Exhibit 1017

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(54) BROWSING OR SEARCHING USER INTERFACES AND OTHER ASPECTS

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G06F 17/30 (2006.01)

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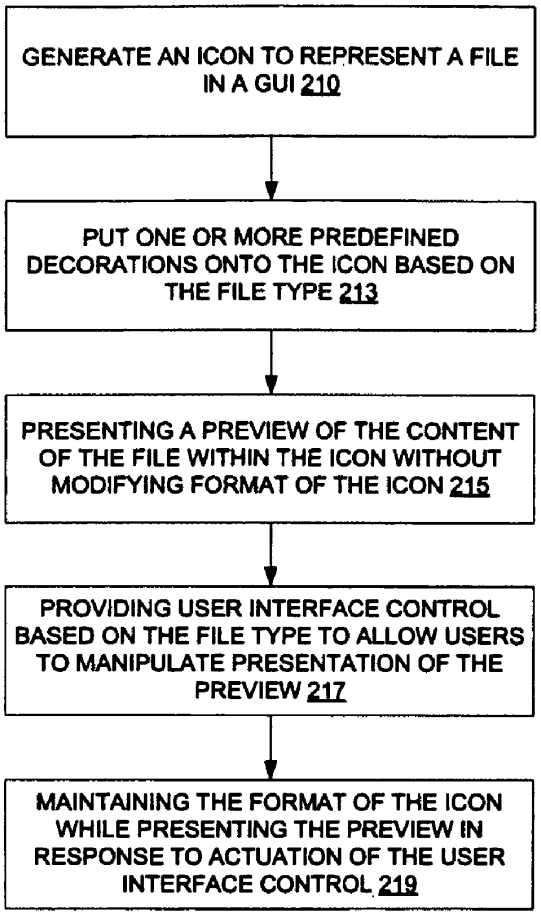
(57) ABSTRACT

User interfaces for browsing and/or searching are described. In some embodiments, the metadata of a file includes a field having an indicator to indicate whether a preview of the content of the file is available. If the preview is available, then a plug-in associated with the creator application of the file is executed to present the preview within the icon. Furthermore, if the preview is interactive according to the metadata, then various user interface control may be generated to allow users to manipulate the presentation of the preview. Other embodiments are also described, and computer readable media and apparatuses are also described.



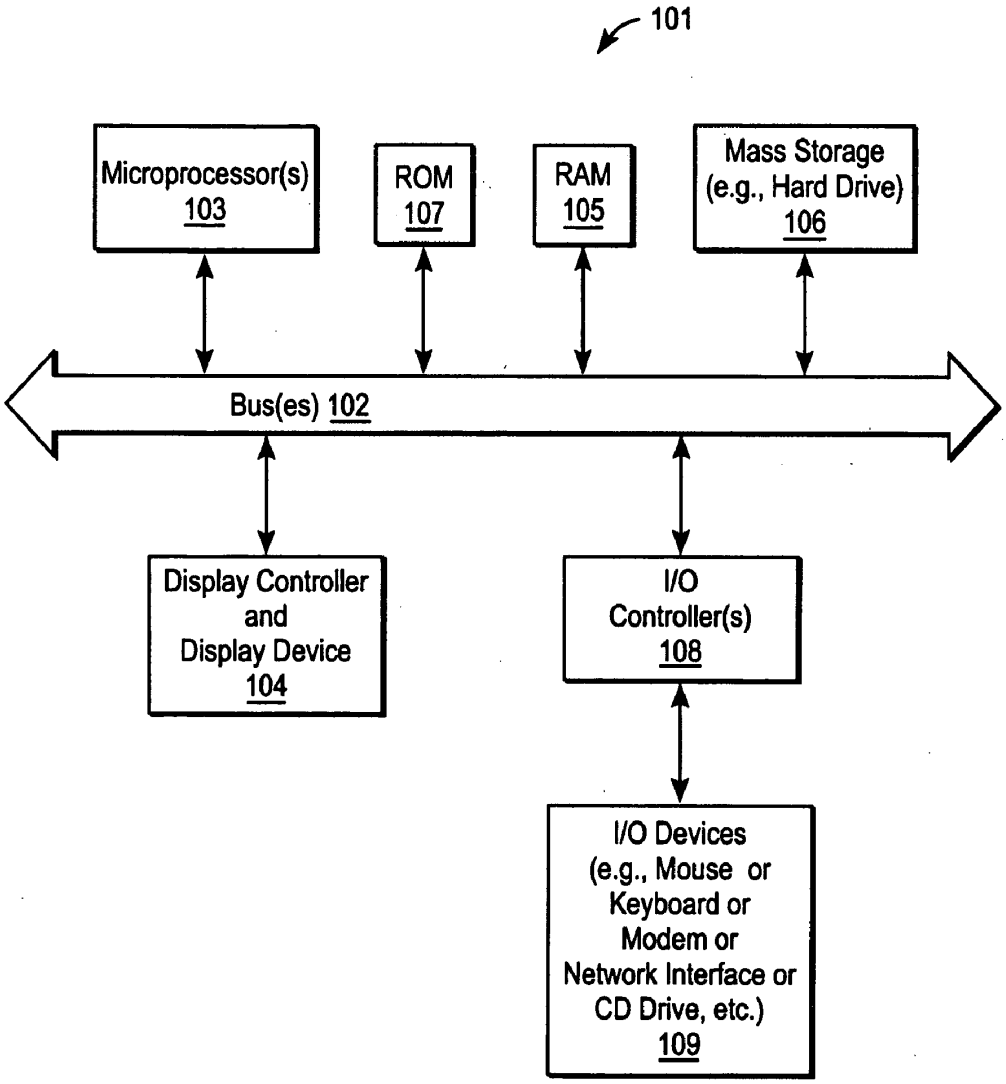

101
Microprocessor(s)
103
ROM
107
RAM
105
Mass Storage
(e.g., Hard Drive)
106
Bus(es) 102
Display Controller
and
Display Device
104
I/O
Controller(s)
108
I/O Devices
(e.g., Mouse or
Keyboard or
Modem or
Network Interface or
CD Drive, etc.)
109

FIG. 1

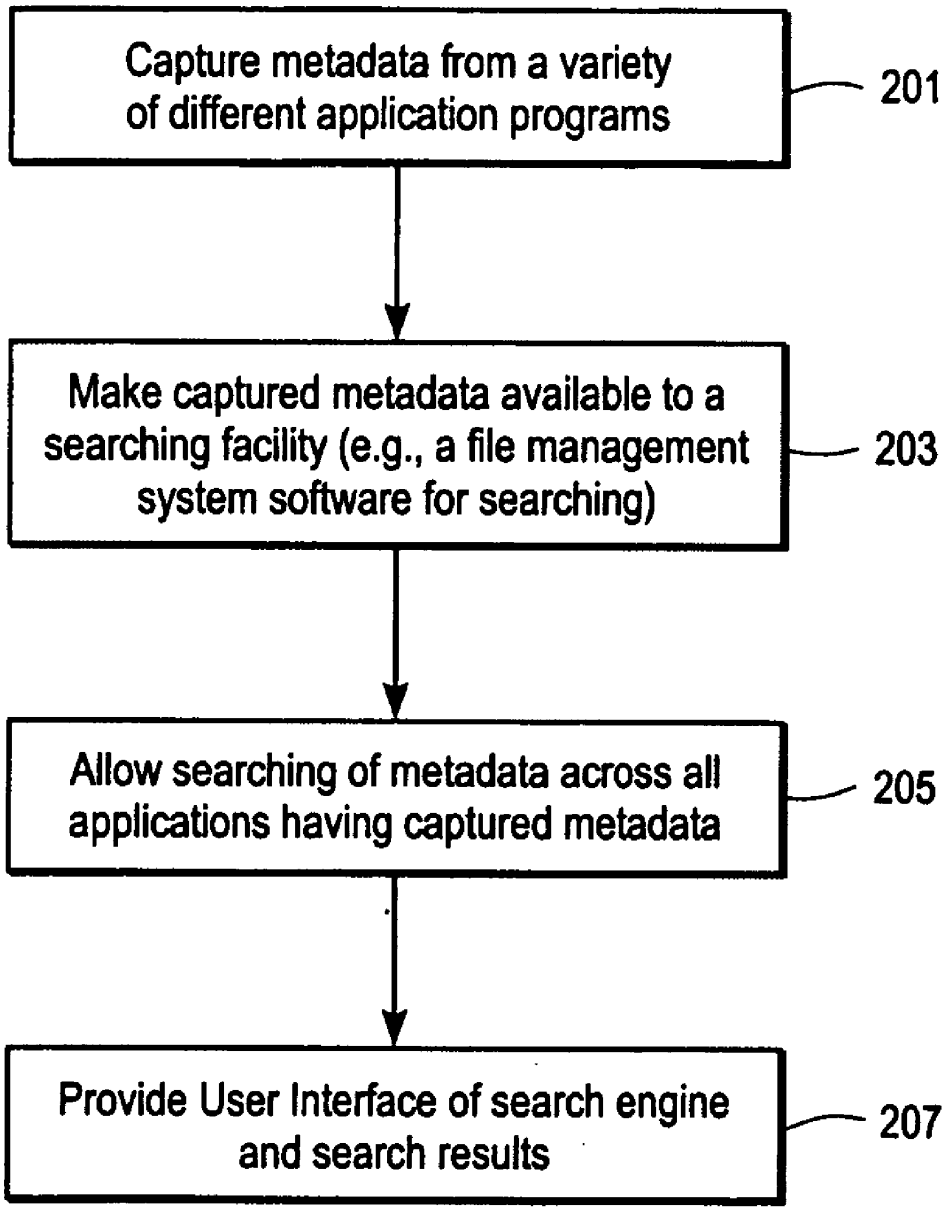

Capture metadata from a variety of different application programs
201
Make captured metadata available to a searching facility (e.g., a file management system software for searching)
203
Allow searching of metadata across all applications having captured metadata
205
Provide User Interface of search engine and search results
207

FIG. 2

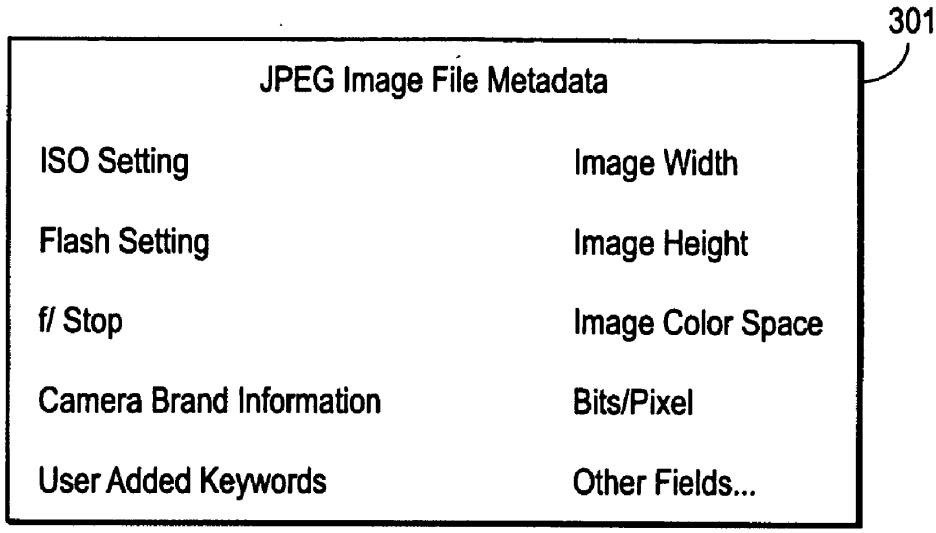

301
JPEG Image File Metadata
ISO Setting
Flash Setting
f/ Stop
Camera Brand Information
User Added Keywords
Image Width
Image Height
Image Color Space
Bits/Pixel
Other Fields...

FIG. 3A

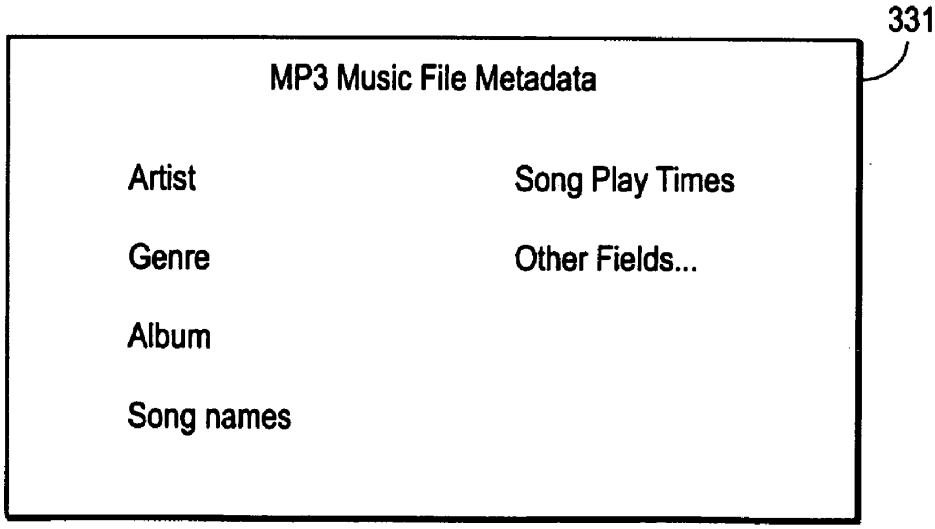

331
MP3 Music File Metadata
Artist
Genre
Album
Song names
Song Play Times
Other Fields...

FIG. 3B

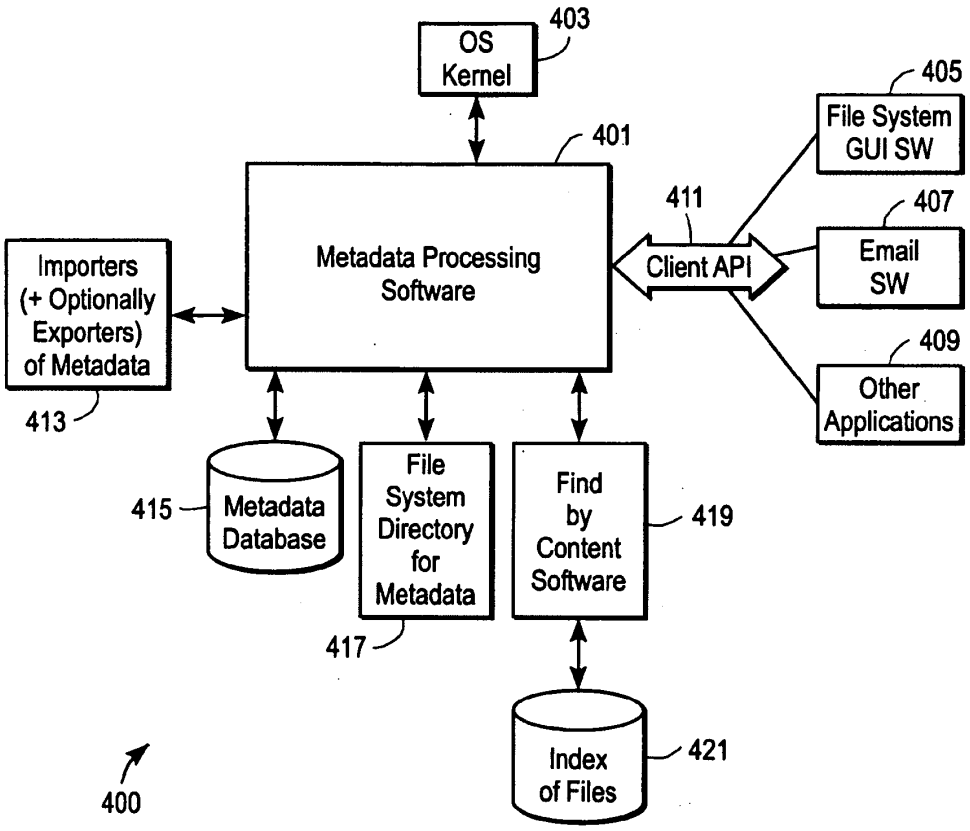

OS Kernel
403
401
Metadata Processing Software
Importers (+ Optionally Exporters) of Metadata
413
411
Client API
405
File System GUI SW
407
Email SW
409
Other Applications
415
Metadata Database
File System Directory for Metadata
417
Find by Content Software
419
Index of Files
421
400

FIG. 4

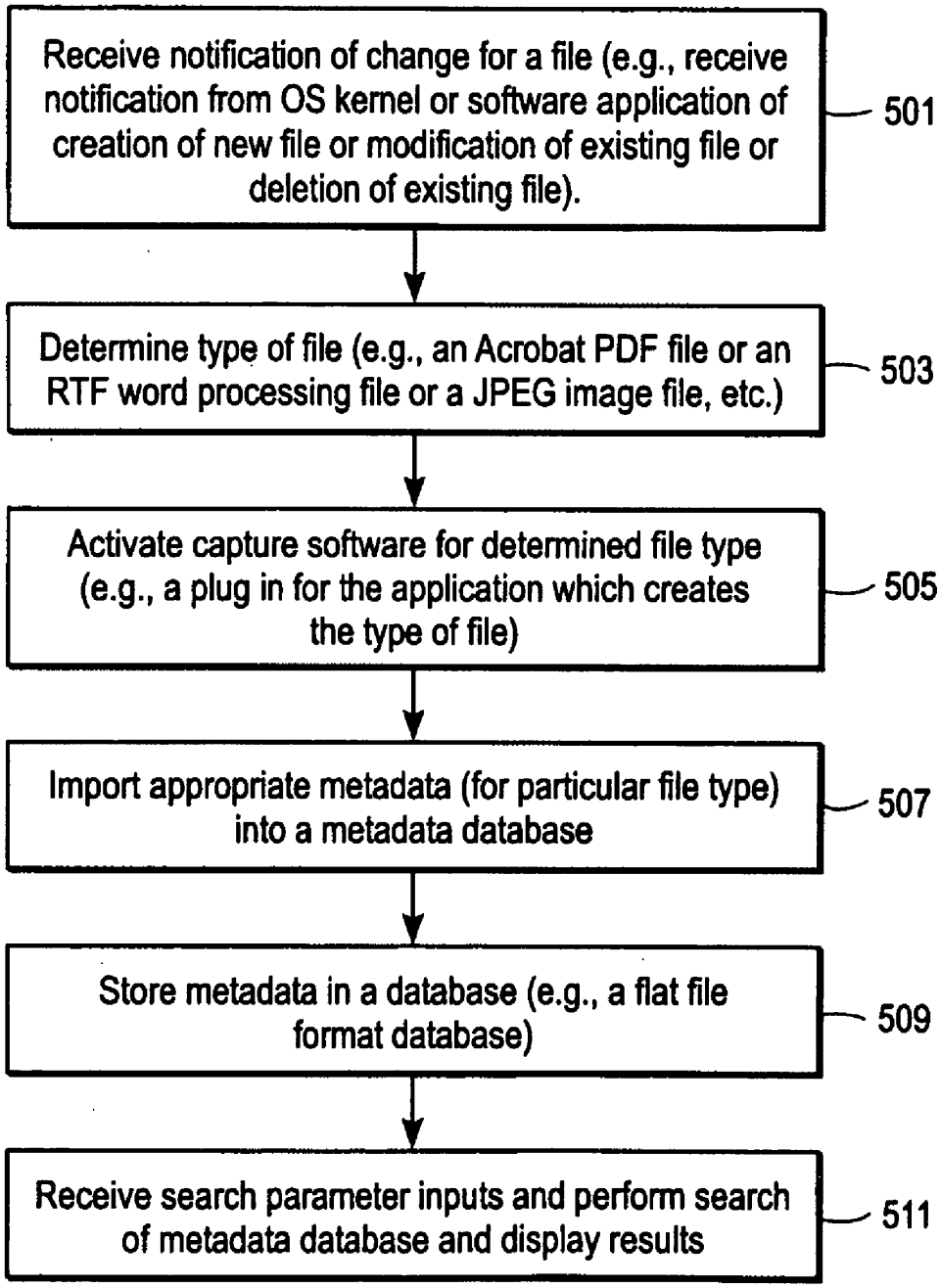

Receive notification of change for a file (e.g., receive notification from OS kernel or software application of creation of new file or modification of existing file or deletion of existing file).
501
Determine type of file (e.g., an Acrobat PDF file or an RTF word processing file or a JPEG image file, etc.)
503
Activate capture software for determined file type (e.g., a plug in for the application which creates the type of file)
505
Import appropriate metadata (for particular file type) into a metadata database
507
Store metadata in a database (e.g., a flat file format database)
509
Receive search parameter inputs and perform search of metadata database and display results
511

FIG. 5

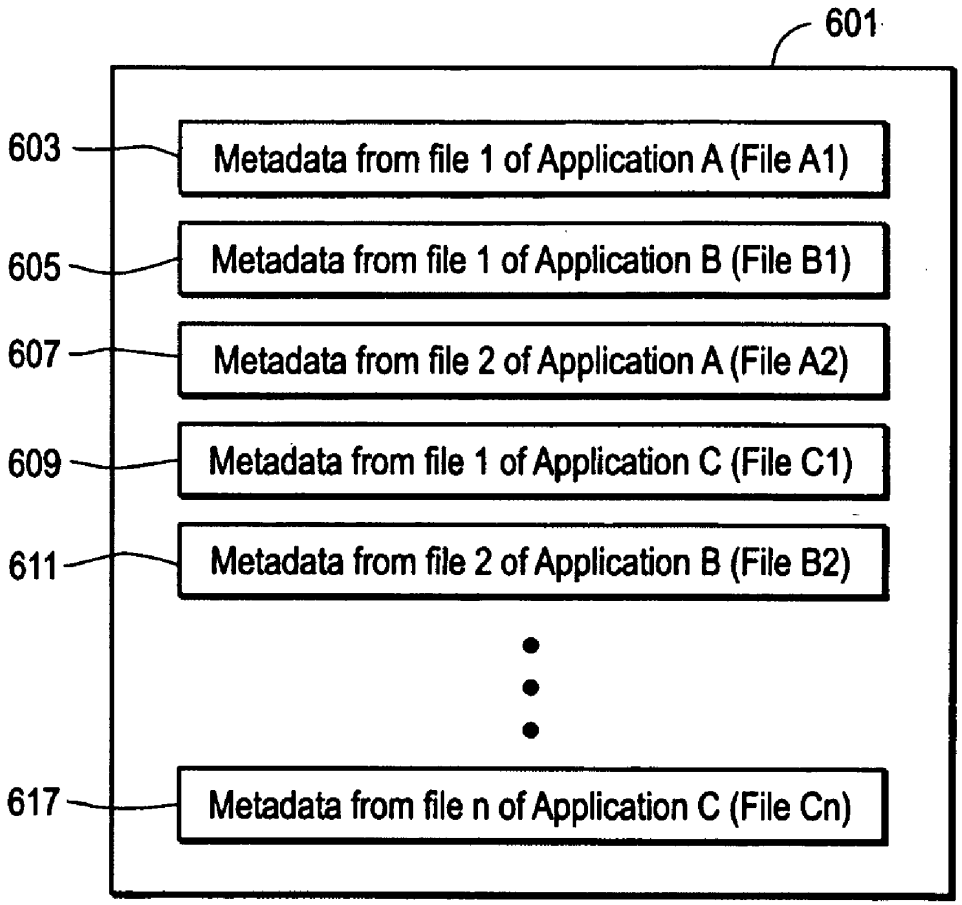

601
603
Metadata from file 1 of Application A (File A1)
605
Metadata from file 1 of Application B (File B1)
607
Metadata from file 2 of Application A (File A2)
609
Metadata from file 1 of Application C (File C1)
611
Metadata from file 2 of Application B (File B2)
617
Metadata from file n of Application C (File Cn)

FIG. 6

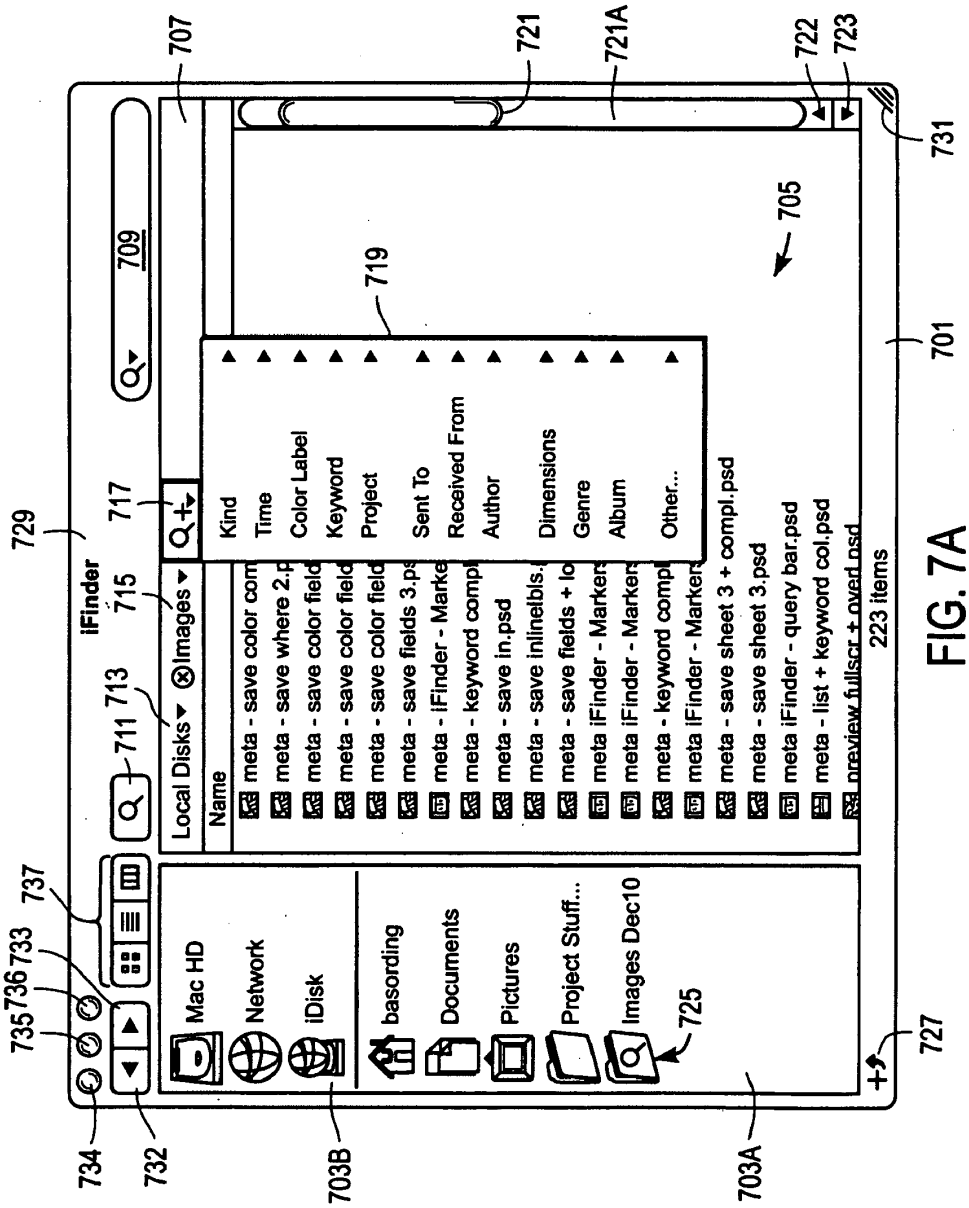

iFinder
Local Disks
Images
Name
Kind
Time
Color Label
Keyword
Project
Sent To
Received From
Author
Dimensions
Genre
Album
Other...
meta - save color com
meta - save where 2.p
meta - save color field
meta - save color field
meta - save color field
meta - save fields 3.ps
meta - iFinder - Marke
meta - keyword compl
meta - save in.psd
meta - save inlinelbls.
meta - save fields + lo
meta iFinder - Markers
meta iFinder - Markers
meta - keyword compl
meta iFinder - Markers
meta - save sheet 3 + compl.psd
meta - save sheet 3.psd
meta iFinder - query bar.psd
meta - list + keyword col.psd
preview fullscr + over.psd
223 items
Mac HD
Network
iDisk
basording
Documents
Pictures
Project Stuff...
Images Dec10
701
703A
703B
705
707
709
711
713
715
717
719
721
721A
722
723
725
727
729
731
732
733
734
735
736
737

FIG. 7A

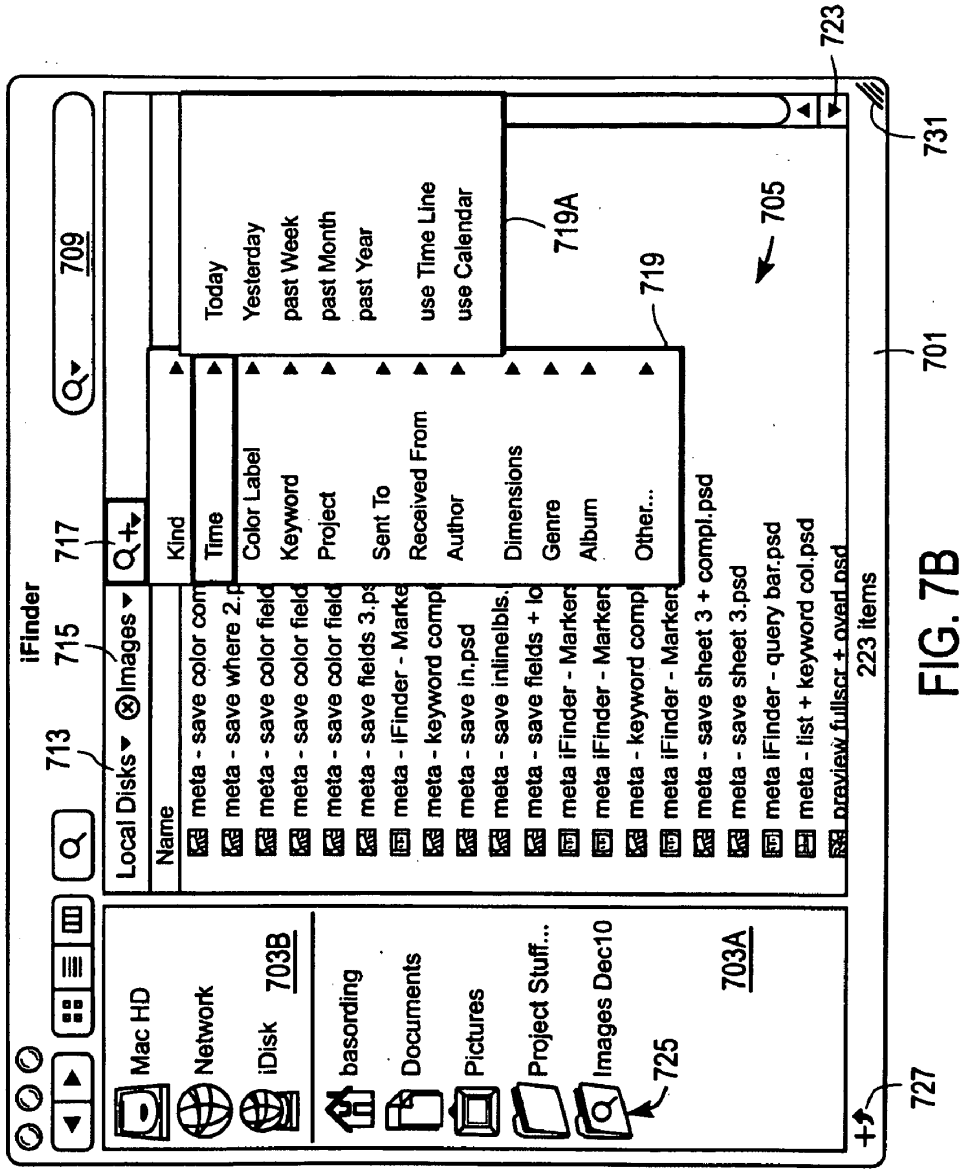

iFinder
713
715
717
709
Local Disks
Images
Name
Kind
Time
Color Label
Keyword
Project
Sent To
Received From
Author
Dimensions
Genre
Album
Other...
Today
Yesterday
past Week
past Month
past Year
use Time Line
use Calendar
719A
719
705
meta - save color com
meta - save where 2.p
meta - save color field
meta - save color field
meta - save color field
meta - save fields 3.ps
meta - iFinder - Marke
meta - keyword compl
meta - save in.psd
meta - save inlinelbls.
meta - save fields + lo
meta iFinder - Marker
meta iFinder - Marker
meta - keyword compl
meta iFinder - Marker
meta - save sheet 3 + compl.psd
meta - save sheet 3.psd
meta iFinder - query bar.psd
meta - list + keyword col.psd
preview fullscr + ovarl.psd
223 items
Mac HD
Network
iDisk
703B
basording
Documents
Pictures
Project Stuff...
Images Dec10
725
703A
723
731
701
727

FIG. 7B

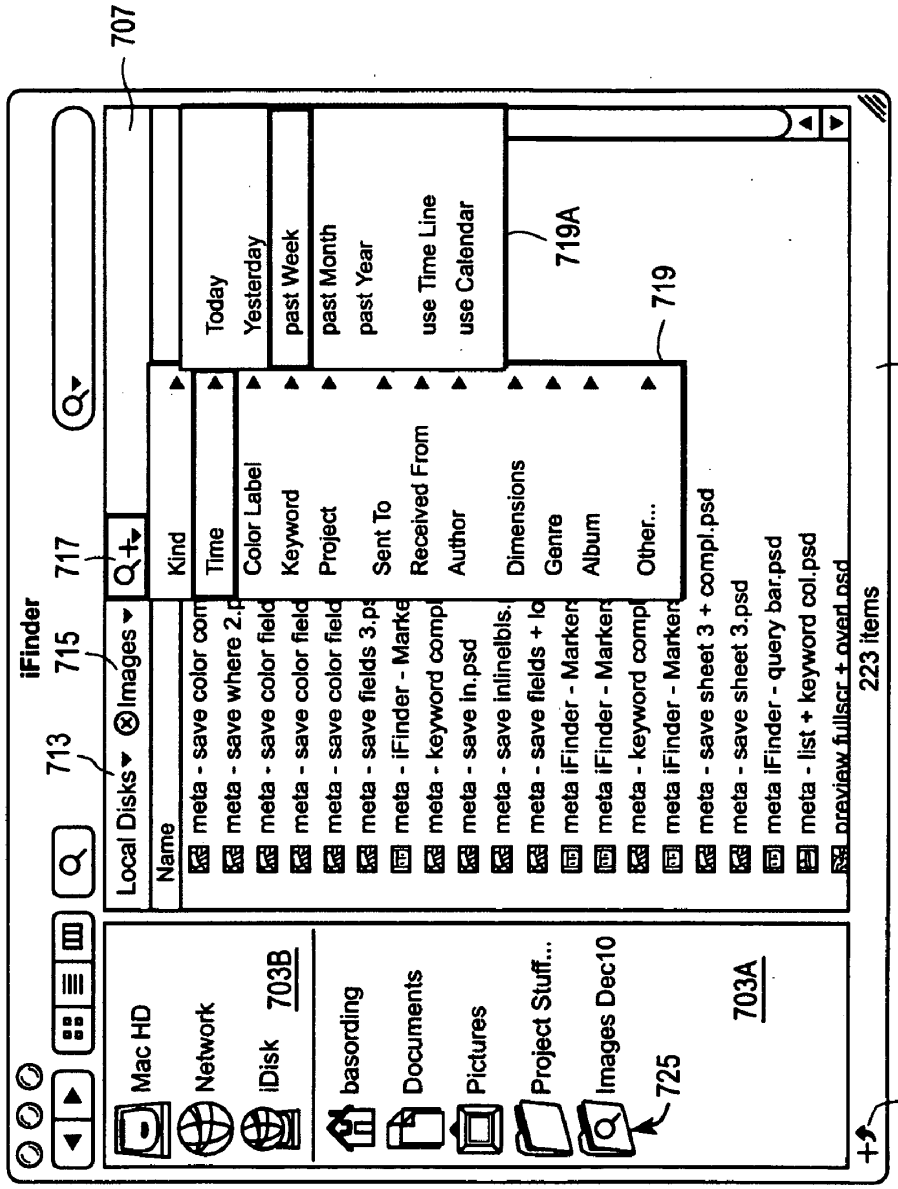

iFinder
Mac HD
Network
iDisk
703B
basording
Documents
Pictures
Project Stuff...
Images Dec10
725
703A
Local Disks
713
715
Images
717
707
Name
meta - save color com
meta - save where 2.p
meta - save color field
meta - save color field
meta - save color field
meta - save fields 3.ps
meta - iFinder - Marke
meta - keyword compl
meta - save in.psd
meta - save inlinelbls.
meta - save fields + lo
meta iFinder - Marker
meta iFinder - Marker
meta - keyword compl
meta iFinder - Marker
meta - save sheet 3 + compl.psd
meta - save sheet 3.psd
meta iFinder - query bar.psd
meta - list + keyword col.psd
preview fullscr + overl.psd
223 items
Kind
Time
Color Label
Keyword
Project
Sent To
Received From
Author
Dimensions
Genre
Album
Other...
719
Today
Yesterday
past Week
past Month
past Year
use Time Line
use Calendar
719A
701
727

FIG. 7C

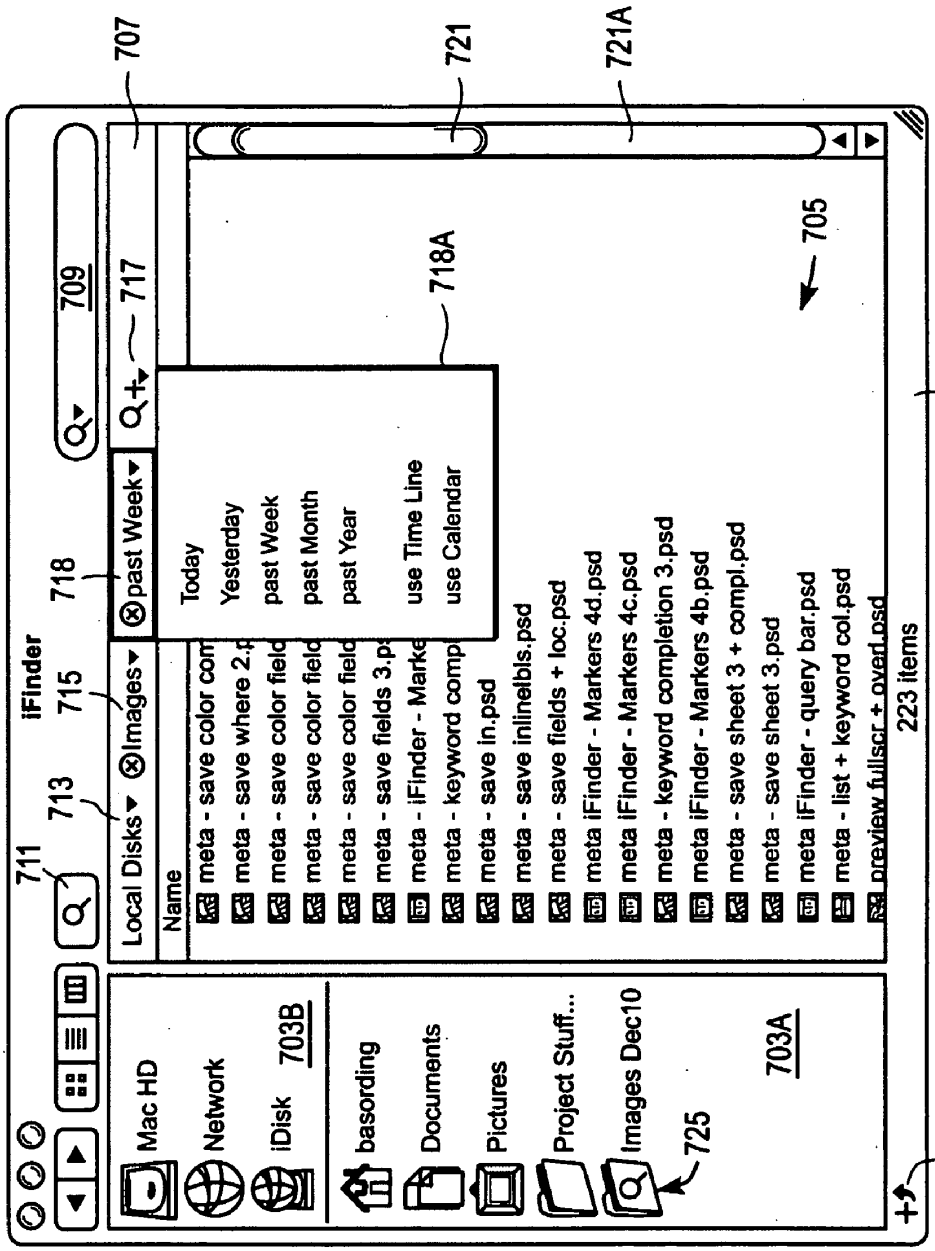

iFinder
Mac HD
Network
iDisk
703B
basording
Documents
Pictures
Project Stuff...
Images Dec10
725
703A
Local Disks
Images
past Week
Name
meta - save color com
meta - save where 2.p
meta - save color field
meta - save color field
meta - save color field
meta - save fields 3.ps
meta - iFinder - Marke
meta - keyword comp
meta - save in.psd
meta - save inlinelbls.psd
meta - save fields + loc.psd
meta iFinder - Markers 4d.psd
meta iFinder - Markers 4c.psd
meta - keyword completion 3.psd
meta iFinder - Markers 4b.psd
meta - save sheet 3 + compl.psd
meta - save sheet 3.psd
meta iFinder - query bar.psd
meta - list + keyword col.psd
preview fullscr + over.psd
223 items
Today
Yesterday
past Week
past Month
past Year
use Time Line
use Calendar
711
713
715
718
717
718A
707
709
721
721A
705
701
727

FIG. 7D

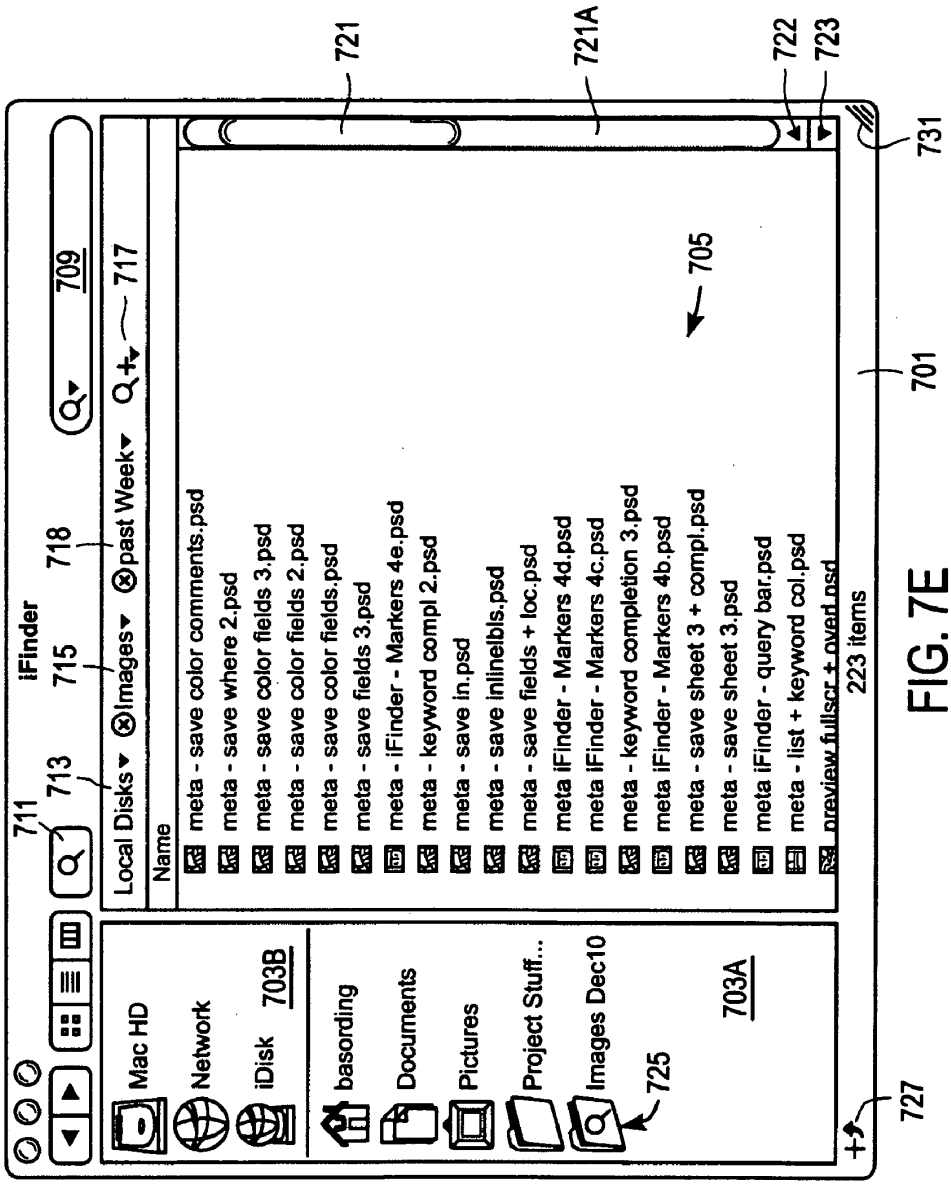

iFinder
711
713
715
718
709
717
721
721A
722
723
731
701
705
727
725
703A
703B
Mac HD
Network
iDisk
basording
Documents
Pictures
Project Stuff...
Images Dec10
Local Disks
Images
past Week
Name
meta - save color comments.psd
meta - save where 2.psd
meta - save color fields 3.psd
meta - save color fields 2.psd
meta - save color fields.psd
meta - save fields 3.psd
meta - iFinder - Markers 4e.psd
meta - keyword compl 2.psd
meta - save in.psd
meta - save inlinelbls.psd
meta - save fields + loc.psd
meta iFinder - Markers 4d.psd
meta iFinder - Markers 4c.psd
meta - keyword completion 3.psd
meta iFinder - Markers 4b.psd
meta - save sheet 3 + compl.psd
meta - save sheet 3.psd
meta iFinder - query bar.psd
meta - list + keyword col.psd
preview fullscr + overl.psd
223 items

FIG. 7E

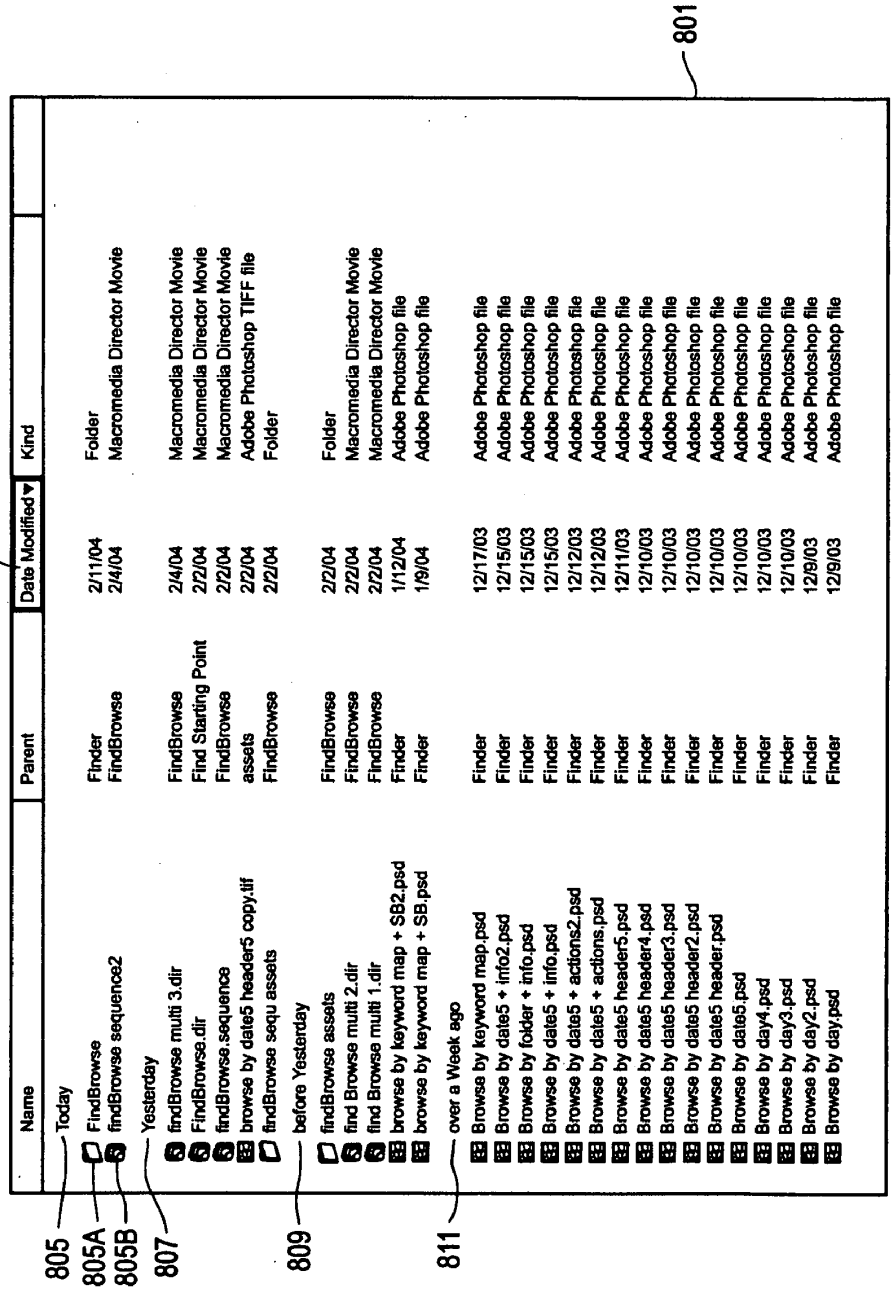

801
803
805
805A
805B
807
809
811
Name
Parent
Date Modified
Kind
Today
FindBrowse Finder 2/11/04 Folder
findBrowse sequence2 FindBrowse 2/4/04 Macromedia Director Movie
Yesterday
findBrowse multi 3.dir FindBrowse 2/4/04 Macromedia Director Movie
FindBrowse.dir Find Starting Point 2/2/04 Macromedia Director Movie
findBrowse.sequence FindBrowse 2/2/04 Macromedia Director Movie
browse by date5 header5 copy.tif assets 2/2/04 Adobe Photoshop TIFF file
findBrowse sequ assets FindBrowse 2/2/04 Folder
before Yesterday
findBrowse assets FindBrowse 2/2/04 Folder
find Browse multi 2.dir FindBrowse 2/2/04 Macromedia Director Movie
find Browse multi 1.dir FindBrowse 2/2/04 Macromedia Director Movie
browse by keyword map + SB2.psd Finder 1/12/04 Adobe Photoshop file
browse by keyword map + SB.psd Finder 1/9/04 Adobe Photoshop file
over a Week ago
Browse by keyword map.psd Finder 12/17/03 Adobe Photoshop file
Browse by date5 + info2.psd Finder 12/15/03 Adobe Photoshop file
Browse by folder + info.psd Finder 12/15/03 Adobe Photoshop file
Browse by date5 + info.psd Finder 12/15/03 Adobe Photoshop file
Browse by date5 + actions2.psd Finder 12/12/03 Adobe Photoshop file
Browse by date5 + actions.psd Finder 12/12/03 Adobe Photoshop file
Browse by date5 header5.psd Finder 12/11/03 Adobe Photoshop file
Browse by date5 header4.psd Finder 12/10/03 Adobe Photoshop file
Browse by date5 header3.psd Finder 12/10/03 Adobe Photoshop file
Browse by date5 header2.psd Finder 12/10/03 Adobe Photoshop file
Browse by date5 header.psd Finder 12/10/03 Adobe Photoshop file
Browse by date5.psd Finder 12/10/03 Adobe Photoshop file
Browse by day4.psd Finder 12/10/03 Adobe Photoshop file
Browse by day3.psd Finder 12/10/03 Adobe Photoshop file
Browse by day2.psd Finder 12/9/03 Adobe Photoshop file
Browse by day.psd Finder 12/9/03 Adobe Photoshop file

FIG. 8A

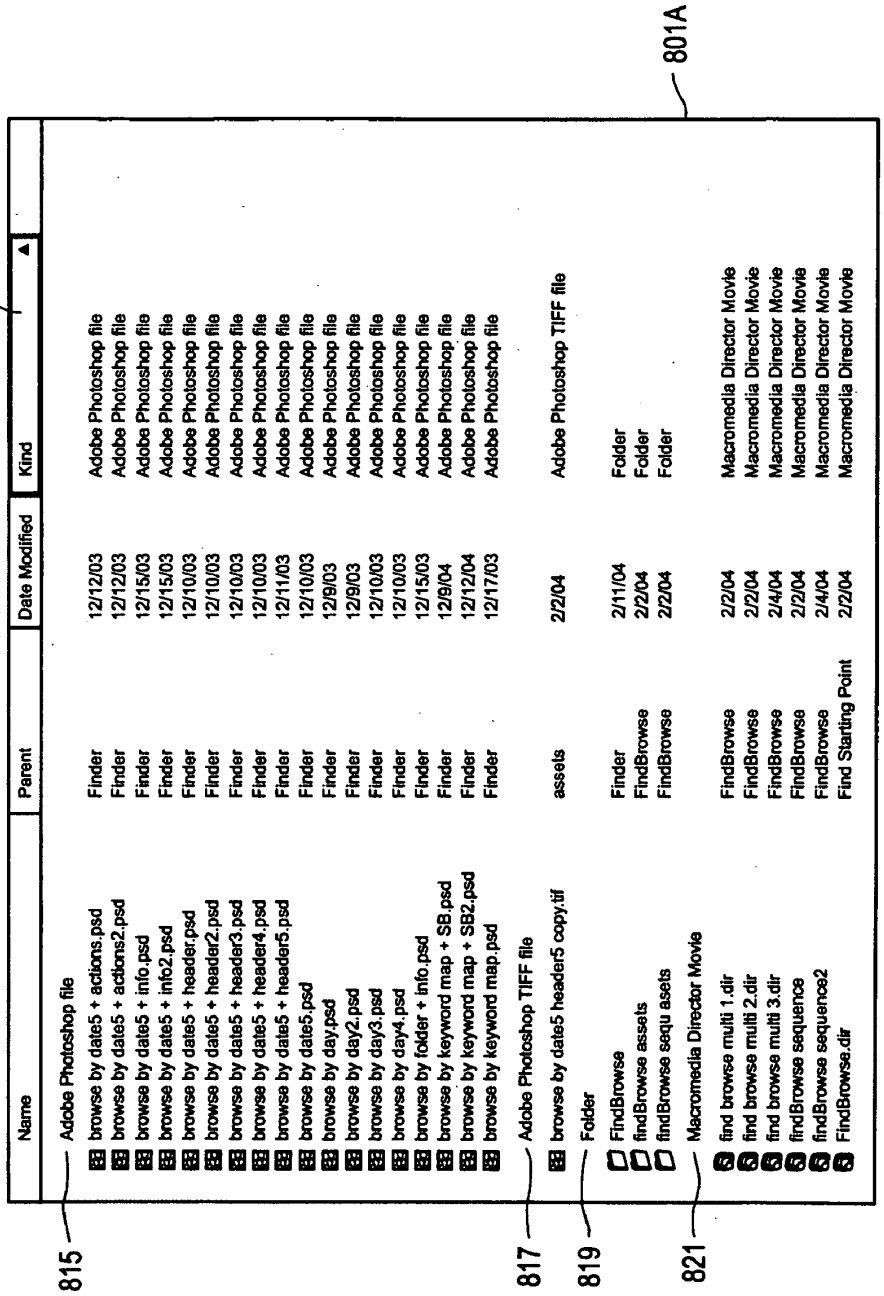

801A
802
815
817
819
821
Name
Parent
Date Modified
Kind
Adobe Photoshop file
browse by date5 + actions.psd Finder 12/12/03 Adobe Photoshop file
browse by date5 + actions2.psd Finder 12/12/03 Adobe Photoshop file
browse by date5 + info.psd Finder 12/15/03 Adobe Photoshop file
browse by date5 + info2.psd Finder 12/15/03 Adobe Photoshop file
browse by date5 + header.psd Finder 12/10/03 Adobe Photoshop file
browse by date5 + header2.psd Finder 12/10/03 Adobe Photoshop file
browse by date5 + header3.psd Finder 12/10/03 Adobe Photoshop file
browse by date5 + header4.psd Finder 12/10/03 Adobe Photoshop file
browse by date5 + header5.psd Finder 12/11/03 Adobe Photoshop file
browse by date5.psd Finder 12/10/03 Adobe Photoshop file
browse by day.psd Finder 12/9/03 Adobe Photoshop file
browse by day2.psd Finder 12/9/03 Adobe Photoshop file
browse by day3.psd Finder 12/10/03 Adobe Photoshop file
browse by day4.psd Finder 12/10/03 Adobe Photoshop file
browse by folder + info.psd Finder 12/15/03 Adobe Photoshop file
browse by keyword map + SB.psd Finder 12/9/04 Adobe Photoshop file
browse by keyword map + SB2.psd Finder 12/12/04 Adobe Photoshop file
browse by keyword map.psd Finder 12/17/03 Adobe Photoshop file
Adobe Photoshop TIFF file
browse by date5 header5 copy.tif assets 2/2/04 Adobe Photoshop TIFF file
Folder
FindBrowse Finder 2/11/04 Folder
findBrowse assets FindBrowse 2/2/04 Folder
findBrowse sequ asets FindBrowse 2/2/04 Folder
Macromedia Director Movie
find browse multi 1.dir FindBrowse 2/2/04 Macromedia Director Movie
find browse multi 2.dir FindBrowse 2/2/04 Macromedia Director Movie
find browse multi 3.dir FindBrowse 2/4/04 Macromedia Director Movie
findBrowse sequence FindBrowse 2/2/04 Macromedia Director Movie
findBrowse sequence2 FindBrowse 2/4/04 Macromedia Director Movie
FindBrowse.dir Find Starting Point 2/2/04 Macromedia Director Movie

FIG. 8B

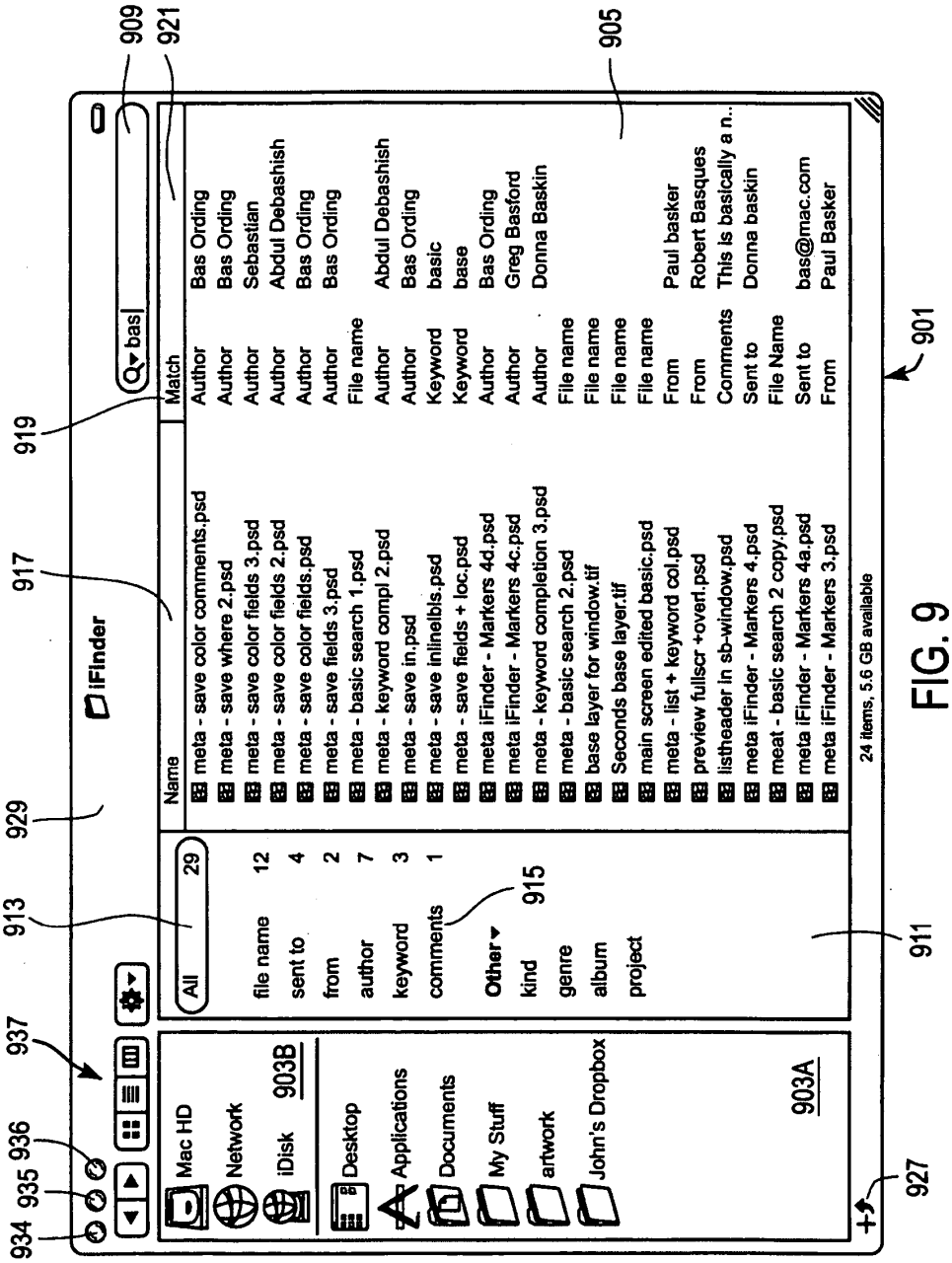

934
935
936
937
929
913
917
919
921
909
905
901
911
915
927
iFinder
bas
Mac HD
Network
iDisk
903B
Desktop
Applications
Documents
My Stuff
artwork
John's Dropbox
903A
All
29
file name 12
sent to 4
from 2
author 7
keyword 3
comments 1
Other
kind
genre
album
project
Name
Match
meta - save color comments.psd
meta - save where 2.psd
meta - save color fields 3.psd
meta - save color fields 2.psd
meta - save color fields.psd
meta - save fields 3.psd
meta - basic search 1.psd
meta - keyword compl 2.psd
meta - save in.psd
meta - save inlinelbls.psd
meta - save fields + loc.psd
meta iFinder - Markers 4d.psd
meta iFinder - Markers 4c.psd
meta - keyword completion 3.psd
meta - basic search 2.psd
base layer for window.tif
Seconds base layer.tif
main screen edited basic.psd
meta - list + keyword col.psd
preview fullscr +overl.psd
listheader in sb-window.psd
meta iFinder - Markers 4.psd
meat - basic search 2 copy.psd
meta iFinder - Markers 4a.psd
meta iFinder - Markers 3.psd
Author Bas Ording
Author Bas Ording
Author Sebastian
Author Abdul Debashish
Author Bas Ording
Author Bas Ording
File name
Author Abdul Debashish
Author Bas Ording
Keyword basic
Keyword base
Author Bas Ording
Author Greg Basford
Author Donna Baskin
File name
File name
File name
File name
From Paul basker
From Robert Basques
Comments This is basically a n..
Sent to Donna baskin
File Name
Sent to bas@mac.com
From Paul Basker
24 items, 5.6 GB available

FIG. 9

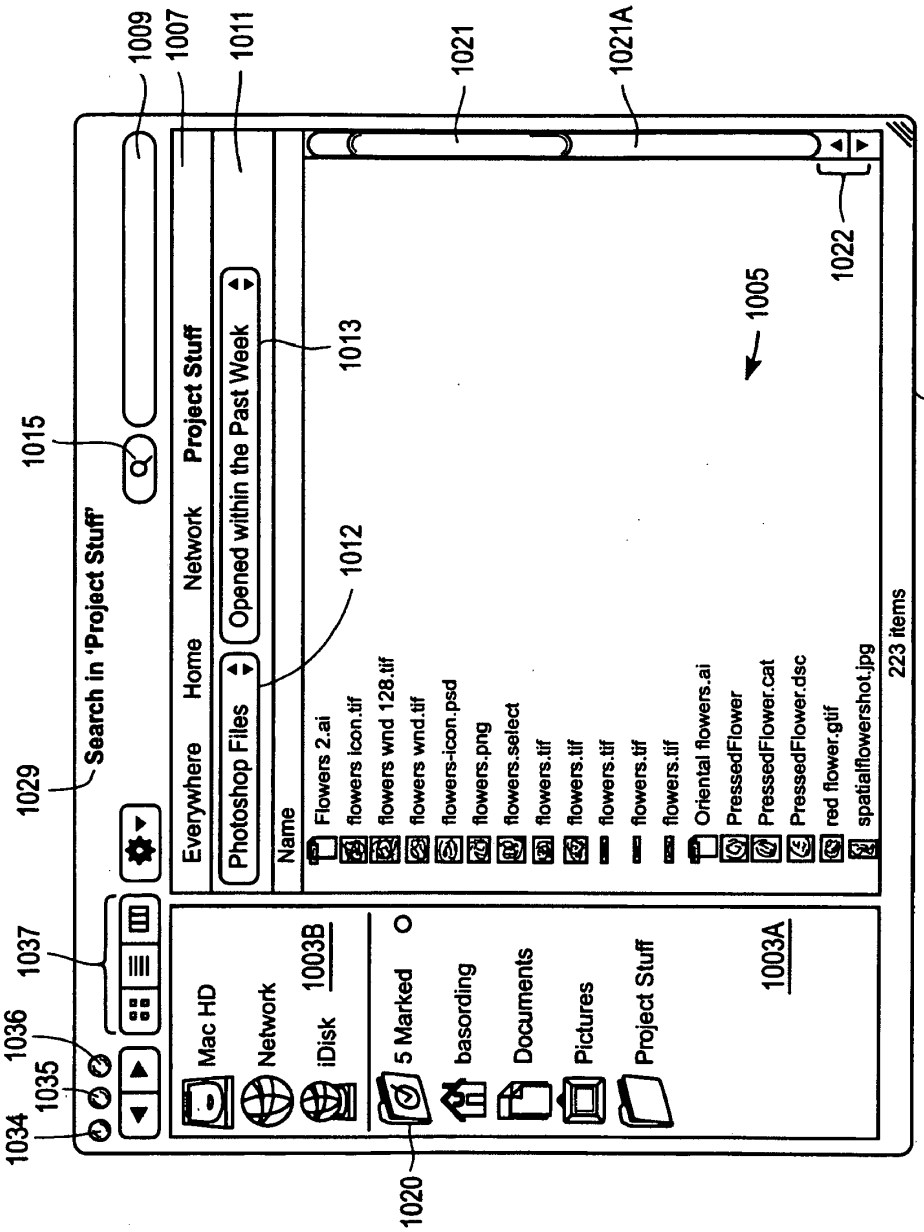

1009
1007
1011
1021
1021A
1015
1029
1037
1036
1035
1034
1020
1013
1012
1005
1022
1001
Search in 'Project Stuff'
Everywhere
Home
Network
Project Stuff
Photoshop Files
Opened within the Past Week
Name
Flowers 2.ai
flowers icon.tif
flowers wnd 128.tif
flowers wnd.tif
flowers-icon.psd
flowers.png
flowers.select
flowers.tif
flowers.tif
flowers.tif
flowers.tif
flowers.tif
Oriental flowers.ai
PressedFlower
PressedFlower.cat
PressedFlower.dsc
red flower.gtif
spatialflowershot.jpg
223 items
Mac HD
Network
iDisk
1003B
5 Marked
basording
Documents
Pictures
Project Stuff
1003A

FIG. 10

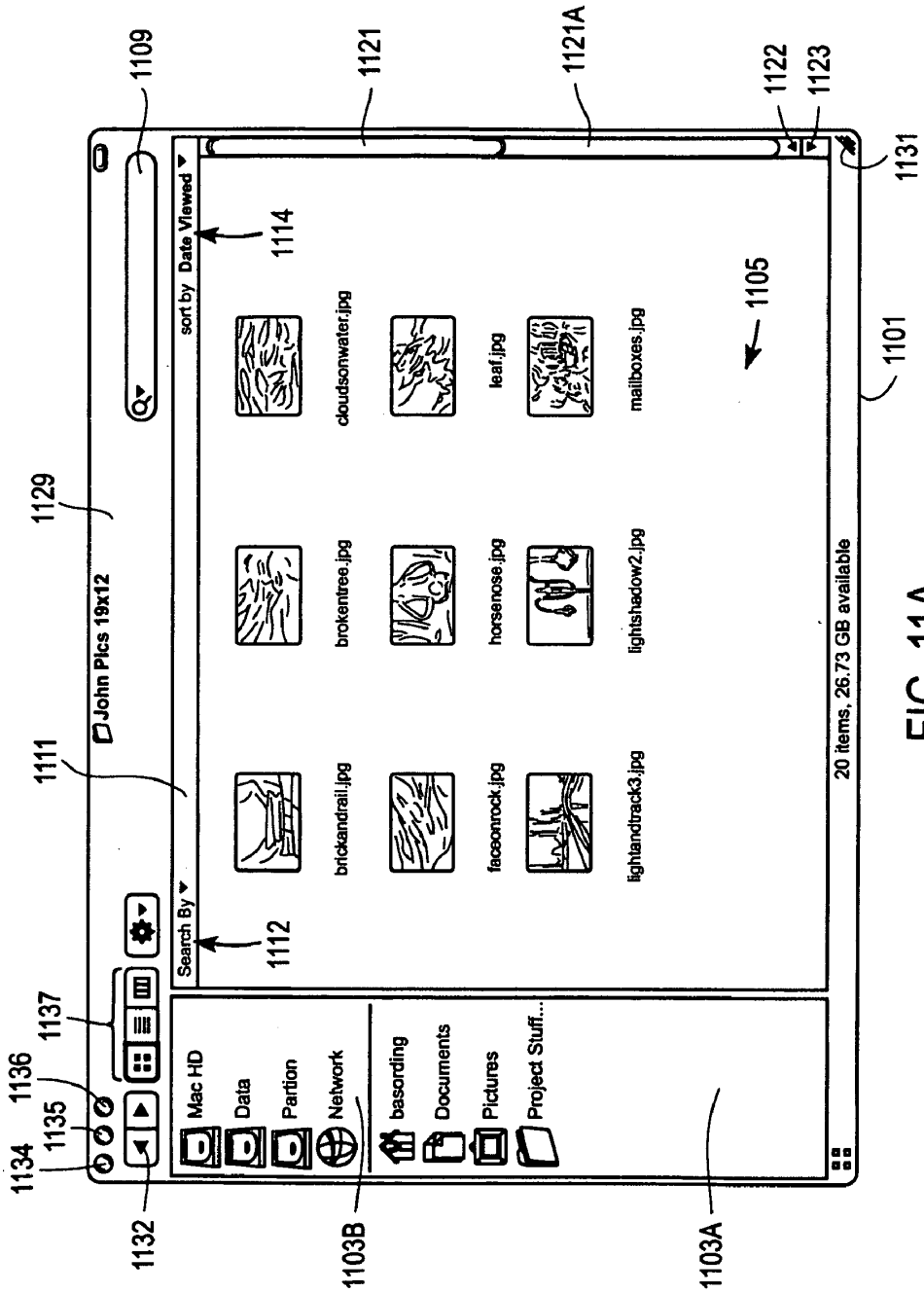

1109
1121
1121A
1122
1123
1131
1114
1105
1101
1129
1111
1112
1137
1136
1135
1134
1132
1103B
1103A
John Pics 19x12
sort by Date Viewed
Search By
brickandrail.jpg
brokentree.jpg
cloudsonwater.jpg
facesonrock.jpg
horsenose.jpg
leaf.jpg
lightandtrack3.jpg
lightshadow2.jpg
mailboxes.jpg
20 items, 26.73 GB available
Mac HD
Data
Partion
Network
basording
Documents
Pictures
Project Stuff...

FIG. 11A

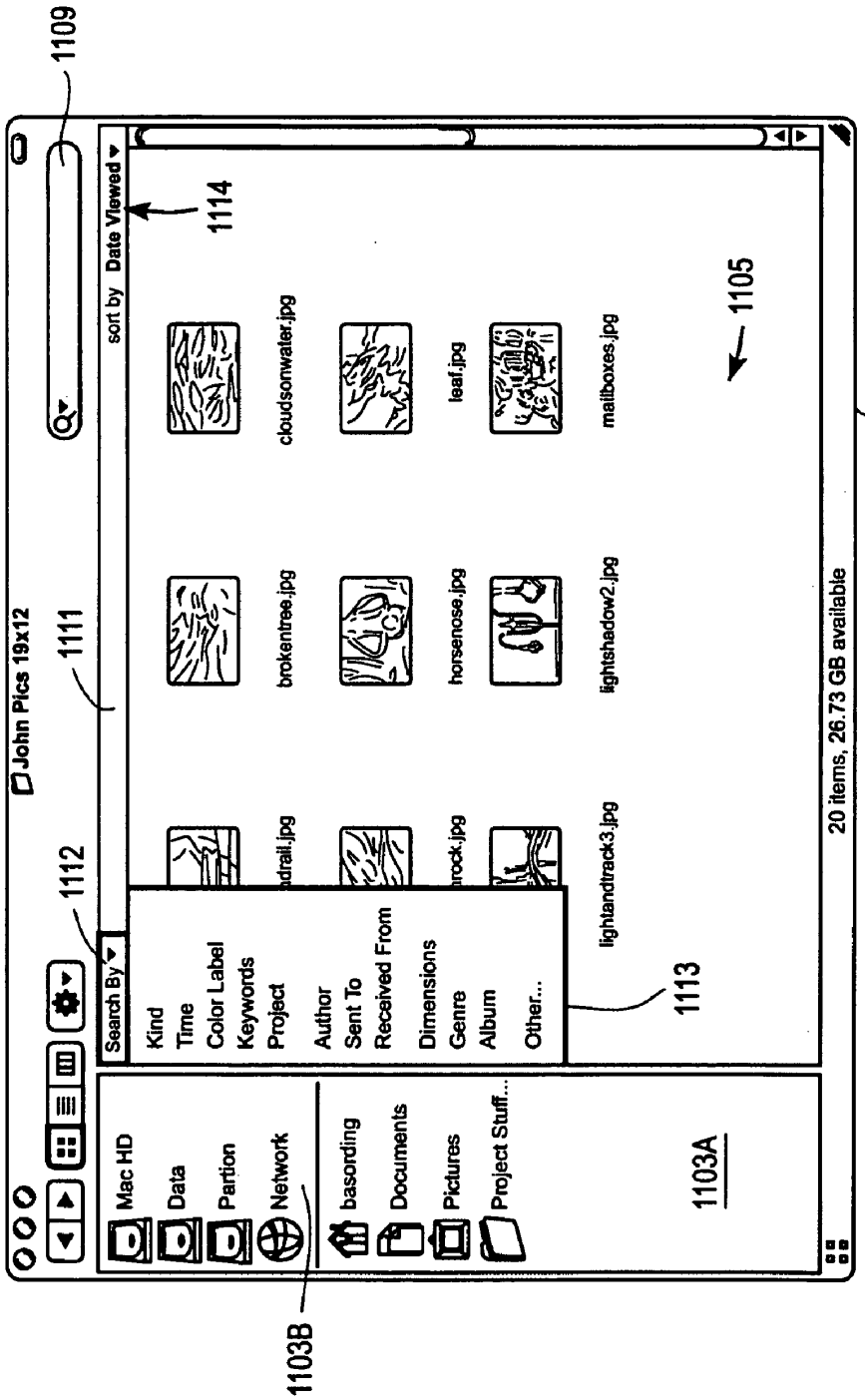

1109
1114
1105
1101
1111
1112
1113
1103A
1103B
John Pics 19x12
sort by Date Viewed
Search By
Kind
Time
Color Label
Keywords
Project
Author
Sent To
Received From
Dimensions
Genre
Album
Other...
Mac HD
Data
Partion
Network
basording
Documents
Pictures
Project Stuff...
cloudsonwater.jpg
leaf.jpg
mailboxes.jpg
brokentree.jpg
horsenose.jpg
lightshadow2.jpg
lightandtrack3.jpg
20 items, 26.73 GB available

FIG. 11B

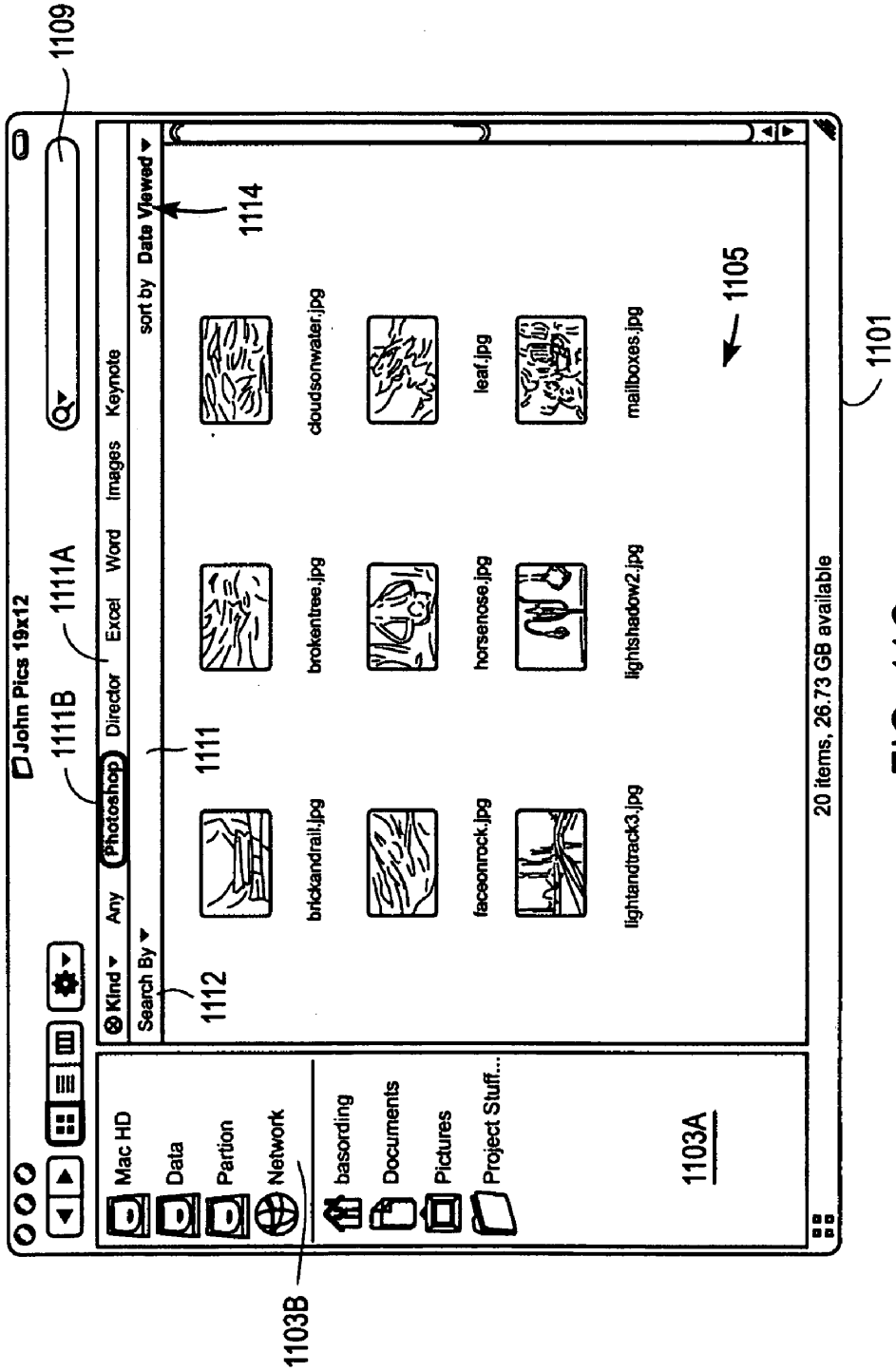

1109
John Pics 19x12
1111A
1111B
Photoshop
Director
Excel
Word
Images
Keynote
Kind
Any
Search By
sort by
Date Viewed
1114
1111
1112
brickandrail.jpg
brokentree.jpg
cloudsonwater.jpg
facesonrock.jpg
horsenose.jpg
leaf.jpg
lightandtrack3.jpg
lightshadow2.jpg
mailboxes.jpg
1105
Mac HD
Data
Partion
Network
basording
Documents
Pictures
Project Stuff...
1103A
1103B
20 items, 26.73 GB available
1101

FIG. 11C

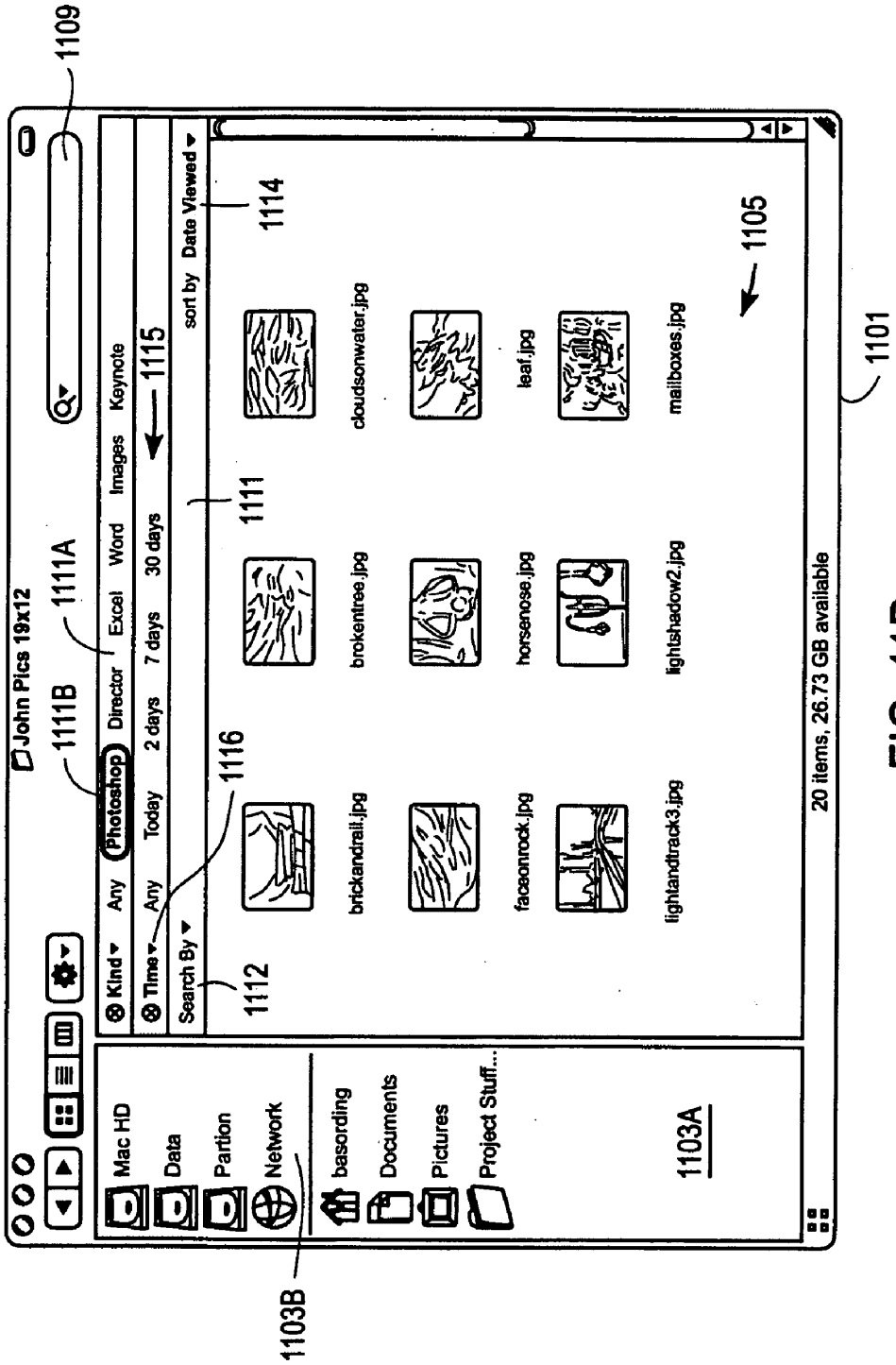

1109
John Pics 19x12
1111A
1111B
Kind
Any
Photoshop
Director
Excel
Word
Images
Keynote
Time
Any
Today
2 days
7 days
30 days
1115
Search By
1116
1112
sort by
Date Viewed
1114
1111
1105
1101
brickandrail.jpg
brokentree.jpg
cloudsonwater.jpg
faceonrock.jpg
horsenose.jpg
leaf.jpg
lightandtrack3.jpg
lightshadow2.jpg
mailboxes.jpg
20 items, 26.73 GB available
Mac HD
Data
Partion
Network
basording
Documents
Pictures
Project Stuff...
1103A
1103B

FIG. 11D

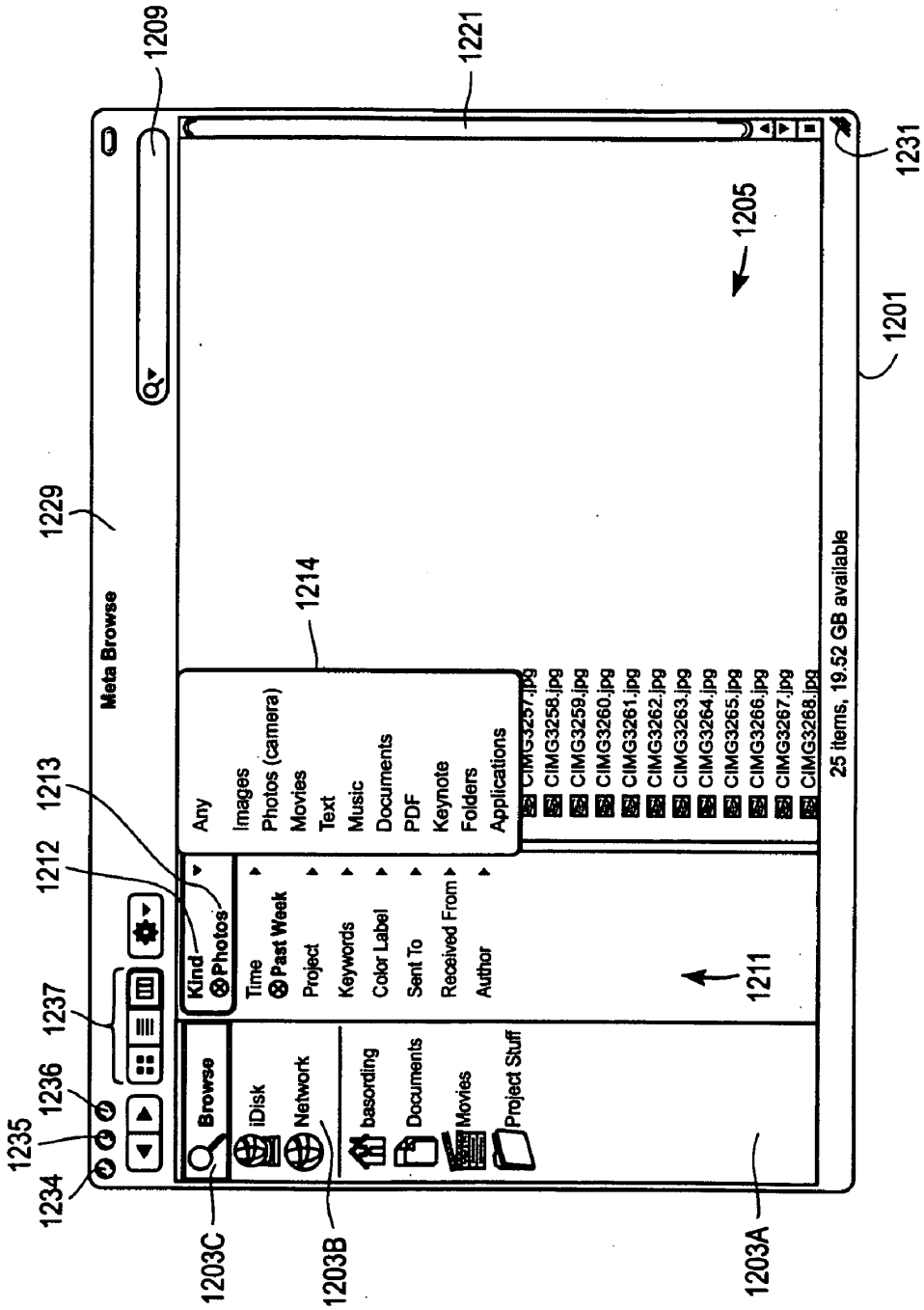

1209
1221
1231
1205
1201
1229
Meta Browse
1214
1213
1212
1237
1236
1235
1234
Any
Images
Photos (camera)
Movies
Text
Music
Documents
PDF
Keynote
Folders
Applications
Kind
Photos
Time
Past Week
Project
Keywords
Color Label
Sent To
Received From
Author
Browse
iDisk
Network
basording
Documents
Movies
Project Stuff
CIMG3257.jpg
CIMG3258.jpg
CIMG3259.jpg
CIMG3260.jpg
CIMG3261.jpg
CIMG3262.jpg
CIMG3263.jpg
CIMG3264.jpg
CIMG3265.jpg
CIMG3266.jpg
CIMG3267.jpg
CIMG3268.jpg
25 items, 19.52 GB available
1211
1203C
1203B
1203A

FIG. 12A

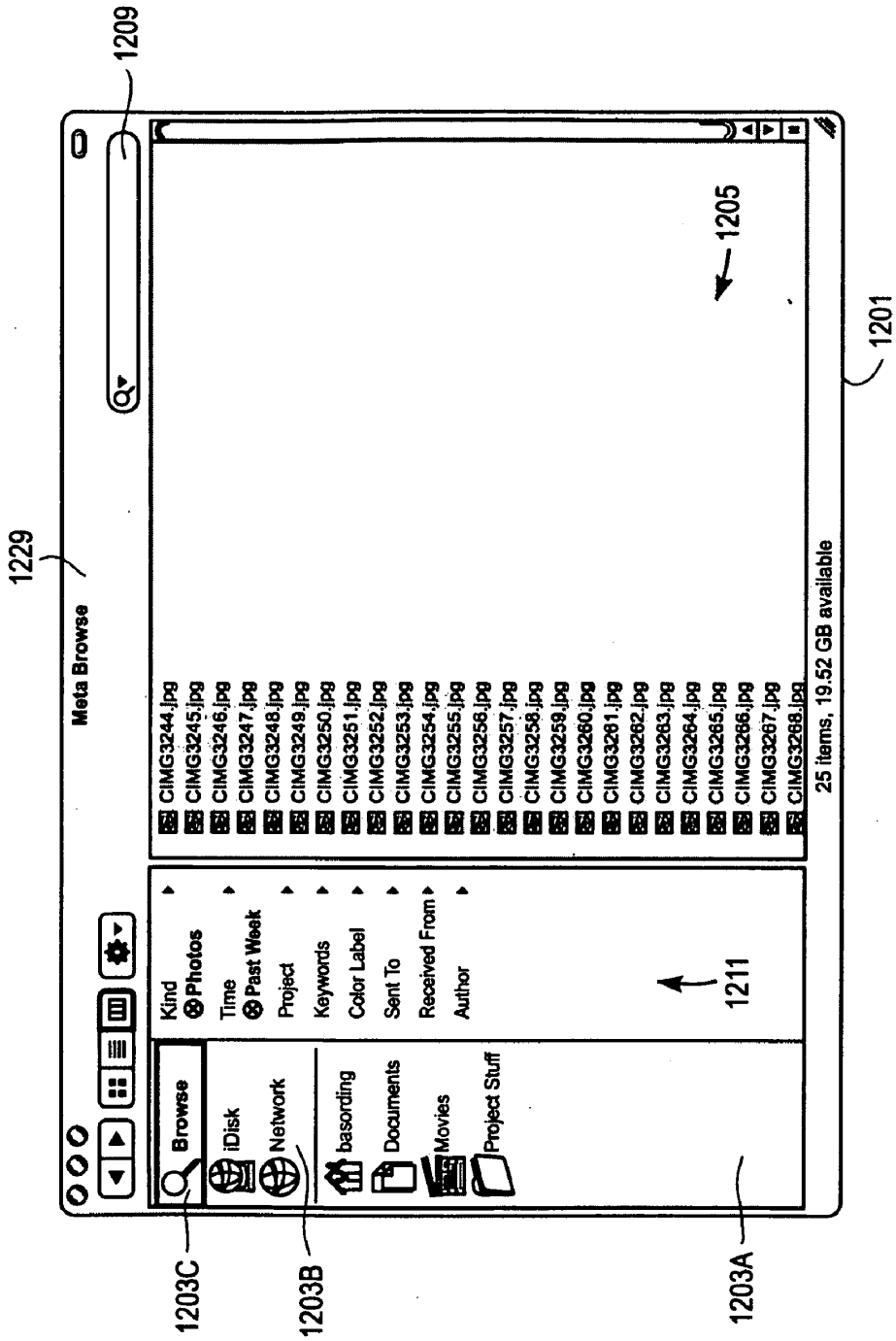

1229
1209
Meta Browse
1205
1201
CIMG3244.jpg
CIMG3245.jpg
CIMG3246.jpg
CIMG3247.jpg
CIMG3248.jpg
CIMG3249.jpg
CIMG3250.jpg
CIMG3251.jpg
CIMG3252.jpg
CIMG3253.jpg
CIMG3254.jpg
CIMG3255.jpg
CIMG3256.jpg
CIMG3257.jpg
CIMG3258.jpg
CIMG3259.jpg
CIMG3260.jpg
CIMG3261.jpg
CIMG3262.jpg
CIMG3263.jpg
CIMG3264.jpg
CIMG3265.jpg
CIMG3266.jpg
CIMG3267.jpg
CIMG3268.jpg
25 items, 19.52 GB available
Kind
Photos
Time
Past Week
Project
Keywords
Color Label
Sent To
Received From
Author
1211
Browse
iDisk
Network
basording
Documents
Movies
Project Stuff
1203C
1203B
1203A

FIG. 12B

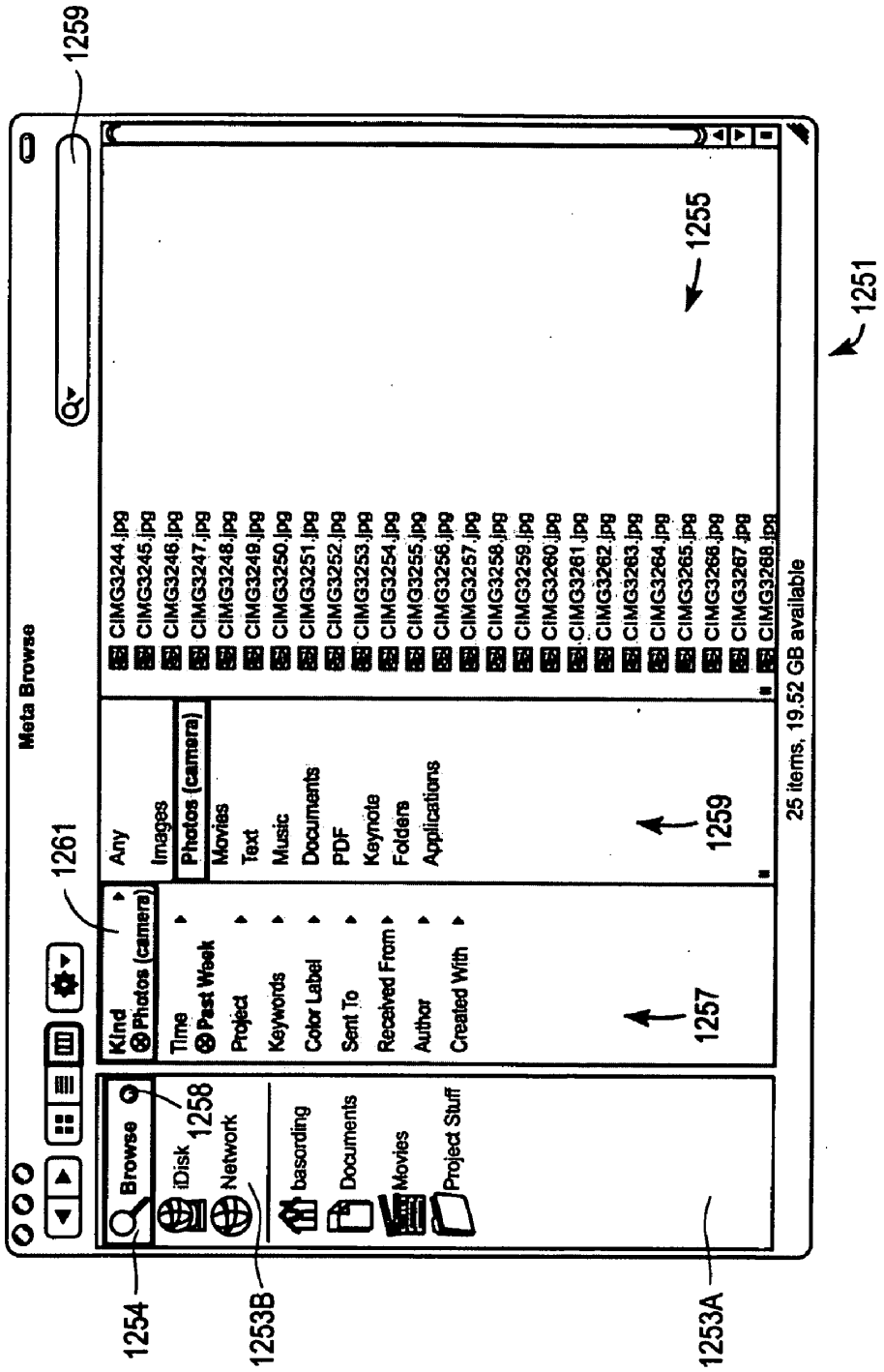

1259
Meta Browse
1261
Browse
1258
iDisk
Network
basording
Documents
Movies
Project Stuff
1254
1253B
Kind
Photos (camera)
Time
Past Week
Project
Keywords
Color Label
Sent To
Received From
Author
Created With
Any
Images
Photos (camera)
Movies
Text
Music
Documents
PDF
Keynote
Folders
Applications
1257
1259
CIMG3244.jpg
CIMG3245.jpg
CIMG3246.jpg
CIMG3247.jpg
CIMG3248.jpg
CIMG3249.jpg
CIMG3250.jpg
CIMG3251.jpg
CIMG3252.jpg
CIMG3253.jpg
CIMG3254.jpg
CIMG3255.jpg
CIMG3256.jpg
CIMG3257.jpg
CIMG3258.jpg
CIMG3259.jpg
CIMG3260.jpg
CIMG3261.jpg
CIMG3262.jpg
CIMG3263.jpg
CIMG3264.jpg
CIMG3265.jpg
CIMG3266.jpg
CIMG3267.jpg
CIMG3268.jpg
25 items, 19.52 GB available
1255
1251
1253A

FIG. 12C

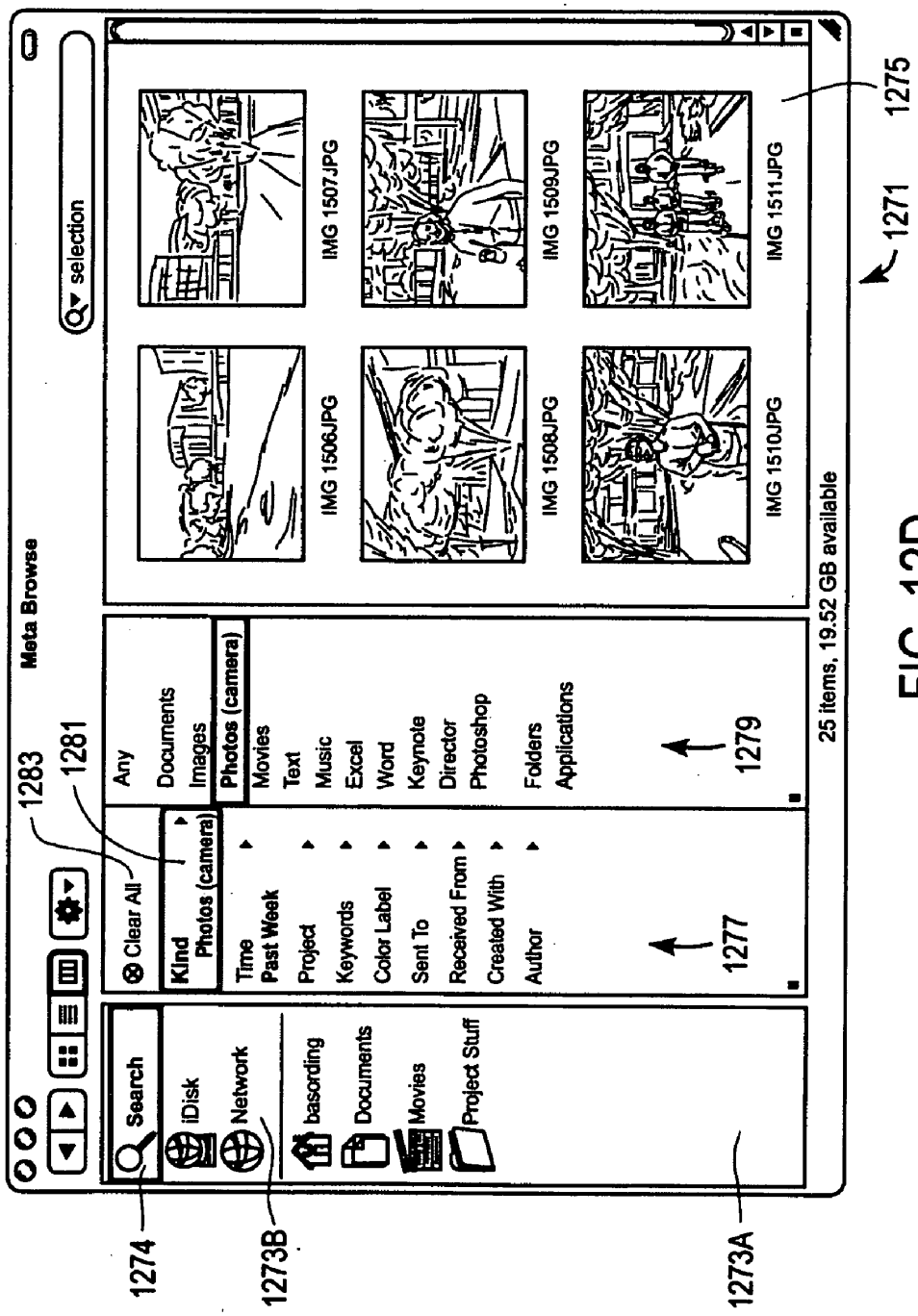

Meta Browse
selection
Search
iDisk
Network
basording
Documents
Movies
Project Stuff
Clear All
Kind
Photos (camera)
Time
Past Week
Project
Keywords
Color Label
Sent To
Received From
Created With
Author
Any
Documents
Images
Photos (camera)
Movies
Text
Music
Excel
Word
Keynote
Director
Photoshop
Folders
Applications
IMG 1506JPG
IMG 1507JPG
IMG 1508JPG
IMG 1509JPG
IMG 1510JPG
IMG 1511JPG
25 items, 19.52 GB available
1271
1273A
1273B
1274
1275
1277
1279
1281
1283

FIG. 12D

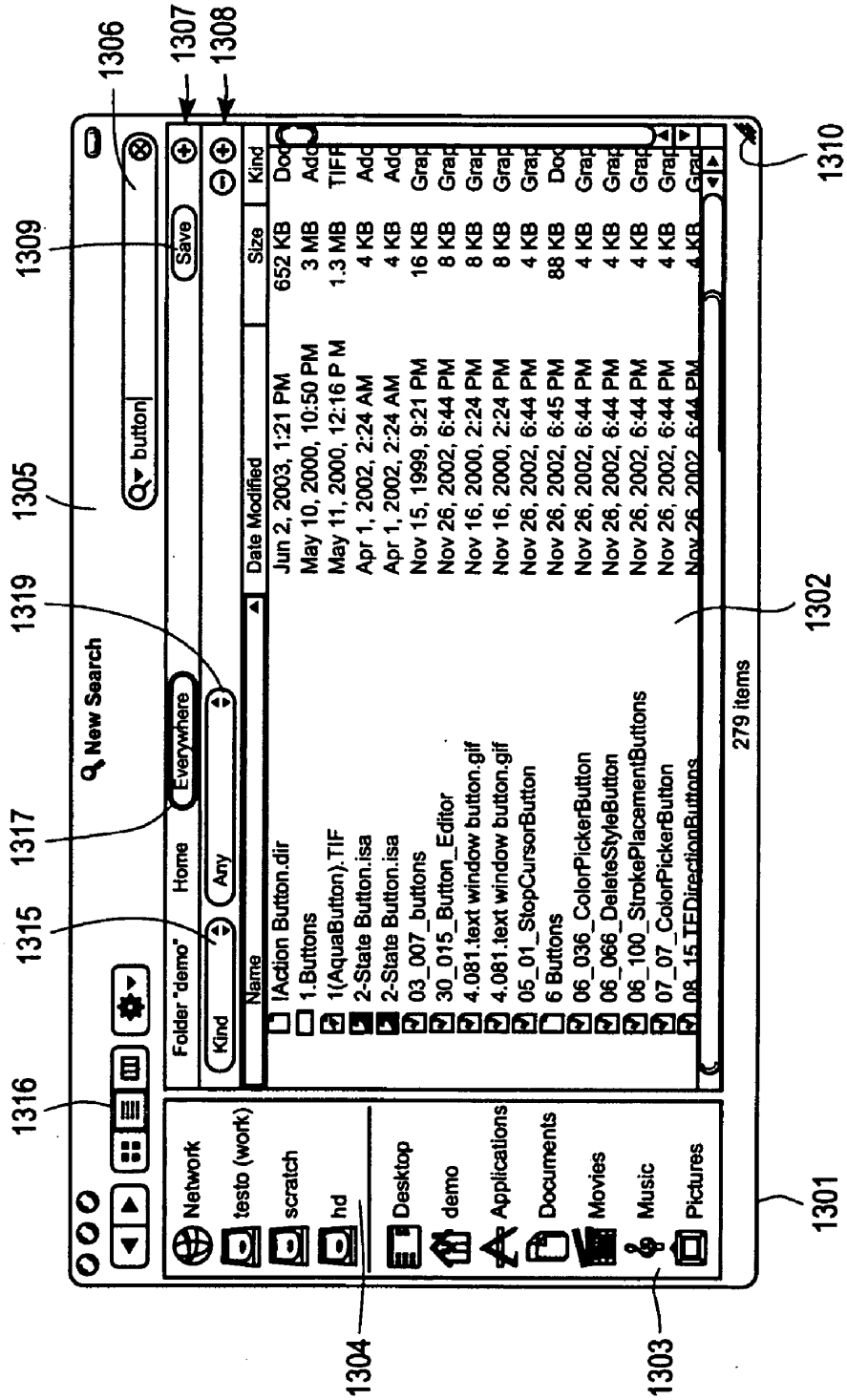

1306
1307
1308
1309
1305
1319
1317
1315
1316
1310
1302
1301
1304
1303
New Search
button
Save
Everywhere
Folder "demo"
Home
Kind
Any
Name
Date Modified
Size
Kind
!Action Button.dir
1.Buttons
1(AquaButton).TIF
2-State Button.isa
2-State Button.isa
03_007_buttons
30_015_Button_Editor
4.081.text window button.gif
4.081.text window button.gif
05_01_StopCursorButton
6 Buttons
06_036_ColorPickerButton
06_066_DeleteStyleButton
06_100_StrokePlacementButtons
07_07_ColorPickerButton
279 items
Network
testo (work)
scratch
hd
Desktop
demo
Applications
Documents
Movies
Music
Pictures

FIG. 13A

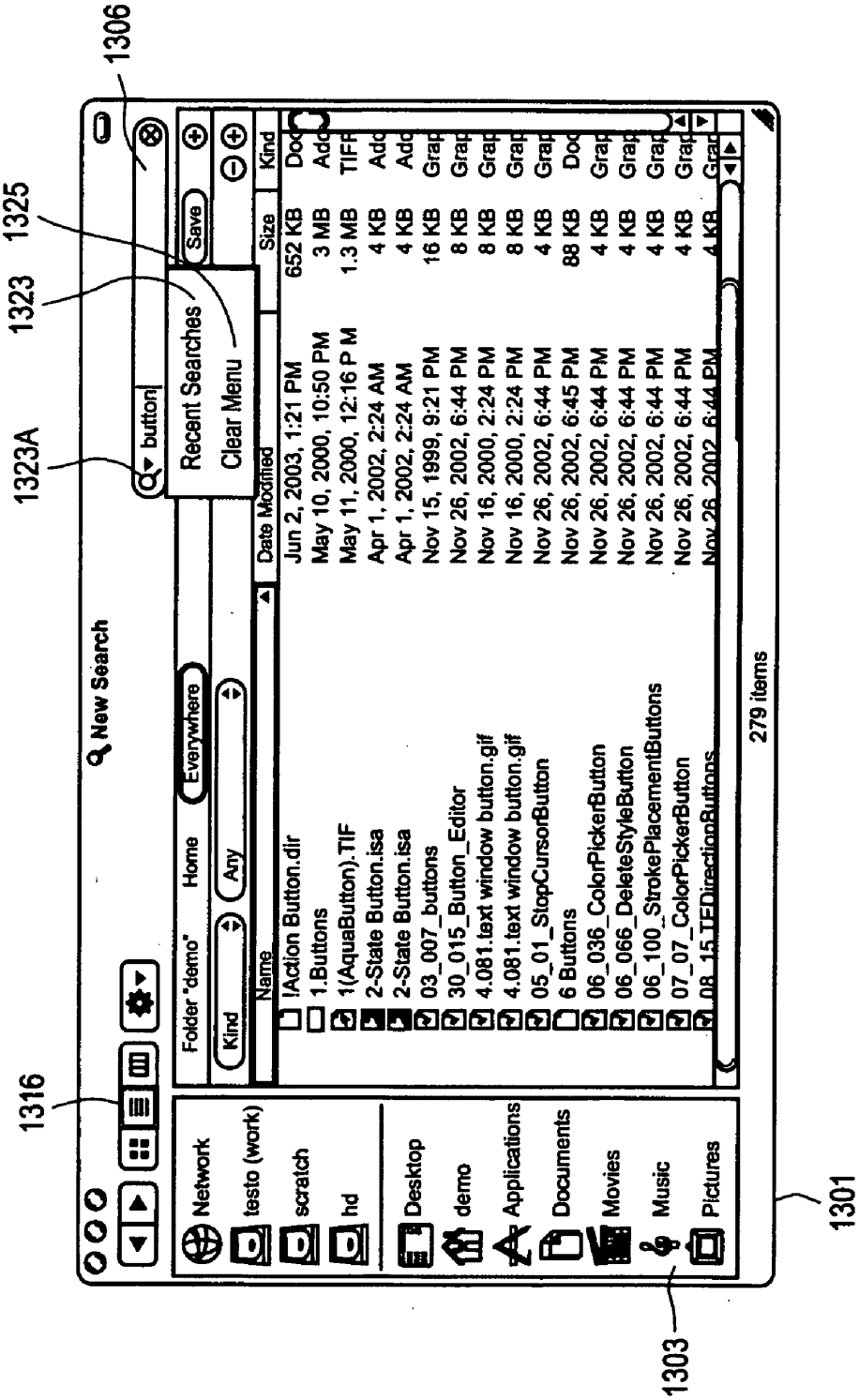

1306
1325
1323
1323A
1316
1303
1301
New Search
button
Recent Searches
Clear Menu
Save
Folder "demo"
Home
Everywhere
Kind
Any
Name
Date Modified
Size
Kind
!Action Button.dir
1.Buttons
1(AquaButton).TIF
2-State Button.isa
2-State Button.isa
03_007_buttons
30_015_Button_Editor
4.081.text window button.gif
4.081.text window button.gif
05_01_StopCursorButton
6 Buttons
06_036_ColorPickerButton
06_066_DeleteStyleButton
06_100_StrokePlacementButtons
07_07_ColorPickerButton
08_15_TEDirectionButtons
279 items
Network
testo (work)
scratch
hd
Desktop
demo
Applications
Documents
Movies
Music
Pictures

FIG. 13B

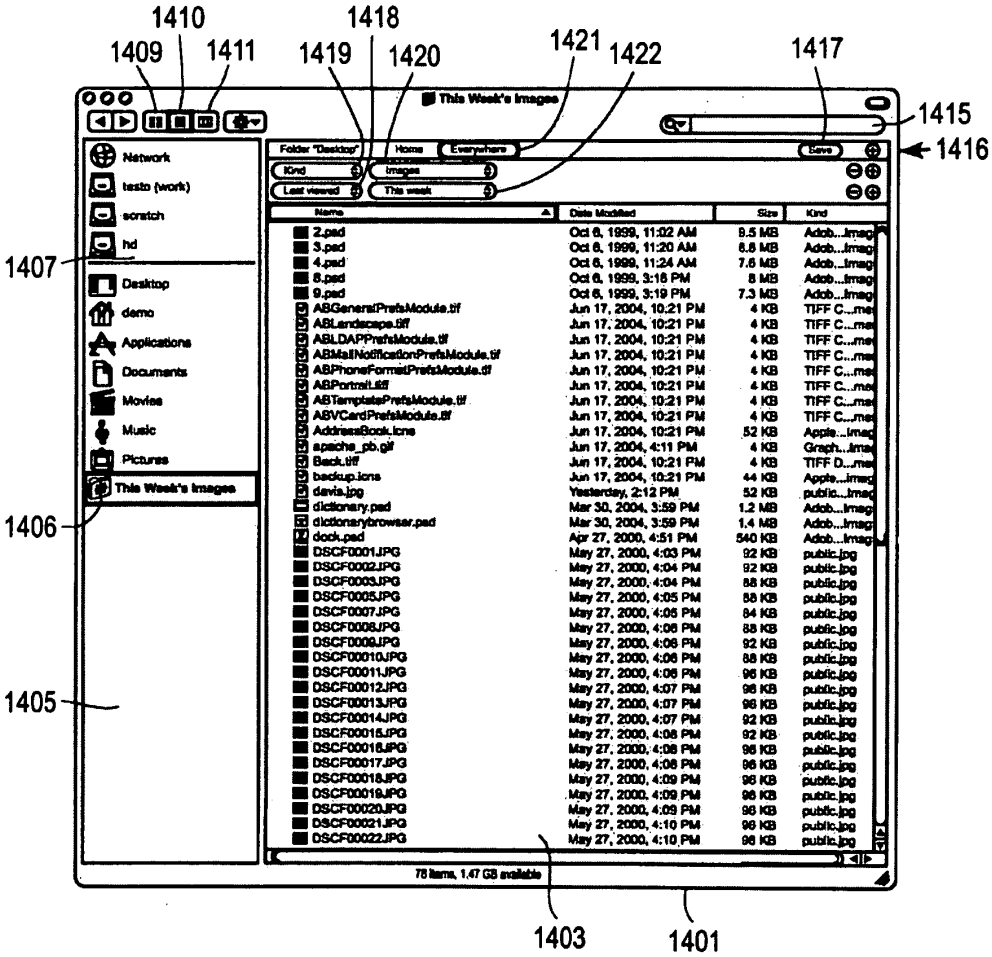

1410
1409
1411
1418
1419
1420
1421
1422
1417
1415
1416
1407
1406
1405
1403
1401
This Week's Images
Network
testo (work)
scratch
hd
Desktop
demo
Applications
Documents
Movies
Music
Pictures
This Week's Images
Folder "Desktop"
Home
Everywhere
Save
Kind
Images
Last viewed
This week
Name
Date Modified
Size
Kind
78 items, 1.47 GB available

FIG. 14A

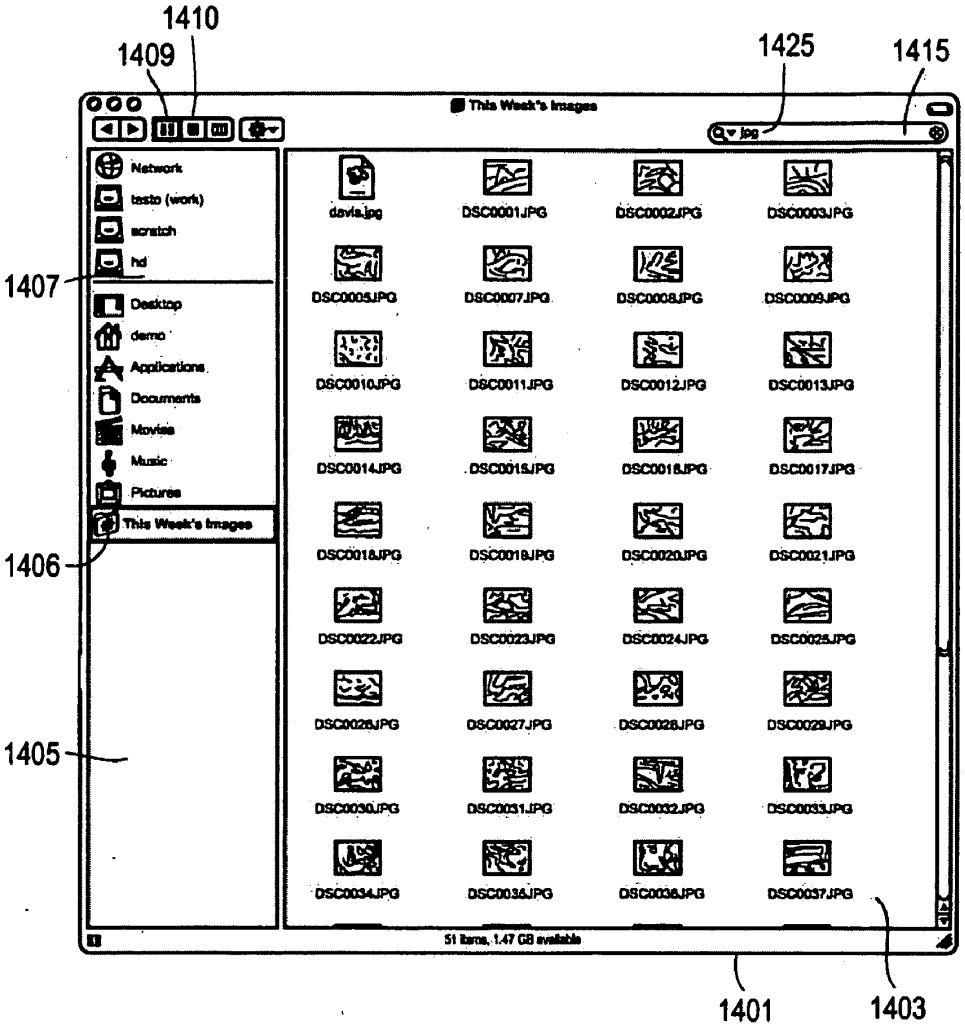

1410
1409
1425
1415
This Week's Images
jpg
Network
tasto (work)
scratch
hd
1407
Desktop
demo
Applications
Documents
Movies
Music
Pictures
This Week's Images
1406
1405
davis.jpg
DSC0001JPG
DSC0002JPG
DSC0003JPG
DSC0005JPG
DSC0007JPG
DSC0008JPG
DSC0009JPG
DSC0010JPG
DSC0011JPG
DSC0012JPG
DSC0013JPG
DSC0014JPG
DSC0015JPG
DSC0016JPG
DSC0017JPG
DSC0018JPG
DSC0019JPG
DSC0020JPG
DSC0021JPG
DSC0022JPG
DSC0023JPG
DSC0024JPG
DSC0025JPG
DSC0026JPG
DSC0027JPG
DSC0028JPG
DSC0029JPG
DSC0030JPG
DSC0031JPG
DSC0032JPG
DSC0033JPG
DSC0034JPG
DSC0035JPG
DSC0036JPG
DSC0037JPG
51 items, 1.47 GB available
1401
1403

FIG. 14B

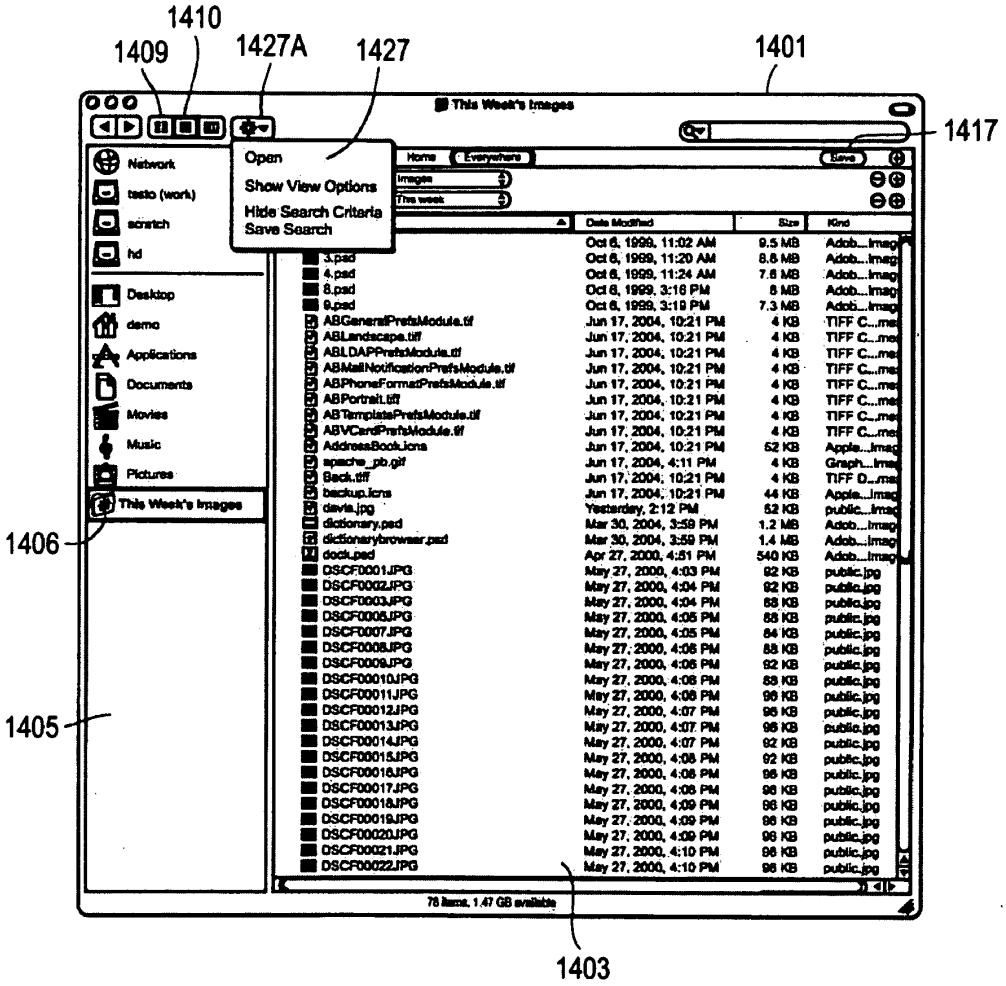

1410
1409
1427A
1427
1401
1417
1406
1405
1403
This Week's Images
Open
Show View Options
Hide Search Criteria
Save Search
Network
testo (work)
scratch
hd
Desktop
demo
Applications
Documents
Movies
Music
Pictures
This Week's Images
Home
Everywhere
Save
Images
This week
Date Modified
Size
Kind
76 items, 1.47 GB available

FIG. 14C

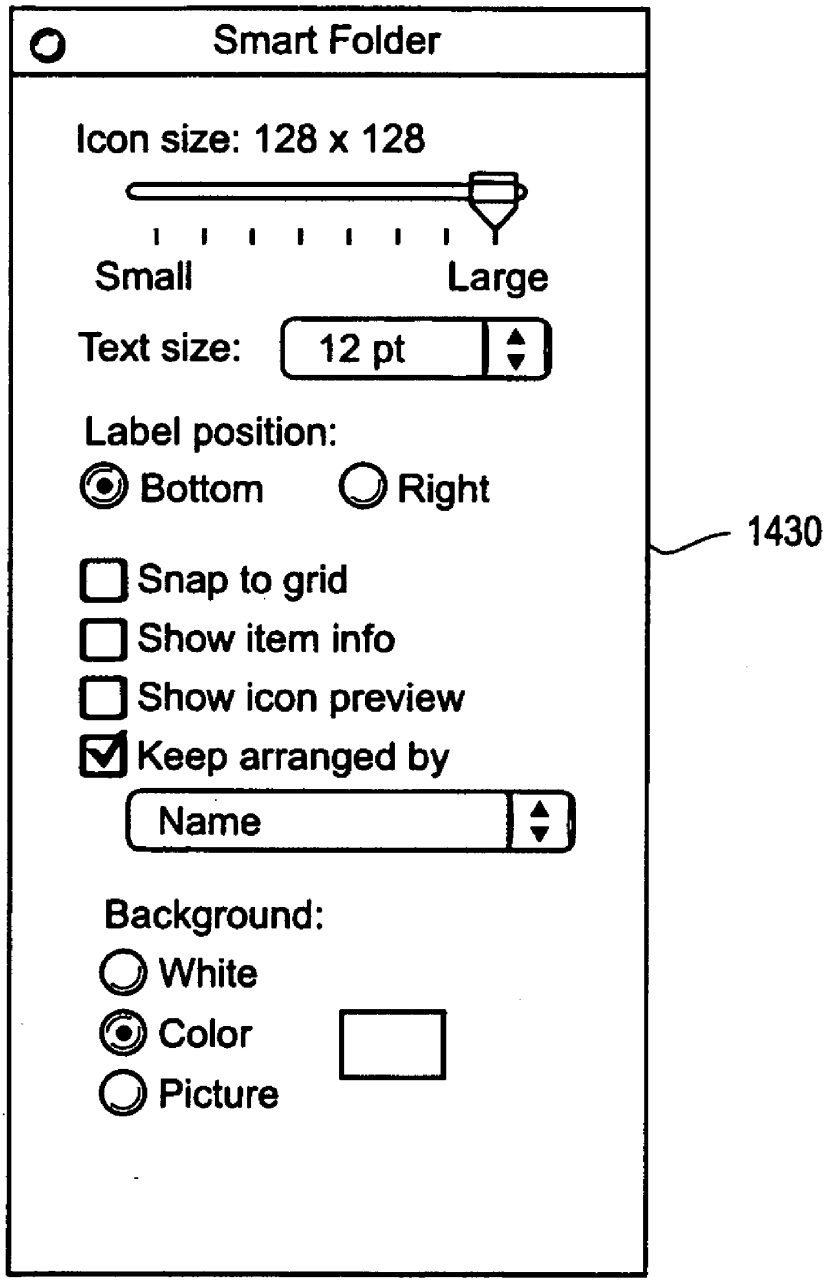

Smart Folder
Icon size: 128 x 128
Small
Large
Text size:
12 pt
Label position:
Bottom
Right
Snap to grid
Show item info
Show icon preview
Keep arranged by
Name
Background:
White
Color
Picture
1430

FIG. 14D

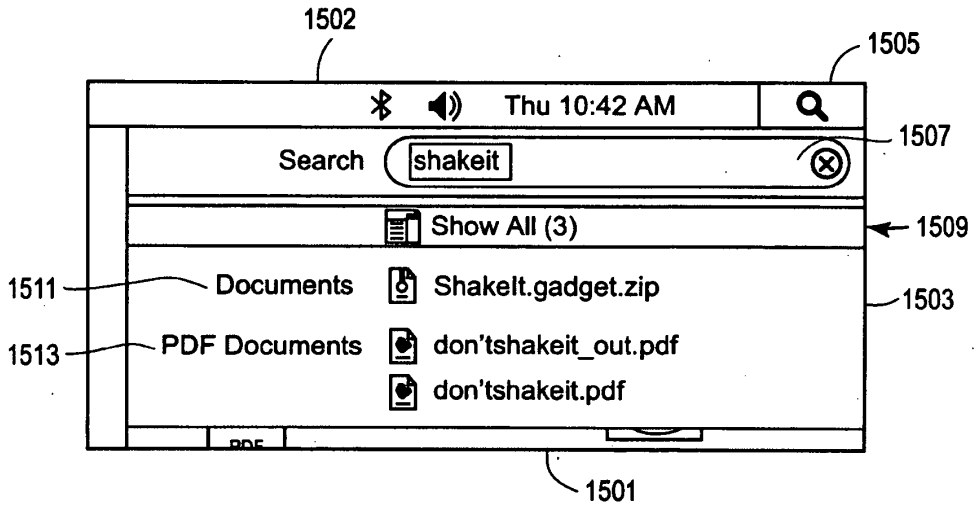

1502
1505
Thu 10:42 AM
1507
Search
shakeit
Show All (3)
1509
1511
Documents
ShakeIt.gadget.zip
1503
1513
PDF Documents
don'tshakeit_out.pdf
don'tshakeit.pdf
1501

FIG. 15A

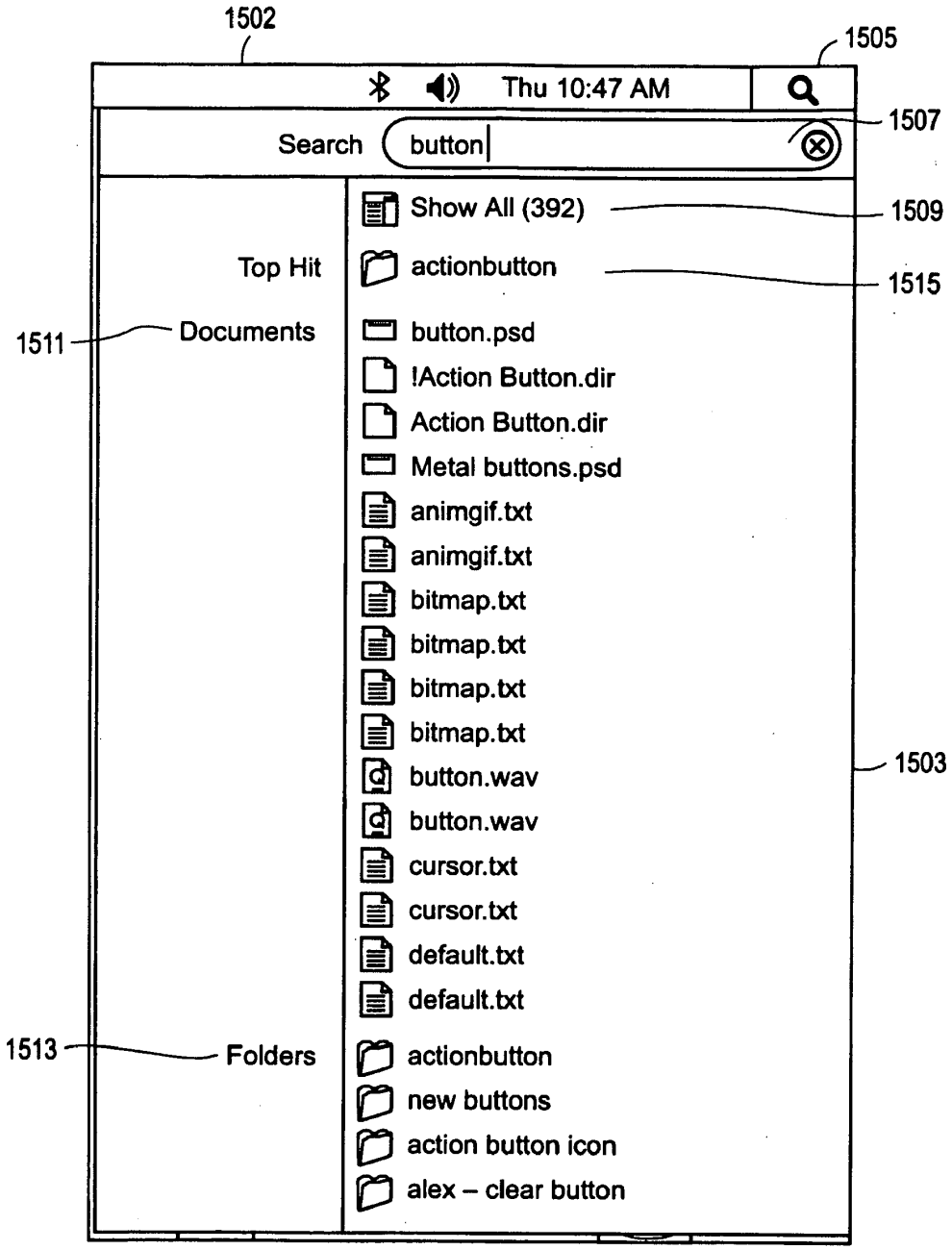

1502
1505
Thu 10:47 AM
1507
Search
button
Show All (392)
1509
Top Hit
actionbutton
1515
1511
Documents
button.psd
!Action Button.dir
Action Button.dir
Metal buttons.psd
animgif.txt
animgif.txt
bitmap.txt
bitmap.txt
bitmap.txt
bitmap.txt
button.wav
button.wav
cursor.txt
cursor.txt
default.txt
default.txt
1503
1513
Folders
actionbutton
new buttons
action button icon
alex – clear button

FIG. 15B

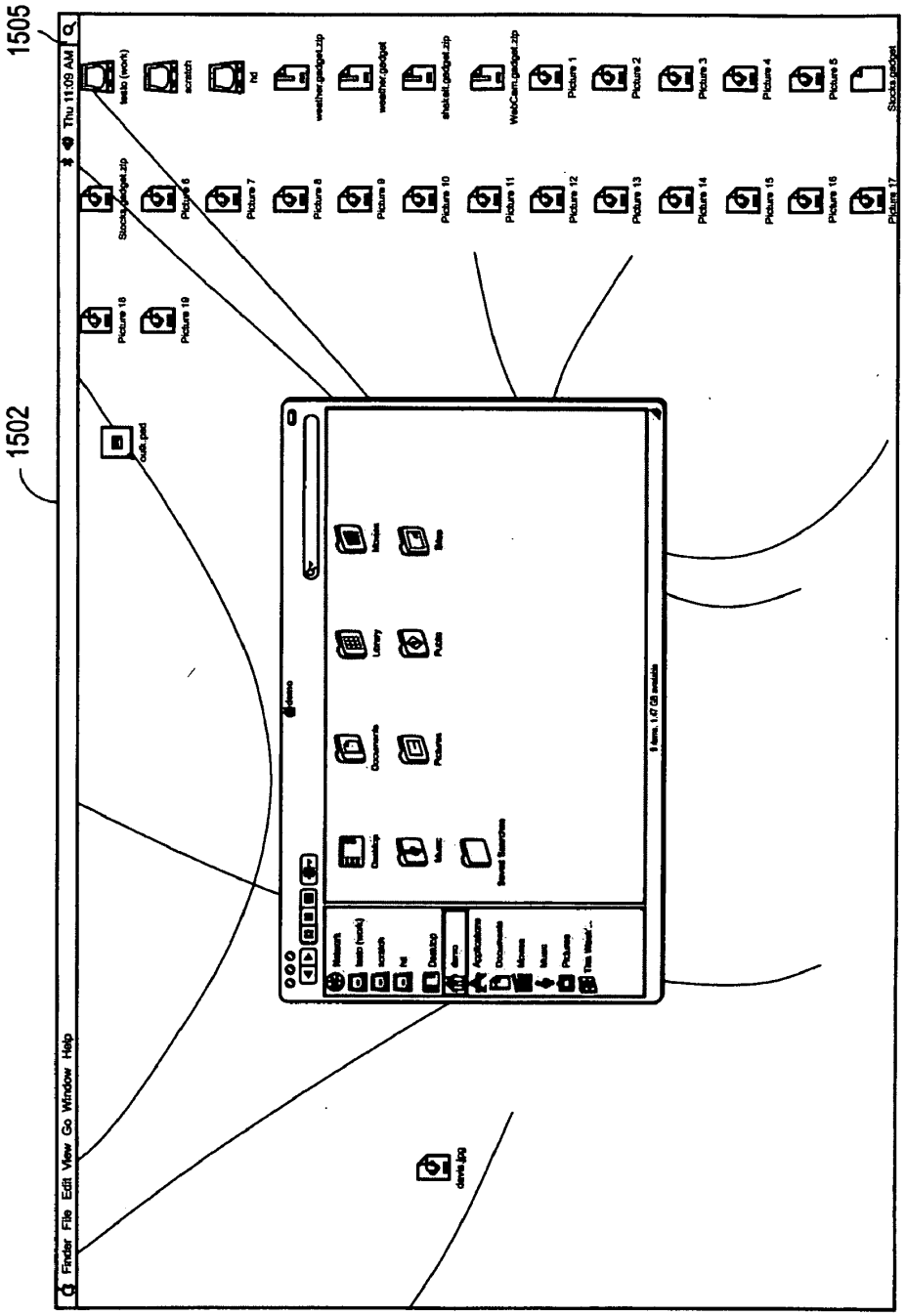

1505
1502
Finder File Edit View Go Window Help
Thu 11:09 AM
Stocks.gadget.zip
Picture 6
Picture 7
Picture 8
Picture 9
Picture 10
Picture 11
Picture 12
Picture 13
Picture 14
Picture 15
Picture 16
Picture 17
Picture 18
Picture 19
Stocks.gadget
Movies
Music
Pictures
Public
Sites
Library
Documents
Desktop
Shared Searches
Applications
Devices
Network
1 item, 1.47 GB available

FIG. 15C

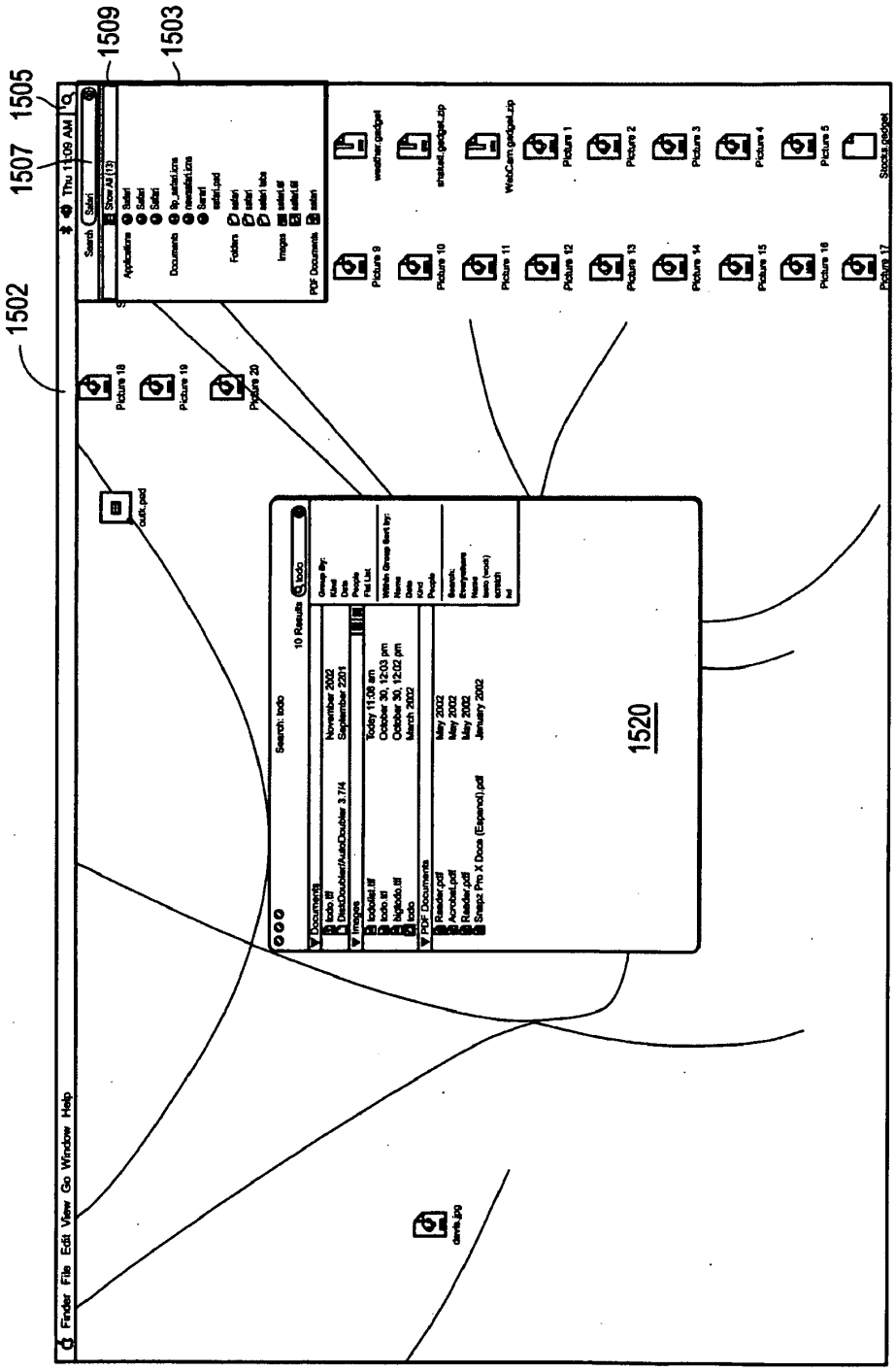


FIG. 15D

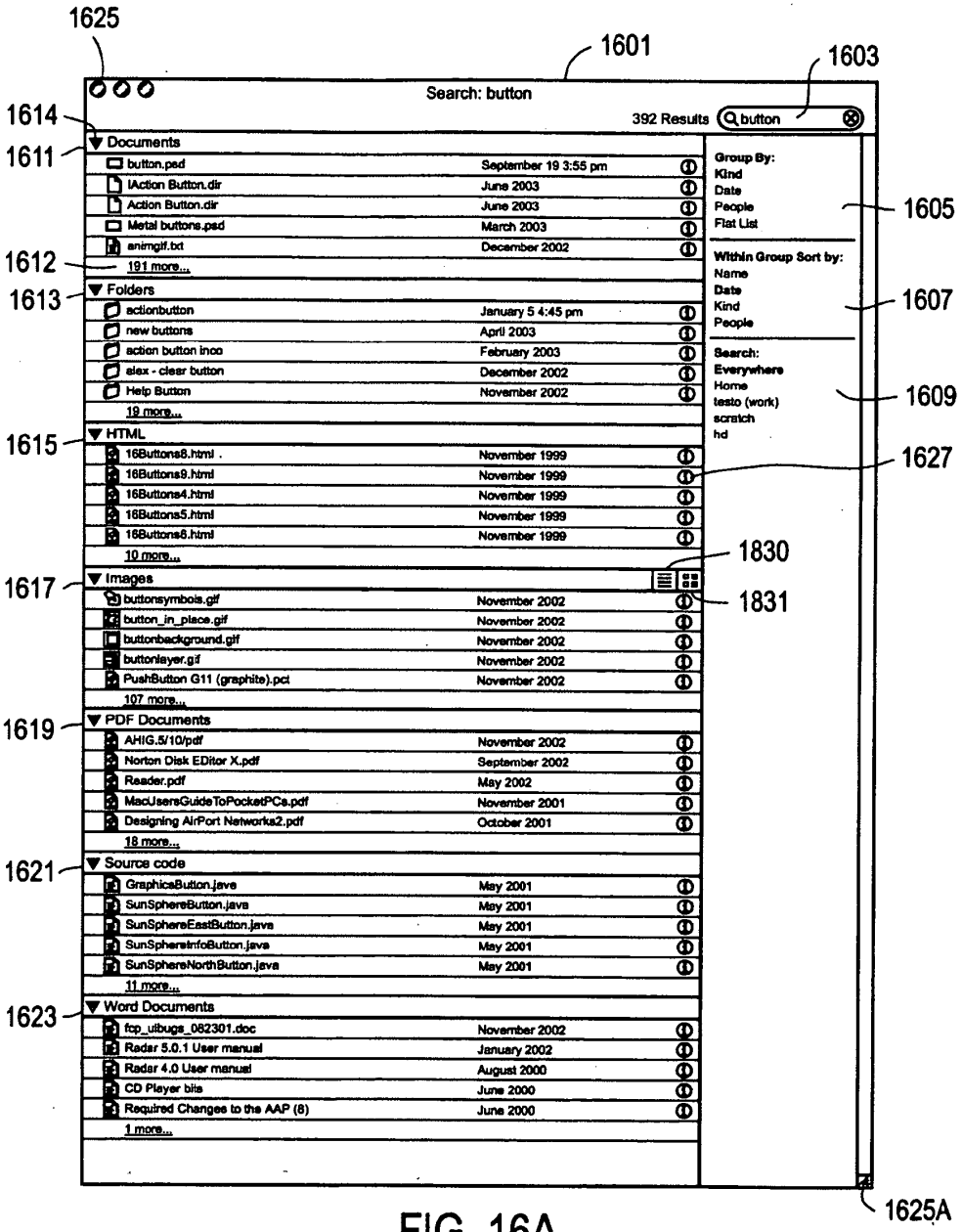

1625
1601
1603
Search: button
392 Results
button
1614
1611
Documents
button.psd September 19 3:55 pm
IAction Button.dir June 2003
Action Button.dir June 2003
Metal buttons.psd March 2003
animgif.txt December 2002
1612
191 more...
1613
Folders
actionbutton January 5 4:45 pm
new buttons April 2003
action button inco February 2003
alex - clear button December 2002
Help Button November 2002
19 more...
1615
HTML
16Buttons8.html November 1999
16Buttons9.html November 1999
16Buttons4.html November 1999
16Buttons5.html November 1999
16Buttons6.html November 1999
10 more...
1617
Images
buttonsymbols.gif November 2002
button_in_place.gif November 2002
buttonbackground.gif November 2002
buttonlayer.gif November 2002
PushButton G11 (graphite).pct November 2002
107 more...
1619
PDF Documents
AHIG.5/10/pdf November 2002
Norton Disk EDitor X.pdf September 2002
Reader.pdf May 2002
MacUsersGuideToPocketPCs.pdf November 2001
Designing AirPort Networks2.pdf October 2001
18 more...
1621
Source code
GraphicsButton.java May 2001
SunSphereButton.java May 2001
SunSphereEastButton.java May 2001
SunSphereInfoButton.java May 2001
SunSphereNorthButton.java May 2001
11 more...
1623
Word Documents
fcp_uibugs_082301.doc November 2002
Radar 5.0.1 User manual January 2002
Radar 4.0 User manual August 2000
CD Player bits June 2000
Required Changes to the AAP (8) June 2000
1 more...
Group By:
Kind
Date
People
Flat List
1605
Within Group Sort by:
Name
Date
Kind
People
1607
Search:
Everywhere
Home
testo (work)
scratch
hd
1609
1627
1830
1831
1625A

FIG. 16A

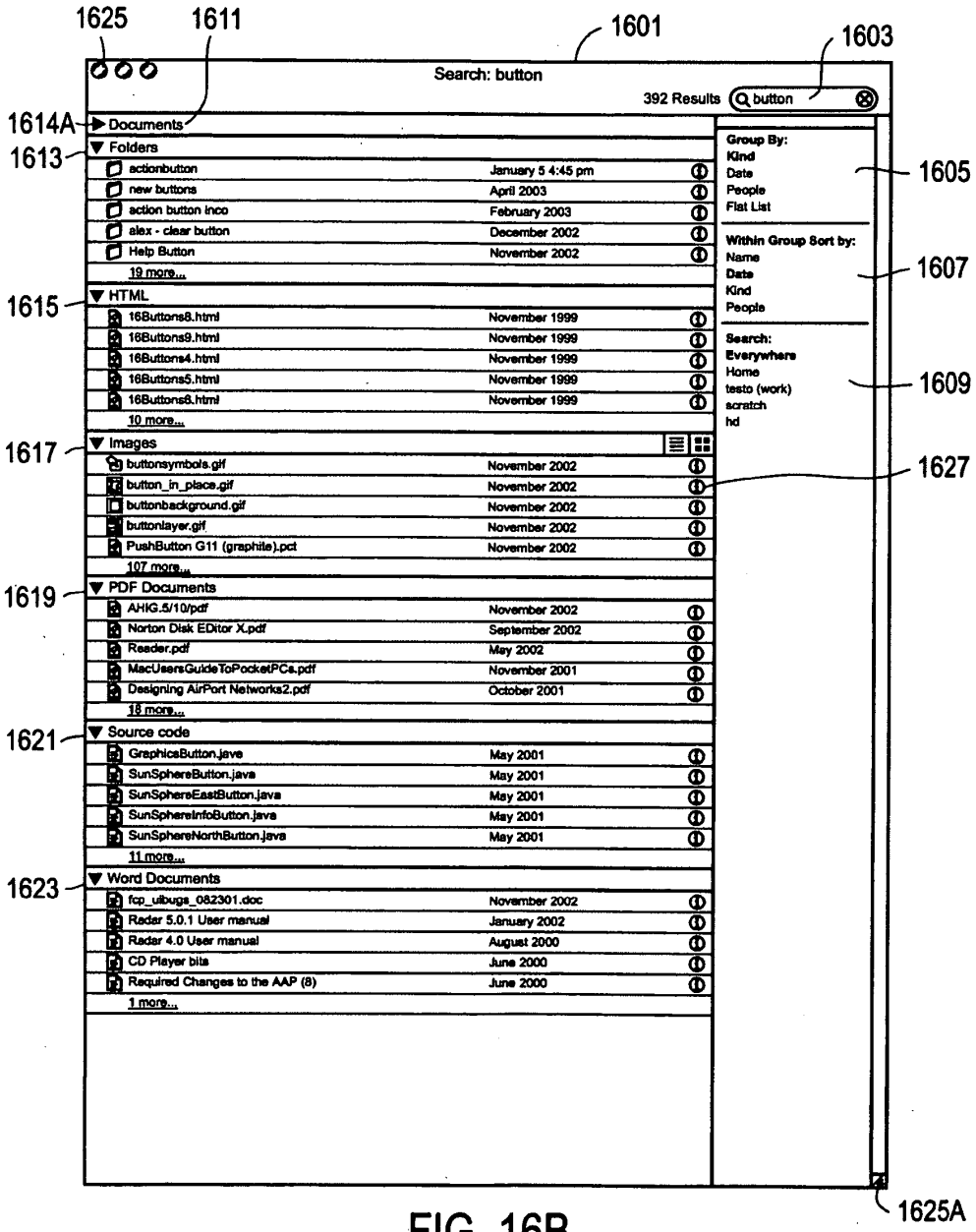

1625
1611
1601
1603
Search: button
392 Results
button
1614A
Documents
1613
Folders
actionbutton January 5 4:45 pm
new buttons April 2003
action button inco February 2003
alex - clear button December 2002
Help Button November 2002
19 more...
1615
HTML
16Buttons8.html November 1999
16Buttons9.html November 1999
16Buttons4.html November 1999
16Buttons5.html November 1999
16Buttons6.html November 1999
10 more...
1617
Images
buttonsymbols.gif November 2002
button_in_place.gif November 2002
buttonbackground.gif November 2002
buttonlayer.gif November 2002
PushButton G11 (graphite).pct November 2002
107 more...
1619
PDF Documents
AHIG.5/10/pdf November 2002
Norton Disk EDitor X.pdf September 2002
Reader.pdf May 2002
MacUsersGuideToPocketPCs.pdf November 2001
Designing AirPort Networks2.pdf October 2001
18 more...
1621
Source code
GraphicsButton.jave May 2001
SunSphereButton.java May 2001
SunSphereEastButton.java May 2001
SunSphereInfoButton.java May 2001
SunSphereNorthButton.java May 2001
11 more...
1623
Word Documents
fcp_uibugs_082301.doc November 2002
Radar 5.0.1 User manual January 2002
Radar 4.0 User manual August 2000
CD Player bits June 2000
Required Changes to the AAP (8) June 2000
1 more...
Group By:
Kind
Date
People
Flat List
1605
Within Group Sort by:
Name
Date
Kind
People
1607
Search:
Everywhere
Home
testo (work)
scratch
hd
1609
1627
1625A

FIG. 16B

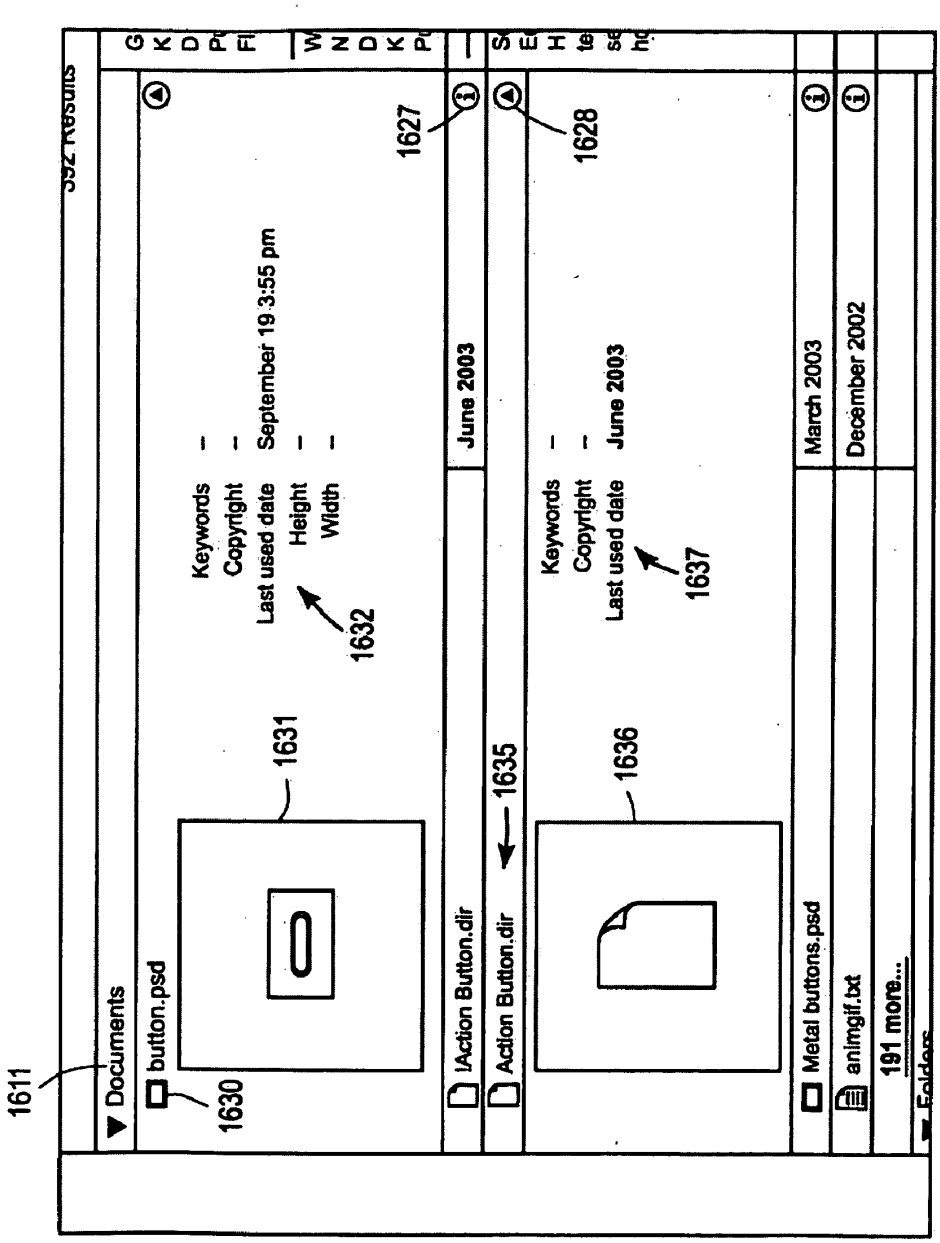

1611
Documents
1630
button.psd
1631
Keywords --
Copyright --
Last used date September 19 3:55 pm
Height --
Width --
1632
1627
IAction Button.dir
June 2003
1635
Action Button.dir
1628
1636
Keywords --
Copyright --
Last used date June 2003
1637
Metal buttons.psd
March 2003
animgif.txt
December 2002
191 more...

FIG. 17

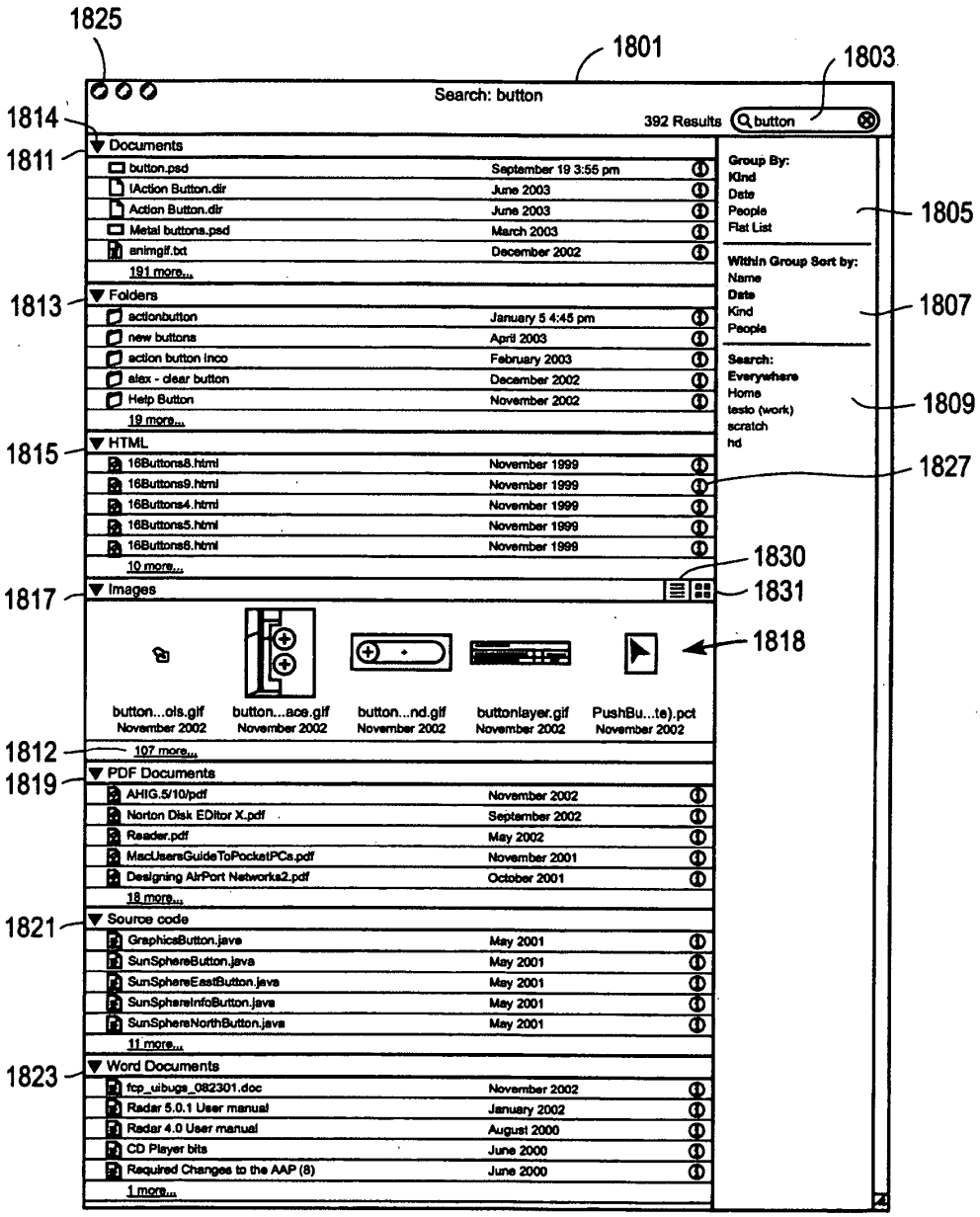

1825
1801
1803
Search: button
392 Results
button
1814
1811
Documents
button.psd September 19 3:55 pm
IAction Button.dir June 2003
Action Button.dir June 2003
Metal buttons.psd March 2003
animgif.txt December 2002
191 more...
1813
Folders
actionbutton January 5 4:45 pm
new buttons April 2003
action button inco February 2003
alex - clear button December 2002
Help Button November 2002
19 more...
1815
HTML
16Buttons8.html November 1999
16Buttons9.html November 1999
16Buttons4.html November 1999
16Buttons5.html November 1999
16Buttons6.html November 1999
10 more...
1817
Images
button...ols.gif November 2002
button...ace.gif November 2002
button...nd.gif November 2002
buttonlayer.gif November 2002
PushBu...te).pct November 2002
1812
107 more...
1819
PDF Documents
AHIG.5/10/pdf November 2002
Norton Disk EDitor X.pdf September 2002
Reader.pdf May 2002
MacUsersGuideToPocketPCs.pdf November 2001
Designing AirPort Networks2.pdf October 2001
18 more...
1821
Source code
GraphicsButton.java May 2001
SunSphereButton.java May 2001
SunSphereEastButton.java May 2001
SunSphereInfoButton.java May 2001
SunSphereNorthButton.java May 2001
11 more...
1823
Word Documents
fcp_uibugs_082301.doc November 2002
Radar 5.0.1 User manual January 2002
Radar 4.0 User manual August 2000
CD Player bits June 2000
Required Changes to the AAP (8) June 2000
1 more...
Group By:
Kind
Date
People
Flat List
1805
Within Group Sort by:
Name
Date
Kind
People
1807
Search:
Everywhere
Home
testo (work)
scratch
hd
1809
1827
1830
1831
1818

FIG. 18A

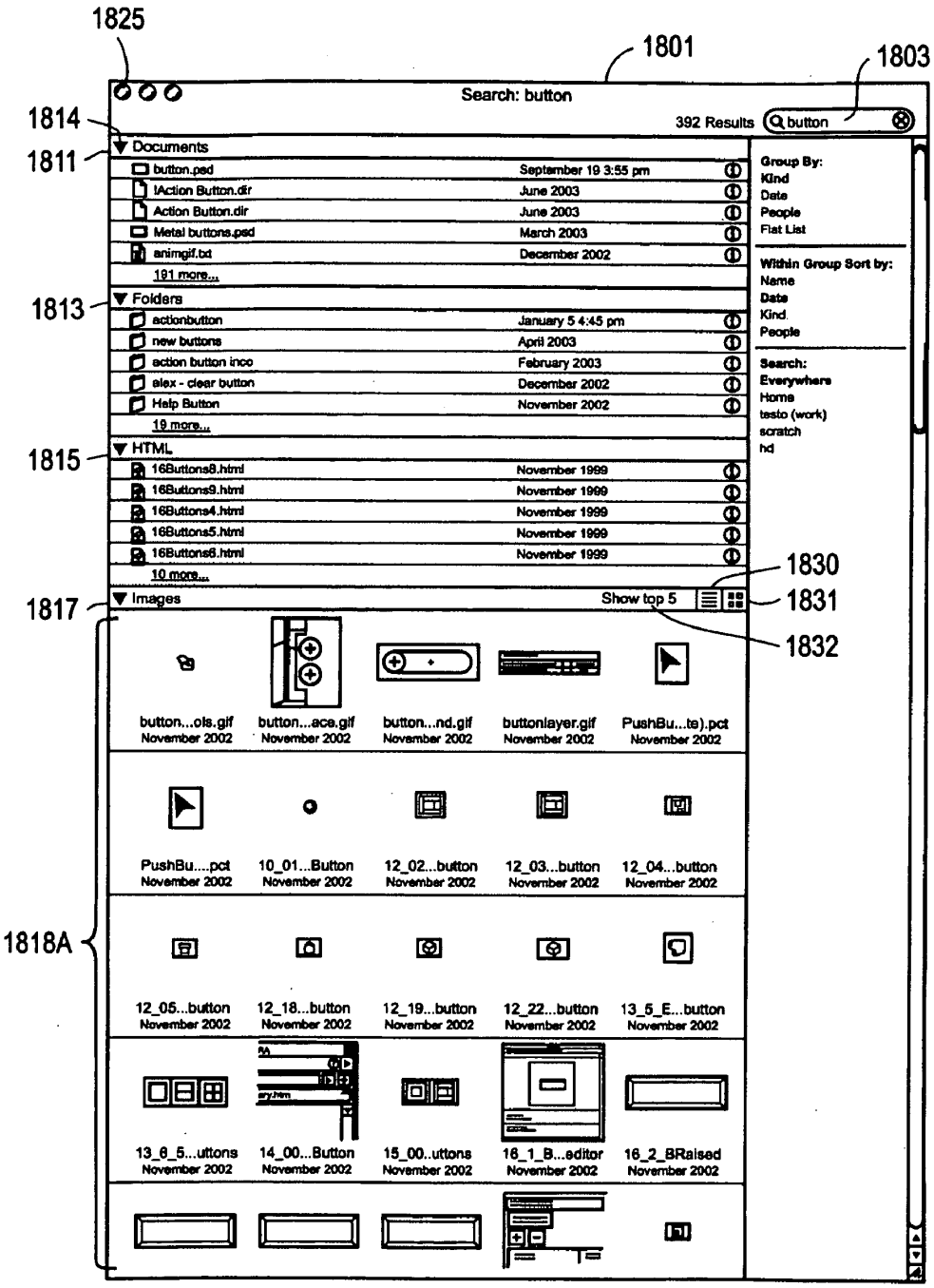

1825
1801
1803
Search: button
392 Results
button
1814
1811
Documents
button.psd September 19 3:55 pm
!Action Button.dir June 2003
Action Button.dir June 2003
Metal buttons.psd March 2003
animgif.txt December 2002
191 more...
1813
Folders
actionbutton January 5 4:45 pm
new buttons April 2003
action button inco February 2003
alex - clear button December 2002
Help Button November 2002
19 more...
1815
HTML
16Buttons8.html November 1999
16Buttons9.html November 1999
16Buttons4.html November 1999
16Buttons5.html November 1999
16Buttons6.html November 1999
10 more...
1830
1817
Images
Show top 5
1831
1832
button...ols.gif November 2002
button...ace.gif November 2002
button...nd.gif November 2002
buttonlayer.gif November 2002
PushBu...te).pct November 2002
PushBu....pct November 2002
10_01...Button November 2002
12_02...button November 2002
12_03...button November 2002
12_04...button November 2002
1818A
12_05...button November 2002
12_18...button November 2002
12_19...button November 2002
12_22...button November 2002
13_5_E...button November 2002
13_6_5...uttons November 2002
14_00...Button November 2002
15_00..uttons November 2002
16_1_B...editor November 2002
16_2_BRaised November 2002
Group By:
Kind
Date
People
Flat List
Within Group Sort by:
Name
Date
Kind
People
Search:
Everywhere
Home
testo (work)
scratch
hd

FIG. 18B

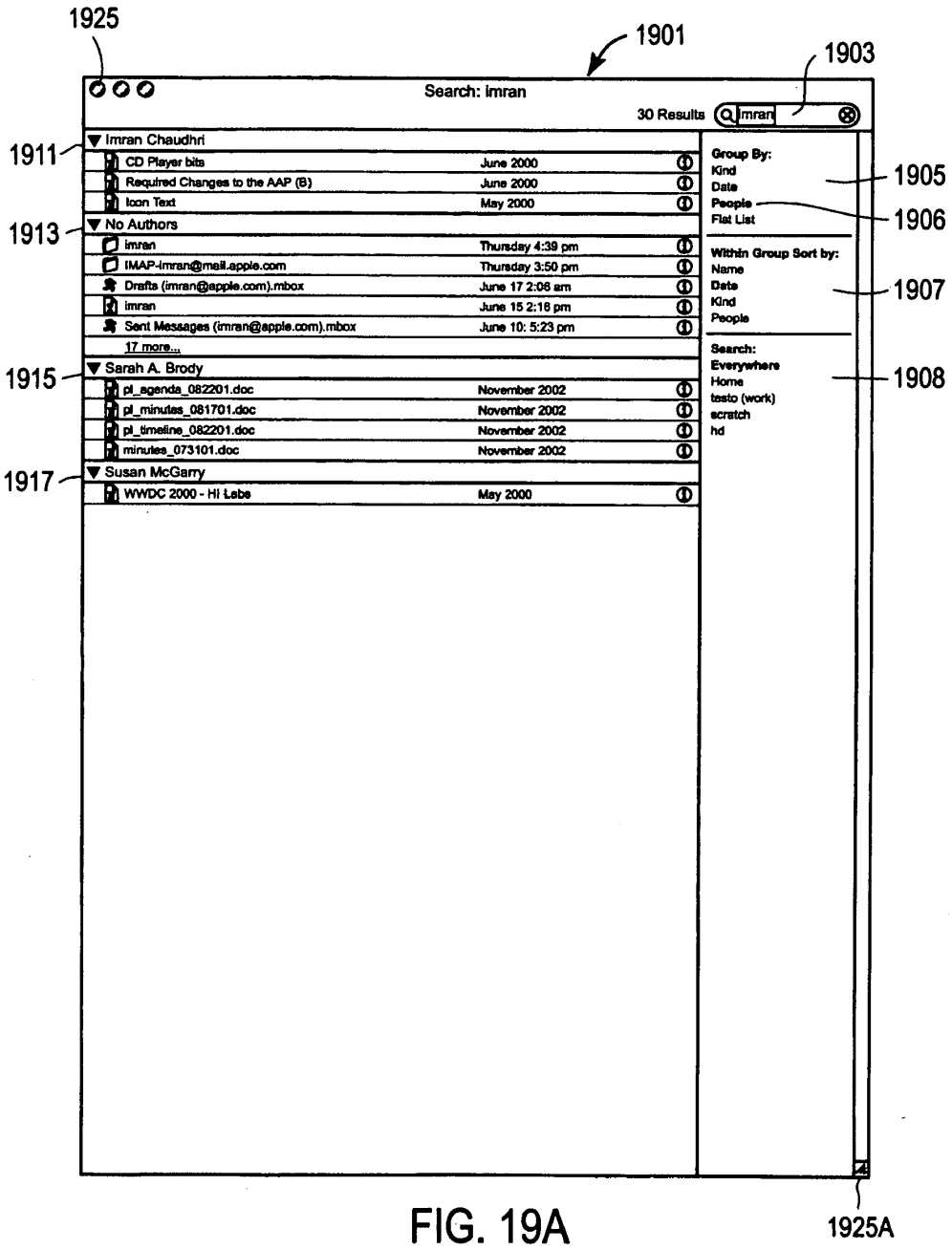

1925
1901
1903
Search: Imran
30 Results
Imran
1911
Imran Chaudhri
CD Player bits
June 2000
Required Changes to the AAP (B)
June 2000
Icon Text
May 2000
1913
No Authors
imran
Thursday 4:39 pm
IMAP-imran@mail.apple.com
Thursday 3:50 pm
Drafts (imran@apple.com).mbox
June 17 2:08 am
imran
June 15 2:18 pm
Sent Messages (imran@apple.com).mbox
June 10: 5:23 pm
17 more...
1915
Sarah A. Brody
pl_agenda_082201.doc
November 2002
pl_minutes_081701.doc
November 2002
pl_timeline_082201.doc
November 2002
minutes_073101.doc
November 2002
1917
Susan McGarry
WWDC 2000 - HI Labs
May 2000
Group By:
Kind
Date
People
Flat List
1905
1906
Within Group Sort by:
Name
Date
Kind
People
1907
Search:
Everywhere
Home
testo (work)
scratch
hd
1908
1925A

FIG. 19A

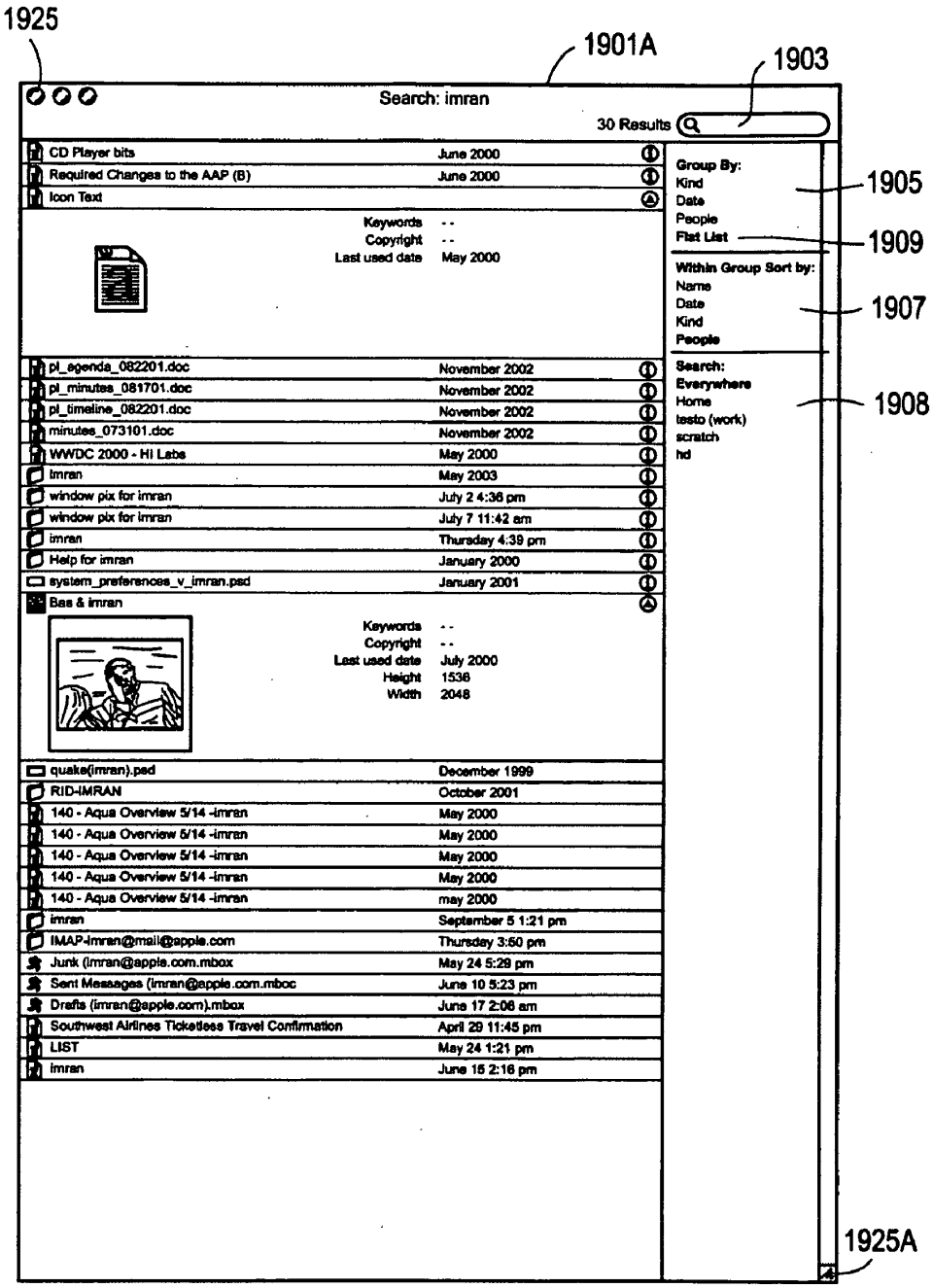

1925
1901A
1903
Search: imran
30 Results
CD Player bits June 2000
Required Changes to the AAP (B) June 2000
Icon Text
Keywords - -
Copyright - -
Last used date May 2000
pl_agenda_082201.doc November 2002
pl_minutes_081701.doc November 2002
pl_timeline_082201.doc November 2002
minutes_073101.doc November 2002
WWDC 2000 - HI Labs May 2000
Imran May 2003
window pix for imran July 2 4:36 pm
window pix for imran July 7 11:42 am
imran Thursday 4:39 pm
Help for imran January 2000
system_preferences_v_imran.psd January 2001
Bas & imran
Keywords - -
Copyright - -
Last used date July 2000
Height 1536
Width 2048
quake(imran).psd December 1999
RID-IMRAN October 2001
140 - Aqua Overview 5/14 -imran May 2000
140 - Aqua Overview 5/14 -imran May 2000
140 - Aqua Overview 5/14 -imran May 2000
140 - Aqua Overview 5/14 -imran May 2000
140 - Aqua Overview 5/14 -imran may 2000
imran September 5 1:21 pm
IMAP-imran@mail@apple.com Thursday 3:50 pm
Junk (imran@apple.com.mbox May 24 5:29 pm
Sent Messages (imran@apple.com.mboc June 10 5:23 pm
Drafts (imran@apple.com).mbox June 17 2:06 am
Southwest Airlines Ticketless Travel Confirmation April 29 11:45 pm
LIST May 24 1:21 pm
imran June 15 2:16 pm
Group By:
Kind
Date
People
Flat List
1905
1909
Within Group Sort by:
Name
Date
Kind
People
1907
Search:
Everywhere
Home
testo (work)
scratch
hd
1908
1925A

FIG. 19B

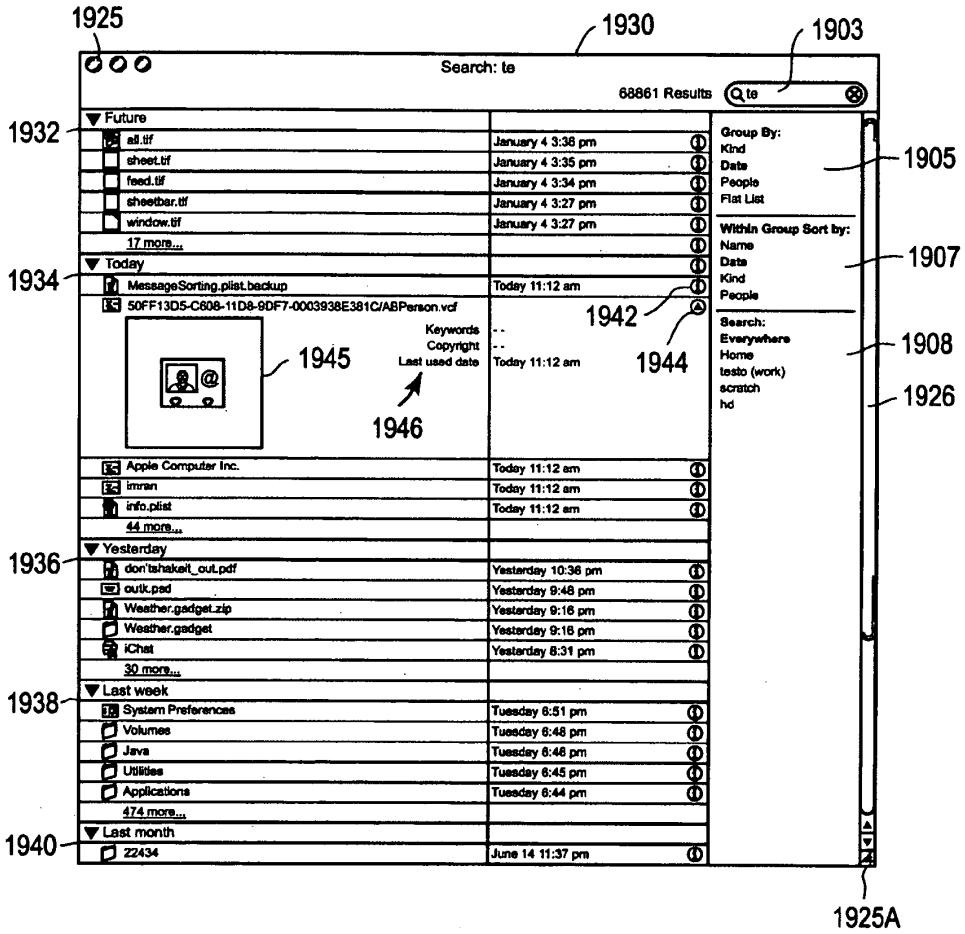

1925
1930
1903
Search: te
68861 Results
te
1932
Future
all.tif
January 4 3:38 pm
sheet.tif
January 4 3:35 pm
feed.tif
January 4 3:34 pm
sheetbar.tif
January 4 3:27 pm
window.tif
January 4 3:27 pm
17 more...
1934
Today
MessageSorting.plist.backup
Today 11:12 am
50FF13D5-C608-11D8-9DF7-0003938E381C/ABPerson.vcf
1942
Keywords
Copyright
Last used date
Today 11:12 am
1945
1944
1946
Apple Computer Inc.
Today 11:12 am
imran
Today 11:12 am
info.plist
Today 11:12 am
44 more...
1936
Yesterday
don'tshakeit_out.pdf
Yesterday 10:36 pm
outk.pad
Yesterday 9:48 pm
Weather.gadget.zip
Yesterday 9:16 pm
Weather.gadget
Yesterday 9:16 pm
iChat
Yesterday 8:31 pm
30 more...
1938
Last week
System Preferences
Tuesday 6:51 pm
Volumes
Tuesday 6:48 pm
Java
Tuesday 6:46 pm
Utilities
Tuesday 6:45 pm
Applications
Tuesday 6:44 pm
474 more...
1940
Last month
Z2434
June 14 11:37 pm
Group By:
Kind
Date
People
Flat List
1905
Within Group Sort by:
Name
Date
Kind
People
1907
Search:
Everywhere
Home
testo (work)
scratch
hd
1908
1926
1925A

FIG. 19C

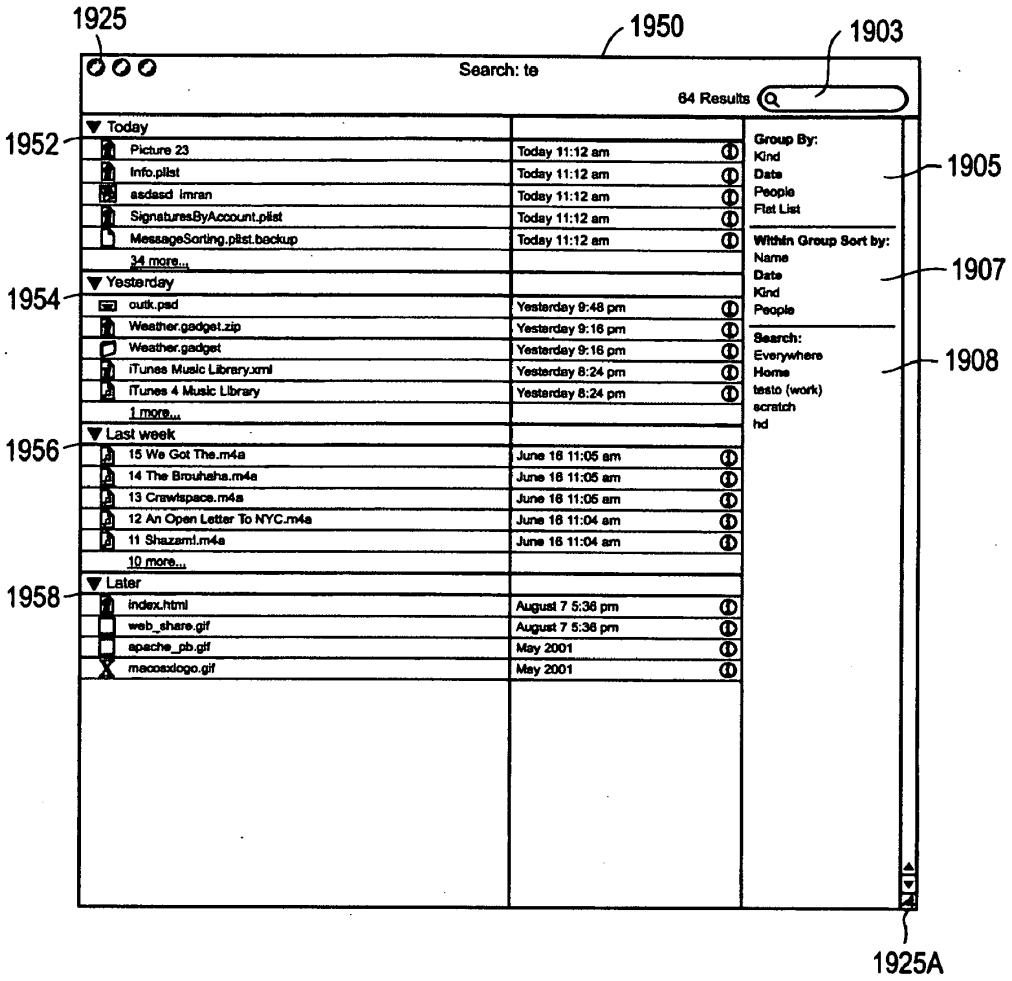

1925
1950
1903
Search: te
64 Results
1952
Today
Picture 23
Today 11:12 am
Info.plist
Today 11:12 am
asdasd imran
Today 11:12 am
SignaturesByAccount.plist
Today 11:12 am
MessageSorting.plist.backup
Today 11:12 am
34 more...
1954
Yesterday
outk.psd
Yesterday 9:48 pm
Weather.gadget.zip
Yesterday 9:16 pm
Weather.gadget
Yesterday 9:16 pm
iTunes Music Library.xml
Yesterday 8:24 pm
iTunes 4 Music Library
Yesterday 8:24 pm
1 more...
1956
Last week
15 We Got The.m4a
June 16 11:05 am
14 The Brouhaha.m4a
June 16 11:05 am
13 Crawlspace.m4a
June 16 11:05 am
12 An Open Letter To NYC.m4a
June 16 11:04 am
11 Shazam!.m4a
June 16 11:04 am
10 more...
1958
Later
index.html
August 7 5:36 pm
web_share.gif
August 7 5:36 pm
apache_pb.gif
May 2001
macosxlogo.gif
May 2001
Group By:
Kind
Date
People
Flat List
1905
Within Group Sort by:
Name
Date
Kind
People
1907
Search:
Everywhere
Home
testo (work)
scratch
hd
1908
1925A

FIG. 19D

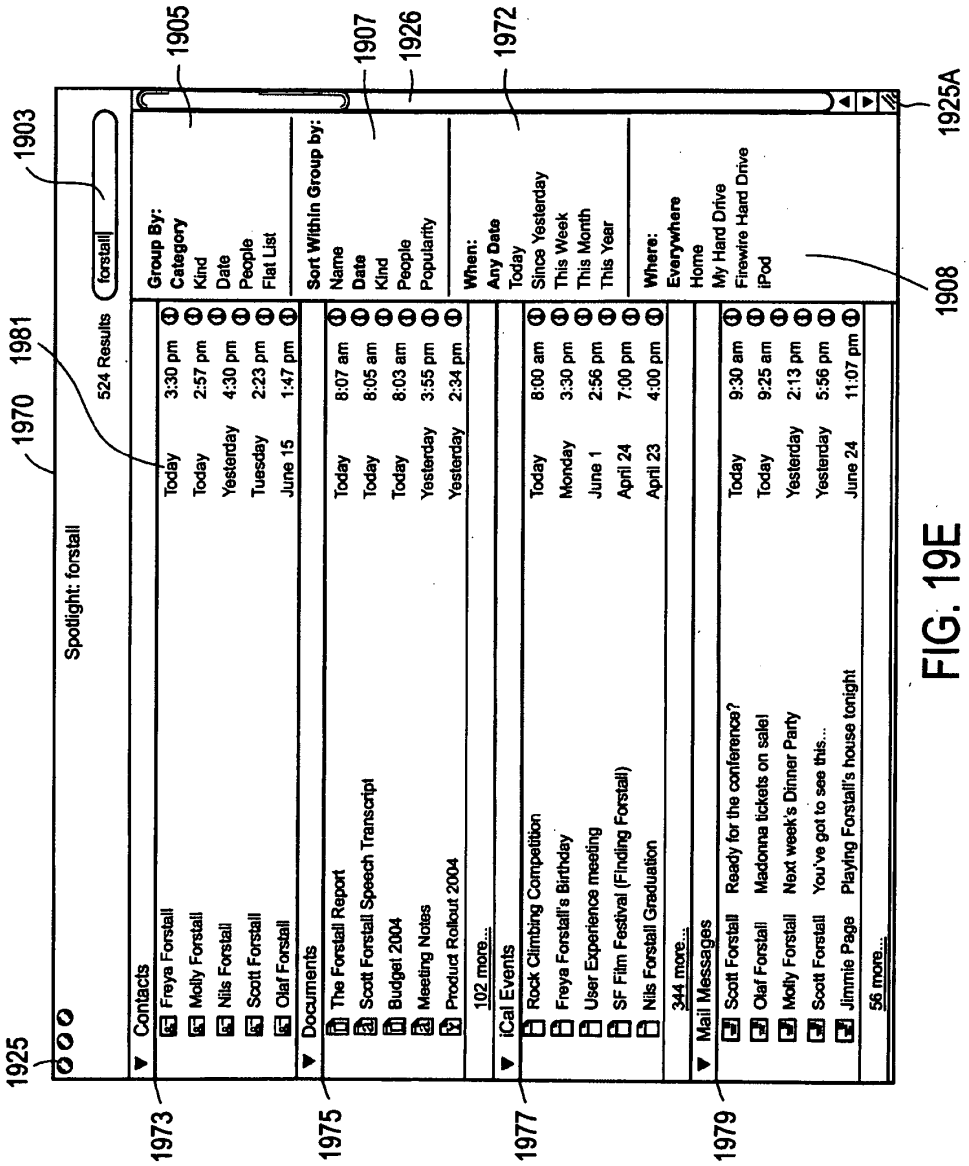

1925
1903
1970
1981
1905
1907
1926
1972
1925A
1908
1973
1975
1977
1979
Spotlight: forstall
forstall
524 Results
Contacts
Freya Forstall Today 3:30 pm
Molly Forstall Today 2:57 pm
Nils Forstall Yesterday 4:30 pm
Scott Forstall Tuesday 2:23 pm
Olaf Forstall June 15 1:47 pm
Documents
The Forstall Report Today 8:07 am
Scott Forstall Speech Transcript Today 8:05 am
Budget 2004 Today 8:03 am
Meeting Notes Yesterday 3:55 pm
Product Rollout 2004 Yesterday 2:34 pm
102 more...
iCal Events
Rock Climbing Competition Today 8:00 am
Freya Forstall's Birthday Monday 3:30 pm
User Experience meeting June 1 2:56 pm
SF Film Festival (Finding Forstall) April 24 7:00 pm
Nils Forstall Graduation April 23 4:00 pm
344 more...
Mail Messages
Scott Forstall Ready for the conference? Today 9:30 am
Olaf Forstall Madonna tickets on sale! Today 9:25 am
Molly Forstall Next week's Dinner Party Yesterday 2:13 pm
Scott Forstall You've got to see this... Yesterday 5:56 pm
Jimmie Page Playing Forstall's house tonight June 24 11:07 pm
56 more...
Group By:
Category
Kind
Date
People
Flat List
Sort Within Group by:
Name
Date
Kind
People
Popularity
When:
Any Date
Today
Since Yesterday
This Week
This Month
This Year
Where:
Everywhere
Home
My Hard Drive
Firewire Hard Drive
iPod

FIG. 19E

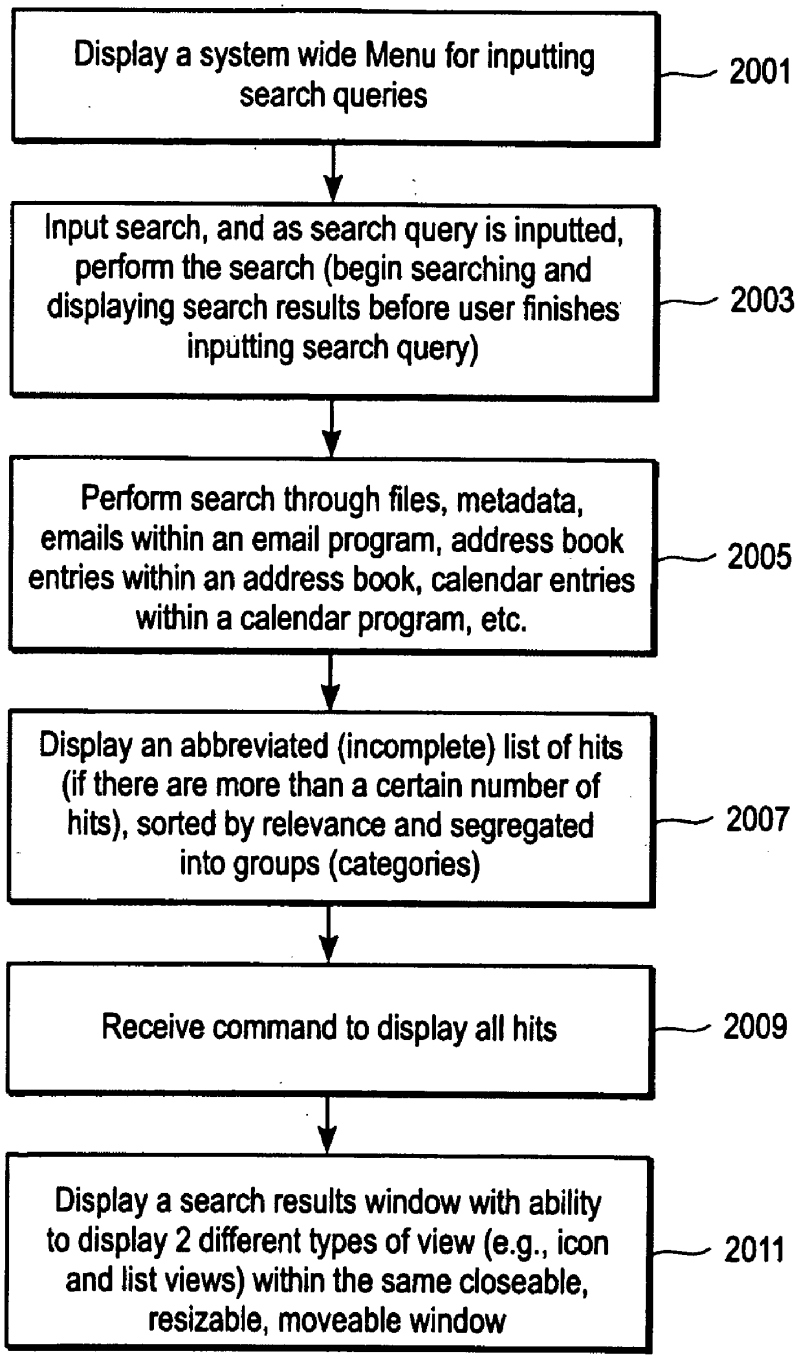

Display a system wide Menu for inputting search queries
2001
Input search, and as search query is inputted, perform the search (begin searching and displaying search results before user finishes inputting search query)
2003
Perform search through files, metadata, emails within an email program, address book entries within an address book, calendar entries within a calendar program, etc.
2005
Display an abbreviated (incomplete) list of hits (if there are more than a certain number of hits), sorted by relevance and segregated into groups (categories)
2007
Receive command to display all hits
2009
Display a search results window with ability to display 2 different types of view (e.g., icon and list views) within the same closeable, resizable, moveable window
2011

FIG. 20

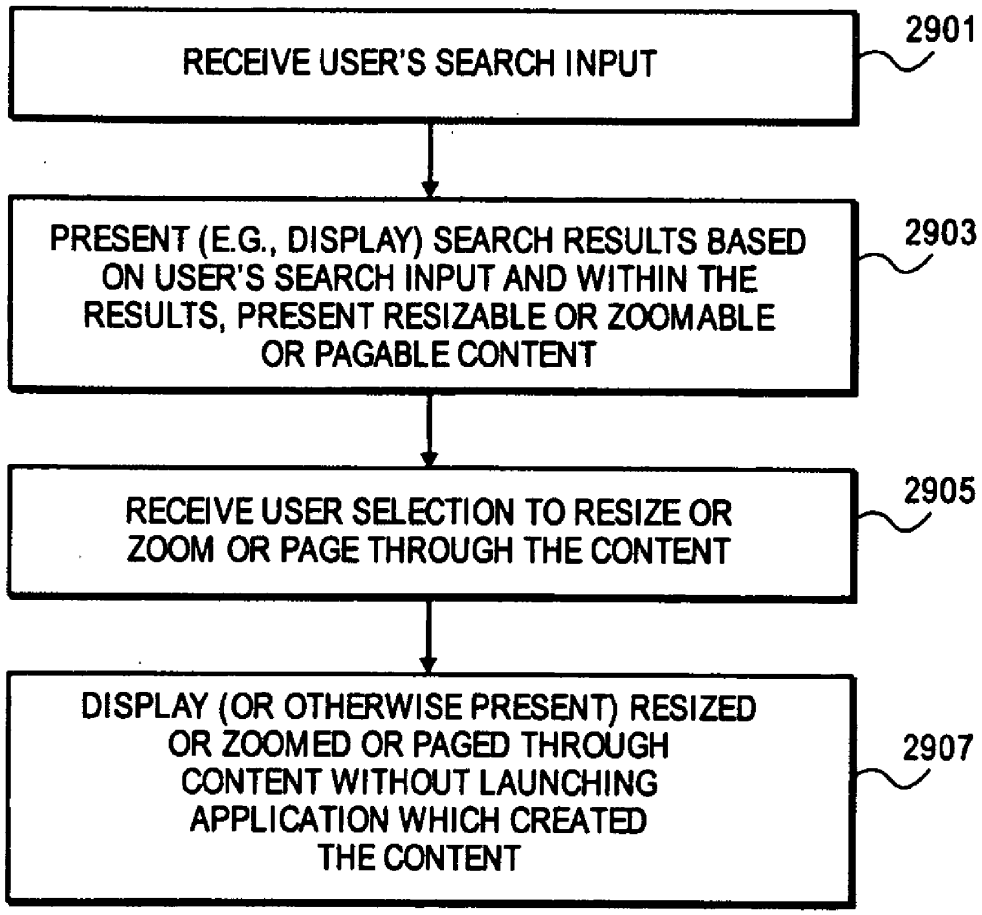

RECEIVE USER'S SEARCH INPUT
2901
PRESENT (E.G., DISPLAY) SEARCH RESULTS BASED ON USER'S SEARCH INPUT AND WITHIN THE RESULTS, PRESENT RESIZABLE OR ZOOMABLE OR PAGABLE CONTENT
2903
RECEIVE USER SELECTION TO RESIZE OR ZOOM OR PAGE THROUGH THE CONTENT
2905
DISPLAY (OR OTHERWISE PRESENT) RESIZED OR ZOOMED OR PAGED THROUGH CONTENT WITHOUT LAUNCHING APPLICATION WHICH CREATED THE CONTENT
2907

FIG. 21

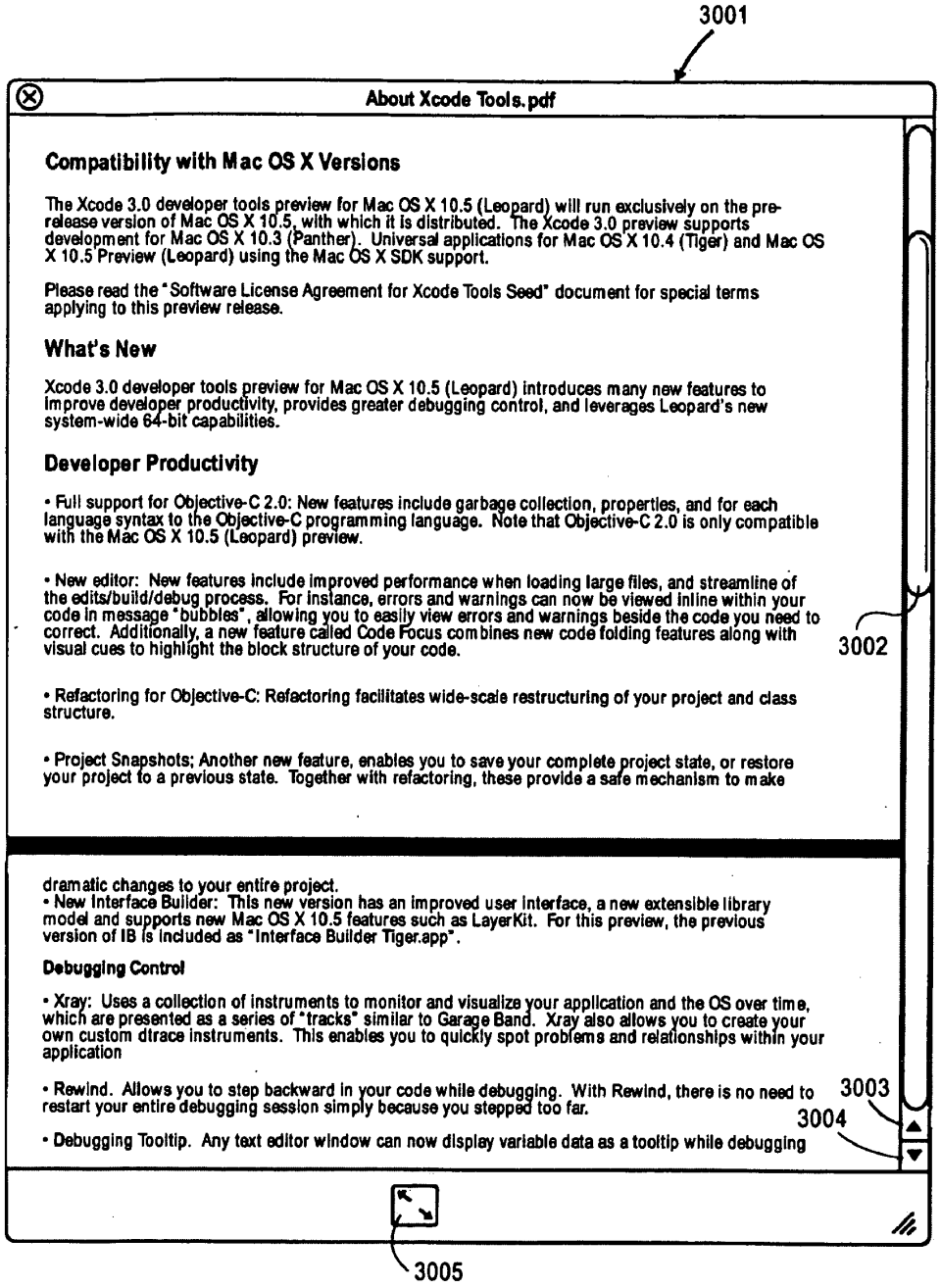

3001
About Xcode Tools.pdf
Compatibility with Mac OS X Versions
The Xcode 3.0 developer tools preview for Mac OS X 10.5 (Leopard) will run exclusively on the pre-release version of Mac OS X 10.5, with which it is distributed. The Xcode 3.0 preview supports development for Mac OS X 10.3 (Panther). Universal applications for Mac OS X 10.4 (Tiger) and Mac OS X 10.5 Preview (Leopard) using the Mac OS X SDK support.
Please read the "Software License Agreement for Xcode Tools Seed" document for special terms applying to this preview release.
What's New
Xcode 3.0 developer tools preview for Mac OS X 10.5 (Leopard) introduces many new features to improve developer productivity, provides greater debugging control, and leverages Leopard's new system-wide 64-bit capabilities.
Developer Productivity
• Full support for Objective-C 2.0: New features include garbage collection, properties, and for each language syntax to the Objective-C programming language. Note that Objective-C 2.0 is only compatible with the Mac OS X 10.5 (Leopard) preview.
• New editor: New features include improved performance when loading large files, and streamline of the edits/build/debug process. For instance, errors and warnings can now be viewed inline within your code in message "bubbles", allowing you to easily view errors and warnings beside the code you need to correct. Additionally, a new feature called Code Focus combines new code folding features along with visual cues to highlight the block structure of your code.
3002
• Refactoring for Objective-C: Refactoring facilitates wide-scale restructuring of your project and class structure.
• Project Snapshots; Another new feature, enables you to save your complete project state, or restore your project to a previous state. Together with refactoring, these provide a safe mechanism to make
dramatic changes to your entire project.
• New Interface Builder: This new version has an improved user interface, a new extensible library model and supports new Mac OS X 10.5 features such as LayerKit. For this preview, the previous version of IB is included as "Interface Builder Tiger.app".
Debugging Control
• Xray: Uses a collection of instruments to monitor and visualize your application and the OS over time, which are presented as a series of "tracks" similar to Garage Band. Xray also allows you to create your own custom dtrace instruments. This enables you to quickly spot problems and relationships within your application
• Rewind. Allows you to step backward in your code while debugging. With Rewind, there is no need to restart your entire debugging session simply because you stepped too far.
3003
3004
• Debugging Tooltip. Any text editor window can now display variable data as a tooltip while debugging
3005

FIG. 22A

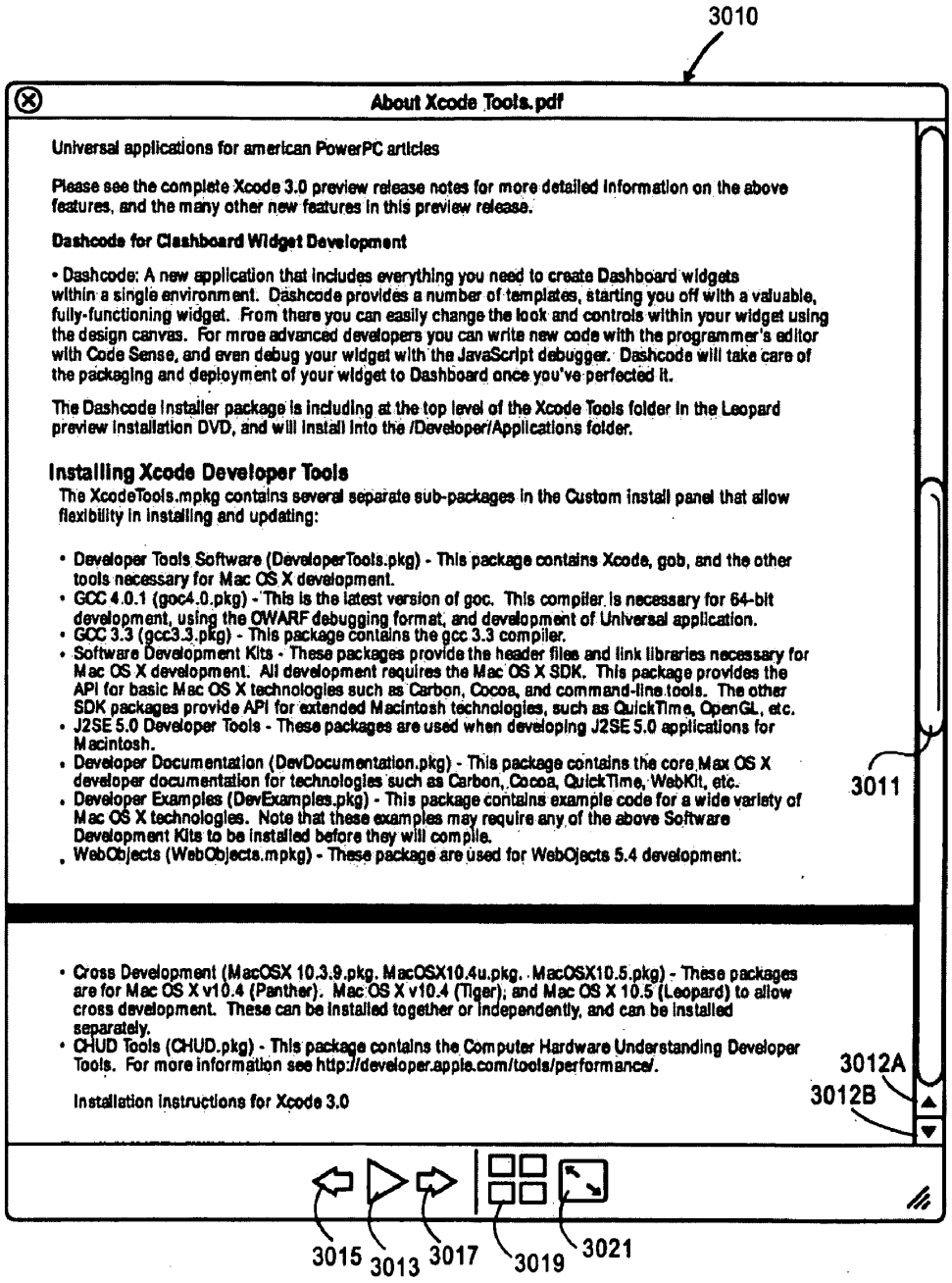

3010
About Xcode Tools.pdf
Universal applications for american PowerPC articles
Please see the complete Xcode 3.0 preview release notes for more detailed information on the above features, and the many other new features in this preview release.
Dashcode for Clashboard Widget Development
• Dashcode: A new application that includes everything you need to create Dashboard widgets within a single environment. Dashcode provides a number of templates, starting you off with a valuable, fully-functioning widget. From there you can easily change the look and controls within your widget using the design canvas. For mroe advanced developers you can write new code with the programmer's editor with Code Sense, and even debug your widget with the JavaScript debugger. Dashcode will take care of the packaging and deployment of your widget to Dashboard once you've perfected it.
The Dashcode Installer package is including at the top level of the Xcode Tools folder in the Leopard preview installation DVD, and will install into the /Developer/Applications folder.
Installing Xcode Developer Tools
The XcodeTools.mpkg contains several separate sub-packages in the Custom install panel that allow flexibility in installing and updating:
• Developer Tools Software (DeveloperTools.pkg) - This package contains Xcode, gob, and the other tools necessary for Mac OS X development.
• GCC 4.0.1 (goc4.0.pkg) - This is the latest version of goc. This compiler is necessary for 64-bit development, using the OWARF debugging format, and development of Universal application.
• GCC 3.3 (gcc3.3.pkg) - This package contains the gcc 3.3 compiler.
• Software Development Kits - These packages provide the header files and link libraries necessary for Mac OS X development. All development requires the Mac OS X SDK. This package provides the API for basic Mac OS X technologies such as Carbon, Cocoa, and command-line tools. The other SDK packages provide API for extended Macintosh technologies, such as QuickTime, OpenGL, etc.
• J2SE 5.0 Developer Tools - These packages are used when developing J2SE 5.0 applications for Macintosh.
• Developer Documentation (DevDocumentation.pkg) - This package contains the core Max OS X developer documentation for technologies such as Carbon, Cocoa, QuickTime, WebKit, etc.
• Developer Examples (DevExamples.pkg) - This package contains example code for a wide variety of Mac OS X technologies. Note that these examples may require any of the above Software Development Kits to be installed before they will compile.
• WebObjects (WebObjects.mpkg) - These package are used for WebOjects 5.4 development.
3011
• Cross Development (MacOSX 10.3.9.pkg, MacOSX10.4u.pkg, MacOSX10.5.pkg) - These packages are for Mac OS X v10.4 (Panther), Mac OS X v10.4 (Tiger), and Mac OS X 10.5 (Leopard) to allow cross development. These can be installed together or independently, and can be installed separately.
• CHUD Tools (CHUD.pkg) - This package contains the Computer Hardware Understanding Developer Tools. For more information see http://developer.apple.com/tools/performance/.
Installation instructions for Xcode 3.0
3012A
3012B
3015
3013
3017
3019
3021

FIG. 22B

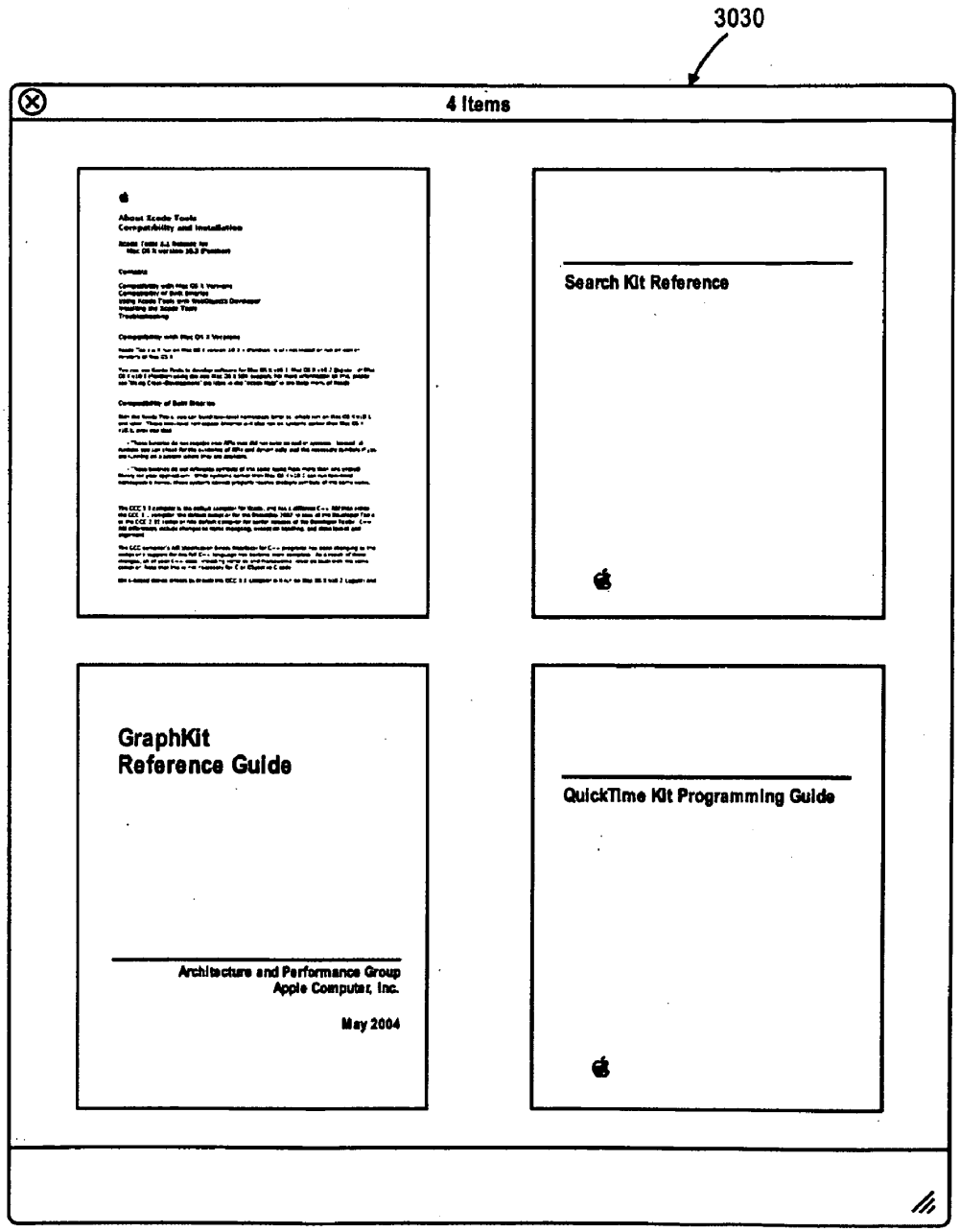

3030
4 Items
Search Kit Reference
GraphKit
Reference Guide
Architecture and Performance Group
Apple Computer, Inc.
May 2004
QuickTime Kit Programming Guide

FIG. 22C

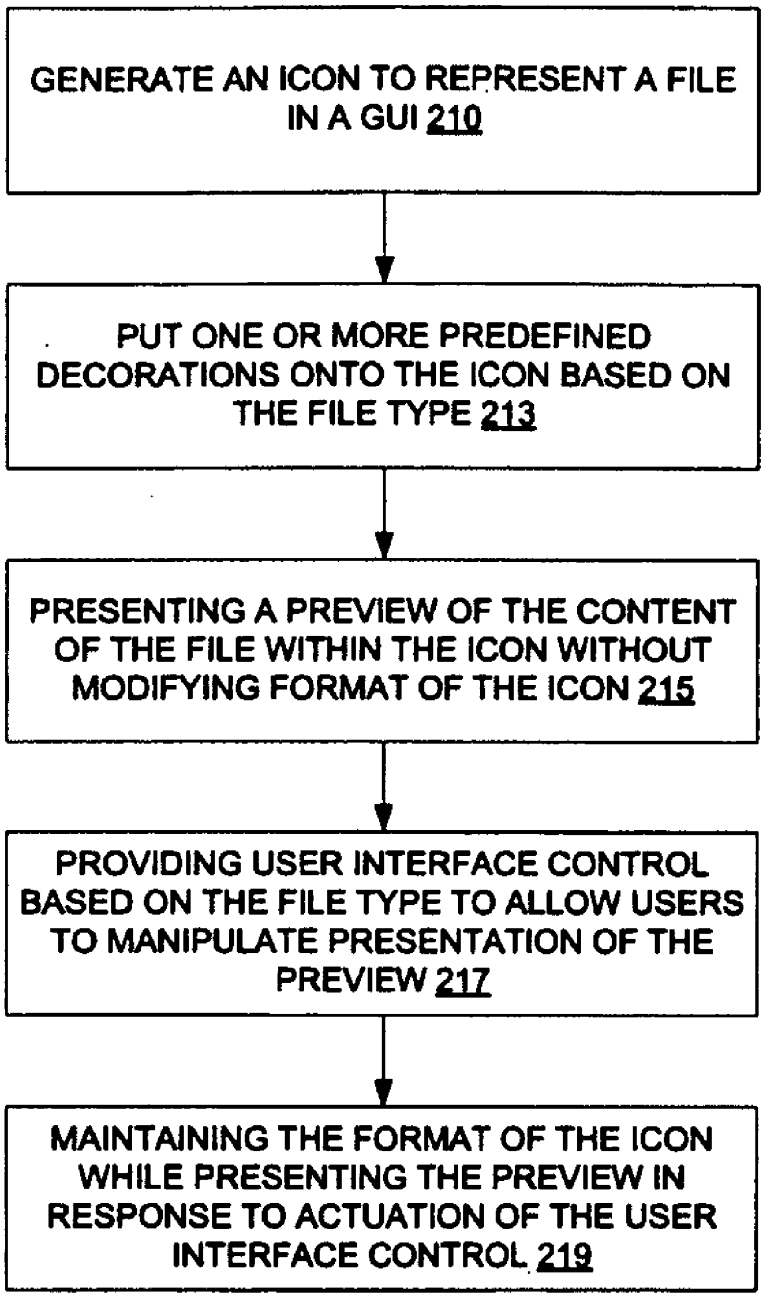

GENERATE AN ICON TO REPRESENT A FILE IN A GUI 210
PUT ONE OR MORE PREDEFINED DECORATIONS ONTO THE ICON BASED ON THE FILE TYPE 213
PRESENTING A PREVIEW OF THE CONTENT OF THE FILE WITHIN THE ICON WITHOUT MODIFYING FORMAT OF THE ICON 215
PROVIDING USER INTERFACE CONTROL BASED ON THE FILE TYPE TO ALLOW USERS TO MANIPULATE PRESENTATION OF THE PREVIEW 217
MAINTAINING THE FORMAT OF THE ICON WHILE PRESENTING THE PREVIEW IN RESPONSE TO ACTUATION OF THE USER INTERFACE CONTROL 219

FIG. 23

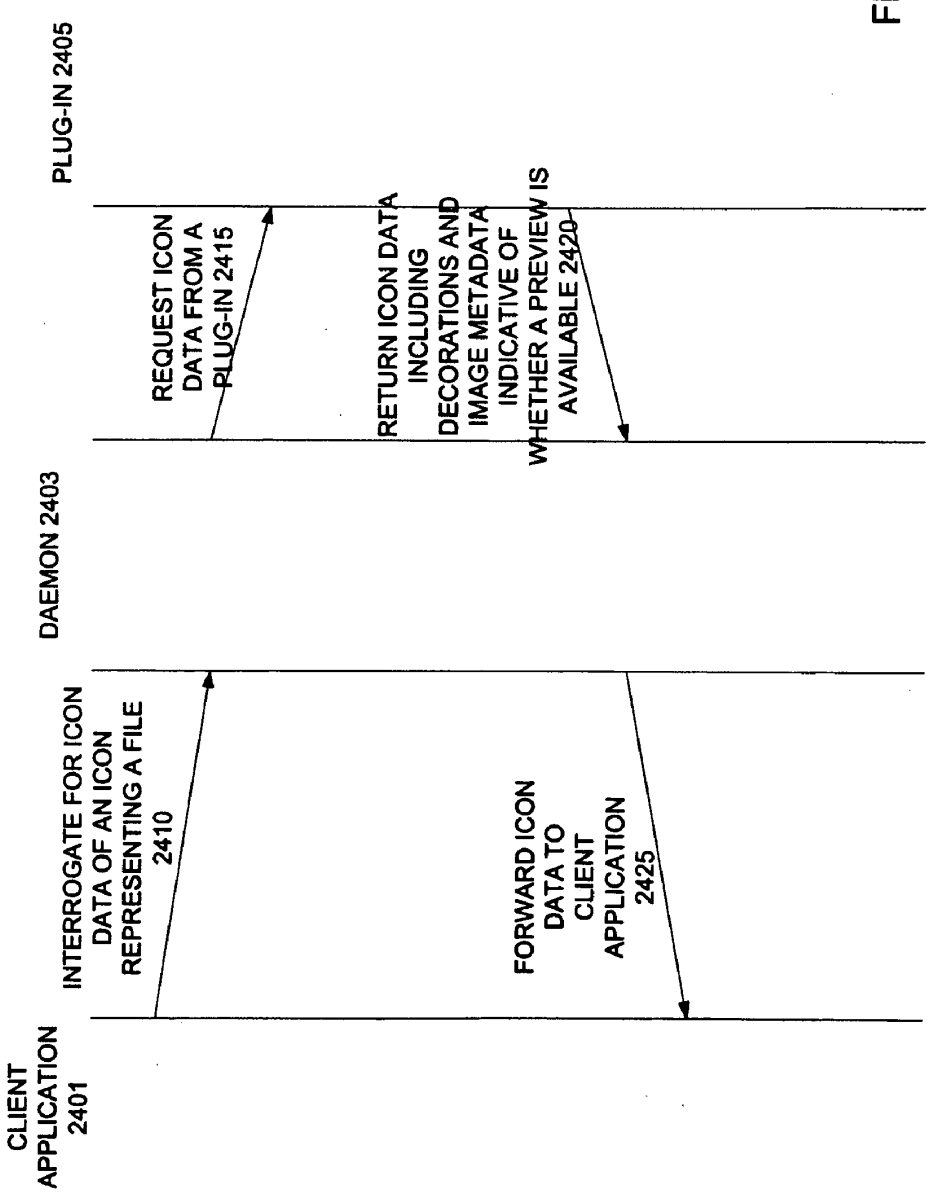

CLIENT APPLICATION 2401
DAEMON 2403
PLUG-IN 2405
INTERROGATE FOR ICON DATA OF AN ICON REPRESENTING A FILE 2410
REQUEST ICON DATA FROM A PLUG-IN 2415
RETURN ICON DATA INCLUDING DECORATIONS AND IMAGE METADATA INDICATIVE OF WHETHER A PREVIEW IS AVAILABLE 2420
FORWARD ICON DATA TO CLIENT APPLICATION 2425

FIG. 24

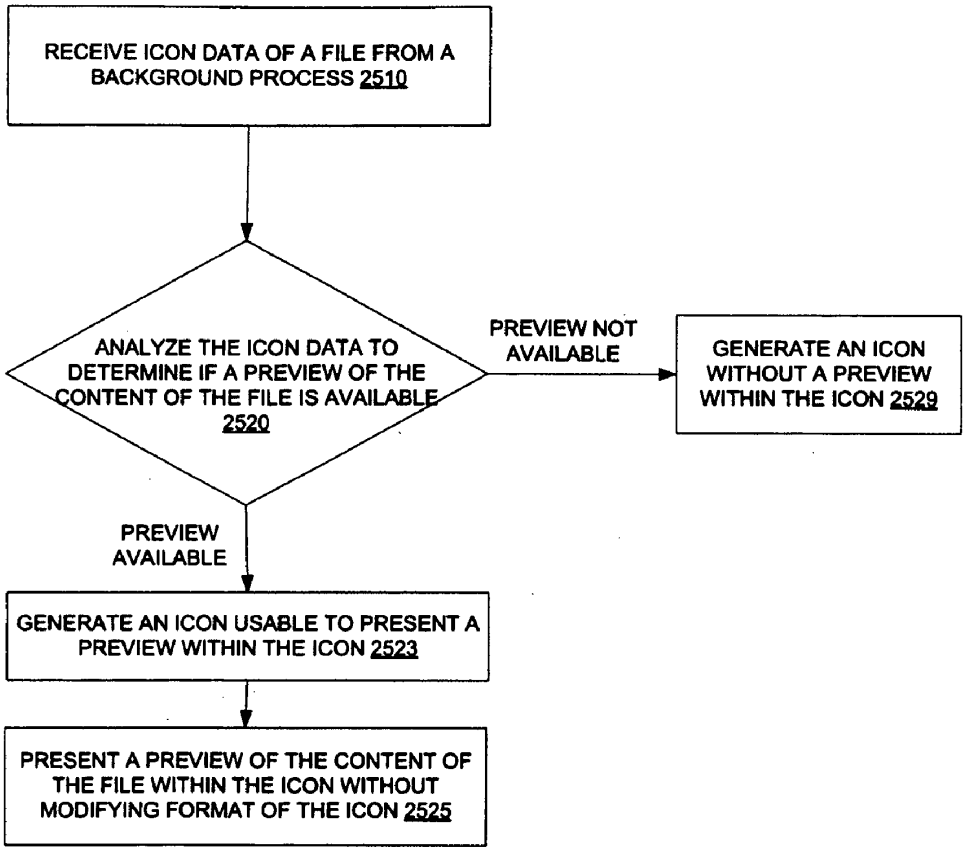

RECEIVE ICON DATA OF A FILE FROM A BACKGROUND PROCESS 2510
ANALYZE THE ICON DATA TO DETERMINE IF A PREVIEW OF THE CONTENT OF THE FILE IS AVAILABLE 2520
PREVIEW NOT AVAILABLE
GENERATE AN ICON WITHOUT A PREVIEW WITHIN THE ICON 2529
PREVIEW AVAILABLE
GENERATE AN ICON USABLE TO PRESENT A PREVIEW WITHIN THE ICON 2523
PRESENT A PREVIEW OF THE CONTENT OF THE FILE WITHIN THE ICON WITHOUT MODIFYING FORMAT OF THE ICON 2525

FIG. 25

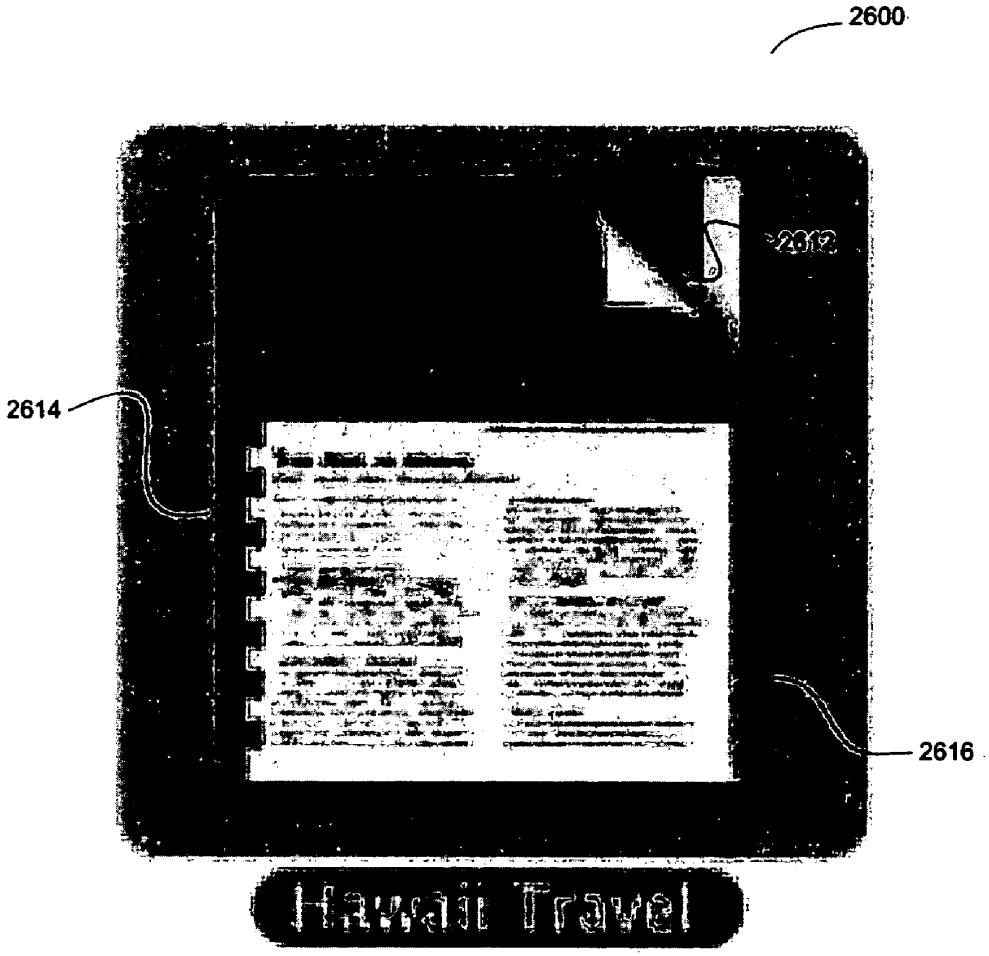


FIG. 26A

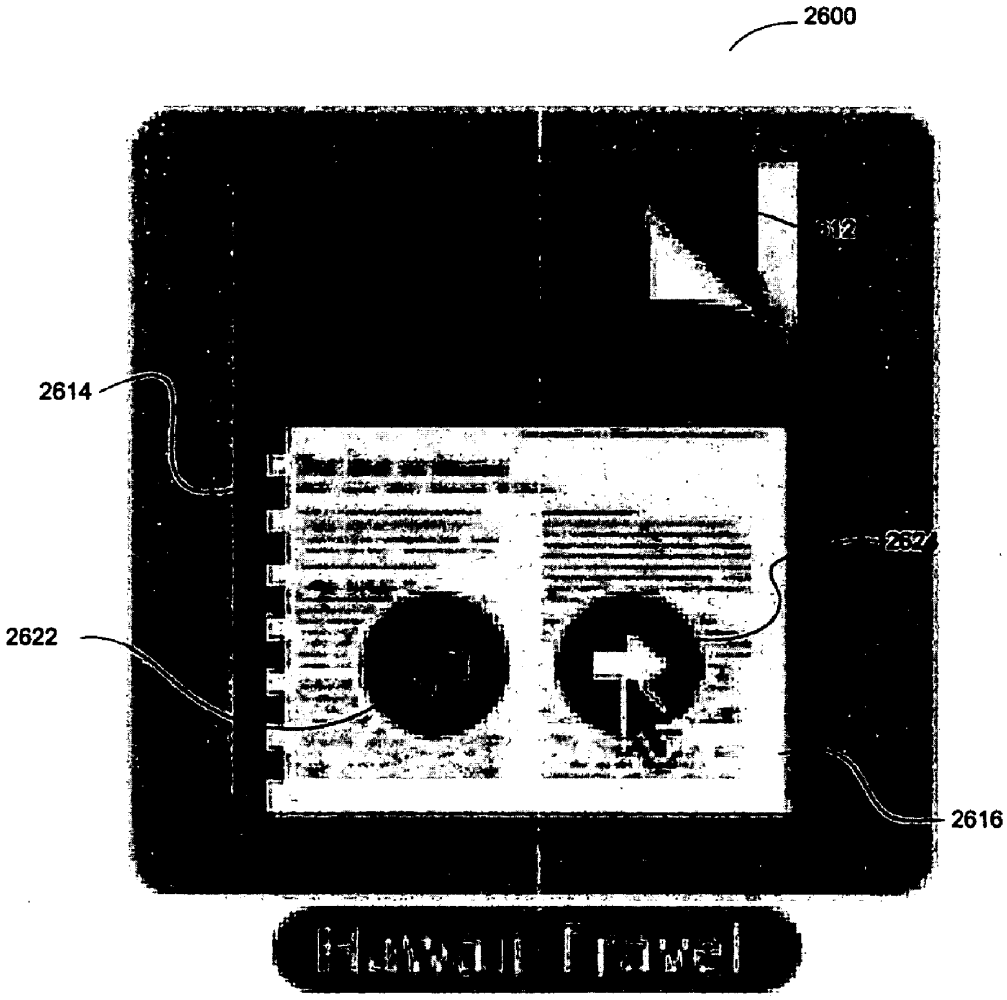


FIG. 26B

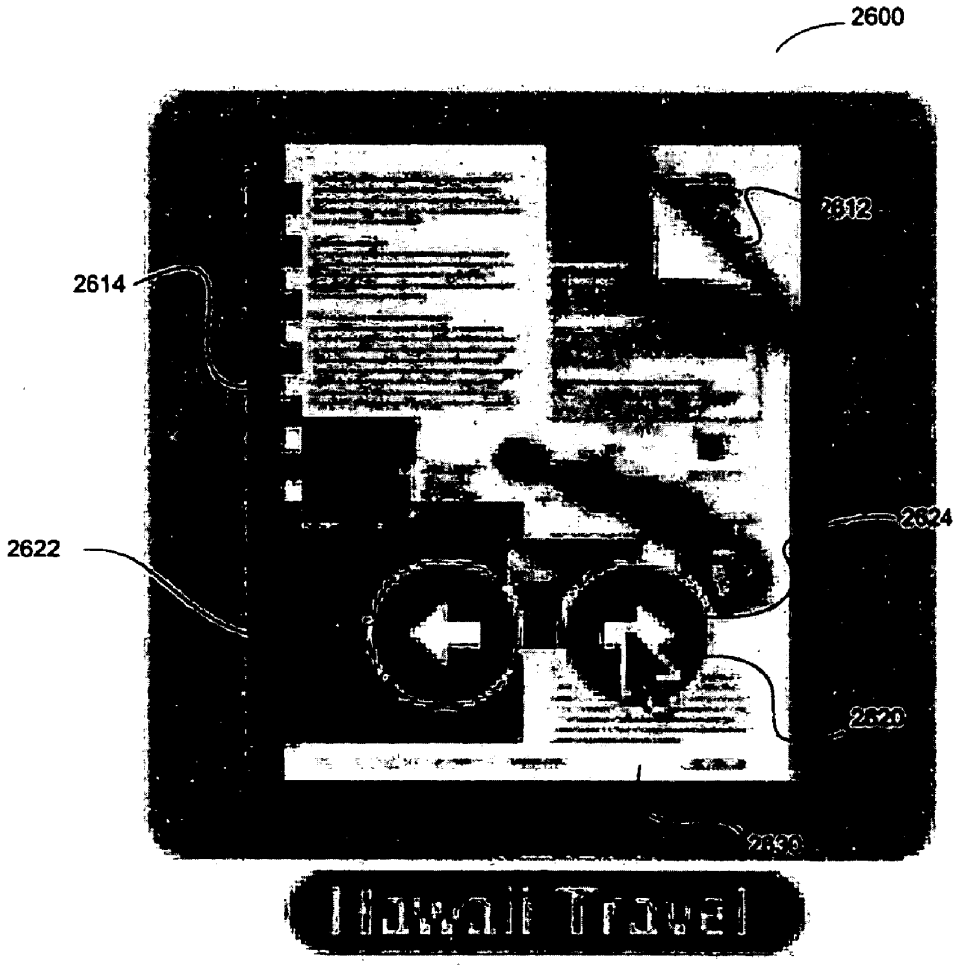


FIG. 26C

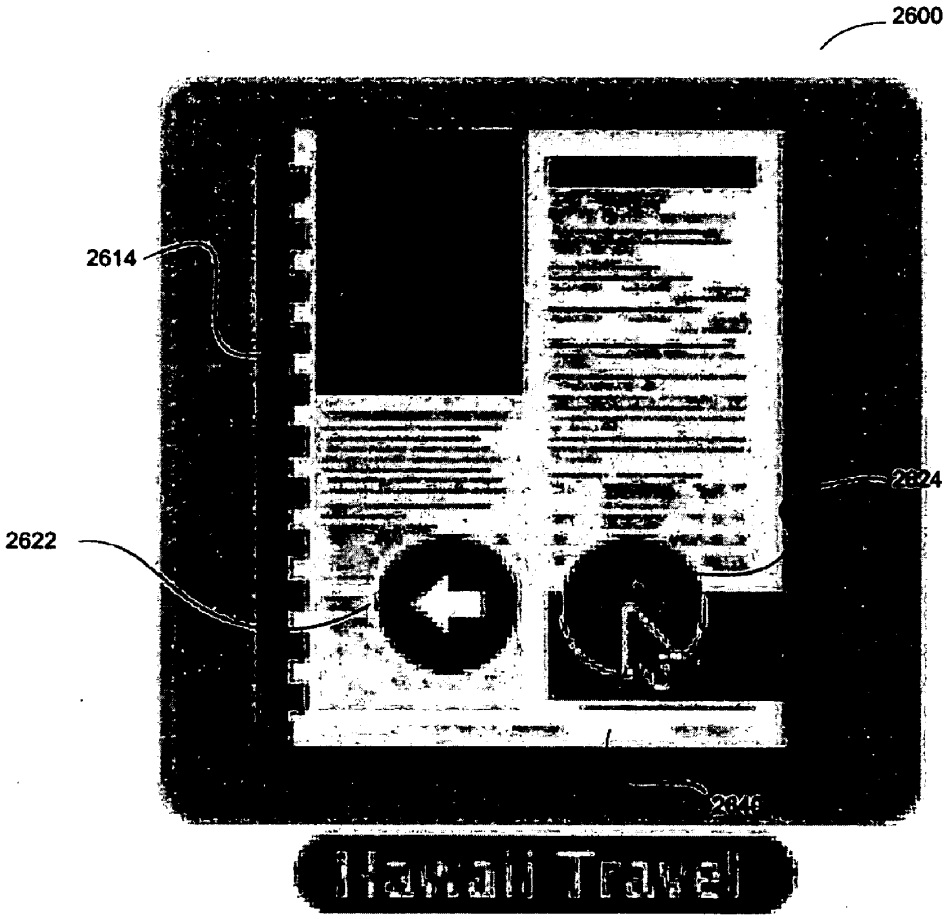


FIG. 26D

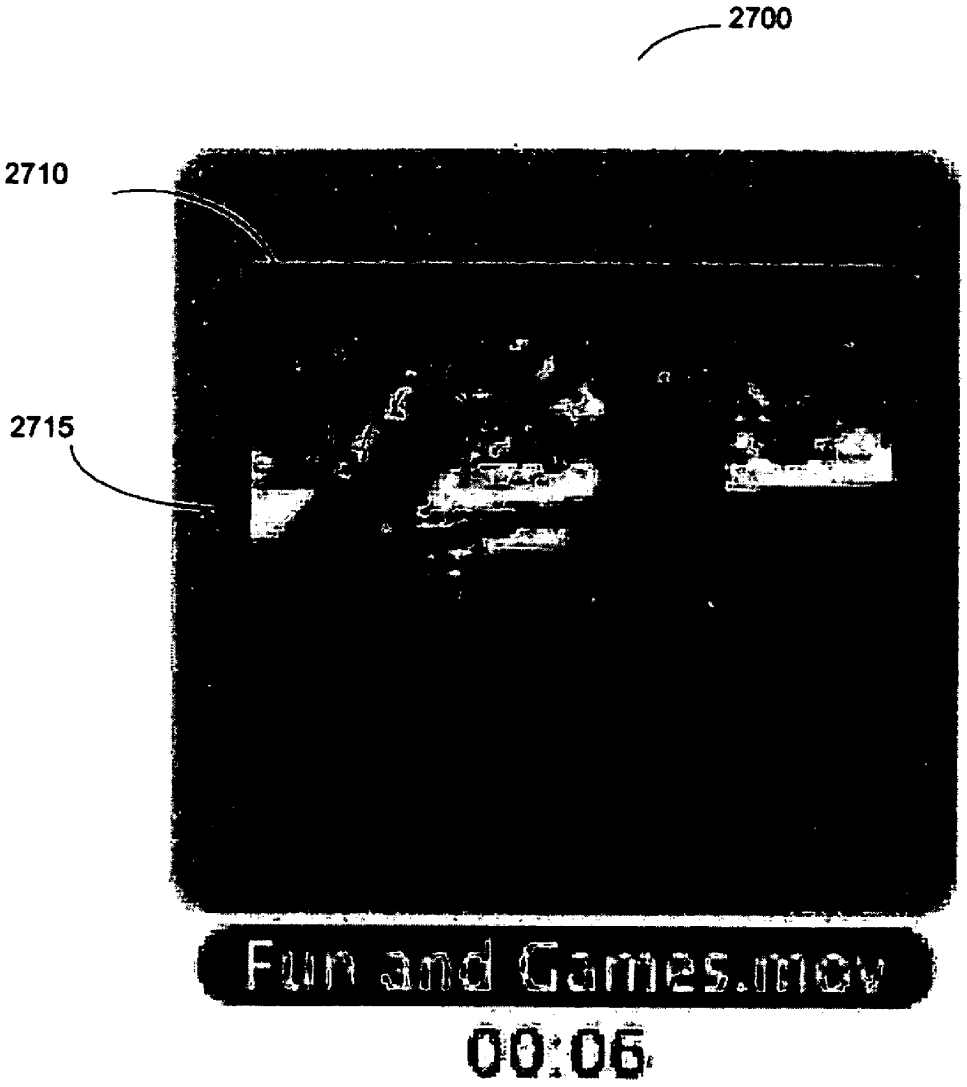


FIG. 27A

FIG. 27B

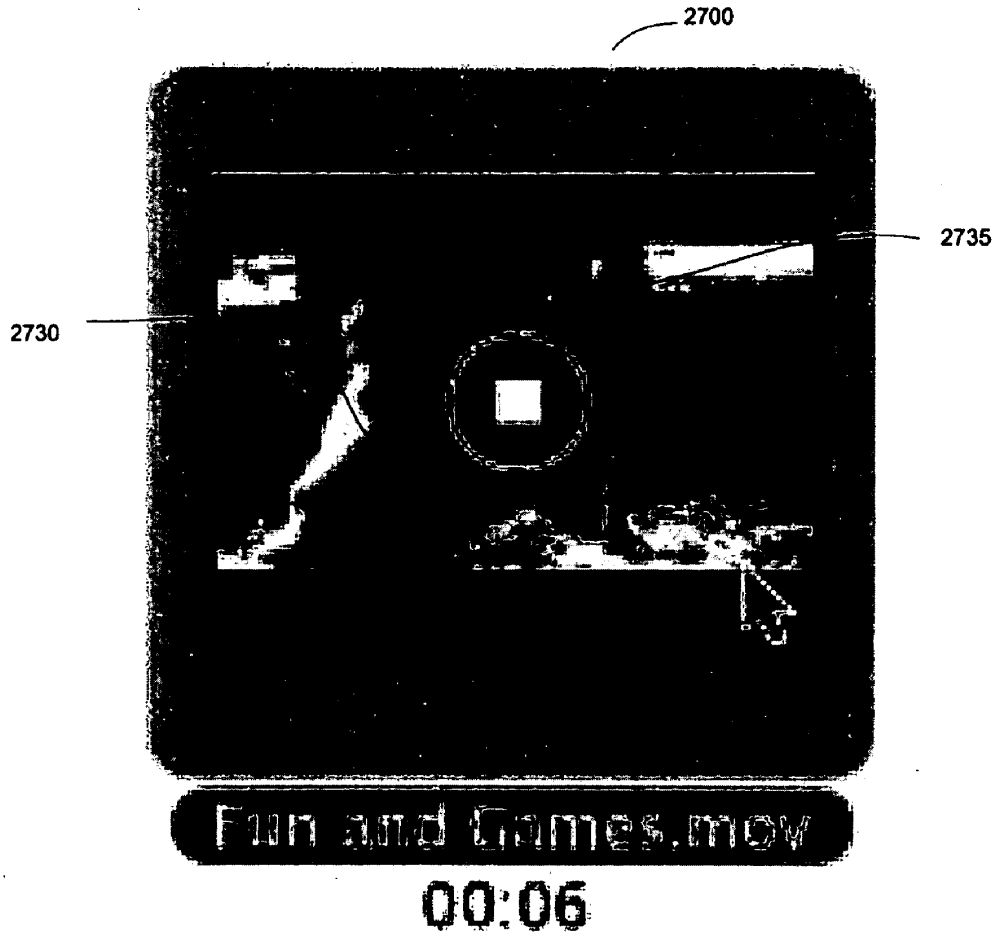


FIG. 27C

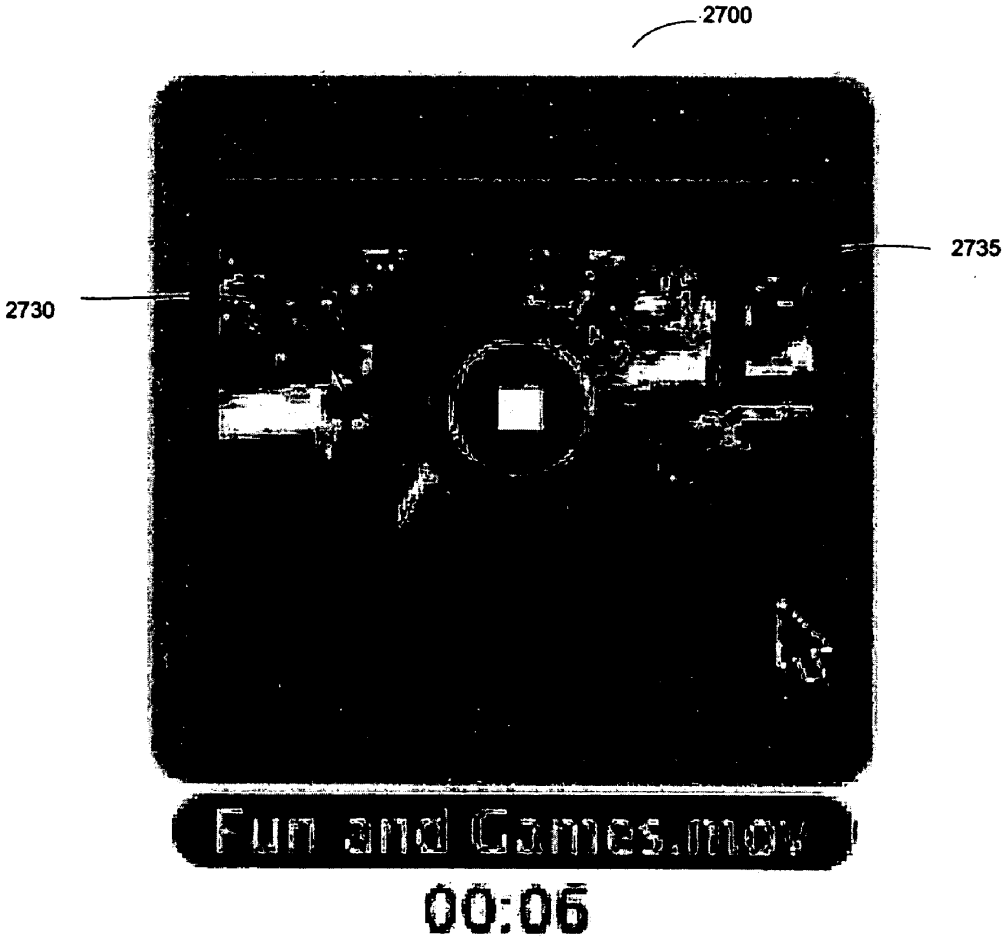


FIG. 27D

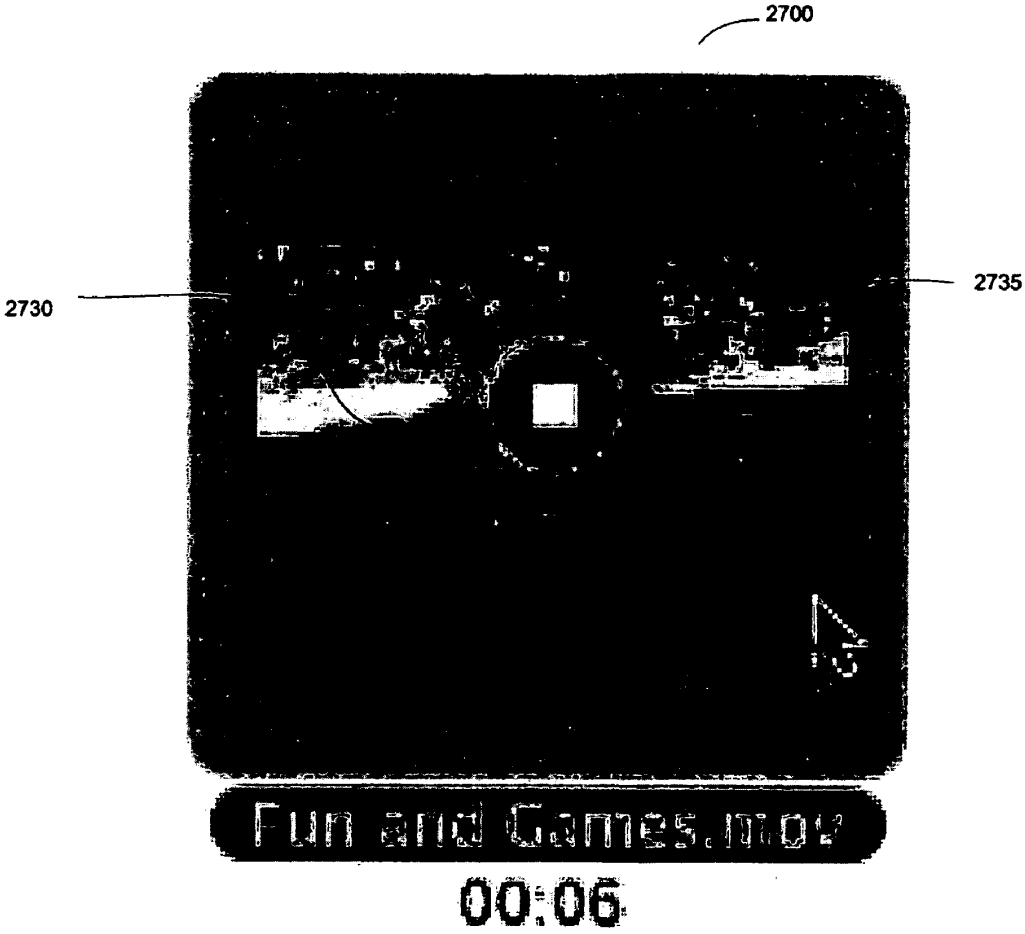


FIG. 27E

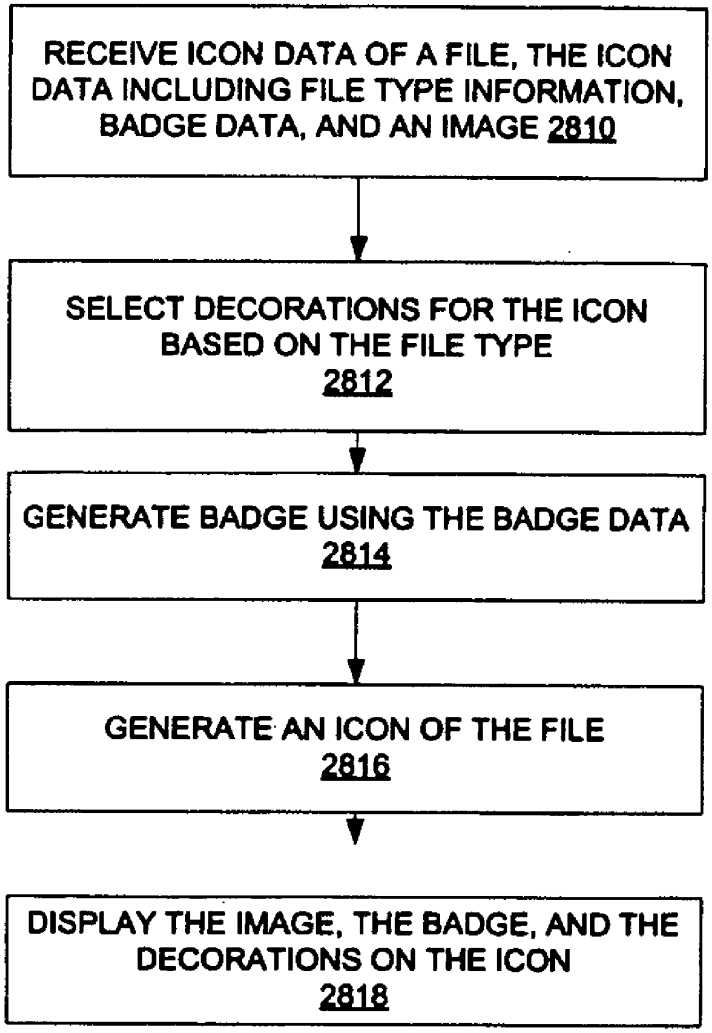

RECEIVE ICON DATA OF A FILE, THE ICON DATA INCLUDING FILE TYPE INFORMATION, BADGE DATA, AND AN IMAGE 2810
SELECT DECORATIONS FOR THE ICON BASED ON THE FILE TYPE 2812
GENERATE BADGE USING THE BADGE DATA 2814
GENERATE AN ICON OF THE FILE 2816
DISPLAY THE IMAGE, THE BADGE, AND THE DECORATIONS ON THE ICON 2818

FIG. 28

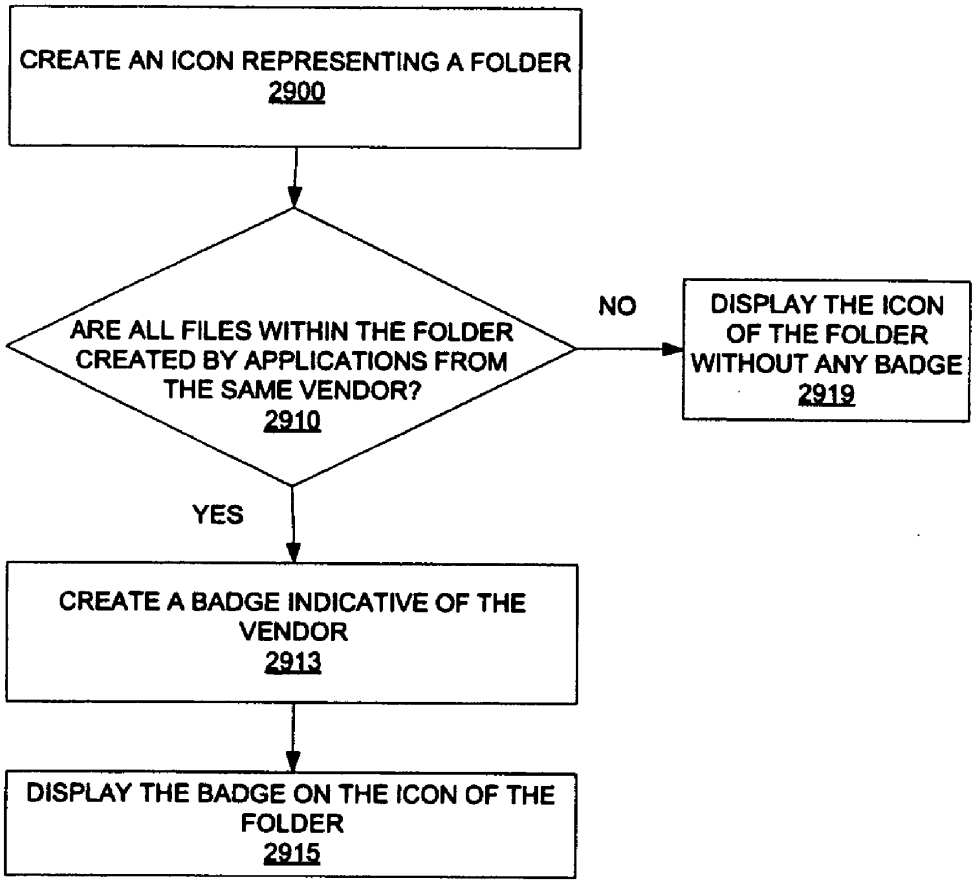

CREATE AN ICON REPRESENTING A FOLDER
2900
ARE ALL FILES WITHIN THE FOLDER CREATED BY APPLICATIONS FROM THE SAME VENDOR?
2910
NO
DISPLAY THE ICON OF THE FOLDER WITHOUT ANY BADGE
2919
YES
CREATE A BADGE INDICATIVE OF THE VENDOR
2913
DISPLAY THE BADGE ON THE ICON OF THE FOLDER
2915

FIG. 29

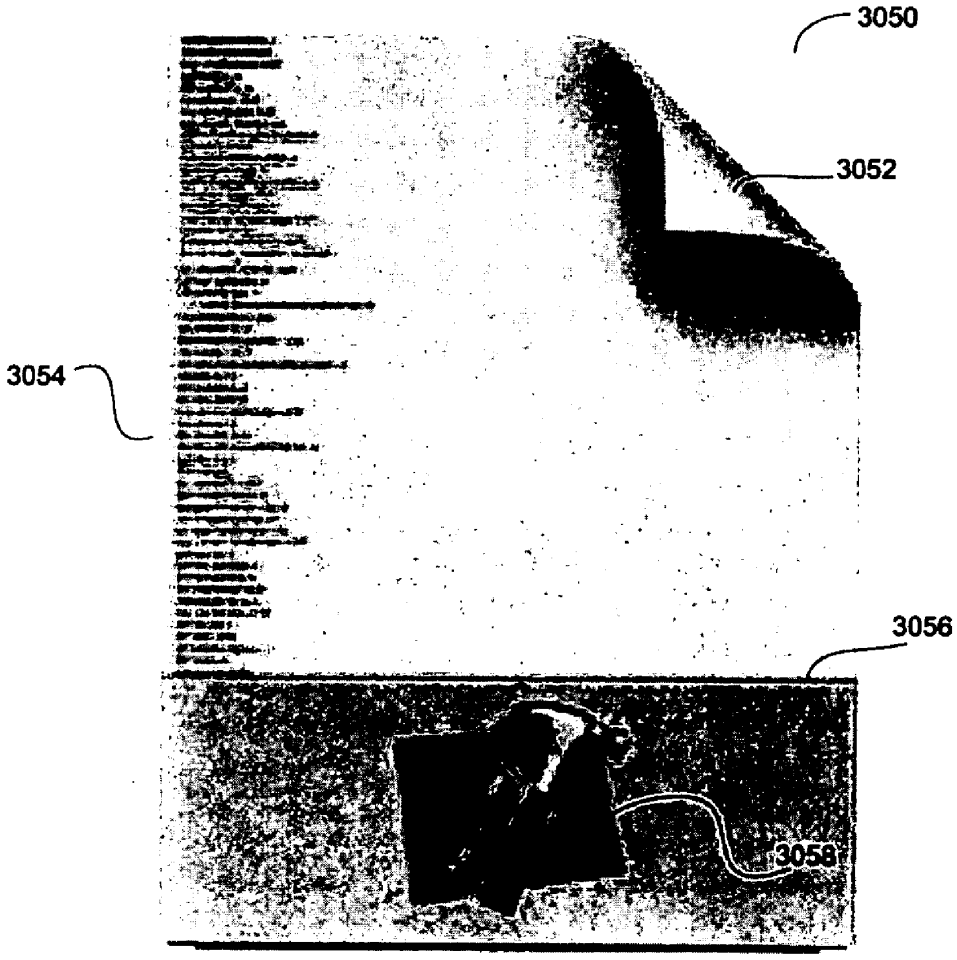


FIG. 30A

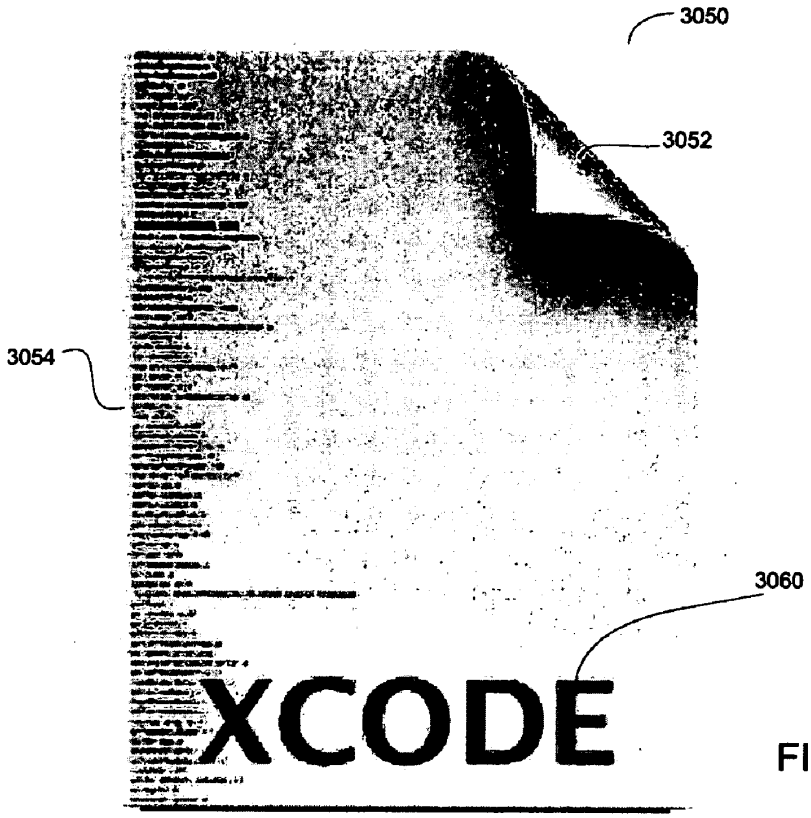


FIG. 30B

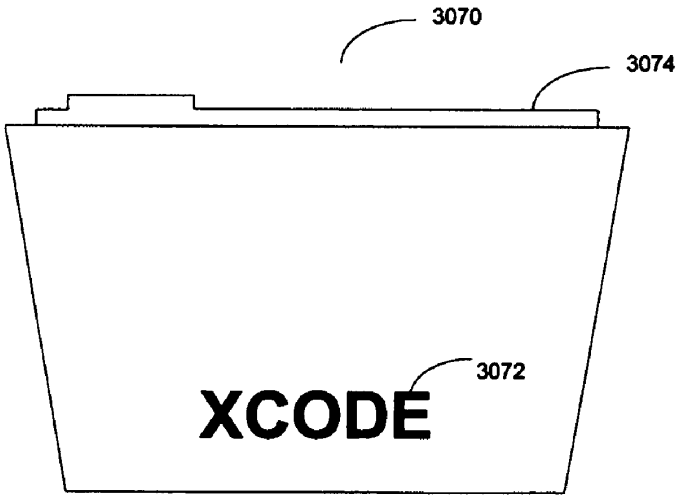


FIG. 30C

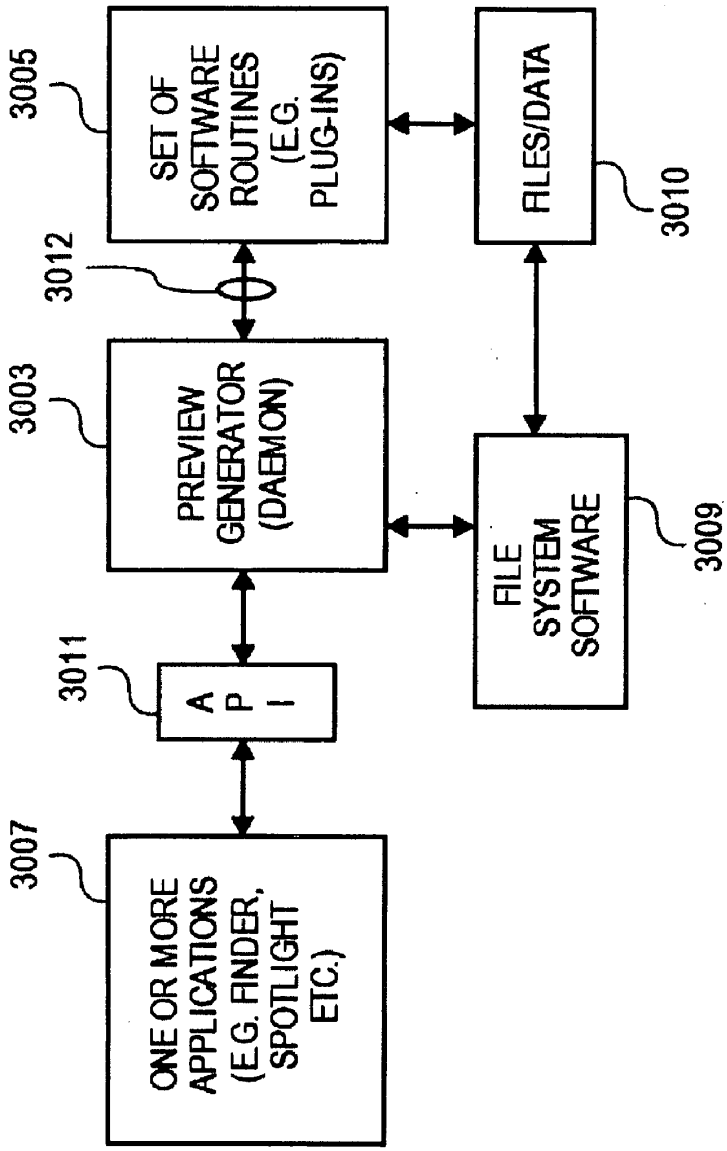

3005
SET OF SOFTWARE ROUTINES (E.G. PLUG-INS)
3012
3003
PREVIEW GENERATOR (DAEMON)
3011
A P I
3007
ONE OR MORE APPLICATIONS (E.G. FINDER, SPOTLIGHT ETC.)
FILES/DATA
3010
FILE SYSTEM SOFTWARE
3009

FIG. 31

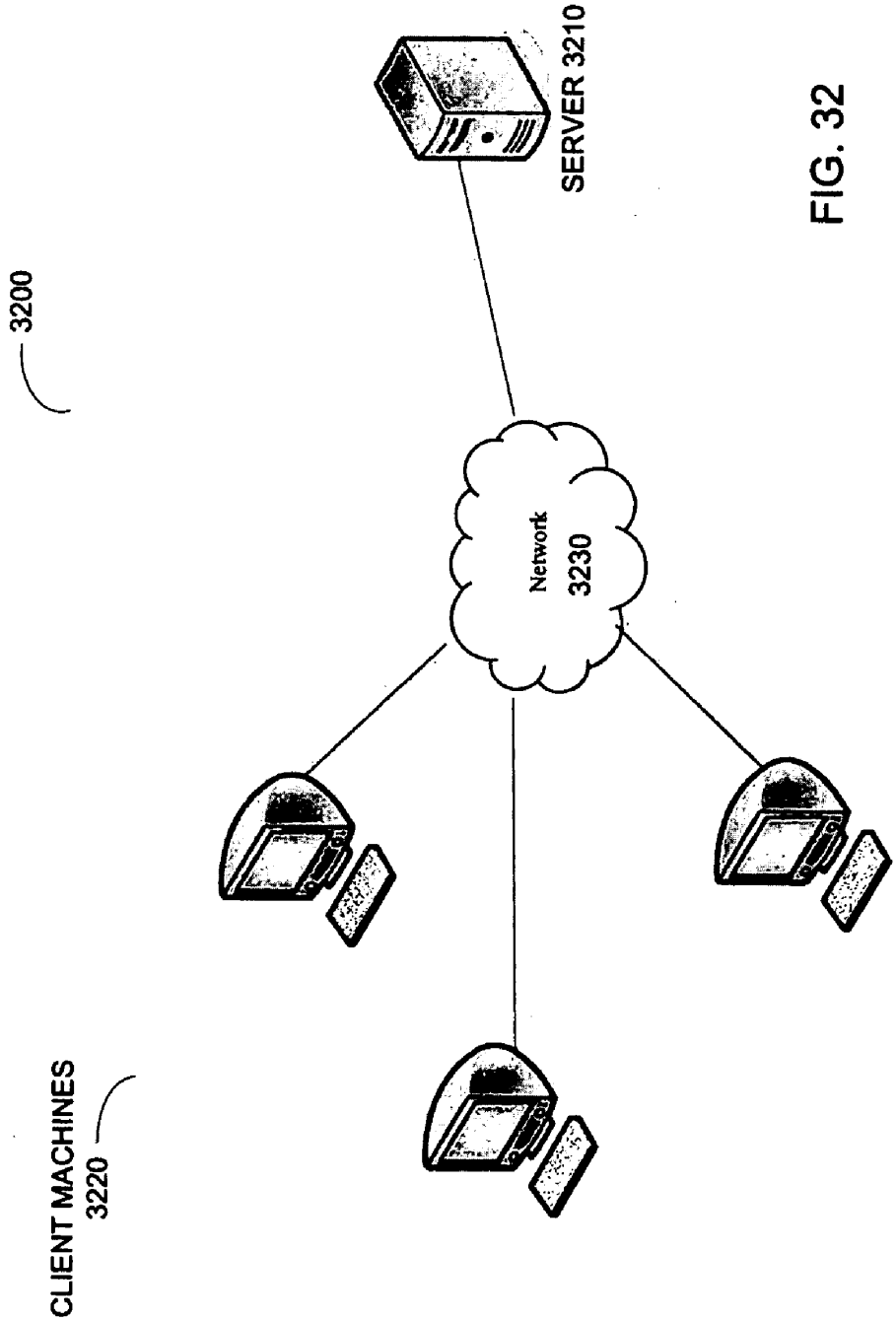


FIG. 32

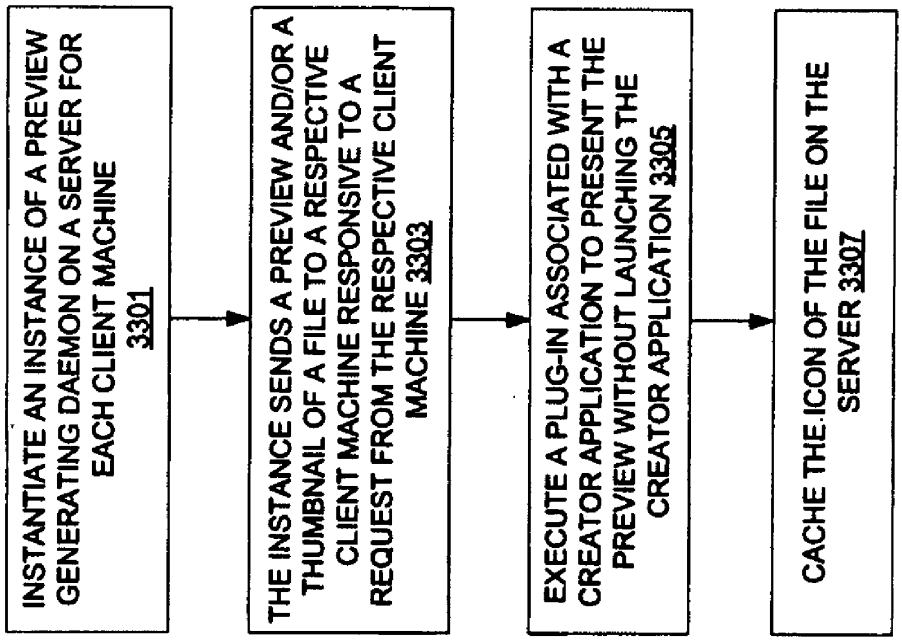

INSTANTIATE AN INSTANCE OF A PREVIEW GENERATING DAEMON ON A SERVER FOR EACH CLIENT MACHINE 3301
THE INSTANCE SENDS A PREVIEW AND/OR A THUMBNAIL OF A FILE TO A RESPECTIVE CLIENT MACHINE RESPONSIVE TO A REQUEST FROM THE RESPECTIVE CLIENT MACHINE 3303
EXECUTE A PLUG-IN ASSOCIATED WITH A CREATOR APPLICATION TO PRESENT THE PREVIEW WITHOUT LAUNCHING THE CREATOR APPLICATION 3305
CACHE THE ICON OF THE FILE ON THE SERVER 3307

FIG. 33

BROWSING OR SEARCHING USER INTERFACES AND OTHER ASPECTS

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 61/059,614, filed on Jun. 6, 2008.

BACKGROUND OF THE INVENTION

[0002] Modern data processing systems, such as general purpose computer systems, allow the users of such systems to create a variety of different types of data files. For example, a typical user of a data processing system may create text files with a word processing program such as Microsoft Word or may create an image file with an image processing program such as Adobe's PhotoShop. Numerous other types of files are capable of being created or modified, edited, and otherwise used by one or more users for a typical data processing system. The large number of the different types of files that can be created or modified can present a challenge to a typical user who is seeking to find a particular file which has been created.

[0003] Modern data processing systems often include a file management system which allows a user to place files in various directories or subdirectories (e.g. folders) and allows a user to give the file a name. Further, these file management systems often allow a user to find a file by searching for the file's name, or the date of creation, or the date of modification, or the type of file. An example of such a file management system is the Finder program which operates on Macintosh computers from Apple Inc. of Cupertino, Calif. Another example of a file management system program is the Windows Explorer program which operates on the Windows operating system from Microsoft Corporation of Redmond, Wash. Both the Finder program and the Windows Explorer program include a find command which allows a user to search for files by various criteria including a file name or a date of creation or a date of modification or the type of file. However, this search capability searches through information which is the same for each file, regardless of the type of file. Thus, for example, the searchable data for a Microsoft Word file is the same as the searchable data for an Adobe PhotoShop file, and this data typically includes the file name, the type of file, the date of creation, the date of last modification, the size of the file and certain other parameters which may be maintained for the file by the file management system.

[0004] Certain presently existing application programs allow a user to maintain data about a particular file. This data about a particular file may be considered metadata because it is data about other data. This metadata for a particular file may include information about the author of a file, a summary of the document, and various other types of information. A program such as Microsoft Word may automatically create some of this data when a user creates a file and the user may add additional data or edit the data by selecting the "property sheet" from a menu selection in Microsoft Word. The property sheets in Microsoft Word allow a user to create metadata for a particular file or document. However, in existing systems, a user is not able to search for metadata across a variety of different applications using one search request from the user. Furthermore, existing systems can perform one search for data files, but this search does not also include searching through metadata for those files.

SUMMARY OF THE DESCRIPTION

[0005] Methods for managing data in a data processing system and systems for managing data are described herein.

[0006] A method of managing data in one exemplary embodiment includes displaying an icon representing a file in a graphical user interface (GUI), where the icon includes one or more predefined decorations. The decorations may be chosen based on the file type, such as slide decorations for presentations, a foldover for documents, etc. This may also be referred to as type conformance. A preview of the content of the file is presented within the icon without launching an application which has created the file (also referred to as the creator application). The pre-defined decorations on the icon may be maintained on the icon while the preview of the content of the file is presented. The format of the icon (e.g., shape of the icon, size of the icon, etc.) may be maintained as well during presentation of the preview.

[0007] In some embodiments, various user interface control are provided to allow users to manipulate the presentation of the preview within the icon. Thus, such preview is also referred to as interactive preview and the icon displaying the interactive preview are referred to as a dynamic icon. For example, if the file is a document, buttons may be provided to allow users to page through pages of the document within the icon as if one was turning the pages sequentially. Alternatively, a button may be provided to allow users to zoom into a portion of the document within the icon. Alternatively, a scroll bar may be provided to allow users to scroll up and down the document within the icon. If the file is a video, then a play button may be provided to allow users to initiate playing a preview of the video within the icon. Furthermore, a stop button may be provided to allow users to stop playing the video. In some embodiments, a status indicator, such as a ring, a bar, etc., may be provided to indicate the portion of the preview of the video played. If the file is a still image, then a thumbnail of the image may be displayed as a preview and one or more buttons may be provided to allow users to zoom in or out of the thumbnail of the image.

[0008] According to some aspects of the invention, the GUI in which the icon is displayed is associated with a client application, such as a file management application of a hierarchical file system (HFS), such as Finder from Apple, Inc. of Cupertino, Calif., and Window Explorer from Microsoft Corp. of Redmond, Wash. Via the GUI, users may manage files in the HFS. Alternatively, the GUI in which the icon is displayed is associated with a file searching application, such as Spotlight from Apple, Inc. The GUI may include a result window of the file searching application. Icons of files found by the file searching application may be displayed in the result window and previews of contents of the files, if available, are presented within the icons inside the result window. No additional window may be generated to present the preview.

[0009] In some embodiments, the metadata of the file includes a field having an indicator to indicate whether a preview of the content of the file is available. If the preview is available, then a plug-in associated with the creator application of the file is executed to present the preview within the icon. Furthermore, if the preview is interactive according to the metadata, then various user interface control may be generated to allow users to manipulate the presentation of the preview.

[0010] According to some aspects of the invention, a background process (also referred to as a daemon) may request icon data of an icon from the plug-in in response to a request from the client application. As mentioned above, the plug-in is associated with a creator application of the file. The icon data includes decorations of the icon (which may be chosen based on the file type) and metadata of the file. As mentioned above, the metadata may include a field having an indicator to indicate whether a preview of the content of the file is available. After the background process receives the icon data from the plug-in, the background process forwards the icon data to the client application. In some embodiments, the client application analyzes the metadata to determine if a preview of the content of the file is available, and if so, whether the preview is interactive. If the preview is available and is interactive, then the client application may generate an icon usable to present the preview and execute the plug-in to present the preview within the icon. User interface control appropriate for the type of content may be provided to allow users to manipulate the presentation of the preview within the icon.

[0011] In at least certain embodiments, the icon data from the plug-in further includes badge data and an image (such as a thumbnail). The badge data includes additional information on the file, the creator application of the file, and/or a third party vendor of the creator application. For example, the badge data may include the version of the creator application. Using the badge data, a badge may be generated and displayed on the icon. For example, a badge containing a graphic image to identify a creator application (e.g., a logo of the creator application) and/or the third party vendor (e.g., a trademark of the third party vendor) may be displayed on an icon of a file created by the creator application. Such a badge may be referred to as an image badge. Alternatively, a badge containing text of the name of the creator application may be displayed on the icon. Such a badge may be referred to as a text badge.

[0012] According to some aspects of the invention, icons representing folders may be badged as well. When an icon is created for a folder, it is determined if all files within the folder is produced by applications from a single third party vendor using badge data in icon data of icons representing the files within the folder. If so, a badge indicative of the single third party vendor is generated. Then the badge is displayed on the icon of the folder. The badge may include text, a graphic image, or a combination of both. The icon of the folder may further include decorations for folders, such as a binder.

[0013] In some embodiments, the above operations to create icons, to present previews within the icons, and to create badges for the icons are performed by a single computing machine, such as a personal computer. Alternatively, the above operations to create icons, to present previews within the icons, and to create badges for the icons are performed by various computing machines within a system. According to some aspects of the invention, a server in the system initiates an instance of a preview generator for each client machine in the system. The instance sends at least one of a preview and a thumbnail of a file to the client machine responsive to a request for the file from the client machine to allow the client machine to present the preview. The instance may generate an icon representing the file and execute a plug-in associated with a creator application of the file to present the preview within the icon so that the creator application does not have to be launched. Furthermore, the icon may be cached on the server so that other instances of the preview generator may use the same icon.

[0014] Other aspects of the present inventions include various data processing systems which perform these methods and machine readable media which cause a data processing system to perform various methods described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The present invention is illustrated by way of example and not limitation in the figures of the accompanying drawings in which like references indicate similar elements.

[0016] FIG. **1** shows an exemplary embodiment of a data processing system, which may be a general-purpose computer system and which may operate in any of the various methods described herein.

[0017] FIG. **2** shows a general example of one exemplary method of one aspect of the invention.

[0018] FIG. **3**A shows an example of the content of the particular type of metadata for a particular type of file.

[0019] FIG. **3**B shows another example of a particular type of metadata for another particular type of file.

[0020] FIG. **4** shows an example of an architecture for managing metadata according to one exemplary embodiment of the invention.

[0021] FIG. **5** is a flow chart showing another exemplary method of the present invention.

[0022] FIG. **6** shows an example of a storage format, which utilizes a flat file format for metadata according to one exemplary embodiment of the invention.

[0023] FIGS. **7**A-**7**E show a sequence of graphical user interfaces provided by one exemplary embodiment in order to allow searching of metadata and/or other data in a data processing system.

[0024] FIGS. **8**A and **8**B show two examples of formats for displaying search results according to one exemplary embodiment of the invention.

[0025] FIG. **9** shows another exemplary user interface of the present invention.

[0026] FIG. **10** shows another exemplary user interface of the present invention.

[0027] FIGS. **11**A-**11**D show, in sequence, another exemplary user interface according to the present invention.

[0028] FIGS. **12**A-**12**D show alternative embodiments of user interfaces according to the present invention.

[0029] FIGS. **13**A and **13**B show further alternative embodiments of user interfaces according to the present invention.

[0030] FIGS. **14**A, **14**B, **14**C, and **14**D show further alternative embodiments of user interfaces according to the present invention.

[0031] FIGS. **15**A, **15**B, **15**C and **15**D show another alternative embodiment of user interfaces according to the present invention.

[0032] FIGS. **16**A and **16**B show certain aspects of embodiments of user interfaces according to the present invention.

[0033] FIG. **17** shows an aspect of certain embodiments of user interfaces according to the present invention.

[0034] FIGS. **18**A and **18**B show further aspects of certain embodiments of user interfaces according to the present invention.

[0035] FIGS. **19**A, **19**B, **19**C, **19**D, and **19**E show further illustrative embodiments of user interfaces according to the present invention.

[0036] FIG. **20** is a flow chart which illustrates another exemplary method of the present invention.

[0037] FIG. **21** shows a method, according to one exemplary embodiment, of another aspect of the present inventions.

[0038] FIGS. **22**A, **22**B and **22**C show examples of previews of items found from a search query, with the previews being capable of being presented within the window showing the search results.

[0039] FIG. **23** provides an example of one method of generating dynamic icons having previews within the dynamic icons.

[0040] FIG. **24** illustrates one embodiment of a call diagram to change a thumbnail of a file to live preview of the file.

[0041] FIG. **25** is a flowchart showing one embodiment of a method of changing a thumbnail to live preview.

[0042] FIGS. **26**A-**26**D show one embodiment of a dynamic icon.

[0043] FIGS. **27**A-**27**E show another embodiment of a dynamic icon.

[0044] FIG. **28** shows one embodiment of a method to badge icons.

[0045] FIG. **29** shows one embodiment of a method to badge a folder.

[0046] FIGS. **30**A-**30**C show some exemplary embodiments of badged icons.

[0047] FIG. **31** shows an example of an architecture, which includes at least one application program interface (API), that allows an application, such as a user level application, to obtain a preview of files and other data without having to launch another application which created that file or other data.

[0048] FIG. **32** illustrates one embodiment of a system in which embodiments of the present invention may be implemented.

[0049] FIG. **33** illustrates one embodiment of a method for providing a preview generator on a server.

DETAILED DESCRIPTION

[0050] The subject invention will be described with reference to numerous details set forth below, and the accompanying drawings will illustrate the invention. The following description and drawings are illustrative of the invention and are not to be construed as limiting the invention. Numerous specific details are described to provide a thorough understanding of the present invention. However, in certain instances, well known or conventional details are not described in order to not unnecessarily obscure the present invention in detail.

[0051] The present description includes material protected by copyrights, such as illustrations of graphical user interface images. The owners of the copyrights, including the assignee of the present invention, hereby reserve their rights, including copyright, in these materials. The copyright owner has no objection to the facsimile reproduction by anyone of the patent document or the patent disclosure, as it appears in the Patent and Trademark Office file or records, but otherwise reserves all copyrights whatsoever. Copyright Apple Inc. 2008.

[0052] FIG. **1** shows one example of a typical computer system which may be used with the present invention. Note that while FIG. **1** illustrates various components of a computer system, it is not intended to represent any particular architecture or manner of interconnecting the components as such details are not germane to the present invention. It will also be appreciated that personal digital assistants (PDAs), cellular telephones, media players (e.g. an iPod), devices which combine aspects or functions of these devices (e.g. a media player combined with a PDA and a cellular telephone in one device), an embedded processing device within another device, network computers, a consumer electronic device, and other data processing systems which have fewer components or perhaps more components may also be used with or to implement one or more embodiments of the present invention. The computer system of FIG. **1** may, for example, be a Macintosh computer from Apple Inc.

[0053] As shown in FIG. **1**, the computer system **101**, which is a form of a data processing system, includes a bus **102** which is coupled to a microprocessor(s) **103** and a ROM (Read Only Memory) **107** and volatile RAM **105** and a non-volatile memory **106**. The microprocessor **103** may be a microprocessor from Intel or a G3 or G4 microprocessor from Motorola, Inc. or one or more G5 microprocessors from IBM. The bus **102** interconnects these various components together and also interconnects these components **103**, **107**, **105**, and **106** to a display controller and display device **104** and to peripheral devices such as input/output (I/O) devices which may be mice, keyboards, modems, network interfaces, printers and other devices which are well known in the art. Typically, the input/output devices **109** are coupled to the system through input/output controllers **108**. The volatile RAM (Random Access Memory) **105** is typically implemented as dynamic RAM (DRAM) which requires power continually in order to refresh or maintain the data in the memory. The mass storage **106** is typically a magnetic hard drive or a magnetic optical drive or an optical drive or a DVD RAM or other types of memory systems which maintain data (e.g. large amounts of data) even after power is removed from the system. Typically, the mass storage **106** will also be a random access memory although this is not required. While FIG. **1** shows that the mass storage **106** is a local device coupled directly to the rest of the components in the data processing system, it will be appreciated that the present invention may utilize a non-volatile memory which is remote from the system, such as a network storage device which is coupled to the data processing system through a network interface such as a modem or Ethernet interface. The bus **102** may include one or more buses connected to each other through various bridges, controllers and/or adapters as is well known in the art. In one embodiment the I/O controller **108** includes a USB (Universal Serial Bus) adapter for controlling USB peripherals and an IEEE 1394 controller for IEEE 1394 compliant peripherals.

[0054] It will be apparent from this description that aspects of the present invention may be embodied, at least in part, in software. That is, the techniques may be carried out in a computer system or other data processing system in response to its processor, such as a microprocessor, executing sequences of instructions contained in a memory, such as ROM **107**, RAM **105**, mass storage **106** or a remote storage device. In various embodiments, hardwired circuitry may be used in combination with software instructions to implement the present invention. Thus, the techniques are not limited to any specific combination of hardware circuitry and software nor to any particular source for the instructions executed by the data processing system. In addition, throughout this description, various functions and operations are described as being performed by or caused by software code to simplify description. However, those skilled in the art will recognize

what is meant by such expressions is that the functions result from execution of the code by a processor, such as the microprocessor **103**.

Capturing and Use of Metadata Across a Variety of Application Programs

[0055] FIG. **2** shows a generalized example of one embodiment of the present invention. In this example, captured metadata is made available to a searching facility, such as a component of the operating system which allows concurrent searching of all metadata for all applications having captured metadata (and optionally for all non-metadata of the data files). The method of FIG. **2** may begin in operation **201** in which metadata is captured from a variety of different application programs. This captured metadata is then made available in operation **203** to a searching facility, such as a file management system software for searching. This searching facility allows, in operation **205**, the searching of metadata across all applications having captured metadata. The method also provides, in operation **207**, a user interface of a search engine and the search results which are obtained by the search engine. There are numerous possible implementations of the method of FIG. **2**. For example, FIG. **5** shows a specific implementation of one exemplary embodiment of the method of FIG. **2**. Alternative implementations may also be used. For example, in an alternative implementation, the metadata may be provided by each application program to a central source which stores the metadata for use by searching facilities and which is managed by an operating system component, which may be, for example, the metadata processing software. The user interface provided in operation **207** may take a variety of different formats, including some of the examples described below as well as user interfaces which are conventional, prior art user interfaces. The metadata may be stored in a database which may be any of a variety of formats including a B tree format or, as described below, in a flat file format according to one embodiment of the invention.

[0056] The method of FIG. **2** may be implemented for programs which do not store or provide metadata. In this circumstance, a portion of the operating system provides for the capture of the metadata from the variety of different programs even though the programs have not been designed to provide or capture metadata. For those programs which do allow a user to create metadata for a particular document, certain embodiments of the present invention may allow the exporting back of captured metadata back into data files for applications which maintain metadata about their data files.

[0057] The method of FIG. **2** allows information about a variety of different files created by a variety of different application programs to be accessible by a system wide searching facility, which is similar to the way in which prior art versions of the Finder or Windows Explorer can search for file names, dates of creation, etc. across a variety of different application programs. Thus, the metadata for a variety of different files created by a variety of different application programs can be accessed through an extension of an operating system, and an example of such an extension is shown in FIG. **4** as a metadata processing software which interacts with other components of the system and will be described further below.

[0058] FIGS. **3**A and **3**B show two different metadata formats for two different types of data files. Note that there may be no overlap in any of the fields; in other words, no field in one type of metadata is the same as any field in the other type of metadata. Metadata format **301** may be used for an image file such as a JPEG image file. This metadata may include information such as the image's width, the image's height, the image's color space, the number of bits per pixel, the ISO setting, the flash setting, the F/stop of the camera, the brand name of the camera which took the image, user-added keywords and other fields, such as a field which uniquely identifies the particular file, which identification is persistent through modifications of the file. Metadata format **331** shown in FIG. **3**B may be used for a music file such as an MP3 music file. The data in this metadata format may include an identification of the artist, the genre of the music, the name of the album, song names in the album or the song name of the particular file, song play times or the song play time of a particular song and other fields, such as a persistent file ID number which identifies the particular MP3 file from which the metadata was captured. Other types of fields may also be used. The following chart shows examples of the various fields which may be used in metadata for various types of files.

Item name	Parent in hierarchy	Attribute name	Description/Notes	CFType	Multi-value	Localized	User set-table	Get-table	Copied with copy	App viewable
Item	n/a	Authors	Who created or contributed to the contents of this item	CFString	Yes	No	Yes	Yes	Yes	Address Book
		Comment	A free form text comment	CFString	No	No	Yes	Yes	Yes	
		ContentType	This is the type that is determined by UTI	CFString	No	?	No	Yes	Yes	
		ContentTypes	This is the inheritance of the UTI system	CFString	Yes	?	No	Yes	Yes	
		CreatedDate	When was this item created	CFDate	No	No	No	Yes	Yes	
		DisplayName	The name of the item as the user would like to read it. Very well may be the file name, but it may also be the subject of an e-mail message or the full name of a person, for example.	CFString	No	Yes	Yes	Yes	Yes	Finder (or Launch Services)

-continued

Item name	Parent in hierarchy	Attribute name	Description/Notes	CFType	Multi-value	Localized	User set-table	Get-table	Copied with copy	App viewable
		Keywords	This is a list words set by the user to identify arbitrary sets of organization. The scope is determined by the user and can be flexibly used for any kind of organization. For example, Family, Hawaii, Project X, etc.	CFString	Yes	System-provided keywords (if any)	Yes	Yes	Ask	
		Contact Keywords	A list of contacts that are associated with this document, beyond what is captured as Author. This may be a person who's in the picture or a document about a person or contact (performance review, contract)	CFString	Yes	No	Yes	Yes	Ask	Address Book
		ModifiedDate	When this item was last modified	CFDate	No	No	No	Yes		
		Rating	A relative rating (0 to 5 value) on how important a particular item is to you, whether it's a person, file or message	CFNumber	No	n/a	Yes	Yes		
		RelatedTos	A list of other items that are arbitrarily grouped together.	CFString	Yes	No	Yes	Yes		
		TextContent	An indexed version of any content text	CFString	No	No	No	Yes		
		UsedDates	Which days was the document opened/viewed/played	CFDate	Yes	No	No	Yes		
Content/ Data	Item	Copyright	Specifies the owner of this content, i.e. Copyright Apple Inc.	CFString	No	No	Yes	Yes		
		CreatorApp	Keeps track of the application that was used to create this document (if it's known).	CFString	No	?	No	Yes		
		Languages	The languages that this document is composed in (for either text or audio-based media)	CFString	Yes	Yes	Yes	Yes		
		ParentalControl	A field that is used to determine whether this is kid-friendly content or not	CFString	No	?	Yes	Yes		
		Publishers	The name or a person or organization that published this content.	CFString	Yes	No	Yes	Yes		Address Book
		PublishedDate	The original date that this content was published (if it was), independent of created date.	CFDate	No	No	Yes	Yes		
		Reviewers	A list of contacts who have reviewed the contents of this file. This would have to be set explicitly by an application.	CFString	Yes	No	Yes	Yes		Address Book
Image	Data	ReviewStatus	Free form text that used to specify where the document is in any arbitrary review process	CFString	No	?	Yes	Yes		
		TimeEdited	Total time spent editing document	CFDate	No	No	No	Yes		
		WhereTos	Where did this go to, eg. CD, printed, backedup	CFString	Yes	System-provided words only (if any)	?	Yes		

-continued

Item name	Parent in hierarchy	Attribute name	Description/Notes	CFType	Multi-value	Localized	User set-table	Get-table	Copied with copy	App viewable
		WhereFroms	Where did this come from, e.g. camera, email, web download, CD	CFString	Yes	System-provided words only (if any)	?	Yes		
		BitsPerSample	What is the bit depth of the image (8-bit, 16-bit, etc.)	CFNumber	No			Yes		
		ColorSpace	What color space model is this document following	CFString	No			Yes		ColorSync Utility?
		ImageHeight	The height of the image in pixels	CFNumber	No			Yes		
		ImageWidth	The width of the image in pixels	CFNumber	No			Yes		
		ProfileName	The name of the color profile used with for image	CFString	No			Yes		ColorSync Utility?
		ResolutionWidth	Resolution width of this image (i.e. dpi from a scanner)	CFNumber	No			Yes		
		ResolutionHeight	Resolution height of this image (i.e. dpi from a scanner)	CFNumber	No			Yes		
		LayerNames	For image formats that contain "named" layers (e.g. Photoshop files)	CFString	Yes			Yes		
		Aperture	The f-stop rating of the camera when the image was taken	CFNumber	No			Yes		
		CameraMake	The make of the camera that was used to acquire this image (e.g. Nikon)	CFString	No	Yes		Yes		
		CameraModel	The model of the camera used to acquire this image (Coolpix 5700)	CFString	No	Yes		Yes		
		DateTimeOriginal	Date/time the picture was taken	CFDate	No			Yes		
		ExposureMode	Mode that was used for the exposure	CFString	No			Yes		
		ExposureTime	Time that the lens was exposed while taking the picture	CFDate	No			Yes		
		Flash	This attribute is overloaded with information about red-eye reduction. This is not a binary value	CFNumber	No			Yes		
		GPS	Raw value received from GPS device associated with photo acquisition. It hasn't necessarily been translated to a user-understandable location.	CFString	No			Yes		
		ISOSpeed	The ISO speed the camera was set to when the image was acquired	CFNumber	No			Yes		
		Orientation	The orientation of the camera when the image was acquired	CFString	No			Yes		
		WhiteBalance	The white balance setting of the camera when the picture was taken	CFNumber	No			Yes		
		EXIFversion	The version of EXIF that was used to generate the metadata for the image	CFString	No			Yes		
		AcquisitionSources	The name or type of device that used to acquire the media	CFString	Yes			Yes		

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Item name	Parent in hierarchy	Attribute name	Description/Notes	CFType	Multi-value	Localized	User set-table	Get-table	Copied with copy	App viewable
Time-based	Data	Codecs	The codecs used to encode/decode the media	CFString	Yes			Yes		
		DeliveryType	FastStart or RTSP	CFString	No			Yes		
		Duration	The length of time that the media lasts	CFNumber	No			Yes		
		Streamable	Whether the content is prepared for purposes of streaming	CFBoolean	No			Yes		
		TotalBitRate	The total bit rate (audio & video combined) of the media.	CFNumber	No			Yes		
		AudioBitRate	The audio bit rate of the media	CFNumber	No			Yes		
		AspectRatio	The aspect ratio of the video of the media	CFString	No			Yes		
		ColorSpace	The color space model used for the video aspect of the media	CFString	No			Yes		
		FrameHeight	The frame height in pixels of the video in the media	CFNumber	No			Yes		
		FrameWidth	The frame width in pixels of the video in the media	CFNumber	No			Yes		
		ProfileName	The name of the color profile used on the video portion of the media	CFString	No			Yes		
		VideoBitRate	The bit rate of the video aspect of the media	CFNumber	No			Yes		
Text	Data	Subject	The subject of the text. This could be metadata that's supplied with the text or something automatically generated with technologies like VTWIN	CFString	No			Yes		
		PageCount	The number of printable pages of the document	CFNumber	No			Yes		
		LineCount	The number of lines in the document	CFNumber	No			Yes		
		WordCount	The number of words in the document	CFNumber	No			Yes		
		URL	The URL that will get you to this document (or at least did at one time). Relevant for saved HTML documents, bookmarks, RSS feeds, etc.	CFString	No			Yes		
		PageTitle	The title of a web page. Relevant to HTML or bookmark documents	CFString	No			Yes		
		Google Hierarchy	Structure of where this page can be found in the Google hierarchy. Relevant to HTML or bookmark documents	CFString	No			Yes		
Compound document	Data	<Abstract>	There are no specific attributes assigned to this item. This is to catch all app-specific file formats that fall within Data, but don't fit into any of the other types. Typically these documents have multiple types of media embedded within them. (e.g. P	n/a	n/a	n/a	n/a	n/a	n/a	n/a

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Item name	Parent in hierarchy	Attribute name	Description/Notes	CFType	Multi-value	Localized	User set-table	Get-table	Copied with copy	App viewable
PDF	Compound document	NumberOfPages	The number of printable pages in the document	CFNumber	No			Yes		
		PageSize	The size of the page stored as points	CFNumber	No		No	Yes		
		PDFTitle	PDF-specific title metadata for the document	CFString	No		?	Yes		
		PDFAuthor	PDF-specific author metadata for the document	CFString	No		?	Yes		Address Book
		PDFSubject	PDF-specific subject metadata for the document	CFString	No		?	Yes		
		PDFKeywords	PDF-specific keywords metadata for the document	CFString	Yes		?	Yes		
		PDFCreated	PDF-specific created metadata for the document	CFDate	No		?	Yes		
		PDFModified	PDF-specific modified metadata for the document	CFDate	No		?	Yes		
		PDFVersion	PDF-specific version metadata for the document	CFString	No		?	Yes		
		SecurityMethod	Method by which this document is kept secure	CFString	No			Yes		
Presentation (Keynote)	Compound document	SlideTitles	A collection of the titles on slides	CFString	Yes			Yes		
		SlideCount	The number of slides	CFString	No			Yes		
		SpeakerNotesContent	The content of all the speaker notes from all of the slides together	CFString	?			Yes		
Application	Item	Categories	The kind of application this is: productivity, games, utility, graphics, etc. A set list that	CFString	Yes			Yes		
Message	Item	Recipients	Maps to To and Cc: addresses in a mail message.	CFString	Yes			Yes		Address Book
		Priority	The priority of the message as set by the sender	CFString	No			Yes		
		AttachmentNames	The list of filenames that represent attachments in a particular message (should be actionable within the Finder)	CFString	Yes			Yes		
		Authors	maps to From address in mail message	CFString	Yes	No	Yes	Yes	Yes	Address Book
		Comment	Not applicable to Mail right now (should we consider?)	CFString	No	No	Yes	Yes	Yes	
		ContentType		CFString	No		No	Yes	Yes	
		ContentTypes		CFString	Yes		No	Yes	Yes	
		CreatedDate	When was this message was sent or received	CFDate	No	No	No	Yes	Yes	
		DisplayName	Subject of the message	CFString	No	Yes	Yes	Yes	Yes	
		Keywords	There will be a way to set keywords within Mail	CFString	Yes	System-provided keywords (if any)	Yes	Yes	Ask	
		Contact Keywords	Could be where recipients are held	CFString	Yes	No	Yes	Yes	Ask	Address Book
		ModifiedDate	Not applicable	CFDate	No	No	No	Yes		
		Rating	A relative rating (0 to 5 stars) on how important a particular message is to you (separate from a message's Priority)	CFNumber	No	n/a	Yes	Yes		

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Item name	Parent in hierarchy	Attribute name	Description/Notes	CFType	Multi-value	Localized	User set-table	Get-table	Copied with copy	App viewable
		RelatedTos	Potentially threaded messages could be put into this category	CFString	Yes	No	Yes	Yes		
		TextContent	An indexed version of the mail message	CFString	No	No	No	Yes		
		UsedDates	The day/time in which the mail message was viewed/read	CFDate	Yes	No	No	Yes		
Contact	Item	Company	The company that this contact is an employee of	CFString	No			Yes		Address Book
		E-mails	A list of e-mail addresses that this contact has	CFString	Yes			Yes		Mail
		IMs	A list of instant message handles this contact has	CFString	Yes			Yes		iChat
		Phones	A list of phone numbers that relate to this contact	CFString	Yes					
		Addresses	A list of physical addresses that relate to this person	CFString	Yes					
		Authors	the name of the owner of the Address Book (current user name)	CFString	Yes	No	Yes	Yes	Yes	Address Book
		Comment		CFString	No	No	Yes	Yes	Yes	
		ContentType		CFString	No		No	Yes	Yes	
		ContentTypes		CFString	Yes		No	Yes	Yes	
		CreatedDate	date the user entered this into his AddressBook (either through import or direct entry)	CFDate	No	No	No	Yes	Yes	
		DisplayName	Composite name of contact (First Name, Last Name)	CFString	No	Yes	Yes	Yes	Yes	
		Keywords	There will be a way to set keywords within Address Book	CFString	Yes	System-provided keywords (if any)	Yes	Yes	Ask	
		Contact Keywords		CFString	Yes	No	Yes	Yes	Ask	Address Book
		ModifiedDate	Last time this contact entry was modified	CFDate	No	No	No	Yes		
		Rating	A relative rating (0 to 5 stars) on how important a particular contact is to you (separate from a message's Priority)	CFNumber	No	n/a	Yes	Yes		
		RelatedTos	(potentially could be used to associate people from the same company or family)	CFString	Yes	No	Yes	Yes		
		TextContent	An indexed version of the Notes section	CFString	No	No	No	Yes		
		UsedDates	The day/time in which the contact entry was viewed in Address Book	CFDate	Yes	No	No	Yes		
Meeting (TBD)	Item	Body	text, rich text or document that represents the full content of the event	CFString	No			Yes		
		Description	text describing the event	CFString	No			Yes		
		EventTimes	time/date the event starts	CFDate	Yes			Yes		
		Duration	The length of time that the meeting lasts	CFNumber	No			Yes		
		Invitees	The list of people who are invited to the meeting	CFString	Yes			Yes		Address Book
		Location	The name of the location where the meeting is taking place	CFString	No			Yes		

[0059] One particular field which may be useful in the various metadata formats would be a field which includes an identifier of a plug-in or other software element which may be used to capture metadata from a data file and/or export metadata back to the creator application. Another field which may be useful in the various metadata formats would be a field which includes an indicator on whether a preview of the content of a file is available. In some embodiments, the field may further include another indicator to tell whether the preview, if available, is interactive.

[0060] Various different software architectures may be used to implement the functions and operations described herein. The following discussion provides one example of such an architecture, but it will be understood that alternative architectures may also be employed to achieve the same or similar results. The software architecture shown in FIG. **4** is an example which is based upon the Macintosh operating system. The architecture **400** includes a metadata processing software **401** and an operating system (OS) kernel **403** which is operatively coupled to the metadata processing software **401** for a notification mechanism which is described below. The metadata processing software **401** is also coupled to other software programs such as a file system graphical user interface software **405** (which may be the Finder), an email software **407**, and other applications **409**. These applications are coupled to the metadata processing software **401** through client application program interface **411** which provide a method for transferring data and commands between the metadata processing software **401** and the software **405**, **407**, and **409**. These commands and data may include search parameters specified by a user as well as commands to perform searches from the user, which parameters and commands are passed to the metadata processing software **401** through the interface **411**. The metadata processing software **401** is also coupled to a collection of importers **413** which extract data from various applications. In particular, in one exemplary embodiment, a text importer is used to extract text and other information from word processing or text processing files created by word processing programs such as Microsoft Word, etc. This extracted information is the metadata for a particular file. Other types of importers extract metadata from other types of files, such as image files or music files. In this particular embodiment, a particular importer is selected based upon the type of file which has been created and modified by an application program. For example, if the data file was created by PhotoShop, then an image importer for PhotoShop may be used to input the metadata from a PhotoShop data file into the metadata database **415** through the metadata processing software **401**. On the other hand, if the data file is a word processing document, then an importer designed to extract metadata from a word processing document is called upon to extract the metadata from the word processing data file and place it into the metadata database **415** through the metadata processing software **401**. Typically, a plurality of different importers may be required in order to handle the plurality of different application programs which are used in a typical computer system. The importers **413** may optionally include a plurality of exporters which are capable of exporting the extracted metadata for particular types of data files back to property sheets or other data components maintained by certain application programs. For example, certain application programs may maintain some metadata for each data file created by the program, but this metadata is only a subset of the metadata extracted by an importer from this type of data file. In this instance, the exporter may export back additional metadata or may simply insert metadata into blank fields of metadata maintained by the application program.

[0061] The software architecture **400** also includes a file system directory **417** for the metadata. This file system directory keeps track of the relationship between the data files and their metadata and keeps track of the location of the metadata object (e.g. a metadata file which corresponds to the data file from which it was extracted) created by each importer. In one exemplary embodiment, the metadata database is maintained as a flat file format as described below, and the file system directory **417** maintains this flat file format. One advantage of a flat file format is that the data is laid out on a storage device as a string of data without references between fields from one metadata file (corresponding to a particular data file) to another metadata file (corresponding to another data file). This arrangement of data will often result in faster retrieval of information from the metadata database **415**.

[0062] The software architecture **400** of FIG. **4** also includes find by content software **419** which is operatively coupled to a database **421** which includes an index of files. The index of files represents at least a subset of the data files in a storage device and may include all of the data files in a particular storage device (or several storage devices), such as the main hard drive of a computer system. The index of files may be a conventional indexed representation of the content of each document. The find by content software **419** searches for words in that content by searching through the database **421** to see if a particular word exists in any of the data files which have been indexed. The find by content software functionality is available through the metadata processing software **401** which provides the advantage to the user that the user can search concurrently both the index of files in the database **421** (for the content within a file) as well as the metadata for the various data files being searched. The software architecture shown in FIG. **4** may be used to perform the method shown in FIG. **5** or alternative architectures may be used to perform the method of FIG. **5**.

[0063] The method of FIG. **5** may begin in operation **501** in which a notification of a change for a file is received. This notification may come from the OS kernel **403** which notifies the metadata processing software **401** that a file has been changed. This notification may come from sniffer software elements which detect new or modified files and deletion of files. This change may be the creation of a new file or the modification of an existing file or the deletion of an existing file. The deletion of an existing file causes a special case of the processing method of FIG. **5** and is not shown in FIG. **5**. In the case of a deletion, the metadata processing software **401**, through the use of the file system directory **417**, deletes the metadata file in the metadata database **415** which corresponds to the deleted file. The other types of operations, such as the creation of a new file or the modification of an existing file, causes the processing to proceed from operation **501** to operation **503** in which the type of file which is the subject of the notification is determined. The file may be an Acrobat PDF file or an RTF word processing file or a JPEG image file, etc. In any case, the type of the file is determined in operation **503**. This may be performed by receiving from the OS kernel **403** the type of file along with the notification or the metadata processing software **401** may request an identification of the type of file from the file system graphical user interface software **405** or similar software which maintains information

about the data file, such as the creator application or parent application of the data file. It will be understood that in one exemplary embodiment, the file system graphical user interface software **405** is the Finder program which operates on the Macintosh operating system. In alternative embodiments, the file system graphical user interface system may be Windows Explorer which operates on Microsoft's Windows operating system. After the type of file has been determined in operation **503**, the appropriate capture software (e.g. one of the importers **413**) is activated for the determined file type. The importers may be a plug-in for the particular application which created the type of file about which notification is received in operation **501**. Once activated, the importer or capture software imports the appropriate metadata (for the particular file type) into the metadata database, such as metadata database **415** as shown in operation **507**. Then in operation **509**, the metadata is stored in the database. In one exemplary embodiment, it may be stored in a flat file format. Then in operation **511**, the metadata processing software **401** receives search parameter inputs and performs a search of the metadata database (and optionally also causes a search of non-metadata sources such as the index of files **421**) and causes the results of the search to be displayed in a user interface. This may be performed by exchanging information between one of the applications, such as the software **405** or the software **407** or the other applications **409** and the metadata processing software **401** through the interface **411**. For example, the file system software **405** may present a graphical user interface, allowing a user to input search parameters and allowing the user to cause a search to be performed. This information is conveyed through the interface **411** to the metadata processing software **401** which causes a search through the metadata database **415** and also may cause a search through the database **421** of the indexed files in order to search for content within each data file which has been indexed. The results from these searches are provided by the metadata processing software **401** to the requesting application which, in the example given here, was the software **405**, but it will be appreciated that other components of software, such as the email software **407**, may be used to receive the search inputs and to provide a display of the search results. Various examples of the user interface for inputting search requests and for displaying search results are described herein and shown in the accompanying drawings.

[0064] It will be appreciated that the notification, if done through the OS kernel, is a global, system wide notification process such that changes to any file will cause a notification to be sent to the metadata processing software. It will also be appreciated that in alternative embodiments, each application program may itself generate the necessary metadata and provide the metadata directly to a metadata database without the requirement of a notification from an operating system kernel or from the intervention of importers, such as the importers **413**. Alternatively, rather than using OS kernel notifications, an embodiment may use software calls from each application to a metadata processing software which receives these calls and then imports the metadata from each file in response to the call.

[0065] As noted above, the metadata database **415** may be stored in a flat file format in order to improve the speed of retrieval of information in most circumstances. The flat file format may be considered to be a non-B tree, non-hash tree format in which data is not attempted to be organized but is rather stored as a stream of data. Each metadata object or metadata file will itself contain fields, such as the fields shown in the examples of FIGS. **3**A and **3**B. However, there will typically be no relationship or reference or pointer from one field in one metadata file to the corresponding field (or another field) in the next metadata file or in another metadata file of the same file type. FIG. **6** shows an example of the layout in a flat file format of metadata. The format **601** includes a plurality of metadata files for a corresponding plurality of data files. As shown in FIG. **6**, metadata file **603** is metadata from file **1** of application A and may be referred to as metadata file A**1**. Similarly, metadata file **605** is metadata from file **1** of application B and may be referred to as metadata file B**1**. Each of these metadata files typically would include fields which are not linked to other fields and which do not contain references or pointers to other fields in other metadata files. It can be seen from FIG. **6** that the metadata database of FIG. **6** includes metadata files from a plurality of different applications (applications A, B, and C) and different files created by each of those applications. Metadata files **607**, **609**, **611**, and **617** are additional metadata files created by applications A, B, and C as shown in FIG. **6**.

[0066] A flexible query language may be used to search the metadata database in the same way that such query languages are used to search other databases. The data within each metadata file may be packed or even compressed if desirable. As noted above, each metadata file, in certain embodiments, will include a persistent identifier which uniquely identifies its corresponding data file. This identifier remains the same even if the name of the file is changed or the file is modified. This allows for the persistent association between the particular data file and its metadata.

User Interface Aspects

[0067] Various different examples of user interfaces for inputting search parameters and for displaying search results are provided herein. It will be understood that some features from certain embodiments may be mixed with other embodiments such that hybrid embodiments may result from these combinations. It will be appreciated that certain features may be removed from each of these embodiments and still provide adequate functionality in many instances.

[0068] FIG. **7**A shows a graphical user interface which is a window which may be displayed on a display device which is coupled to a data processing system such as a computer system. The window **701** includes a side bar having two regions **703**A, which is a user-configurable region, and **703**B, which is a region which is specified by the data processing system. Further details in connection with these side bar regions may be found in co-pending U.S. patent application Ser. No. 10/873,661 filed Jun. 21, 2004, and entitled "Methods and Apparatuses for Operating a Data Processing System," by inventors Donald Lindsay and Bas Ording. The window **701** also includes a display region **705** which in this case displays the results of searches requested by the user. The window **701** also includes a search parameter menu bar **707** which includes configurable pull down menus **713**, **715**, and **717**. The window **701** also includes a text entry region **709** which allows a user to enter text as part of the search query or search parameters. The button **711** may be a start search button which a user activates in order to start a search based upon the selected search parameters. Alternatively, the system may perform a search as soon as it receives any search parameter inputs or search queries from the user rather than waiting for a command to begin the search. The window **701**

also includes a title bar **729** which may be used in conjunction with a cursor control device to move, in a conventional manner, the window around a desktop which is displayed on a display device. The window **701** also includes a close button **734**, a minimize button **735**, and a resize button **736** which may be used to close or minimize or resize, respectively, the window. The window **701** also includes a resizing control **731** which allows a user to modify the size of the window on a display device. The window **701** further includes a back button **732** and a forward button **733** which function in a manner which is similar to the back and forward buttons on a web browser, such as Internet Explorer or Safari. The window **701** also includes view controls which include three buttons for selecting three different types of views of the content within the display region **705**. When the contents found in a search exceed the available display area of a display region **705**, scroll controls, such as scroll controls **721**, **722**, and **723**, appear within the window **701**. These may be used in a conventional manner, for example, by dragging the scroll bar **721** within the scroll region **721**A using conventional graphical user interface techniques.

[0069] The combination of text entry region **709** and the search parameter menu bar allow a user to specify a search query or search parameters. Each of the configurable pull down menus presents a user with a list of options to select from when the user activates the pull down menu. As shown in FIG. **7**A, the user has already made a selection from the configurable pull down menu **713** to specify the location of the search, which in this case specifies that the search will occur on the local disks of the computer systems. Configurable pull down menu **715** has also been used by the user to specify the kind of document which is to be searched for, which in this case is an image document as indicated by the configurable pull down menu **715** which indicates "images" as the selected configuration of this menu and hence the search parameter which it specifies. The configurable pull down menu **717**, as shown in FIG. **7**A, represents an add search parameter pull down menu. This add search parameter pull down menu allows the user to add additional criteria to the search query to further limit the search results. In the embodiment shown in FIG. **7**A, each of the search parameters is logically ANDed in a Boolean manner. Thus the current search parameter specified by the user in the state shown in FIG. **7**A searches all local disks for all images, and the user is in the middle of the process of selecting another search criteria by having selected the add search criteria pull down menu **717**, resulting in the display of the pull down menu **719**, which has a plurality of options which may be selected by the user.

[0070] FIG. **7**B shows the window **701** after the user has caused the selection of the time option within pull down menu **719**, thereby causing the display of a submenu **719**A which includes a list of possible times which the user may select from. Thus it appears that the user wants to limit the search to all images on all local disks within a certain period of time which is to be specified by making a selection within the submenu **719**A.

[0071] FIG. **7**C shows the window **701** on the display of a data processing system after the user has selected a particular option (in this case "past week") from the submenu **719**A. If the user accepts this selection, then the display shown in FIG. **7**D results in which the configurable pull down menu **718** is displayed showing that the user has selected as part of the search criteria files that have been created or modified in the past week. It can be seen from FIG. **7**D that the user can change the particular time selected from this pull down menu **718** by selecting another time period within the pull down menu **718**A shown in FIG. **7**D. Note that the configurable pull down menu **717**, which represents an add search parameter menu, has now moved to the right of the configurable pull down menu **718**. The user may add further search parameters by pressing or otherwise activating the configurable pull down menu **717** from the search parameter menu bar **707**. If the user decides that the past week is the proper search criteria in the time category, then the user may release the pull down menu **718**A from being displayed in a variety of different ways (e.g. the user may release the mouse button which was being depressed to keep the pull down menu **718**A on the display). Upon releasing or otherwise dismissing the pull down menu **718**A, the resulting window **701** shown in FIG. **7**E then appears. There are several aspects of this user interface shown in FIG. **7**A-**7**E which are worthy of being noted. The search parameters or search query is specified within the same window as the display of the search results. This allows the user to look at a single location or window to understand the search parameters and how they affected the displayed search results, and may make it easier for a user to alter or improve the search parameters in order to find one or more files. The configurable pull down menus, such as the add search parameter pull down menu, includes hierarchical pull down menus. An example of this is shown in FIG. **7**B in which the selection of the time criteria from the pull down menu **717** results in the display of another menu, in this case a submenu **719**A which may be selected from by the user. This allows for a compact presentation of the various search parameters while keeping the initial complexity (e.g. without submenus being displayed) at a lower level. Another useful aspect of the user interface shown in FIG. **7**A-**7**E is the ability to reconfigure pull down menus which have previously been configured. Thus, for example, the configurable pull down menu **713** currently specifies the location of the search (in this case, all local disks), however, this may be modified by selecting the pull down region associated with the configurable pull down menu **713**, causing the display of a menu of options indicating alternative locations which may be selected by the user. This can also be seen in FIG. **7**D in which the past week option has been selected by the user (as indicated by "past week" being in the search parameter menu bar **707**), but a menu of options shown in the pull down menu **718**A allows the user to change the selected time from the "past week" to some other time criteria. Another useful aspect of this user interface is the ability to continue adding various search criteria by using the add search criteria pull down menu **717** and selecting a new criteria.

[0072] It will also be appreciated that the various options in the pull down menus may depend upon the fields within a particular type of metadata file. For example, the selection of "images" to be searched may cause the various fields present in the metadata for an image type file to appear in one or more pull down menus, allowing the user to search within one or more of those fields for that particular type of file. Other fields which do not apply to "images" types of files may not appear in these menus in order reduce the complexity of the menus and to prevent user confusion.

[0073] Another feature of the present invention is shown in FIGS. **7**A-**7**E. In particular, the side bar region **703**A, which is the user-configurable portion of the side bar, includes a representation of a folder **725** which represents the search

results obtained from a particular search, which search results may be static or they may be dynamic in that, in certain instances, the search can be performed again to obtain results based on the current files in the system. The folder **725** in the example shown in FIGS. **7**A-**7**E represents a search on a local disk for all images done on December 10. By selecting this folder in the side bar region **703**A, the user may cause the display in the display region **705** of the results of that search. In this way, a user may retrieve a search result automatically by saving the search result into the side bar region **703**A. One mechanism for causing a search result or a search query to be saved into the side bar region **703**A is to select the add folder button **727** which appears in the bottom portion of the window **701**. By selecting this button, the current search result or search query is saved as a list of files and other objects retrieved in the current search result. In the case where the search query is saved for later use rather than the saving of a search result, then the current search query is saved for re-use at a later time in order to find files which match the search query at that later time. The user may select between these two functionalities (saving a search result or saving a search query) by the selection of a command which is not shown.

[0074] FIGS. **8**A and **8**B show another aspect of a user interface feature which may be used with certain embodiments of the present invention. The window **801** of FIG. **8**A represents a display of the search results which may be obtained as a result of using one of the various different embodiments of the present invention. The search results are separated into categories which are separated by headers **805**, **807**, **809**, and **811** which in this case represent periods of time. This particular segmentation with headers was selected by the user's selecting the heading "date modified" using the date modified button **803** at the top of the window **801**. An alternative selection of the kind category by selecting the button **802** at the top of the window **801**A shown in FIG. **8**B results in a different formatting of the search results which are now categorized by headers which indicate the types of files which were retrieved in the search and are separated by the headings **815**, **817**, **819**, and **821** as shown in FIG. **8**B. The use of these headings in the search results display allows the user to quickly scan through the search results in order to find the file.

[0075] FIG. **9** shows another aspect of the present invention that is illustrated as part of the window **901** shown in FIG. **9**. This window includes a display region **905** which shows the results of the search and the window also includes two side bar regions **903**A and **903**B, where the side bar region **903**A is the user-configurable portion and the side bar region **903**B is the system controlled portion. A folder add button **927** may be selected by the user to cause the addition of a search result or a search query to be added to the user-configurable portion of the side bar. The window **901** also includes conventional window controls such as a title bar or region **929** which may be used to move the window around a display and view select buttons **937** and maximize, minimize and resize buttons **934**, **935**, and **936** respectively. The window **901** shows a particular manner in which the results of a text-based search may be displayed. A text entry region **909** is used to enter text for searching. This text may be used to search through the metadata files or the indexed files or a combination of both. The display region **905** shows the results of a search for text and includes at least two columns, **917** and **919**, which provide the name of the file that was found and the basis for the match. As shown in column **919**, the basis for the match may be the author field or a file name or a key word or comments or other data fields contained in metadata that was searched. The column **921** shows the text that was found which matches the search parameter typed into the text entry field **909**. Another column **911** provides additional information with respect to the search results. In particular, this column includes the number of matches for each particular type of category or field as well as the total number of matches indicated in the entry **913**. Thus, for example, the total number of matches found for the comments field is only 1, while other fields have a higher number of matches.

[0076] FIG. **10** shows certain other aspects of some embodiments of the present invention. Window **1001** is another search result window which includes various fields and menus for a user to select various search parameters or form a search query. The window **1001** includes a display region **1005** which may be used to display the results of a search and a user-configurable side bar portion **1003**A and a system specified side bar portion **1003**B. In addition, the window **1001** includes conventional scrolling controls such as controls **1021** and **1022** and **1021**A. The window further includes conventional controls such as a title bar **1029** which may be used to move the window and view control buttons **1037** and maximize, minimize, and resize buttons **1034**, **1035**, and **1036**. A start search button **1015** is near a text entry region **1009**. A first search parameter menu bar **1007** is displayed adjacent to a second search parameter bar **1011**. The first search parameter search bar **1007** allows a user to specify the location for a particular search while two menu pull down controls in the second search parameter menu bar **1011** allow the user to specify the type of file using the pull down menu **1012** and the time the file was created or last modified using the menu **1013**.

[0077] The window **1001** includes an additional feature which may be very useful while analyzing a search result. A user may select individual files from within the display region **1005** and associate them together as one collection. Each file may be individually marked using a specific command (e.g. pressing the right button on a mouse and selecting a command from a menu which appears on the screen, which command may be "add selection to current group") or similar such commands. By individually selecting such files or by selecting a group of files at once, the user may associate this group of files into a selected group or a "marked" group and this association may be used to perform a common action on all of the files in the group (e.g. print each file or view each file in a viewer window or move each file to a new or existing folder, etc.). A representation of this marked group appears as a folder in the user-configurable portion **1003**A. An example of such a folder is the folder **1020** shown in the user-configurable portion **1003**A. By selecting this folder (e.g. by positioning a cursor over the folder **1020** and pressing and releasing a mouse button or by pressing another button) the user, as a result of this selection, will cause the display within the display region **1005** of the files which have been grouped together or marked. Alternatively, a separate window may appear showing only the items which have been marked or grouped. This association or grouping may be merely temporary or it may be made permanent by retaining a list of all the files which have been grouped and by keeping a folder **1020** or other representations of the grouping within the user-configurable side bar, such as the side bar **1003**A. Certain embodiments may allow multiple, different groupings to exist at the same time, and each of these groupings or associations may be merely temporary (e.g. they exist only while

the search results window is displayed), or they may be made permanent by retaining a list of all the files which have been grouped within each separate group. It will be appreciated that the files within each group may have been created from different applications. As noted above, one of the groupings may be selected and then a user may select a command which performs a common action (e.g. print or view or move or delete) on all of the files within the selected group.

[0078] FIGS. **11**A, **11**B, **11**C, and **11**D show an alternative user interface for allowing a user to input search queries or search parameters. The user interface shown in these figures appears within the window **1101** which includes a user-configurable side bar region **1103**A and a system specified side bar region **1103**B. The window **1101** also includes traditional window controls such as a window resizing control **1131** which may be dragged in a conventional graphical user interface manner to resize the window, and the window further includes scrolling controls such as controls **1121**, **1122**, and **1123**. The scrolling control **1121** may, for example, be dragged within the scrolling region **1121**A or a scroll wheel on a mouse or other input device may be used to cause scrolling within a display region **1105**. Further, traditional window controls include the title bar **1129** which may be used to move the window around a desktop which is displayed on a display device of a computer system and the window also includes view buttons **1137** as well as close, minimize, and resize buttons **1134**, **1135** and **1136**. A back and forward button, such as the back button **1132**, are also provided to allow the user to move back and forth in a manner which is similar to the back and forth commands in a web browser. The window **1101** includes a search parameter menu bar **1111** which includes a "search by" pull down menu **1112** and a "sort by" pull down menu **1114**. The "search by" pull down menu **1112** allows a user to specify the particular search parameter by selecting from the options which appear in the pull down menu once it is activated as shown in FIG. **11**B. In particular, the pull down menu **1113** shows one example of a pull down menu when the "search by" pull down menu **1112** has been activated. The "sort by" pull down menu **1114** allows a user to specify how the search results are displayed within a display region **1105**. In the example shown in FIGS. **11**A-**11**D a user has used the "sort by" pull down menu **1114** to select the "date viewed" criteria to sort the search results by. It should also be noted that the user may change the type of view of the search results by selecting one of the three view buttons **1137**. For example, a user may select an icon view, which is the currently selected button among the view buttons **1137**, or the user may select a list view or a column view.

[0079] FIG. **11**B shows the result of the user's activation of a "search by" pull down menu **1112** which causes the display of the menu **1113** which includes a plurality of options from which the user may choose to perform a search by. It will be appreciated that there are a number of different ways for a user to activate the "search by" pull down menu **1112**. One way includes the use of a cursor, such as a pointer on a display which is controlled by a cursor control device, such as a mouse. The cursor is positioned over the region associated with the "search by" menu title (which is the portion within the search parameter menu bar **1111** which contains the words "search by") and then the user indicates the selection of the menu title by pressing a button, such as a mouse's button, to cause the pull down menu to appear, which in this case is the menu **1113** shown in FIG. **11**B. At this point, the user may continue to move the cursor to point to a particular option within the menu, such as the "time" option. This may result in the display of a submenu to the left or to the right of the menu **1113**. This submenu may be similar to the submenu **719**A or to the menu **1214** shown in FIG. **12**A. If the "kind" option is selected in the menu **1113**, the submenu may include a generic list of the different kinds of documents, such as images, photos, movies, text, music, PDF documents, email documents, etc. or the list may include references to specific program names such as PhotoShop, Director, Excel, Word, etc. or it may include a combination of generic names and specific names. FIG. **11**C shows the result of the user having selected PhotoShop type of documents from a submenu of the "kind" option shown in menu **1113**. This results in the display of the search parameter menu bar **1111**A shown in FIG. **11**C which includes a highlighted selection **1111**B which indicates that the PhotoShop type of documents will be searched for. The search parameter menu bar **1111** appears below the search parameter menu bar **1111**A as shown in FIG. **11**C. The user may then specify additional search parameters by again using the "search by" pull down menu **1112** or by typing text into the text entry field **1109**. For example, from the state of the window **1101** shown in FIG. **11**C, the user may select the "search by" pull down menu **1112** causing the display of a menu containing a plurality of options, such as the options shown within the menu **1113** or alternative options such as those which relate to PhotoShop documents (e.g. the various fields in the metadata for PhotoShop type of documents). A combination of such fields contained within metadata for PhotoShop type documents and other generic fields (e.g. time, file size, and other parameters) may appear in a menu, such as the menu **1113** which is activated by selecting the "search by" pull down menu. The user may then select another criteria such as the time criteria. In this case, the window **1101** displays a new search parameter menu bar **1115** which allows a user to specify a particular time. The user may select one of the times on the menu bar **1115** or may activate a pull down menu by selecting the menu title "time," which is shown as the menu title **1116**. The state of the window **1101** shown in FIG. **11**D would then search for all PhotoShop documents created in the last 30 days or 7 days or 2 days or today or at any time, depending on the particular time period selected by the user.

[0080] FIGS. **12**A, **12**B, **12**C and **12**D show another example of a user interface for allowing the creation of search queries for searching metadata and other data and for displaying the results of the search performed using a search query. The different implementation shown in FIGS. **12**A-**12**D shows a user interface presentation in a column mode; this can be seen by noting the selection of the column button, which is the rightmost button in the view buttons **1237** shown in FIG. **12**A. The window **1201** has two columns **1211** and the display region **1205**, while the window **1251** of FIG. **12**C has three columns which are columns **1257**, **1259**, and the display region **1255**, and the window **1271** has three columns which are columns **1277**, **1279**, and the display region **1275**.

[0081] The window **1201** shown in FIGS. **12**A and **12**B includes a display region **1205** which shows the results of a search; these results may be shown dynamically as the user enters search parameters or the results may be shown only after the user has instructed the system to perform the search (e.g. by selecting a "perform search" command). The window **1201** includes conventional window controls, such as a resizing control **1231**, a scrolling control **1221**, a title bar **1229** which may be used to move the window, a window close

button, a window minimize button, and a window resize button **1234**, **1235**, and **1236**, respectively. The window **1201** also includes a user-configurable side bar region **1203**A and a system specified side bar region **1203**B. It can be seen from FIG. **12**A that a browse mode has been selected as indicated by the highlighted "browse" icon **1203**C in the system specified side bar region **1203**B. The window **1201** also includes a text entry region **1209**, which a user may use to enter text for a search, and the window **1201** also includes view selector buttons **1237**.

[0082] A column **1211** of window **1201** allows a user to select various search parameters by selecting one of the options which in turn causes the display of a submenu that corresponds to the selected option. In the case of FIG. **12**A, the user has selected the "kind" option **1212** and then has used the submenu **1214** to select the "photos" option from the submenu, resulting in an indicator **1213** (photos) to appear in the column **1211** under the "kind" option as shown in FIG. **12**A. It can also be seen that the user has previously selected the "time" option in the column **1211** and has selected from a submenu brought up when the "time" option was selected the "past week" search parameter. When the user has finished making selections of the various options and suboptions from both the column **1112** and any of the corresponding submenus which appear, then the display showed in FIG. **12**B appears. Note that the submenus are no longer present and that the user has completed the selection of the various options and suboptions which specify the search parameters. Column **1211** in FIG. **12**B provides feedback to the user indicating the exact nature of the search query (in this case a search for all photos dated in the past week), and the results which match the search query are shown in the display region **1205**.

[0083] FIGS. **12**C and **12**D show an alternative embodiment in which the submenus which appear on a temporary basis in the embodiment of FIGS. **12**A and **12**B are replaced by an additional column which does not disappear after a selection is made. In particular, the column **1259** of the window **1251** functions in the same manner as the submenu **1214** except that it remains within the window **1251** after a selection is made (wherein the submenu **1214** is removed from the window after the user makes the selection from the submenu). The column **1279** of window **1271** of FIG. **12**D is similar to the column **1259**. The window **1251** includes a side bar which has a user-configurable side bar region **1253**A and a system defined side bar region **1253**B. The system specified side bar region **1253**B includes a "browse" selection region **1254** which has a clear button **1258** which the user may select to clear the current search query. The window **1271** of FIG. **12**D provides an alternative interface for clearing the search query. The window **1271** also includes a user configurable side bar region **1273**A and a system specified side bar region **1273**B, but the clear button, rather than being with the "search" region **1274** is at the top of the column **1277**. The user may clear the current search parameter by selecting the button **1283** as shown in FIG. **12**D.

[0084] FIG. **13**A shows another embodiment of a window **1301** which displays search results within a display region **1302**. The window **1301** may be a closeable, minimizeable, resizeable, and moveable window having a resizing control **1310**, a title bar **1305** which may be used to move the window, a text entry region **1306** and a user configurable portion **1303**, and a system specified portion **1304**. The window **1301** further includes buttons for selecting various views, including an icon view, a list view, and a column view. Currently, the list view button **1316** has been selected, causing the display of the search results in a list view manner within the display region **1302**. It can be seen that the text ("button") has been entered into the text entry region **1306** and this has caused the system to respond with the search results shown in the display region **1302**. The user has specified a search in every location by selecting "everywhere" button **1317**. Further, the user has searched for any kind of document by selecting the "kind" option from the pull down menu **1315** and by selecting the "any" option in the pull down menu **1319**. The where or location slice **1307** includes a "+" button which may be used to add further search parameters, and similarly, the slice **1308** includes a "+" and a "−" button for adding or deleting search parameters, respectively. The slice **1307** further includes a "save" button **1309** which causes the current search query to be saved in the form of a folder which is added to the user configurable portion **1303** for use later. This is described further below and may be referred to as a "smart folder." The search input user interface shown in FIGS. **13**A and **13**B is available within, in certain embodiments, each and every window controlled by a graphical user interface file management system, such as a Finder program which runs on the Macintosh or Windows Explorer which runs on Microsoft Windows. This interface includes the text entry region **1306** as well as the slices **1307** and **1308**.

[0085] The window **1301** shown in FIG. **13**B shows the activation of a menu by selecting the search button **1323**A, causing a display of a menu having two entries **1323** and **1325**. Entry **1323** displays recently performed searches so that a user may merely recall a prior search by selecting the prior search and cause the prior search to be run again. The menu selection **1325** allows the user to clear the list of recent searches in the menu.

[0086] FIGS. **14**A, **14**B, and **14**C show examples of another window in a graphical user interface file system, such as the Finder which runs on the Macintosh operating system. These windows show the results of a particular search and also the ability to save and use a smart folder which saves a prior search. The window **1401** shown in FIG. **14**A includes a display region **1403**, a user configurable region **1405**, a smart folder **1406**, a system specified region **1407**, an icon view button **1409**, a list view button **1410**, and a column view button **1411**. The window **1401** also includes a text entry region **1415** and a location slice **1416** which may be used to specify the location for the search, which slice also includes a save button **1417**. Additional slices below the slice **1416** allow the user to specify further details with respect to the search, in this case specifying types of documents which are images which were last viewed this week. The user has set the search parameters in this manner by selecting the "kind" option from the pull down menu **1419** and by selecting the "images" type from the pull down menu **1420** and by selecting the "last viewed" option from pull down menu **1418** and by selecting "this week" from the pull down menu **1422**. The user has also selected "everywhere" by selecting the button **1421** so that the search will be performed on all disks and storage devices connected to this system. The results are shown within the display region **1403**. The user can then save the search query by selecting the "save" button **1417** and may name the saved search query as "this week's images" to produce the smart folder **1406** as shown in the user configurable portion **1405**. This allows the user to repeat this search at a later time by merely selecting the smart folder **1406** which causes the system to perform a new search again, and all data which

matches the search criteria will be displayed within the display region **1403**. Thus, after several weeks, a repeating of this search by selecting the smart folder **1406** will produce an entirely different list if none of the files displayed in the display region **1403** of FIG. **14**A are viewed in the last week from the time in which the next search is performed by selecting the smart folder **1406**.

[0087] FIG. **14**B shows a way in which a user may sort or further search within the search results specified by a saved search, such as a smart folder. In the case of FIG. **14**B, the user has selected the smart folder **1406** and has then entered text "jpg" **1425** in the text entry region **1415**. This has caused the system to filter or further limit the search results obtained from the search query saved as the smart folder **1406**. Thus, PhotoShop files and other files such as TIF files and GIF files are excluded from the search results displayed within the display region **1403** of FIG. **14**B because the user has excluded those files by adding an additional search criteria specified by the text **1425** in the text entry region **1415**. It can be seen that the "jpg" text entry is ANDed logically with the other search parameters to achieve the search results displayed in the display region **1403**. It can also be seen that the user has selected the icon view by selecting the icon view button **1409**. Thus, it is possible for a user to save a search query and use it later and to further limit the results of the search query by performing a search on the results of the search query to further limit the search results.

[0088] FIG. **14**C shows the window **1401** and shows the search results displayed within the display region **1403**, where the results are based upon the saved search specified by the smart folder **1406**. The user has caused a pull down menu **1427** to appear by selecting the pull down region **1427**A. The pull down region **1427** includes several options, which a user may select. These options include hiding the search criteria or saving the search (which is similar to selecting the button **1417**) or showing view options or opening the selected file. This allows the user, for example, to hide the search criteria, thereby causing the slice **1416** and the other search parameters to be removed from the window **1401** which is a moveable, resizeable, minimizeable, and closeable window.

[0089] FIG. **14**D shows an example of a user interface which allows the user to specify the appearance of a smart folder, such as the smart folder **1406**.

[0090] FIGS. **15**A, **15**B, **15**C, and **15**D show an example of a system wide search input user interface and search result user interface. In one particular exemplary embodiment, these user interfaces are available on the entire system for all applications which run on the system and all files and metadata, and even address book entries within an address book program, such as a personal information manager, and calendar entries within a calendar program, and emails within an email program, etc. In one exemplary embodiment, the system begins performing the search and begins displaying the results of the search as the user types text into a text entry field, such as the text entry field **1507**. The search results are organized by categories and are displayed as a short list which is intentionally abbreviated in order to present only a selected number of the most relevant (scored) matches or hits to the search query. The user can ask for the display of all the hits by selecting a command, such as the "show all" command **1509**. FIG. **15**A shows a portion of a display controlled by a data processing system. This portion includes a menu bar **1502** which has at its far end a search menu command **1505**. The user can select the search menu command by positioning a cursor, using a mouse, for example, over the search menu command **1505** and by pressing a button or by otherwise activating or selecting a command. This causes a display of a text entry region **1507** into which a user can enter text. In the example shown in FIG. **15**A, which is a portion of the display, the user has entered the text "shakeit" causing the display of a search result region immediately below a "show all" command region **1509** which is itself immediately below the text entry region **1507**. It can be seen that the hits or matches are grouped into categories ("documents" and "PDF documents") shown by categories **1511** and **1513** within the search result region **1503**. FIG. **15**B shows another example of a search. In this case, a large number of hits was obtained (392 hits), only a few of which are shown in the search result region **1503**. Again, the hits are organized by categories **1511** and **1513**. Each category may be restricted in terms of the number of items displayed within the search result region **1503** in order to permit the display of multiple categories at the same time within the search result region. For example, the number of hits in the documents category may greatly exceed the available display space within the search result region **1503**, but the hits for this category are limited to a predetermined or dynamically determinable number of entries within the search result region **1503** for the category **1511**. An additional category, "top hit" is selected based on a scoring or relevancy using techniques which are known in the art. The user may select the "show all" command **1509** causing the display of a window, such as window **1601** shown in FIG. **16**A. FIG. **15**C shows a display of a graphical user interface of one embodiment of the invention which includes the menu bar **1502** and the search menu command **1505** on the menu bar **1502**. FIG. **15**D shows another example of the search result region **1503** which appeared after a search of the term "safari" was entered into the text entry region **1507**. It can be seen from the search result region **1503** of FIG. **15**D that the search results are again grouped into categories. Another search result window **1520** is also shown in the user interface of FIG. **15**D. It can be seen that application programs are retrieved as part of the search results, and a user may launch any one of these application programs by selecting it from the search result region, thereby causing the program to be launched.

[0091] FIGS. **16**A and **16**B show examples of search result windows which may be caused to appear by selecting the "show all" command **1509** in FIG. **15**A or **15**B. Alternatively, these windows may appear as a result of the user having selected a "find" command or a some other command indicating that a search is desired. Moreover, the window **1601** shown in FIGS. **16**A and **16**B may appear in response to either of the selection of a show all command or the selection of a find command. The window **1601** includes a text entry region **1603**, a group by menu selection region **1605**, a sort by menu selection region **1607**, and a where menu selection region **1609**. The group by selection region **1605** allows a user to specify the manner in which the items in the search results are grouped according to. In the example shown in FIG. **16**A, the user has selected the "kind" option from the group by menu selection region **1605**, causing the search results to be grouped or sorted according to the kind or type of document or file. It can be seen that the type of file includes "html" files, image files, PDF files, source code files, and other types of files as shown in FIG. **16**A. Each type or kind of document is separated from the other documents by being grouped within a section and separated by headers from the other sections. Thus, headers **1611**, **1613**, **1615**, **1617**, **1619**, **1621**, and **1623**

designate each of the groups and separate one group from the other groups. This allows a user to focus on evaluating the search results according to certain types of documents. Within each group, such as the document groups or the folder groups, the user has specified that the items are to be sorted by date, because the user has selected the date option within the sort by menu region **1607**. The user has also specified that all storage locations are to be searched by selecting "everywhere" from the where menu selection region **1609**. Each item in the search result list includes an information button **1627** which may be selected to produce the display of additional information which may be available from the system. An example of such additional information is shown in FIG. **17** in which a user has selected the information button **1627** for item **1635**, resulting in the display of an image **1636** corresponding to the item as well as additional information **1637**. Similarly, the user has selected the information button for another item **1630** to produce the display of an image of the item **1631** as well as additional information **1632**. The user may remove this additional information from the display by selecting the close button **1628** which causes the display of the information for item **1635** to revert to the appearance for that item shown in FIG. **16**A. The user may collapse an entire group to hide the entries or search results from that group by selecting the collapse button **1614** shown in FIG. **16**A, thereby causing the disappearance of the entries in this group as shown in FIG. **16**B. The user may cause these items to reappear by selecting the expand button **1614**A as shown in FIG. **16**B to thereby revert to the display of the items as shown in FIG. **16**A.

[0092] The search results user interface shown in FIGS. **16**A and **16**B presents only a limited number of matches or hits within each category. In the particular example of these figures, only the five top (most relevant or most highly sorted) hits are displayed. This can be seen by noticing the entry at the bottom of each list within a group which specifies how many more hits are within that group; these hits can be examined by selecting this indicator, such as indicator **1612**, which causes the display of all of the items in the documents category or kind for the search for "button" which was entered into the text entry region **1603**. Further examples of this behavior are described below and are shown in conjunction with FIGS. **18**A and **18**B. It will be appreciated that window **1601** is a closeable and resizable and moveable window and includes a close button and a resizing control **1625**A.

[0093] FIGS. **18**A and **18**B illustrate another window **1801** which is very similar to the window **1601**. The window **1801** includes a text entry region **1803**, a group by menu selection region **1805**, a sort by menu selection region **1807**, and a where menu selection region **1809**, each of which function in a manner which is similar to the regions **1605**, **1607**, and **1609** respectively of FIG. **16**A. Each item in a list view within the window **1801** includes an information button **1827**, allowing a user to obtain additional information beyond that listed for each item shown in the window **1801**. The window **1801** further includes headers **1811**, **1813**, **1815**, **1817**, **1819**, **1821**, and **1823** which separate each group of items, grouped by the type or kind of document, and sorted within each group by date, from the other groups. A collapse button **1814** is available for each of the headers. The embodiment shown in FIGS. **18**A and **18**B shows the ability to switch between several modes of viewing the information. For example, the user may display all of the hits within a particular group by selecting the indicator **1812** shown in FIG. **18**A which results in the display of all of the images files within the window **1801** within the region **1818**A. The window is scrollable, thereby allowing the user to scroll through all the images. The user can revert back to the listing of only five of the most relevant images by selecting the "show top **5**" button **1832** shown in FIG. **18**B. Further, the user can select between a list view or an icon view for the images portion shown in FIGS. **18**A and **18**B. The user may select the list view by selecting the list view button **1830** or may select the icon view by selecting the icon view button **1831**. The list view for the images group is shown in FIG. **16**A and the icon view for the images group is shown in FIGS. **18**A and **18**B. It can be seen that within a single, moveable, resizable, closeable search result window, that there are two different views (e.g. a list view and an icon view) which are concurrently shown within the window. For example, the PDF documents under the header **1819** are displayed in a list view while the images under the header **1817** are displayed in an icon view in FIGS. **18**A and **18**B. It can also be seen from FIGS. **18**A and **18**B that each image is shown with a preview which may be capable of live resizing as described in a patent application entitled "Live Content Resizing" by inventors Steve Jobs, Steve Lemay, Jessica Kahn, Sarah Wilkin, David Hyatt, Jens Alfke, Wayne Loofbourrow, and Bertrand Serlet, filed on Jun. 25, 2004, and being assigned to the assignee of the present inventions described herein, and which is hereby incorporated herein by reference.

[0094] FIG. **19**A shows another example of a search result window which is similar to the window **1601**. The window **1901** shown in FIG. **19**A includes a text entry region **1903** and a group by menu selection region **1905** and a sort by menu selection region **1907** and a where menu selection region **1908**. Further, the window includes a close button **1925** and a resizing control **1925**A. Text has been entered into the text entry region **1903** to produce the search results shown in the window **1901**. The search results again are grouped by a category selected by a user which in this case is the people options **1906**. This causes the headers **1911**, **1913**, **1915**, and **1917** to show the separation of the groups according to names of people. Within each group, the user has selected to sort by the date of the particular file or document. The user interface shown in FIG. **19**A allows a user to specify an individual's name and to group by people to look for communications between two people, for example. FIG. **19**B shows another way in which a user can group a text search ("imran") in a manner which is different from that shown in FIG. **19**A. In the case of FIG. **19**B, the user has selected a flat list from the group by menu selection region **1905** and has selected "people" from the sort by menu region **1907**. The resulting display in window **1901**A is without headers and thus it appears as a flat list.

[0095] FIG. **19**C shows the user interface of another search result window **1930** which includes a text entry region **1903** and the selection regions **1905**, **1907**, and **1908** along with a scrolling control **1926**. The results shown in the window **1930** have been grouped by date and sorted within each group by date. Thus, the headers **1932**, **1934**, **1936**, **1938**, and **1940** specify time periods such as when the document was last modified (e.g. last modified today, or yesterday, or last week). Also shown within the search results window **1930** is the information button **1942** which may be selected to reveal further information, such as an icon **1945** and additional information **1946** as shown for one entry under the today group. This additional information may be removed by selecting the contraction button **1944**.

[0096] FIG. **19**D shows a search result window **1950** in which a search for the text string "te" is grouped by date but the search was limited to a "home" folder as specified in the where menu selection region **1908**. Time specific headers **1952**, **1954**, **1956**, and **1958** separate items within one group from the other groups as shown in FIG. **19**D.

[0097] FIG. **19**E shows an alternative embodiment of a search result window. In this embodiment, the window **1970** includes elements which are similar to window **1901** such as the selection regions **1905**, **1907**, and a scrolling control **1926** as well as a close button **1925** and a resizing control **1925**A. The search result window **1970** further includes a "when" menu selection region **1972** which allows the user to specify a search parameter based on time in addition to the text entered into the text entry region **1903**. It can be seen from the example shown in FIG. **19**E that the user has decided to group the search results by the category and to sort within each group by date. This results in the headers **1973**, **1975**, **1977**, and **1979** as shown in FIG. **19**E.

[0098] FIG. **20** shows an exemplary method of operating a system wide menu for inputting search queries, such as the system wide menu available by selecting the search menu command **1505** shown in FIG. **15**A or **15**B, or **15**C. In operation **2001**, the system displays a system wide menu for inputting search queries. This may be the search menu command **1505**. The user, in operation **2003**, inputs a search, and as the search query is being inputted, the system begins performing and begins displaying the search results before the user finishes inputting the search query. This gives immediate feedback and input to the user as the user enters this information. The system is, in operation **2005**, performing a search through files, metadata for the files, emails within an email program, address book entries within an address book program, calendar entries within a calendar program, etc. The system then, in operation **2007**, displays an abbreviated (e.g. incomplete) list of hits if there are more than a certain number of hits. An example of this abbreviated listing is shown in FIG. **15**B. The listing may be sorted by relevance and segregated into groups such as categories or types of documents. Then in operation **2009**, the system receives a command from the user to display all the hits and in operation **2011** the system displays the search results window, such as the window **1601** shown in FIG. **16**A. This window may have the ability to display two different types of views, such as an icon view and a list view within the same closeable, resizable, and moveable window. It will be appreciated that the searching, which is performed as the user is typing and the displaying of results as the user is typing may include the searching through the metadata files created from metadata extracted from files created by many different types of software programs.

[0099] Another aspect of the present inventions relates to previews, displayed within search results windows, icons, dynamic icons, etc., where some or all of which are at least one of being resizeable, zoomable, or pageable through. For example, a first representation (e.g., an icon, a dynamic icon, etc.) of a first file found by the search may contain a preview that is at least one of being resizeable or zoomable or scrollable or pageable through within a display region, such as a window, which contains the results of the search. FIG. **21** shows an exemplary method for performing at least some of the functionality of this aspect. In operation **2901**, a user's search input is received by a data processing system which, in turn, in operation **2903**, performs the search and then presents the search results based on the user's search input. In addition, the results are presented such that, for at least one file which was found by the search, the file is represented by an icon, a dynamic icon having a preview, or other representation of the file, where the preview or the representation is at least one of resizeable or zoomable or scrollable or pageable through or a combination of those capabilities. For example, if the file which is found is a picture file, then a thumbnail of the picture file may be the representation which is resizeable within the search results window, such that it can be enlarged in size or decreased in size on the display device within the search results window. Further, the picture, which is a thumbnail which represents the file, may be zoomable in that the content of the representation may be zoomed in (e.g. magnified) or out (e.g. demagnified) while maintaining the same area or size of the representation. In addition or alternatively, the content in the representation may be pageable in that multiple different pages of the content may be displayed either sequentially over time by paging through the multiple pages in sequence, as if one were flipping through pages in a book, or multiple pages may be spread out concurrently. One or more of these actions may be possible, depending upon the particular type of content. Images may typically be resizeable or zoomable or scrollable and may also be pageable, for example. In at least certain embodiments of the present invention, as shown in operation **2907**, the representation within the search results window may be resized or scrolled or zoomed or paged through without having to launch the application which created the content.

[0100] A preview, at least in certain embodiments, can apply to files (e.g., documents, still images, video, etc.) or other objects (e.g. records, emails, messages, vCards, etc.). A single page preview can be used for a thumbnail or in any situation where a single image is needed to provide a preview of an item. Multiple items can be previewed at once and compared, or viewed in sequence. When multiple items are previewed at once, they can be of any file type including many different file types. The previews can be shown in the same window as the search results window or in a separate window or in a layer that is overlaid above the item, shown in a search result, which is being previewed in the layer above. Alternatively, the previews of contents of files may be presented within icons and/or dynamic icons representing the files, where the icons and/or dynamic icons may be displayed in a window, such as the search result window.

[0101] A preview may be presented using a variety of different implementations, such as a plug-in implementation which uses one or more plug-ins, such as a QuickTime plug-in, etc. Each of the previews may be formatted in one of several standard data/file types (such as PDF, text, HTML, JPEG, a movie format, or a sound/music format, etc.). The previews may be either generated by the application, which created the item or file represented by the preview, when the item or file is stored or may be generated dynamically when needed. A dynamically generated preview may be produced by invoking a generator plug-in that translates the native format of the item being previewed to one of the "standard" data/file types (e.g. PDF, text, HTML, JPEG, a standard movie format, or a standard sound/music format, etc.). A preview generator plug-in may be loaded in a separate process to protect against failures and/or security vulnerabilities. Alternatively, a trusted generator plug-in (e.g., QuickTime), or a set of such plug-ins may be loaded directly in the process of presenting the search results and such plug-ins may be used to present the previews. A preview generator may be capable

of handling multiple preview requests concurrently and the preview generator and/or the search software controlling the search results window may manage a queue of preview requests, and the search software can cancel or reorder the preview requests in the queue.

[0102] The following figures show examples of previews or other representations which are resizeable or zoomable or scrollable or pageable through. FIG. **22**A shows an example of a preview **3001** displayed on a display device, either within a search result window or as an overlay on the window. The preview **3001** is scrollable and resizeable; it may be scrolled using any one of the scroll controls **3002**, **3003** and/or **3004**. It may be resized using the resize control **3005**. FIG. **22**B shows a preview **3010** which can display multiple documents or items in a scrollable format. The view shown in FIG. **22**B of the preview **3010** shows only one document and another document can be selected for viewing using interface controls **3015**, **3013**, and **3017**. The view of preview **3010** is scrollable using scroll controls **3011**, **3012**A and/or **3012**B. The view of preview **3010** is also resizeable using resize control **3005**. The user can also switch to display multiple documents or items at once in the view of preview **3010** by selecting the user interface control **3019** which will cause the preview shown in FIG. **22**B to appear similar to the preview shown in FIG. **22**C which shows multiple documents concurrently. The preview shown in FIG. **22**C may also be scrollable.

[0103] Previews or other representations which are resizeable or scrollable or zoomable or pageable through may also be provided in other user interfaces which may include alternative types of views, such as within a dynamic icon, which is further described below. FIG. **23** provides an example of one method of generating dynamic icons having previews within the dynamic icons. The method may begin in block **210** in which an icon of a file is generated to represent the file in a graphical user interface (GUI). In block **213**, one or more predefined decorations are put onto the icon based on the file type of the file. For example, a foldover may be put at the top right corner of the icon for documents. In block **215**, a preview of the content of the file is presented within the icon without modifying the format of the icon. For example, the shape and size of the icon, as well as decorations on the icon, remain the same as the preview of the content of the file is presented within the icon. Unlike some existing user interface, no new window is generated to present the preview. In some embodiments, an initial view of the preview may include an image of a predetermined portion of the file, such as the first page of a document, a thumbnail of an image, a pre-selected scene in a video, etc. The initial view of the preview may also be referred to as the initial preview.

[0104] In some embodiments, the preview within the icon is interactive such that presentation of the preview may change in response to user input. Various user interface control are provided based on the file type to allow users to manipulate presentation of the preview in block **217**. In one example, where the file is a document, a left arrow button and a right arrow button may be provided to allow users to page through the document, as if one were flipping through pages in a book sequentially. In another example, where the file is a video, a play button may be provided to allow users to initiate playing of a preview of the video. Furthermore, a stop button may be provided to allow users to stop playing the preview of the video. In another example, where the file is an image, a zoom button may be provided to allow users to zoom in and/or zoom out of a thumbnail of the image presented in the icon. While presenting the preview in response to actuation of the user interface control, the format of the icon (e.g., size of icon, shape of icon, color of icon, etc.) is maintained at block **219**. Furthermore, some or all of the decorations on the icon may be maintained during presentation of the preview. For example, a foldover at the top right corner of an icon of a document is maintained while users page through a preview of the document within the icon until reaching the last page of the document. When the last page of the document is presented, the foldover may be removed to indicate that the last page of the document is being presented. Alternatively, a status indicator is provided to inform users of the status of the presentation of the preview. For instance, a status bar or a status ring may be provided to indicate the portion of a preview of a video that has been played. Details of some examples of dynamic icons are shown in FIGS. **26**A-**26**D and **27**A-**27**E below.

[0105] In some embodiments, the dynamic icons created according to the method described above are displayed in GUIs associated with hierarchical file system (HFS) management application, such as the Finder program from Apple, Inc., of Cupertino, Calif., which operates on the Macintosh operating system. In alternate embodiments, the HFS management application may be Windows Explorer, which operates on Microsoft's Windows operating system. For example, a GUI associated with a HFS management application may include a window displaying dynamic icons to represent files inside a directory. Users of the GUI may readily preview the content of a file within a respective dynamic icon without opening another window or viewing panel. Alternatively, the dynamic icons are displayed in GUIs associated with a file searching application, such as the Spotlight program from Apple, Inc., of Cupertino, Calif. For example, files resulted from a search by the file searching application may be represented by dynamic icons displayed in a search result window. As such, users of the file searching application may readily preview the content of the files inside their respective dynamic icons without opening another window or viewing panel within the same window.

[0106] In some embodiments, the preview is provided in the metadata of the file. As mentioned above, the metadata of the file may include a field which includes an indicator of whether a preview of the content of the file is available. Furthermore, the field may include an indicator of whether the preview, if available, is interactive. If an interactive preview of the content of the file is available according to these indicators, a client application may turn a thumbnail into a live preview of the content. FIG. **24** illustrates one embodiment of a call diagram to change a thumbnail of a file to live preview. Specifically, FIG. **24** illustrates the interaction between a client application **2401** (on the left of FIG. **24**), a daemon **2403** (in the middle of FIG. **24**), and a plug-in **2405** (on the right of FIG. **24**). Some examples of the client application **2401** include a HFS management application and a file searching application. The daemon **2403** may include a GUI creating daemon, such as Quick Look daemon, which operates on the Macintosh operating system. The plug-in **2405** is associated with an application that has created the file (hereinafter referred to as "the creator application"). Note that there may be multiple plug-ins available in the operating system, each plug-in associated with a distinct application usable to create files (e.g., word processing application, video editing application, etc.).

[0107] Initially, the client application **2401** interrogates the daemon **2403**, which is a process running in the background, for icon data of an icon representing a file **2410**. In response to the interrogation **2410**, the daemon **2403** sends a request for the icon data to the plug-in **2405**. In response to the request **2415**, the plug-in **2405** returns the icon data **2420** to the daemon **2403**. The icon data includes decorations to be put onto the icon and image metadata indicative of whether a preview of the content of the file is available. The daemon **2403** then forwards the icon data **2425** to the client application **2401**. Using the icon data, the client application **2401** may generate the decorations to put onto the icon and determine if a preview of the content of the file is available. If the preview is available, the client application **2401** may present the preview in the icon and provide appropriate user interface control to allow users to manipulate the preview. As such, the thumbnail of the file may be turned into a dynamic icon if the metadata of the file indicates that the preview is available. Details of some embodiments of generating dynamic icons have been described above with reference to FIG. **23**.

[0108] FIG. **25** is a flowchart showing one embodiment of a method of changing thumbnail to live preview. The method may begin in block **2510** in which icon data of a file is received from a background process, such as the daemon **2403** in FIG. **24**. The icon data includes metadata of the file. In block **2520**, the icon data is analyzed to determine if a preview of the content of the file is available. For example, the metadata may include a preview flag, which may be set to indicate that a preview of the content of the file is available. If a preview is not available according to the metadata, then an icon without a preview is generated in block **2529**. The icon generated may still include decorations as specified by the icon data. Otherwise, if a preview is available according to the metadata, then an icon usable to present the preview within the icon is generated in block **2523**. The icon generated may further include decorations as specified by the icon data. In block **2525**, a preview of the content of the file is presented within the icon while maintaining the decorations on the icon. Furthermore, the format of the icon may not be modified.

[0109] In some embodiments, the preview presented within the icon includes an interactive preview. Various user interface control may be provided to allow users to manipulate presentation of the preview. The icon generated is displayed on a GUI associated with a client application (such as the client application **2401** in FIG. **24**). The user interface control may be displayed within the icon and/or outside of the icon on the GUI. In one example, where the file is a document, a left arrow and a right arrow may be provided to allow users to page through the document. Alternatively, a scroll bar may be provided to allow users to scroll up and down the document. In another example, where the file is a video, a play button may be provided to allow users to initiate playing a preview of the video (which may include all or part of the video) within the icon. Furthermore, a stop button may be provided to allow users to stop playing the video. In another example, where the file is an image, a preview of the image may include a thumbnail of the image, and a zoom button may be provided to allow users to zoom in and zoom out of the thumbnail of the image.

User Interface Aspects of Dynamic Icons

[0110] Various different examples of dynamic icons discussed above are provided herein. It will be understood that some features from certain embodiments may be mixed with other embodiments such that hybrid embodiments may result from these combinations. It will be appreciated that certain features may be removed from each of these embodiments and still provide adequate functionality in many instances.

[0111] FIGS. **26**A-**26**D show one embodiment of a dynamic icon, which may be displayed on a GUI associated with a client application (e.g., a file management application, a file searching application, etc.) being executed in a data processing system (e.g., a computer system, etc.). The dynamic icon **2600** in FIGS. **26**A-**26**D represents a document entitled "Hawaii Travel." Decorations on the icon **2600** include a foldover **2612** at the top right corner of the dynamic icon **2600** and a spiral book spine **2614** at the left side of the dynamic icon **2600**. Referring to FIG. **26**A, the dynamic icon **2600** initially displays a first page **2616** of the document. Thus, this preview of the first page **2616** of the document may also be referred to as the initial preview of the document.

[0112] Upon detection of a cursor **2620** moving across the dynamic icon **2600**, a left arrow **2622** and a right arrow **2624** are generated and displayed on the dynamic icon **2600** as shown in FIG. **26**B. The cursor **2620** may be moved across the dynamic icon **2600** in response to actuation of a user input device, such as a mouse, a joystick, arrow buttons in a keyboard, etc. Because the icon **2600** is currently displaying the first page **2616** of the document, the right arrow **2624** is activated, but not the left arrow **2622**. In response to the cursor **2620** actuating the right button **2624**, the dynamic icon **2600** displays the second page **2630** of the document instead of the first page **2616** as shown in FIG. **26**C. Furthermore, the left arrow **2622** is activated to allow the user to turn back to the first page **2616** of the document if desired.

[0113] As shown in FIG. **26**D, the user may turn to the next page, i.e., the third page **2640**, of the document by actuating the right arrow **2624** again. Because the third page **2640** is the last page of the document, the right arrow **2624** is deactivated, while the left arrow **2622** remains activated. Thus, the user may turn back to the previous page (i.e., the second page **2630**) by actuating the left arrow **2622**. Furthermore, the foldover **2612** is removed from the dynamic icon **2600** to indicate that the dynamic icon **2600** is displaying the last page **2640** of the document. However, the spiral book spine **2614** is maintained on the dynamic icon **2600**.

[0114] As shown in FIGS. **26**A-**26**D, the user may readily page through the document within the dynamic icon **2600** without opening the document. Furthermore, the format of the dynamic icon **2600** remains unchanged throughout the preview, and the decorations (such as the foldover **2612** and the spiral book spine **2614**) on the dynamic icon **2600** may be maintained or removed to enhance the presentation of the preview in response to user input.

[0115] FIGS. **27**A-**27**E show another embodiment of a dynamic icon, which may be used with certain embodiments of the present invention. The dynamic icon **2700** represents a video entitled "Fun and Games.mov." Thus, the dynamic icon **2700** has the shape of a filmstrip and is decorated with a filmstrip frame **2710**. Initially, the dynamic icon **2700** displays a pre-selected scene **2715** of the video as shown in FIG. **27**A. The scene **2715** may be specified by the metadata of the video. This preview of the pre-selected scene **2715** may also be referred to as the initial preview of the video.

[0116] Upon detection of a cursor **2720** moving across the dynamic icon **2700**, a play button **2725** is generated and displayed within the dynamic icon **2700** as shown in FIG. **27**B. A user may actuate the play button **2725** to initiate playing of a preview of the video within the dynamic icon

2700. The preview of the video may include all or part of the video. While the video is playing, a stop button **2730** may be generated and displayed within the dynamic icon **2700** as shown in FIG. **27**C. The user may actuate the stop button **2730** to stop playing the preview within the dynamic icon **2700**. Thus, the user may manipulate or control the presentation of the preview of the video using the play button **2725** and the stop button **2730**.

[0117] In some embodiments, the dynamic icon **2700** may further provide a status indicator **2735** as shown in FIGS. **27**C-**27**E. In the current example, the status indicator **2735** is a ring enclosing the stop button **2730** to indicate the portion of the video that has been played in the preview. Specifically, the portion of the video played is represented by the shaded portion of the ring **2735**. As the preview of the video is being played, the portion of the shading in the ring **2735** extends in clockwise direction as shown in FIGS. **27**C-**27**E. When the entire preview has been played, the entire ring **2735** may be shaded.

Icon Badging

[0118] Another aspect of the present inventions relates to icon badging. Badges associated with icons allow third parties that provide creator applications of files to provide more information, in addition to file types, to icon generating software. For example, third parties may indicate in badge data which version of creator applications are used to create the files, and hence, the icon generating software may generate and display an appropriate badge on icons representing the files. FIG. **28** shows one embodiment of a method to badge icons. In block **2810**, an application receives icon data of a file from a plug-in associated with a creator application of the file. The application may include a user interface generator (e.g., Quick Look application from Apple, Inc., of Cupertino, Calif.) to generate a user interface for displaying icons of files for another application, such as Finder application from Apple, Inc. of Cupertino, Calif., Spotlight application from Apple, Inc., Window Explorer program from Microsoft Corp. of Redmond, Wash., etc. The icon data includes file type information, badge data of the file, and an image associated with the file (e.g., a thumbnail, a pre-selected scene of a video, a pre-selected page of a document, etc.). The icon data may be provided as part of the metadata of the file.

[0119] In block **2812**, decorations for the icon are selected based on the file type. This may also be referred to as type conformance. For example, if a file is recognized as a presentation (e.g., Powerpoint files from Microsoft Corp. of Redmond, Wash., Keynote files from Apple, Inc. of Cupertino, Calif., etc.) according to the file type information, then a slide decoration is provided to the icon of the file. In another example, if a file is recognized as a document (e.g., MSWord files from Microsoft Corp. of Redmond, Wash., Pages files from Apple, Inc. of Cupertino, Calif., etc.) according to the file type information, then a binder decoration is provided to the icon of the file.

[0120] In addition to the file type, the badge data in the icon data provides more information on the file, the creator application, and/or a third party vendor providing the creator application. Via badge data, the third party vendor may provide more hints on the file in addition to the file type. For example, the badge data may indicate the identity of the third party vendor, a version of the creator application, etc. Using the badge data, a badge is generated in block **2814**. The badge may include graphics, text, or a combination of both, to represent the third party, the creator application, and/or other hints provided in the badge data. A badge that includes only graphics is referred to as an image badge. A badge that includes only text is referred to as a text badge.

[0121] In block **2816**, an icon of the file is generated. Then the image, the badge, and the decorations selected above are displayed on the icon. Via the image, the icon may provide users with an initial preview of the file. Via the decorations, the icon may indicate the file type to users. Via the badge, the icon may convey additional hints about the file to users. Note that all of the above information on the file may be conveyed to users by a display of the icon without user intervention. Users do not have to request the above information and there is no need to open another window or viewing panel to display the above information.

[0122] Using badges, the third party vendor may ensure icons of files created by its applications are badged in similar way. Thus, badges allow the third party vendor to provide a substantially uniform look and feel for icons of files created by the third party's applications.

[0123] According to another aspect of the present invention, a folder containing only files created by applications from a single third party may be badged as well. As such, users may easily determine the content of the folder without opening the folder. FIG. **29** shows one embodiment of a method to badge a folder. The method may begin in block **2900** in which an icon representing a folder is created. In block **2910**, it is determined if all files within the folder are created by applications from the same third party vendor, such as Apple, Inc. of Cupertino, Calif., Microsoft Corp. of Redmond, Wash., etc. If not all files within the folder are created by applications from the same vendor, then the icon of the folder is not badged. The icon of the folder is displayed without any badges in block **2919**.

[0124] If all files within the folder are created by the same application or applications from the same third party vendor, then the icon of the folder is badged accordingly. In block **2913**, a badge indicative of the vendor is created. The badge may include graphics, text, or a combination of both. For example, if all files within the folder are created by applications from Apple, Inc. of Cupertino, Calif., then a badge including the graphic logo representing Apple, Inc. may be created. In block **2915**, the badge created is displayed on the icon of the folder. Decorations of the folder may also be displayed on the icon of the folder with the badge. Some exemplary embodiments of badged icons are illustrated in FIGS. **30**A and **30**B.

[0125] Referring to FIG. **30**A, one embodiment of an image badge on an exemplary icon is shown. The icon **3050** represents a file created by Xcode from Apple, Inc. of Cupertino, Calif. An image badge **3056** having a graphic image displaying the logo of Xcode **3058** is displayed on the icon **3050** to indicate to users that the creator application of the file represented by the icon **3050** is Xcode. The icon **3050** further includes an image **3054** of a portion of the content of the file to provide a preview of the content to users. Alternatively, the icon **3050** may include an interactive preview to allow users to page or scroll through the content of the file. Details of some embodiments of interactive preview in icons have been discussed above. Furthermore, a foldover **3052** is chosen as a decoration for the icon **3050** based on the file type. As shown in FIG. **30**A, the foldover **3052** is displayed at the top right corner of the icon **3050**. Other decorations may be chosen based on the file type in alternate embodiments.

[0126] FIG. **30**B illustrates another embodiment of a text badge on the exemplary icon. As mentioned above, the icon **3050** represents a file created by Xcode from Apple, Inc. of Cupertino, Calif. A text badge **3060** including the text "XCODE" is displayed at the bottom of the icon **3050**. Thus, users may readily determine that the file represented by the icon is created by Xcode. The icon **3050** further includes an image **3054** of a portion of the content of the file to provide a preview of the content to users. Alternatively, the icon **3050** may include an interactive preview to allow users to page or scroll through the content of the file. Details of some embodiments of interactive preview in icons have been discussed above. Furthermore, decorations, such as the foldover **3052** at the top right corner of the icon **3050**, are displayed on the icon **3050** based on the file type.

[0127] FIG. **30**C illustrates another embodiment of a text badge on an exemplary folder icon. The folder icon **3070** includes a decoration of a binder outline **3074** and a text badge of Xcode. In the current example, all files in the folder are created by Xcode, therefore, the text badge of Xcode **3072** is displayed on the folder icon **3070** to indicate so.

System Architecture

[0128] As described above, these previews or thumbnails may be shown by a set of software routines such as a set of plug-ins, which are separate from a file management software program, such as Finder or Windows Explorer. This separation between the plug-ins which renders the content and Finder or other file management software provides security and stability because, for example, if the plug-in crashes, Finder may not. These plug-ins may be a standard set of plug-ins that translate the native format of an item being previewed into one of a standard data/file type, such as PDF, text, HTML, JPG, a standard movie format or a standard sound/music format or into fully rendered content (e.g., a bitmap). The set of plug-ins may be an extensible set of plug-ins and may interact with the file management software, such as Finder or Windows Explorer, through a set of APIs in which the file management software makes a call to a plug-in management daemon which receives the call or API from the file management software (or other software program) and which, in turn, asks for the file type (e.g., UTI) from a file system kernel and matches one of the plug-ins in the standard set of plug-ins, which may be extensible, with the file type and which then calls the matched plug-in to cause the plug-in to load and return the content of the file (either in an immediately displayable form or in a standard format) as a preview to the file management software which, in turn, causes the preview to be displayed in, for example, an icon representing the file and/or the cover flow view. This may occur in response to merely browsing the files through the use of the file management software, such as Finder, or through the use of a search software program, such as Spotlight, to find files and then display previews or thumbnails of files retrieved by the search. As noted above, the preview or thumbnail may be generated dynamically upon request rather than when the item or file is stored or created by the application. This dynamic generation may be through an API. It will be understood that a dynamic generation of a preview or thumbnail may be provided without invoking or launching the application which created the file or document. Examples of software architectures to dynamically generate previews are discussed in conjunction with FIG. **31** below.

[0129] In addition to a file management software program or a search software program, such as Spotlight, other software application programs may provide or use application programming interfaces (API) to request the preview generator or preview daemon to provide a preview or thumbnail of the content of a file within their windows. For example, an email program or a calendar program or a video conferencing application or an instant messaging application program or other application programs may also make a call to the preview generator or preview generator daemon to provide the content of a particular file in the manner described herein. In response to the call through an API from the email program or the calendar program or other program, the preview generator or preview generator daemon asks the file system for the file type and matches the file type with a plug-in having an ability to process that file type and causes that plug-in to be loaded (for example, by calling the plug-in through another optional API). The plug-in, in turn, processes the content of the file to generate the preview or thumbnail and provides that content to the original application which requested the content, such as the email program or a calendar program or, as noted above, a file management software. A preview, such as an interactive preview in a dynamic icon (e.g., the dynamic icons shown in FIGS. **26**A-**26**D and FIGS. **27**A-**27**E) or thumbnail may be provided in an inline preview manner in a particular view of a HFS management program, such as the cover flow view, a list view, such as the list view shown in FIG. **17** (which includes a preview or thumbnail view) or in a "get information" or "properties" panel or window or in other uses.

[0130] In some embodiments, an interactive preview may be presented through the following set of software routines while also showing an initial set of previews. For example, thumbnails of files may be the initial set of previews shown in a particular view (e.g. list view, cover flow view, icon view), and the set of software routines provide an interactive preview, within the same view, for at least one of these initial previews. The initial previews may also be provided by this set of software routines, but these initial previews may not be interactive with the view; for example, they are not interactive within the view, in response to user commands so they will not, in response to user commands, allow a user to page through or scroll through or browse through the content or to zoom or resize the content or playback the content, such as playback the movie. On the other hand, the interactive preview is interactive in response to user commands in that it can respond to a user command to page through or scroll through or browse or resize or zoom the document represented by the interactive preview or playback the content, either within the particular view (e.g. a list view or cover flow view or icon view (see, e.g. FIGS. **26**A-**26**D and **27**A-**27**E)) or zoom out from the particular view or be layered over the particular view. Such user interface for showing both initial previews and interactive previews may be used in a list view or icon view, such as a list view or icon view of files or folders from a search result or a list view or icon view of files and folders from within a file management software window (e.g. a Finder window).

[0131] FIG. **31** shows an example of software architecture **3001** which may be used to dynamically generate previews, such as one or both of initial previews and interactive previews. This architecture may include one or more APIs, such as API **3011** and optional API **3012** to act as an interface between separate software programs. For example, API **3011** interfaces between a preview generator **3003**, which may be a

preview generator daemon provided by an operating system software, and one or more application programs **3007** (such as a file management software program or a search software program, etc.). The one or more application programs **3007** make calls, through the API **3011**, in order to have a preview generated for a file or other item in a particular view. The preview generator **3003** is configured to receive those calls to generate a preview of the content of the file. The preview of the content can be generated by requesting a software routine (such as a first plug-in), in a set of software routines **3005**, to generate either displayable content or data in a standard format which can be converted by the application which made the call (or a helper application/plug-in or system resource) into displayable content. The first plug-in may be loaded and then process the file (from the storage **3010** of files and data) to generate the preview; the preview generator may determine the file type of the file by making a call, to determine the file type, to the file system software **3009** which returns an identifier of the file type of the file, and then the preview generator **3003** may match the file type with the most appropriate routine in the set of routines before causing the most appropriate routine to be loaded to generate the preview. Each software routine may include data identifying the file types it can process, and the preview generator matches the file type for the file, which was in the call through API **3011**, with the software routine, which can process that file type, based on the data identifying the file types it can process.

[0132] In some embodiments, all modules in the above software architecture **3001** are implemented and executed on a single individual computing machine, such as a personal computer. Alternatively, the above software architecture **3001** may be implemented in a distributed manner, such as in a client-server system. FIG. **32** illustrates one embodiment of a system in which embodiments of the present invention may be implemented. The system **3200** includes a server **3210** and a number of client machines **3220**. The client machines **3220** are communicably coupled to the server **3210** via a network **3230**. A preview generator (such as the preview generator **3003** in FIG. **31**) is provided on the server **3210** for access by the client machines **3220**. In some embodiments, multiple distinct instances of the preview generator are provided for multiple distinct client machines. In response to requests from the client machines **3220**, each instance of the preview generator may send a preview of the requested files from the server **3210** to the respective client machines **3220**. In some embodiments, icons representing the files are cached on the server **3210** for use by the various instances of the preview generator. By providing the preview generator on the server **3210**, it is not necessary for the client machines **3220** to have the relevant applications in order to present the preview.

[0133] FIG. **33** illustrates one embodiment of a method for providing a preview generator on a server. One example of the preview generator is Quick Look application from Apple, Inc. of Cupertino, Calif. The method may begin in block **3301** in which an instance of a preview generator is instantiated on a server (such as the server **3210** in FIG. **32**) for each of a number of client machines (such as the client machines **3220** in FIG. **32**). In block **3303**, the instance sends a preview of a file to a respective client machine responsive to a request from the respective client machine. Depending on the file type, the preview may include a thumbnail of an image, a portion of a document, a portion of a video, etc. In block **3305**, a plug-in associated with a creator application of the file is executed to present the preview without launching the creator application. In some embodiments, the preview is presented within the icon while maintaining the format and decorations of the icon. Alternatively, a new window is opened and the preview is presented in the new window. In block **3307**, the icon of the file is cached on the server so that the icon cached can be accessed by other instances of the preview generator.

[0134] In the foregoing specification, the invention has been described with reference to specific exemplary embodiments thereof. It will be evident that various modifications may be made thereto without departing from the broader spirit and scope of the invention as set forth in the following claims. The specification and drawings are, accordingly, to be regarded in an illustrative sense rather than a restrictive sense.

What is claimed is:

1. A computer-implemented method comprising:

in response to a request from a client application, a background process requesting icon data of an icon from a plug-in, the icon representing a file;

the background process receiving the icon data from the plug-in, the icon data including one or more decorations of the icon and image metadata indicative of whether a preview of content of the file is available; and

forwarding the icon data to the client application.

2. The method of claim **1**, wherein the file includes a document, and the preview comprises a pageable display of the document within the icon.

3. The method of claim **1**, wherein the file includes a video, and the preview comprises playing the video within the icon.

4. The method of claim **1**, wherein the file includes an image, and the preview comprises a zoomable display of the image within the icon.

5. The method of claim **1**, wherein the one or more decorations include a foldover at a corner of the icon.

6. The method of claim **1**, wherein the client application includes a hierarchical file system (HFS) management application.

7. The method of claim **1**, wherein the client application includes a search application.

8. A computer readable medium storing executable program instructions which when executed by a data processing system cause the data processing system to perform a method comprising:

in response to a request from a client application, a background process requesting icon data of an icon from a plug-in, the icon representing a file;

the background process receiving the icon data from the plug-in, the icon data including one or more decorations of the icon and image metadata indicative of whether a preview of content of the file is available; and

forwarding the icon data to the client application.

9. The computer readable medium of claim **8**, wherein the file includes a document, and the preview comprises a pageable display of the document within the icon.

10. The computer readable medium of claim **8**, wherein the file includes a video, and the preview comprises playing the video within the icon.

11. The computer readable medium of claim **8**, wherein the file includes an image, and the preview comprises a zoomable display of the image within the icon.

12. The computer readable medium of claim **8**, wherein the one or more decorations include a foldover at a corner of the icon.

13. The computer readable medium of claim **8**, wherein the client application includes a hierarchical file system (HFS) management application.

14. The computer readable medium of claim **8**, wherein the client application includes a search application.

15. An apparatus comprising:

means for requesting icon data of an icon from a plug-in in response to a request from a client application, the icon representing a file;

means for receiving the icon data from the plug-in, the icon data including one or more decorations of the icon and image metadata indicative of whether a preview of content of the file is available; and

means for forwarding the icon data to the client application.

16. A computer implemented method comprising:

in response to a request from a user, interrogating a background process for icon data of an icon, the icon representing a file;

receiving the icon data from the background process, the icon data including one or more decorations of the icon and metadata; and

analyzing the metadata to determine if an interactive preview of content of the file is available

17. The method of claim **16**, further comprising:

generating the icon with the one or more decorations in a graphical user interface (GUI) using the icon data; and

presenting the interactive preview of the content of the file within the icon if the image metadata indicates that the interactive preview is available.

18. The method of claim **17**, wherein the file includes a document, and the method further comprises:

generating user interface control to allow users to page through the document.

19. The method of claim **17**, wherein the file includes a video, and the method further comprises:

generating user interface control to play the video; and

playing the video within the decorated icon in response to a user actuating the user interface control.

20. The method of claim **17**, wherein the GUI is associated with a hierarchical file system (HFS).

21. The method of claim **17**, wherein the GUI is associated with a search application.

22. A computer readable medium storing executable program instructions which when executed by a data processing system cause the data processing system to perform a method comprising:

in response to a request from a user, interrogating a background process for icon data of an icon, the icon representing a file;

receiving the icon data from the background process, the icon data including one or more decorations of the icon and metadata; and

analyzing the metadata to determine if an interactive preview of content of the file is available

23. The computer readable medium of claim **22**, further comprising:

generating the icon with the one or more decorations in a graphical user interface (GUI) using the icon data; and

presenting the interactive preview of the content of the file within the icon if the image metadata indicates that the interactive preview is available.

24. The computer readable medium of claim **23**, wherein the file includes a document, and the method further comprises:

generating user interface control to allow users to page through the document.

25. The computer readable medium of claim **23**, wherein the file includes a video, and the method further comprises:

generating user interface control to play the video; and

playing the video within the decorated icon in response to a user actuating the user interface control.

26. The computer readable medium of claim **23**, wherein the GUI is associated with a hierarchical file system (HFS).

27. The computer readable medium of claim **23**, wherein the GUI is associated with a search application.

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