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Koren

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(54) **PROVIDING ALERTS IN AN INFORMATION-SHARING COMPUTER-BASED SERVICE**

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This patent is subject to a terminal disclaimer.

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(52) **U.S. Cl.**
CPC ***G06Q 10/10*** (2013.01); *G06F 2221/2119* (2013.01); *G06F 2221/2149* (2013.01)
USPC **715/200**; 715/205

(58) **Field of Classification Search**
USPC 715/200, 751, 205; 709/234, 245
See application file for complete search history.

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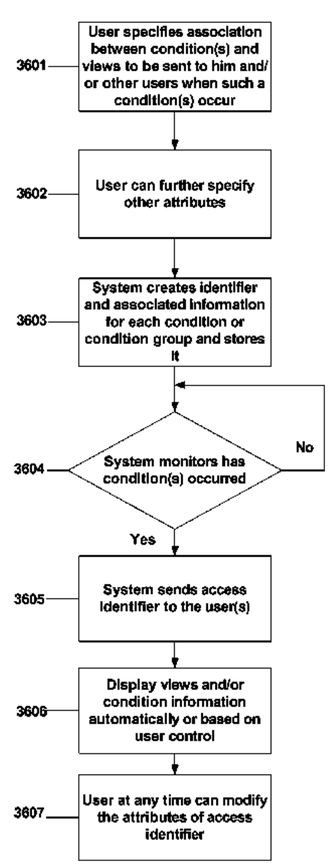
(57) **ABSTRACT**

Techniques are provided that allow users that express an interest in an event (e.g. in other user application events) to be notified about the event and to have the capability to interact, in relation to the event, with other users. The system automatically alerts interested users to the occurrence of the event and can provide additional information with the alert (such as associated view(s)), so that the alert can be related, in context, with that additional information. Messages with a corresponding text description can be provided automatically if triggered by conditions that have been specified by the user. A user can proactively watch a limited number of views, but once there are changes that occur in other views of interest, the user will receive a message that includes an access identifier to such other view or views.

92 Claims, 64 Drawing Sheets



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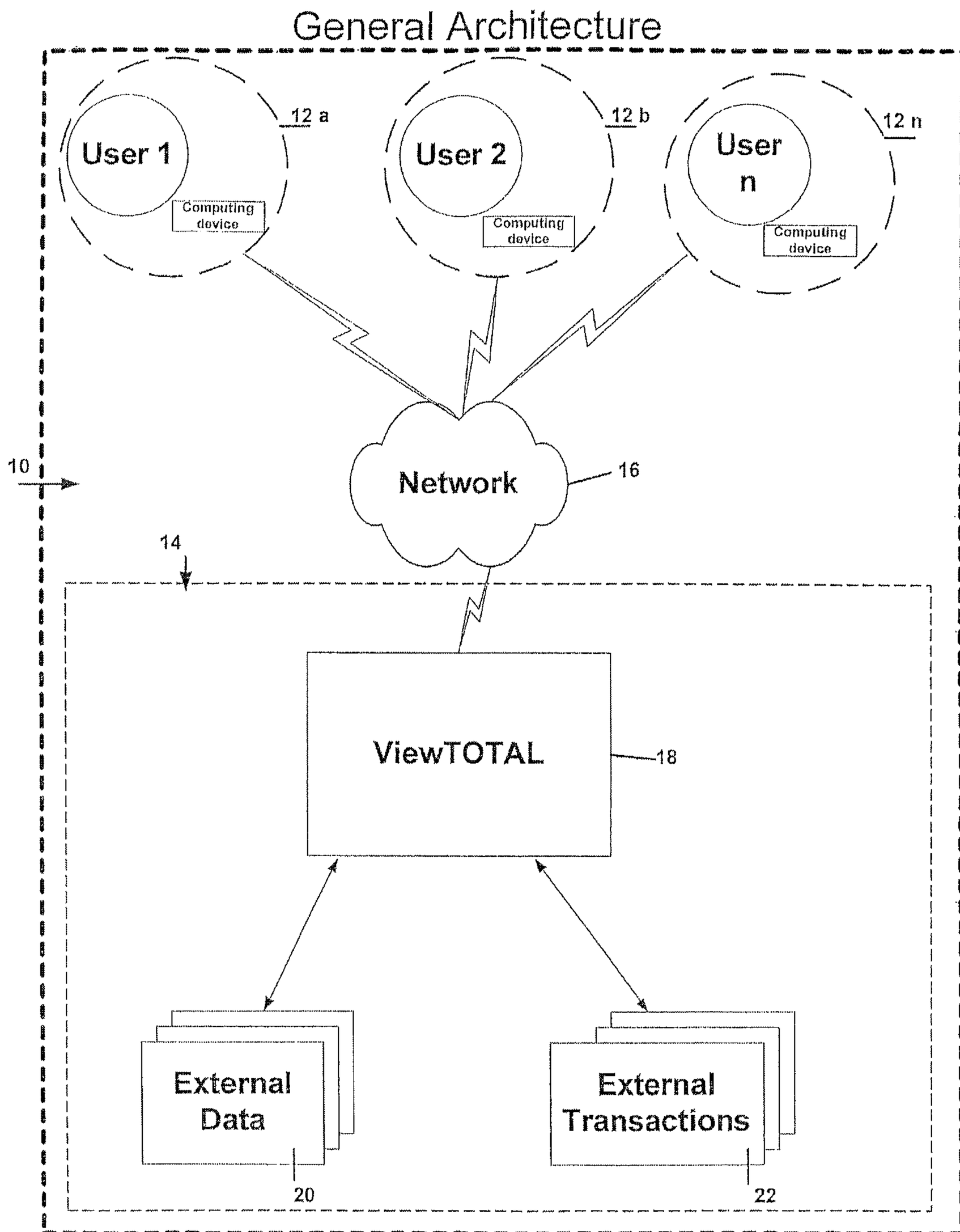

General Architecture
User 1
12 a
Computing device
User 2
12 b
Computing device
User n
12 n
Computing device
10
Network
16
14
ViewTOTAL
18
External Data
20
External Transactions
22

FIG. 1

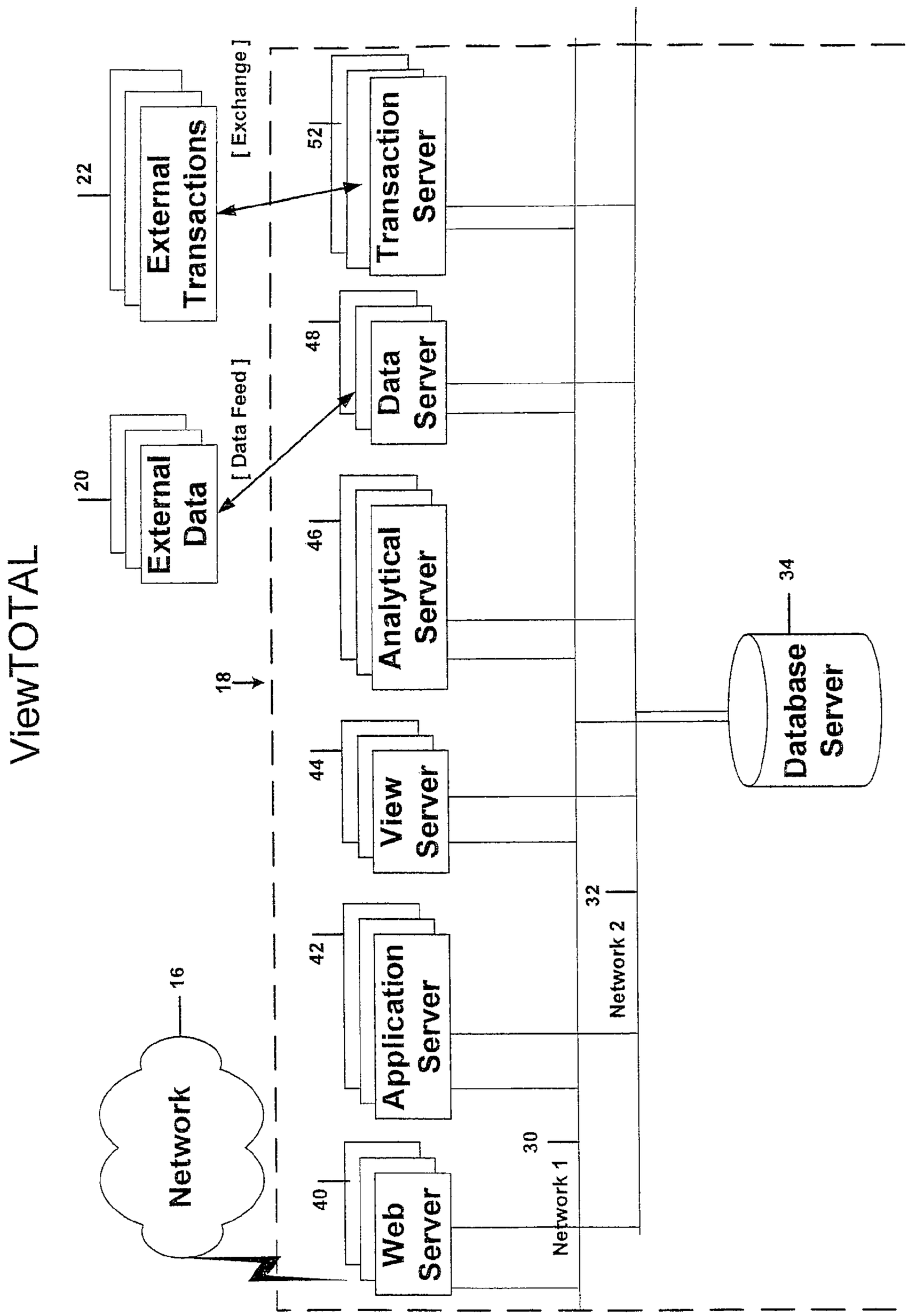

ViewTOTAL
Network
16
External Data
20
External Transactions
22
[Data Feed]
[Exchange]
18
Web Server
40
Application Server
42
View Server
44
Analytical Server
46
Data Server
48
Transaction Server
52
Network 1
30
Network 2
32
Database Server
34

FIG. 2

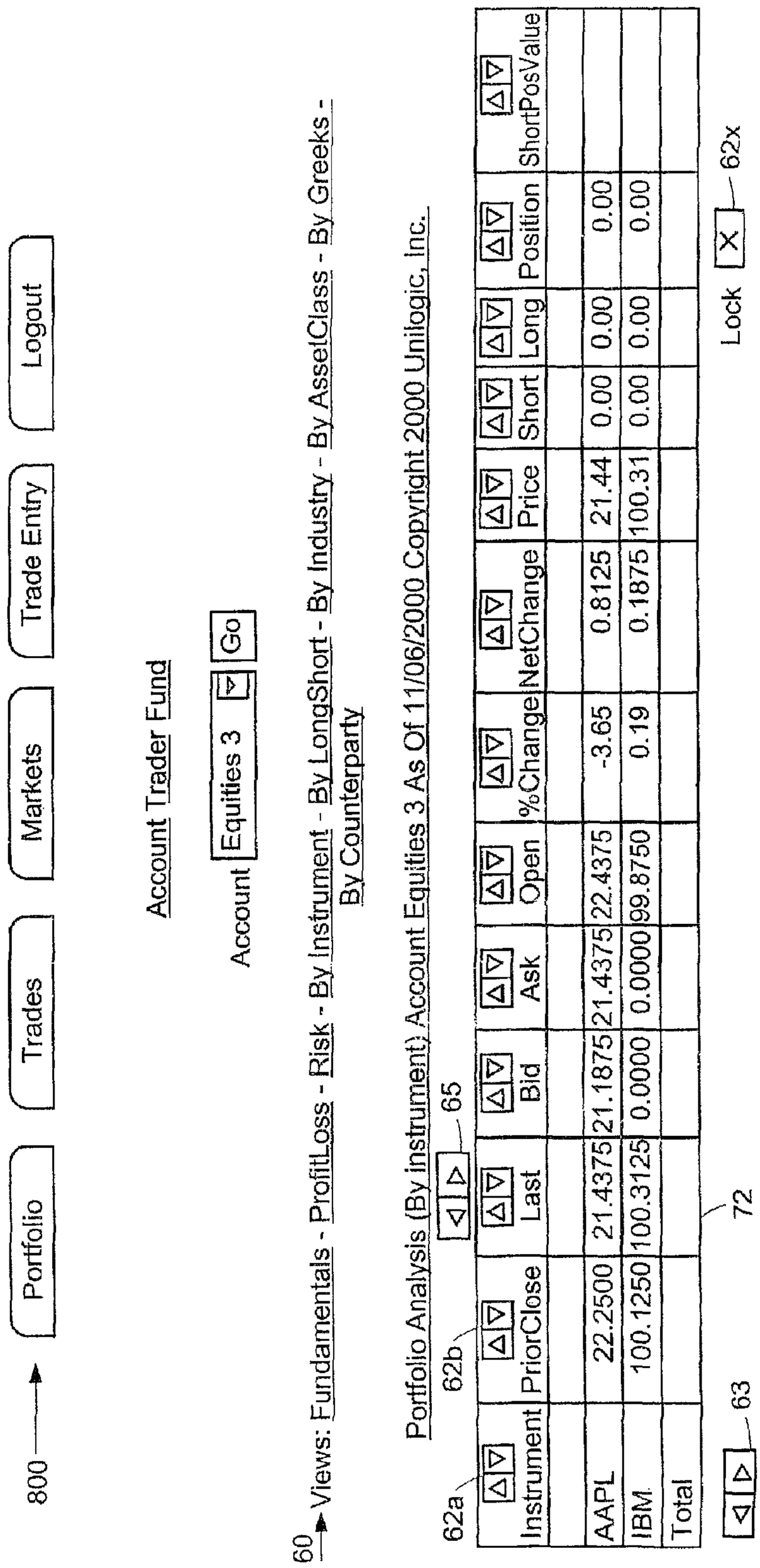

800
Portfolio
Trades
Markets
Trade Entry
Logout
Account Trader Fund
Account Equities 3 Go
60
Views: Fundamentals - Risk - By Instrument - By AssetClass - By LongShort - By Industry - By Greeks - By Counterparty
Portfolio Analysis (By instrument) Account Equities 3 As Of 11/06/2000 Copyright 2000 Unilogic, Inc.
62a
62b
65
Instrument
PriorClose
Last
Bid
Ask
Open
%Change
NetChange
Price
Short
Long
Position
ShortPosValue
AAPL 22.2500 21.4375 21.1875 21.4375 22.4375 -3.65 0.8125 21.44 0.00 0.00 0.00
IBM 100.1250 100.3125 0.0000 0.0000 99.8750 0.19 0.1875 100.31 0.00 0.00 0.00
Total
72
63
Lock X
62x

FIG. 3

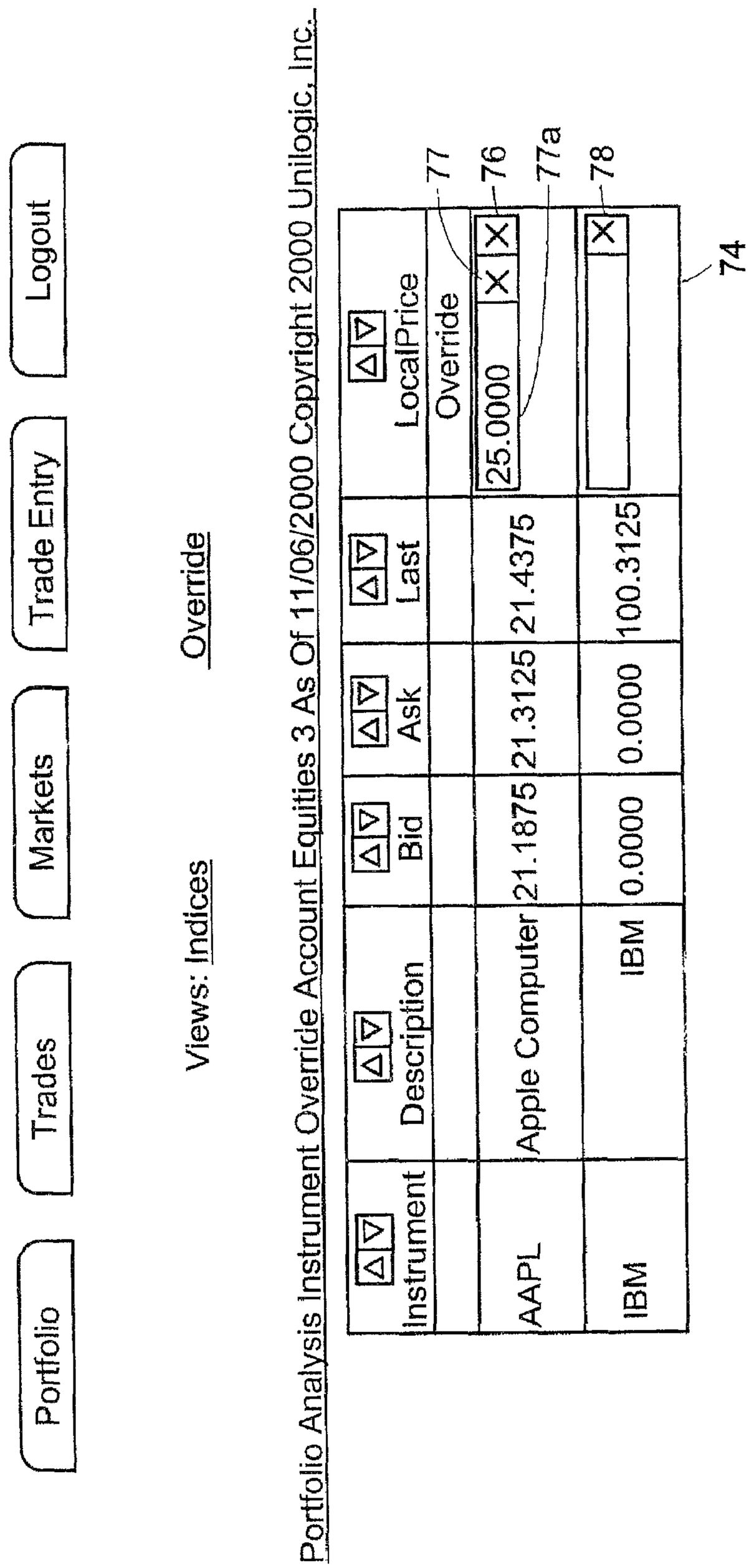

Portfolio
Trades
Markets
Trade Entry
Logout
Views: Indices
Override
Portfolio Analysis Instrument Override Account Equities 3 As Of 11/06/2000 Copyright 2000 Unilogic, Inc.
Instrument
Description
Bid
Ask
Last
LocalPrice
Override
AAPL
Apple Computer
21.1875
21.3125
21.4375
25.0000
IBM
IBM
0.0000
0.0000
100.3125
77
76
77a
78
74

FIG. 4

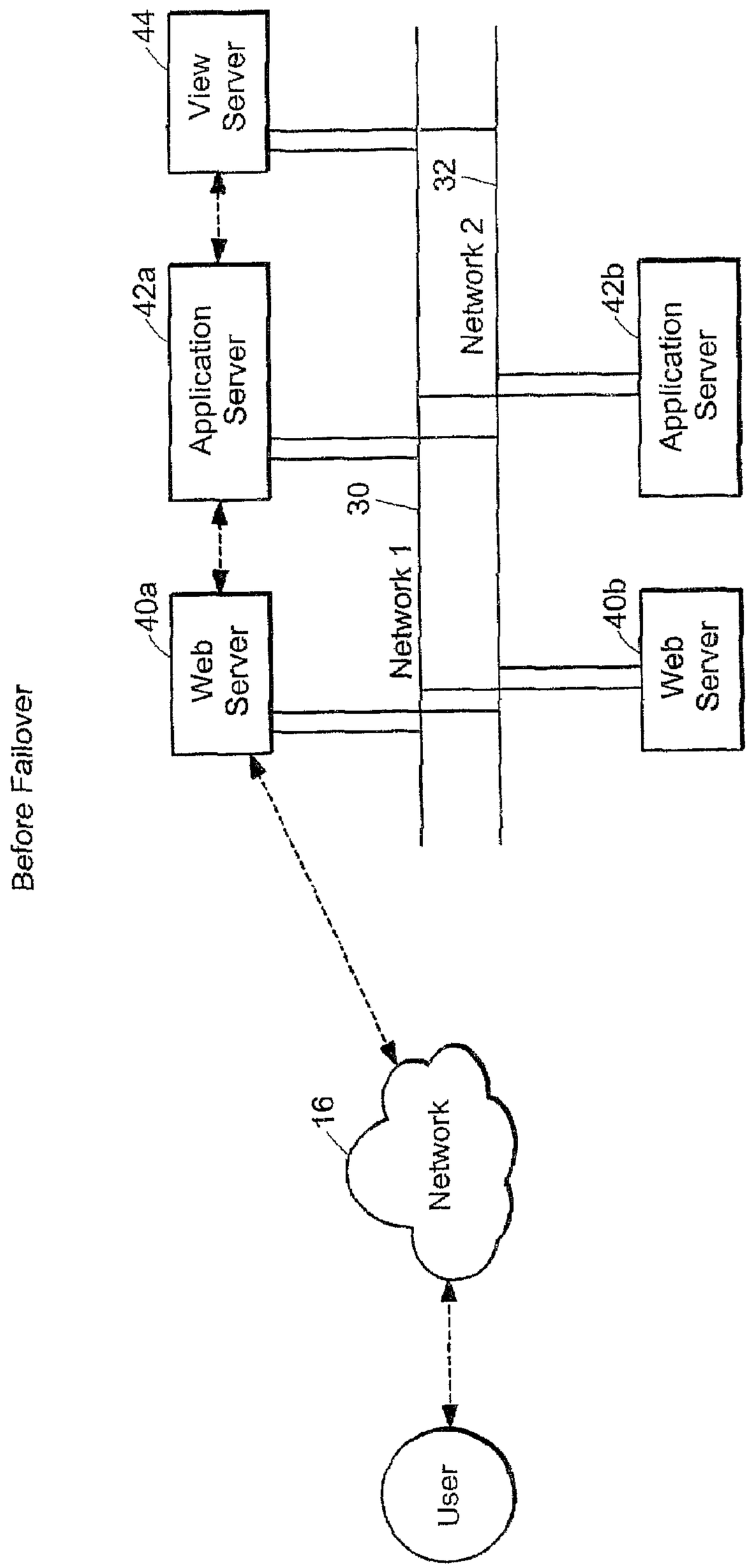

Before Failover
View Server
44
Application Server
42a
Web Server
40a
Network 1
30
Network 2
32
Application Server
42b
Web Server
40b
Network
16
User

FIG. 5A

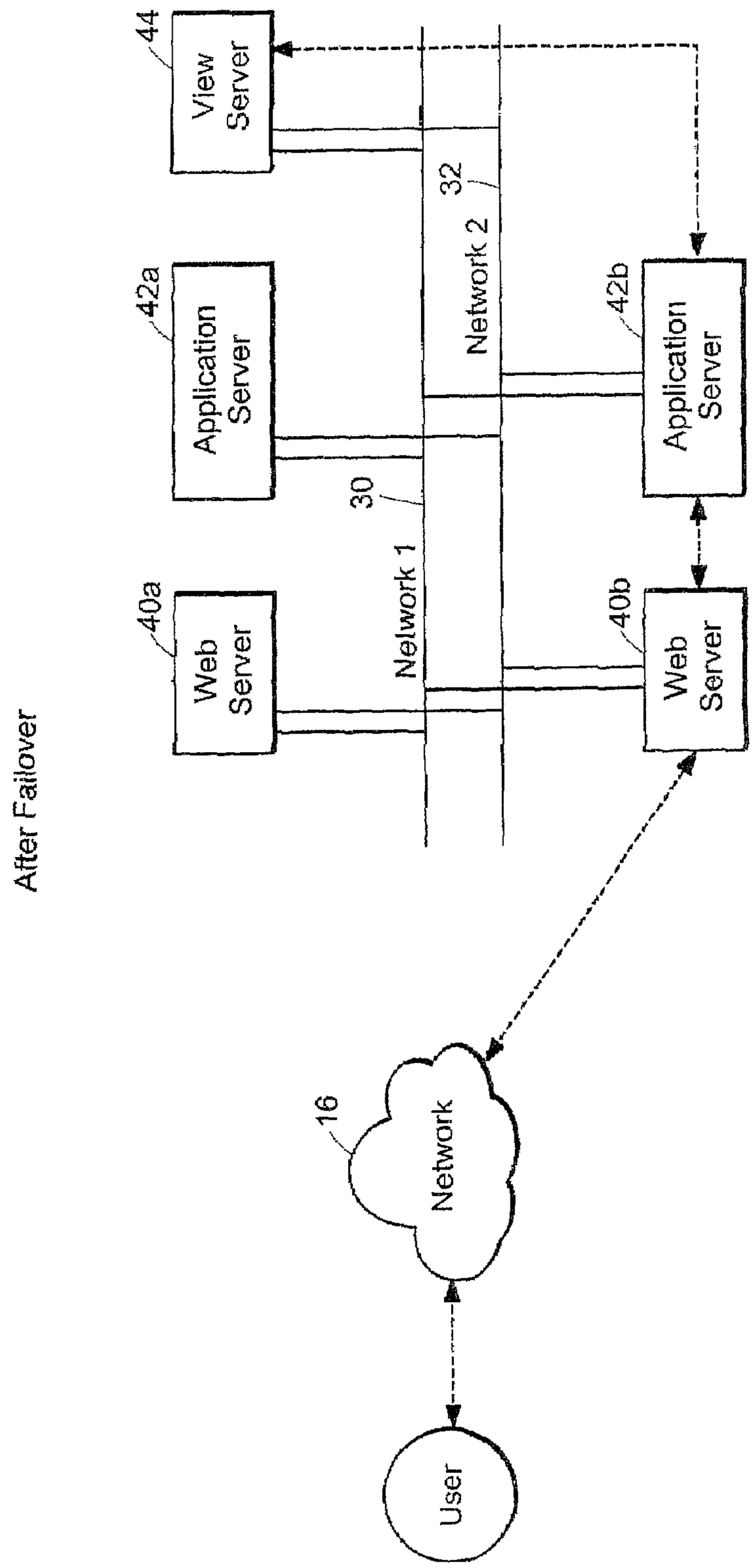

After Failover
44
View Server
32
Network 2
42a
Application Server
42b
Application Server
30
Network 1
40a
Web Server
40b
Web Server
16
Network
User

FIG. 5B

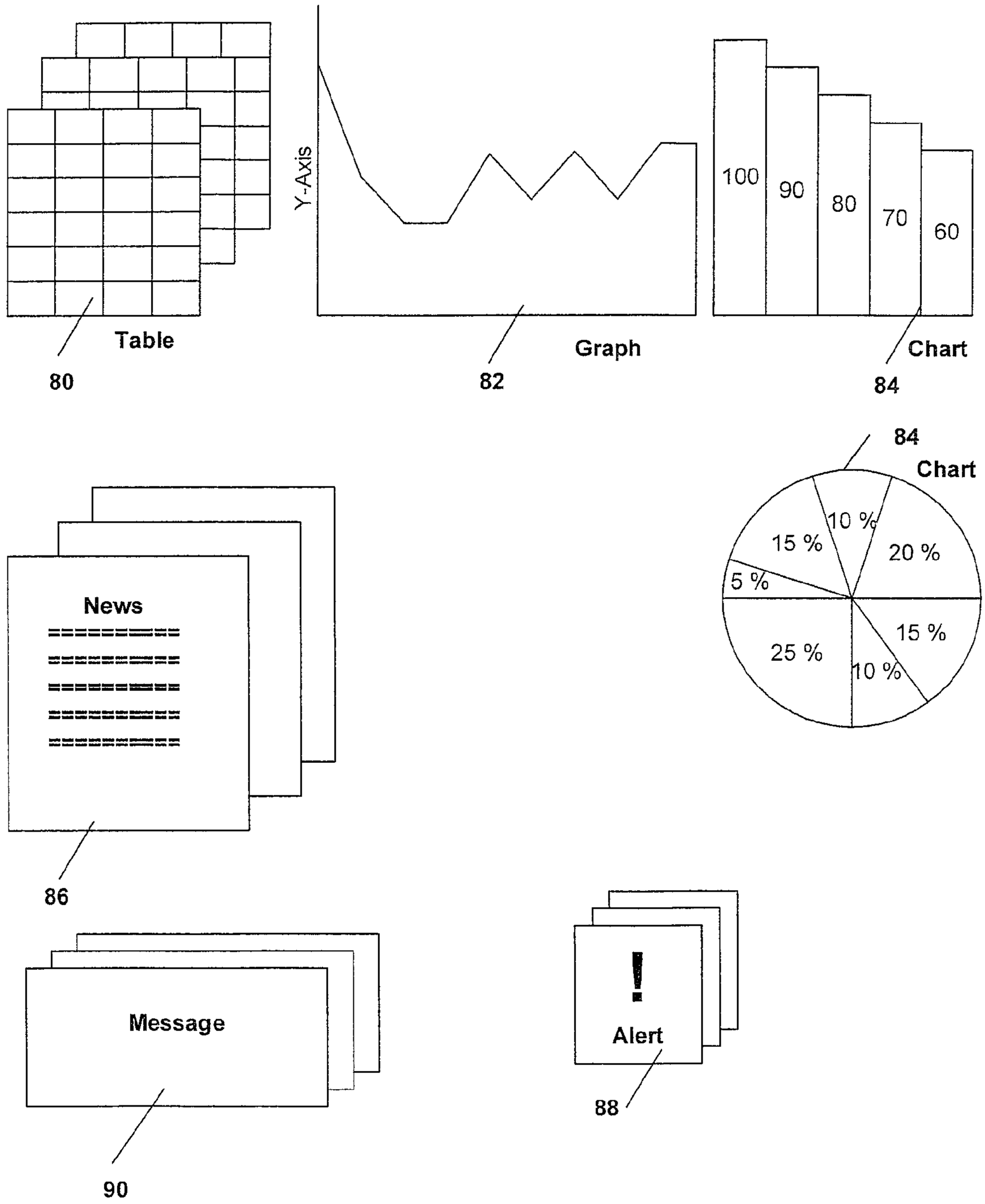


Table
80
Y-Axis
Graph
82
100
90
80
70
60
Chart
84
84
Chart
10 %
15 %
20 %
5 %
15 %
25 %
10 %
News
86
Message
90
!
Alert
88

FIG. 6

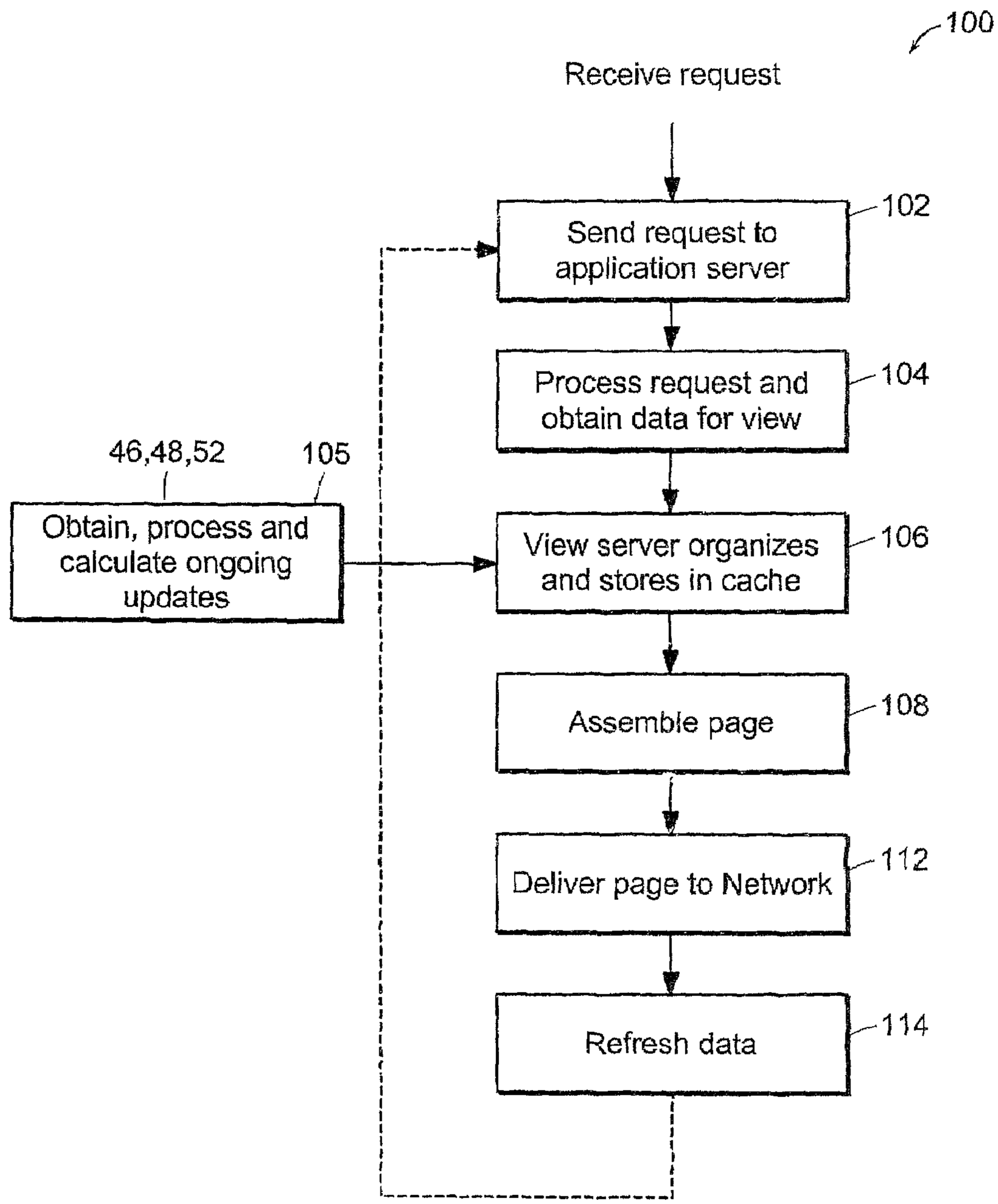

100
Receive request
Send request to application server
102
Process request and obtain data for view
104
46,48,52
105
Obtain, process and calculate ongoing updates
View server organizes and stores in cache
106
Assemble page
108
Deliver page to Network
112
Refresh data
114

FIG. 7

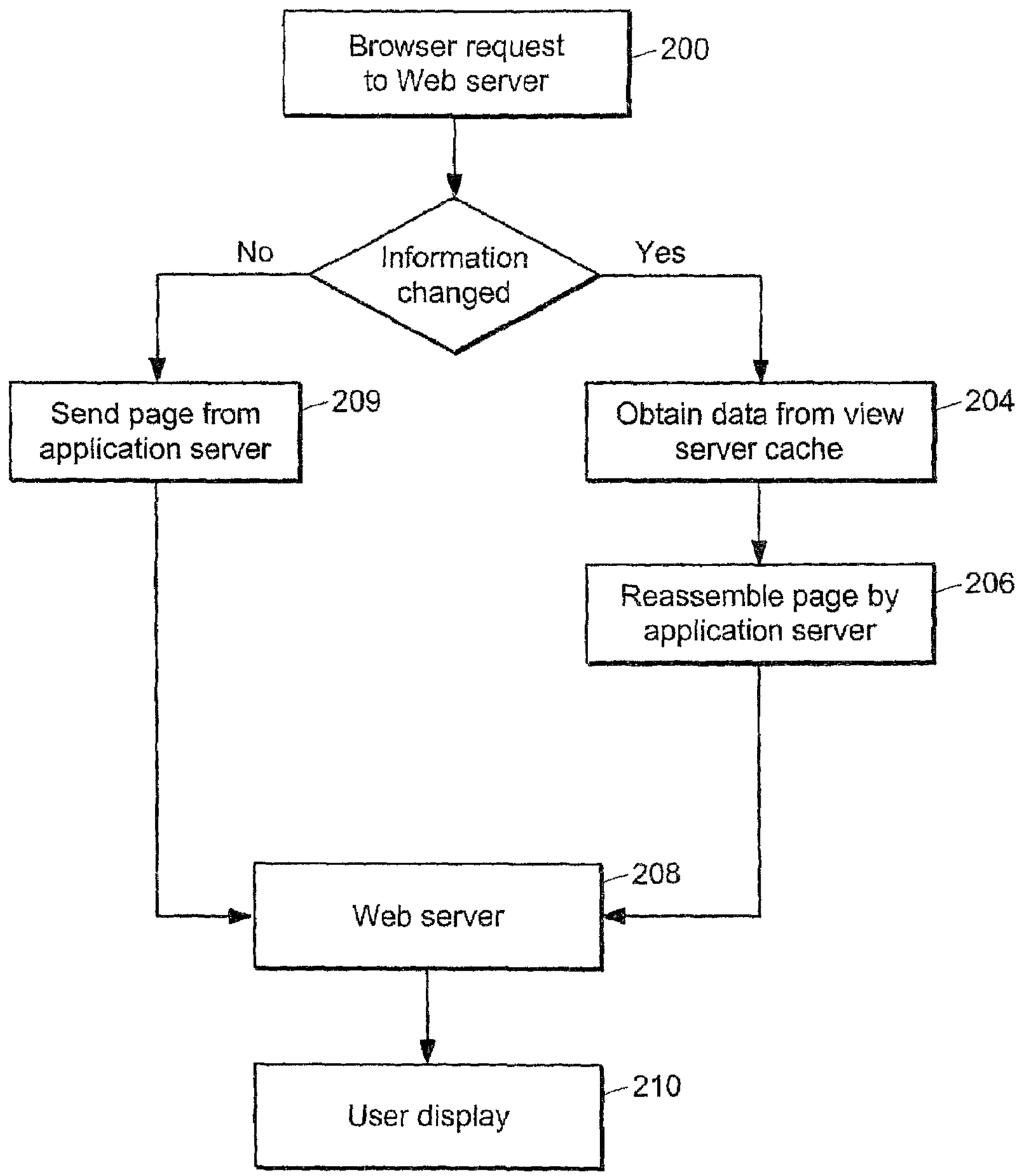

Browser request to Web server
200
Information changed
No
Yes
Send page from application server
209
Obtain data from view server cache
204
Reassemble page by application server
206
Web server
208
User display
210

FIG. 8

Portfolio | Trades | Markets | Trade Entry | Logout

Account Trader Fund

Account Equities 1 Go

Views: Blotter - DailyBlotter - Expiration

Trade Blotter Account Equities1 As Of 11/29/2000 Copyright 2000 Unilogic, Inc.

To modify or cancel a trade please click on arrow near TradeID

TradeID	Security Name	Description	Trade Type	Trade Status	Trade Dividend	Trade Quantity	Trade Price	Security Type	Counterparty	Trade Date	Maturity
2641	IBM	IBM	Buy	Open	0.00	1000.00	99.000	Common Stock	Bank Of America	11/06/2000	
Total											

FIG. 8A

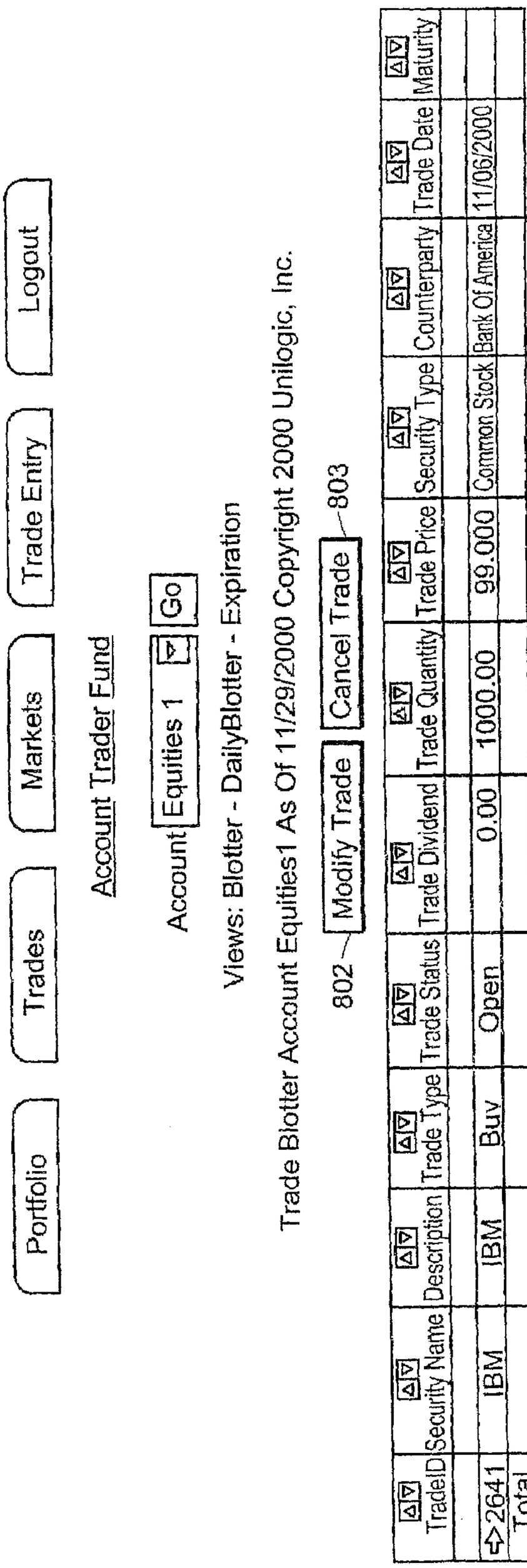

Portfolio
Trades
Markets
Trade Entry
Logout
Account Trader Fund
Account Equities 1 Go
Views: Blotter - DailyBlotter - Expiration
Trade Blotter Account Equities1 As Of 11/29/2000 Copyright 2000 Unilogic, Inc.
802
Modify Trade
Cancel Trade
803
TradeID
Security Name
Description
Trade Type
Trade Status
Trade Dividend
Trade Quantity
Trade Price
Security Type
Counterparty
Trade Date
Maturity
2641
IBM
IBM
Buy
Open
0.00
1000.00
99.000
Common Stock
Bank Of America
11/06/2000
Total

FIG. 8B

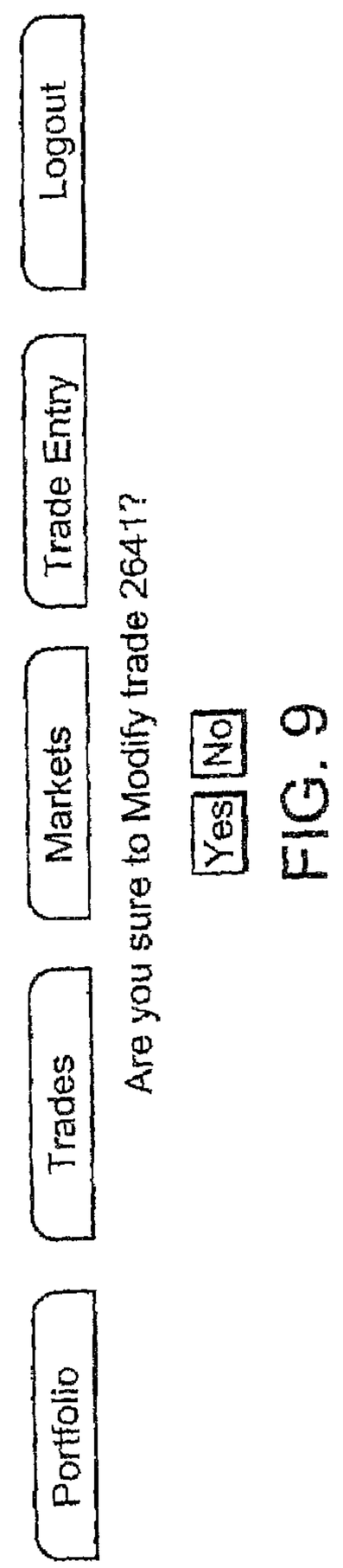

Portfolio
Trades
Markets
Trade Entry
Logout
Are you sure to Modify trade 2641?
Yes
No

FIG. 9

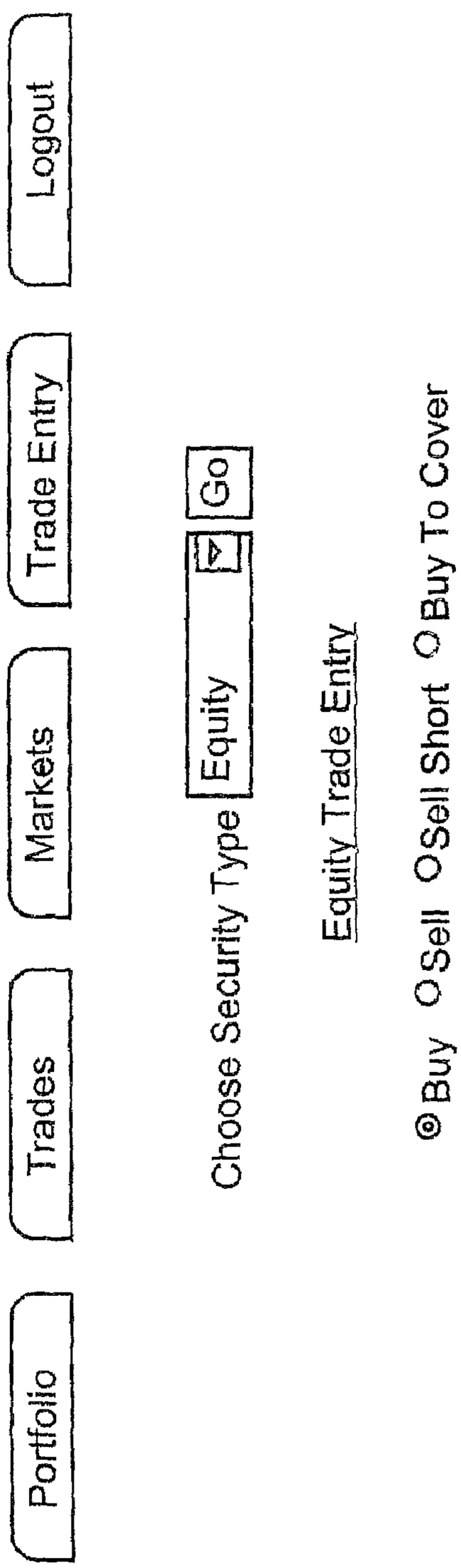

Portfolio
Trades
Markets
Trade Entry
Logout
Choose Security Type
Equity
Go
Equity Trade Entry
Buy
Sell
Sell Short
Buy To Cover
Account
Equities1
Amount
1000.00
Equity
IBM
Trade Price
99.000
Counterparty
BankOfAmerica
Commission
50.00
Trade Date
11/06/2000
Hedge
Trade ID
2641
submit

FIG. 10

Portfolio | Trades | Markets | Trade Entry | Logout

Account Trader Fund

Account Currencies1 Go

Views: Fundamentals - ProfitLoss - Risk - By Allocation - By AssetClass - By Counterparty - By Country - By Currency - By Industry - By Instrument - By LongShort

1000

Portfolio Analysis (By Country) Account Currencies1 As Of 11/26/2000 Copyright 2000 Unilogic, Inc.

Country	Spot	ShortPosValue	LongPosValue	PosValue	UnrealizedP/L OTD	RealizedP/L OTD
USA	1.0000	0.00	29,700.00	29,700.00	-1,300.00	0.00
Japan	112.0000	0.00	32,428.57	32,428.57	-4,911.43	0.00
Total		0.00	62,128.57	62,128.57	-6,211.43	0.00

FIG. 11

Portfolio | Trades | Markets | Trade Entry | Logout

Detail Portfollo Analysis (By Country-Japan) Account Currencies1 As Of 11/26/2000 Copyright 2000 Unilogic, Inc.

Instrument	Local Price	Currency	Maturity	Position	PosValue	UnrealizedP/L OTD	RealizedP/L OTD
EWJ	11.75	USD		2,000.00	23,500.00	-4,760.00	0.00
Japanese_Yen	112.00	Japanese_Yen		1,000,000.00	8,928.57	-161.43	0.00
Total					32,428.57	-4,911.43	0.00

Refresh Detail | Back To Aggregate View

FIG. 12

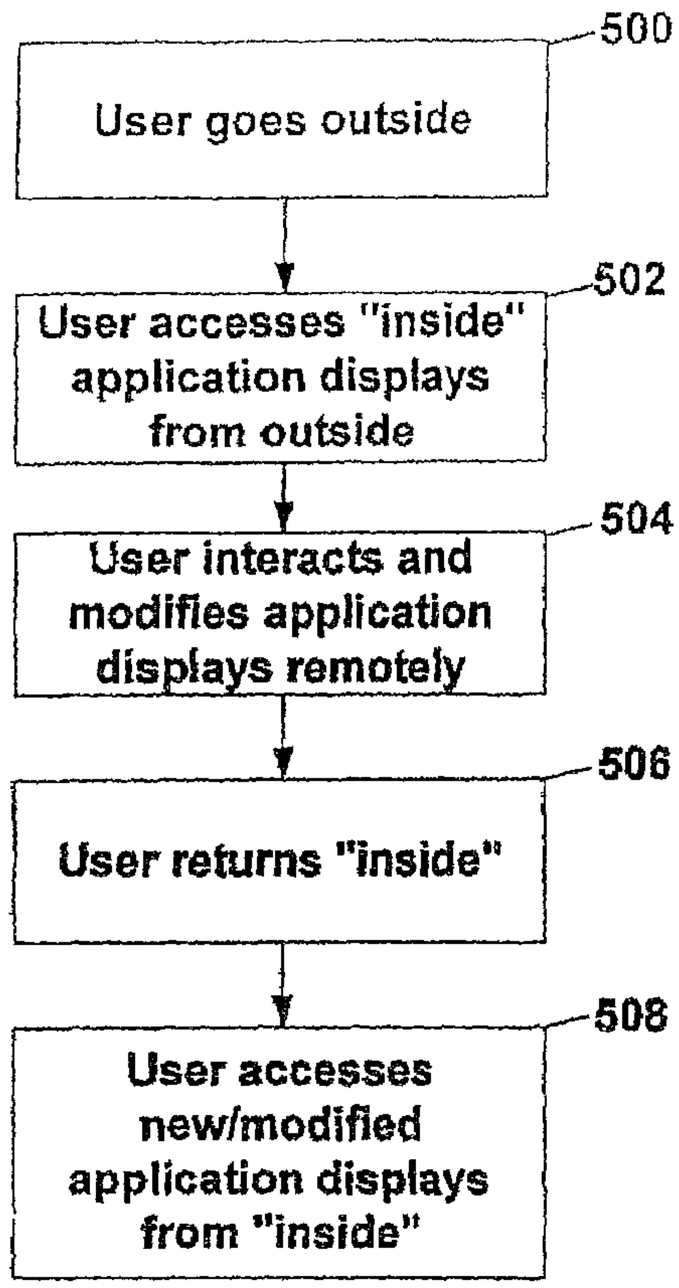

500
User goes outside
502
User accesses "inside" application displays from outside
504
User interacts and modifies application displays remotely
506
User returns "inside"
508
User accesses new/modified application displays from "inside"

FIG. 13

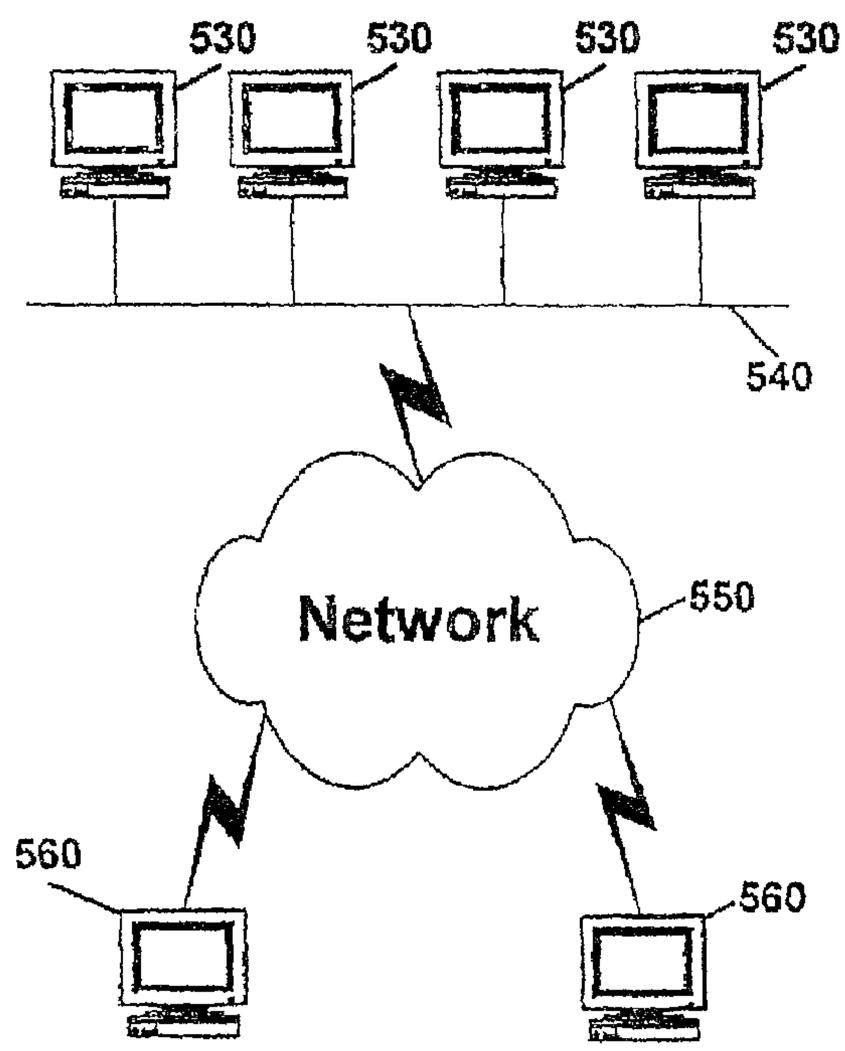

530
530
530
530
540
Network
550
560
560

FIG. 14

Portfolio | Trades | Curves | Markets | Trade Entry | Configure

Logout

Account Trader Fund

Account Currencies1 Go

Views: Fundamentals - ProfitLoss - Risk - By Allocation - By AssetClass - By Country - By Currency - By Industry - By Instrument - By LongShort - By Greeks

600 Portfolio Analysis (By AssetClass) Account Currencies1 As Of 05/22/2001

AssetClass	ShortPosValue	LongPosValue	PosValue	%PosValue	UnrealizedP/L OTD	RealizedP/L OTD
Currencies	-884,642.60	0.00	-884,642.60	25.53	-44,642.60	0.00
Options	0.00	55,000.00	55,000.00	1.59	29,000.00	0.00
Equities	-490,350.00	2,082,630.00	1,592,280.00	72.89	1,179,175.00	0.00
Total	-1,374,992.60	2,137,630.00	762,637.40	100.00	1,163,532.40	0.00

FIG. 15

Portfolio | Trades | Curves | Markets | Trade Entry | Configure

Logout

Account Trader Fund

Account Currencies1 Go

Views: Fundamentals - ProfitLoss - Risk - By Allocation - By AssetClass - By Counterparty - By Currency - By Industry - By Instrument - By LongShort - By Greeks

Portfolio Analysis (By AssetClass) Account Currencies1 As Of 05/22/2001

600 602 620 604 606

AssetClass	ShortPosValue	LongPosValue	PosValue	%PosValue	UnrealizedP/L	RealizedP/L
					OTD	OTD
Currencies	-884,779.58	0.00	-884,779.58	25.53	-44,779.58	0.00
Options	0.00	55,000.00	55,000.00	1.59	29,000.00	0.00
Equities	-490,350.00	2,082,630.00	1,592,280.00	72.88	1,179,175.00	0.00
Total	-1,375,129.58	2,137,630.00	762,500.42	100.00	1,163,395.42	0.00

FIG. 16

Portfolio | Trades | Curves | Markets | Trade Entry | Configure

Logout

Account Trader Fund

Account Currencies1 Go

Views: Fundamentals - ProfitLoss - Risk - By Allocation - By AssetClass - By Counterparty - By Country - By Currency - By Industry - By Instrument - By LongShort - By Greeks

Portfolio Analysis (By AssetClass) Account Currencies1 As Of 05/22/2001

630 632 640

AssetClass	ShortPosValue	LongPosValue	PosValue	%PosValue	UnrealizedP/L	RealizedP/L
					OTD	OTD
Currencies	-884,897.02	0.00	-884,897.02	25.53	-44,897.02	0.00
Options	0.00	55,000.00	55,000.00	1.59	29,000.00	0.00
Equities	-490,350.00	2,082,630.00	1,592,280.00	72.88	1,179,175.00	0.00
Total	-1,375,247.02	2,137,630.00	762,382.98	100.00	1,163,277.98	0.00

Selected Column

FIG. 17

Portfolio | Trades | Curves | Markets | Trade Entry | Configure

Logout

Account Trader Fund

Account Currencies1 Go

Views: Fundamentals - ProfitLoss - Risk - By Allocation - By AssetClass - By Counterparty - By Country - By Currency - By Industry - By Instrument - By LongShort - By Greeks

Portfolio Analysis (By AssetClass) Account Currencies1 As Of 05/22/2001

600 620 650

AssetClass	LongPosValue	PosValue	ShortPosValue	%PosValue	UnrealizedP/L	RealizedP/L
					OTD	OTD
Currencies	0.00	-884,779.58	-884,779.58	25.53	-44,779.58	0.00
Options	55,000.00	55,000.00	0.00	1.59	29,000.00	0.00
Equities	2,082,630.00	1,592,280.00	-490,350.00	72.88	1,179,175.00	0.00
Total	2,137,630.00	762,500.42	-1,375,129.58	100.00	1,163,395.42	0.00

Selected Column

FIG. 18

Portfolio | Trades | Curves | Markets | Trade Entry | Configure | Logout

Account Trader Fund

Account Currencies1 Go

Views: Fundamentals - ProfitLoss - Risk - By Allocation - By AssetClass - By Counterparty - By Country - By Currency - By Industry - By Instrument - By LongShort - By Greeks

Portfolio Analysis (By AssetClass) Account Currencies1 As Of 05/22/2001

654

AssetClass	LongPosValue	PosValue	ShortPosValue	%PosValue	UnrealizedP/L	RealizedP/L
					OTD	OTD
Currencies	0.00	-885,779.58	-885,249.53	25.54	-44,249.53	0.00
Options	55,000.00	55,000.00	0.00	1.59	29,000.00	0.00
Equities	2,082,630.00	1,592,280.00	-490,350.00	72.87	1,179,175.00	0.00
Total	2,137,630.00	762,500.47	-1,375,599.53	100.00	1,162,925.47	0.00

658 Chart Type: Bar - HorizontalBar - Pie

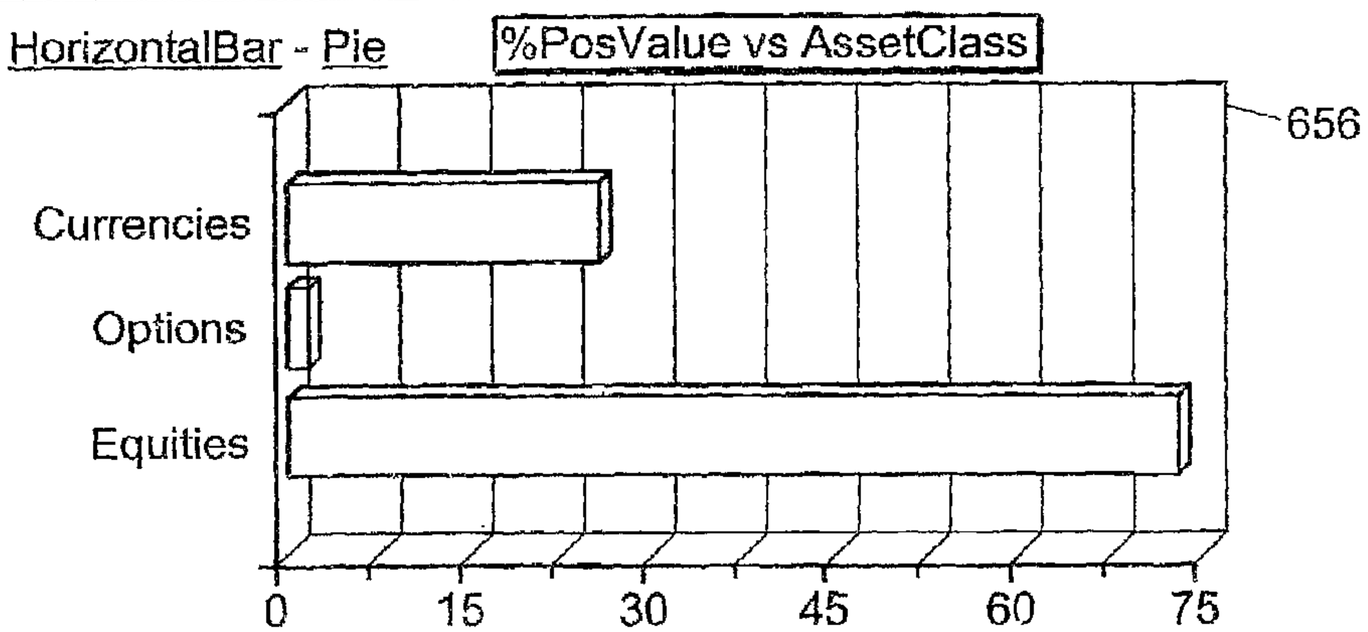


FIG. 19

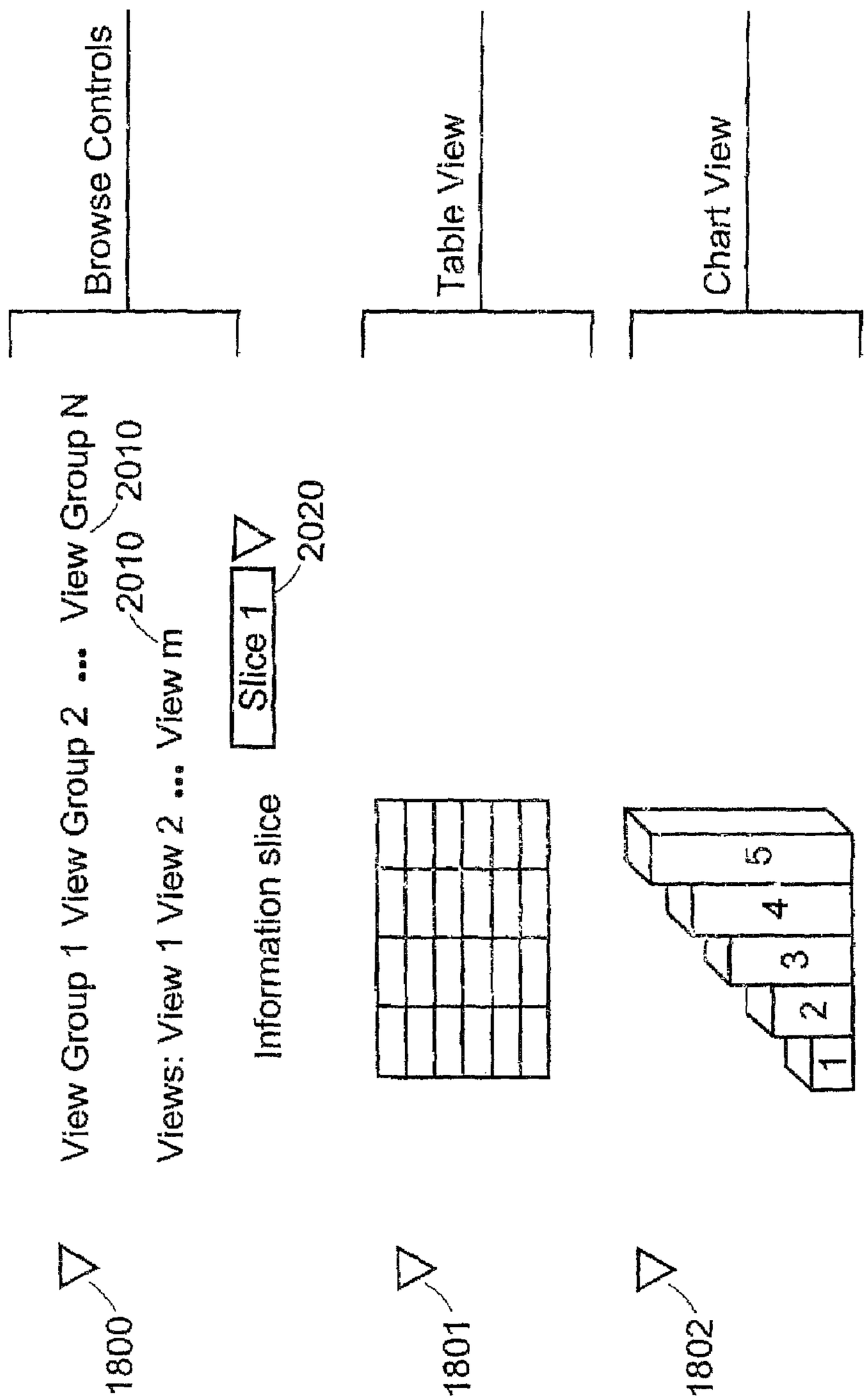

Browse Controls
View Group 1 View Group 2 ... View Group N
2010
2010
Views: View 1 View 2 ... View m
Slice 1
2020
Information slice
Table View
Chart View
1
2
3
4
5
1800
1801
1802

FIG. 20A

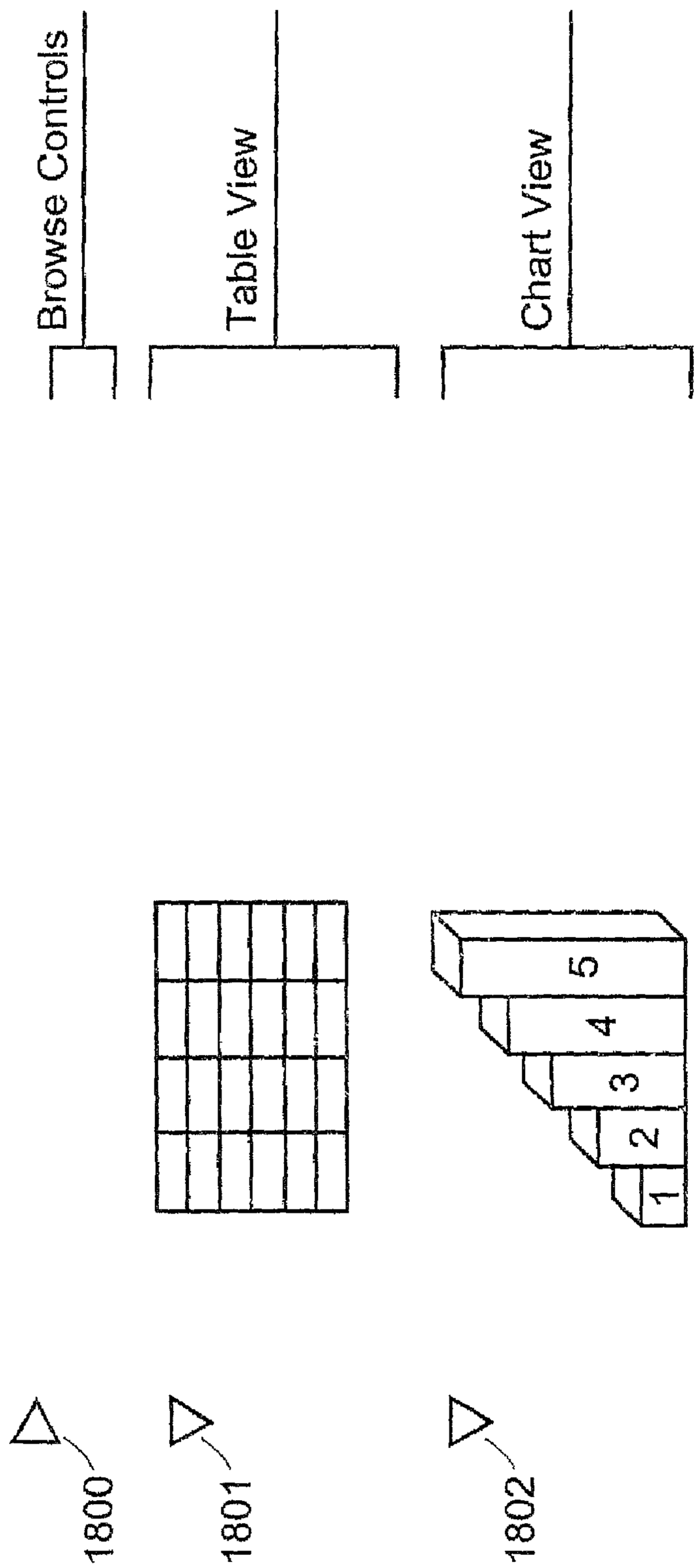


FIG. 20B

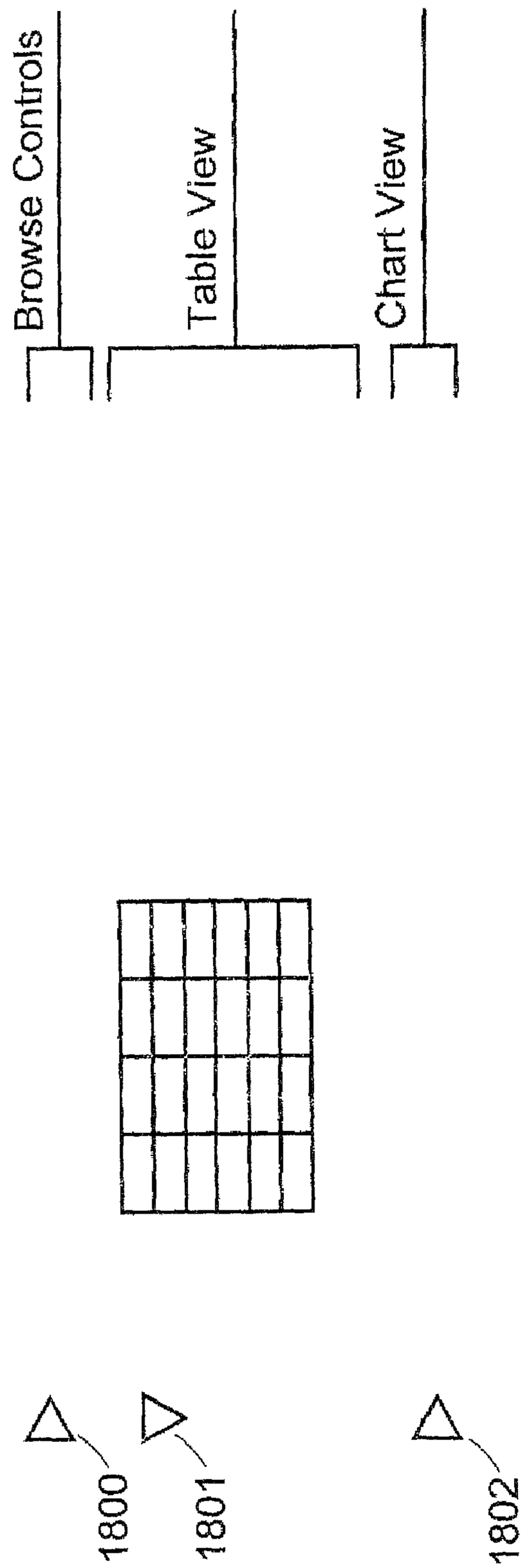


FIG. 20C

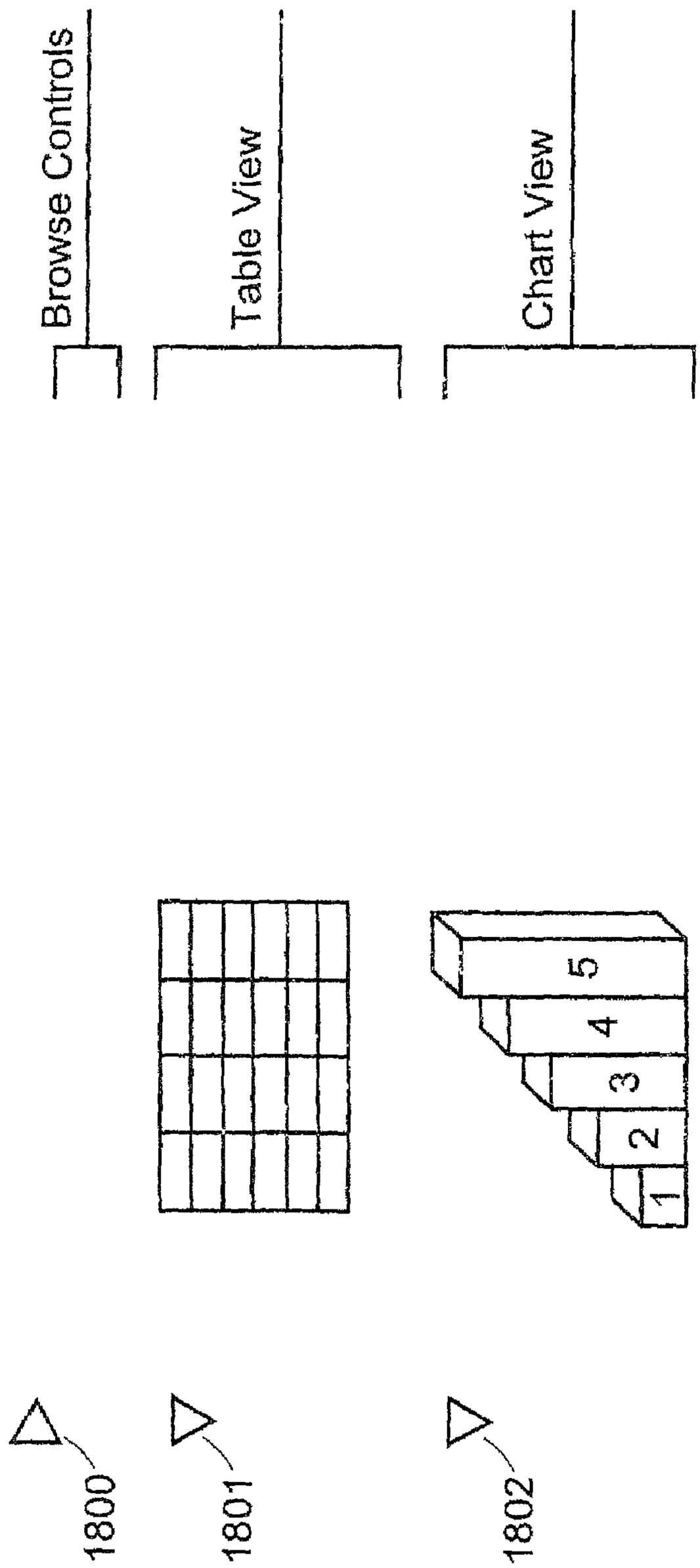


FIG. 20D

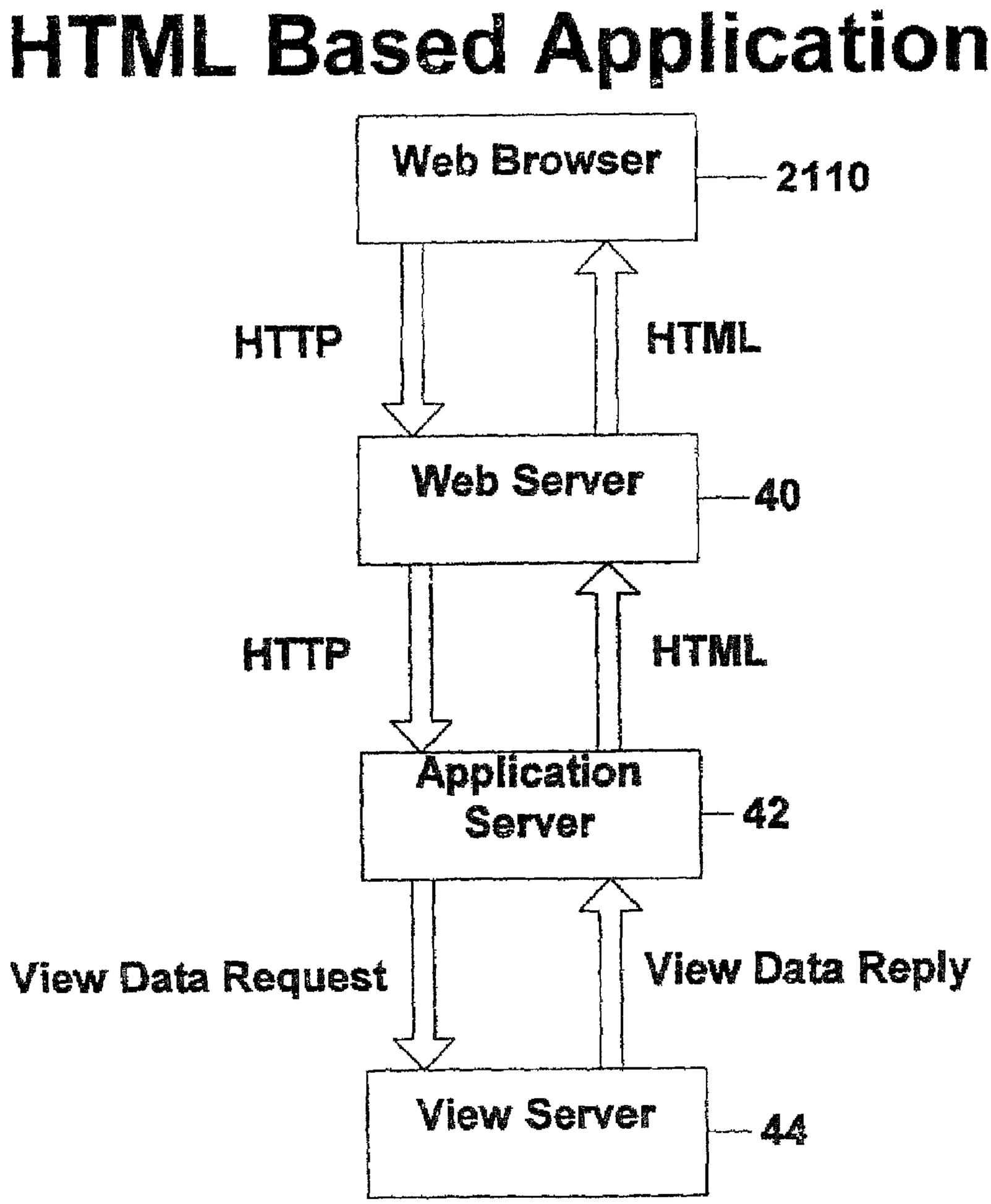

HTML Based Application
Web Browser
2110
HTTP
HTML
Web Server
40
HTTP
HTML
Application Server
42
View Data Request
View Data Reply
View Server
44

FIG. 21

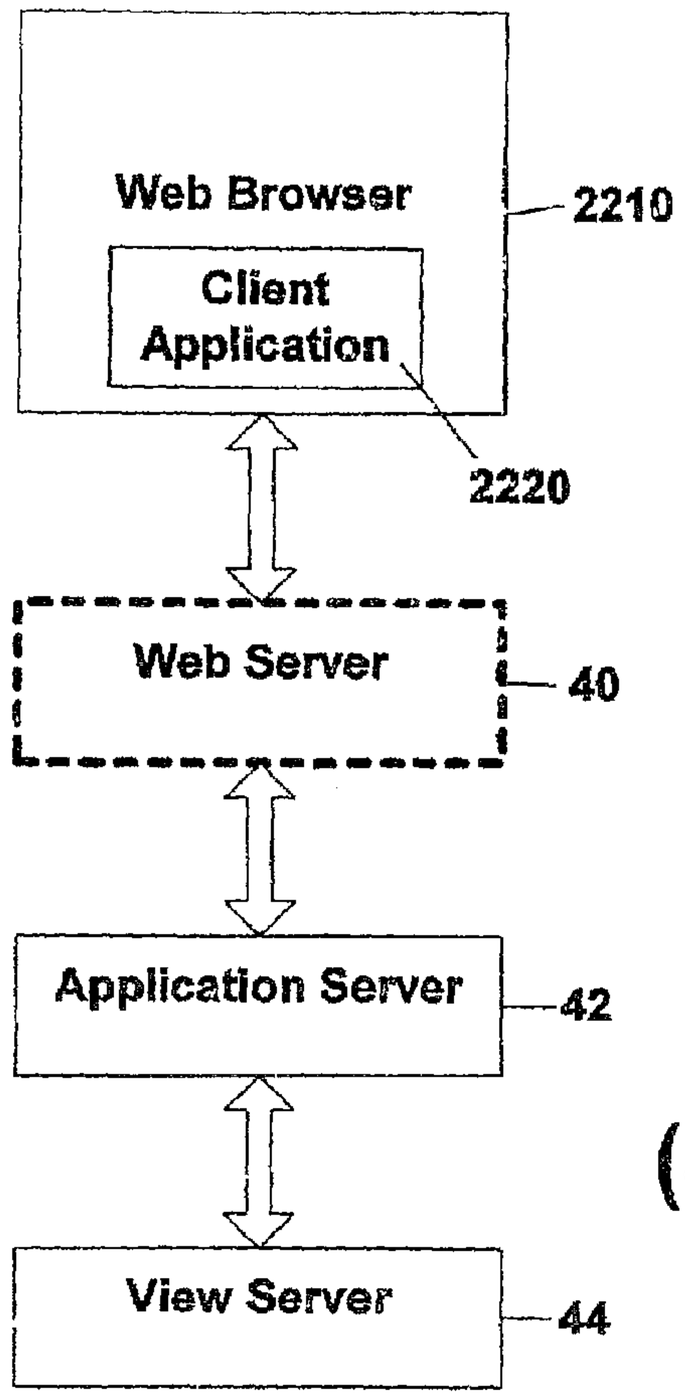


FIG. 22

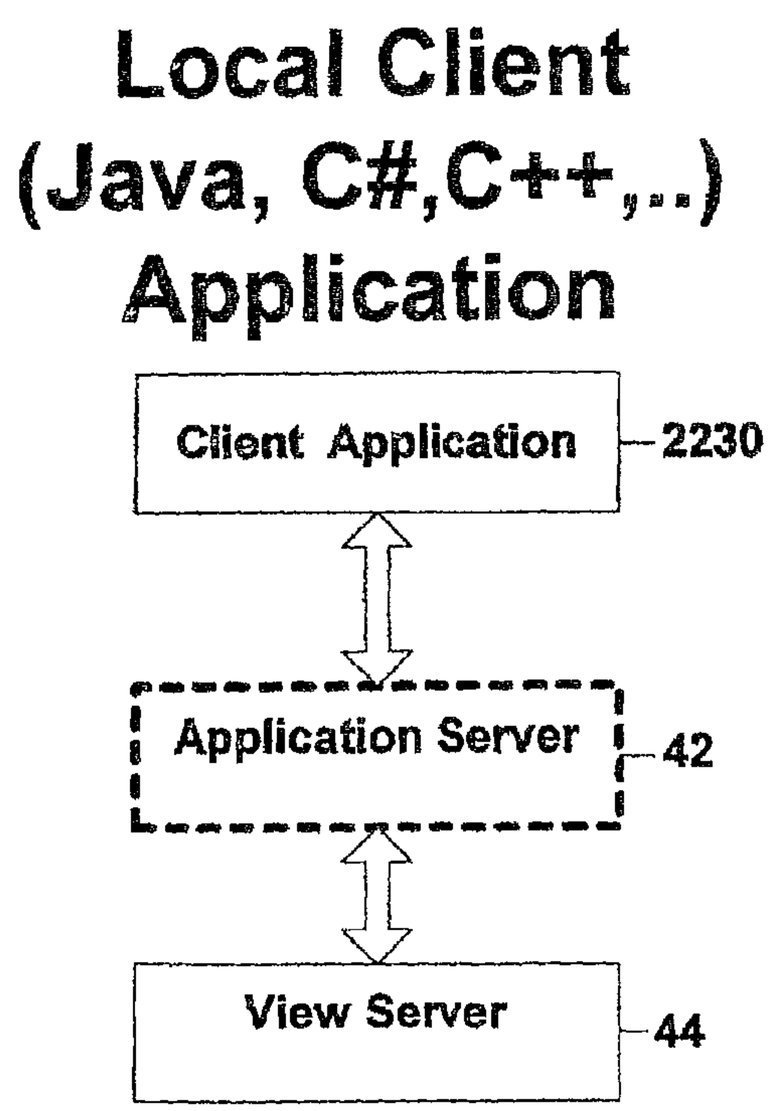


FIG. 22A

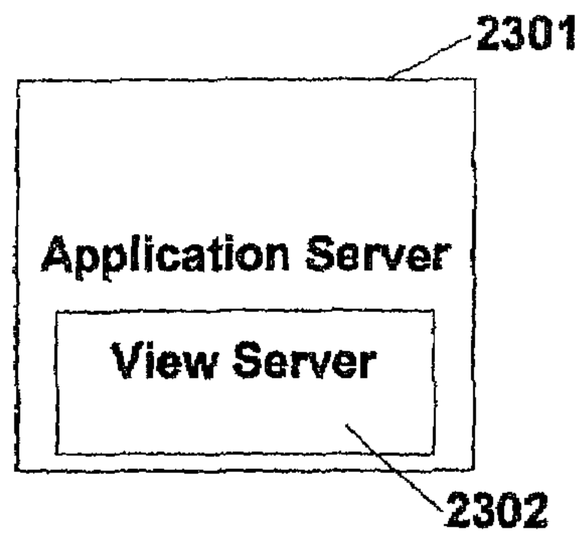


FIG. 23A

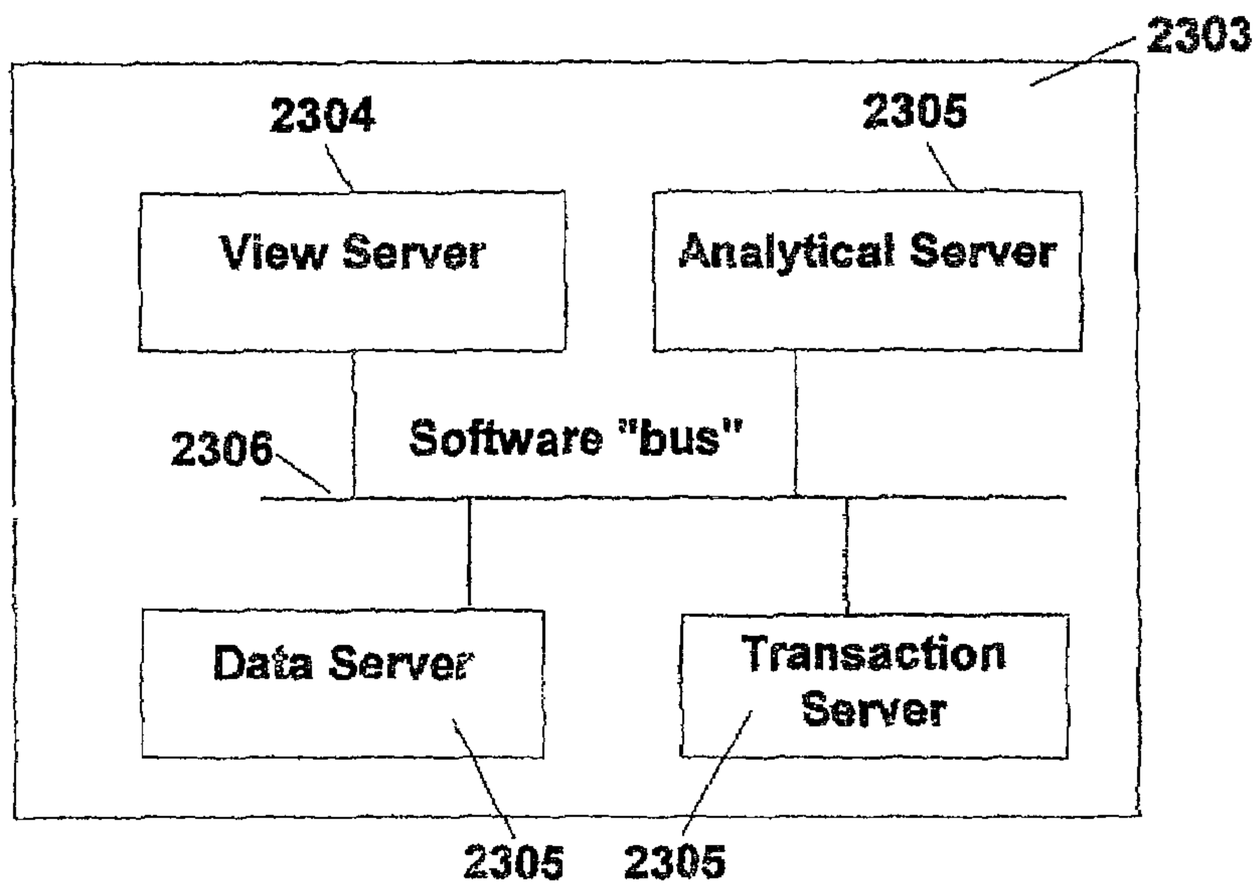


FIG. 23B

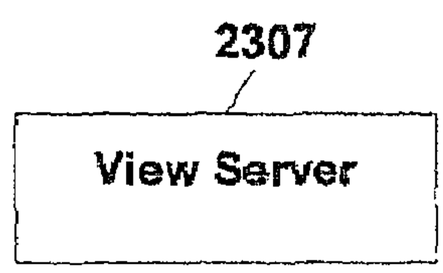


FIG. 23C

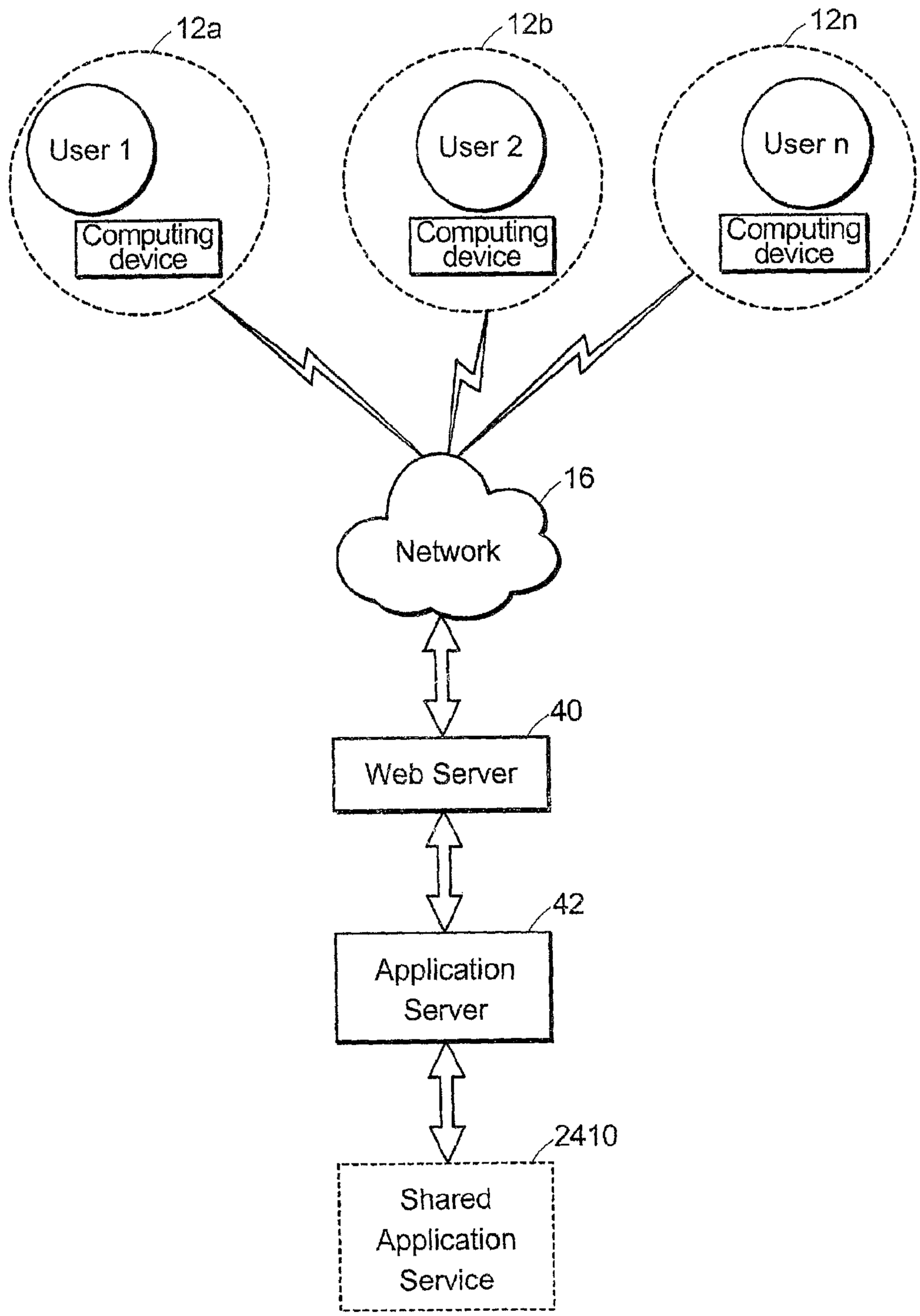

HTML based shared application service
12a
User 1
Computing device
12b
User 2
Computing device
12n
User n
Computing device
16
Network
40
Web Server
42
Application Server
2410
Shared Application Service

FIG. 24A

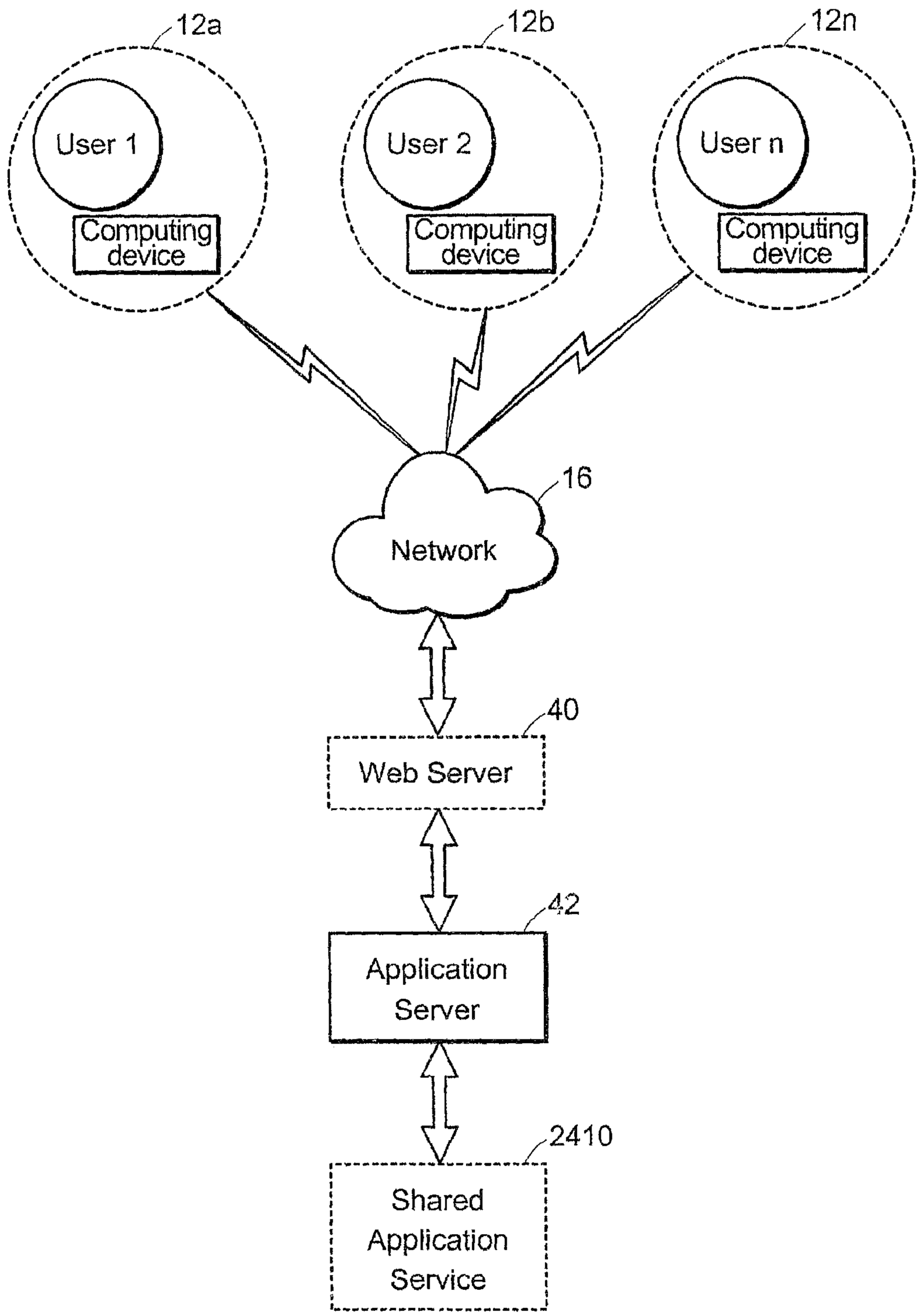

Browser based client (Java, C#, ...) using shared application service
12a
User 1
Computing device
12b
User 2
Computing device
12n
User n
Computing device
16
Network
40
Web Server
42
Application Server
2410
Shared Application Service

FIG. 24B

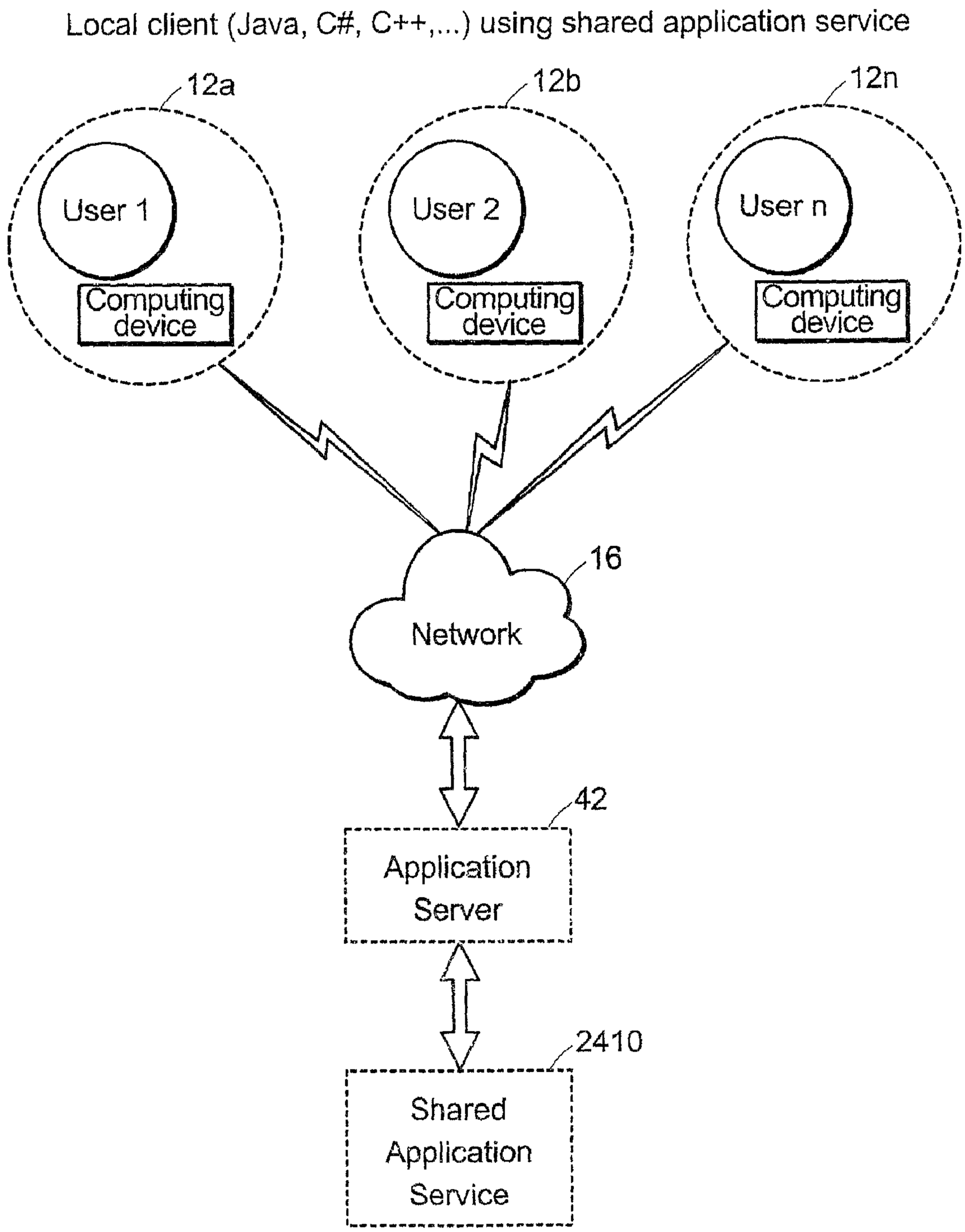

Local client (Java, C#, C++,...) using shared application service
12a
User 1
Computing device
12b
User 2
Computing device
12n
User n
Computing device
16
Network
42
Application Server
2410
Shared Application Service

FIG. 24C

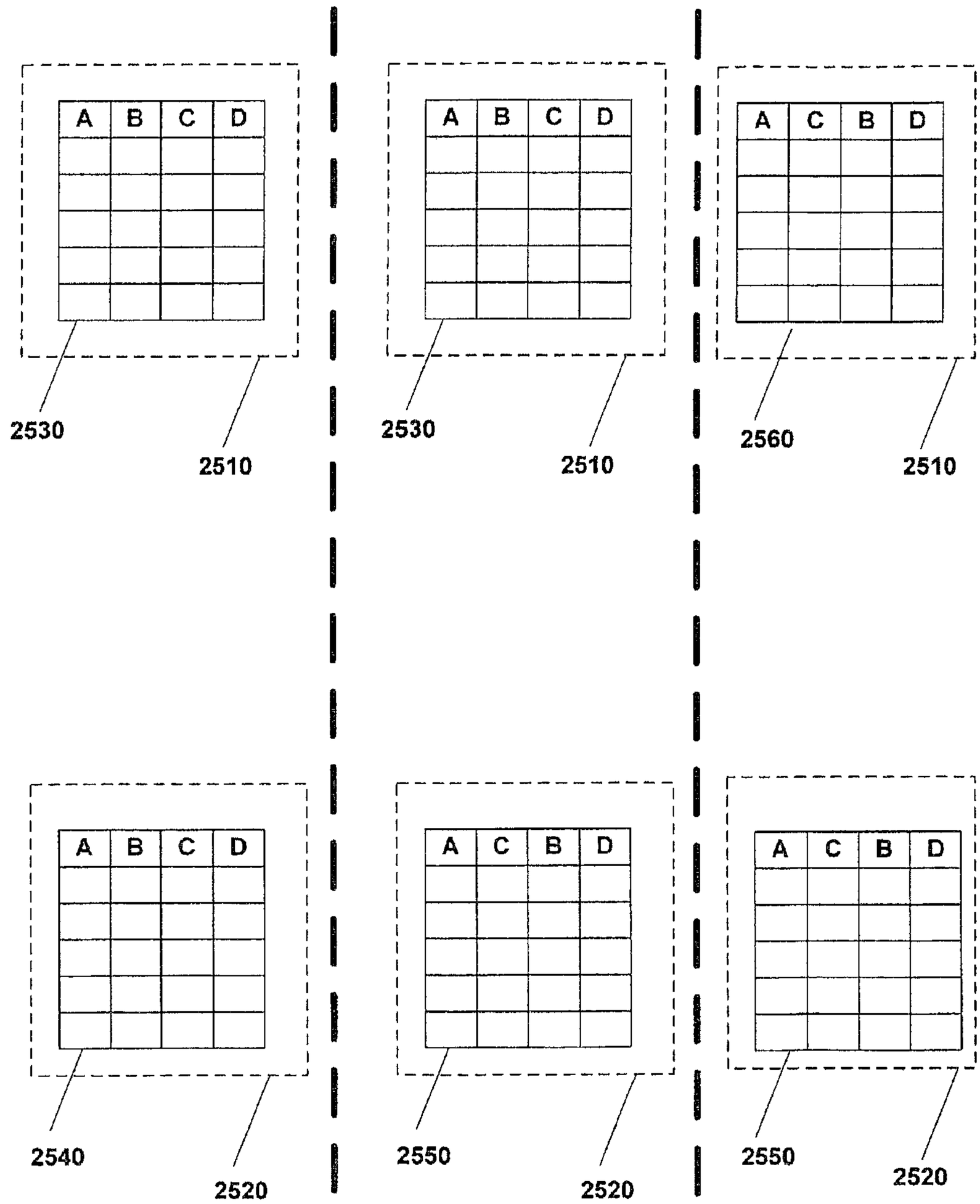


FIG. 25A FIG. 25B FIG. 25C

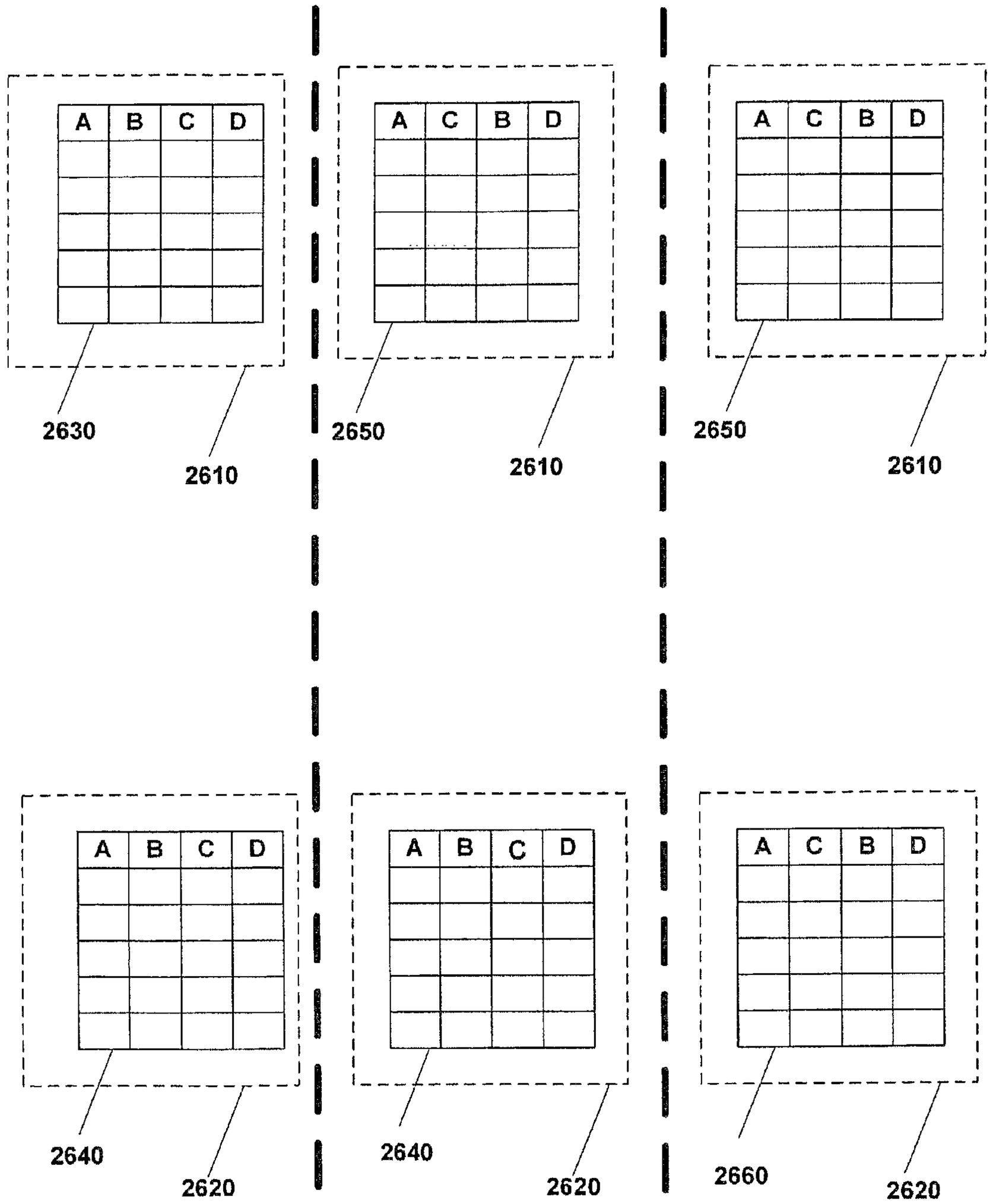


FIG. 26A FIG. 26B FIG. 26C

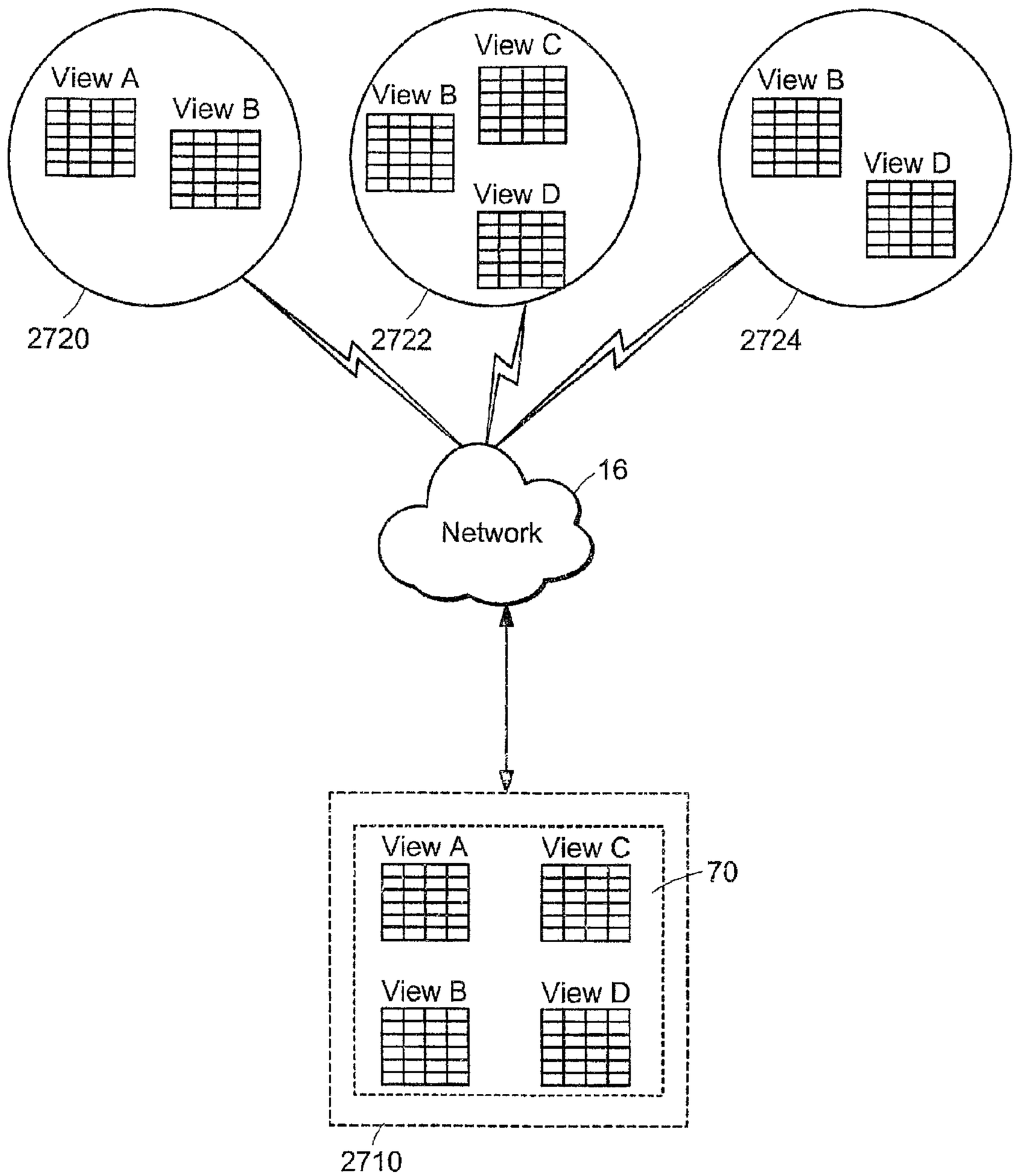

View A
View B
View C
View B
View D
View B
View D
2720
2722
2724
16
Network
View A
View C
View B
View D
70
2710

FIG. 27

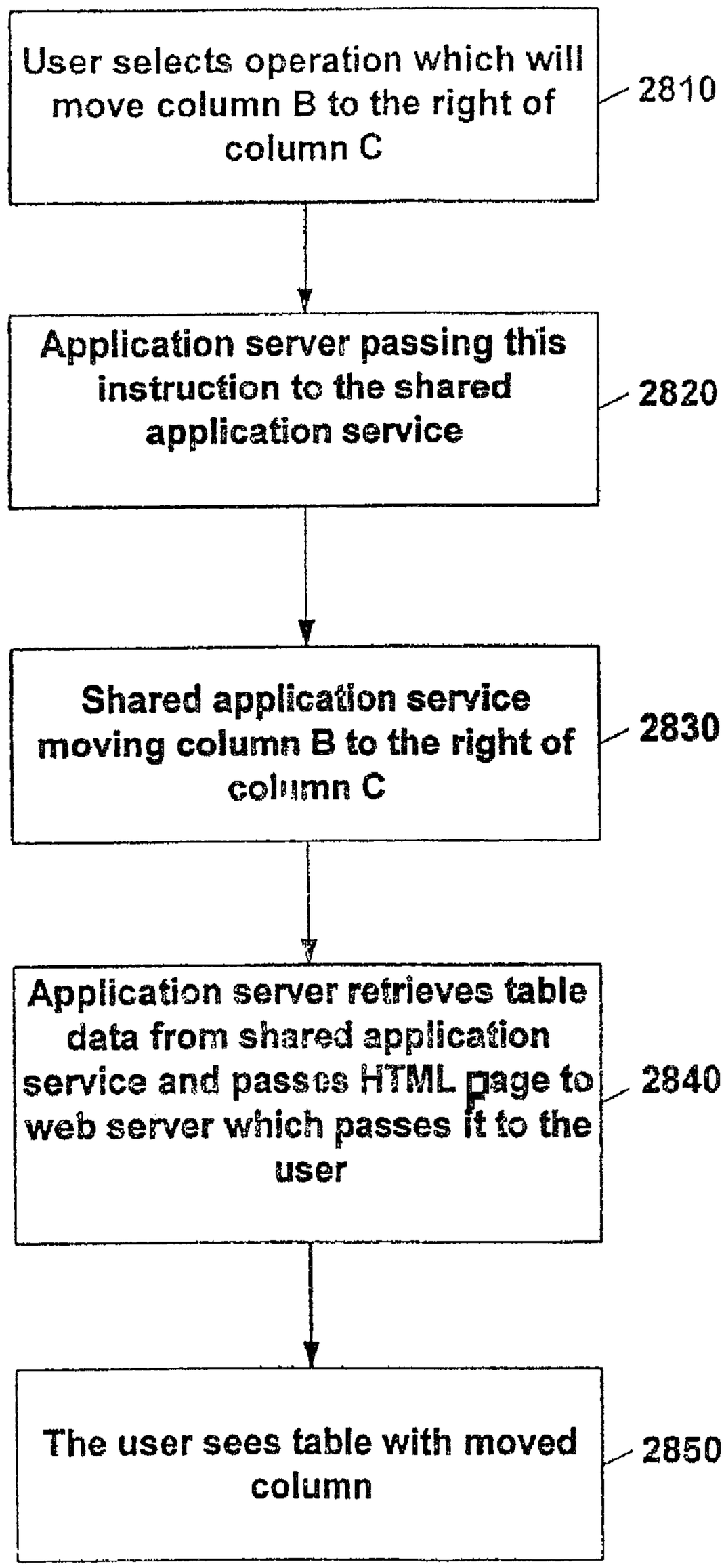

User selects operation which will move column B to the right of column C
2810
Application server passing this instruction to the shared application service
2820
Shared application service moving column B to the right of column C
2830
Application server retrieves table data from shared application service and passes HTML page to web server which passes it to the user
2840
The user sees table with moved column
2850

FIG. 28

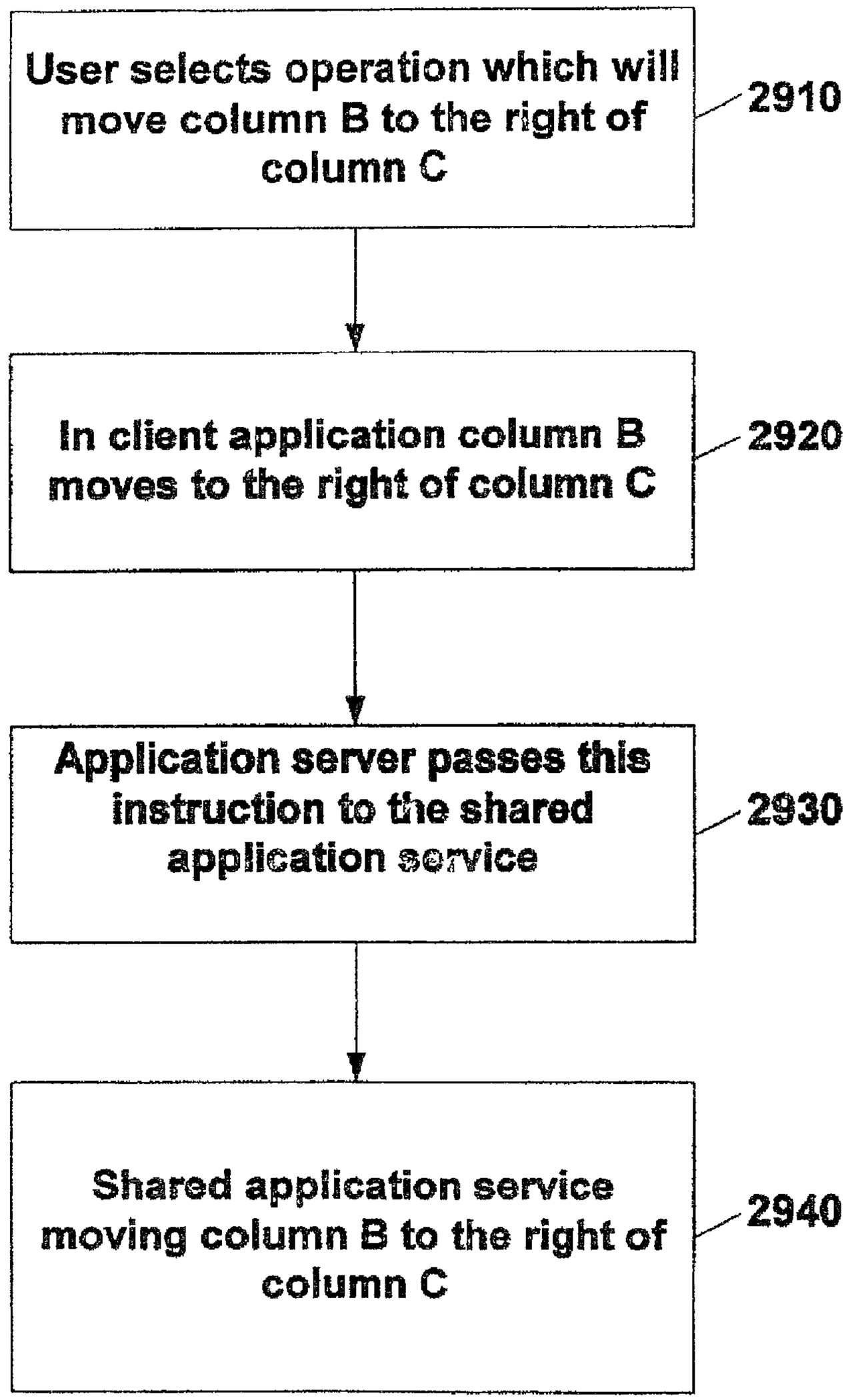
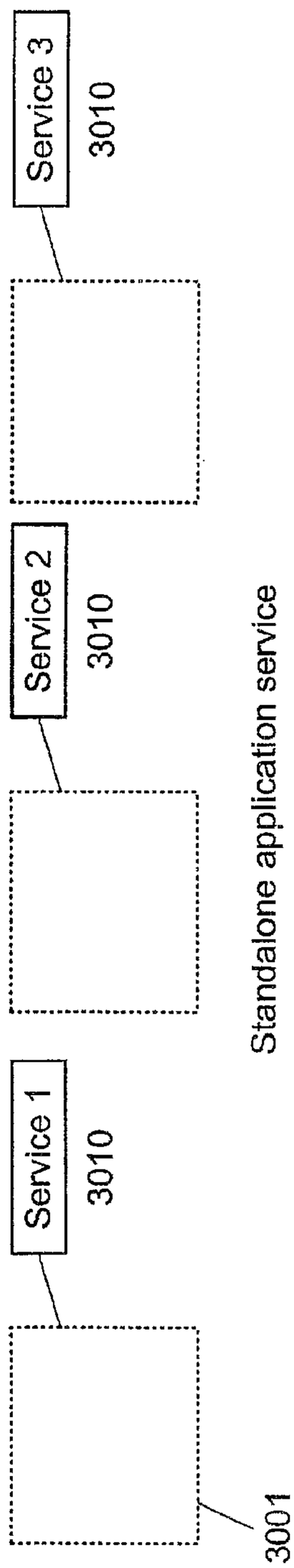
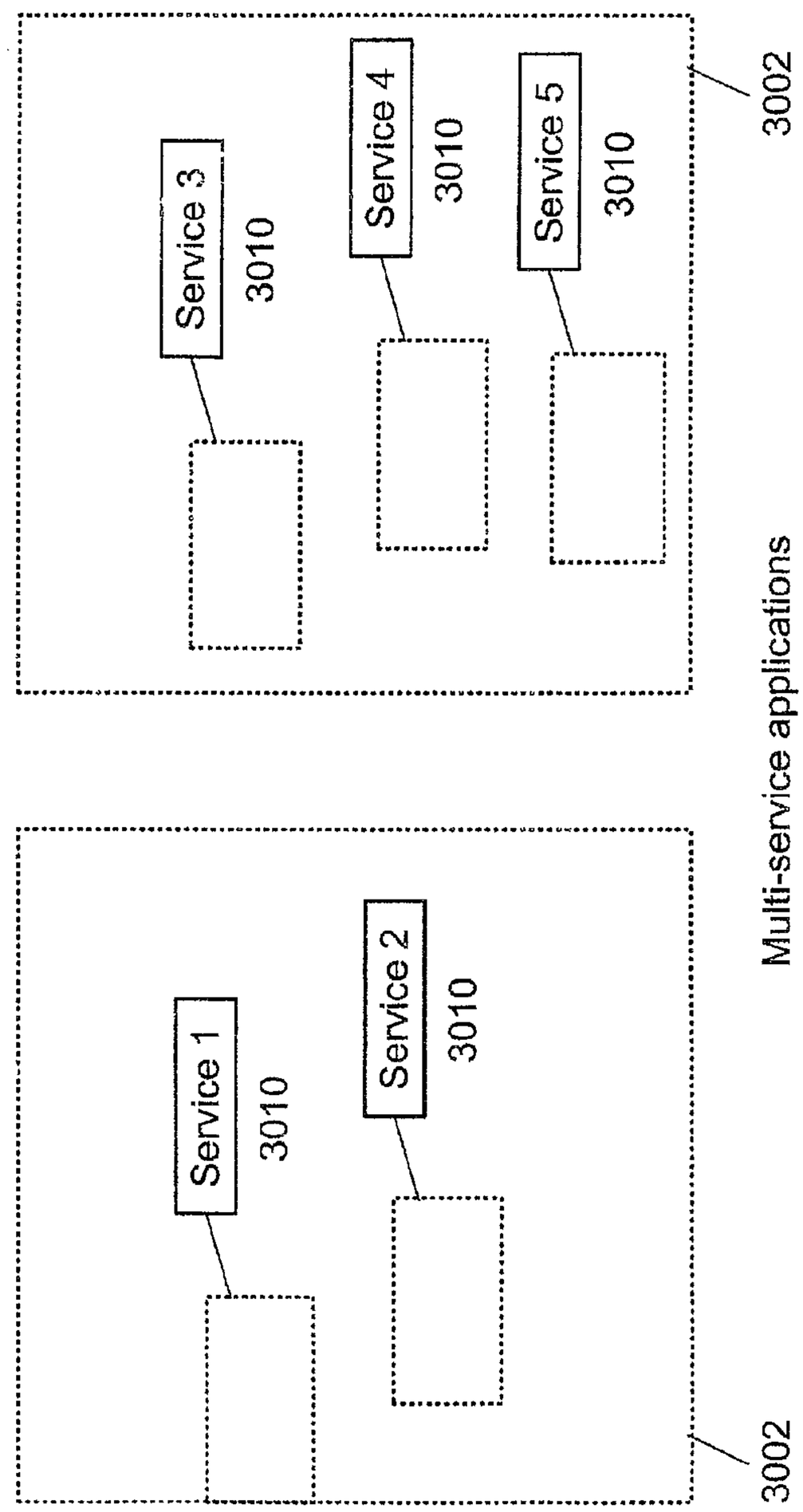

User selects operation which will move column B to the right of column C
2910
In client application column B moves to the right of column C
2920
Application server passes this instruction to the shared application service
2930
Shared application service moving column B to the right of column C
2940

FIG. 29



Standalone application service

FIG. 30A



Multi-service applications

FIG. 30B

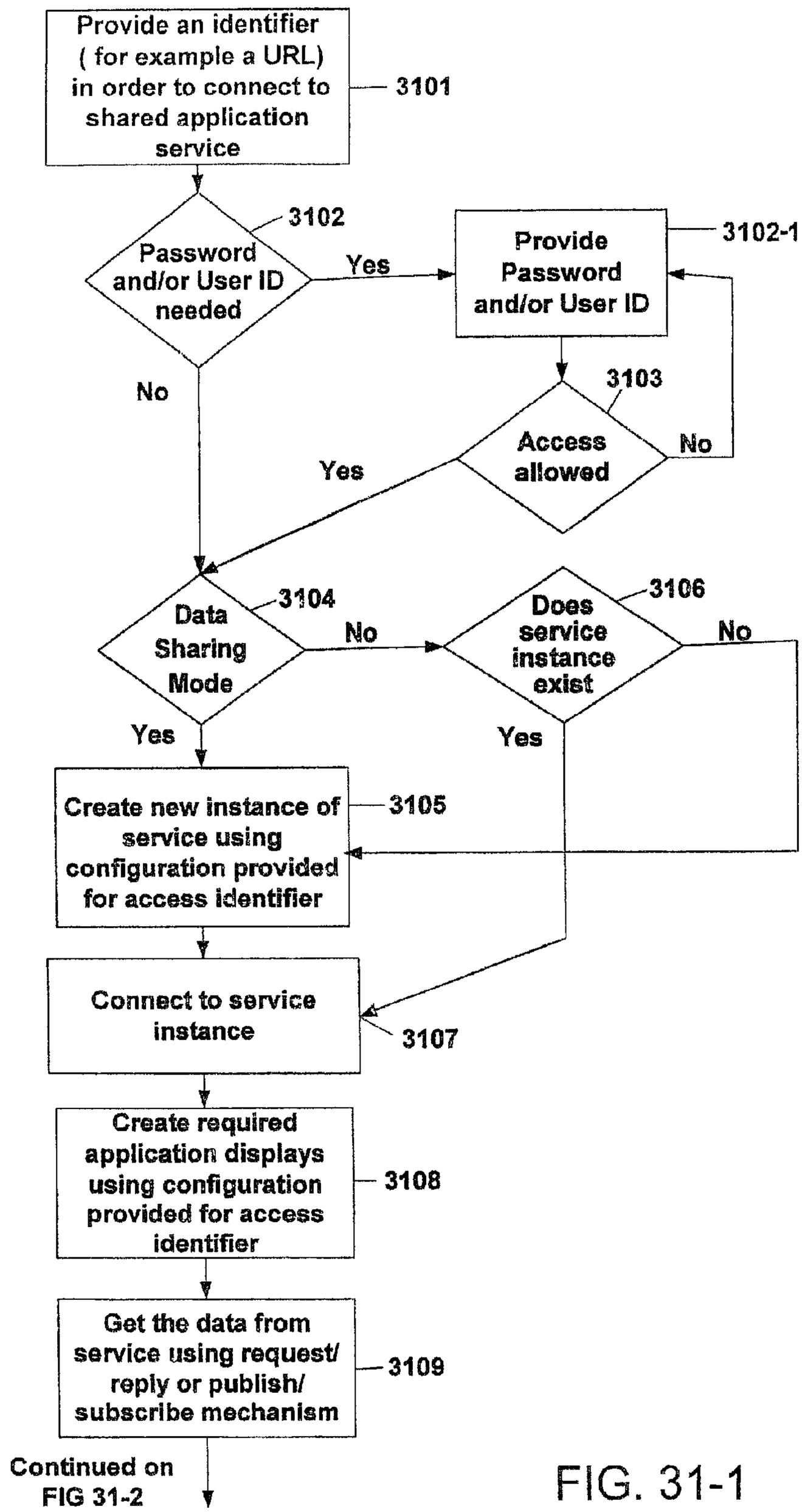

Provide an identifier (for example a URL) in order to connect to shared application service
3101
Password and/or User ID needed
3102
Yes
No
Provide Password and/or User ID
3102-1
Access allowed
3103
No
Yes
Data Sharing Mode
3104
No
Does service instance exist
3106
No
Yes
Yes
Create new instance of service using configuration provided for access identifier
3105
Connect to service instance
3107
Create required application displays using configuration provided for access identifier
3108
Get the data from service using request/ reply or publish/ subscribe mechanism
3109
Continued on FIG 31-2

FIG. 31-1

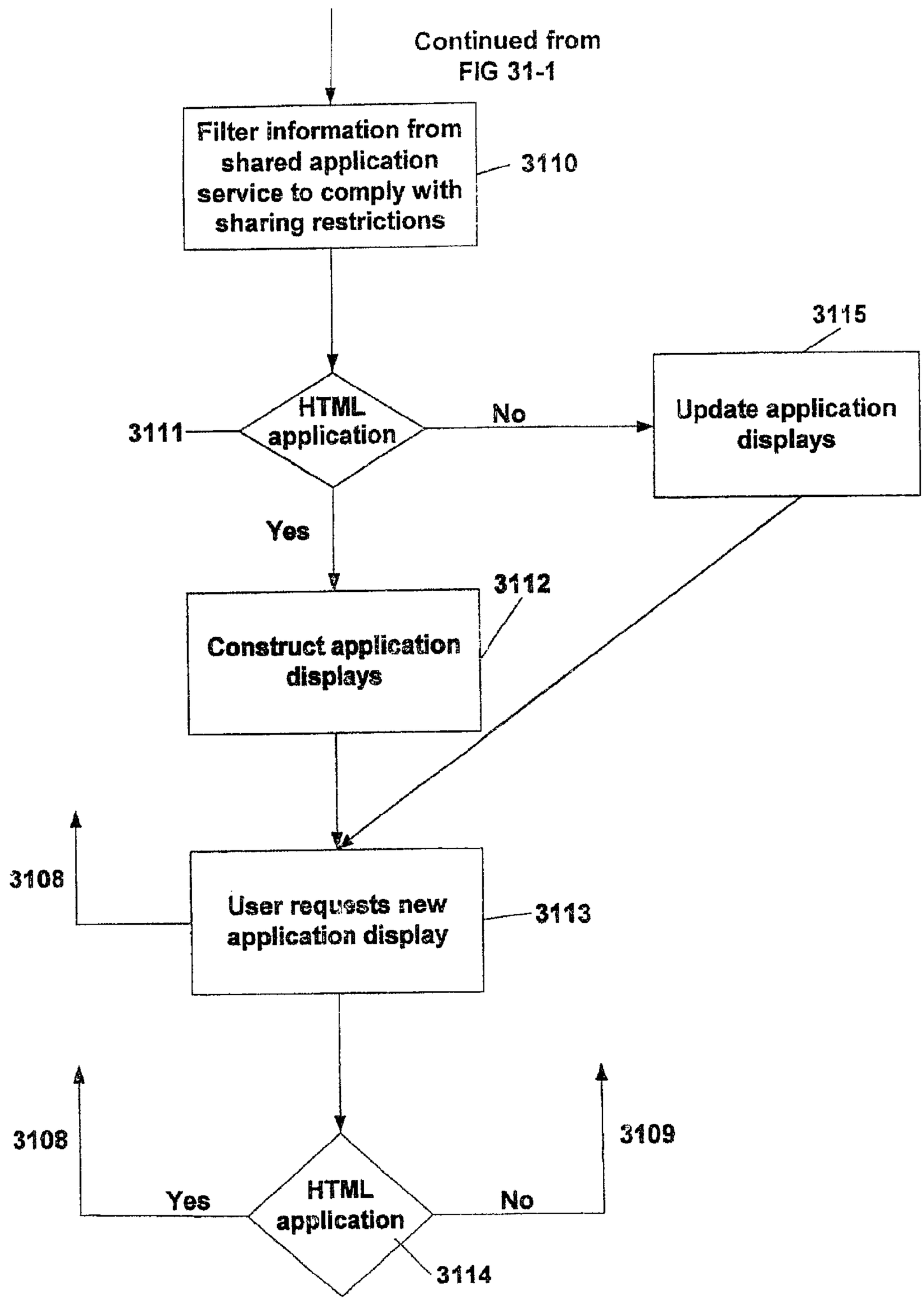

Continued from FIG 31-1
Filter information from shared application service to comply with sharing restrictions
3110
HTML application
3111
No
Update application displays
3115
Yes
Construct application displays
3112
User requests new application display
3113
3108
3108
3109
Yes
HTML application
No
3114

FIG. 31-2

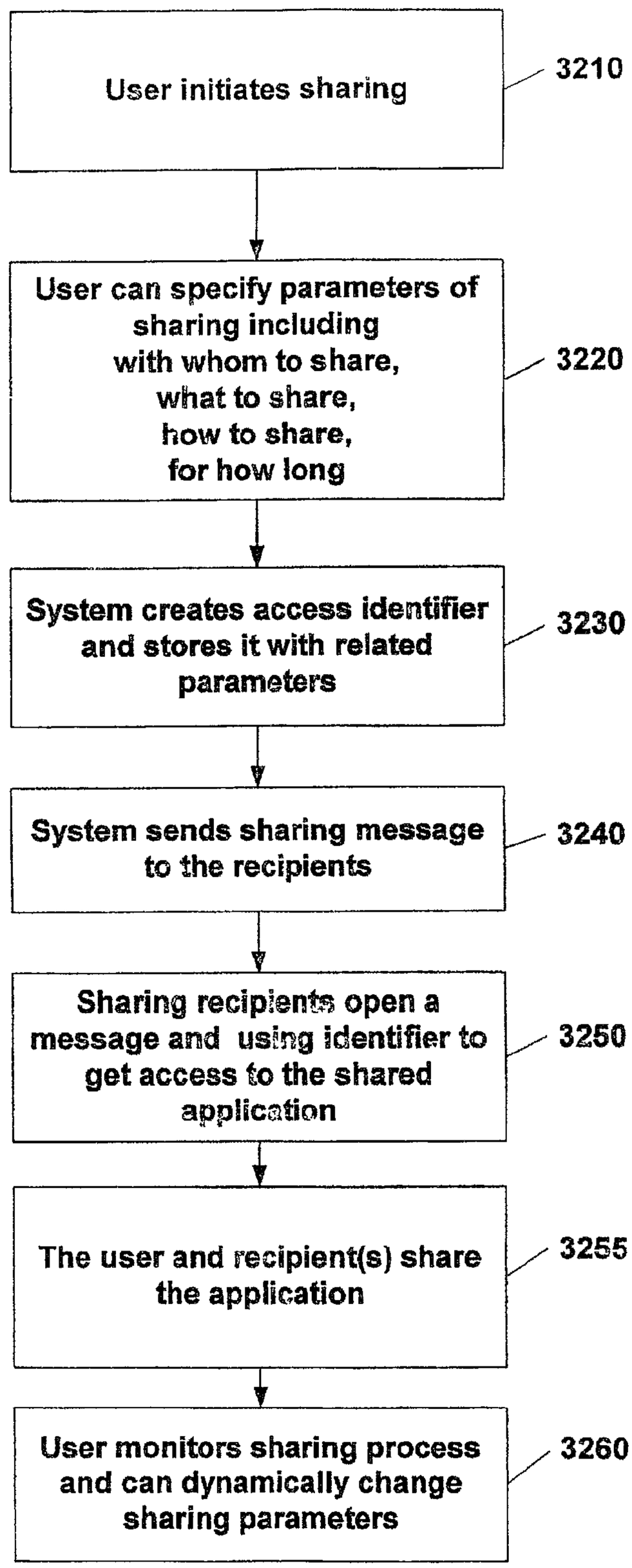

User initiates sharing
3210
User can specify parameters of sharing including with whom to share, what to share, how to share, for how long
3220
System creates access identifier and stores it with related parameters
3230
System sends sharing message to the recipients
3240
Sharing recipients open a message and using identifier to get access to the shared application
3250
The user and recipient(s) share the application
3255
User monitors sharing process and can dynamically change sharing parameters
3260

FIG. 32

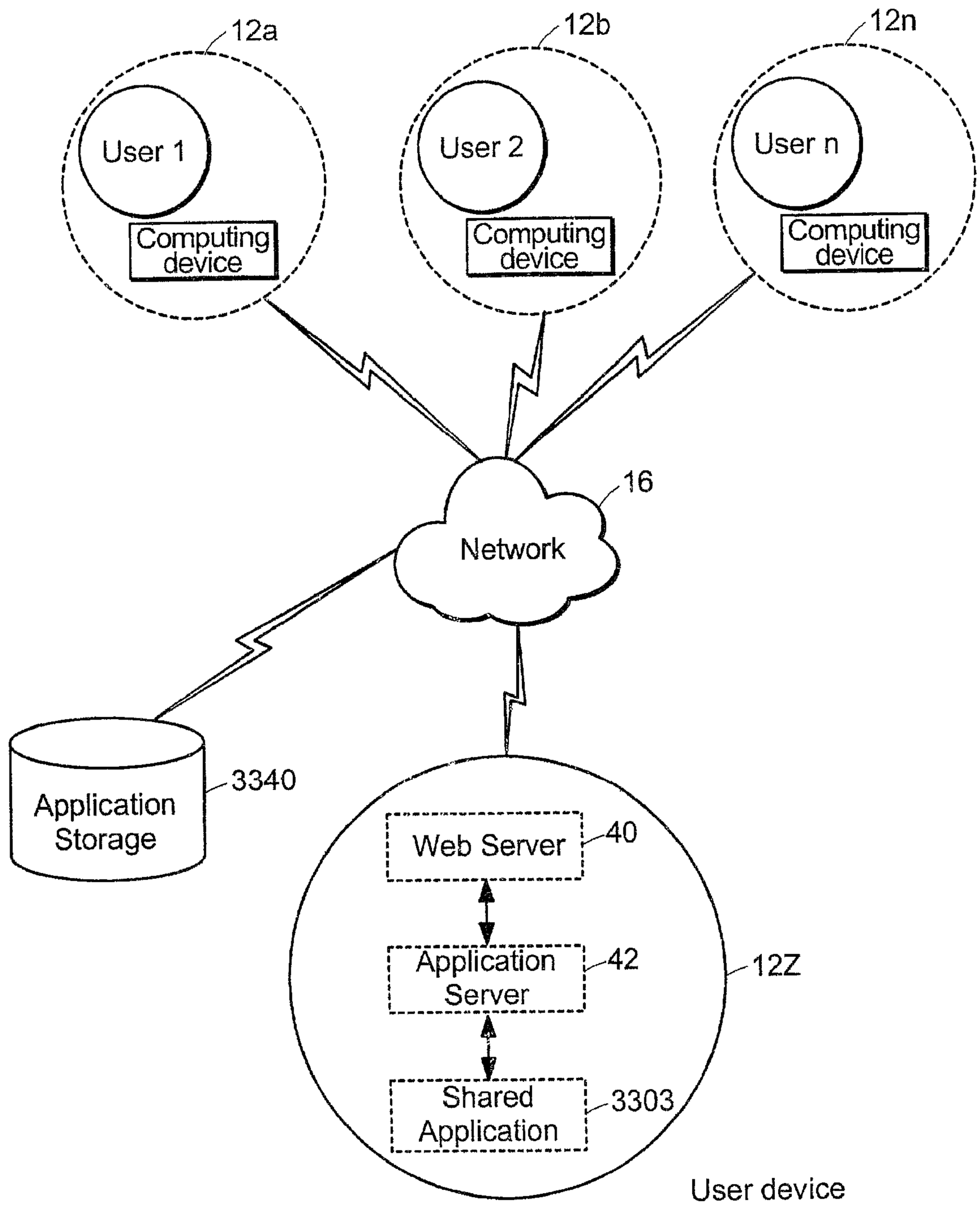

12a
User 1
Computing device
12b
User 2
Computing device
12n
User n
Computing device
16
Network
Application Storage
3340
Web Server
40
Application Server
42
12Z
Shared Application
3303
User device

FIG. 33

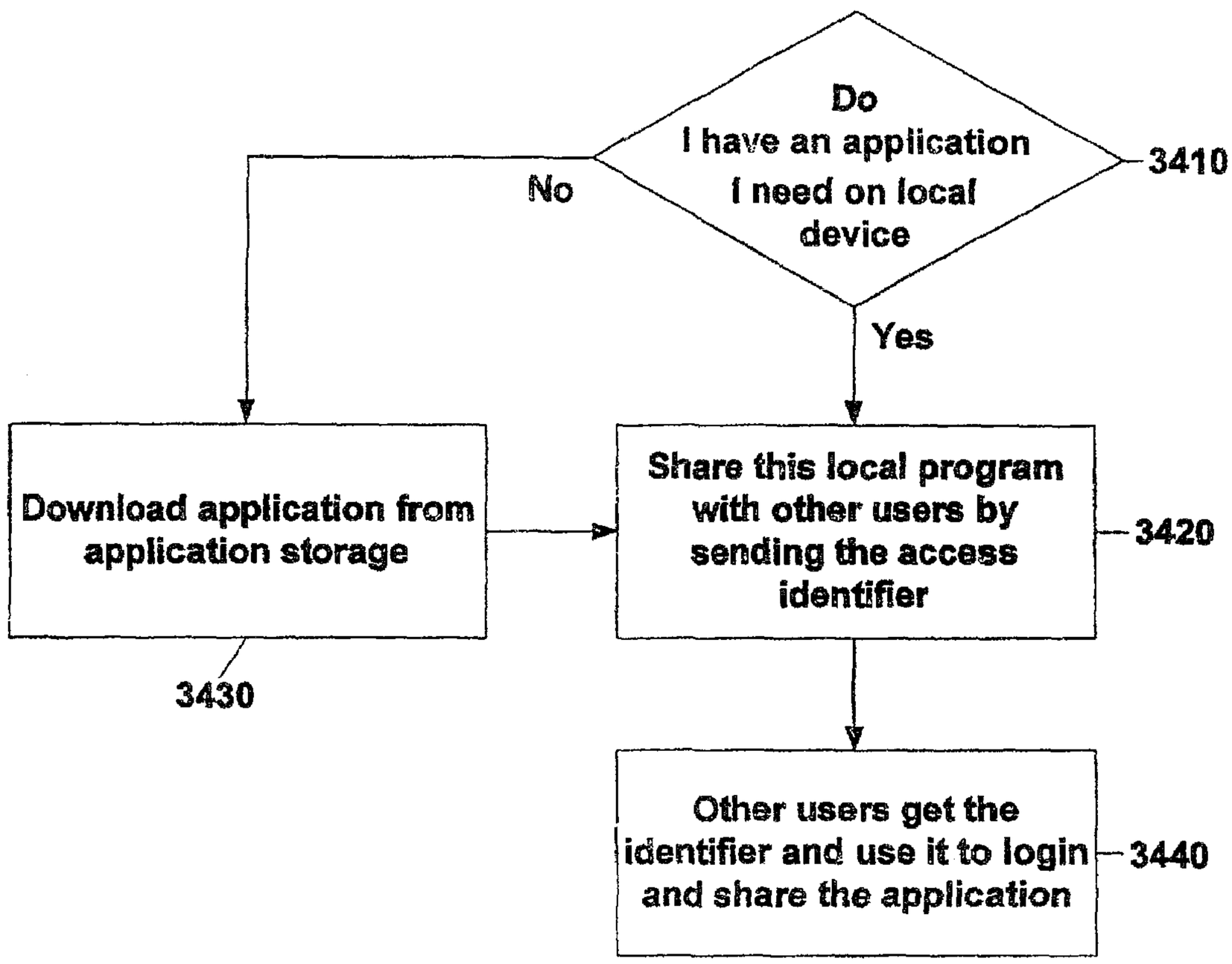

Do
I have an application
I need on local
device
3410
No
Yes
Download application from
application storage
3430
Share this local program
with other users by
sending the access
identifier
3420
Other users get the
identifier and use it to login
and share the application
3440

FIG. 34

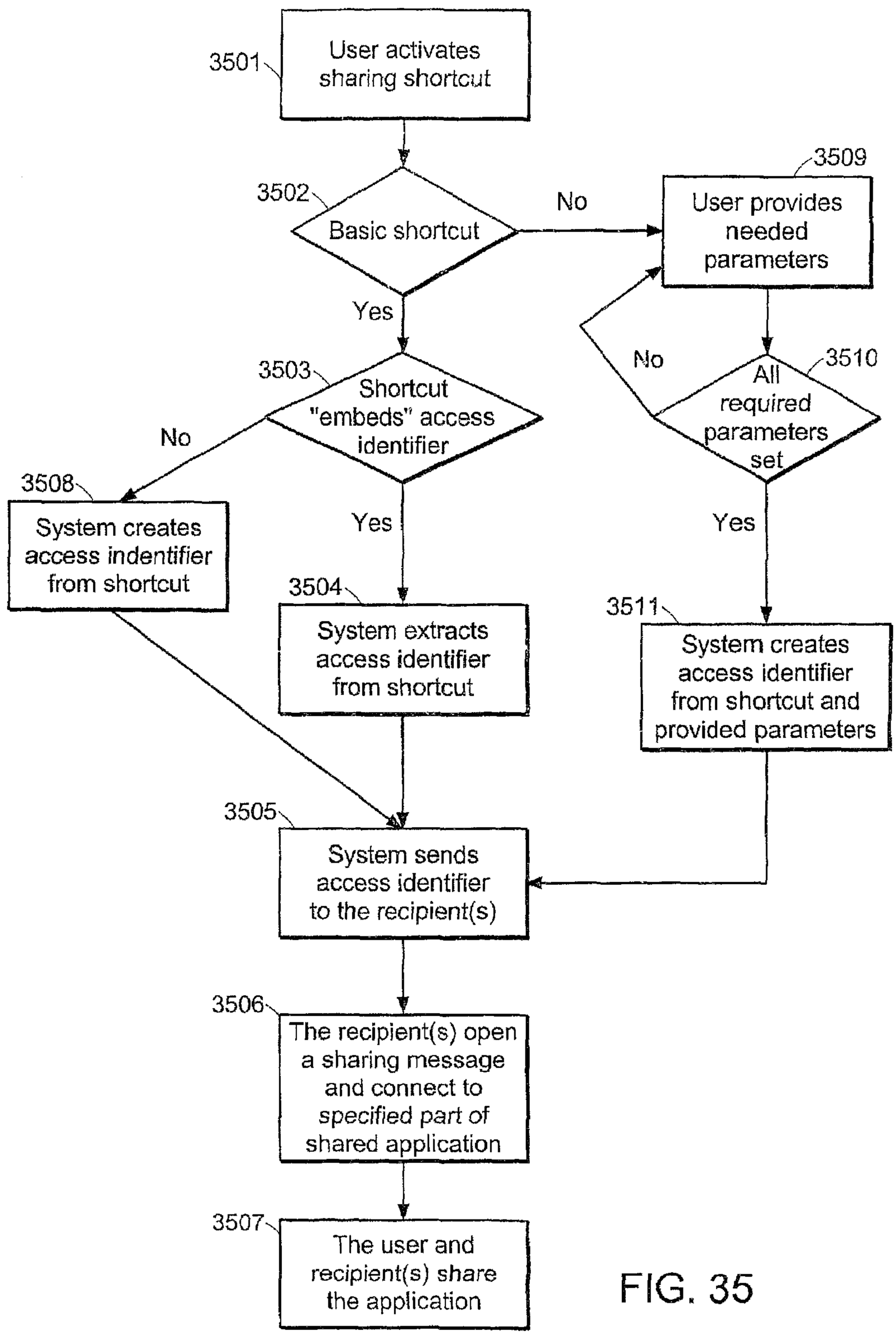

3501
User activates sharing shortcut
3502
Basic shortcut
No
3509
User provides needed parameters
Yes
No
3510
All required parameters set
3503
Shortcut "embeds" access identifier
No
3508
System creates access indentifier from shortcut
Yes
Yes
3504
System extracts access identifier from shortcut
3511
System creates access identifier from shortcut and provided parameters
3505
System sends access identifier to the recipient(s)
3506
The recipient(s) open a sharing message and connect to specified part of shared application
3507
The user and recipient(s) share the application

FIG. 35

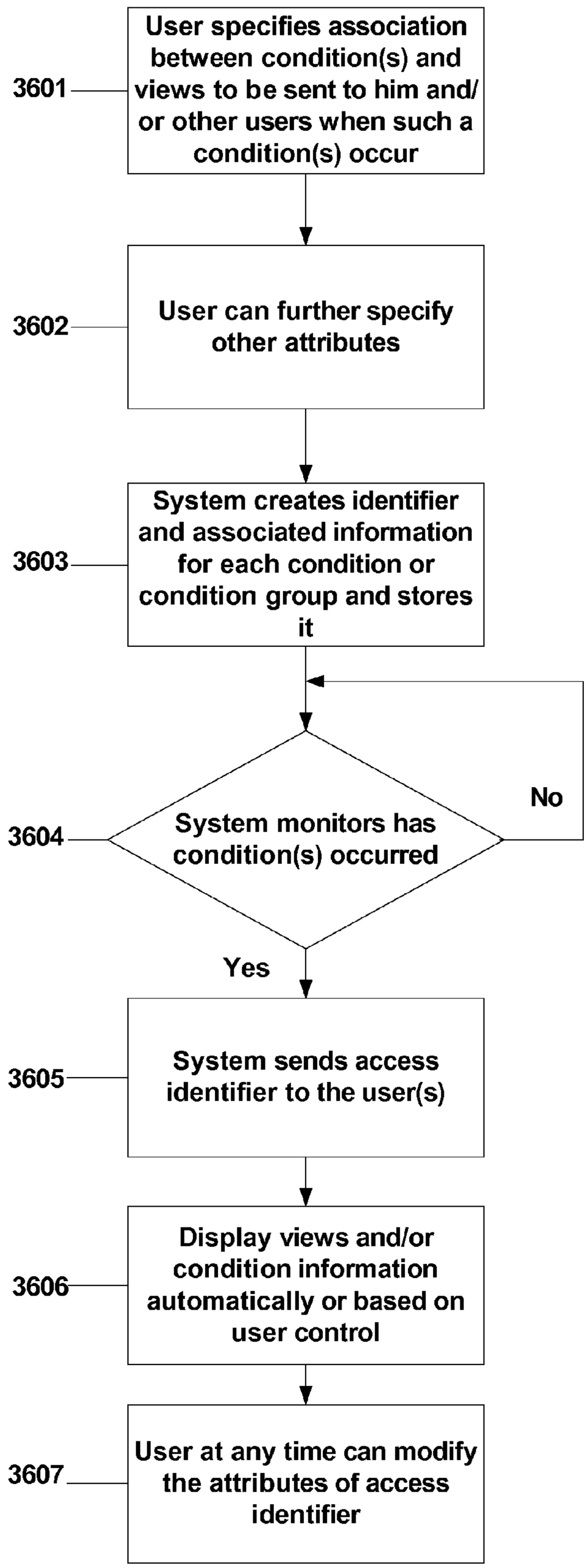

3601
User specifies association between condition(s) and views to be sent to him and/or other users when such a condition(s) occur
3602
User can further specify other attributes
3603
System creates identifier and associated information for each condition or condition group and stores it
3604
System monitors has condition(s) occurred
No
Yes
3605
System sends access identifier to the user(s)
3606
Display views and/or condition information automatically or based on user control
3607
User at any time can modify the attributes of access identifier

FIG. 36

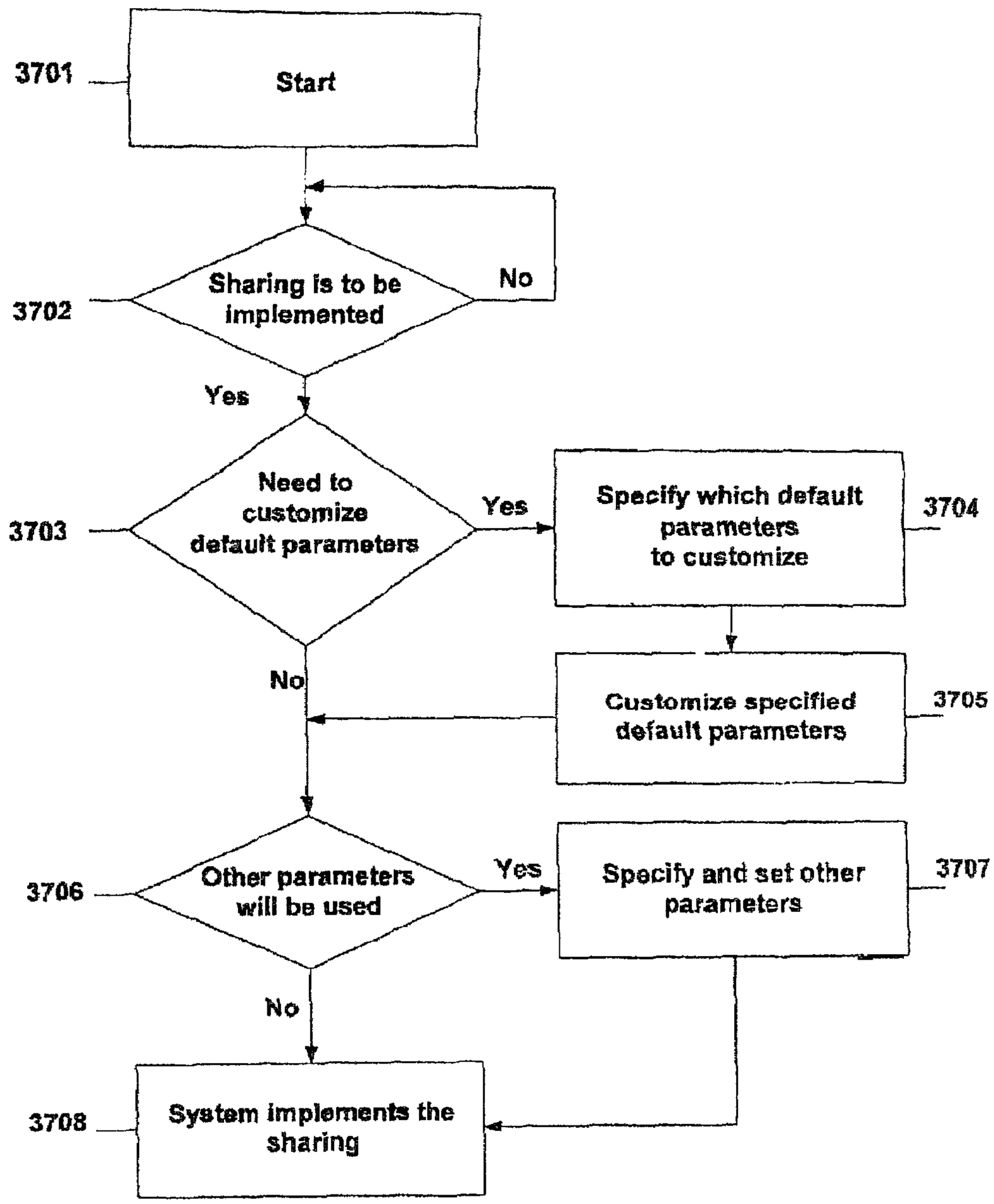

3701
Start
3702
Sharing is to be implemented
No
Yes
3703
Need to customize default parameters
Yes
Specify which default parameters to customize
3704
No
Customize specified default parameters
3705
3706
Other parameters will be used
Yes
Specify and set other parameters
3707
No
3708
System implements the sharing

FIG. 37

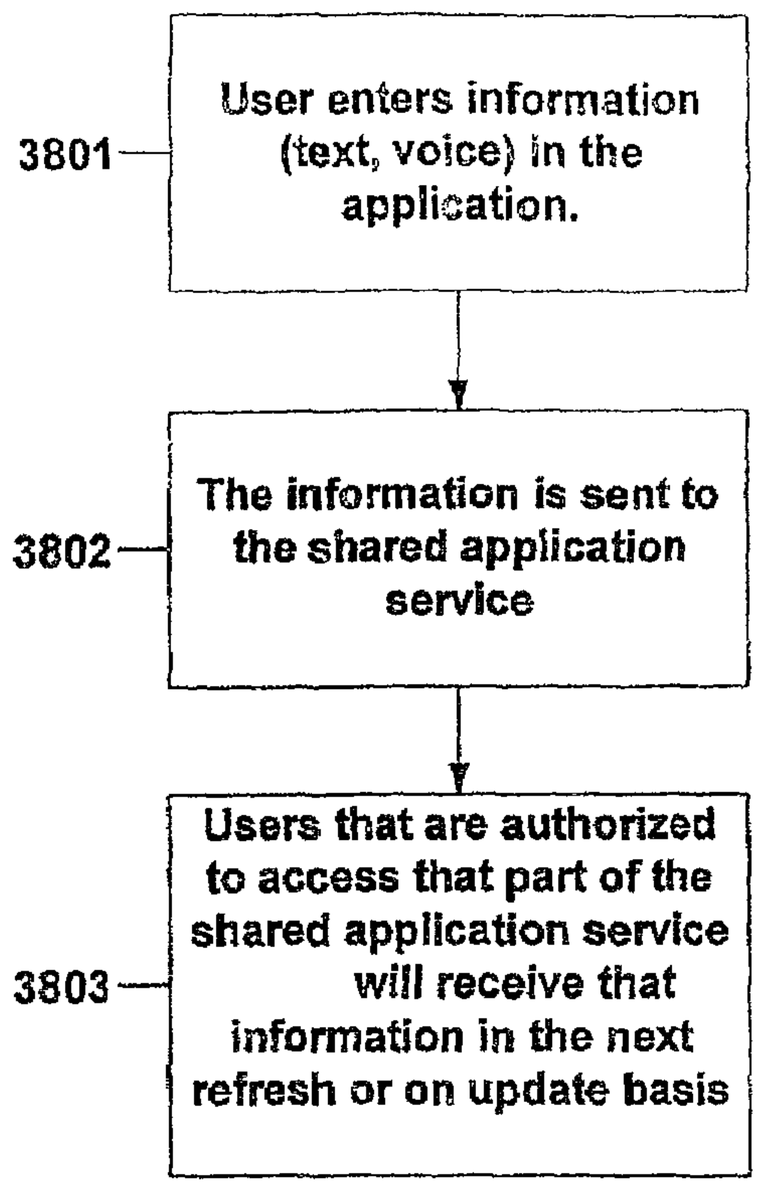


FIG. 38

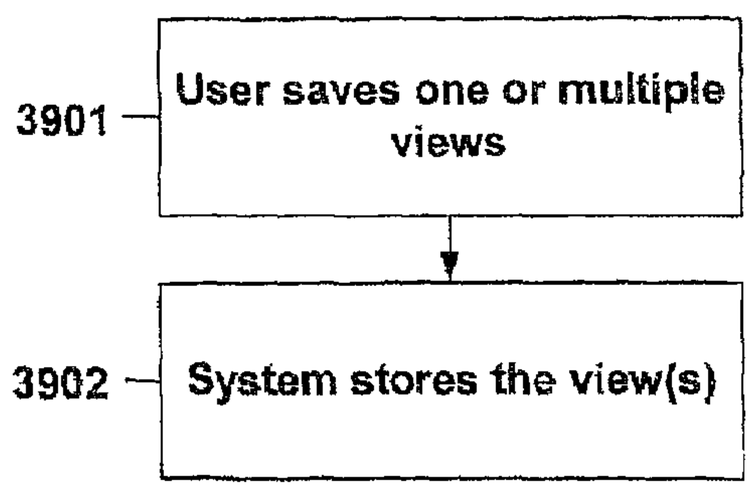


FIG. 39A

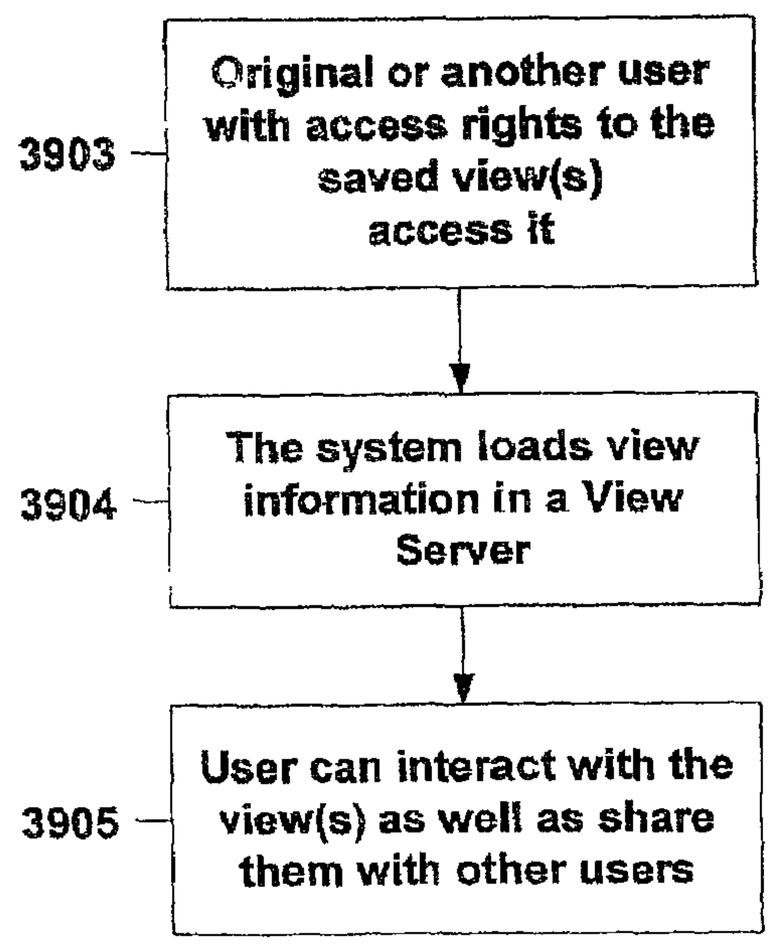


FIG. 39B

4001

{	{	{	{
A	B	C	D
Text1	1100	200	150
Text2	500	100	200
Text3	1100	300	450
Text4	700	500	100
Text5	800	700	250
Text6	850	900	600
Text7	800	400	200
TOTAL	5850	3100	1950

4010

FIG. 40A

4002

{	{	{	
B	C	D	
500	100	200	
700	500	100	
800	1100	450	
850	900	600	
1100	500	600	
TOTAL	3100	1950	

4003

4003A

4020

4006

FIG. 40B

{	{	{	
B	C avg	D	
500	100	200	
700	500	100	
800	550	450	
850	900	600	
1100	250	600	
TOTAL	3100	1950	

4030

FIG. 40C

{	{	{	{
A	B	C	D
Text1	1100	200	150
Text3	1100	300	450
TOTAL	2200	500	600

4040

FIG. 40D

{		{
D	B	C
100	700	500
150	1100	200
200	1300	500
250	800	700
450	1100	300
600	850	900
TOTAL	5850	3100

4050

FIG. 40E

4101

{	{	{	{
A	B	C	D
Text1	1100	200	150
Text2	500	100	200
Text3	1100	300	450
Text4	700	500	100
Text5	800	700	250
Text6	850	900	600
Text7	800	400	200
TOTAL	5850	3100	1950

4110

FIG. 41A

4102

{		{	{
B		C	D
	500-750	600	300
	750-1000	2000	1050
	1000-1250	500	600
TOTAL		3100	1950

4003

4120

FIG. 41B

{		{	{
B		C avg	D
	500-750	300	300
	750-1000	666.67	1050
	1000-1250	250	600
TOTAL		3100	1950

4130

FIG. 41C

4201

*	*	*	*
A	B	C	D
Text1	1100	200	150
Text2	500	100	200
Text3	1100	300	450
Text4	700	500	100
Text5	800	700	250
Text6	850	900	600
Text7	800	400	200
TOTAL	5850	3100	1950

4210

FIG. 42A

4202

*	*	*	*
A	B	C	D
Text2	500	100	200
Text4	700	500	100
Text5	800	700	250
Text6	850	900	600
Text7	800	400	200
TOTAL	3650	2600	1350

4220

FIG. 42B

4203

*	*	*	*
A	B	C	D
Text2	500	100	200
Text4	700	500	100
Text5	800	700	250
Text7	800	400	200
TOTAL	2800	1700	750

4230

FIG. 42C

A	B	C	D
Text1	1100	200	150
Text2	500	100	200
Text3	1100	300	450
TOTAL	2700	600	800

4310

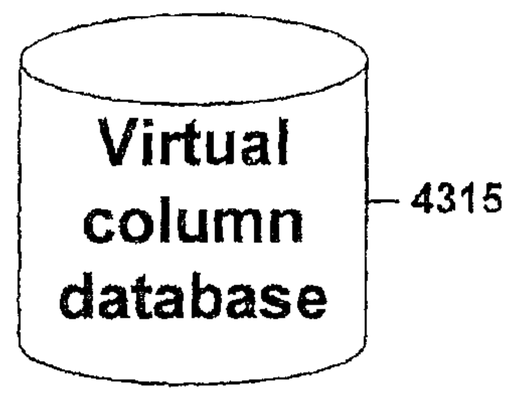


FIG. 43A

A	B	C	D	M
Text1	1100	200	150	125
Text2	500	100	200	175
Text3	1100	300	450	100
TOTAL	2700	600	800	400

4320

FIG. 43B

4332 4332 4332

v	v	v	v	v
A	B	C	D	M
Text1	1100	200	150	125
Text2	500	100	200	175
Text3	1100	300	450	100
TOTAL	2700	600	800	400

4330

FIG. 43C

v	v	v	v
A	B	D	M
Text1	1100	150	125
Text2	500	200	175
Text3	1100	450	100
TOTAL	2700	800	400

4340

FIG. 43D

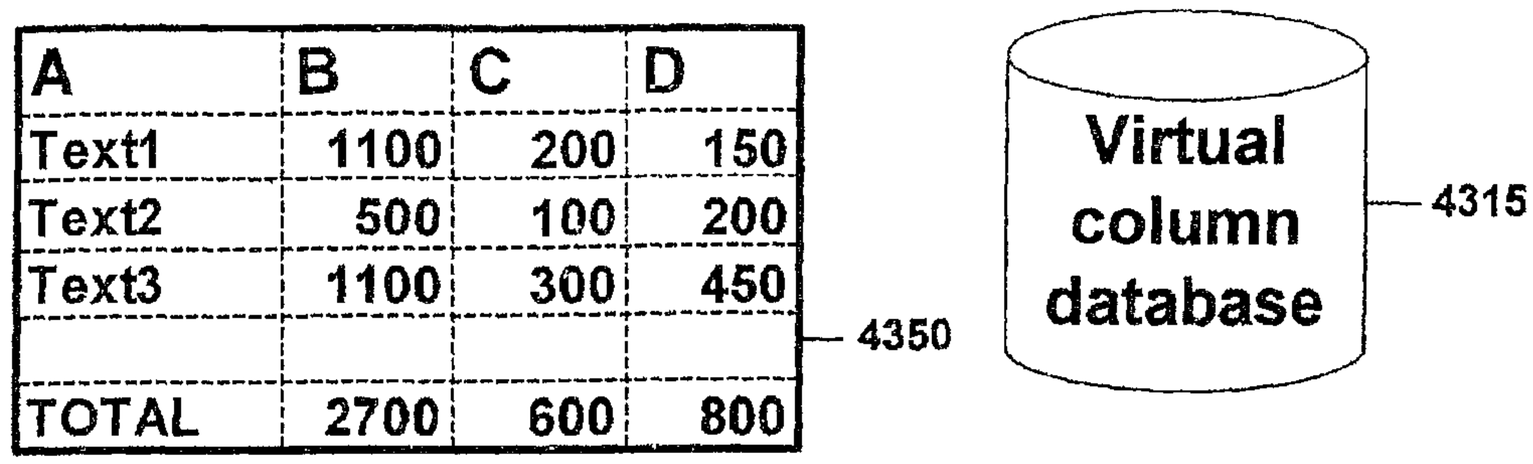


FIG. 43E

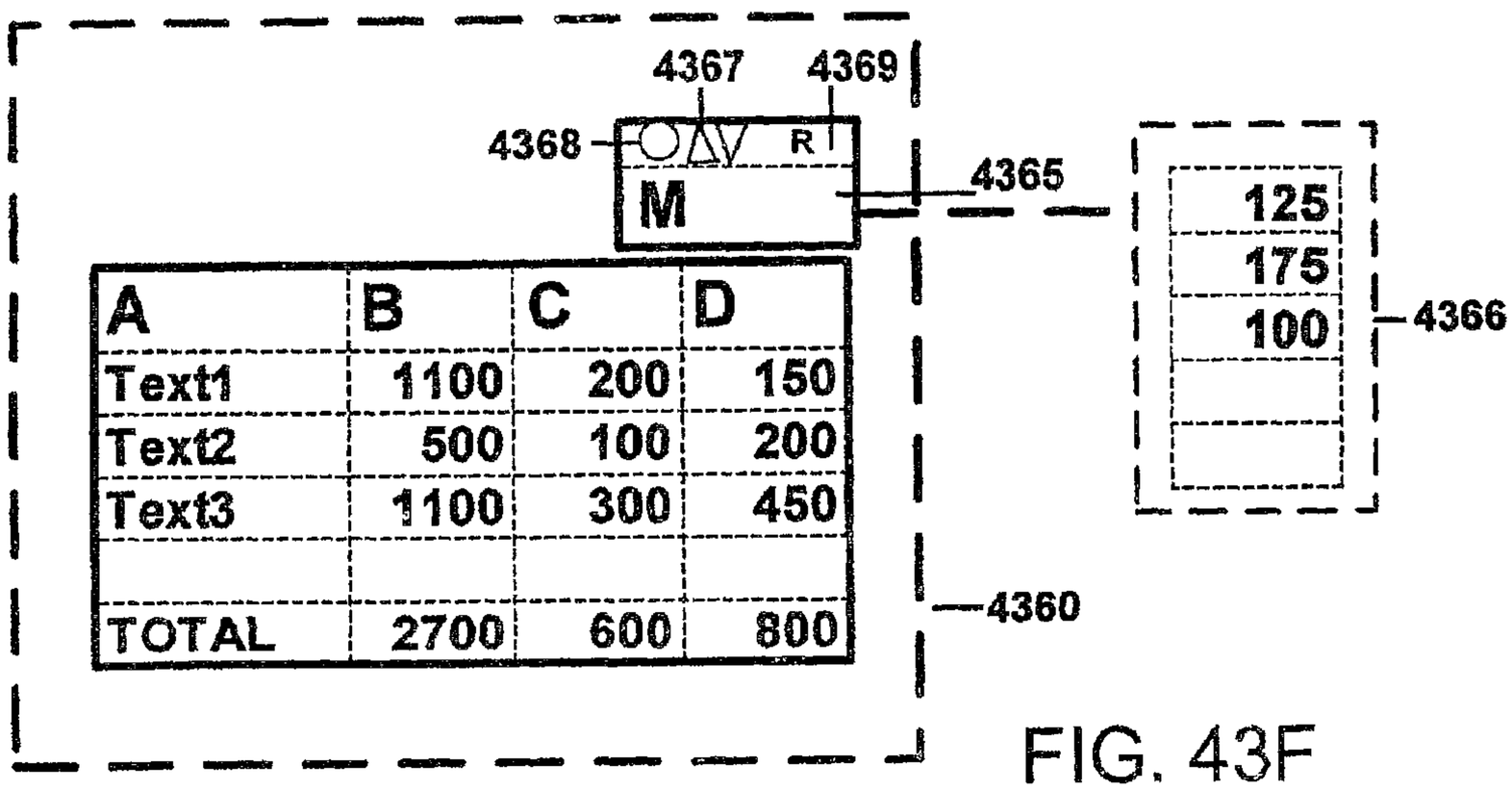


FIG. 43F

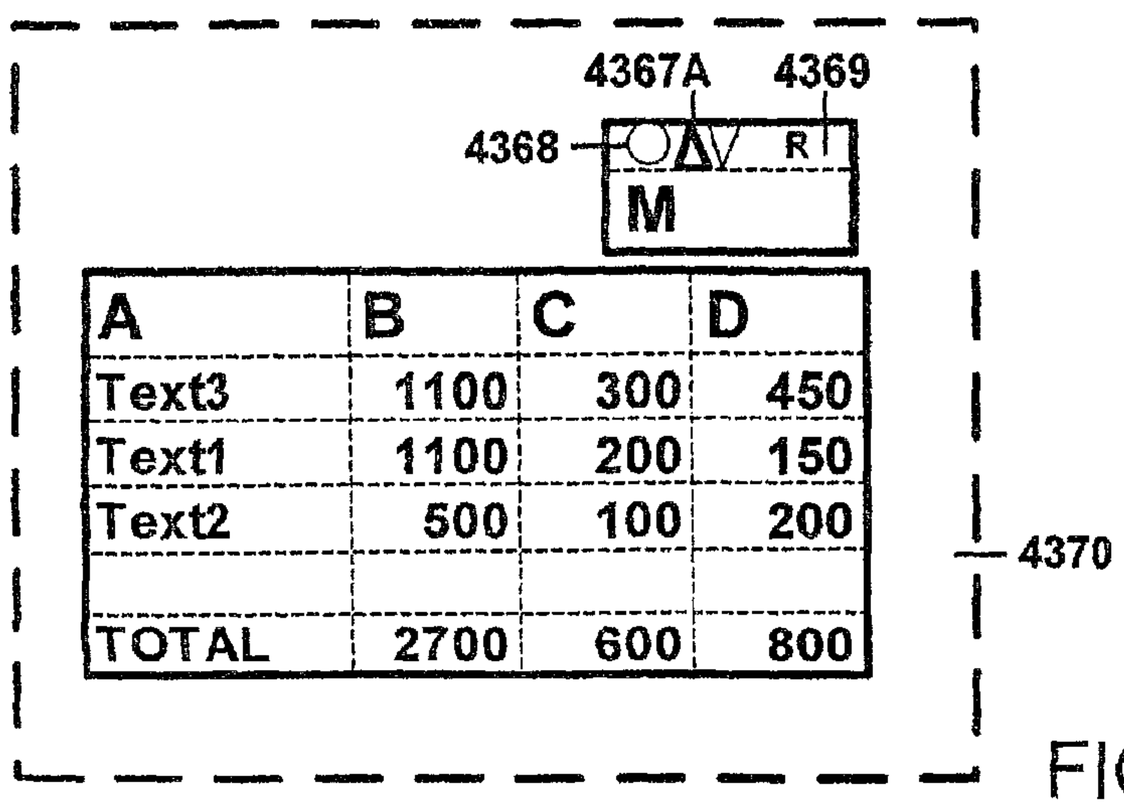


FIG. 43G

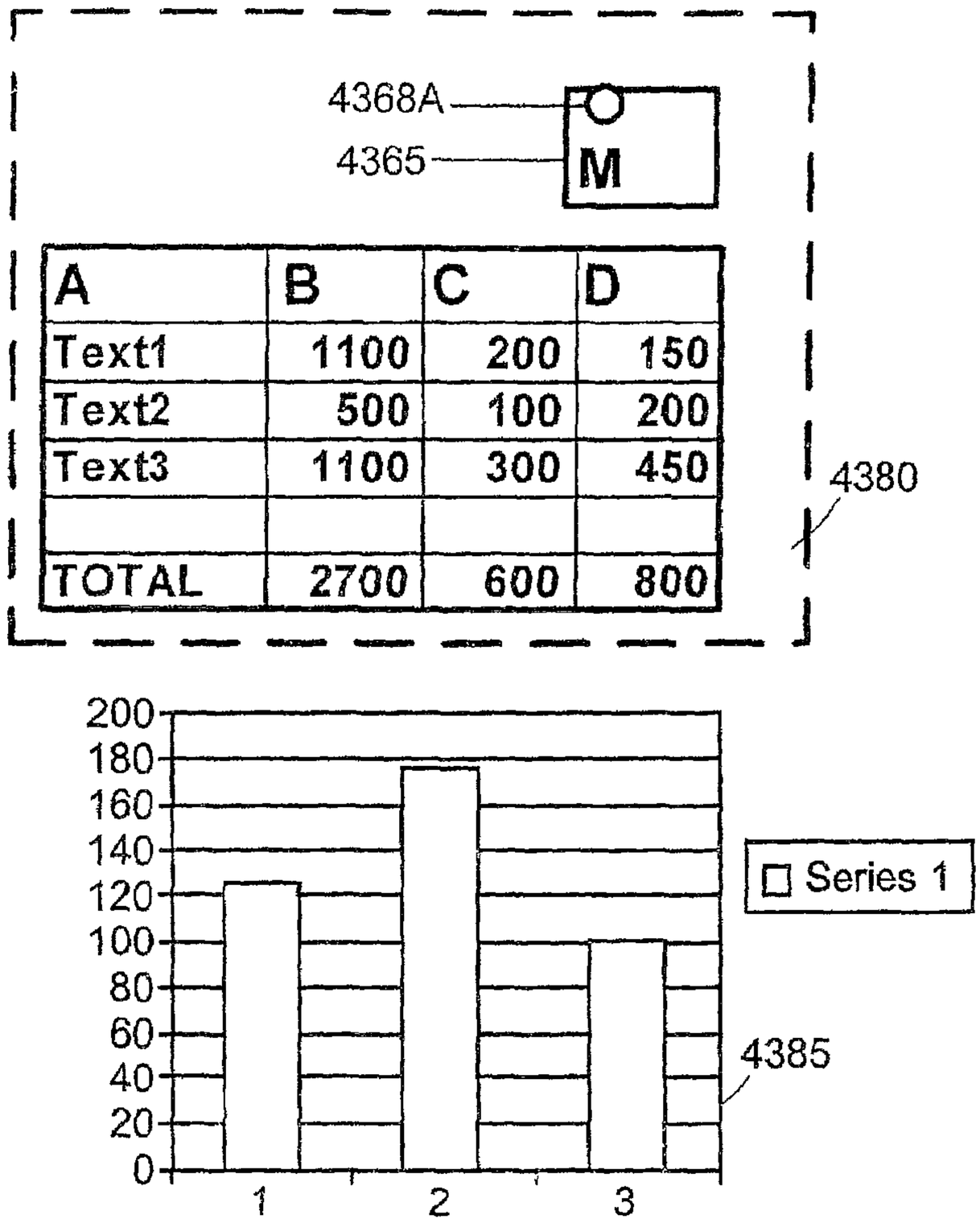


FIG. 43H

A	B	C	D	M
Text1	1100	200	150	125
Text2	500	100	200	175
Text3	1100	300	450	100
TOTAL	2700	600	800	400

4390

FIG. 43I

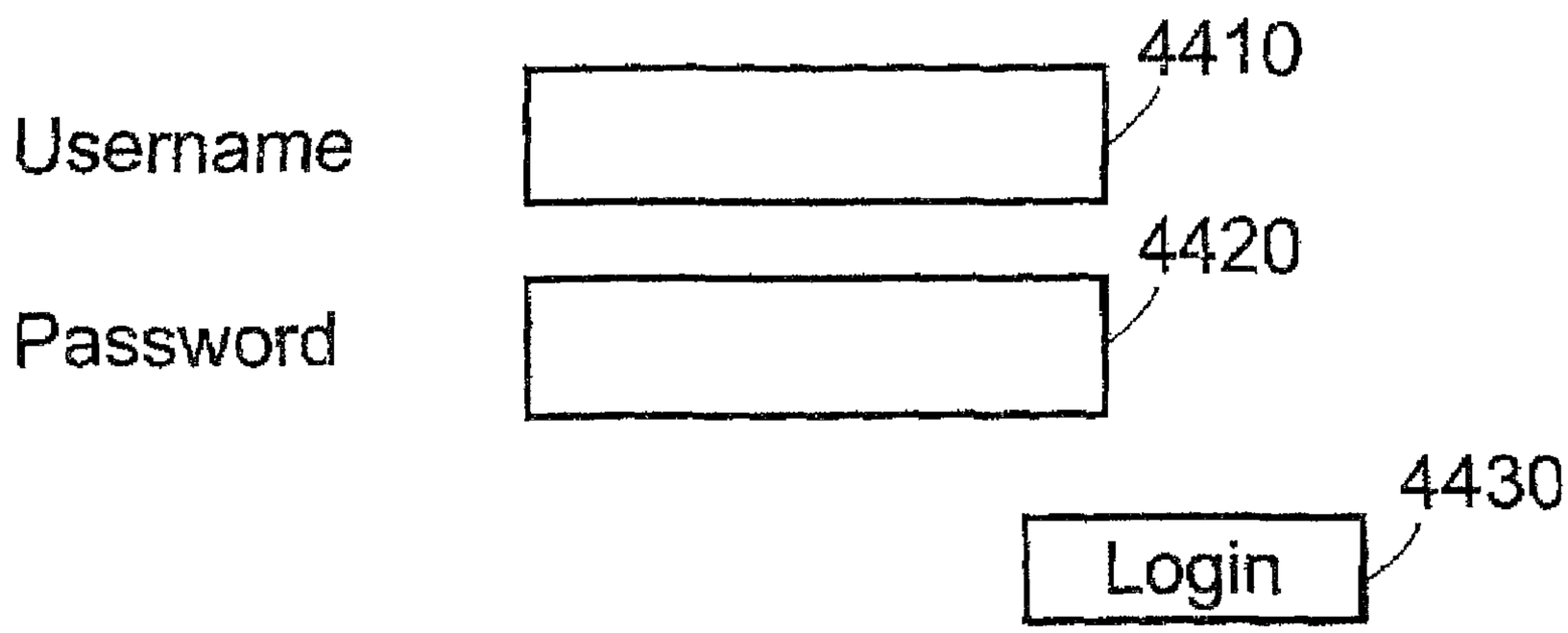


FIG. 44A

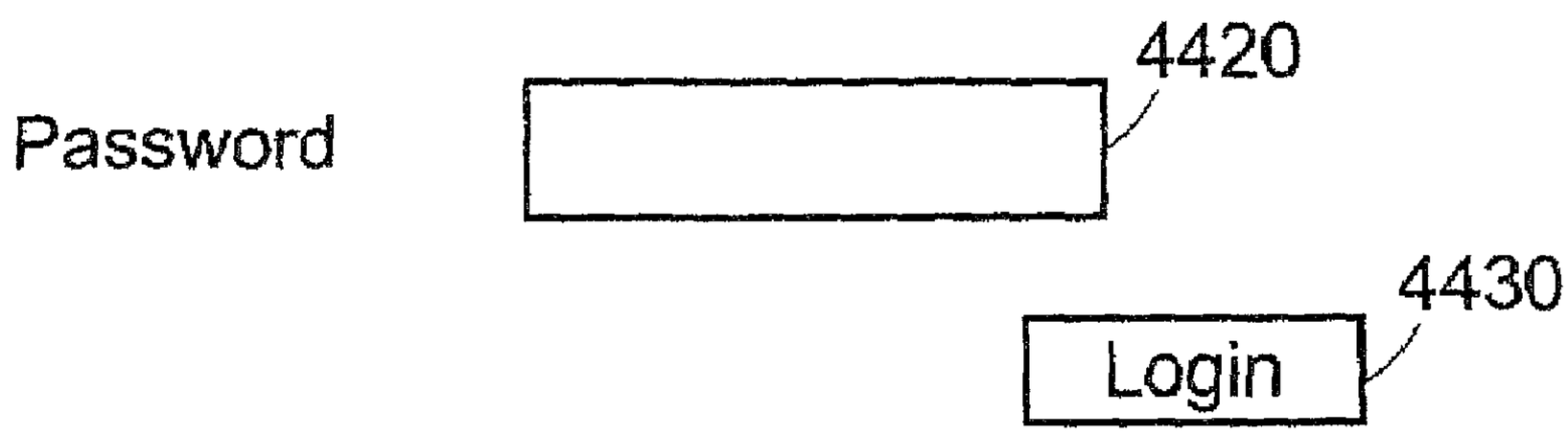


FIG. 44B

4501

o	o	o	o
A	B	C	D
Text1	1100	200	150
Text2	500	100	200
Text3	1100	300	450
Text4	700	500	100
TOTAL	3400	1100	900

4510

FIG. 45A

4502 4503

o	O	o	o
A	B	C	D
Text1	1100	200	150
Text2	500	100	200
Text3	1100	300	450
Text4	700	500	100
TOTAL	3400	1100	900

4510

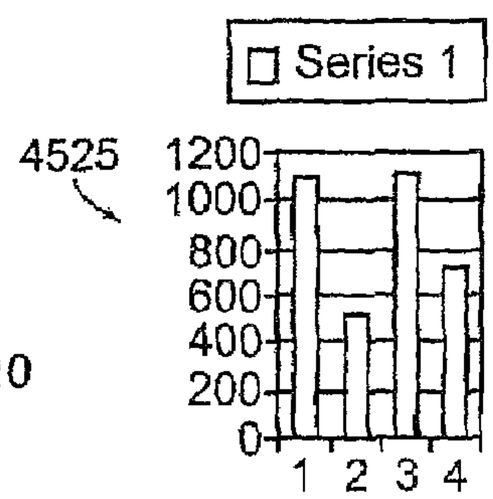


FIG. 45B

4501 4504

o	o	o	O
A	B	C	D
Text1	1100	200	150
Text2	500	100	200
Text3	1100	300	450
Text4	700	500	100
TOTAL	3400	1100	900

4510

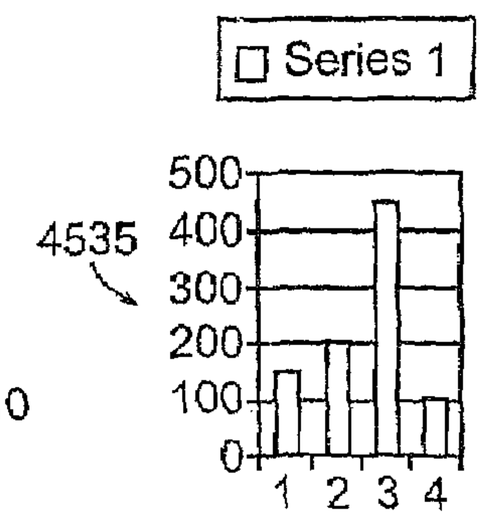
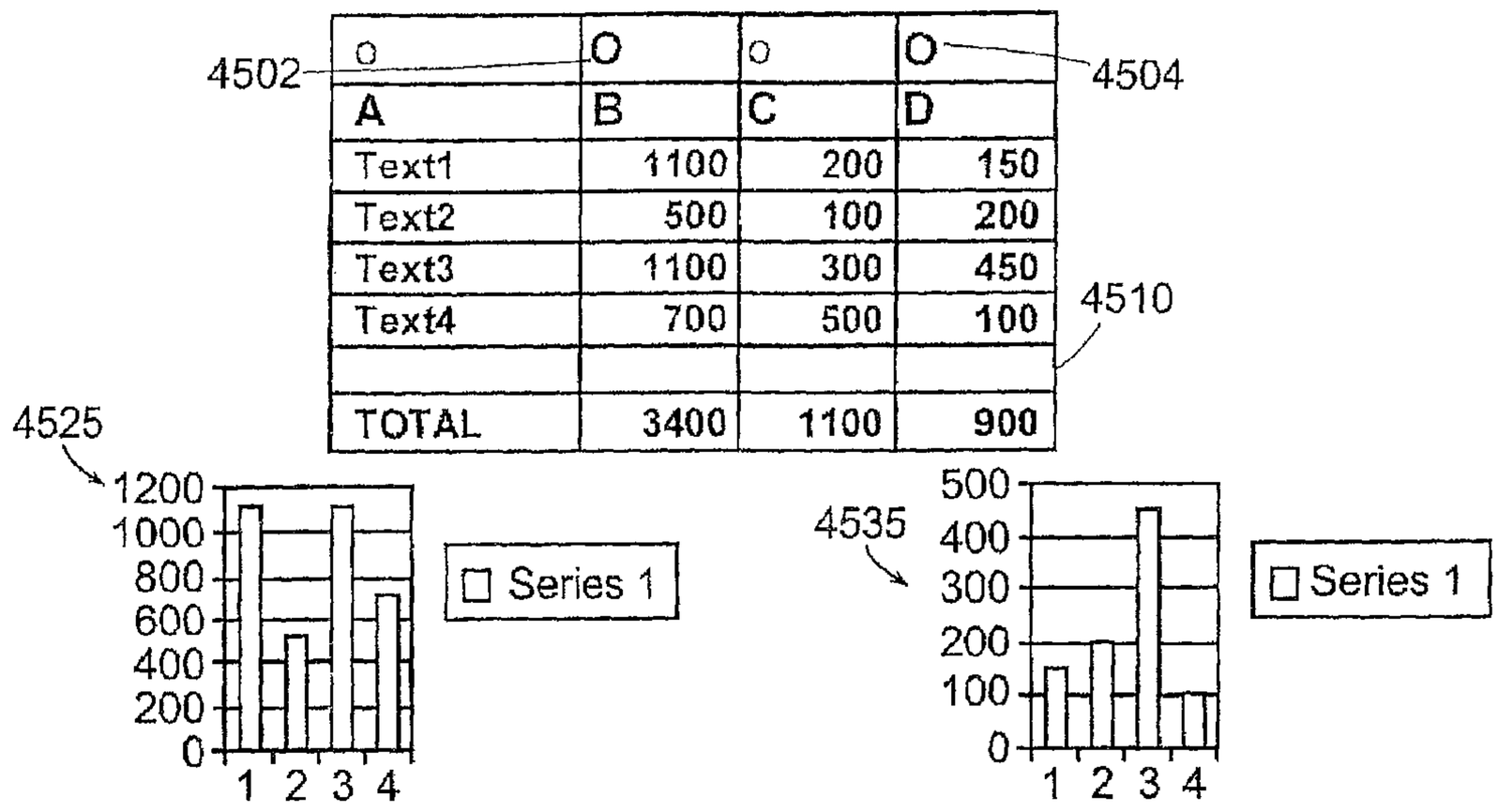
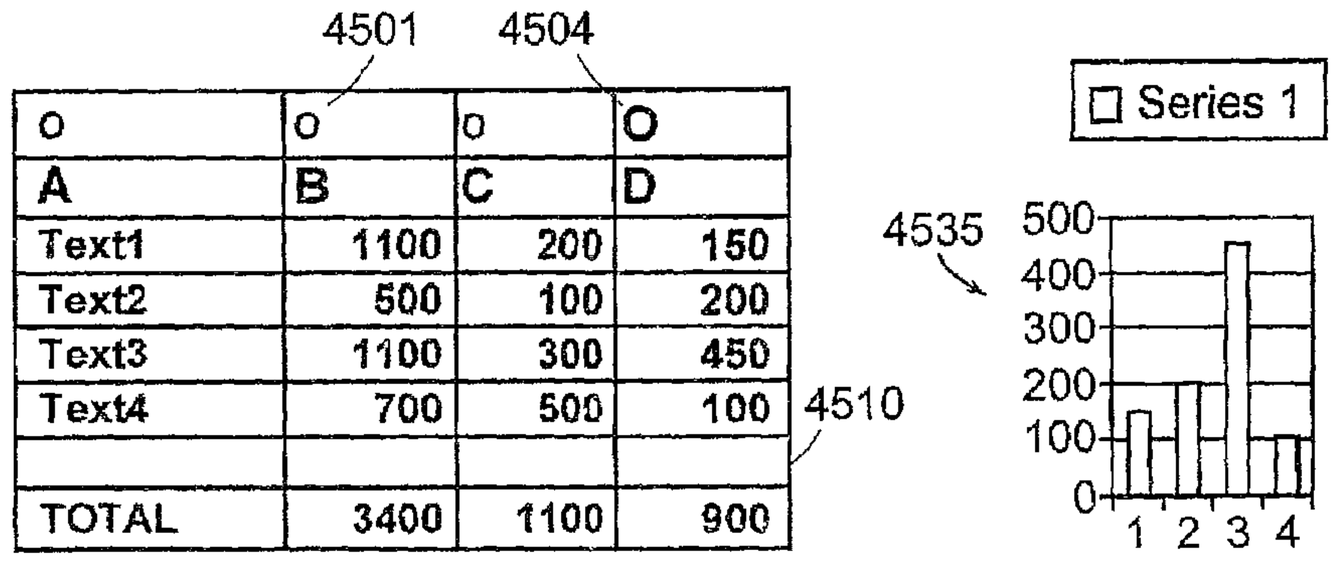


FIG. 45C



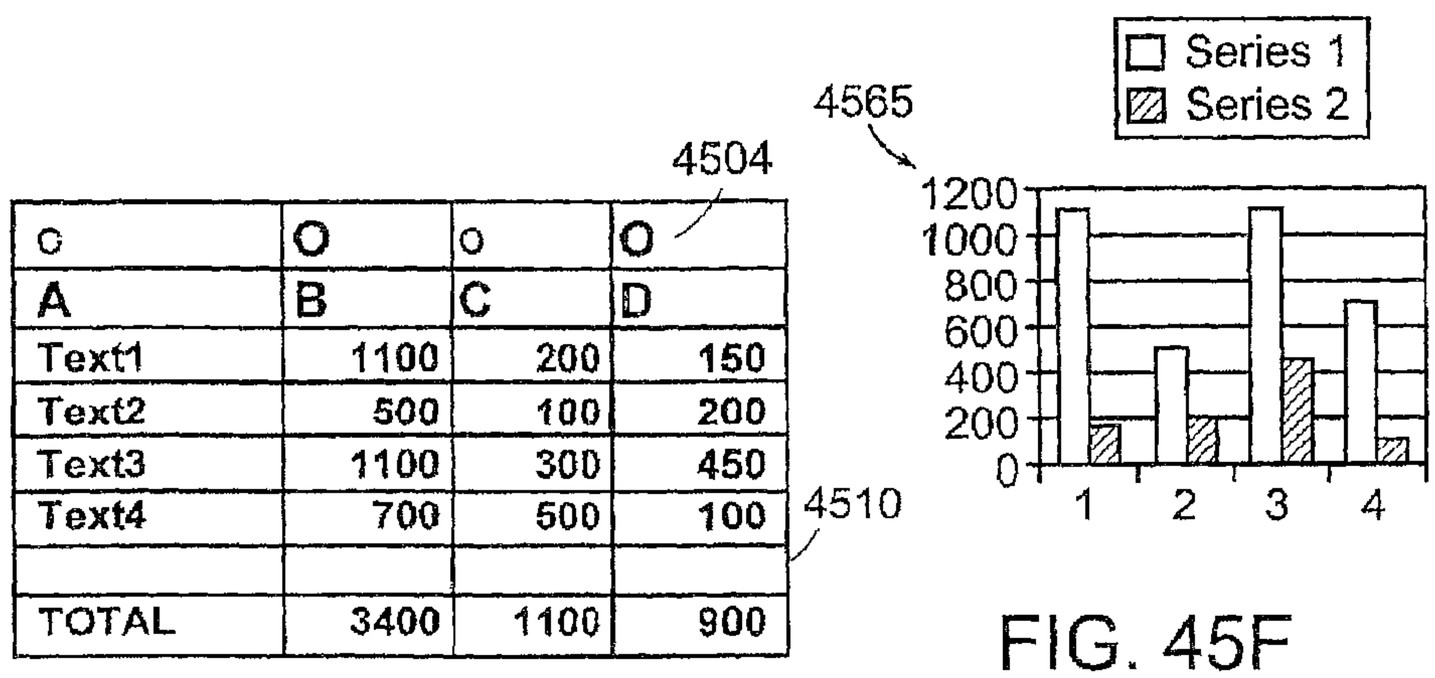
o	O	o	O
A	B	C	D
Text1	1100	200	150
Text2	500	100	200
Text3	1100	300	450
Text4	700	500	100
TOTAL	3400	1100	900

FIG. 45D



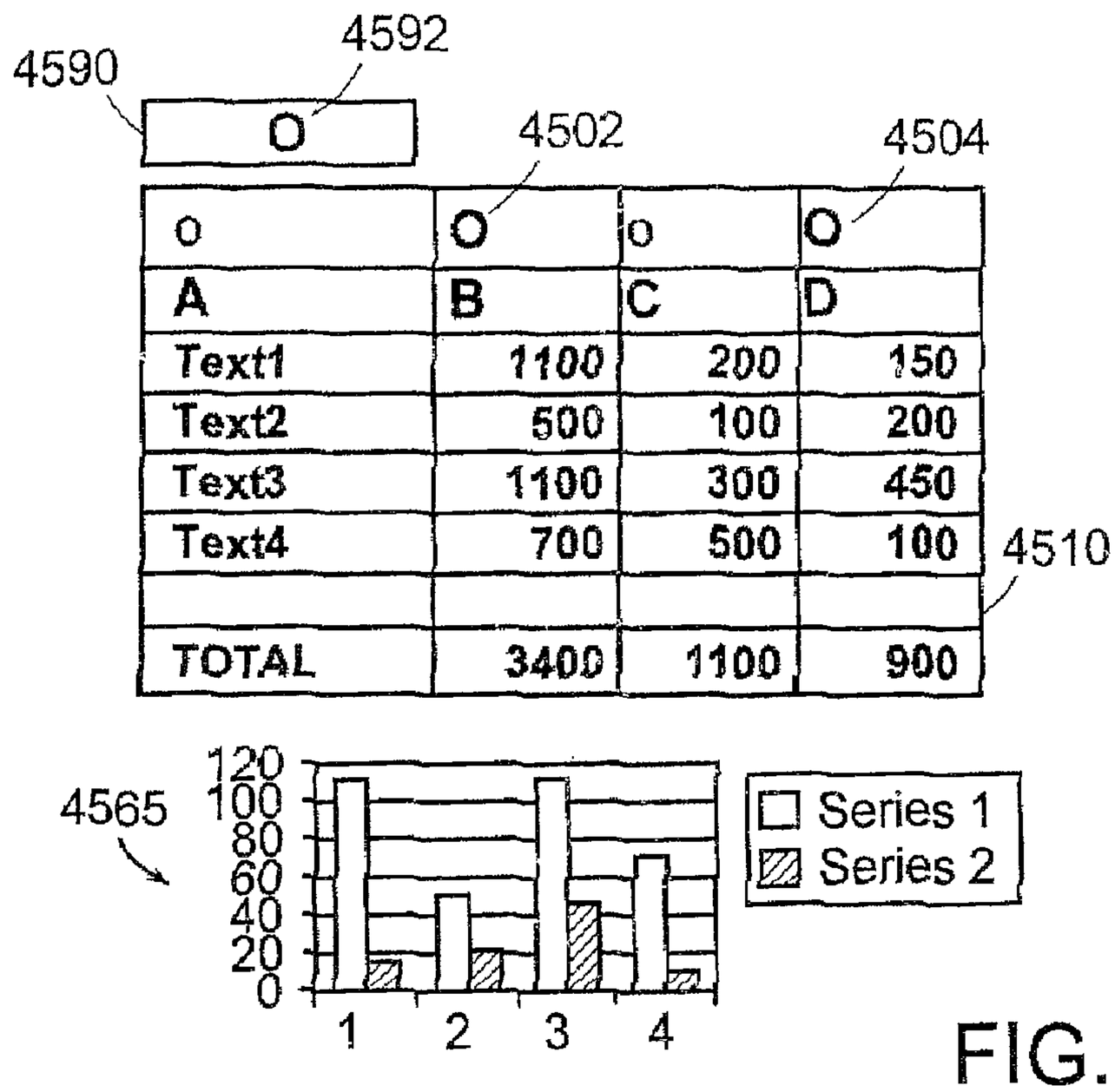
o	o	o	O
A	B	C	D
Text1	1100	200	150
Text2	500	100	200
Text3	1100	300	450
Text4	700	500	100
TOTAL	3400	1100	900

FIG. 45E



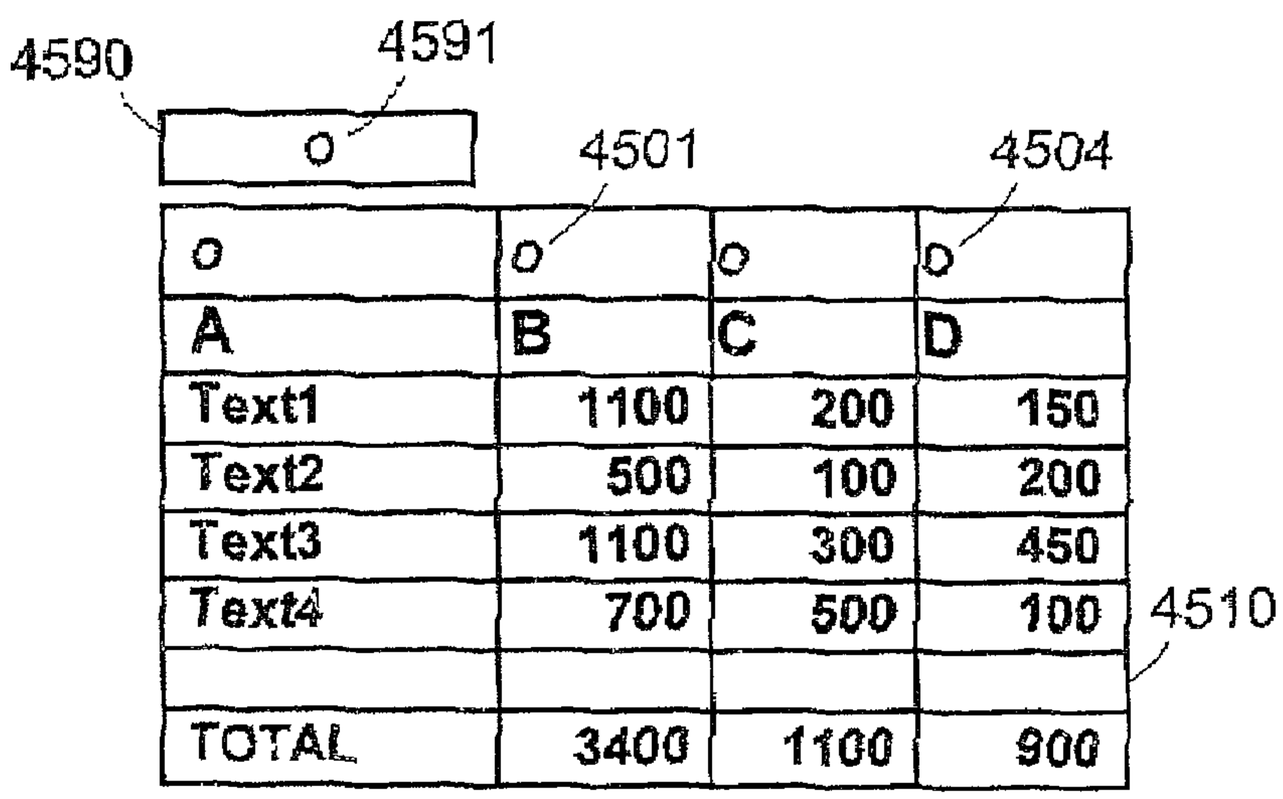
o	O	o	O
A	B	C	D
Text1	1100	200	150
Text2	500	100	200
Text3	1100	300	450
Text4	700	500	100
TOTAL	3400	1100	900

FIG. 45F



o	o	o	o
A	B	C	D
Text1	1100	200	150
Text2	500	100	200
Text3	1100	300	450
Text4	700	500	100
TOTAL	3400	1100	900

FIG. 45G



o	o	o	o
A	B	C	D
Text1	1100	200	150
Text2	500	100	200
Text3	1100	300	450
Text4	700	500	100
TOTAL	3400	1100	900

FIG. 45H

4603

4602

A	B	C
Text1	2/15/99	1000
Text2	3/12/99	3500
Text1	3/12/99	1800
Text1	2/15/99	1500
Text1	5/20/99	500
Text2	3/12/99	2000
Text1	2/15/99	1000
Text2	3/12/99	3500
Text2	6/8/99	1000
Text2	4/10/99	2000

4610

FIG. 46A

4604

4602A

A	B	C
Text1	2/15/99	1000
Text1	3/12/99	1800
Text1	2/15/99	1500
Text1	5/20/99	500
Text1	2/15/99	1000
Text2	3/12/99	3500
Text2	3/12/99	2000
Text2	3/12/99	3500
Text2	6/8/99	1000
Text2	4/10/99	2000

4620

FIG. 46B

4604A

4602A

A	B	C
Text1	2/15/99	1000
Text1	2/15/99	1500
Text1	2/15/99	1000
Text1	3/12/99	1800
Text1	5/20/99	500
Text2	3/12/99	3500
Text2	3/12/99	2000
Text2	3/12/99	3500
Text2	4/10/99	2000
Text2	6/8/99	1000

4630

FIG. 46C

4604A 4606A

4602A

A	B	C
Text1	2/15/99	1000
Text1	2/15/99	1000
Text1	2/15/99	1500
Text1	3/12/99	1800
Text1	5/20/99	500
Text2	3/12/99	2000
Text2	3/12/99	3500
Text2	3/12/99	3500
Text2	4/10/99	2000
Text2	6/8/99	1000

4640

FIG. 46D

4604A 4606A

4602A 4608

B	A	C
2/15/99	Text1	1000
2/15/99	Text1	1000
2/15/99	Text1	1500
3/12/99	Text1	1800
3/12/99	Text2	2000
3/12/99	Text2	3500
3/12/99	Text2	3500
4/10/99	Text2	2000
5/20/99	Text1	500
6/8/99	Text2	1000

4650

FIG. 46E

4604A 4606

4602A 4608A

B	A	C
2/15/99	Text1	1500
2/15/99	Text1	1000
2/15/99	Text1	1000
3/12/99	Text1	1800
3/12/99	Text2	3500
3/12/99	Text2	3500
3/12/99	Text2	2000
4/10/99	Text2	2000
5/20/99	Text1	500
6/8/99	Text2	1000

4660

FIG. 46F

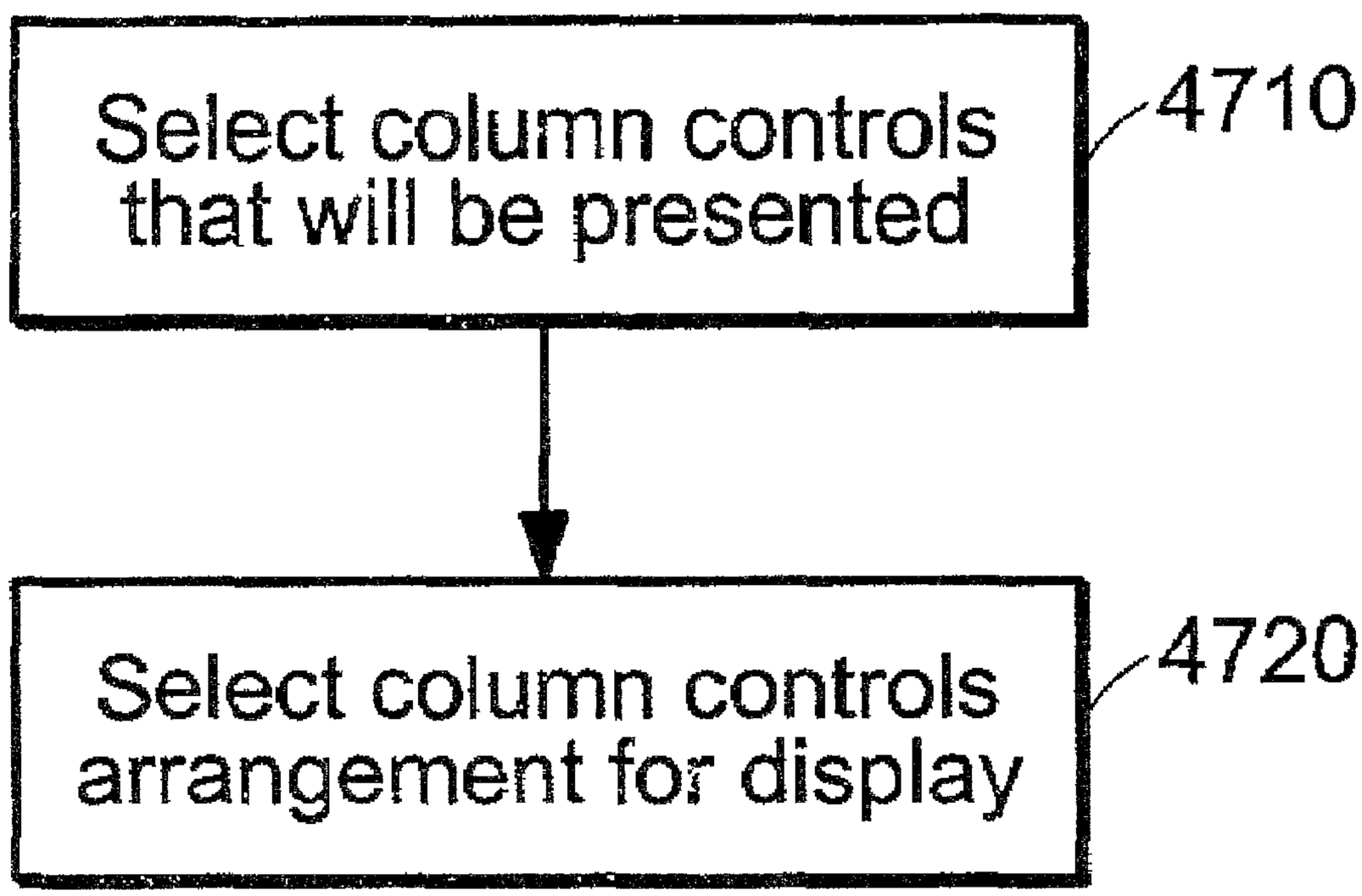

Select column controls that will be presented
4710
Select column controls arrangement for display
4720

FIG. 47

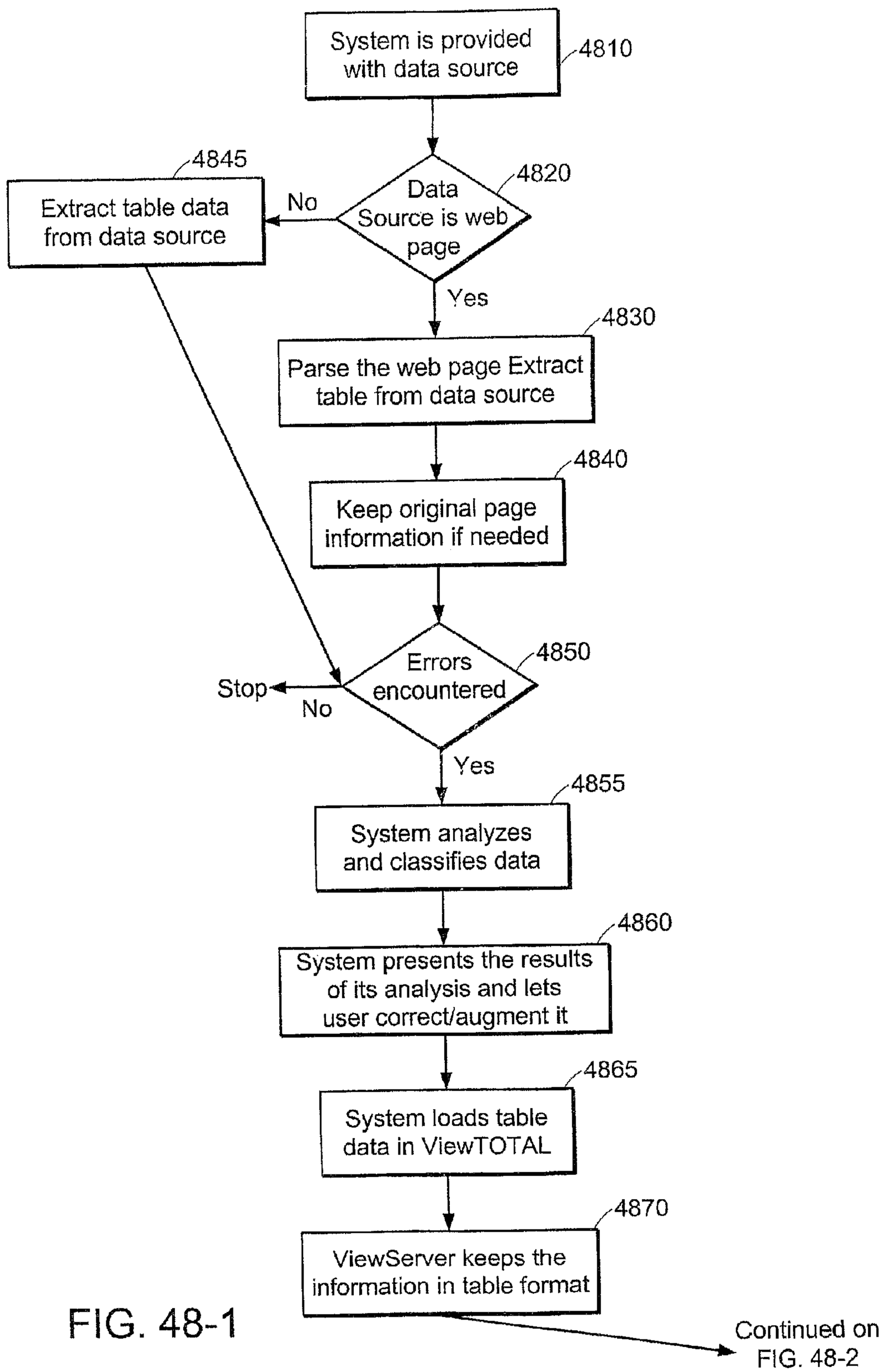

System is provided with data source
4810
Data Source is web page
4820
No
Extract table data from data source
4845
Yes
Parse the web page Extract table from data source
4830
Keep original page information if needed
4840
Errors encountered
4850
Stop
No
Yes
System analyzes and classifies data
4855
System presents the results of its analysis and lets user correct/augment it
4860
System loads table data in ViewTOTAL
4865
ViewServer keeps the information in table format
4870
Continued on FIG. 48-2

FIG. 48-1

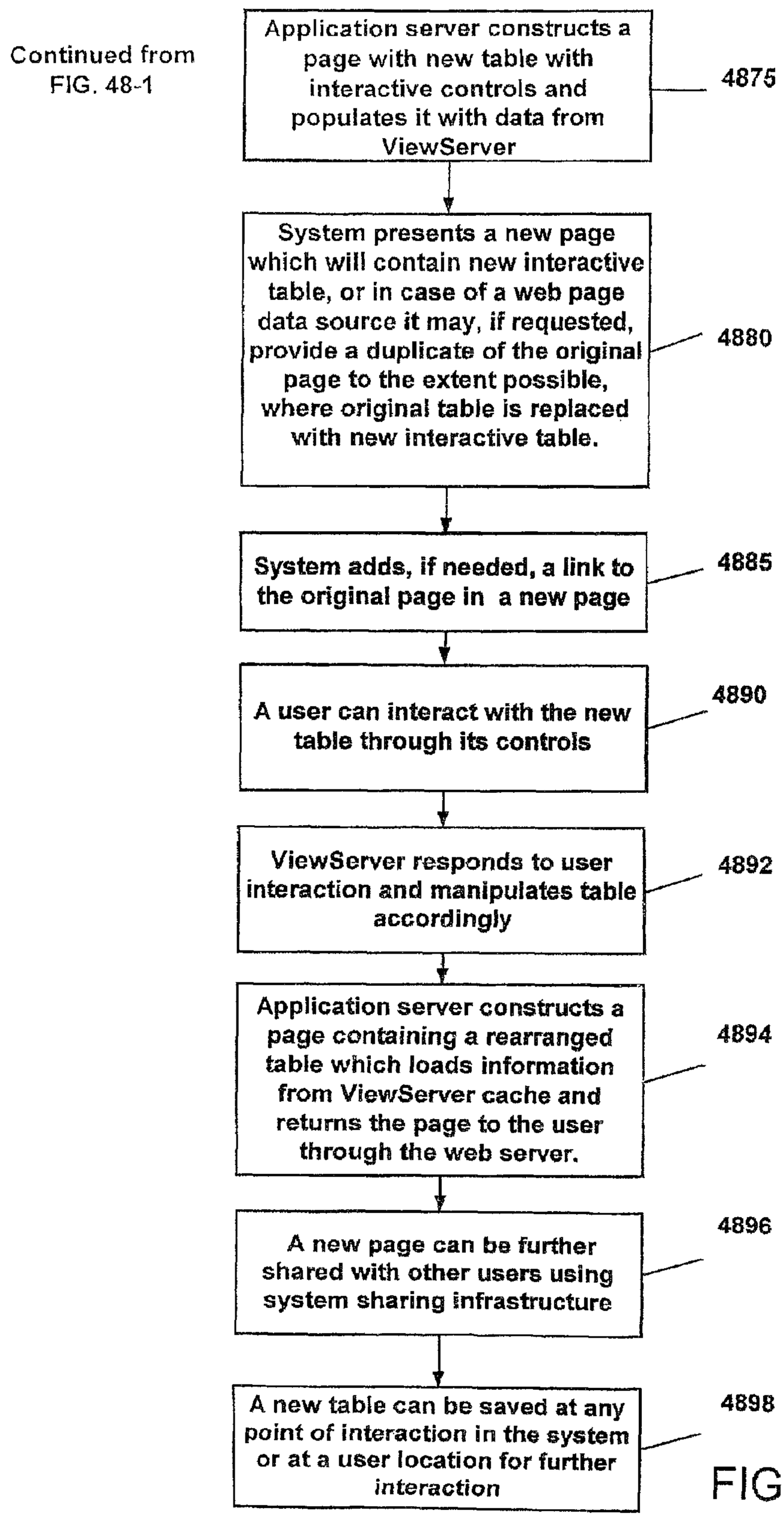

Continued from FIG. 48-1
Application server constructs a page with new table with interactive controls and populates it with data from ViewServer
4875
System presents a new page which will contain new interactive table, or in case of a web page data source it may, if requested, provide a duplicate of the original page to the extent possible, where original table is replaced with new interactive table.
4880
System adds, if needed, a link to the original page in a new page
4885
A user can interact with the new table through its controls
4890
ViewServer responds to user interaction and manipulates table accordingly
4892
Application server constructs a page containing a rearranged table which loads information from ViewServer cache and returns the page to the user through the web server.
4894
A new page can be further shared with other users using system sharing infrastructure
4896
A new table can be saved at any point of interaction in the system or at a user location for further interaction
4898

FIG. 48-2

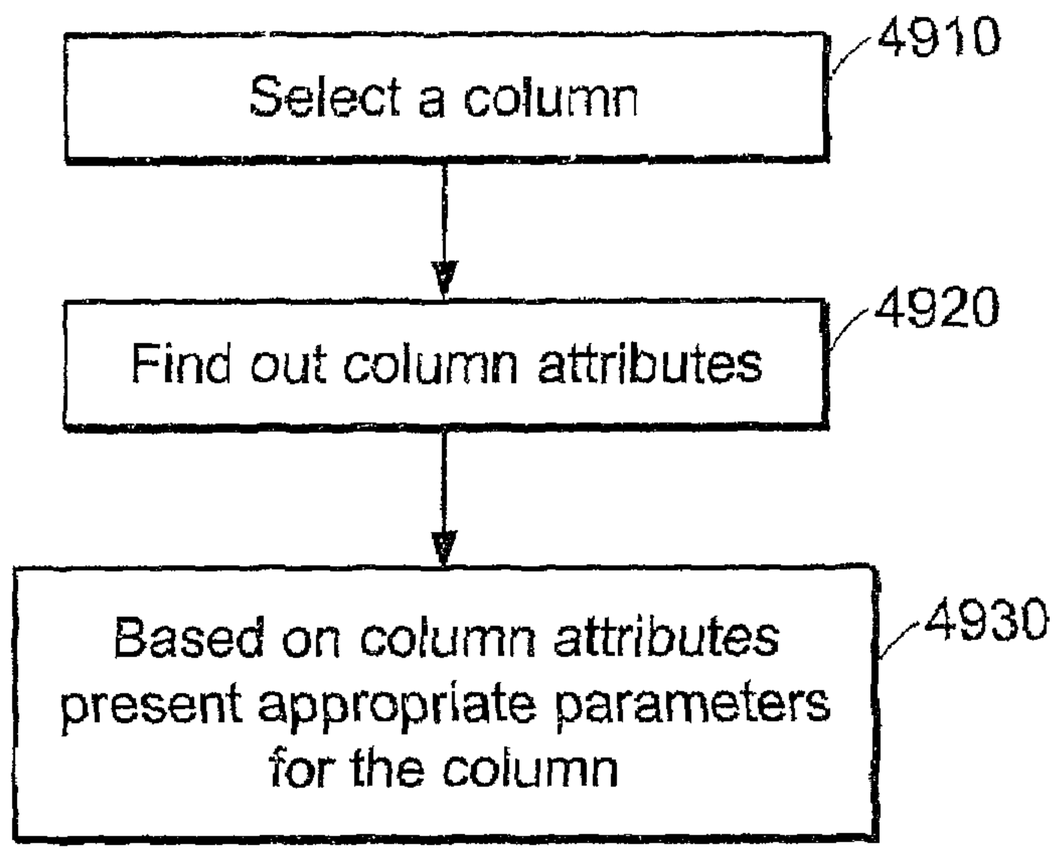

Select a column
4910
Find out column attributes
4920
Based on column attributes present appropriate parameters for the column
4930

FIG. 49

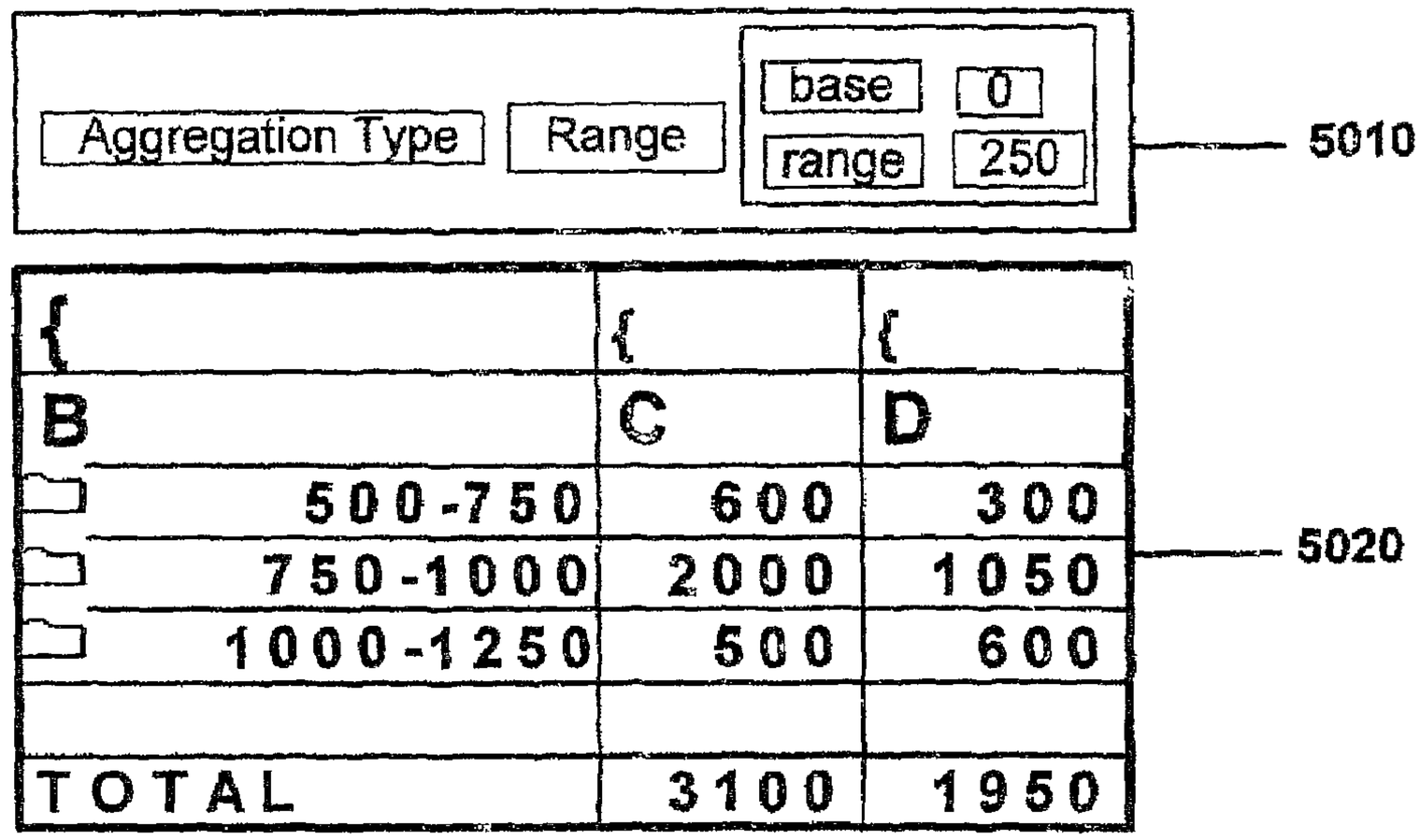

Aggregation Type
Range
base
0
range
250
5010
B
C
D
500-750
600
300
750-1000
2000
1050
1000-1250
500
600
TOTAL
3100
1950
5020

FIG. 50

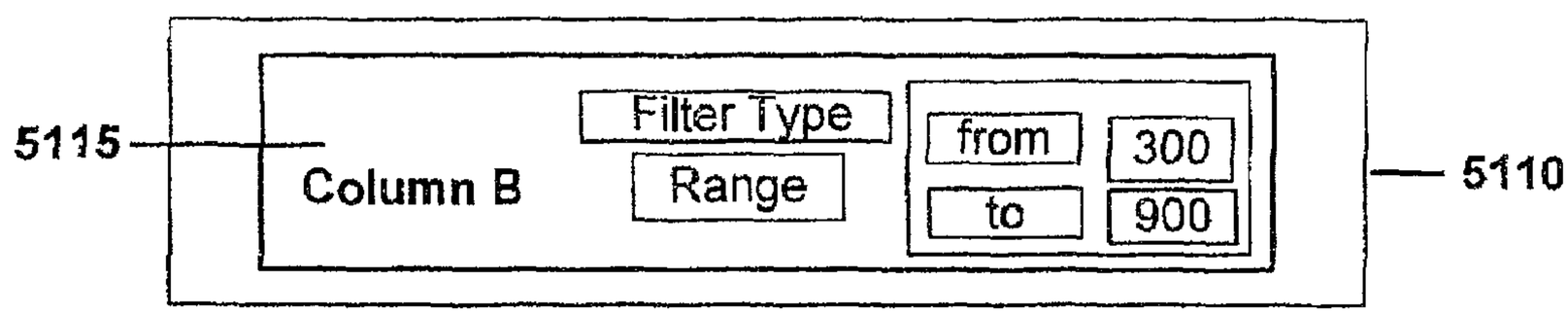


FIG. 51A

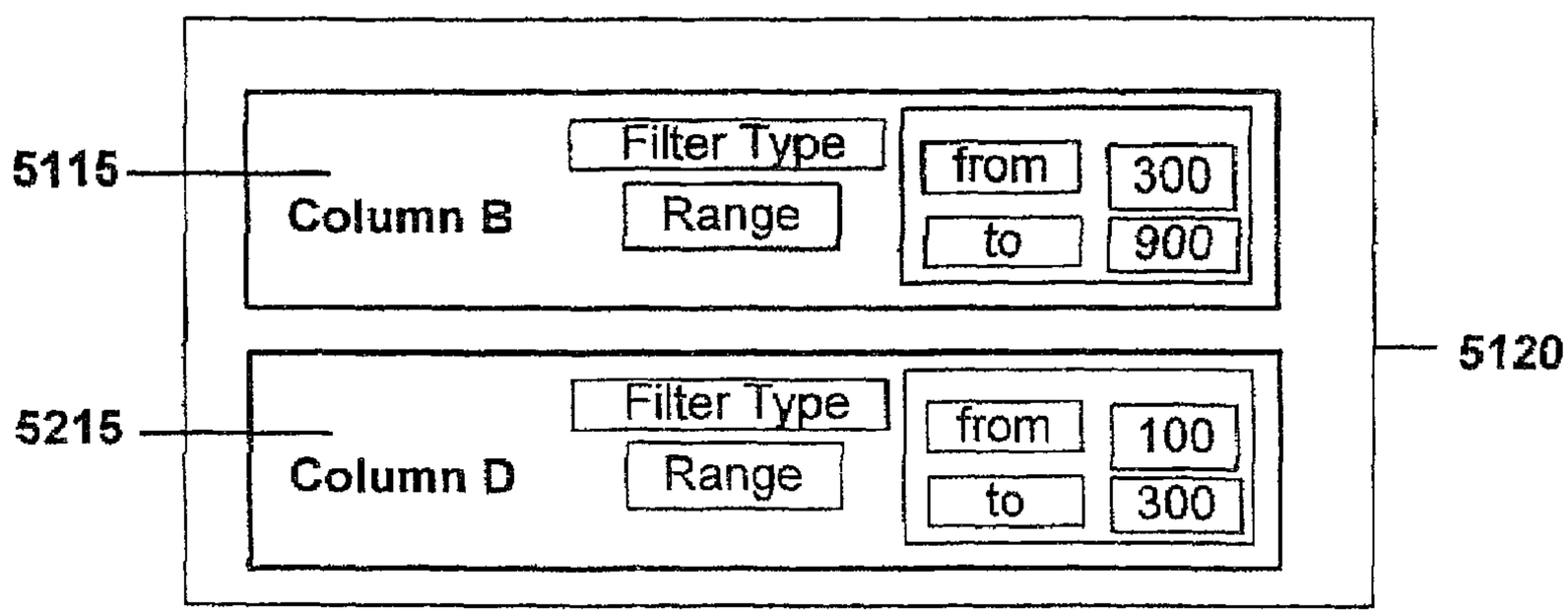


FIG. 51B

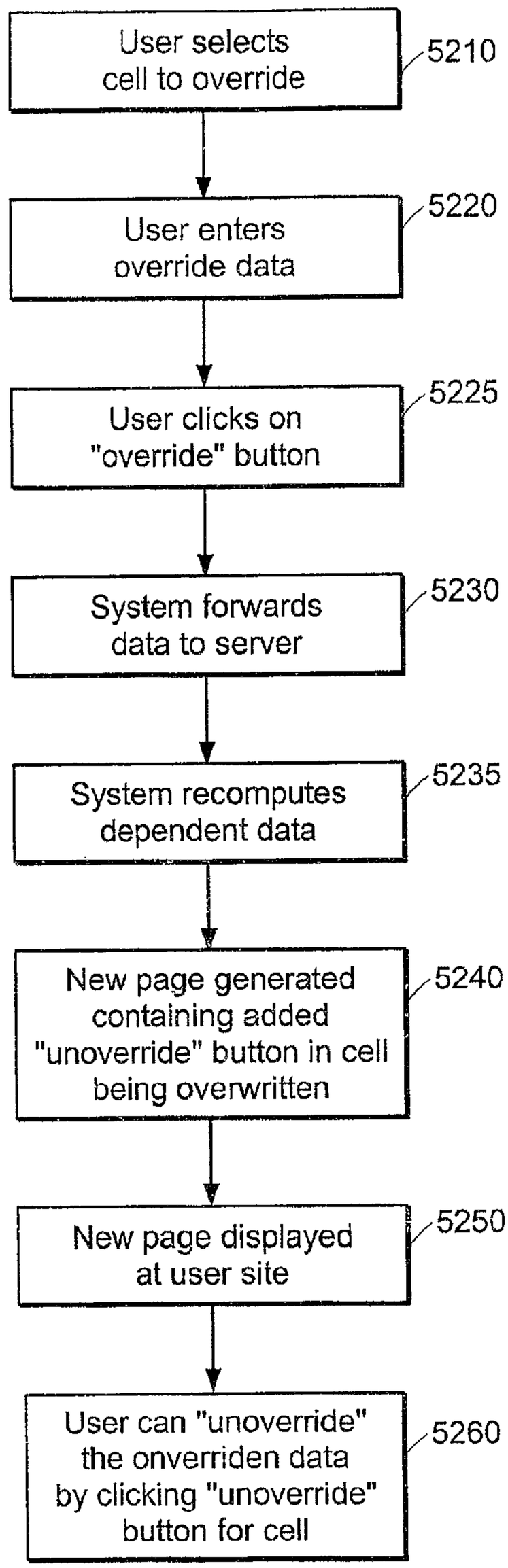

User selects cell to override
5210
User enters override data
5220
User clicks on "override" button
5225
System forwards data to server
5230
System recomputes dependent data
5235
New page generated containing added "unoverride" button in cell being overwritten
5240
New page displayed at user site
5250
User can "unoverride" the onverriden data by clicking "unoverride" button for cell
5260

FIG. 52

PROVIDING ALERTS IN AN INFORMATION-SHARING COMPUTER-BASED SERVICE

RELATED INFORMATION

This application is a continuation under 35 U.S.C. §120 of U.S. patent application Ser. No. 11/746,547 filed May 9, 2007 now U.S. Pat. No. 8,255,791; which is a continuation of U.S. patent application Ser. No. 09/998,517 filed Nov. 29, 2001 (now U.S. Pat. No. 7,231,596), which in turn claims priority to the following U.S. Provisional applications: Provisional Application No. 60/250,035 filed Nov. 29, 2000, Provisional Application No. 60/259,488 filed Jan. 3, 2001, and Provisional Application No. 60/293,413 filed May 24, 2001. Each these U.S. patent applications and U.S. Provisional patent applications is incorporated herein by reference as if fully set forth herein.

BACKGROUND OF THE INVENTION

The invention relates generally to methods and apparatus for providing scaleable, flexible, and interactive views of dynamically changing data stored in a cache, and more particularly, to a method and apparatus for flexibly interacting, controlling and collaborating, in real-time, the display of data stored at a remote location and provided for interactive display over a network or locally.

The invention relates to many Web-based applications and as one example, to financial fields, such as financial portfolio and market data applications. In particular, in order to function effectively, users need the proper tools to research, monitor, and analyze portfolio and market information, and to communicate with one another, with customers and with suppliers. Existing software systems currently provide only partial solutions to these needs. These systems do not provide a flexible, outsourced, real-time, collaborative, Web-based total solution. It is further important for these professionals to have real-time tools which enable up-to-date data to be effectively displayed, manipulated and shared in order to allow fully informed and current decisions to be undertaken. Flexibility in user presentation can also be important to understanding the data and the relationship between different data points and entities.

BRIEF DESCRIPTION OF DRAWINGS

The present invention is illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings. Other features and advantages of the invention will be apparent from the following drawings, taken together with the description of the invention, in which:

FIG. **1** is a general architectural description in accordance with the invention;

FIG. **2** is a more detailed description of the server architecture in accordance with the invention;

FIG. **3** is a first screen shot illustrating, a tabular view of data in accordance with the invention;

FIG. **4** is a second screen shot illustrating a tabular presentation of data in accordance with the invention;

FIGS. **5**A and **5**B a yet further detailed diagram of the overall server architecture in accordance with the failover mode of the invention;

FIG. **6** is a representation illustrating user display options;

FIG. **7** is a flow chart describing the general operation in accordance with the operating method of the invention;

FIG. **8** is a more detailed flow chart description of system operation in accordance with the invention;

FIG. **8**A is a third screen shot illustrating a tabular presentation of data in which a selected trade can be modified or cancelled;

FIG. **8**B is a fourth screen shot illustrating the next step in modifying or canceling a selected trade;

FIG. **9** is a confirmation screen shot for modifying the selected trade;

FIG. **10** is a screen shot of a tabular presentation enabling the user to modify a selected trade;

FIG. **11** is a screen shot illustrating a tabular presentation of data aggregated by country;

FIG. **12** is a screen shot illustrating a tabular presentation of data as a result of "drill down" of the country aggregation illustrated in FIG. **11**;

FIG. **13** is a flow chart illustrating a particular implementation scenario shared application display methodology;

FIG. **14** is an alternate architecture for implementing the invention;

FIGS. **15-19** are screen shots illustrating column operations according to one aspect of the invention;

FIGS. **20**A-**20**D represent a diagram of application display operations, allowing to hide and reveal different areas in the application display;

FIG. **21** is a diagram of an HTML based application;

FIG. **22** is a diagram of a browser based client application;

FIG. **22**A is a diagram of a local client application;

FIG. **23**A is a diagram of ViewServer implemented as a part of an ApplicationServer;

FIG. **23**B is a diagram of ViewServer, AnalyticalServer, DataServer and transaction server implemented together as a part of module/thread/process;

FIG. **23**C is a diagram of ViewServer implemented as an operating system process;

FIG. **24**A is a diagram of an HTML based shared application;

FIG. **24**B is a diagram of a browser based client shared application;

FIG. **24**C is a diagram of a local client shared application;

FIGS. **25** A-C are diagrams showing moving a column in an HTML based shared application;

FIGS. **26** A-C are diagrams showing moving a column in a client-based shared application;

FIG. **27** is a diagram showing the display of different subsets of shared application functionality at the same time;

FIG. **28** is a flowchart of the operations performed in FIGS. **25**A-C;

FIG. **29** is a flowchart of the operations performed in of FIGS. **26**A-C;

FIG. **30** A is a diagram of standalone shared applications;

FIG. **30** B is a diagram of multi-service shared applications;

FIGS. **31-1** and **31-2** are a flowchart illustrating a connection to the shared application;

FIG. **32** is a flowchart illustrating a process of application sharing;

FIG. **33** is a one-to-many sharing of a local application through the network;

FIG. **34** is a flowchart illustrating application sharing by downloading a shared application (in whole or in part) to the local device for further sharing;

FIG. **35** is a flowchart illustrating the operation of sharing shortcuts;

FIG. **36** is a flowchart illustrating a process for alerting a user about changes in monitored conditions associated with the views;

FIG. **37** is a flowchart illustrating the process of setting parameters for controlling application access;

FIG. **38** is a flowchart illustrating the process of sharing media messages in the system;

FIGS. **39**A-B illustrate flowchart of the process of saving and subsequently restoring views for further interaction;

FIGS. **40**A-E are diagrams showing dynamic basic aggregation of a table;

FIGS. **41**A-C are diagrams showing dynamic parameterized aggregation of a table;

FIGS. **42**A-C are diagrams showing dynamic filtering of a table;

FIGS. **43**A-I are diagrams showing a virtual column operations in a table;

FIGS. **44**A-B are diagrams showing a login panel;

FIGS. **45**A-H are diagrams showing various column charting operations;

FIGS. **46**A-F are diagrams showing multi-column sort operations;

FIG. **47** is a flowchart illustrating column control bar operations;

FIGS. **48-1** and **48-2** are a flowchart illustrating the Matrix-Click methodology;

FIG. **49** is flowchart illustrating providing parameters for table columns;

FIG. **50** illustrates an aggregation control panel according to one aspect of the invention;

FIGS. **51**A and **51**B illustrate filter control panels according to an aspect of the invention; and

FIG. **52** is a flowchart of the override function.

DESCRIPTION OF PARTICULAR EMBODIMENTS

Overall Architecture

Referring to FIG. **1**, according to the invention, a general architecture of the system **10** includes a plurality of users **12***a*, . . . **12***n* connecting to the display generation system **14** over a communication network **16**, here the Internet. The users **12** typically employ computing devices having a CPU, memory, storage, display, input devices, networking devices, etc., for communications with network **16**. Other networks can include, for example an intranet or wireless network, local or with area networks, other public networks, etc. While other networks can be employed, the ubiquitous nature of the Internet, and the ability to connect to it make it an ideal communications medium with which to provide user access to the interactive display generation system **14**. The display generation system **14** has a data processing, acquisition, and caching system **18** (here designated ViewTOTAL), which obtains; data from external data sources **20** and which further obtains transactional information from external transaction data sources **22**. The users obtain, with this architecture, in accordance with the invention, a flexible, scaleable, real-time, interactive and collaborative view of configured data from the system **18** as described in more detail below.

Each of the computing devices is interconnected by a network. For simplicity, it is presumed that the network is a Transmission Control Protocol/Internet Protocol (TCP/IP) network. However, other networking protocols such as the Internet Control Message Protocol (ICMP) extension to TCP/IP, Internetwork Packet eXchange (IPX), Sequenced Packet Exchange (SPX), AppleTalk, or the like can also be used. The network may be a single physical link, or a logical structure crafted from a combination of physical and non-physical data pathways (e.g., analog or digital dialup connections, satellite links, etc.).

In one embodiment, the system employs the combination of web-client software on each user computing device and web server software on the server. For example, the users can utilize web browsers and receive active HTML content (or JavaScript, Java, JScript, Active Server Page (ASP) files, ActiveX, Visual Basic, and the like) to interact with the server; and the web server can be an Apache web server or a Microsoft Internet Information Server.

When the system uses a web server, it is expected that Hypertext Markup Language (HTML) tags (or the equivalent) are used to cause transfer of pages to the client. (HTML is a document format based on the Standard Generalized Markup Language (SMGL) that uses "tags" to flag formatting, structure, data access, etc.)

The system **18**, referring to FIG. **2**, has, in the illustrated embodiment a plurality of independent servers, having their own operating systems, connected to communication networks, for example, private networks **30**, **32**, and which also connect to a database source **34** which can be either a mass storage system having its own operating system and third party database software, individual disk drives and a controller, or some other form of storage. The plurality of servers, and the private networks **30** and **32**, enable the system **18** to be resilient in the case of failure of one of the networks, and enable, as will be seen below, redundancy at the server level.

Other configurations of servers and networks can also be used. The various servers noted above are in essence a set of object-oriented modules that can be implemented in variety of ways such as an operating system process, a thread in an operating system process, or a module in an operating system process, on one or multiple computers. There can be as a little as one instance of each server, or as many as needed system wide. Such a system is usable with one network, or even without the network if the whole system is running on one computing device, but multiple networks can be deployed for the purpose of redundancy.

The distinction between the "servers" are functional, and a variety of server hybrids can be assembled to fit particular needs or circumstances. In general DataServer deals with data gathering, AnalyticalServer deals with computations, TransactionServer deals with transactions and ViewServer deals with keeping displayed views. The servers typically cache the data in memory, therefore allowing quick access to their "clients" to the cached data. The ViewTOTAL can be assembled from any variety of combinations of the servers described above, while also having ApplicationServers for page generations and web servers for communicating with the users over the network. Indeed, it is also possible to have all of the ViewTOTAL functionality implemented on a single server system rather than multiple smaller systems.

For example, ViewServer can be implemented as an operating system process **2307** in FIG. **23**C, or as a thread/module **2302** within an ApplicationServer process **2301** in FIG. **23**A, or combined as a thread/module **2304** within one process **2303** with additional "servers" **2305**, and communicating over a software "bus" **2306** as illustrated in FIG. **23**B.

In particular, the illustrated system **18** includes one or more web servers **40**, one or more ApplicationServers **42**, one or more ViewServers **44**, one or more AnalyticalServers **46**, one or more DataServers **48** which can receive data from external data sources **20**, and one or more transaction servers **52** which can receive external transactions from any of plurality of

sources, such as external transaction sources **22**, user input, uploaded data (such as through FTP or the Web), as well as other sources.

The system architecture enables provision of real-time shared views with the capability of interacting and manipulating application displays bi-directionally between systems connected through a Web to Web connection, a Web to local program connection, and a local program to Web connection, as well as a local program to local program connection through the Web.

In operation, referring to FIG. **7**, the system **18** receives a request at **100** from the network **16** at the web server **40**. The web server receives the typically html page request and sends, at **102**, the request to the ApplicationServer **42** typically over one of the networks **30**, **32**. The ViewServers subscribe to updates from DataServer **48**, transaction server **52**, and AnalyticalServer **46** as well as using data from the database server **34**.

The AnalyticalServer **46** asynchronously takes the information, processes, etc. and "calculates" the necessary data at **105**, and delivers the data necessary for assembling the page (at **106**) which will be organized and stored by the ViewServer in its cache (step **106**) returned to the user over the networks **30**, **32** through the ViewServer **44**.

The AnalyticalServer **46** asynchronously takes the information, processes, etc. and "calculates" the necessary data at **105**. It publishes the resulting data over the networks **30**, **32**. ViewServer receives the data to which it subscribed, and organizes and stores the data in its cache (step **106**). The ApplicationServer assembles the page from the ViewServer data (at **108**) and the page is returned to the user over the networks **30**, **32** through the web server **40** at **112**.

The AnalyticalServer recalculates only the changes in the received data, and the interval for recalculation is configurable, in the illustrated embodiment. Thus, for example, when the AnalyticalServer operates in a "HotCache" mode, it recalculates everything in real-time; when it operates in a "WarmCache" mode, it recalculates in the timeout period; and when it operates in a "ColdCache" mode, it recalculates only when requested. It is the user decision or an automated priority configuration system which decides which mode of operation to use. The DataServer receives data updates from subscribed data sources. Once received, the DataServer sends the data to its own subscribers and keeps a copy in its memory. The transaction server loads transactions from available sources, aggregates them, and keeps them in memory. It also subscribes to new transactions, modifications and cancellations and notifies its subscribers of the "updates" in stored data. The ViewServer subscribes to updates of the combination of data, analytics, and transactions, and when the information is received, it organizes and stores it in cache. The information that ViewServer subscribes to is either configurable globally (same information for all the users) or configurable as a per-user or per access identifier (see below). These and other configurations are kept by the system in a configuration database. Referring to FIG. **21**, in the case of HTML-based applications, the ViewServer **44** operates in a request-reply mode—it receives update requests from the user application (for example a web browser **2110**) on the client side and will automatically return an updated version of the web data or "view" through the ApplicationServer **42** and web server **40**.

Referring to FIG. **22**, in the case of a client-based application, the ViewServer **44** can operate either in a request—reply mode or in a publish-subscribe mode. In the publish-subscribe mode, client-based application **2210** subscribes to receive updates through its associated web browser, and the ViewServer **44** publishes the updates through the ApplicationServer **42** (since the client is, for example Java based, the web server **40** may not needed). While commonly using the HTTP protocol to communicate with the client through the web server and/or ApplicationServer, ViewServer can do it through other apparatus, without using the web server and/or the ApplicationServer. For example, it can be performed by having communication adapters in both ViewServer and the client program that use a common communication protocol.

In any instance, the invention described herein is not dependent upon the client program or how the client and server connect. In fact, referring to FIG. **22**A, for a local client application, the locally based application may communicate directly with the ViewServer rather than processing through the ApplicationServer **42**.

In the case of a local client-based application, the ViewServer may be implemented as that application. The ViewServer keeps information in its cache memory **70** specifically for speeding the access to the displayed data (at the user's display). When update occurs, the data status, on a cell by cell basis, can be displayed to the user using a color scheme customized for each user. Further, in appropriate circumstances, the ViewServer can communicate directly with the local client-based application.

Referring to FIG. **7** again, some of the data processing at **106** can result from a user request, for example, a data override request, while other of the data can be automatically processed at **106** as a result of the addition of new data obtained by the DataServer **48** or the transaction server **52**. A client program can provide an automatic update using publish-subscribe paradigm, while HTML provides the data on request. The ViewServer organizes its cache **70** by displayed views of the application, from which it can then be passed, through the ApplicationServer where the web page is assembled at **108**, to the web server, for delivery at **112** over the network **16** and then to a user **12**. Such an organization of data greatly simplifies the page creation by the ApplicationServer, which serves as a mere "formatter" of the data that is already organized for viewing. Referring to FIG. **3**, the data can be presented in a typical tabular format as illustrated by the screen shot of FIG. **3**. This shows the data from two instruments being presented, in real time, to the user. The user can, as noted in the "Views" line **60**, enable various views to be provided. Clicking on any of these elements will request from the system **18** a new view. The view is automatically refreshed, as noted above, at **114**.

The ViewServers **44** each have their own cache **70** so that when requesting a currently used data view, it can be obtained without having to perform any further analysis or obtain any further information, again, from the database source **34**. In a preferred embodiment, the table view, such as that illustrated in FIG. **3** is efficiently updated by subscribing to and receiving only changed data from relevant published data sources. In the illustrated particular embodiment of the invention, the cache **70** is organized in terms of user requested data views, as illustrated in FIG. **27**.

According to the described embodiments, an application display is the display from the application which can be, for example, a Graphical User Interface (GUI) window or an HTML page. Each instance of the application display can have application controls including navigation controls **2010**, information slice controls **2020**, and a plurality of views such as table **80**, graph **82**, chart **84**, news **86**, alert **88**, message **90** etc. (See for example FIG. **6**). Each application can have one or more application displays as illustrated in FIGS. **8**A, **8**B, **10**, **11** and **12**.

In a preferred embodiment of the invention, ViewServer will keep a version identifier for each of its views. The view version identifier will separately keep data changes and presentation changes. The ApplicationServer will keep the version identifier of its views as well and will compare its version of a requested view with the version kept in the ViewServer. For each data or presentation change, the view associated version identifier will be updated. If the version identifier for particular view(s) in the ViewServer did not change since the last view request by the application, the ApplicationServer can return its cached page for this view(s) without needing to reassemble the page.

In addition, referring to FIGS. **39**A and **39**B, views (one or multiple) can be saved at **3901** (for example as reports) and stored by the system at **3902**. Later, the original or another user with access rights can access the saved view(s) at **3903**. The system loads the saved views into ViewTOTAL, at **3904**, and in particular, according to this embodiment of the invention, saved views need to be loaded by a DataServer while updating the AnalyticalServer and the user can interact with them, as well as share them with other users at **3905**.

Sharing Mechanism

The system enables sharing information among a group of users communicating through a network, in a way that allows the users to share the application look, feel, interaction and data, in whole or in part.

In a particular preferred implementation, according to this aspect of the invention, the system architecture provides shared application displays with a capability of interacting and manipulating such application displays bi-directionally between systems connected through a network. The system implements bi-directional communication between user applications and shared application service **2410** as illustrated in FIG. **24**A for HTML based application, in FIG. **24**B for a browser client based application, and in FIG. **24**C for a local client.

For a client based program like a Java applet, the web server **40** is needed to download its code, but it does not necessarily use a web server, or even an application server **42** for communication. Furthermore, for a local client, even the application server **42** may not be needed.

The shared application service can be for example an operating system process, an operating system thread, or a module within the process/thread. The shared application service can reside on a "server" or it can be downloaded from application storage **3304**, in whole or in part to the client, and can be further shared with other users using architecture illustrated in FIG. **33**. One shared application can have multiple services and can serve multiple user groups simultaneously. Users can join and leave the sharing group at any time.

There are a number of sharing modes that can be employed, either individually or in combination by a system. A data sharing mode refers to sharing a common set of data, so that when data changes are made by one of the users, or the shared application service data is updated through its internal computations or application external data sources, the change is reflected in the shared application service and will be seen by all other users of the application service when they view any such affected display or displays.

Data sharing allows an independent arrangement of shared data to be viewed by each user. For example, moving a column in a data sharing arrangement will not affect the shared application service or other user views, but an update of underlying shared data will. Typically in the case of data sharing, the system will create a new application service instance for each new user, as illustrated in FIG. **31**.

View sharing refers to the way applications look, feel, and interact, and are shared among the users, so if, for example, a column is moved in a shared view, the column will be moved in the shared application and each other users' applications.

Typically, there is only one shared application service instance in the view sharing mode, even if there are multiple users authorized to access this particular service. Referring to FIG. **30**A, a shared application service can be implemented as a standalone application **3001** instantiated for each user (or user group in the case of identical sharing within a group) or, referring to FIG. **30**B, a multi-service application **3002** that provides configurable application functionality to each user (or user group in case of identical sharing within a group). Each instance of application service (either shared or not) has a unique global identifier **3010** which is used to by other system components, such as an ApplicationServer, to address the service.

A particular embodiment of such a shared application implementation according to the invention, is a ViewServer, which provides information view services to the user applications. The ViewServer organization of its cache, in terms of application views, enables sharing of application displays among multiple users. When a view in a ViewServer changes as a result of an information update or user manipulation, all the users that share this view in a view sharing mode, will receive a new updated view (either in real-time or at the next display refresh). The users that share in a data sharing mode will receive updates only in the case of an information update.

In the case of restricted access to an application the system can provide application access (and potential sharing) in one of two ways: the first method provides a username and or password. For example, as shown in FIG. **44**A, the system displays username field **4410**, password field **4420** (use of a password field may not be always necessary) and login button **4430**. Upon entering these fields, the user activates the login button **4430**. If the system authorizes login, the user is allowed to use the application. When using the same username and password, it essentially allows login to the same application, and enable complete sharing of the application. In the second method system create (as a result of a user request or an automatic system initialization) an identifier for such an access (to be called "access identifier") and stores the access identifier with its associated information, which will specify the application services allowed to the user or users of that identifier. An identifier can thus be provided for each user (user identifier) or the whole group (group identifier). The identifier can provide an access to information (that can be static or dynamic) in the system. The accessed application service can be shared with other users (in whole or in part), or be provided on a standalone basis. The access identifier can be implemented, for example, as a URL link. Alternative access identifier implementation could be a username and password combination, in whole or in part. When the identifier is user specific and requires a password, use of that identifier should prompt only for the password field **4420** as shown in FIG. **44**B, and save unnecessary typing of user name by the user.

Because of the nature of web based applications, accessing one application may allow access to multiple applications, and the other applications can be accessible through a URL link in the original application.

When implemented by use of a URL (a uniform resource locator), the system sends the access identifier (URL) to the user. The user opens its message (for example email, or a page in his application, appearing as a URL link). The user clicks on the link and brings the page to view. After a successful login (if a link requires authorization), the user enters his login information. If authorized by a system, he is allowed

login to the application. The system connects the user to the application service which can be used according to the access identifier.

Referring to FIG. **32**, when a user decides to share his application, in whole or in part, with additional users over the network at **3210**, the user can specify which parts of application to share, any restrictions on how the shared application can be used, and for how long to share the application (at **3220**). The user also decides who shall have access to the shared application (at **3220**). The system then creates access identifier and stores it with related parameters at **3230**. The system then sends a sharing message to the specified recipients at **3240**. After opening the received message, recipients get access to shared application and can then use it (at **3250**). The user and recipients (at **3255**) are now sharing the application. In addition, the user can proactively monitor use of the application by other users and dynamically change any attributes associated with sharing the application (at **3260**).

The application can provide the user with "shortcuts" which will allow to the user perform sharing more effectively. There are a number of shortcuts, among them a basic shortcut and a parameterized shortcut. The basic shortcut contains all the parameters for sharing and will be activated under control of one action. The parameterized shortcut has some parameters preset, and some parameters that need to be provided.

The user can create the shortcuts and store them in the system for further use. In a preferred embodiment according to the invention, a basic shortcut will contain an access identifier, to eliminate the need to create an access identifier each time, when all the parameters are already known. The parameters for implementing sharing can be provided from a combination of default values, and/or the previous usage history for the parameter, or can be provided by user.

For example, referring to FIG. **35**, the application can have Share View, Share Page, and Share Application shortcuts that allow the user to specify what part of the application to share. In some cases, the user can specify, in one action **3501**, what functionality to share and with whom.

More specifically, for example, in the case of technical support, the user can use help "shortcuts" such as View Help, Page Help, and Application Help. The shortcuts can be implemented, for example, as links or voice activated commands. Activating the View Help "shortcut" will cause an access identifier for the current view either to be extracted from shortcut at **3508** or to be created from the shortcut at **3502** and sent automatically at **3505** to technical support.

The technical support person who accesses a message with the access identifier will receive access to the specified user view at **3506** (which can be continuously updated). This will make the support process much more efficient, because the support person can instantly see and share at **3507** (either in the data or the view sharing mode) the information with which the user needs help.

In one particular embodiment of the invention the method for using a shared application can be implemented, as illustrated in FIGS. **31-1** and **31-2** using the following steps:

Connect to the shared application by providing an access identifier (for example a URL) (step **3101**);

If the identifier requires either a user identifier and/or password (step **3102**), the user enters this information (step **3102-1**);

If access granted at **3103**, then if the identifier indicates a data sharing mode (step **3104**), go to step **3105**;

Otherwise the system checks for the existence of an instance of the required application service at step **3106**;

If no application service instance exists go to step **3105**; otherwise the system connects (step **3107**) to an existing application service instance;

In the step **3105** the system creates a new instance of the application service using the configuration associated with the access identifier and connects to the service instance;

The ApplicationServer (in the case of an HTML application), or otherwise the client-based application then creates, in step **3108**, required application displays using the configuration associated with the access identifier; (the creation of application displays is affected because there are many displays and only few are required at a time).

The information is acquired from the shared application, in step **3109**, using either a request/reply or a publish/subscribe mechanism;

The information is filtered as necessary at **3110**;

If the application is an HTML application, the application display, with the information, is constructed at **3112**; Otherwise, the application updates its displays with new information at **3115**; If the user requests a new application display at **3113** the systems goes to **3108**; Otherwise the system then loops to update or refresh, as necessary, the shared display depending upon the user application type as indicated in step **3112** (for example in an HTML implemented application the system loops to step **3108**, while in client-based implementation the system loops to the step **3109**);

The filtering operation of shared information, applied at **3110** can be performed in either the shared application service or in the ApplicationServer. When the ApplicationServer performs the filtering, the shared application service will provide all of the information for each application display and the ApplicationServer will filter the information for each user. This approach makes it easy to implement the shared application service since it is not aware of the application display filtering. The drawback is that unnecessary information is passed to the ApplicationServer.

Another approach is to implement filtering in the shared application service. This approach minimizes the data transferred to the ApplicationServer but introduces more complexity in the application service. To make data access and manipulation effective and fast, shared applications can store information in terms of user data views, so it can rapidly make updates according to user requests and distribute the updated data to the users. Each user application display, which can be a page (in HTML) or a window (in case of client-based applications), and each view within an application display, will be represented by corresponding objects in the shared application.

In a particular embodiment of the invention, the manipulation actions and parameters which result, for example in the column manipulations described above, will be sent to the ViewServer for further processing.

Referring to FIGS. **25**A-C and **26**A-C, (and the corresponding flow charts of FIGS. **28**, **29**) suppose a user wants to move a column in a table. The shared application, in this case, will retain information, in cache, in terms of the user views. The shared application can store the information in a table format, which will make it easier for the application to move specified columns and also to update the views of other users.

For example, in an HTML user application, referring to FIG. **25**A and FIG. **28**, a table view **2530**, in a user application **2510** and a table view **2540** in a shared application **2520** are illustrated, before moving a column. In FIG. **25**B, the user selects the operation which will move column B to the right of column C (step **2810**), and this instruction is passed to the shared application **2520** (step **2820**) which implements the move as shown **2550** (step **2830**); The user table view **2530**, at

this point in time remains the same. Referring to FIG. **25**C, the next time the user page is refreshed (step **2840**), it will reflect in the new view, shown at **2560**, the column move operation, already performed in shared application (step **2850**).

In a client-based user application, now referring to FIG. **26**A and FIG. **29**, a table view **2630** in a user application **2610** and a table view **2640** in a shared application **2620** show the data presentation before moving a column. Referring to FIG. **26**B, a user selects an operation which will move column B to the right of column C (step **2910**). This column is moved at the user application **2610** as shown at **2650** (step **2920**); while the shared application table view **2640** remains the same. Referring to FIG. **26**C, the instruction is then passed to the shared application **2620** (step **2930**), which moves its table column B as shown at **2660** (step **2940**).

Referring to FIG. **27**, different users can be given access to different subsets of shared application functionality (typically the views) at the same time. Thus, as shown in FIG. **27**, a shared application **2710** has opened several views A, B, C, D. Three user applications **2720**, **2722**, **2724** connect to the network **16**. In accordance with the invention, different ones of the user applications will typically have access to different views of shared application. Thus, as shown in this example, user application **2720**, has access to views A and B; user application **2722** has access to views B, C and D; and user application **2724** has access to views B and D. According to this aspect of the invention, a change made in view B, will be seen by all the user applications; while a change in view D will only be seen by the other user application **2724** or **2722**, respectively (typically instantly in a client-based application or at a next refresh in an HTML-based application). Changes in view A will be seen only by user application **2720**.

The shared application service also allows users to interactively share information in different media forms such as data views (table, charts/graphs), text-like views (news, alerts, messages), voice and video. Once an application is shared for example, through the data views, the sharing participants can collaborate further through the use of text, voice and/or video. Upon access to the shared application service, then, the user will be able to read and write text, speak and hear using voice, and show and watch video, as well as view the associated application. (When the shared application service is sharing views, it is acting as a shared ViewServer.)

Users can thus collaborate using media such as text, voice and video in relationship to the combination of data views, application displays, the applications themselves, and events, or can collaborate independent of them. For example, in case of a text/data-view relationship, referring to FIG. **38**, the user can type in the text view at **3801** related to the specific view in the application display, and the information is sent to the shared application service at **3802**, and that text also can be shared with other users that take part in sharing that view at **3803**. This way, users can not only share the data and views, but also can include commentary relevant to the shared views.

In another example, in the case of media/event relationship, there is a headline about particular event. A user that expresses an interest to interact about the event will be notified about the event and will have the capability to interact, in relation to the event, with other users (by text, through voice or video). The particular form of interaction (and sharing) can be selectively specified. This is comparable to a dynamic bulletin board, where the subject is event driven, and where the user can specify who are allowed to participate. The interactions can be recorded and replayed later. In the case of an event interest(s), the users specify their interest (which can be in either other user application events or system events) and the system automatically alerts them to the occurrence of the event. Furthermore, the system can provide not just the alert but also additional information (such as the associated view(s)), so that the alert can be related, in context, with that additional information. For example, messages with a corresponding text description can be provided automatically if triggered by conditions that have been specified by the user. In this way, a user can proactively watch a limited number of views, but once there are changes that occur in other views of interest, the user will receive a message that includes an access identifier to such other view or views. The identifier can point to or provide an access to a snapshot of a view at the triggered moment as well real-time views. The view typically contains a combination of table views, chart/graph views, news, etc.

Referring now to FIG. **36**, the user specifies, at **3601**, any association(s) among one or more conditions (a condition group) and the views to be sent to him and/or other users when such condition(s) occur. The user can further specify other attributes, at **3602**, such as the size and location of the views to be displayed, and whether to display these views automatically or under control of the user. The system creates an identifier and the associated information for each condition or condition group (users, views, view size, and location, etc) and stores the identifier and information (at **3603**). The system monitors for the occurrence of such condition/condition group at **3604**. When condition/condition group occurs, the system sends the access identifier to the user(s) at **3605**. The views can then be displayed to the user automatically or manually under user control (at **3606**). It should be noted, that the user, at any time, can modify the attributes of an access identifier at **3607**.

Referring to FIG. **37**, once initiated at **3701**, the system tests, at **3702**, whether sharing is to be implemented. If sharing is to be implemented, the user then determines, at **3703** whether any default parameters will be customized. If none are to be customized, the user proceeds to **3706**, otherwise the user specifies and customizes those parameters at **3705**. The user then determines whether any other parameters need to be specified at **3706**. If yes, the user specifies and sets those parameters at **3707** after which the system implements the sharing mode at **3708**. If no parameters are to be specified at **3706** the system proceeds to implement the sharing mode at **3708**.

The application access identifier can be generated automatically by the system based on the identity of receiver, or can be generated using user specified information at the time of generation. In either instance, it is then sent to the recipients by the system. The sender of the identifier will be able to see what identifiers he sent and can dynamically change access of a recipient by modifying parameters associated with the identifier. The system will selectively create application views and displays based on these parameters. Such a per-user customization will provide a subset of shared application functionality to such a user.

The user can specify application access parameters or use default parameters (which can be further overwritten). Some or all of the parameters can have a default value on a per user basis. The system will create an access identifier and will store the following parameters associated with the identifier. In a typical implementation, the system parameters which are used are:

For how long the identifier is valid?

Which users can use the identifier ?

Does the identifier usage requires further information?

such password and/or user ID?

What information is accessible?

information slices;
view groups and views;
columns within the view;
chart/graph type available;
capability to make transactions;
What content is displayed?
Sensitive content can be "blacked-out"
What kind of interaction is allowed:
for example, moving columns, sorting, etc.
Is data sharing or view sharing implemented?
What components of the application display are shared?
Can further sharing of the application be allowed?

The system will keep a history of sharing and can provide a user with the choice of previously selected used parameters.

In other aspects of the invention, a number of implementations and uses of the inventive architecture are described below.

In one particular embodiment, the system can be deployed locally and the shared application is implemented as a local application with a graphical user interface (GUI). This configuration of the software allows a bi-directional interaction between in-house (local) applications and Internet/Intranet (web-based) applications where any operation in one program is automatically reflected in another program through the use of shared views. For example, sorting or moving a column by a first in-house user of a group, will result in an updated (sorted/moved) display on the web-based application of a second user of the group, and vice versa. Further, when the user using web-based application accesses a new application display which has not yet been viewed by the local user, it will cause a new window to pop up on the local user's screen. Also, in another example, when the user using a web-based application, changes an information slice (such as a portfolio which he is viewing in the case of a financial application), the result will be displayed in the local application, thus showing that information slice (portfolio) to the local user.

This application display methodology can be advantageous for users who want to control proprietary data and applications locally, and at the same time, have the flexibility of interactively remotely accessing the data through the network in exactly same way as though they were local.

The system thus also provides a message sharing platform. Referring to FIG. **13**, as one example, users can go to an outside meeting (step **500**) and yet access all of the application views which are available on the corresponding local application, in the same way that it existed, at his computer, when he left it. (step **502**). Further, he can access the views, interactively, from any computer with internet access and without any setup delay. In addition, the user can interact and modify the views from the remote location, (step **504**), and when the user returns from the meeting (step **506**) he will find, at his display device, the views he was watching before he left and/or any new/modified views created during his outside visit (step **508**).

In another example, the user can monitor from home any of his peers and can selectively look at any of the application displays of his peers in the real-time. This is accomplished because the ViewServer keeps information regarding the views which were accessed and used. Essentially then, the methodology of the invention, using this structure, provides the capability of sharing interactive real-time application views from any location at any time.

In a similar manner, two or more web-based applications can interact through shared application displays in a shared application/ViewServer architecture (FIG. **2**) and where the shared application/ViewServer can be either a local application or a server application.

Accordingly, a typical architecture for implementing shared views and maintaining the applications "in-house" is illustrated in FIG. **14**. In accordance with this architectural aspect of the invention, a plurality of local computing devices **530** connect to a private network or intranet **540** and run the applications "locally". There is provided a connection between the private network (for example a local area network or virtual private network) and the public network (for example the Internet or intranet) **550**. Remote computing devices **560** connect over the public network to the private network **540**. In a similar way if network **550** represents an intranet then local users can access and share other local user applications of others. Another example is a one-to-many sharing interaction where the user runs his local application on his device (which can be, for example, a computer, laptop or wireless PDA) and can share the application with other users through the network. This way the user is in complete control of the application sharing because it resides on his device and he can, at any point of time, physically disconnect other users or terminate the program.

Referring to FIG. **33**, an operation according to one embodiment of the invention, a user device **12Z**, in this particular embodiment, will have a web server **40**, an ApplicationServer **42** as well as a shared application **3303**. In the case that the application is not initially located on the user device (such Java applet or C# based program, for example), as tested at **3410** (FIG. **34**), it can be downloaded with associated resources at **3430** from other locations such as application storage **3340**. Once the application is on the user device, the user can send a message to other users **12-12***n* at **3440** which will contain an identifier for the sharing access. The sharing users will utilize this identifier at **3440** to login to the user device through the web server and share the application. In some embodiments of this aspect of the invention, depending upon the nature of the shared application and the network **16**, the WebServer and ApplicationServer may not be needed.

Interactive Table

HTML is a widely used standard but it does not have the built-in facilities to interactively manipulate table content especially when this content is dynamically updated. According to the invention, therefore, column, row, and cell interactivity can be provided to manipulate the table content. For convenience, most of the interactivity and manipulations described here relate to columns of a table, however they are equally applicable to manipulations and interactivity among the rows of a table. Many of the manipulation herein described can also be advantageously applied to non-HTML tables.

Column Operations

As illustrated in FIG. **3**, there are included in the display various control "buttons." In this embodiment, selecting a control button will visually mark it and deselecting it will remove the visual marking of the control button. In addition, when there is only one control of particular type that can be selected at a time in a given table, selecting another control of the same type will deselect the previous control.

Such control will be called uni-column control. For example, selecting a column to move can be applied only to one column at a time.

On the other hand, a column filter can be applied to multiple columns and as such it is a multi-column control. Selecting second multi-column control will not deselect a first one. Some of the controls can be configured as either uni-column, or multi-column, for example column sort. Multi-column

controls will have in addition to controls associated with columns, a per table control which allows selecting/deselecting all the operation that apply to a selected controls of that type.

There are a few practical reasons, for having such a control. First, it allows deselect all the operations of particular type within one action, without the need to individually deselect controls in each selected column. Second, after deselection, it will allow selection of all previously unselected controls at once, thus keeping a history of last multi-column selection of that type.

Also, the table will keep a history of multi-column operations, thus allowing the user to easily choose from previous operations. For each selected multi-column control of particular type, an associated per-table control of that type will be presented in a per table control panel. This is illustrated in FIG. **45**G and FIG. **45**H.

Buttons **62***a*, **62***b*, . . . , **62***m*, in this embodiment, for example, when clicked upon, will automatically enable a rearrangement of the views, so that the column clicked upon is sorted and visually marked, and presented either in ascending (sort up) or descending (sort down) order. The marked column control button can be visually marked (such as enlarged, and/or highlighted or otherwise distinguished). Any of the columns can be selected and will control the reorientation of each of the rows into an order according to that column.

In addition, an additional control button such as a button **62***x* separate from the table (as illustrated) can be used to lock the particular sort selected (sort lock), no matter to which of the columns the sort relates. Alternatively, a lock button can be displayed adjacent to an actuated button **62***a*, **62***b* . . . **62***m*. The sort lock control button will appear only after a sort was performed in the table. Once locked, that order will be maintained across the entire table and the rows rearranged if updated data requires such a rearrangement in rows. The sort can be implemented to automatically take place as the data is dynamically updated. Note that in accordance with this embodiment of the invention, only one column can be selected at a time to control the sort operation. To indicate such a sort lock, the sort lock control button will be visually marked (such as highlighted and/or enlarged) in the column, that was lock sorted. Actuating that control button, deselects the sort lock function, leaving the visual appearance of that button in its normal state. Further, selecting the sort control button in any other column, while one is already activated, will deselect the previous sort lock, and enable a new sort lock associated with the newly sorted column.

Alternative embodiment of the invention is multi-column sort, and multi-column sort lock/unlock. For example, as shown in FIG. **46**A table **4610** presented, having three columns A (alphanumeric column), B (date column, where format used is Month/Day/Year) and numeric column C. Each of the columns has associated sort controls, such as sort ascending control **4602** and sort descending control **4603** in column A. Selecting control **4602** in FIG. **46**A sorts table **4610** by ascending order of column A resulting in table **4620**, while visually marking control **4602**A, as shown in FIG. **46**B. Selecting control **4604** in FIG. **46**B sorts table **4620** by ascending order of column A and then ascending order of column B, resulting in table **4630**, while visually marking controls **4602**A and **4604**A, as shown in FIG. **46**C. Selecting control **4606** in FIG. **46**C sorts table **4620** by ascending order of column A, then ascending order of column B and then ascending order of column C, resulting in table **4640**, while visually marking controls **4602**A, **4604**A and **4606**A, as shown in FIG. **46**D. In one embodiment, the sort order among the columns in the multi-column sort, is established by the relative positions of the columns. For example, moving column B in FIG. **46**D to the first column, moves column A to the second column, and the sort among the columns is done in the following order: first by ascending order of column B, then by ascending order of column A and then by ascending order of column C, resulting in table **4650**, as shown in FIG. **46**E. Selecting sort descending control **4608** in column C, results in table **4660**, as shown in FIG. **46**F, where visually marking is removed from control **4606**A (indicated at **4606**) and visually marking control is added to control **4608** as indicated at **4608**A. Multi-column sort can be also sort locked, resulting in dynamically keeping the established sort order while data in the table is dynamically updated. Multi-column sort lock control will be typically located in per-table control bar described earlier.

In the preferred embodiment of the invention, the user action and its parameters are passed to and maintained on the ViewServer. For example, sort order will be maintained on the ViewServer, so that the columns will be resorted upon the presentation to the user as the data changes. This allows for the same sort order to be maintained even where the user logs out from one location and logs in from a separate location. This advantageously saves the user from needing to repeat the steps which relate to his preferred "view" of the data as the user may move from one location and log on at another.

In addition, other, or hidden, control buttons can be displayed to scroll and move columns to the left and/or right. Accordingly, in one general embodiment of the invention, one can use a "control button" such as the control button **63** illustrated in FIG. **3** to open up, or activate, a new series of control buttons, like control buttons **65**, which, when clicked upon, selects a column and enables that column to be moved to the left or the right one or more columns. For example, one of the previously hidden control buttons, when clicked upon, can open up a series of buttons (like button **65**), or those buttons **65** can be displayed by default. Then, the first button clicked identifies a column to be moved while a second button clicked identifies where to move the column. The data can then be rearranged in the view. Also, in this manner, the data presentation can be flexibly altered, in an automatic "click and drag" or other manner to move related column data so that it is adjacent to each other. Also, in this manner, different views of the data can be automatically obtained, in real time, to enable view analysis and/or otherwise help the decision process. To accomplish the new view, the requested "button" click is sent by the user's browser back through the network **16** to the system **18** where the new view and page can be assembled and obtained.

For example, according to one embodiment of the invention, each column can have a Control Button to select the column to be controlled, and MoveTo (<- ->) Buttons (such as buttons **630**, **632** to be described later), and Sort Up/Lock/Down buttons. Clicking on the Sort button will rearrange the view so that the column clicked upon is presented either in ascending or descending order. If the Control Button in the column is clicked on, then that column will be identified visually as the selected column and will cause the display of MoveTo buttons on all the columns except the selected column. A TableView Control Button, when clicked, shows the Column Control Button and Column MoveTo (<- ->) Buttons. If the ColumnMoveTo Button of a column is clicked, this column will be moved (if possible) one column to the right if the -> button clicked, or one column to the left if the <- button was clicked. If the Column Control Button is clicked, the subsequent clicking of a <- or -< button on a different column causes the selected column to move accordingly to

the left or the right of the clicked on column. Also, according to another embodiment of the invention, each column can have a Control Button that allows the user to hide that column, as well as button(s) to reveal adjacent hidden columns.

In a particularly preferred embodiment of the invention, referring to FIG. **15**, the GUI presentation has a column control actuation button **600**. This mechanism can turn on (cause to be displayed) "column controls" in the column headers. (FIG. **16**). These controls **602**, **604**, **606**, . . . can be added or removed by actuating the column control actuation button **600**. Thus when this control is turned on, as in FIG. **16**, on, the columns will have controls **602**, **604**, **606**, . . . in the headers, and when the control **600** is turned off (FIG. **15**), the column controls **602**, **604**, **606**, . . . will disappear. In this way, the system preserves space on the user screen and does not show the control buttons when they are not needed. Thus, the system avoids cluttering the screen, yet provides the flexibility to add the controls with one actuation. (For simplicity, in the figures, upon activation of button **600** only those controls needed to understand the figures have been illustrated. It is to be understood that in actual system, all of the control buttons that were configured to be displayed, will be presented.)

The column controls of FIG. **16** allow the user to rapidly and effectively perform a sophisticated manipulation of columns, such as column sort, sort lock, move, hide and reveal, aggregation, filtering, charting and more. These controls allow direct manipulation of information without displaying any additional screens, so that the user can continuously watch the current view. The system will also have a column control bar, which, as shown in FIG. **47**, provides the ability to selectively indicate which of the column controls will appear (at **4710**), and in what arrangement (at **4720**), when the column controls are displayed.

Once the control button **600** is in its "on" state (FIG. **16**), several operations can be implemented. In one such operation, the move select <-> button **620** indicates a column to move. Clicking on the <-> button will select the column for a move and the selected button will be visually marked (for example enlarged). All of the columns, except the selected column will show "now Move To <.vertline..vertline.>" arrows **630**, **632** (FIG. **17**).

In another aspect, either of the <.vertline..vertline.> buttons **630**, **632** will move the selected column respectively to the left/right of the clicked column. Thus, in FIG. **17**, button **640** was selected, with the result shown in FIG. **18**. Further, clicking the <-> button **620** on the selected column will deselect it, and the visually marking of the button **620** will be removed and the "move to" controls **630**, **632** in FIG. **17** in all other columns will disappear. Clicking the <-> on any other column will deselect the previous column as the column to move and will select the "other" column as the column to move.

In addition, one of the column control buttons "–" is used to hide that column. Selecting the "–" control will cause that column to disappear from the table. Such a "hidden" column will be indicated by a newly appearing "+" button in the column that was adjacent to the "hidden" column. Selecting the "+" button will "reveal" the "hidden" column. It is possible that a given column will have more then one "+" which will indicate there are multiple hidden columns adjacent to that column. The user can selectively "reveal" a specific column whose identity can be displayed while rolling a mouse over the "+" buttons.

Aggregation

Referring to FIG. **40**A, other controls for effecting other manipulations of the table can be made visible by clicking on button **600**. The control buttons {'**4001**, as shown at FIG. **40**A, are used for preset or dynamic aggregation of the table by the content of the associated column when selected. Beside a preset aggregation table, where the aggregation criteria are fixed, the table can be dynamically aggregated by any column in the table. When a column is selected for aggregation by activating '{', the aggregate control **4001** will be visually marked (for example enlarged and/or highlighted) to indicate the selection, as shown at **4002** (FIG. **40**B). If that column was not a first column, the aggregated column will become the first column. In the newly created aggregated table, only the numeric data columns that can be aggregated will be presented. When aggregated view **4020** is drilled down upon, by activating a folder-like control **4003**A, for a row **4006** in the aggregated column, the resulting detail table **4040** (FIG. **40**D) for that row will present all of the columns of data from the original table **4010**. The original table **4010** will again be displayed after deselecting the selected '{' control **4002**. Alternatively, selecting aggregation of a different column, for example column D in table **4020** will display a new aggregated table **4050** (FIG. **40**E). In both cases, the visually marking of previously selected control **4002** will be removed. There can be at least two types of aggregation: basic aggregation and parameterized aggregation (for example, range aggregation where aggregation is performed based on specified ranges). Basic aggregation uses solely a column content to group the information. For example, in FIG. **40**A, basic aggregation is applied to column B in the table **4010**.

As a result, a new table **4020** is generated containing only the aggregated column B and derived numeric columns, such as shown in columns in C and D. The column B becomes a first column. Original column A, which contained text information is not included in table view **4020**. In FIG. **40**B, five aggregated groups are created in column B labeled **500**, **700**, **800**, **850** and **1100**, and contain folder-like controls **4003**. An aggregation control **4002** in column B visually indicates that aggregation is performed using that column. Correspondingly, the content of a selected row in column C in table **4020** is the result of straight addition of the values in column C for the rows having a value in column B of table **4010** equal to the value in column B of the selected row in table **4020**. Further manipulation of the resulting aggregated columns, using a selected function, is possible. For example, in FIG. **40**C an averaging function is applied to the underlying data of column C resulting in average values as illustrated in column C avg. For example, the value of C avg in the row corresponding to the folder labeled **1100** of FIG. **40**C is an average value of the values in column C in the rows of FIG. **40**A, which contain value **1100** in column B. As noted above, other functions can be applied to the underlying data of FIG. **40**A.

Referring now to FIG. **41**A, a range aggregation of column information is illustrated, applying for convenience the same table illustrated in FIG. **40**A. The aggregation criteria applied to column B in FIG. **41**A, rather then selecting single cell values, selects a range of column cell values and aggregates the data associated with the rows grouped by the selected criteria. For example, aggregating a column B in FIG. **41**A using a range of 250, for example, as illustrated, using a base level of 0, will result in a table **4120** as shown in FIG. **41**B. Applying an averaging function to the underlying data in column C, in FIG. **41**B, results in the illustrated table **4130** of FIG. **41**C.

The parameters for parameterized aggregation can be automatically presented based on raw column type (such as string, numeric, date), the semantics of that column (for example—column name), the view, and the user's previously selected parameters for that column.

In operation, referring to FIG. **40** or FIG. **41**, the user initiates the aggregation operation by clicking on the '{' control. The system, if so configured, can perform, for example, in response to single action, an immediate default aggregation (for example a basic aggregation, or the aggregation performed last time). If a parameterized aggregation is performed in a non default mode, the system displays an aggregation control panel **5010** in any of a number of convenient display formats, for example a pop up window, or in a designated area appearing above the table, as shown in FIG. **50**. Deselecting column aggregation, will remove column aggregation panel, if it was displayed.

In the aggregation control panel display, aggregation criteria will be presented and will be context sensitive (either one or a combination of per column data type, column semantics, per view, per user). For example, if the aggregated column represents dates, and parameterized aggregation is selected, the displayed criteria could present a choice of aggregating the data by week, month, quarter, year or another increment to be used for aggregation (for example, aggregate by each consecutive 3 days). In the case of text columns in a parameterized aggregation, the displayed criteria could be a choice of regular expressions. In addition, the context sensitive history of a user's previous selections can be displayed. That history is dependent at least on the column and/or the aggregation type selected. The user can choose additional aggregation parameters from the aggregation control panel. Upon selection, a table corresponding, for example, to FIG. **40**B or **41**B, is presented for view.

Filtering

Referring to FIGS. **42**A-C, in addition to the controls already described, another column control '*' **4201** is used for dynamic filtering of the table by the content of selected column. The table rows can be dynamically filtered by any column or columns in the table. A column is selected for filtering by activating the '*' filtering control, and will be visually marked (for example an enlarged or highlighted '*' **4202**) to indicate the selection. In the newly created filtered table **4220**, only the rows that match the filter criteria in the filtered column or columns will be displayed. As a result, the totals in the columns, where totals are computed, can be affected. The effect of column filtering will be reversed after deselecting the selected '*' control in the column, and the visual marking of previously selected control **4202** will be removed. In the case where the table is already aggregated, the rows of the table underlying the aggregated table are those that filtered.

For example, in FIG. **42**A filtering is applied to column B by selecting control button '*' **4201** in that column. As illustrated in FIG. **51**A, a filter control panel **5110** appears, for example as a pop-up window or displayed above the table. The user sets the filter criteria for that column, for example, a range between 300 and 900 (as shown in FIG. **51**A, the filter control panel **5110** at this point presents filter criteria **5115** for column B) and applies it. As a result, a new table **4220**, as shown in FIG. **42**B, is displayed. Subsequently, activating a filter control in a different column will display new filter criteria in the filter control panel **5120** for each column to be filtered. Setting the filter in the range between 100 and 300 in column D (as shown in FIG. **51**B, a filter control panel **5120** at this point presents filter criteria **5115** for column B and filter criteria **5215** for column D) results in the table **4230** as shown in FIG. **42**C.

Filter criteria presented in the control panel will be context sensitive (either one or a combination of column data type, column semantics (for example—column name), view and user history). For example, if the filtered column represents dates, the criteria presented could be a choice of start date and end date, or criteria including only rows whose date is within a specified number of date units (for example, filter from today going forward a week). In the case of text columns, the filter criteria could present a choice of regular expressions. Upon activating a filter in the filter control panel, the selected filter criteria will be applied to the table. In addition, the context sensitive history of a user's previous selections can be displayed. That history is dependent on the column to which the filtering is applied. The user can choose additional parameters from the filtering control panel. In both cases of aggregation and filtering, the user can be visually presented with indications as to the nature of the information presented. For example, the title of the view will indicate if the view is aggregated and/or filtered and will provide the corresponding details.

Charting

Referring again to FIGS. **18** and **19**, the column header can also have a control button "o" **650** (FIG. **18**) to indicate charting. Clicking on this button, will cause the system to present a graph/chart **656** (FIG. **19**) for the selected column. The column is visually marked in the column header by having a larger "O" button **654** (FIG. **19**). Clicking on the "O" button **654** will deselect the charted column reverting control button "O" to its original size and will close the display chart/graph for this column.

Charting/graphing can be enabled for one column at a time, or for multiple columns (either real columns or proxy columns). A proxy column is one not fully revealed in the selected, displayed column. In the case of uni-column charting/graphing control, selecting the control will result in displaying one chart/graph at a time for the associated table. In the case of multiple column charting/graphing, the system will display a chart/graph of each of the plural selected columns separately, or combine them in one chart/graph, if possible, depending for example, on data and/or chart/graph type. Each of the charts has separate controls for further customization, for example a chart type control **658**.

For example, referring to FIG. **45**A, charting/graphing is applied to column B by selecting control 'o' **4501** in that column of table **4510**. As a result, a chart **4525** is displayed together with a table **4510**, where chart/graph control **4502** is visually marked, as shown in FIG. **45**B. If charting/graphing is set for uni-column operation, then selecting charting/graphing control **4503** in column D in FIG. **45**B, will result as shown in FIG. **45**C, in a table **4510**, where chart/graph for column B is replaced by chart/graph **4535**, where control **4504** is visually marked, and the visual marking of control **4501** is removed.

If charting/graphing is set, by the user or system, for multi-column operation with a separate chart/graph display for each column, then selecting charting/graphing control **4503** in column D in FIG. **45**B, will result, as shown in FIG. **45**D, in a table **4510**, where both control **4502** and control **4504** are visually marked, and chart/graph **4535** is displayed along with chart/graph **4525**. Further clicking on control **4502** in column B in FIG. **45**D will deselect the chart/graph for that column, and will result, as shown in FIG. **45**E, in a table **4510** where the visual marking is removed from control **4501**, and only graph/chart **4535** is displayed.

If charting/graphing is set for multi-column operation, where the data is combined in one chart/graph, then selecting charting/graphing control **4503** in column D in FIG. **45**B, will result, as shown in FIG. **45**F, in table **4510**, where both chart/graph controls **4502** and **4504** are visually marked, and a combined chart/graph **4565** for displaying the data of both columns B and D.

Shown in FIG. **45**G, are table **4510**, the combined chart **4565** of columns B and D, visually marked chart/graph controls **4502** and **4504**, a control panel **4590** for the table, and chart/graph "undo" column control **4592** for the table. Selecting control **4592** in FIG. **45**G, results, as shown in FIG. **45**H, in table **4510** without removing chart/graph **4565**, and with the visual marking from controls **4591**, **4501** and **4503** removed. If, control **4591** in FIG. **45**H is selected, it will result in displaying the combined chart/graph for columns B and D (the "undoing" of the last operation) as shown in FIG. **45**G. In the case where table data is continuously updated, (for example, using the adaptive pull mechanism in the case of an HTML based application) the associated charts/graphs are updated accordingly.

The appropriate graph/chart type can be automatically chosen based on the view, the column and the data, if the system is set up for automatic selection. For example, if the data is negative, a horizontal bar graph can be used, and if the view is an aggregated view, a pie chart can be displayed. Otherwise, the system will present the default or most recently used chart/graph type, and provide the capability to select from other chart types, as shown for example, in FIG. **19**, chart **656**.

The invention also provides a view column control follow-up feature, which allows for the relevant column control information and related presentation to propagate from one view to another view, such as, for example, propagating from aggregate view to detail view, or propagating among different views in the same view group.

The view column control follow-up can be provided for both multi-column and uni-column controls, as long as the data in the followed-up view can be presented in a non-conflicting manner. For example, a column sort lock and column charts that are presented in aggregated view can be automatically presented in a detail view. (For an aggregated view, which has presented chart/graphs, the drill down can be performed using a chart/graph or using folder-like control **4003**A in aggregated rows in the table). As a result, the detailed view will be sorted in the same order as aggregated view, and charts presented in the aggregate view will be presented in detail view.

Similarly, all the described controls in the columns can be applied to the rows as well, in which case full symmetry is applied where rows will be substituted by columns, and vice versa. The table, if appropriate, will have a selection mechanism to decide if it is column controlled or alternatively row controlled.

A table, according to the invention, has the capability of dynamically adding columns from an available database of virtual columns or removing columns from the table. That capability, combined with dynamic aggregation by any column and filtering by any column combination (that is, by more than one column) provides a very flexible method for data searching and presentation.

A table's columns can thus be of two types: regular and virtual. Regular columns are ones that appear in the tables, either visible or not (hidden). The virtual columns are ones that can be added to the table, either as a regular column or a proxy column. A proxy column is a column to whose content, column manipulation can be applied, thereby potentially changing the displayed data in the table or in a view related to the table, but without displaying the actual data of the proxy column. A virtual column can be selected from the virtual database using a list, a browsing mechanism or another convenient method. The user can decide how to use the virtual column (either as real or proxy column).

A preferred embodiment, according to this aspect of the invention, for a proxy column features a column header for a regular column, which contains all the column controls. Furthermore, the selected column can be instantiated as a new column in the table. In addition, the list of columns can be provided dynamically, based on available database information and may be presented as a combination of column type, column semantics and user preferences. Further, if a column can be parameterized, appropriate parameter choices for instantiated column will be provided. Referring to FIG. **49**, for example, if the column is P&L (profit and loss), choices of time horizon will be provided, such as daily, weekly, monthly, quarterly and yearly, as well as potentially an optional parameter, if it is realized or unrealized.

For example, a proxy column can be sorted upon, potentially changing the order of the table rows; or a proxy column can be charted without affecting the display of the table. As an example, in FIG. **43**A, a table **4310** and a virtual column database **4315** are illustrated. Selecting a column M from the database **4315** and adding it to the table **4310** results in table **4320**, as shown in FIG. **43**B, with column M being added to the table as regular column.

All displayed regular columns can become virtual. FIG. **43**C illustrates a table **4330** with a 'V' control **4332** in the table headers, which were for example activated by using control actuation button **600**. Activating the 'V' control in column C will remove this column from the table **4330**, resulting in table **4340** as shown in FIG. **43**D, although the column is still available for all purpose in the virtual column database **4315**. The use of the virtual columns is illustrated in FIGS. **43**E-I. The column M is added, as a result of user selection, as a proxy column to the table **4350** (FIG. **43**E) from the virtual column database **4315**. The resulting table **4360** is shown in FIG. **43**F, where **4365** represents a proxy column M. (Note that the content of the proxy column is not displayed, whereas the content is displayed when the virtual column is selected as real column, and therefore added to a table, as in FIG. **43**B.) Sorting table **4360** by ascending value content of column M (which has values of **125** for row **1**, **175** for row **2**, and **100** for row **3** as shown in column content **4366**) by activating a sort ascending control **4367** in the proxy column header results in the table **4370** shown in FIG. **43**G, where control **4367**A is visually marked.

Activating a graph control **4368** in proxy column **4365** in a table **4360** results in table **4380**, where control **4368**A is visually marked and graph **4385** is shown in FIG. **43**H. Activating an 'R' control **4369** in proxy column **4365** in table **4360** will make the column a regular column M in table **4390**, as illustrated in FIG. **43**I.

Override Feature (Cell Operation)

Referring to FIG. **4**, and the flow chart of FIG. **52**, in another aspect of the invention, a display of a so-called "override" is presented in tabular form **74**. In accordance with this aspect of the invention, the system, for example, but not necessarily, in real time, provides for overriding the data provided by the system with user-generated data. Accordingly, referring to FIG. **4**, the tabular representation **74** includes a so-called "override" section illustratively shown as the last column under "local price." (Other columns could be identified as "overrideable" as well, provided, in accordance with the system, their data can be overwritten.) In this section, the user selects the cell(s) to override (step **5210**) and can enter price data (step **5220**), which is to override the actual price provided by the data in the system **18**. In operation, the view may present, for a cell, a display of a text field **77***a* and an override button **76** (*x*). Upon "clicking" on the override button "x," (at step **5225**) after entering the override data in the text field (here **25**), the user's system will forward the override data through the network (step **5230**), for example

the web, to the system **18** where it will be used to recalculate all of the other dependent data in the system (step **5235**) either locally or globally as determined by the user system. A new page display will then be generated (step **5240**) containing an added unoverride button **77** in the cell being overridden, and provided to the user for display by the web server **40** (step **5250**). (Each of the users that will have access to the effects of the overridden data, will see the changes according to system operation.) In this configuration, the user can thereafter "unoverride" the overridden data (step **5260**) by clicking on the unoverride button **77** (which conditionally appears only in an overridden cell) and the system **18** will then reverse the overridden data with associated system provided data if such data exists, and will recalculate all of the data with such system provided data. The resulting revised display will then reflect the system provided value for any of the data, which has been "unoverrode." Further, it is important to recognize that the system provided data may be dynamically changing or at least updated from the time of the override.

Accordingly, the system thus provides an operational flexibility unavailable previously and enables the real-time data presentation to be overridden in any and all of the processed displays presented by the system, and then "unoverridden".

Row Operations

While the description herein has concentrated upon column manipulations and activities, as noted above, the same tools and functions could be equally applied to rows of a table. Further, however, the user has a capability in accordance with the invention to select a row, for example, by selecting a symbol, and to indicate for the selected row various operations similar to, but different than, those described above. Referring now to FIG. **8**A, in one aspect, a user can modify or edit some of the row information by displaying the original screen where the row is defined, and effecting the modification. For example, a trade can be modified by clicking on the "Modify trade" control button **800**. This causes a new screen to open (FIG. **8**B), and the user either modifies **802**, or cancels the trade, **803**, causing a new window to open. After the user confirms that the trade is to be modified by clicking on the "yes" button **900** (FIG. **9**), the system displays, referring to FIG. **10**, the detailed data for that selected trade entry. The user can modify this trade entry as desired, and when done, the modified trade will replace the original trade in the user display (FIG. **8**A) as well as in the system **18** storage and memory.

In another aspect of the invention, the user can require and display, for portfolio analysis, aggregated data (as described above) collected by any of a variety of characteristics, for example, by country as illustrated in FIG. **11**. Alternative aggregated views can be provided to present the data, as noted in line **1000**, by allocation, by asset class, by currency, by industry etc. These views, while accessed by the user, will be kept in the ViewServer cache **70** for display by the ApplicationServer **42** through the web server **40**. When the aggregated symbol is clicked upon, a more detailed presentation, as shown in the display detail drill down table of FIG. **12**, will be displayed.

Adaptive Pull

In accordance with another aspect of the invention, as noted above, the metadata is preferably provided with the retimed web page to automatically refresh the display at a periodic rate. When a refresh is requested by the browser, at **200**, referring to FIG. **8**, the ApplicationServer **42** inquires of the system, at **202**, whether any of the data and/or presentation has changed, and if any has changed, that update data is available at **204** in ViewServer cache **70**. Cache **70** is constantly being updated, asynchronously, as new data is acquired by the system, or as data is rearranged. The page is then reassembled and passed through the ApplicationServer at **206**, to the web server at **208**, and then to the user browser for eventual display at **210**. This is a simple process for "HTML" pages.

If no change has been made in the data and/or presentation, then there is no need to provide a further update and the same page can be used at **209**.

The system can automatically provide for a dynamically changing repetition rate for the refresh depending upon parameters set in accordance with the system operation. Thus, refresh can occur much more quickly when changes have been requested to be made to the display at the user system, but updates can be made much less frequently when, for example, further user requests have not taken place, for example, for ten minutes, or when the markets have closed. Other use parameters can also be provided to control the rate of refresh of the display, such as tabular display **72**. For the financial markets, this can be depend upon the instruments being displayed, the time of day, the nature of the market, whether this is a new view or a new page (the system will automatically display a default view of the page when entered the first time), etc.

Alternative Data Sources

The ViewTOTAL data sources and processing servers are dependent on the task at hand and can vary. One useful embodiment is to load a table (or table like data) into ViewTOTAL from an external data source, for example, a spreadsheet, and allow it to be manipulated through controls provided in the interactive table described above. It can also share the resulting interaction with other users in the network. Another useful interaction is to load information into ViewServer from the web page by parsing it. The resulting information can be presented separately of the original page, or it may be displayed within a page which emulates the original page where a new table is substituted by the interactive table.

For example, the system can parse data from a data source (for example, a file, a database, a web page, etc.) and load it in ViewTOTAL for further interaction and sharing. Referring to FIG. **48**, the system is provided, manually or automatically, with a data source (step **4810**). If the data source is a web page address (URL), tested at **4820**, the system parses the page and extracts table or table-like information from the page (step **4830**). The system also maintains the original page information for further possible page duplication (step **4840**). If the data source was not a web page address, the system extracts the data form the non web page data sources at **4845**. If no errors occur, tested at **4850**, the system attempts to analyze and classify the data at **4855**. One example of the results of the system analysis is to identify a data column type.

The results of the analysis can them be presented to the user for correction or augmentation (step **4860**). The system then loads the extracted table data information into the ViewTOTAL through the DataServer, populating other servers, for example ViewServer and the AnalyticalServer, caches. This is indicated at **4865**. The ViewServer maintains the information in a table format (step **4870**), and the ApplicationServer constructs a new page with a new table having interactive controls and populates the new table with the table from the ViewServer (step **4875**). The system then presents the new page which will contain the new interactive table, where, in the case of a web page data source, it can, if requested, provide a duplicate of the original page to the extent possible, where the original table is replaced with the new interactive table (step **4880**). In a particular aspect of the invention, the new page can contain a link to the original page (step **4885**).

The user can then interact with the new table through its controls which communicate with the ViewServer (through the web server and Application Server as described above) (step **4890**). The ViewServer responds to the user interaction as described hereinbefore and manipulates the table accordingly (step **4892**). The ApplicationServer can construct the page containing a pre-arranged table which load information from the ViewServer cache and returns the page to the user through the web server (step **4894**). The new page can be further shared among other users using the system sharing infrastructure as described in more detail elsewhere (step **4896**). Finally, a new table cam be saved at any point of the interaction with the user in the system or at the user location for yet further interaction (step **4898**).

Client-Based Programs

In an alternate embodiment of the invention, client-based programs (such as Java applets, C# programs, or local programs) can be employed to download, through the web, the necessary information, preferably on a real-time basis, to update the user view. In this aspect of the invention, the client-based programs are created so that most of the program effort takes place at the servers of system **18** while a relatively "thin" program is downloaded to the user's browser, or deployed on the user's computing devices. The refresh of data at the user display takes place, incrementally and dynamically, preferably in real time. The client-based program reads the display configuration from the server and dynamically creates appropriate view groups. One program can flexibly present any view groups, and any views within a view group, as well as any columns in the case of a table based configuration. Preferably, the user display changes occur in a minimum number of elements such as, in the case of tables, symbols, fields and cells as opposed to full pages in the case of HTML. Symbols (and hence rows) and fields (and hence columns) can be dynamically added and deleted as well as cells being dynamically updated. The program can deal with visual representation and interaction without necessarily fully "understanding" the content meaning.

Thus, according to this aspect of the invention, it is only necessary to use the "thin" client-based program since in this embodiment much of the available information or data is handled at the server. This results in a real time dynamic update of the information on display at the user's site.

One Click Failover

In yet another aspect of the invention, the display includes a "failover button", which can be used in those instances where, for some reason, the system **18** is unable (or is slow, for example) to provide the display updates. In this embodiment of the invention, referring to FIGS. **5**A and **5**B, clicking on the failover button enables the system to access an alternate web server **40***b* connected to communication private networks **30**, **32** to access an alternate ApplicationServer **42***b*. The alternate ApplicationServer **42***b*, as illustrated in FIG. **5**B, then accesses the original ViewServer for the user, which maintained the display view parameters previously used to create the display seen by the user, and delivers it to the user browser, for example, through a faster route. If the original ViewServer were also unavailable, an alternate server would pick up the views recently accessed by this user. The ApplicationServer is thus able to update the previous display view, which is cached at the ViewServer, and delivers it through the web server **40***b*, to the Internet and then to the user, thus enabling a reliable and redundant connection to the data even if, for example, the web server **40***a* and/or ApplicationServer **42***a*, originally being employed, were to fail or slow down. This operation is illustrated in FIG. **5**A, the "before failover mode" configuration and FIG. **5**B the "after failover mode" configuration. Importantly, it is the user who, in this embodiment, initiates the transfer upon recognizing the inability to obtain further updates or other views from the system **18** using the path originally assigned to it.

The link to the failover server will be generated by the current ApplicationServer with the name of the failover server, with an encrypted user identification (such as an access identifier or user name and password), timestamp (if the button is pressed after certain time period it will not be allowed to login for security reasons) as well as other parameters such as view name. The failover server will log in the user, connect to the ViewServer and display the specified view and as such it will provide "hot recovery." Thus, for example, before failover, a page can have associated with it "failover" buttons (and written in the pages) as follows:

Button 1	Button 2		FailoverButton
[http://serverA . . .]	[http://serverA . . .]	. . .	[http://serverB . . .]

After failover, the displayed page can contain the alternate failover identifications:

Button 1	Button 2		FailoverButton
[http://serverB . . .]	[http://serverB . . .]	. . .	[http://serverA . . .] or
[http://serverB . . .]	[http://serverB . . .]	. . .	[http://serverC . . .]

if more than 2 web servers are available for further redundancy.

General Look and Feel

Referring to FIG. **6**, at the user/browser site, many different type displays can and are provided by the system **18**. As noted above, in connection with FIGS. **3** and **4**, various tables **80** can be provided to illustrate the data being requested. But in addition, graphs **82**, charts **84**, news text **86** and various Alert information, either in the form tables, texts, graphs, charts, or other indicia, can be provided and displayed to the user. In particular, when using, for example, the tables provided in FIG. **3**, color can be indicative of changes in value from a previous update, or from an update within the previous, for example, ten minutes. Thus, red can, for example, be used to indicate values in any cell that have decreased in value while green might be used to represent values that have increased in value. This easy visual indication of changes in various portions of the table provide the user with an immediate advantageous secondary source of visual indication to enable quick understanding and mental analysis of the display being presented. This is particularly useful where the display is both involved and complex.

Referring to FIG. **6**, each of the graphs, charts, and other presentations, etc. have a defined configuration. In accordance with a preferred embodiment of the invention, each user has his own preferred configuration for the graphs, tables, etc. The server maintains the configuration information for the user and provides to the user the information as the user has previously designated. In addition, as illustrated in, for example, FIG. **3**, many of the application presentations have a structure in which they provide a View Group **800** such as the group's portfolio, trades, markets, trade entry, and log out (FIG. **3**), and within the View Groups, views which include the interactive views **60**.

The ViewServer will keep configuration data on a per user basis, identifying what View Groups **800** and Views **60** the user sees, as well as parameters for Tables (for example,

which column to show and in what order) and Charts (for example, a default chart type). By clicking on User View Group, the application shows a list of Views for this group. By Clicking on the View, the application shows the presented data on one or more tables or charts or on a combination of them. Note also that certain views, like tables and charts, typically display dynamically changing information.

Referring to FIGS. **20**A-D each page will have different display areas such as Display Browse Controls (View Group controls, View controls, View Slice controls), TableView, ChartView, AlertView, NewsView, MessageView etc. Each of those and other display areas can be hidden or revealed by display area control actuation buttons, such as buttons **1800**, **1801**, **1802**. Selecting such a control button on the visible area will make this area disappear. Selecting it again will make this area reappear. Selecting button **1800** in FIG. **20**A will cause the page view to change and look like FIG. **20**B. Selecting button **1802** in FIG. **20**B will cause the page view to change and look like FIG. **20**C Selecting button **1802** in FIG. **20**C will cause page view to change and look like FIG. **20**D (the same view as FIG. **20**B).

As noted above, to display data updates on the user screen, the ViewServer will refresh the page using the "refresh" meta tag embedded in the page HTML. The direction of the data change in the data preferably is provided by a color change, for example green to indicate an increase in value and red to indicate the decrease in value.

The user will have an interface to create new views from virtual columns. In addition the user can specify, other attributes such as filters, aggregations, e.t.c. At any point of time the view can be reconfigured, named and saved with its attributes. Also, the user will have an interface to create a ViewGroup and add/remove views, name and save ViewGroups, as well as create application displays by choosing ViewGroups. As such, the user has a full interactive capability to create his own configurable applications, which can be reconfigured further later.

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

Additions, subtractions, and modifications of the disclosed preferred embodiments of the invention will be apparent to those of skill in this field and are within the scope of the following claims.

What is claimed is:

1. A system, comprising memory operatively coupled to one or more processors that are configured to execute instructions that cause the system to perform a method comprising steps of:

receiving from a first user a first expression of interest in being notified about interactions of a third user;

receiving from a second user a second expression of interest in being notified about interactions of the third user;

receiving an indication of a particular interaction of the third user;

after receiving the first expression of interest, receiving the second expression of interest, and receiving the indication, performing the steps of:

based, at least in part, on the first expression of interest, sending first information about the particular interaction to the first user;

based, at least in part, on the second expression of interest, sending the first information about the particular interaction to the second user; and

wherein the first information includes one or more links that provide access to one or more views that are associated with the particular interaction;

receiving from the first user a first comment entered in a first text entry interface, wherein the first text entry interface is related to the first information; and

sending the first comment to the second user to enable display of the first comment, in relation to the first information, to the second user.

2. The system of claim **1** wherein:

the step of sending the first information to the first user causes display of the first information in a particular application display of the first user; and

the method further comprises:

receiving from the first user a third expression of interest in being notified about interactions of a fourth user that is different from the third user; and

in response, at least in part, to a given interaction of the fourth user with the system, sending second information to the first user, based, at least in part, on the third expression of interest to cause display of the second information concurrently with the first information in the particular application display.

3. The system of claim **2** wherein the second information includes one or more links that provide access to one or more views that are associated with the given interaction.

4. The system of claim **2** wherein:

the particular application display of the first user is generated by a locally installed client-based program that is not a web browser;

the locally installed client-based program is a program that is downloaded to a wireless PDA from an application storage that is remote relative to the wireless PDA;

the particular application display of the first user is displayed by the wireless PDA; and

the application storage is maintained remote from said system.

5. The system of claim **2** wherein the particular interaction is a different type of interaction than the given interaction.

6. The system of claim **5** wherein:

the given interaction corresponds to input of a first text by the fourth user; and

the particular interaction corresponds to the third user loading a file to the computer-based service.

7. The system of claim **5** wherein:

the given interaction corresponds to a request to share a web page by the fourth user; and

the particular interaction corresponds to the third user loading a file to the computer-based service.

8. The system of claim **2** wherein:

the particular interaction corresponds to the third user loading at least a portion of a file to the system;

the given interaction corresponds to the fourth user joining a group of users; and

the second information includes a description of the given interaction.

9. The system of claim **1** wherein:

the particular interaction includes interaction with a particular image; and

a particular link of the one or more links provides access to the particular image.

10. The system of claim **9** wherein the particular image is a graph or chart.

11. The system of claim 1 wherein the particular interaction includes interaction with a particular image and the first information includes at least a portion of the particular image.

12. The system of claim 1 wherein the particular interaction corresponds to the third user loading at least a portion of a file to the system.

13. The system of claim 12 wherein the first information includes at least a portion of the file.

14. The system of claim 1 wherein at least one of the one or more links is a URL.

15. The system of claim 1 wherein:

the particular interaction corresponds to input of a text, by the third user, into a text entry interface that is related to a given view that is shared, at least in part, among the first, second and third users;

the method further comprises maintaining, for the third user, at least a portion of content of the given view;

the method further comprises causing said text to be shared with the first user and the second user; and

a given link from the one or more links provides access to said given view.

16. The system of claim 1 wherein receiving the first expression of interest comprises receiving a specification of interest in interactions of the third user.

17. The system of claim 1 wherein the particular interaction corresponds to the third user accessing a given view; and

a given link, of the one or more links, provides access to the given view.

18. The system of claim 17 wherein:

the given view is a news view; and

content of the news view originates from a data source that is remote relative to the first user, the second user, the third user and the system.

19. The system of claim 1 wherein a given link, of the one or more links, enables the first user to participate in same type of interaction with the system, as the particular interaction.

20. The system of claim 1 wherein the first information is sent to the first user and the second of user, without receiving explicit instruction provided by the third user, regarding who should be notified specifically about the particular interaction.

21. The system of claim 1 wherein the first information is sent to the first user and the second of user, without receiving instruction provided by the third user, regarding who should be notified specifically about the particular interaction.

22. The system of claim 1 wherein the following steps of the method are performed in real-time:

receiving from the first user a first comment entered in a first text entry interface, wherein the first text entry interface is related to the first information; and

sending the first comment to the second user to enable display of the first text, in relation to the first information, to the second user.

23. The system of claim 1 wherein the text entry interface is a text view.

24. The system of claim 1 wherein the method further comprises limiting access to the first comment to users who are authorized to access the first information.

25. The system of claim 1 wherein:

the particular interaction involves a given view; and

a given link, of the one or more links, provides access to the given view.

26. The system of claim 1 wherein the step of sending the first comment automatically causes display of the first comment, in relation to the first information, to the second user.

27. The system of claim 1 wherein the step of sending the first comment automatically causes display of the first comment, in relation to the first information, without causing redisplay of the first information, to the second user.

28. The system of claim 1 wherein the first comment is sent to the second user based, at least in part, on the second expression of interest.

29. A method comprising:

creating, by a computer-based service, a plurality of associations, each of which associates (a) occurrence of one or more application events from a plurality of application events, with (b) one or more users from a plurality of users;

enabling, by the computer-based service, each user of the plurality of users to interact, over a network, with one or more applications;

monitoring, by the computer-based service, for occurrence of said plurality of application events;

wherein each application event, from the plurality of application events, corresponds to interaction with at least one of the one or more applications, by at least one user from the plurality of users;

in response, at least in part, to occurrence of a first application event from the plurality of application events, the computer-based service sending first information about the first application event to each user of a plurality of second users, from the plurality of users;

wherein the first information includes one or more links that provide access to one or more views that are associated with the first application event;

wherein the first application event occurred based, at least in part, on interaction of a first user, from the plurality of users, with a given view from the one or more views;

wherein sending the first information includes sending the first information to at least one user of the plurality of second users, based, at least in part, on a first association of the plurality of associations;

wherein the step of creating includes creating the first association based on the computer-based service receiving, from the at least one user of the plurality of second users, an expression of interest in interactions of the first user;

receiving, by the computer-based service, a comment from a particular second user, of the plurality of second users;

wherein the first user is a different user than the particular second user;

wherein the comment is entered in a text entry interface that is related to the first information; and

the computer-based service sending the comment, to each user of the plurality of second users other than the particular second user, to cause display of the comment, in relation to the first information, to the each user of the plurality of second users other than the particular second user.

30. The method of claim 29 wherein:

the step of sending the first information causes display of the first information in a respective application display of each user of the plurality of second users; and

the step of sending the comment causes display of the comment, in relation to the first information, in the respective application display of the each user from the plurality of second users other than the particular second user.

31. The method of claim 29 wherein receiving the expression of interest comprises receiving a specification of interest in interactions of the first user.

32. The method of claim 29 wherein the first association associates the at least one user of the plurality of second users

with occurrence of application events, of the plurality of application events, that correspond to interactions of the first user.

33. The method of claim **32** wherein the first association associates the at least one user of the plurality of second users with occurrence of the first application event.

34. The method of claim **29** wherein:

the given view includes a given image; and

a given link of the one or more links provides access to the given image.

35. The method of claim **29** wherein:

the interaction of the first user corresponds to input of a text that causes the given view to be updated with said text;

at least a portion of the given view is shared among the first user and the plurality of second users;

the method further comprises maintaining, by the computer-based service for the first user, at least a portion of content of the given view; and

the method further comprises causing said text to be shared with the plurality of second users.

36. The method of claim **29** wherein the first text entry interface is related to the first information at least in that the comment entered in the first text entry interface is shared only with users who received the first information.

37. The method of claim **29** wherein the comment is sent, to the each user of the plurality of second users other than the particular second user, without receiving from the particular second user any explicit indication of to whom to send the comment.

38. One or more non-transitory computer-readable media storing instructions which, when executed by one or more processors, cause the one or more processors to perform a method comprising steps of:

providing a computer-based service over a network to a set of users, wherein a first user, a second user and a third user belong to the set of users;

receiving, by the computer-based service from the first user, a first expression of interest in being notified about interactions of the third user;

receiving, by the computer-based service from the second user, a second expression of interest in being notified about interactions of the third user;

receiving, by the computer-based service an indication of a particular interaction of the third user;

after receiving the first expression of interest, receiving the second expression of interest, and receiving the indication, the computer-based service performing the steps of:

based, at least in part, on the first expression of interest, sending first information about the particular interaction to the first user;

based, at least in part, on the second expression of interest, sending the first information about the particular interaction to the second user; and

wherein the first information includes one or more links that provide access to one or more views that are associated with the particular interaction;

receiving, by the computer-based service from the first user, a first comment entered in a first text entry interface, wherein the first text entry interface is related to the first information; and

in response to receiving the first comment, the computer-based service sending the first comment to the second user, based, at least in part, on the second expression of interest, to cause display of the first comment, in relation to the first information, to the second user.

39. The one or more non-transitory computer-readable media of claim **38** wherein:

the particular interaction includes interaction with a particular image; and

the step of sending the first information to the first user causes display of at least a portion of the particular image to the first user.

40. The one or more non-transitory computer-readable media of claim **38** wherein:

the particular interaction corresponds to the third user loading at least a portion of a file to the computer-based service; and

at least one link from the one or more links provides access to the at least a portion of the file.

41. The one or more non-transitory computer-readable media of claim **38** wherein:

the particular interaction corresponds to input of a text, by the third user, into a text entry interface that is related to a given view that is shared, at least in part, among the first, second and third users;

the method further comprises enabling the third user to control access to the given view;

the method further comprises maintaining, at least a portion of content of the given view by the computer-based service;

the method further comprises causing said text to be shared with the first user and the second user; and

a given link from the one or more links provides access to said given view.

42. The one or more non-transitory computer-readable media of claim **38** wherein a given link, of the one or more links, enables the first user to participate in same type of interaction with the computer-based service, as the particular interaction.

43. The one or more non-transitory computer-readable media of claim **38** wherein:

the particular interaction involves a given view; and

a given link, of the one or more links, provides access to the given view.

44. The one or more non-transitory computer-readable media of claim **38** wherein a given view, of the one or more views, is associated with the particular interaction at least in that the particular interaction includes interaction with the given view; and

a given link, of the one or more links, provides access to the given view.

45. The one or more non-transitory computer-readable media of claim **44** wherein the one or more views include the given view and a particular view, and

the particular view is associated with the particular interaction at least in that particular view provides context of the particular interaction.

46. The one or more non-transitory computer-readable media of claim **45** wherein the given link provides access to a combination of views, including both the given view and the particular view.

47. The one or more non-transitory computer-readable media of claim **44** wherein the given link points to the given view.

48. The one or more non-transitory computer-readable media of claim **38** wherein the first text entry interface is related to the first information at least in that any comment entered in the first text entry interface is shared with users that are authorized to access the first information.

49. A method comprising:

providing a computer-based service over a network to a set of users, wherein a first user, a second user and a third user belong to the set of users;

receiving, by the computer-based service from the first user, a first expression of interest in being notified about interactions of the third user;

receiving, by the computer-based service from the second user, a second expression of interest in being notified about interactions of the third user;

receiving, by the computer-based service an indication of a particular interaction of the third user;

after receiving the first expression of interest, receiving the second expression of interest, and receiving the indication, the computer-based service performing the steps of:

based, at least in part, on the first expression of interest, sending first information about the particular interaction to the first user;

based, at least in part, on the second expression of interest, sending the first information about the particular interaction to the second user; and

wherein the first information includes one or more links that provide access to one or more views that are associated with the particular interaction;

receiving, by the computer-based service from the first user, a first comment entered in a first text entry interface, wherein the first text entry interface is related to the first information; and

the computer-based service sending the first comment to the second user to cause display of the first comment, in relation to the first information, to the second user.

50. The method of claim **49** wherein:

the particular interaction corresponds to interaction with a given view of the one or more views; and

a given link, of the one or more links, enables the first user to participate in same type of interaction with the given view, as the particular interaction.

51. The method of claim **49** wherein receiving the first expression of interest comprises receiving a first specification of interest in interactions of the third user.

52. The method of claim **49** wherein the following steps of the method are performed in real-time:

receiving, by the computer-based service from the first user, a first comment entered in a first text entry interface, wherein the first text entry interface is related to the first information; and

the computer-based service sending the first comment to the second user to cause display of the first comment, in relation to the first information, to the second user.

53. The method of claim **49** wherein the computer-based service sending the first comment to the second user without resending the first information to the second user.

54. The method of claim **49** wherein the computer-based service sending the first comment to the second user without receiving from the first user any explicit indication of to whom to send the first comment.

55. The method of claim **49** wherein the particular interaction corresponds to the third user loading at least a portion of a file to the computer-based service.

56. The method of claim **49** wherein:

the particular interaction involves a given view; and

a given link, of the one or more links, provides access to the given view.

57. The method of claim **49** wherein:

the particular interaction corresponds to input of a text, by the third user, into a text entry interface that is related to a given view that is shared, at least in part, among the first, second and third users;

the method further comprises enabling the third user to control access to the given view;

the method further comprises maintaining, at least a portion of content of the given view by the computer-based service;

the method further comprises causing said text to be shared with the first user and the second user; and

a given link from the one or more links provides access to said given view.

58. One or more non-transitory computer-readable media storing instructions which, when executed by one or more processors, cause the one or more processors to perform a method comprising steps of:

creating, by a computer-based service, a plurality of associations, each of which associates (a) occurrence of one or more application events from a plurality of application events, with (b) one or more users from a plurality of users;

enabling, by the computer-based service, each user of the plurality of users to interact, over a network, with one or more applications;

monitoring, by the computer-based service, for occurrence of said plurality of application events;

wherein each application event, from the plurality of application events, corresponds to interaction with at least one of the one or more applications, by at least one user from the plurality of users;

in response, at least in part, to occurrence of a first application event from the plurality of application events, the computer-based service sending first information about the first application event to each user of a plurality of second users, from the plurality of users;

wherein the first information includes one or more links that provide access to one or more views that are associated with the first application event;

wherein the first application event occurred based, at least in part, on interaction of a first user, from the plurality of users, with a given view from the one or more views;

wherein sending the first information includes sending the first information to at least one user of the plurality of second users, based, at least in part, on a first association of the plurality of associations;

wherein the step of creating includes creating the first association based on the computer-based service receiving, from the at least one user of the plurality of second users, an expression of interest in interactions of the first user;

receiving, by the computer-based service, a comment from a particular second user, of the plurality of second users;

wherein the first user is a different user than the particular second user;

wherein the comment is entered in a text entry interface that is related to the first information; and

the computer-based service sending the comment, to each user of the plurality of second users other than the particular second user, to enable display of the comment, in relation to the first information, to the each user of the plurality of second users other than the particular second user.

59. The one or more non-transitory computer-readable media of claim **58** wherein:

the first application event corresponds to the first user causing at least a portion of a file to be loaded to the computer-based service; and

the step of sending the first information to the at least one user of the plurality of second users includes causing display of the at least a portion of the file to the at least one user of the plurality of second users.

60. The one or more non-transitory computer-readable media of claim **58** wherein receiving the expression of interest comprises receiving a specification of interest in interactions of the first user.

61. The one or more non-transitory computer-readable media of claim **58** wherein the first application event corresponds to the first user accessing the given view; and

a given link, of the one or more links, provides access to the given view.

62. The one or more non-transitory computer-readable media of claim **58** wherein the first association associates the at least one user of the plurality of second users with occurrence of application events, of the plurality of application events, that correspond to interactions of the first user.

63. The one or more non-transitory computer-readable media of claim **58** wherein:

the at least one user of the plurality of second users is a given user;

the given user is a different user than a particular user of the plurality of second users;

sending the first information includes sending the first information to the particular user, based, at least in part, on a second association of the plurality of associations;

the first association is different from the second association; and

the step of creating includes creating the second association based on the computer-based service receiving, from the particular user, an expression of interest in interactions of the first user.

64. The one or more non-transitory computer-readable media of claim **58** wherein:

the computer-based service sends the comment to a given second user of the plurality of second users, based, at least in part, on the first information having been sent to the given second user; and

the given second user is a different user than the particular second user.

65. A method comprising:

providing a computer-based service over a network to a set of users, wherein the set of users includes a first user and a plurality of second users;

receiving, by the computer-based service, from a given user of the plurality of second users, a given expression of interest in being notified about interactions of the first user;

receiving, by the computer-based service, an indication of a first interaction of the first user;

after receiving the given expression of interest and receiving the indication, sending, by the computer-based service, first information about the first interaction to each user of the plurality of second users, to cause display of the first information in a respective view of each of the plurality of second users;

wherein the step of sending the first information includes sending the first information to the given user based, at least in part, on the given expression of interest;

wherein the first information includes one or more links that provide access to one or more views that are associated with the first interaction;

receiving, by the computer-based service from a particular second user, of the plurality of second users, a comment entered in a particular text entry interface, wherein the particular text entry interface is related to the first information; and

in response to receiving the comment, the computer-based service sending the comment, to each user of the plurality of second users other than the particular second user, to enable display of the comment, in relation to the first information, to the each user of the plurality of second users other than the particular second user.

66. The method of claim **65** wherein:

the first interaction corresponds to the first user causing at least a portion of a file to be loaded to the computer-based service; and

the first information includes the at least a portion of the file.

67. The method of claim **66** wherein the file is a spreadsheet.

68. The method of claim **65** wherein the first information includes a description of the first interaction.

69. The method of claim **68** wherein the description includes a text description.

70. The method of claim **65** wherein the first information includes a particular image that provides a context of the first interaction.

71. The method of claim **65** further comprising:

receiving, by the computer-based service from the given user, a particular expression of interest in being notified about interactions of a second user that is different from the first user, wherein the second user belongs to the set of users; and

in response, at least in part, to a given interaction of the second user, the computer-based service sending second information to the given user, based, at least in part, on the particular expression of interest to cause display of the second information concurrently with the first information in the respective view of the given user.

72. The method of claim **65** wherein receiving the given expression of interest comprises receiving a specification of interest in interactions of the first user.

73. The method of claim **72** wherein the first information is sent, by the computer-based service, to each user of the plurality of second users, without receiving instruction provided by the first user, regarding who should be notified specifically about the first interaction.

74. The method of claim **65** further comprising, limiting access to the first comment to users in the set of users who are authorized to access the first information.

75. The method of claim **65** wherein the first interaction includes interaction with a particular image and the first information includes at least a portion of the particular image.

76. The method of claim **65** wherein:

the first interaction involves a given view; and

a given link, of the one or more links, provides access to at least a portion of content of the given view.

77. The method of claim **65** wherein:

the first interaction includes interaction with a given view;

a given link, of the one or more links, enables the given user to participate in same type of interaction, with the given view, as the first interaction.

78. The method of claim **65** wherein:

the first interaction corresponds to input of a text, by the first user, into a text entry interface that is related to a given view that is shared, at least in part, among the first user and the plurality of second users;

the method further comprises enabling the first user to control access to the given view;

the method further comprises maintaining, at least a portion of content of the given view by the computer-based service;

the method further comprises causing said text to be shared with the plurality of second users; and

a given link from the one or more links provides access to said given view.

79. A system, comprising one or more processors configured to execute instructions that cause the system to perform the method recited in claim **65**.

80. One or more non-transitory computer-readable media storing instructions which, when executed by one or more processors, cause the one or more processors to perform the method recited in claim **65**.

81. The method of claim **65** wherein the computer-based service sends the comment, to the each user of the plurality of second users other than the particular second user, without receiving from the particular second user any explicit indication of to whom to send the comment.

82. The method of claim **65** wherein the step of sending the comment automatically causes display of the comment, in relation to the first information, to the each user of the plurality of second users other than the particular second user.

83. The method of claim **65** wherein the step of sending the comment automatically causes display of the comment, in relation to the first information, without causing redisplay of the first information, to the each user of the plurality of second users other than the particular second user.

84. A method comprising:

providing a computer-based service over a network to a set of users, wherein the set of users includes a first user and a plurality of second users;

receiving, by the computer-based service, from a given user of the plurality of second users, a given expression of interest in being notified about interactions of the first user;

receiving, by the computer-based service, an indication of a first interaction of the first user;

after receiving the given expression of interest and receiving the indication, sending, by the computer-based service, first information about the first interaction to each user of the plurality of second users, to cause display of the first information to each of the plurality of second users;

wherein the step of sending the first information includes sending the first information to the given user based, at least in part, on the given expression of interest;

wherein the first information includes one or more links that provide access to one or more views that are associated with the first interaction;

in response to receiving, by the computer-based service from a particular second user, of the plurality of second users, a particular comment, the computer-based service sending the particular comment to each user of the plurality of second users other than the particular second user, to automatically cause display of the particular comment, in relation to the first information, to the each user of the plurality of second users other than the particular second user; and

in response to receiving, by the computer-based service from a given second user, of the plurality of second users, a given comment, the computer-based service sending the given comment to each user of the plurality of second users other than the given second user to automatically cause display of the given comment, in relation to the first information and the particular comment, to the each user of the plurality of second users other than the given second user.

85. The method of claim **84** wherein the particular comment is displayed to the particular second user below the first information, and the given comment is displayed below the particular comment.

86. A system, comprising one or more processors configured to execute instructions that cause the system to perform the method recited in claim **84**.

87. One or more non-transitory computer-readable media storing instructions which, when executed by one or more processors, cause the one or more processors to perform the method recited in claim **84**.

88. The method of claim **84** wherein:

the computer-based service performs the step of sending the particular comment without receiving from the particular second user any explicit indication of to whom to send the particular comment; and

the computer-based service performs the step of sending the given comment without receiving from the given second user any explicit indication of to whom to send the given comment.

89. The method of claim **84** wherein:

the first information includes a headline about the first interaction;

the first information, the particular comment and the given comment are displayed in a view of the particular second user;

the view is organized as a bulletin board; and

the headline corresponds to a subject of the bulletin board.

90. One or more non-transitory computer-readable media storing instructions which, when executed by one or more processors, cause the one or more processors to perform a method comprising steps of:

receiving, by a computer-based service from a first user, a first expression of interest in being notified about interactions of a third user;

receiving, by the computer-based service from a second user, a second expression of interest in being notified about interactions of the third user;

receiving, by the computer-based service an indication of a particular interaction of the third user;

after receiving the first expression of interest, receiving the second expression of interest, and receiving the indication, the computer-based service performing the steps of:

based, at least in part, on the first expression of interest, sending first information about the particular interaction to the first user;

based, at least in part, on the second expression of interest, sending the first information about the particular interaction to the second user; and

wherein the first information includes one or more links that provide access to one or more views that are associated with the particular interaction;

receiving, by the computer-based service from the first user, a first comment;

causing display of the first comment, in relation to the first information, to the second user, based, at least in part, on the second expression of interest;

receiving, by the computer-based service from the second user, a second comment; and

causing display of the second comment, in relation to the first information, to the first user, based, at least in part, on the first expression of interest.

91. The one or more non-transitory computer-readable media of claim **90** wherein the step of causing display of the

first comment to the second user includes causing display of the first comment below the first information.

92. The one or more non-transitory computer-readable media of claim **90** wherein the step of causing display of the second comment to the first user includes causing display of the first comment below the first information, and the second comment below the first comment.

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