers the pattern prediction algorithm to further increment n until a pattern enforcing a "y" before the <b> is created. The algorithm may perform several iterations, depending on the complexity of the web data data and the pattern needed.

After step **940** is performed, a step **950** is performed in which a vendor specific data extraction file is generated. In an exemplary embodiment, a routine is used that computes relevant URLs from code samples. Alternatively, the routine that computes URLs can be passed as a form. After step **950** is performed, a step **960** is performed in which a cache is created. After step **960** is performed, a step **970** is performed in which patterns for extraction of product data are created. In a preferred embodiment, a regression test mechanism supports editing the special routines.

FIG. **10** illustrates an exemplary process of the non-programming development of rules associated voice portal **10**. In the exemplary process, a rule writer from a set of rule writers **1010** accesses the World Wide Web ("WWW") **1020** in order to access information from any one of data source **1030**, data source **1035**, data source **1040**, or any other data source connected to WWW **1020**. Data retrieved from a data source is placed into a data structure utilizing a data organizing tool **1025**. Rule writers **1010** use data organizing tool **1025** to apply one of a multitude of possible forms to "pages" of information available via WWW **1020**. Such forms provide indications for the location of relevant information on the page and labeled with some distinctive tag. For example, a page provided on WWW **1020** may include a data input box in the upper left hand corner of the page. Further, relevant information on a part or service may be located after a HTML tag, such as, "<title>" for the title of a book.

It should be noted that as used herein the term "page" includes a user interface screen or similar arrangement which can be viewed by a user of the diagnostic system, such as screens providing graphical or textual representations of data, messages, reports and so forth. Moreover, such pages may be defined by a markup language or a programming language such as Java, perl, java script, or any other suitable language.

Using the form selected by rule writers **1010** from data organizing tool **1025**, data from data sources is organized into a data structure **1045**, data structure **1050**, data structure

1055, or any similar structure for maintaining information. Data structures **1045**, **1050**, and **1055** may be compared, fused, or utilized in the formation of a unified data structure **1060**. Unified data structure **1060** is stored in a database **1070**.

Advantageously, the exemplary process illustrated in FIG. **10** allows non-expert rule writers **1010** to select from a variety of forms provided by data organizing tool **1025** to use in the retrieval of information from particular web sites available via WWW **1020**. As such, data contained on web pages from data sources **1030**, **1035**, and **1040** can continually be updated to database **1070** with the form selected by rule writers **1010** using data organizing tool **1025**. As information contained in data structures **1045**, **1050**, and **1055** are compared for accuracy, data organizing tool **1025** detects when web pages have changed the format or arrangement of data on their corresponding web page.

FIGS. **11–24** illustrate an exemplary process of creating a new rule. Further, FIGS. **11–24** illustrate possible interactions between a rule writer and data organizing tool **1025** (FIG. **10**). One exemplary rule is based off an existing rule: the Amazon.com book products. The steps taken in constructing this rule are similar to the steps taken in constructing any other rule.

FIG. **11** illustrates a graphical user interface (GUI) **1110** which is used to initiate the creation of rules **820** (FIG. **8**). GUI **1110** includes a vendor window **1120**, a spider selection window **1130**, a query window **1140**, a status window **1150**, a search box area **1160**, and a code window **1197**. Search box area **1160** includes a slider bar **1170**, right set of arrows **1180**, left set of arrows **1190**, and a search window **1195**.

To start a new data source, a rule writer enters the data source (e.g., Amazon Book) in a vendor window **1120**. The rule writer presses 'Enter' and clicks the 'New' button. After this action is performed, a graphical user interface (GUI) **1200** illustrated in FIG. **12** is shown. The rule writer clicks on the 'Done' button after confirming that the data source is listed correctly. Next, graphical user interface (GUI) **1300** illustrated in FIG. **13** is shown. A URL is displayed corresponding to the selected vendor name. The rule writer is asked to confirm the correct URL. In the example of Amazon Book, the URL http://www.AmazonBook.com appears in a window of GUI **1300**. However, the URL link should read http://www.Amazon.com. The rule writer corrects the URL and clicks on the "done" button.

Referring again now to FIG. **11**, the rule writer selects the type of query that is desired. First, the rule writer selects query window **1140** and chooses from a list of potential queries. For example, "book package" maybe a possible query for the book vertical domain of interest. This search is started when the rule writer clicks on the "SDE" (search data editor) button in query window **1140**. The SDE button invokes a search data editor, which provides a graphical user interface (GUI) **1400** illustrated in FIG. **14**. GUI **1400** shows a list of attributes useable in a search for the particular item of interest. For example, where books are being searched, attributes such as ISBN or UPC are shown. Where searches are for other items, attributes are listed which correspond to that item. A search for "Movie Showings" results with attributes listed, such as, Movie Package, time, and showing date (see block **330** described with reference to FIG. **4**).

The rule writer types a ISBN number into the corresponding data box and clicks 'Done'. Buttons **1430** in GUI **1400** advantageously allow the rule writer to save different search criteria during different searches. Once the search criteria is entered, the rule writer clicks 'Done' and because no rules have been defined for the particular data source (i.e., Amazon Book), a graphical user interface (GUI) **1500** illustrated in FIG. **15** appears. GUI **1500** asks whether the rule writer wants to add a new rule or change the search data. In this example, the rule writer clicks on the "add" button and GUI **1500** expands to become graphical user interface (GUI) **1600** illustrated in FIG. **16**.

Referring now to FIG. **16**, the rule writer confirms that the correct type of query is highlighted. In this example, ISBN is highlighted and the rule writer clicks on the "yes" button. A graphical user interface (GUI) **1700** illustrated in FIG. **17** appears to instruct the rule writer that the home page of Amazon Book is loaded into the netscape browser. The rule writer is instructed to browse the web page associated to the ISBN rule. Once the search page is loaded into the Internet browser, the rule writer clicks the "done" button.

A graphical user interface (GUI) **1800** illustrated in FIG. **18** shows a form option to be selected by the rule writer. If the form is correct, the rule writer clicks the "done" button. If the form listed does not give the rule writer the choices required, the rule writer clicks on the "next" button to see other forms on the page. Once a page that matches is found, a graphical user interface (GUI) **1900** illustrated in FIG. **19** is displayed.

Data organizing tool **1025** (FIG. **10**) displays the resulting page in the Internet browser. If the page is correct, the rule writer clicks on "okay" on GUI **1900**. A graphical user interface (GUI) **2000** illustrated in FIG. **20** appears and asks how to detect single items on the page if the search matches on multiple items. GUI **2000** is also used to indicate where to find the URL to get details about the queried item. If only a single item was found, the rule writer clicks the "defer" button because not enough information is present to build the regular expression. If multiple items are found, a regular expression is entered into a data window **2010**. For example, an author search may return multiple items because a single author may have written several books. In other cases, even if the query only matches one item, it may be necessary to follow an additional URL link to get the information.

A graphical user interface (GUI) **2100** illustrated in FIG. **21** appears next and is used to detect multiple product pages. If the rule writer goes directly to the item searched for, there is no need for information to build the regular expression. Referring again to FIG. **11**, code window **1197** is filled with HTML code from the retrieved page. At this point, the rule writer is ready to specify attributes. Attributes are specified by entering a regular expression into the box next to their name. The regular expression must specify one substring in it (using parenthesis) as a result of the expression. For example, the regular expression: "this (all) matches" would return "all" as its result (assuming that the regular expression was able to match). For example, determining the pattern used to find the title of a book requires that the rule writer type in the title of the book into search window **1195**. A variety of HTML signals may be used. The "\s*" is required to indicate possible blank space between words. The first match of the search string entered in search window **1195** will highlight the first match found in the HTML code. For example, a title may be found inside a pair of <title> tags with some extra information. An exemplary attribute for title of a book may be "<title> ([Ô<]*) </title>". Once the attribute is entered, all matches to the attribute are found.

Referring again to FIG. **14**, search data editor **1400** consists of a form which can be used to assign values to type dependent attributes. The status window indicates what data organizing tool **1025** is doing. In an exemplary embodiment, the status states are idle, running the query over the Internet, and using the cache. Query window **1140** allows the rule

writer to set the type of query desired for the data source in question as well as set the search criteria by using the SDE button.

Spider selection window **1130** allows the rule writer to set the spider to be used if not doing a query search. In an exemplary embodiment, the possible spider types are full, incremental, special, and reference. A full spider takes all items that match the chosen type. Incremental spiders are usually used to pick up updates of data from Internet data sources. Special spiders are usually used to pick up something that the site has that is special, such as, best sellers for books. Reference spiders are usually used to confirm that the site is still up and rules are working.

Vendor window **1120** allows the rule writer to set the data source to work on. Search window **1195** allows the rule writer to keep text to be searched for in the HTML code. In code window **1197**, there is a cursor to indicate position of text entry. Left set of arrows **1190** includes a first number, which is the starting point of where the search will run when running from the cache. The second number indicates the total number of pages in the cache. The set of arrows in this window controls the page to start from when the rule writer runs from the cache. Right set of arrows **1180** includes arrows to scroll through pages retrieved.

Spiders are similar to queries but they are called when no other rules are applicable. Spiders are responsible for gathering information on every object in the web site that matches the specified type. The spider consists of several nested loops, each designed to go one level deeper into the hierarchy. Referring now to FIG. **22**, an exemplary spider hierarchy **2200** is shown for a book spider where a level **2210** is the start page, a level **2220** represents book category pages, level **2230** represents book sub-category pages, and a level **2240** represents book pages.

Referring now to FIG. **23**, a graphical user interface (GUI) **2300** is used to retrieve the URL of a page to be associated with a spider rule. A spider depth slide rule allows the rule writer to tell data organizing tool **1025** how many links down it takes to get to the actual product page. The upper bound slide rule allows the rule writer to specify a limit on how many items to spider. Once the URL is selected and a spider depth and an upper bound is selected, the rule writer clicks on the "done" button. A graphical user interface (GUI) **2400** illustrated in FIG. **24** is shown. The rule writer enters search patterns for the spider to use in a similar fashion to the search patterns entered for a query described with reference to FIG. **11**. Once the pattern is entered, the rule writer clicks on the "build" button and the spider will start to run.

Advantageously, the graphical user interfaces shown and described with reference to FIGS. **11–24** allow non-expert rule writers to perform data searches and create forms of rules for information retrieval. Once the forms are created, the forms can be frequently used to gather updated information. Further, forms are helpful to retrieving large amounts of information available at a vendor's web site using a common form corresponding to the arrangement and display of information by the vendor on the web site. Advantageously, forms of rule creation by non-experts provides for lower costs to update information available at web sites. Further, the forms advantageously automate accurate retrieval of Internet-based information.

FIG. **25** illustrates an exemplary process of fusing information in a database. In exemplary embodiment illustrated by FIG. **25**, a flowchart **2500** depicts a simplistic fusion process, or "quick fusion", executed by fusion engine **150** (FIG. **2**). In a step **2510**, update engine **160** receives information from network **20** and places the information in an existant data structure in database **170** via existant subsystem **140**. Fusion engine **150** has access to existants from update engine **160** via existant subsystem **140**, which accesses database **170**. After step **2510** is performed, a step **2515** is performed in which fusion engine **150** gathers exact fusion attributes from an attribute definition table corresponding to the existant retrieved in step **2510**. After step **2515** is performed, a step **2512** is performed in which fusion engine **150** executes a "mash" of each fusion attribute from existence retrieved from database **170** into an easily comparable form. In an exemplary embodiment, a "mash" form removes spaces, prepositions, and other non-essential words. Advantageously, a "mashed" format provides for quick searching capabilities.

After step **2520** is performed, a step **2525** is performed in which fusion engine **150** formulates a database query in which the data source is set to "same" and the status is set to "canonical". This query is intended to find an already existing canonical existant from the same data source file which matches the current information. After step **2525** is performed, a step **2530** is performed in which a decision is made whether a match in database **170** is found. If a match in database **170** is found due to the query of step **2525**, a step **2535** is performed in which the existant contained in database **170** is updated.

If no match in database **170** is found from the query of step **2525**, a step **2540** is performed in which the query of step **2525** is reformulated and the data source is set to "same" and the status is set to "non-canonical". This query is intended to find an already existing existant from the same data source file which matches the current information. After step **2540**, a step **2545** is performed in which a decision is made whether a match is found in database **170** from the reformulated query of step **2540**. If a match is found, a step **2550** is performed in which the existant is in database **170** is updated.

If no match is found in database **170**, a step **2555** is performed in which the query is reformulated with the data source being set to "any" and the status is set to "canonical". This query is intended to find an already existing canonical existant from any data source which matches the current information. After step **2555**, a step **2560** is performed in which a determination is made whether a match in database **170** is found. If no match in database **170** is found, a step **2565** is performed in which an existant is added to database **170**.

If a match in database **170** is found or after step **2550** is performed, a step **2570** is performed in which a determination is made whether the match is a system existant. If the match is a system existant, a step **2575** is performed in which the system existant is updated. If the match is not a system existant, a step **2580** is performed in which a canonical system existant is formed. After step **2580** is performed, a step **2585** is performed in which the existant is added to database **170**. After step **2585**, a step **2590** is performed in which the fusion tables are updated.

Advantageously, the exemplary process of fusing information in a database illustrated by FIG. **25** provides for the comparison of information on multiple web sites. As such, a determination can be made if one web site contains the same information as another web site. Furthermore, information contained in database **170** of voice portal **10** can continually add information, relationships, and associations of information from Internet-based sources, which provides for greater usability of information retrieved from data sources.

FIG. **26** illustrates a flow chart **2600** depicting steps taken in an exemplary process of fusion. In the exemplary process described with reference to FIG. **26**, a fusion process is shown which is more comprehensive than the fusion process depicted in flow chart **2500** described with reference to FIG. **25**. In a step **2610**, fusion engine **150** reads an attributes definition table from database **170**. After step **2610** is performed, a step **2615** is performed in which fusion engine **150** reads a fusion control language file for each existant type requiring advanced fusion. After step **2615** is performed, a step **2620** is performed in which fusion engine **150** compiles fusion files into an intermediate computer code. After step **2620** is performed, a step **2625** is performed in which fusion engine **150** holds previously fused existants into memory. After step **2625**, a step **2630** is performed in which fusion engine collects attributes into equivalent sets. After step **2630**, a step **2635** is performed in which a decision is made whether an attribute is textual. If fusion engine **150** determines that the attribute is not textual, a step **2640** is performed in which the values are indexed. If fusion engine **150** determines attribute is textual, a step **2645** is performed in which fusion engine **150** indexes substring occurrences in the attribute.

After step **2645**, a step **2650** is performed in which fusion engine **150** determines whether the text is structured. If the text is determined to not be structured, a step **2670** is performed. If the text is determined to be structured, fusion engine **150** identifies location and isolated structural segment of the text in a step **2655**. After step **2655**, a step **2660** is performed in which fusion engine **150** parses isolated parts and identifies semantic information. After step **2660**, a step **2665** is performed in which fusion engine **150** indexes semantic information. After step **2665**, step **2670** is performed in which fusion engine **150** executes validity checks to verify the integrity of database **170**. After step **2670**, a step **2675** is performed in which fusion engine **150** retrieves the existant to be fused.

After step **2675**, a step **2680** is performed in which fusion engine **150** activates fusion criteria and matching programs for corresponding existant types. Fusion criteria and matching programs involve the use of existant rules which are established as described with reference to FIG. **10**. After step **2680**, a step **2685** is performed in which fusion engine **150** executes the first fusion rule from the fusion criteria and matching programs and returns all matches. After step **2685**, a step **2690** is performed in which a decision is made whether an acceptable match has been found. In an exemplary embodiment, an acceptable match is one in which a predetermined percentage (e.g., 70%) of attributes are common. In an alternative embodiment, an acceptable match is one in which all attributes which have values that are the same. If an acceptable match has been found, a step **2697** is performed in which a fusion engine **150** fuses existants together. If an acceptable match is not found, a step **2691** is performed in which the next fusion rule is executed and all matches are returned.

After step **2691**, step **2692** is performed in which a determination is made whether an acceptable match is found. If an acceptable match is found, step **2697** is performed in which fusion engine **150** fuses existants together. Fusion of existants includes the creation of a new existant which is associated with the existants to be fused and contains all information therein. If an acceptable match is not found, a step **2693** is performed in which a determination is made whether the last rule has been tested. If the last rule has not been tested, step **2691** is performed again. If the last rule has been tested, a step **2694** is performed in which fusion engine **150** determines whether there are strong partial matches. In an exemplary embodiment, a strong partial match is one in which a match is within a certain percentage, such as, 70%. If strong partial matches exist, a step **2698** is performed in which a deference is made to human examination. If partial matches are not found, a step **2695** is performed in which fusion engine **150** rejects the fusion creation, and a step **2699** is performed in which a new existant is created.

Advantageously, the exemplary process of fusing information in a database illustrated in FIG. **26** provides for the automatic comparison of information from the same or different data sources. As such, information contained in database **170** can continually be updated and given added relatedness to information from other data sources. Further, fusion allows for the compilation of a more complete and robust unified database than the millions of databases individually available on the Internet.

FIG. **27** illustrates an exemplary process of creating a canonical data structure from two data structures. A data file **2700** is identified by a unique identification number and contains a first data file **2710**, a second data file **2720**, and a canonical data file **2730**. In an exemplary embodiment, first data file **2710** contains information relating to particular movie retrieved from the IMDB ("Internet Movie Data Base") website (http://www.IMDB.com). Second data file **2720** includes movie information for a particular movie obtained from the Reel.com website. In the example illustrated by FIG. **27**, data file **2710** includes a title "Boys of Arizona," the director "Wiltz," the release year "1997," and a synopsis "great movie." Similarly, data file **2720** includes a title "The Boys of Arizona," the director "Bob Wiltz," the release year "1998," and a synopsis which is blank.

During the process of creating a canonical data file, a rules file **2740** is introduced which contains rules for a particular type of information. In the example shown in FIG. **27**, rules file **2740** contains information relating to the attributes of movies. By application of rules **2740**, a canonical data file **2730** is created by taking the most complete title from data file **2710** and data file **2720**, which is the title from data file **2710**: "The Boys of Arizona." Director information is obtained from data file **2720** because it is more complete than data file **2710** because it contains the director's first and last name. A conflict exists as to the release year listed by data file **2710** and that listed by data file **2720**. Based on prior information, the conflict is resolved to indicate that data file **2720** has a more correct release year. Canonical data file **2730** include the synopsis data file **2710** because the synopsis of data file **2720** is blank.

Advantageously, the process of creating canonical data files described with reference to FIG. **27** creates data files with more complete and accurate information. Furthermore, the process allows comparison of information between multiple websites. Even further, the process of creation of chronicle data files allows the increase in relatedness and association relationships among data files.

FIG. **28** illustrates a functional diagram **2800** of the operations carried out during isolation of data obtained from the web and transformation of that data for storage in a database. The exemplary process includes extracting data from network **20** into a data structure **2810** in which data is arranged and organized. For example, data related to a traffic report may be extracted from the Internet to include information on a description, a main road, a crossroad, a time, a date, and a severity rating. Data structure **2810** is created and organized by use of rules **2815** which include text patterns and descriptions which permit the arrangement and organi-

zation of data into data structure **2810**. Data structure **2810** is stored in a data file on a database. Data in data structure **2810** undergoes a transformation in which a first term substitution form is applied to create a data structure **2820**. Rules **2825** are applied during the term substitution to create data structure **2820**, including lexical entry of the transformation table. In the traffic report example, "Rd." is transformed to be "road", "I." is transformed to be "interstate", and "Rt." is transformed to be "route".

Data contained in data structure **2820** is then put in a parsed form in a data structure **2830** according to rules **2835** which apply attribute phrase grammars for transferred data. In the traffic report example, a "direction", such as, north, west, south, and east is identified and a "highway identifier" is determined, such as "interstate" or "highway". Data in data structure **2830** is then placed in a re-arranged form in data structure **2840** by applying term arrangement rules **2845**. Data in data structure **2840** is manipulated by a second term substitution form and placed in data structure **2850** by applying rules **2855** from the lexical transformation table. For example, the term "St." is determined to be either "street" or "saint" based on its locational identifier <street st.> or <city st.> in the lexical transformation table.

After the lexical transformations are performed, data is placed in data structure **2860**, an unfused, normalized, and tagged format. Data structure **2860** preferably resides in database **2850**. Normalized and tagged format refers to a format including a uniform organization such that data can be easily searched and compared and HTML tags. Often, HTML tags provide information on the type of data, its location, and its length. Unfused means that the data has not gone through the fusion process described with reference to FIGS. **25** and **26**.

Advantageously, the data isolation process described with reference to FIG. **28** takes data from the Web and transforms it into a normalized and tagged format in a database. Normalized and tagged data is prepared for organization, manipulation, and fusion. Advantageously, the data isolation process is uniform and works for data from a wide range of data sources. Thus, generally the process includes obtaining data from Internet sources, creating a first data file with the obtained data in a first format, and generating phrases from the obtained data where the phrases are in a second format associated with a specific interface.

A wide range of applications may be used to convert the obtained data into the first and second formats. For example, text patterns, lexical transform tables, attribute phrase grammars, and term arrangement rules may be used to convert obtained data into a uniform and searchable format, which is saved in a data file in a database, and then convert the saved data to an interface specific format. In alternative embodiments, other patterns, tables, rules, and data manipulation applications may be used.

FIG. **29** is a functional diagram **2900** illustrating the transformation of data from database **170** to a user of voice portal **10** via some user interface platform (e.g., WAP, Web, phone, ASR, TTF). Data contained in data structure **2860** (shown also in FIG. **29**) is put in a parsed form in a data structure **2910** by applying rules **2915** with attribute phrase grammars for normalized and tagged data. Attribute phase grammars take normalized and tagged data to create sensible phrases which include the attributes identified. Data from data structure **2910** is then placed in data structure **2920** by applying a term substituted form using rules **2920** containing lexical entry transformation tables. In the exemplary embodiment, the lexical entry transformation tables of rules **2920** list the data output structure corresponding to a particular interface. For example, the term "route" is transformed into "Rt." for WAP applications and transformed into "Route" for telephone applications using speech. Similarly, the term "U.S." is transformed into "U.S." for WAP applications and to "you ess" for phone applications using speech.

Data from data structure **2920** is placed in a re-arranged form in a data structure **2930** by applying rules **2935** in which term replacement rules are applied, depending on the output device used. Term rearrangement rules move terms around to the arrangement which best suits different user interfaces. Data in data structure **2930** is then placed in a data structure **2940** in which sentences are generated by applying rules **2945** which include phase generation grammars. For example, a sentence may be generated which says "we have a <severity> traffic incident between <cross location> and <cross location> on <main road>." Once data is in the format of data structure **2940**, it is prepared for a variety of output interfaces, such as, WAP, Web, phone, and ASR.

Advantageously, the data transformation process described with reference to FIG. **29** is a uniform process which takes data and prepares it for a wide range of user interfaces. For example, the process allows for data to be extracted from web sources and be semantically identified and prepared for speech transmission via a speech interface. At the same time, the process allows for the same data to be prepared for transmission to WAP devices or web applications.

FIGS. **30–33** illustrate several operational paths that demonstrate exemplary interactions between the user and voice portal **10**. User interface **110** preferably makes use of explicit prompting to guide the user into making appropriate utterances as described with reference to FIGS. **32–33**.

FIG. **30** is a flow diagram **3000** depicting an exemplary system overview, including process blocks representing various functionalities of voice portal **10**. In an exemplary execution path, at a block **3010**, voice portal **10** greets the user by saying, "Welcome to Quack, brought to you by American Express." Preferably, voice portal **10** uses caller-ID as means of identifying the user. In a preferred embodiment, phone numbers are stored as a customer attribute in database **170**. Alternatively, phone numbers are stored in a customer database. Voice portal continues by stating, "Hello, Steve Woods. Please say your PIN or enter it on the numeric keypad. If this is not Steve, please say or enter your phone number." The user then responds verbally "5082" to give his or her PIN. Once authentication is made, voice portal **10** goes to a block **3020**. At block **3020**, voice portal **10** indicates "You are at the Quack runway. Please say the name of the category you are interested in from the following list: movies, weather, traffic, stocks, and sports." The user responds with a category name or a goodbye. If a category name is provided, voice portal **10** goes to a block **3030**. If a goodbye is given, voice portal **10** provides a graceful exit to voice portal **10**. In an exemplary response, the user says "Weather" and voice portal **10** goes to block **3030**. At block **3030**, voice portal **10** says, "Welcome to Weather, brought to you by The Weather Channel," and goes to a block **3040**. At block **3040**, the identify unique existant subsystem is performed.

After block **3040**, a block **3050** is performed in which a determination is made as to whether the existant was found in the identify unique existant subsystem of block **3040**. If the existant was not found, control returns to block **3030**. If the existant was found, a block **3060** is performed in which the found existant subsystem (described with reference to FIG. **33**) is performed.

Referring now to FIG. **31**, the identify unique existant subsystem executed at block **3040** (FIG. **30**) includes a block **3110** in which database **170** provides an attribute from an attribute dependency graph for the current vertical domain (e.g., weather, traffic, movies). If there are not more attributes in the attribute dependancy graph, control passes to a block **3115** where an existant search fail is noted. After block **3115**, control passes to block **3030** (FIG. **30**). After block **3110** (FIG. **31**), a block **3120** is executed in which an attribute vocabulary is built from an attribute value set provided by database **170**. After block **3120** is performed, a block **3130** is performed in which voice portal **10** uses automatic speech recognition (ASR) techniques following a method N to acquire the user's response to an attribute value prompt. For example, voice portal **10** may request the user's location by ZIP code, one exemplary method N. The user may respond by giving his or her ZIP code, such as, "53045".

At a block **3140**, a decision is made as to whether the voice recognition was successful. If not successful, block **3130** is performed with ASR techniques following a fallback method N+1. For example, in the weather vertical domain, a fallback method N+1 may be to ask for the state and city of the user's location. In preferred embodiments, fallback methods include choosing an attribute from a list, constraining the attribute value set by partitioning space (e.g., get state, then city name), and spelling the attribute value. If voice recognition is successful, a block **3150** is performed in which voice portal **10** searches database **170** with the acquired attribute. After block **3150** is performed, a flow chart **3200** (FIG. **32**) is performed.

Referring now to FIG. **32**, flow chart **3200** is shown illustrating a portion of the identify unique existant subsystem. After block **3150** is performed (FIG. **31**), a block **3210** is performed to determine the number of matching existants from the search of database **170**. Different actions are taken depending on the number of matches found in the search of the product database. If no matches are found, a block **3220** is performed in which a determination is made as to whether to seek a Compound Unique Key. A Compound Unique Key may exist if there are one or more unique keys or identifiers which are not contained within database **170**, but may be used to find the desired item on the Internet.

If one match is found, a block **3230** is performed in which voice portal **10** verifies if the match is the correct existant. If the number of matches is greater than one but less than the maximum number for a list, a block **3240** is performed in which the user is requested to identify the existant from the list of matches. If more matches are found than the maximum number of possible entries in a list, a block **3250** is performed in which it is determined whether the attribute is "extensible." In other words, a determination is made as to whether more information can be provided about the attribute. If more information cannot be provided, control returns to block **3110** (FIG. **31**) in which another attribute from the attribute dependency graph is obtained. If the attribute is extensible, a block **3260** is performed in which the attribute is attempted to be extended. If the attribute can be extended, control passes to block **3120** (FIG. **31**) in which a vocabulary set is built and ASR techniques and methods are used to obtain an attribute value. If the attribute cannot be extended, control passes to block **3110** (FIG. **31**) in which another attribute from the attribute dependency graph is obtained. If the extension of the attribute results in a list of items, control passes to block **3240**.

Referring now to the query performed at block **3220**, if a determination is made that there is not a Compound Unique Key to use for a WWW search, control passes to passes to block **3110** (FIG. **31**). If the determination is made that a Compound Unique Key may exist, control passes to a block **3270** in which a determination is made as to whether the WWW is searched. If the WWW is not to be searched, control passes to block **3030** (FIG. **30**) which is the top level of the current vertical domain. If the WWW is to be searched, control passes to a block **3280**. Referring now to block **3230** and block **3240**, if the correct existant is found or the correct existant is found from the list, control passes to block **3280**. If the correct extistant is not found in block **3230** or block **3240**, control passes to block **3220** for a determination of whether there is a Compound Unique Key which can be searched on to find an item. At block **3280**, a web lookup is performed. At this point, the customer may be presented targeted advertisement of a variety of lengths. Advertising is described in further detail with reference to FIG. **36**. During block **3280**, block **3060** is performed in which a found existant subsystem is executed.

Referring now to FIG. **33**, the found existant subsystem includes a block **3310** in which a log is made into the customer database of the found item. In a preferred embodiment, customer database is included in database **170**. After block **3310**, a block **3320** is performed in which information is prepared for presentation as appropriate to the vertical domain from information in database **170**. After block **3320**, a block **3330** is performed in which related information and command grammar is built. For example, in the movie vertical domain, if a list of movies showing at a specific theater is played, grammar would include the movie titles to allow the user to ask for more information about a particular movie.

At a block **3340**, information is returned from the user. In a preferred embodiment, possible acceptable commands include commands to hear more detailed information, to hear information from a specific source, to hear related information (e.g., cheaper, better), and to take action appropriate to the vertical domain (e.g., increase the bid, change location). After block **3340**, a block **3350** is performed in which the next activity is obtained. If a new vertical domain is desired, control passes to block **3020** (FIG. **30**). If a new selection from the top of the current vertical domain is desired, control passes to block **3030** (FIG. **30**). If a new existant is desired, control passes to block **3040** (FIG. **30**).

Referring again to FIG. **32**, after block **3280** is performed, a block **3290** is performed in which web lookup results are coordinated by updating database **170**. During coordination of the web results at block **3290**, a smart delay handle may be performed at a block **3295** in which advertisements or other forms of handling a delay are performed. Smart delay handle at block **3295** uses information from the customer database and the advertising database. In a preferred embodiment, the customer database and the advertising database are subsets of database **170**. In alternative embodiments, the customer database and the advertising database are physically separate databases.

In operation, the system and method for voice access to Internet-based information described herein advantageously can identify a vertical domain of interest to the consumer (e.g., movies, shopping), and then "funnel" user responses from the range of all possible things in a vertical domain to the one or set of things that the consumer wants. This funneling within a vertical domain involves system-directed questioning the user about attributes of products or services, according to a set of pre-defined "paths" to funnel to a particular item. Paths are defined in terms of orderings of constraints about products to be ascertained and instantiated.

FIG. **34** illustrates a flow diagram **3400** of the funneling process which allows voice portal **10** to funnel user responses and achieve highly accurate rates of voice recognition for user responses. At step **3410**, a user calls voice portal **10**. After step **3410**, a step **3415** is performed in which the caller is identified, using the different possible methods described above. After step **3415**, a step **3420** is performed in which the user selects a vertical domain of interest. A step **3425** is then performed in which the attribute funnel characteristic to the chosen vertical domain of interest is started. After step **3425**, a step **3430** is performed in which voice portal **10** determines whether the user has preferences in this vertical domain of interest. If there are preferences and the user does not want to over-ride them, control passes to a step **3460** in which the item or service is indicated as found based on user preferences.

If no preferences are available or the user over-rides his or her preferences, a step **3435** is performed in which an attribute vocabulary set is built. Vocabulary sets advantageously allow voice portal **10** to have a limited number of possible responses from which to use in speech recognition of user response at this point in the vertical domain of interest. With a defined vocabulary set, voice portal **10** advantageously achieves with high rates of recognition conventional speech recognition techniques. For example, it would be easier to recognize the term "Brewers" after the user has selected Major League Baseball (MLB) teams and a vocabulary set of possible requests for MLB teams has been built. Such a vocabulary set may include a variety of different types of user inputs for the same information. For example, in the MLB team example, a vocabulary set may include all the city or state names associated with MLB teams as well as the MLB team mascot. Thus, "Milwaukee" and "Brewers" would both be part of the vocabulary set of MLB teams.

After an appropriate vocabulary set has been built, a step **3440** is performed in which voice portal **10** queries on the attribute. For example, "What Major League Baseball team would you like to hear about?" After step **3440**, a step **3445** is performed in which the attribute is identified. If an attribute is not identified, a step **3447** may be performed to carry out fallback procedures for the identification of the attribute. At a step **3450**, voice portal **10** determines whether it has reached an "end state," or a point at which the item or service has been found. If an "end state" has not been reached, a step **3455** is performed in which the next attribute is accessed and control returns to step **3430**. In the baseball example given, an end state has not been reached with only the team name. Other "narrower" attributes, such as, recent game results, player statistics, team standings, or other related information must be requested. Once step **3460** is performed, a step **3465** is performed in which the found item or service is reported to the user.

In an exemplary embodiment, the user selects item in the following manner. The user first specifies the domain of interest (e.g. e-commerce, traffic information, weather information, movies, etc.). The user then chooses an item (e.g., a book, a toy, a route of interest for traffic information, a city of interest for weather information, etc.) by specifying attributes of the item. The user is then provided with detailed information for an identified item, appropriate to the domain of the item (e.g. products, traffic, weather, movies, etc.). For example, in the E-commerce domain of interest reviews, vendor information including pricing, shipping costs and availability are available. In the movies domain of interest, directory, producer, and cast are provided. In the auctions domain of interest, outstanding bids are made available.

Advantageously, the user may request information by locale (e.g., the nearest vendor for an identified product, the nearest theater for a movie) with multiple ways to identify a locale (e.g., zip, town name, city area "Boston North, West etc.). In an exemplary embodiment, a strategy for location-identification around ZIP codes is used which involves asking for suburb name, falling back to city or even state and then zooming in again. In an exemplary embodiment, the user is provided upon request with the date and time on which information was last updated. Preferably, all data presented to the user is of currency appropriate to the domain. The user is informed of the source of the information ("provided by XXXXX") for "pure" source information, or information from only one source. In a preferred embodiment, a "help" or "instructions" option is available at every selection point.

The user may request item comparisons based on item attributes, as appropriate to the domain. The user may request identification of "better", "cheaper" and "related" items, as appropriate to the domain. Advantageously, the user may explicitly record items in a number of user-defined lists, as appropriate to the domain of interest. The user may review items from their lists. The user may request phone or email notification of information changes (appropriate to the domain) for items on their lists.

FIG. **35** illustrates a flow diagram **3500** of an exemplary process of carrying out a transaction using voice portal **10**. At step **3510**, a user accesses (telephones or calls) voice portal **10**. After step **3510**, a step **3515** is performed in which a funneling process is performed to identify an item or service desired by the user. Such funneling process performs the operations illustrated in flow diagram **3400** and described with reference to FIG. **34**.

After step **3515**, a step **3520** is performed in which voice portal **10** asks the user to specify a transaction desired and relating to the item or service identified. After step **3520** is performed, a step **3525** is executed in which voice portal **10** identifies the appropriate voice portal rule to execute the specified transaction. After step **3525**, a step **3530** is performed in which the rule is executed to carry out the specified transaction. Transactions can include purchasing an item or service, making a bid on an auction, or any other type of transaction possible over the Internet. After step **3530**, a step **3535** is performed in which voice portal records the result of the transaction. Preferably, the result is recorded in database **170**. After step **3535**, a step **3540** is performed in which the transaction is reported to the user.

Different transactions (e.g., bid, watch, buy, track) are appropriate to different domains. For example, in the e-commerce domain of interest, the user may order an identified product from a chosen vendor. Further, the user may add an item to a shopping cart for purchase at a later time. The user may specify, when ordering, a billing credit card and shipping address (from user profile or manually). The user may also request status information for previously ordered products. As another example, in the auction vertical domain of interest, the user may increase existing bids or the user may place bids on new auctions.

Advantageously, the process of carrying out a transaction using voice portal **10** does not require a user to make any manual actions on a computer. The user can buy items, make bids, or do any other Internet transaction without clicking a mouse, pressing a key on a computer keyboard, or any other computer-interface manual action (e.g., mouse click, keyboard entry). Thus, the process described with reference to FIG. **35** can be a "No Click" Internet transaction process. User can utilize the touch pad of a phone and still perform a "No Click" Internet transaction.

FIG. **36**A illustrates a flow diagram **3600**A of an exemplary process of advertising using voice portal **10**. Advantageously, advertising subsystem **120** includes a method for determining what advertisements to play to a specific user. Generally, this method includes setting selection constraints based on a context, such as, user demographics, location demographics, and a current vertical domain of interest. After selection constraints are set, the method queries an advertisement database based on the constraints and retrieves a list of possible advertisements. The list of possible advertisements is re-ordered based on a sales criteria for each advertisement. An advertisement is selected from the re-ordered list and presented to the user.

Referring to flow diagram **3600**A, in a step **3610**A, advertising subsystem **120** in voice portal **10** sets selection constraints for advertisements to be presented to a user. In one embodiment, the selection constraints are based on user-centric information, such as, user demographics, location demographics, and the current selected vertical domain of interest (if any) as well as advertising-centered information, such as, advertising sales criteria, lack of repetition, and other advertising effectiveness factors. Such constraints or criteria are used in selecting from a variety of different types of advertisements, such as, an introductory sponsorship advertisement, a vertical sponsorship advertisement, and a commercial advertisement. After step **3610**A, a step **3615**A is performed in which database **170** is queried for a list of possible advertisements based on the constraints selected in step **3610**A.

After step **3615**A, a step **3620**A is performed in which the list of possible advertisements is re-ordered based on sales criteria factors. In one embodiment, sales criteria are used to determine the following: (1) Is the advertisement delivery rate being achieved for this advertisement? (2) Has the target delivery minimum been achieved for this advertisement? Advantageously, the sales criteria are used to make sure that each Advertisement customer will have their requirements for delivery satisfied. In one embodiment, a ratio is calculated to prioritize the advertisements on which should be delivered first.

The following provides an example of using a ratio as the determining factor of how advertisements are ordered. Advertisement X needs 100,000 deliveries in its contract. Voice portal **10** has already delivered 7,000 instances of Advertisement X. The start date of the contract is May 10 and end date is June 7th. The current date is assumed to be May 15th. So, an exemplary ratio is determined as follows:

Number of days since start of contract=5.

Length of contract=27 days.

Number of days that the Advertisement needs to be played =22.

Percent of ads played=7,000/100,000~=7%

Percent of days already played=5/27~=18.5%

As such, an exemplary final ratio is:

(% of days already played−% of ads played)/Number of days remaining in contract

Advantageously, this ratio accounts for advertisements that should be played soon (lower denominator→higher ratio), and the discrepancies of advertisements that have already been played get pushed back with a lower ratio.

After step **3620**A in which the list of possible advertisements are re-ordered, a step **3625**A is performed in which an advertisement is chosen. In one embodiment, the advertisement is chosen based on the highest ratio available in the list of possible advertisements. After step **3625**A, different actions are taken depending on the type of advertisement to be presented. In a step **3630**A, if there is no advertisement available and if the advertisement type is an introductory sponsorship advertisement, an exception is raised in a step **3635**A. Otherwise, a step **3640**A is performed in which a decision is made as to whether an advertisement is available. If there is an advertisement available, a step **3645**A is performed in which the advertisement is played. If no advertisement is available, a step **3640**A is performed in which the selection constraints are reset and control returns to step **3620**A.

As such, there are differences in the process steps for each type of Advertisement, of which there are three: introductory sponsorship Advertisements, vertical sponsorship Advertisements, and commercial Advertisements. The following is an exemplary process for selecting an introductory sponsorship Advertisement:

1. Set selection constraints based on location for the introductory sponsorship Advertisement type (vertical is not used because, no vertical is applied). 2. Query the database based on constraints with result transformed into a list of possible Advertisements to play. 3. Reorder the list based on the sales criteria. 4. Choose the Advertisements from the list with the highest ratio. There must be an Advertisement in the database and raise an exception otherwise.

The following is an exemplary process for selecting an vertical sponsorship Ad:

1. Set constraints based on user demographics, location demographics, and vertical type for the vertical sponsorship Advertisement type.
2. Query the database based on constraints with result transformed into a list of possible Advertisements to play.
3. Reorder the list based on the sales criteria.
4. Choose the Advertisement from the list with the highest ratio if one is available and return to the user interface.
5. If none are available, reset selection constraints based only on vertical type and set the type of vertical sponsorship to be only for Quack promotions.
6. Reorder the list based on the sales criteria.
7. Choose the Ad from the list with the highest ratio if one is available and return to the user interface.
8. If the user heard all of the Advertisements from the list, then return the Advertisement that was last played to the user. If for some reason the list is empty and no Advertisements are available, raise an exception.

The following is an exemplary process for selecting a commercial advertisement:

1. Set selection constraints based on location demographics, customer demographics and vertical type for the commercial Advertisement type.
2. Query the database based on those constraints with the result transformed into a list of possible Advertisements to play.
3. Reorder the list based on the sales criteria.
4. Choose the Ad from the list with the highest ratio if one is available and return to the user interface.
5. If none are available, reset selection constraints based only on vertical type and set the type of commercial to be either for Quack (i.e., voice portal system) commercials or paid commercials (regardless of type entered).
6. Reorder the list based on the sales criteria.
7. Choose the Advertisement from the list with the highest ratio if one is available and return to the user interface.

8. If the user heard all of the Advertisements from the list, then return the Advertisement that was last. If for some reason the list is empty and no Advertisements are available, then raise an exception.

Referring now to FIG. **36**B, a flow chart **3600**B illustrates a second exemplary process of advertising using voice portal **10**. In a step **3610**B, a user accesses (telephone or calls) voice portal **10**. After step **3610**B, a step **3615**B is performed in which a user lookup is performed to identify the user. Caller identification may be done in a variety of methods, some of which are described with reference to FIGS. **2** and **30**. After step **3615**B, in a step **3620**B, a determination is made as to whether the user is known by voice portal **10**. If the user is not known, a step **3625**B is performed in which a default profile is used for the user. In an exemplary embodiment, the default profile does not include user constraints or limitations for certain advertisements. The default profile can be geared for certain parameters known about the call, such as for example, the area code of the user, time of day of the call, day of the week, etc. If the user is known or after step **3625**B is performed, a step **3630**B is performed in which advertising subsystem **1**generates a set "S" of advertisements based on the type of interface (e.g., speech, WAP, WWW) including user constraints particular to the current user.

Given the current operating context (e.g., particular user, vertical domain of interest), in a step **3635**B, advertising subsystem **120** generates weights for advertisement set S based on the advertising context. After step **3635**B, a step **3640**B is performed to determine whether the context is enough to accurately know what the user most wants. If the context is not enough, a step **3645**B is performed in which an advertisement is picked based on the partial context obtained. If the context is sufficient, a step **3650**B is performed in which the best fit advertisement is played.

Advantageously, advertising subsystem **120** provides an initial general advertisement or sponsorship message to all callers. Advertising subsystem **120** also provides targeted audio advertisements to users, chosen based on a utility function appropriate to the domain. In an exemplary embodiment, the utility function is related to the availability of the product or service to be advertised, the relatedness of the current item (e.g., DVD is related to television), the relevance to the user (e.g., by demographic), the desirability of the user to the advertiser, and the value to the service provider (e.g., based on cost/return). Advantageously, advertising subsystem **120** is capable of delivering a certain number of advertisements to users within a certain time frame. Moreover, advertising subsystem **120** is capable of delivering advertisements across different platforms, such as wireless application protocol (WAP), WWW, and speech interfaces.

Taking for example, the speech interface platform, within the first minute, one sponsorship advertisement and one targeted advertisement are delivered to the user. Within each additional 40 seconds, a second targeted advertisement is delivered. In one embodiment, a sponsorship message will process in 3–5 seconds, and then a targeted advertisement takes 10–20 seconds.

The implementation of this structure is based on the fact that the introductory sponsorship advertisement is presented upon entering the system. Each time the user enters a vertical, the user is prompted with a "vertical sponsorship". Once the user is about to receive the data requested, a full commercial would be presented to the user. Advantageously, this model approximates the schedule listed in previously as the user is estimated to be searching for their piece of information for 40 seconds before receiving it.

In the advertising context, "Speak-throughs" are requests to deliver more detailed information upon presentation of an advertisement. Advantageously, speak-throughs apply not only to speech interface, but also to both the WAP and WWW. For the WAP, speech and text can be considered for a speak-through while clicking on a banner to find out more on an ad would be a speak-through on the WWW. One embodiment of a speak-through on a voice interaction is to point the customer to a website address or a phone number. In alternative embodiments, speak-throughs collect an email address or a custom phone number to provide to the advertiser to send more relevant information to the customer. With a WWW interface, speak throughs may include using an outside source to manage and audit customer information. Advertising subsystem **120** may also provide targeted "banner" advertisements to users, chosen based on a utility function appropriate to the domain (e.g., WWW interface).

The management of the advertising delivery of advertising subsystem **120** is based on a combination of several factors. In an exemplary embodiment, an advertisement is delivered in one of three places. First, an advertisement may be delivered when the user is preparing to enter the system to begin a new session. This sponsorship message will be in the voice of user interface **110**, or "the system voice", and should rotate among several alternative advertising sponsors. For example, a sponsor message may say, "Quack is brought to you by Visa, the currency of the web" or "Quack is brought to you by SprintPCS; the clear future of cellular services."

Second, another sponsorship advertisement (a "vertical sponsorship" advertisement) may be delivered just before a user has accessed a certain vertical of the system, such as movies, traffic, or weather. For example, such an advertisement may say, "Brought to you by IMDB, the world's authorities on movie information" and "LCE Sony Metreon: Boston's ONLY choice for great movie selections."

Third, an advertisement may be delivered just before the user receives the refined request. This type of advertisement is defined as a "commercial". Such advertisements are timely (i.e., delivered at chosen points) but only on a so-often basis, such as every 2 minutes. Advantageously, the system voice can point out a value-added situation for the user that may be helpful. For example, a nearby restaurant may be suggested when a user is selecting a movie at a particular theater. Speak-through advertisements are preferably used here, although non-speak through advertisements are possible. The advertising content itself is preferably about 7 seconds in length. The speak-through ads are preferably of maximum possible quality (i.e., professionally produced), and of length of about preferably 15 to 20 seconds. For example, if the user selects American Beauty as a movie at LCE Sony Metreon, the system voice says, "I'm looking up the listing at Sony Metreon . . . if you would like to hear about 'Tony's Matriciana': Boston's best Italian food only 5 minutes from Sony Metreon, say 'Tony's!', or hold on for your listing." The user may then automatically set up a reservation. Other relatedness attributes may also be used for targeted advertising. Advantageously, the advertisement is delivered in these different spots due to the current assumptions that making a vertical-specified request will take the amount of time to deliver the advertisements.

Along with these issues, decisions are made on which advertisements users are to have delivered to them. Factors incorporated into this decision include the length of the call, what type of vertical content is requested, combination of content and user profile (and/or location) (i.e. restaurant ads should be local to the customer), revenue potential, callers

requesting specific information, and if the user has heard the advertisement already. In an exemplary embodiment, advertisements are rotated based on the following factors: When was the last time that the ad was played? When was the last time the user heard the ad before this call? Did the user hear the ad already this call? Is the ad delivery rate being achieved for this ad? Has the target delivery minimum been achieved for this ad?

Advantageously, advertisements are delivered in a manner such that the presentation is appropriate to particular customers and are tracked accordingly to billing rates. Thus, certain basic data is gathered to manage each ad, such as, how many times has the ad been played and how many times has an individual user heard the ad?

As well, given this basic data, the following more complex queries are available. For example, queries may include the ability to create a report of all users who have heard an ad among various defined groupings as follows: name, demographic information, location, and relatedness information (what else have these users requested). Queries may also include the ability to create a report of all users who have requested speak-through information.

The capability of barging-in (i.e., stopping the advertisement from being played), which is possible during other modes of operation for voice portal **10** can be removed while presenting an ad. The capability to prevent barge-ins is important in that advertisers must be assured of the data that has been acquired with respect to the advertising that was given through voice portal **10**. In one embodiment, the gathering of this advertising data is done by a third party auditor.

Advertising subsystem **120** keeps a record of all advertisements served to users, including successful (i.e., complete) and unsuccessful (i.e., incomplete) deliveries. Preferably, this record is stored in database **170**. Advantageously, advertisements may be targeted by vertical domain of interest, or caller location or user, or user preferences, or user past interests, or by some other combination of advertiser interests and user collected information.

Advantageously, the use of context sensitive information can be used to narrowly target advertisement to a user. Context-sensitive Advertisement targeting in voice portal **10** relates an Advertisement commercial to nearly exactly what information the user receives. To make this function correctly, an appropriate pointer is passed into the selection algorithm just before the Advertisement is to be played. In the one embodiment, the vertical type is the context pointer.

In other embodiments, an existant is the context pointer that allows more specific targeting. This context pointer matches its attributes' criteria with market research criteria to determine weights in certain categories. These category weights combined with the sales criteria of the Advertisements in the initial list define an ordering of context weights from which to best select Advertisements. This initial list, created from demographics and vertical type, form the basis for the context weighting. Mathematical notation is introduced to generalize this problem into an algorithm, and an example follows to illustrate it.

First, variables are defined with respect to the parameters involved. Let the list of attributes of the existant passed into the algorithm be defined by the set $\{e_1, e_2, \ldots, e_m\}$, where m is the number of attributes in the existant. For example, for a movie existant, sample attributes are genre, location and show time. The list of categories available to associate Advertisements with, are defined by the set $\{C_1, C_2, \ldots, C_n\}$, where n is the total number of categories. Some sample categories in the system would be: family, restaurants, nightlife, movies, and entertainment. Let there be a context category weight, W_i, for each category C_i, where $i \in \{1, \ldots, n\}$. The purpose of having context category weights is to determine the strength of the context in comparison to the advertisement's category weights, as discussed below.

The market research criteria for all existants is represented by $P=\{p_1, p_2, \ldots p_t\}$ where t is the total of all criteria in the database. Each criterion p_j has an associated weight w_j, where $j \in \{1, \ldots, t\}$ and each attribute e_i will try to satisfy all p_j, for all i, j, where $i \in \{1, \ldots, m\}$, $j \in \{1, \ldots, t\}$. Thus, if e_i satisfies p_j, and p_j belongs to category C_k, then $W_k=W_k+w_j$, where $i \in \{1, \ldots, m\}$, $j \in \{1, \ldots t\}$, $k \in \{1, \ldots, n\}$. This iteration is used to define the aforementioned context weights of each category.

Once the total context weight for each category, W_k, is defined, its associated strength ratio, R_k, must be calculated. The strength ratio of a category is used to determine if the context of the existant is strong enough to merit in the selection of the Advertisement. For example, if the family category has many criteria in P, then we want to make sure that the weights corresponding to the context of the existant are in an acceptable proportion. So, $R_k=W_k/T_k$, where T_k is the total weight of all criteria in P relating to category k.

The list of advertisements generated by the demographic query are defined by the set $A=\{A_1, A_2, \ldots, A_r\}$, where r is the total number of ads in the list. Each ad A_i has its own category weight x_k, where $i \in \{1, \ldots, r\}$ and $k \in \{1, \ldots, n\}$ which is used in conjunction with the algorithm's corresponding context category weight ratio R_k.

Thus, once the initial list of Advertisements A has been created by filtering the demographics and Advertisement type on the database, the steps in the algorithm would be as follows:

1. Set category weights, W_k, for each category C_k as follows
   Initialize each $W_k=0$, where $k \in \{1, \ldots, n\}$.
   For each $i \in \{1, \ldots, m\}$ and for each $j \in \{1, \ldots, t\}$, based on the current attributes of the existant, $\{e_1, e_2, \ldots, e_m\}$, if e_i satisfies p_j, and p_j is associated with category C_k, then $W_k=W_k+w_j$, where $k \in \{1, \ldots, n\}$
2. Now tabulate the categories' total weights independent of the attributes of the existant. From those total weights, establish each category's context ratio
   For each $k \in \{1, \ldots, n\}$ and for each $j \in \{1, \ldots, t\}$, if p_j is associated with category C_k, then $T_k=T_k+w_j$. Set the context category context ratio, $R_k=W_k/T_k$
3. For each category k, multiply each R_k by the category weight x_k of each Ad A_i, and then multiply the sum by the sales criteria ratio of the Ad, S_i, to get context total G_i
   For each $i \in \{1, \ldots, r\}$, calculate G_i where

$$G_i=S_i(R_1x_1+\ldots+R_nx_n)$$

4. Select the Ad A_i, where i is defined by $\max(G_i)$, $i \in \{1, \ldots, r\}$.

The above algorithm can be illustrated by a simple example. Consider an example where a user is using the service of voice portal **10** while in the movies vertical domain of interest. The vertical sponsorship Advertisement has been played and the user is just about to receive information regarding a movie showing. Thus as context, the selection includes the pointer to the specific existant that is to be played, which is for arguments' sake, "Mission to Mars". Some of the attributes of the movie showing existant are rating (e.g., R), genre (e.g., Thriller) and a show time (e.g., 4:00 pm), which can be represented by $\{e_1, e_2, e_3\}$. Thus,

there needs to be a list of matching context criteria containing the elements $P=\{p_1, p_2, \ldots p_t\}$. A sample list of criteria could be represented in the database as:

Attributes	Match Type	Value	Category	Weight
Movie	—	—	Entertainment	10
Movie Rating	=	G	Family	80
Movie Rating	=	R	Nightlife	50
Movie Genre	=	Suspense	Teen	40
Movie Genre	=	Suspense	Adult	50
Movie Genre	=	Thriller	Teen	80
Movie Show Time	>	7:00 PM	Teen	80
Movie Show Time	<	4:00 PM	Family	70

From this table, the categories can be inferred as C={Entertainment, Family, Nightlife, Teen, Adult} where k=5. So from step 1, $W_1=10$, $W_2=0$, $W_3=50$, $W_4=80$ and $W_5=0$. From step 2, establish $R_1=1$, $R_2=0$, $R_3=1$, $R_4=0.4$ and $R_5=0$ (this is assuming that P has only 8 elements, which will not likely be the case, and will be around 200 or more elements). Now, assume that the Advertisement list A has three Advertisements. Assume that the weightings of the advertisements' five categories are:

Ad Name	Entertainment	Family	Nightlife	Teen	Adult	Sales Ratio
IMDB	0.9	0.5	0.7	0.9	0.9	0.8
Mission to Mars	0.9	0	0.9	0.9	0.8	1.1
AMC Theaters	0.9	0.9	0.7	0.9	0.7	1.0

So, from these weightings, $\{X_1, X_2, X_3, X_4, X_5\}$, we can make the calculations to get values for G_i for each Ad A_i, where $i\in\{1, 2, 3\}$, as follows:

$$G_i=S_i\cdot(R_1x_1+\ldots+R_nx_n)$$

$$G_1=0.8\cdot((1)(0.9)+0+(1)(0.7)+(0.4)(0.9)+0)=1.568$$

$$G_2=1.1\cdot((1)(0.9)+0+(1)(0.9)+(0.4)(0.9)+0)=2.376$$

$$G_3=1.0\cdot((1)(0.9)+0+(1)(0.7)+(0.4)(0.9)+0)=1.96$$

Thus, based on context and sales ratio determination, the "Mission to Mars" Advertisement is most appropriate. This algorithm notes the context of different categories based on their relevance to the piece of information being retrieved. It also organizes the fact that the Advertisments that need to be played for sales criteria are noted and factored into the ordering. The example illustrates only a short list of ads, categories and criteria in P. The algorithm is intended to take advantage of many more categories and criteria.

FIGS. **37**–**43** illustrate an exemplary dialog map of the interaction between the user and voice portal **10**. The dialog map described with reference to FIGS. **37**–**43** is for illustration purposes only. While only movies, weather, traffic, stocks, and sports vertical domains of interest are shown in the FIGURES, it should be apparent that any vertical domain of interest could be included in such a dialog map (and in the interaction of voice portal **10** with the user), particularly in light of the expansive and adaptive capabilities available due to data structure models **300**, **400**, and **450**, described with reference to FIGS. **4**–**6**. Furthermore, the specific blocks representing different interactions between the user and voice portal **10** are for illustration only. A wide variety of interactions are possible for each of the many possible vertical domains of interest.

FIG. **37** illustrates a dialog map **3700** in which after a telephone call is made by a user to voice portal **10**, a block **3710** is performed in which a welcome is provided. After block **3710**, a block **3720** is performed in which a sign-in procedure is followed (described further with reference to FIG. **38**). After the sign-in procedure of block **3720**, the user can select to have an introduction to the service of voice portal **10** at blocks **3730** and **3740** or go directly to the runway information for introduction of the possible vertical domains of interest at a block **3750**. Specifically, at block **3730**, introductory information is provided on the service provider. At block **3740**, introductory information is provided on how the service works. At block **3750**, voice portal **10** requests the user to select a domain of interest from a "runway" (e.g., movies, weather, traffic, stocks, sports).

If the user selects the movies domain of interest, a block **3760** is performed in which a movies subsystem is executed (described further with reference to FIG. **39**) and the user has access to movie information and transactions, such as, movie listings, theaters, and reviews. If the user selects the weather domain of interest, a block **3770** is performed in which a weather subsystem is executed (described further with reference to FIG. **40**) and the user has access to weather information, such as, today's forecast or the extended forecast for a preferred location or any location. If the user selects the traffic domain of interest, a block **3780** is performed in which a traffic subsystem is executed (described further with reference to FIG. **41**) and the user has access to traffic information, such as, reports by city, reports for a certain route, or personalized reports. If the user selects the stocks domain of interest, a block **3790** is performed in which a stocks subsystem is executed (described further with reference to FIG. **42**) and the user has access to stocks information and transactions, such as, market summaries, stock quotes, stock news, and personalized stock news or transactions (e.g., buy, sell). If the user selects the sports domain of interest, a block **2500** is performed in which a sports subsystem is executed (described further with reference to FIG. **43**) and the user has access to sports information and transactions, such as, sports scores, sports news, sports events ticket information, and sports fantasy league transactions.

Referring now to FIG. **38**, a sign-in subsystem is shown. At a block **3810**, caller identification is attempted. One type of user of voice portal **10** is an unidentified user. The unidentified user calls in (possibly for the first time) and is either locatable by conventional caller-identification techniques ("caller ID") or not. If the caller-ID does not exist in database **170**, the caller is possibly a new caller. If the caller-ID is suppressed, voice portal **10** can't tell either way. In one embodiment, voice portal **10** asks for a phone number (or other identifier) and continues with an "identified" caller. In an alternative embodiment, voice portal **10** continues without verification. This decision may depend on the kinds of information being requested. For example, in particular vertical domains, the identity of the user may need to be determined to identify the user before proceeding (e.g., auctions).

Identified users are either subscribed or non-subscribed. If the identified user is subscribed, voice portal **10** has information on the user, such as, credit cards and preferences from database **170**. Preferably, a user subscribes so that voice portal **10** can start tracking preferences and interests to achieve a higher degree of consumer-value-added and thus loyalty to the service. The user may specify profile information, including addresses and credit card numbers, upon subscription. Further, the more information amassed

about a particular caller, the more directed (and hence valuable) advertisements are.

If caller identification is possible, a block **3820** is performed in which user confirmation is performed by asking the user for a password. Once the password is verified, user preferences can be set and control passes to a block **3870** and control returns to FIG. **37** where an introduction or runway selection is performed. If the password given is invalid, control passes to a block **3840**.

If caller identification is not possible or the user did not know his or her password, control passes to a block **3830** where voice portal **10** determines the user's account status. If the user does not have an account, control passes to a block **3850** where an account setup reminder is given that the user should set up an account. If the user has an account, control passes to block **3840** where voice portal gets the user's account number. If the user has forgotten the account number, control passes to block **3850** where the user is asked to set up an account. If the user provides a valid account number, control passes to block **3820** for user confirmation. If the user gives an account number which is invalid, control passes to block **3860** where voice portal **10** informs the user that the account is invalid and to visit a web site or call a support number for assistance. Control then passes to block **3880** and to FIG. **37** where an introduction or runway selection is performed.

Referring now to FIG. **39**, a movies subsystem is performed. At a block **3910**, voice portal **10** plays an introduction to the movies domain of interest. The user can select options, such as, movies at a theater, listings for a movie, and movie reviews. If the user selects movies at a theater, control passes to a block **3915** in which voice portal **10** determines the geographic location desired by the user. Various methods may be employed to determine location, such as, ZIP code, state and city, or preferences. If there is no theater near the given location, a block **3920** is performed in which a message is played to inform the user that no theater is located in the given area. After location is determined, a block **3925** is performed in which theater names within the location are listed. After block **3925**, a block **3930** is performed in which movies are listed which are playing at theaters within the area. Voice portal **10** requests the user select a movie and control passes to a block **3935**.

Returning now to block **3910**, which played an introduction to the movies domain of interest, if the user requests listings for a movie, a block **3940** is performed in which voice portal **10** requests the movie title from the user. After block **3940**, a block **3945** is performed in which the geographic location desired by the user. As discussed above, a variety of methods may be used to determine the caller's location. If there are theaters showing the selected movie, a block **3950** is performed in which the theaters playing the movie are listed and the user is asked to select from the list. Control then passes to block **3935**. If there are no theaters showing the selected movie, a block **3955** is performed and the times for the movie at the closest locations are provided to the user. Control then passes to block **3935**.

Referring now to block **3910**, which played an introduction to the movies domain of interest, if the user requests a movie review, a block **3960** is performed in which voice portal **10** requests the movie title from the user. After block **3960**, a block **3965** is performed in which the review is played for the selected movie. After block **3965**, a block **3970** is performed in which voice portal **10** asks the user if he or she would like to find showings for the movie selected. If the user declines, control returns to block **3960** to get another movie title for a movie review. If the user accepts, control passes to block **3945**.

At block **3935**, voice portal **10** provides movie showing times for the selected movie and theater. At a block **3980**, voice portal **10** requests a next action. The user can request the theater address, which is then provided at a block **3985**. The user can also request a review of the movie, which is then provided at a block **3990**. Once the user wants to leave the movie domain of interest, control returns to block **3750** of FIG. **37**.

Referring now to FIG. **40**, a weather subsystem is performed, as shown. At a block **4010**, voice portal **10** plays an introduction to the weather domain of interest. After the introduction is played at block **4010**, control passes to a block **4020** in which voice portal **10** obtains location information to use in the weather domain of interest. As described above, multiple methods are possible to obtain location information, such as, obtaining location from ZIP code, city or state, and other locational indicia. After block **4020**, control passes to a block **4030** in which voice portal **10** provides a prompt as to whether the user would like live weather information or weather information for later periods of time. If the user selects to hear weather information for later periods of time, control passes to a block **4040** in which voice portal **10** plays a prompt which provides weather latency options to the user. If the user wants current weather information or after the user has selected latency options at a block **4040**, control passes to a block **4050** in which voice portal **10** provides the weather information desired.

After block **4050** is performed, control passes to a block **4060** in which voice portal **10** asks the user whether an extended forecast is desired. If a extended forecast is desired, control passes to a block **4070** in which voice portal **10** provides an extended forecast. After block **4070** or if the user does not want an extended forecast, control passes to block **4080** in which voice portal **10** asks for the next action from the user. If the user wants to continue in the weather domain of interest, control passes to block **4020**. If the user wants to leave the weather domain of interest, control passes to a block **4090** corresponding to the runway described with reference to FIG. **37** as block **3750**.

Referring now to FIG. **41**, a traffic subsystem is performed. At a block **4110**, voice portal **10** plays an introduction to the traffic domain of interest. After block **4110**, control passes to a block **4115** in which voice portal **10** obtains location information for user or personalized information on the user. After block **4115**, control passes to a block **4120** in which voice portal **10** obtains city traffic information. If no city traffic information is possible, control passes to a block **4135** in which ZIP code traffic information is obtained. ZIP code traffic information is a fallback if a city is not recognized by voice portal **10**. If the city data is not found and data is contained for locations nearby, control passes to a block **4140** in which voice portal **10** asks for a nearby city. If at block **4120** no traffic events are reportable, control passes to a block **4125** in which the user is told no traffic is reportable in the city. If at block **4120** no traffic data is available, control passes to a block **4130** in which the user is provided the option to try another city or to go to the runway for selection of a new domain of interest.

After block **4120**, control passes to a block **4145** in which voice portal **10** requests a specific traffic route or the "whole city." After block **4145**, control passes to a block **4150** in which voice portal **10** obtains route direction information. After block **4150**, control passes to a block **4155** if there is no traffic on the route to report. At block **4155**, the user is given the option to select a new traffic route or the "whole city" as well as going to the runway and selecting a new domain of interest. If route traffic information is available,

after block **4150**, control passes to a block **4160** in which voice portal **10** lists the route traffic for the selected route. If the user has selected "whole city" in block **4145**, control passes a block **4165** in which voice portal **10** lists city traffic information.

After block **4160** and block **4165**, control passes to a block **4170** in which voice portal **10** provides the desired traffic report to the user. After block **4170**, control passes to a block **4175** in which voice portal **10** asks for the next action to be performed in the traffic domain of interest. In an exemplary embodiment, next actions may include repeat the traffic report, continue the list of traffic information, and going to the runway. After the user has made the selection at block **4175**, control passes to an appropriate block. For example, if the user selects to repeat the traffic report, control passes to a block **4170**. If the user selects the continue list option, control passes to either block **4160** or block **4165**, depending on the selection of a specific traffic route or the "whole city" made at block **4145**. If the user selects go to runway, the control passes to a block **4180** which corresponds to the runway described with reference to FIG. **37** as block **3750**.

Referring now to FIG. **42**, a stocks subsystem is performed. At a block **4210**, voice portal **10** plays an introduction to the stocks domain of interest. After block **4210**, control passes to a block **4215** in which voice portal **10** provides the user with the option of selecting for a market summary, stock quotes, or a personalized listing called "MyQuack." If the user selects market summary, control passes to a block **4240** in which a market summary is provided for a variety of markets, such as, the Dow Jones Industrial Average, NASDAQ, S&P 500, NYSE Volume, NASDAQ Volume, and 30 year bonds. If the user selects stock quotes, control passes to a block **4220** in which voice portal **10** obtains a specific stock name from the user. After block **4220**, control passes to a block **4225** in which voice portal **10** obtains the stock exchange corresponding to the stock name provided in block **4220**. After the exchange is identified, control passes to a block **4230** in which voice portal **10** provides stock information, such as, value, last trade, change, volume, and day high/low.

After block **4230**, control passes to a block **4235** in which voice portal **10** asks for the next action to be performed in the stocks domain of interest. In an exemplary embodiment, the user may select to repeat stock information/continue listing stock information, get a new stock, hear market summary, or go to runway. Depending on the selection made by the user at block **4235**, control passes to block **4240** for market summary, block **4220** for a new stock name, a block **4250** for a personalized my quack stock, or a block **4275** for the runway. Before block **4275**, control may pass to a block **4270** in which voice portal provides a preference reminder to the user that preferences may be set to obtain personalized information in a quicker fashion. If the user has already been reminded in this call about preferences, control passes directly to block **4275**.

If in block **4215** the user selects "MyQuack" control passes to a block **4245** if no account information is identified and block **4250** if account information is identified. In block **4245** a preference setup and account information is established. A suggestion may be made to the user that an account be setup on the Web. At block **4250**, personalized stock information is provided, such as, value, last trade, change, and volume. During operation of block **4250**, the user may identify a specific stock by saying, for example, "that one" during the playing of information on the particular stock. If such a selection is made, control passes to a block **4255** in which stock news options are listed for the particular stock. After the user has selected a particular type of stock news from the list in block **4255**, control passes to a block **4260** in which voice portal **10** plays the selected stock news. After block **4260**, control passes to block **4265** in which voice portal **10** asks the user whether to return to get list of stock news (block **4255**) or exist stock news. If the user selects to exist the stock news, control passes to block **4235** in which the next action for stocks is requested. Once the user has completed the stocks domain of interest, control passes to block **4275** corresponding to the runway described with reference to FIG. **37** as block **3750**.

Referring now to FIG. **43**, a sports subsystem is performed. At a block **4310**, voice portal **10** plays an introduction to the sports domain of interest. After block **4310**, control passes to a block **4315** in which voice portal **10** obtains the type of sports desired by the user or the user may say "MyQuack" to get scores for a personalized sports type. If the user chooses a particular sport, control passes to a block **4320** in which voice portal **10** obtains the league name of a selected sport from a list. For example, voice portal **10** may list "NFL, NBA, NHL, and Major League Baseball." After the user has made a selection of the league name, control passes to a block **4325** in which voice portal **10** obtains the specific team the user is interested in. After block **4325**, control passes to a block **4330** in which sports scores are provided. For example, voice portal **10** may say, "The last game played by TEAM was DATE with a final score of TEAM 1, SCORE 1, TEAM 2, SCORE 2."

If in block **4315** the user has selected "MyQuack," control passes to block **4340**. At block **4340**, voice portal **10** provides sports scores for the personalized MyQuack sports teams. After block **4340**, control passes to a block **4335** in which voice portal **10** provides sports news for teams specific news. After block **4330** and block **4335** control passes to a block **4345** in which voice portal **10** asks whether the user would like the sports information just heard to be repeated. If the user responds affirmatively, voice portal **10** returns to repeat the information provided. If the user does not want the information repeated, control passes to a block **4350** in which voice portal **10** asks for the next action to be performed in the sports domain of interest. After block **4350**, control passes to block **4320** to select a league name, block **4340** to provide my quack sports scores, or to a block **4355** for runway information. A block **4355** corresponds to the runway described further with reference to FIG. **37** as block **3750**. Each subsystem of FIGS. **40–43** is shown by way of example only.

While the embodiments illustrated in the FIGURES and described above are presently preferred, it should be understood that these embodiments are offered by way of example only. Other embodiments may include various data structures for simplifying access to the Internet via voice portals. The invention is not limited to a particular embodiment, but extends to various modifications, combinations, and permutations that nevertheless fall within the scope and spirit of the appended claims.

What is claimed is:

1. A method of providing voice access to Internet-based information and services, the method comprising:

receiving a signal indicating a communication connection request, the communication connection request being initiated by a user of a communication apparatus;

establishing a communication connection with the communication apparatus of the user;

receiving voice information from the user; and

communicating voice information responsive to the voice information received from the user, the responsive voice information including Internet-based information;

gathering information from sources via the Internet; and

merging the same information from different data sources into a canonical data object.

2. The method of claim **1**, wherein the step of communicating voice information responsive to the voice information received from the user comprises responsively providing the Internet-based information from a variety of different sources associated with the Internet.

3. The method of claim **2**, wherein the Internet-based information comprises information related to movies, weather, traffic, stocks, and sports.

4. The method of claim **1**, wherein the step of communicating voice information responsive to the voice information received from the user comprises selectively providing advertisements.

5. The method of claim **4**, wherein the step of selectively providing advertisements comprises identifying a set of advertisements with weights corresponding to a profile of the user.

6. The method of claim **4**, further comprising pricing advertisement costs based on number of times the advertisement is presented.

7. The method of claim **4**, wherein the step of selectively providing advertisements comprises providing permission based advertising, the permission based advertising presenting more advertising information after receipt of a request from the user.

8. The method of claim **4**, wherein the step of selectively providing advertisements comprises selectively providing speak-through advertisements.

9. The method of claim **4**, further comprising making a record of selectively provided advertisements.

10. The method of claim **1**, further comprising providing transaction information to the user.

11. The method of claim **10**, further comprising responsively engaging a transaction upon voice confirmation by the user.

12. The method of claim **1**, wherein the step of communicating information by voice to the user comprises selecting information to communicate based on preferences of the user.

13. The method of claim **12**, wherein the step of selecting information to communicate comprises passively determining user preferences.

14. The method of claim **12**, wherein the step of selecting information to communicate comprises actively requesting preferences from the user.

15. The method of claim **1**, further comprising making a record of information communicated to the user during the duration of the communication connection.

16. The method of claim **1**, wherein the step of communicating information by voice to the user comprises dynamically ordering questions to communicate to the user as to anticipate possible user responses.

17. The method of claim **1**, wherein the step of communicating information by voice to the user comprises attribute based funneling of user responses to ascertain a desired item or service.

18. The method of claim **1**, further comprising providing associations between non-identical items according to a closeness relationship.

19. The method of claim **1**, further comprising converting the gathered information into a unique key.

20. The method of claim **1**, wherein the step of converting the gathered information into a unique key comprises applying attribute rules to the gathered information.

21. The method of claim **1**, further comprising fusing vendor supplied information into a unified database.

22. The method of claim **1**, further comprising organizing gathered information into an existant data structure.

23. The method of claim **1**, further comprising transforming the gathered information to a searchable and common format.

24. The method of claim **23**, further comprising converting the gathered information in the searchable and common format to an interface specific format.

25. The method of claim **24**, wherein the step of converting the gathered information to an interface specific format comprises applying attribute phrase grammars.

26. A unitary voice portal to the Internet providing access to a wide variety of information and services available over the Internet, the voice portal comprising:

a user interface;

at least one database coupled to the user interface, the user interface coordinates voice communications with a user, the at least one database storing information regarding users and Internet-based information; and

an update engine coupled to the at least one database, the update engine being in communication with the Internet and providing updated Internet-based information; and

a fusion engine coupled to the at least one database, the fusion engine being configured to compare information from at least one data source and selectively create a canonical data object.

27. The voice portal of claim **26**, further comprising a customer management subsystem coupled to the user interface, the customer management subsystem being configured to acquire information needed to determine user preferences and facts.

28. The voice portal of claim **26**, further comprising an advertising subsystem coupled to the user interface, the advertising subsystem being configured to coordinate the advertisements presented to the user.

29. The voice portal of claim **28**, wherein the advertisements presented to the user comprise any one of sponsorship advertisements, targeted advertisements, and permission-based advertisements.

30. A system for providing voice access to Internet-based information and services, the system comprising:

means for receiving a signal indicating a communication connection request;

means for establishing a communication connection with the user;

means for communicating information by voice to the user;

means for receiving voice information from the user; and

means for communicating voice information responsive to the voice information received from the user, the responsive voice information including Internet-based information obtained from sources via the Internet;

means for gathering information from sources via the Internet; and

means for merging the same information from different data sources into a canonical data object.

31. The system of claim **30**, wherein the means for communicating voice information responsive to the voice information received from the user comprises means for responsively providing information from a variety of different sources.

32. The system of claim **31**, further comprising means for pricing advertisement costs based on number of times the advertisement is presented.

33. The system of claim **30**, wherein the means for communicating voice information responsive to the voice information received from the user comprises means for selectively providing advertisements.

34. The system of claim **33**, wherein the means for selectively providing advertisements comprises means for identifying a set of advertisements with weights corresponding to a profile of the user.

35. The system of claim **30**, further comprising means for providing transaction information to the user.

36. The system of claim **35**, further comprising means for responsively engaging a transaction upon voice confirmation by user.

37. The system of claim **30**, wherein the means for communicating information by voice to the user comprises means for selecting information to communicate based on preferences of the user.

38. The system of claim **37**, wherein the means for selecting information to communicate comprises means for passively determining user preferences.

39. The system of claim **30**, further comprising means for making a record of information communicated to the user during the duration of the communication connection.

40. The system of claim **30**, wherein the means for communicating information by voice to the user comprises means for dynamically ordering questions to communicate to the user as to anticipate possible user responses.

41. The system of claim **30**, wherein the means for communicating information by voice to the user comprises means for attribute based funneling of user responses to ascertain a desired item or service.

42. The system of claim **30**, further comprising means for providing associations between non-identical items according to a closeness relationship.

43. The system of claim **30**, further comprising means for fusing vendor supplied information into a unified database.

44. The system of claim **30**, further comprising means for organizing gathered information into an existant data structure.

45. The system of claim **30**, further comprising means for transforming the gathered information to a searchable and common format.

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