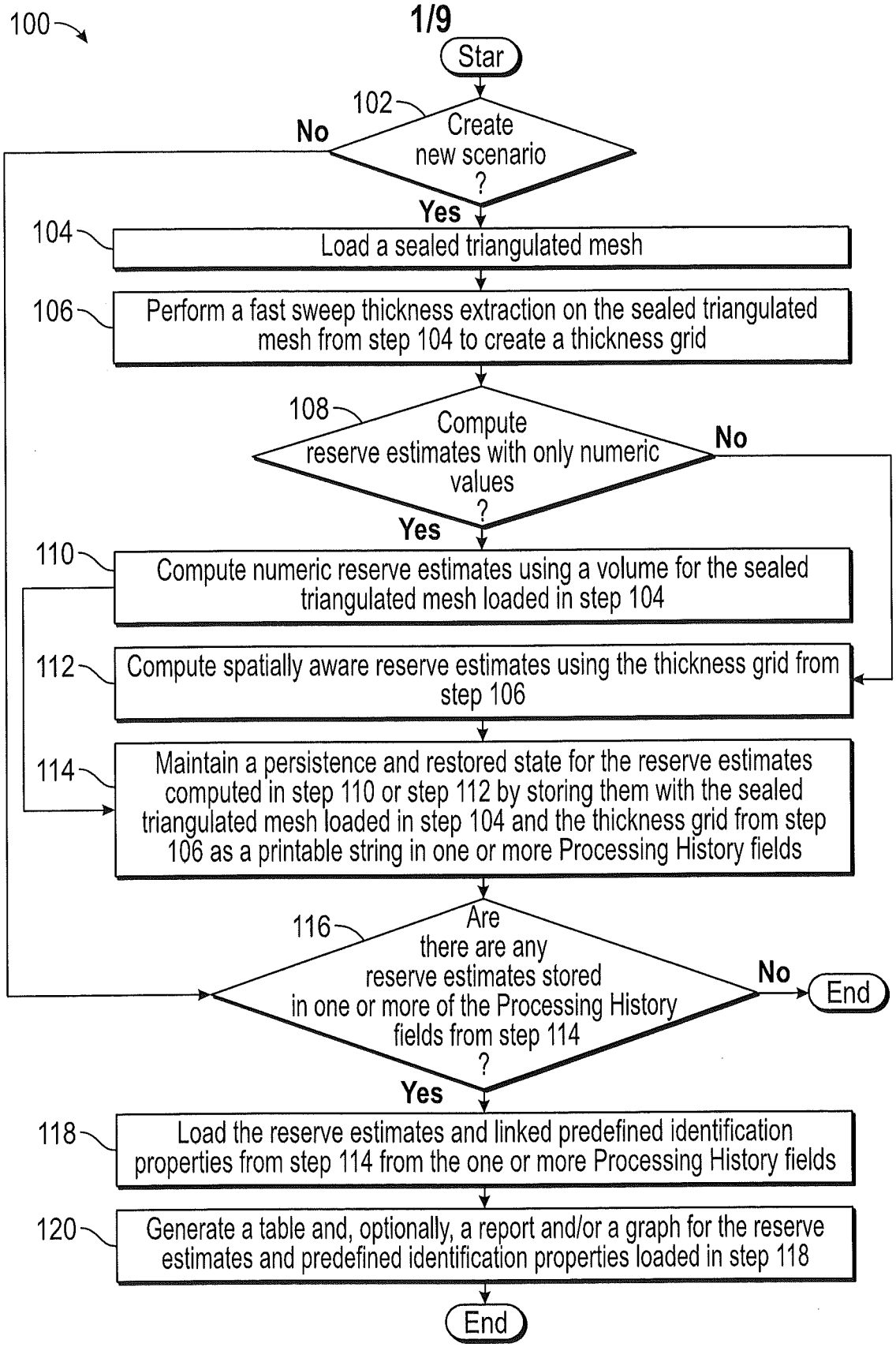
100
Star
102
Create new scenario ?
No
Yes
104
Load a sealed triangulated mesh
106
Perform a fast sweep thickness extraction on the sealed triangulated mesh from step 104 to create a thickness grid
108
Compute reserve estimates with only numeric values ?
No
Yes
110
Compute numeric reserve estimates using a volume for the sealed triangulated mesh loaded in step 104
112
Compute spatially aware reserve estimates using the thickness grid from step 106
114
Maintain a persistence and restored state for the reserve estimates computed in step 110 or step 112 by storing them with the sealed triangulated mesh loaded in step 104 and the thickness grid from step 106 as a printable string in one or more Processing History fields
116
Are there are any reserve estimates stored in one or more of the Processing History fields from step 114 ?
No
End
Yes
118
Load the reserve estimates and linked predefined identification properties from step 114 from the one or more Processing History fields
120
Generate a table and, optionally, a report and/or a graph for the reserve estimates and predefined identification properties loaded in step 118
End

FIG. 1

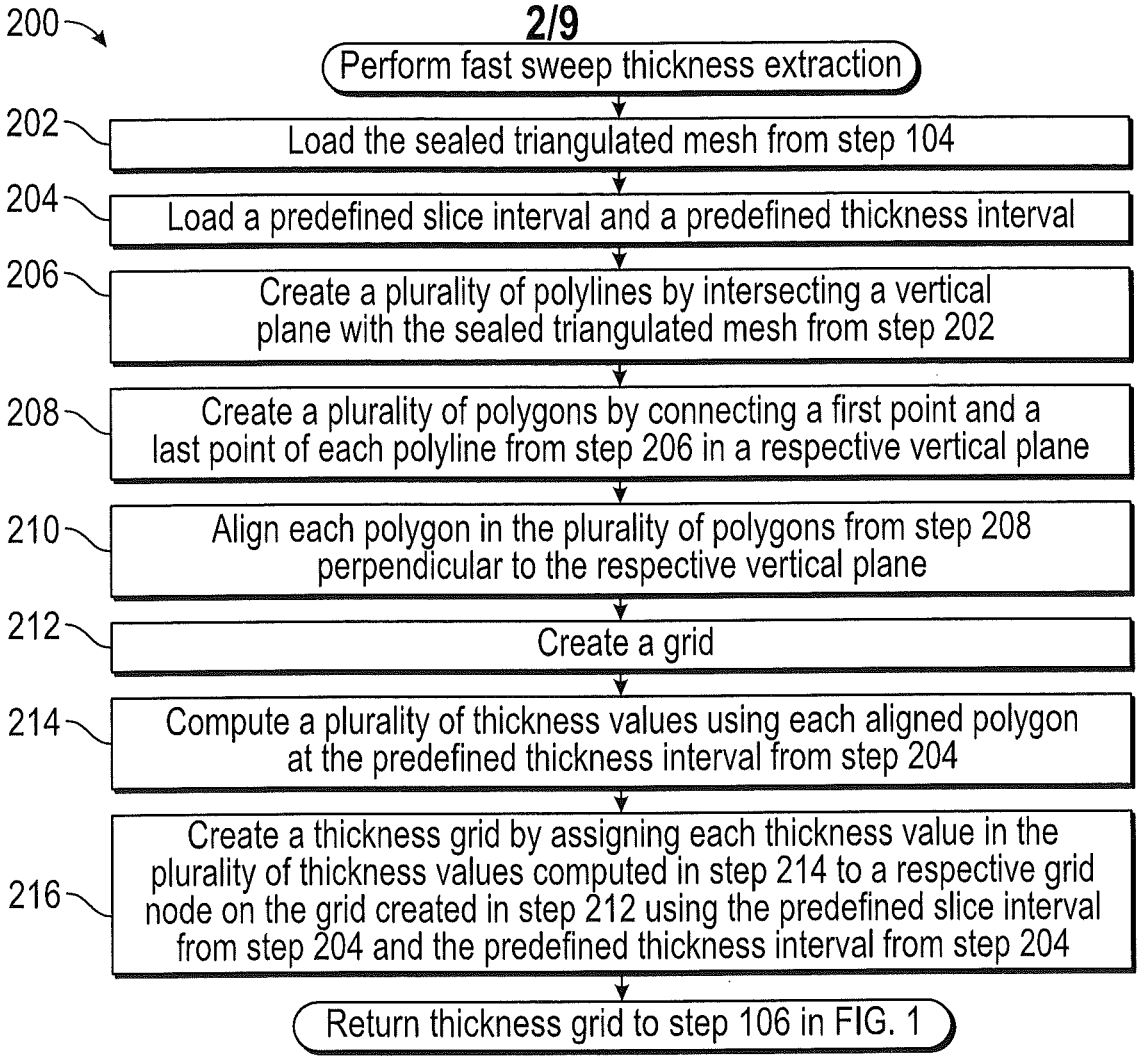
200
Perform fast sweep thickness extraction
202
Load the sealed triangulated mesh from step 104
204
Load a predefined slice interval and a predefined thickness interval
206
Create a plurality of polylines by intersecting a vertical plane with the sealed triangulated mesh from step 202
208
Create a plurality of polygons by connecting a first point and a last point of each polyline from step 206 in a respective vertical plane
210
Align each polygon in the plurality of polygons from step 208 perpendicular to the respective vertical plane
212
Create a grid
214
Compute a plurality of thickness values using each aligned polygon at the predefined thickness interval from step 204
216
Create a thickness grid by assigning each thickness value in the plurality of thickness values computed in step 214 to a respective grid node on the grid created in step 212 using the predefined slice interval from step 204 and the predefined thickness interval from step 204
Return thickness grid to step 106 in FIG. 1

FIG. 2

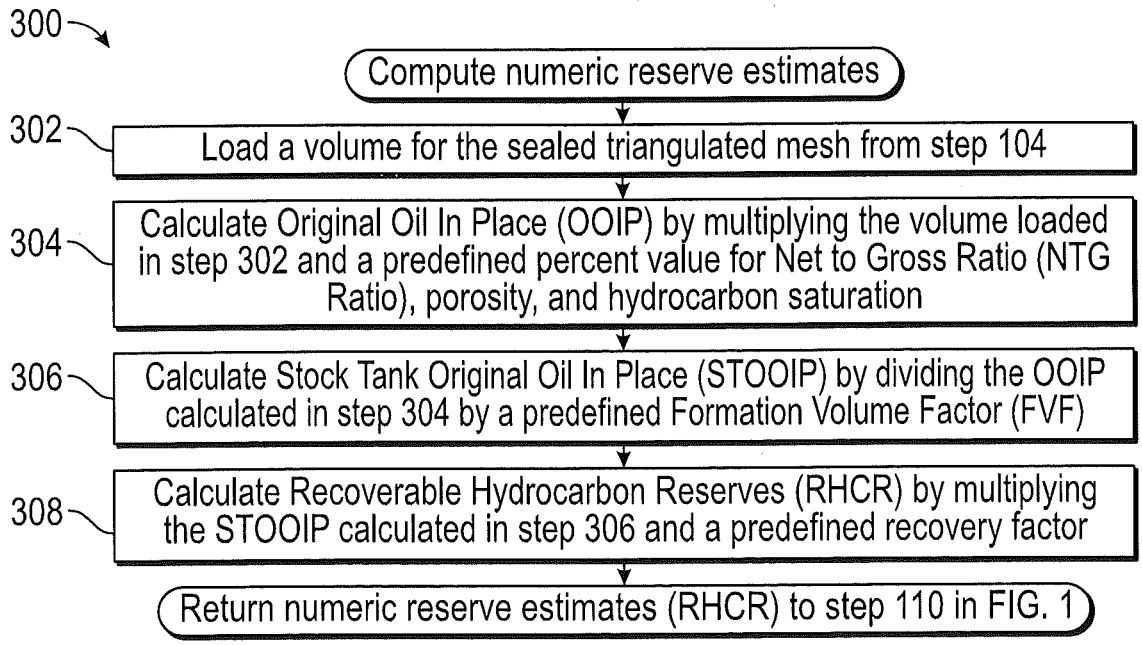
300
Compute numeric reserve estimates
302
Load a volume for the sealed triangulated mesh from step 104
304
Calculate Original Oil In Place (OOIP) by multiplying the volume loaded in step 302 and a predefined percent value for Net to Gross Ratio (NTG Ratio), porosity, and hydrocarbon saturation
306
Calculate Stock Tank Original Oil In Place (STOOIP) by dividing the OOIP calculated in step 304 by a predefined Formation Volume Factor (FVF)
308
Calculate Recoverable Hydrocarbon Reserves (RHCR) by multiplying the STOOIP calculated in step 306 and a predefined recovery factor
Return numeric reserve estimates (RHCR) to step 110 in FIG. 1

FIG. 3

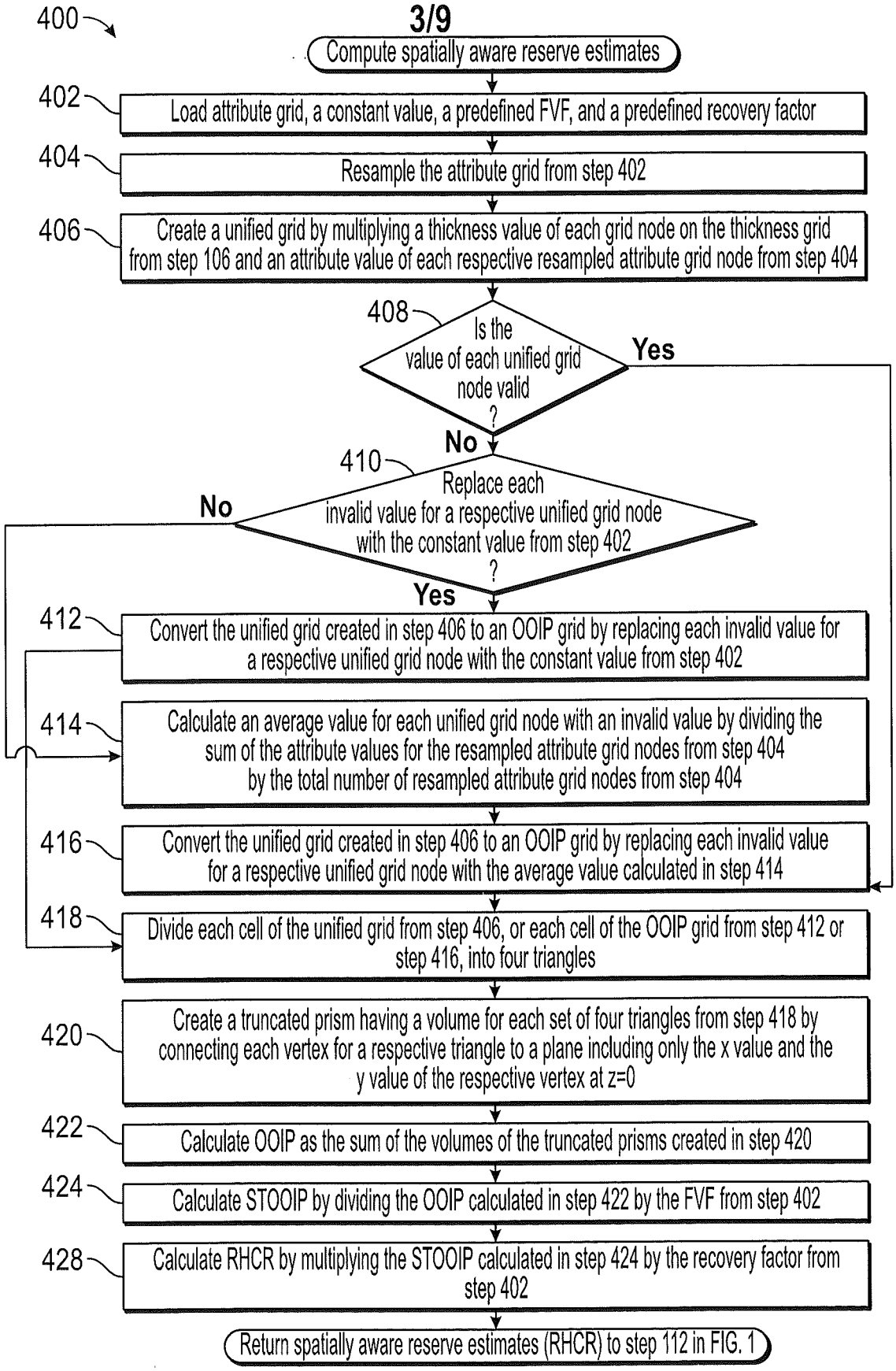
400
Compute spatially aware reserve estimates
402
Load attribute grid, a constant value, a predefined FVF, and a predefined recovery factor
404
Resample the attribute grid from step 402
406
Create a unified grid by multiplying a thickness value of each grid node on the thickness grid from step 106 and an attribute value of each respective resampled attribute grid node from step 404
408
Is the value of each unified grid node valid ?
Yes
No
410
Replace each invalid value for a respective unified grid node with the constant value from step 402 ?
No
Yes
412
Convert the unified grid created in step 406 to an OOIP grid by replacing each invalid value for a respective unified grid node with the constant value from step 402
414
Calculate an average value for each unified grid node with an invalid value by dividing the sum of the attribute values for the resampled attribute grid nodes from step 404 by the total number of resampled attribute grid nodes from step 404
416
Convert the unified grid created in step 406 to an OOIP grid by replacing each invalid value for a respective unified grid node with the average value calculated in step 414
418
Divide each cell of the unified grid from step 406, or each cell of the OOIP grid from step 412 or step 416, into four triangles
420
Create a truncated prism having a volume for each set of four triangles from step 418 by connecting each vertex for a respective triangle to a plane including only the x value and the y value of the respective vertex at z=0
422
Calculate OOIP as the sum of the volumes of the truncated prisms created in step 420
424
Calculate STOOIP by dividing the OOIP calculated in step 422 by the FVF from step 402
428
Calculate RHCR by multiplying the STOOIP calculated in step 424 by the recovery factor from step 402
Return spatially aware reserve estimates (RHCR) to step 112 in FIG. 1

FIG. 4

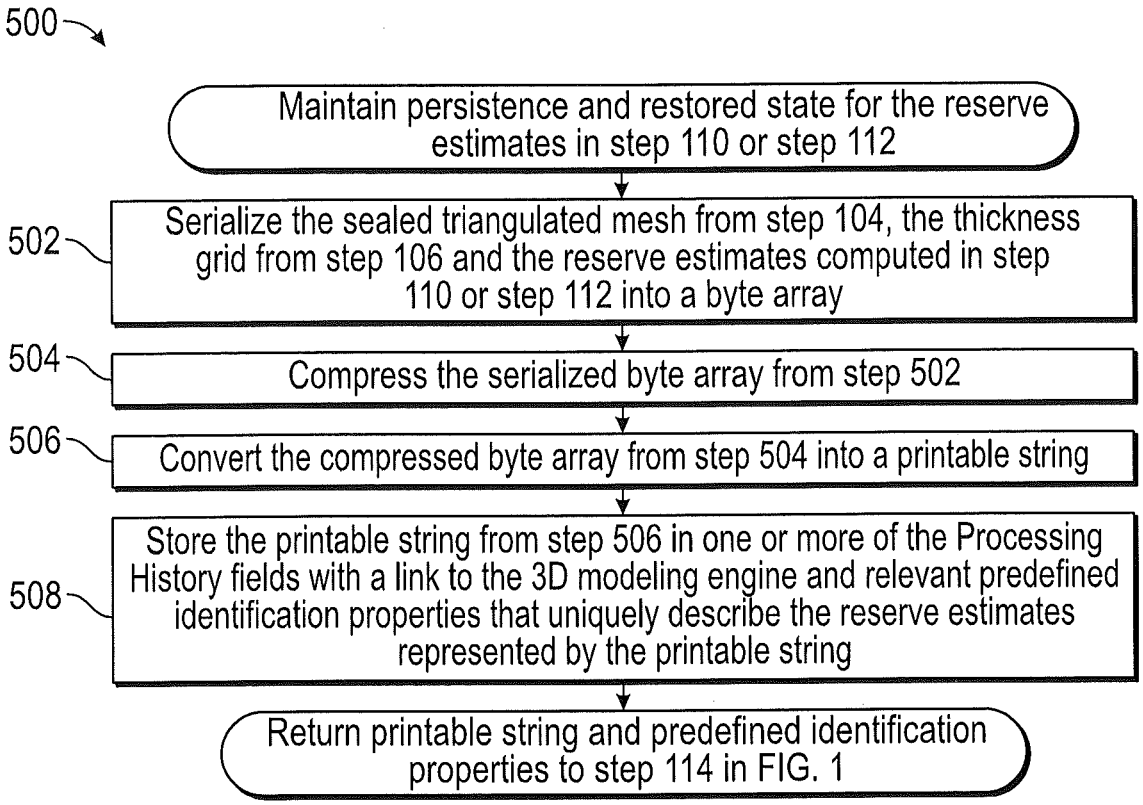
500
Maintain persistence and restored state for the reserve estimates in step 110 or step 112
502
Serialize the sealed triangulated mesh from step 104, the thickness grid from step 106 and the reserve estimates computed in step 110 or step 112 into a byte array
504
Compress the serialized byte array from step 502
506
Convert the compressed byte array from step 504 into a printable string
508
Store the printable string from step 506 in one or more of the Processing History fields with a link to the 3D modeling engine and relevant predefined identification properties that uniquely describe the reserve estimates represented by the printable string
Return printable string and predefined identification properties to step 114 in FIG. 1

FIG. 5

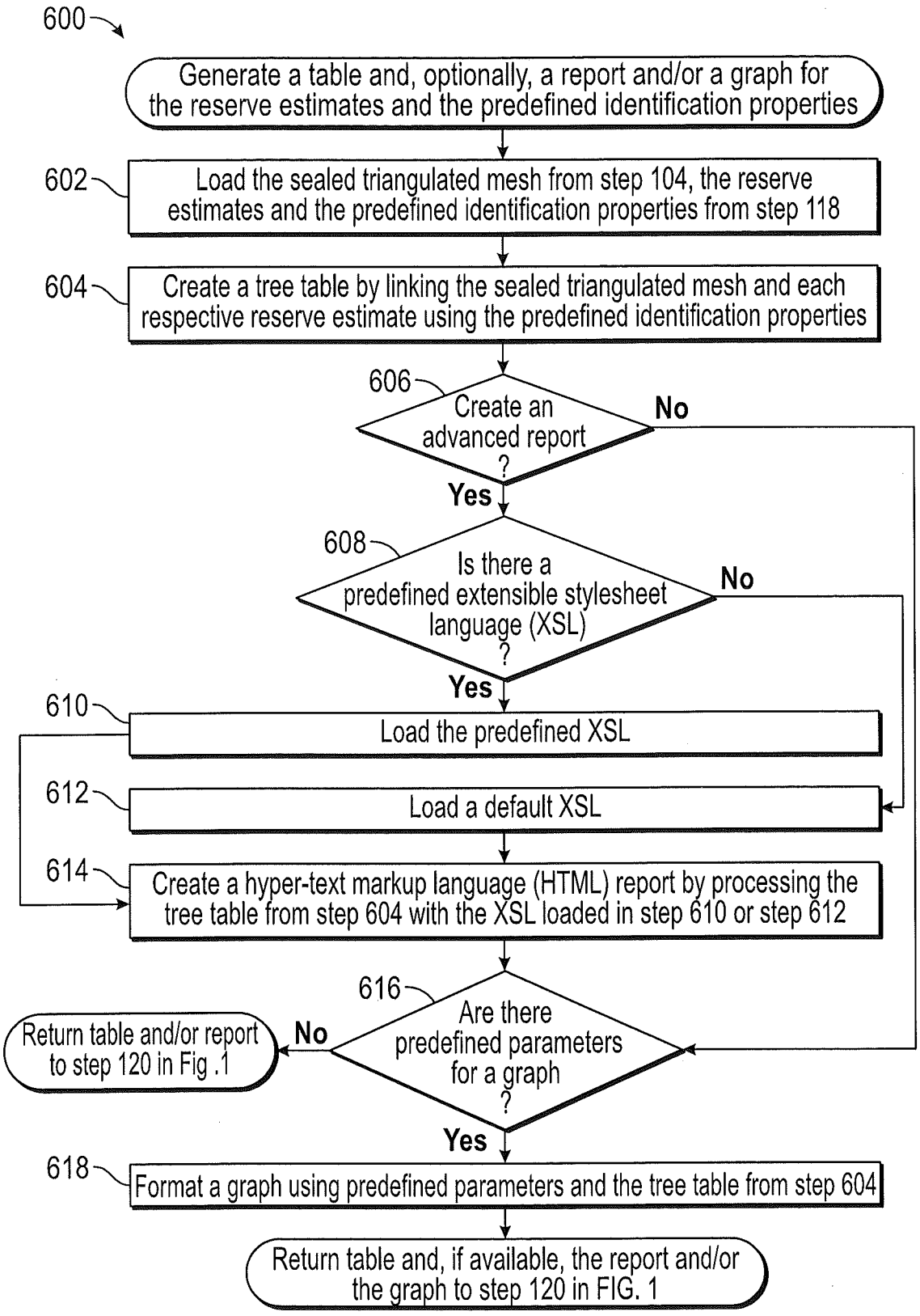
600
Generate a table and, optionally, a report and/or a graph for the reserve estimates and the predefined identification properties
602
Load the sealed triangulated mesh from step 104, the reserve estimates and the predefined identification properties from step 118
604
Create a tree table by linking the sealed triangulated mesh and each respective reserve estimate using the predefined identification properties
606
Create an advanced report ?
No
Yes
608
Is there a predefined extensible stylesheet language (XSL) ?
No
Yes
610
Load the predefined XSL
612
Load a default XSL
614
Create a hyper-text markup language (HTML) report by processing the tree table from step 604 with the XSL loaded in step 610 or step 612
616
Are there predefined parameters for a graph ?
No
Return table and/or report to step 120 in Fig .1
Yes
618
Format a graph using predefined parameters and the tree table from step 604
Return table and, if available, the report and/or the graph to step 120 in FIG. 1

FIG. 6

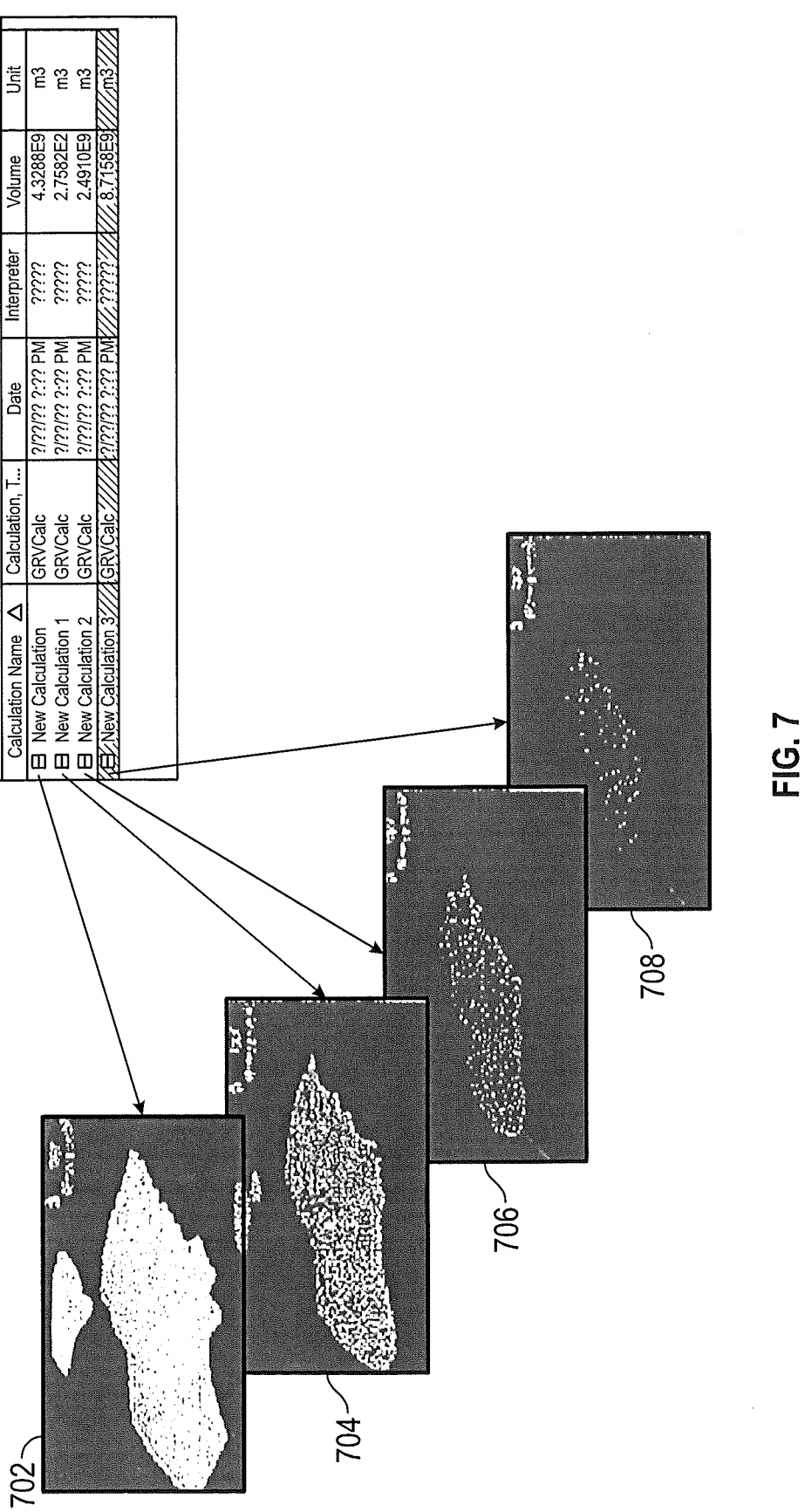
700
Well List
???????
?????
???She?
Fluid Contact1
????????
10
Calculation Name
Calculation, T...
Date
Interpreter
Volume
Unit
New Calculation
GRVCalc
?/??/?? ?:?? PM
?????
4.3288E9
m3
New Calculation 1
GRVCalc
?/??/?? ?:?? PM
?????
2.7582E2
m3
New Calculation 2
GRVCalc
?/??/?? ?:?? PM
?????
2.4910E9
m3
New Calculation 3
GRVCalc
?/??/?? ?:?? PM
?????
8.7158E9
m3
702
704
706
708

FIG. 7

800

| Calculation Name ▽ | Calculation, T... | Date | Interpreter | Volume | Unit |
|---|---|---|---|---|---|
| ⊟ Min Contact | GRVCalc | 5/15/13 9:30 AM | 01STA | 1.2035E10 | ft3 |
| ⊟ OOIP | OOIPCalc | 5/15/13 9:31 AM | 01STA | 2.1435E6 | bbl |
| ⊟ STOOIP | STOOIPCalc | 5/15/13 9:31AM | 01STA | 5.3587E6 | bbl |
| RHCR | RHCRCalc | 5/15/13 9:31 AM | 01STA | 2.1435E6 | bbl |
| ⊟ Max Contact | GRVCalc | 5/14/13 4:08 PM | 01STA | 3.4079E8 | m3 |
| ⊟ OOIP | OOIPCalc | 5/14/13 4:25 PM | 01STA | 1.2004E8 | bbl |
| ⊟ STOOIP | STOOIPCalc | 5/14/13 4:25 PM | 01STA | 7.0609E7 | bbl |
| 0.4 R | RHCRCalc | 5/14/13 4:25 PM | 01STA | 2.8244E7 | bbl |
| 0.2 R | RHCRCalc | 5/15/13 9:21 AM | 01STA | 1.4122E7 | bbl |
| ⊟ OOIP | OOIPCalc | 5/15/13 9:30 AM | 01STA | 6.8158E5 | m3 |
| ⊟ STOOIP | STOOIPCalc | 5/15/13 9:30 AM | 01STA | 4.8684E5 | m3 |
| RHCR | RHCRCalc | 5/15/13 9:30 AM | 01STA | 2.4342E5 | m3 |
| ⊟ Min | OOIPCalc | 5/15/13 9:27 AM | 01STA | 2.1435E6 | bbl |
| ⊟ Low | STOOIPCalc | 5/15/13 9:27 AM | 01STA | 4.287E6 | bbl |
| 0.7 R | RHCRCalc | 5/15/13 9:29 AM | 01STA | 3.0009E6 | bbl |
| 0.2 R | RHCRCalc | 5/15/13 9:27 AM | 01STA | 8.574E5 | bbl |
| ⊟ High | STOOIPCalc | 5/15/13 9:28 AM | 01STA | 1.2609E6 | bbl |
| 0.8 R | RHCRCalc | 5/15/13 9:28 AM | 01STA | 1.0087E6 | bbl |
| 0.3 R | RHCRCalc | 5/15/13 9:28 AM | 01STA | 3.7826E5 | bbl |

FIG. 8

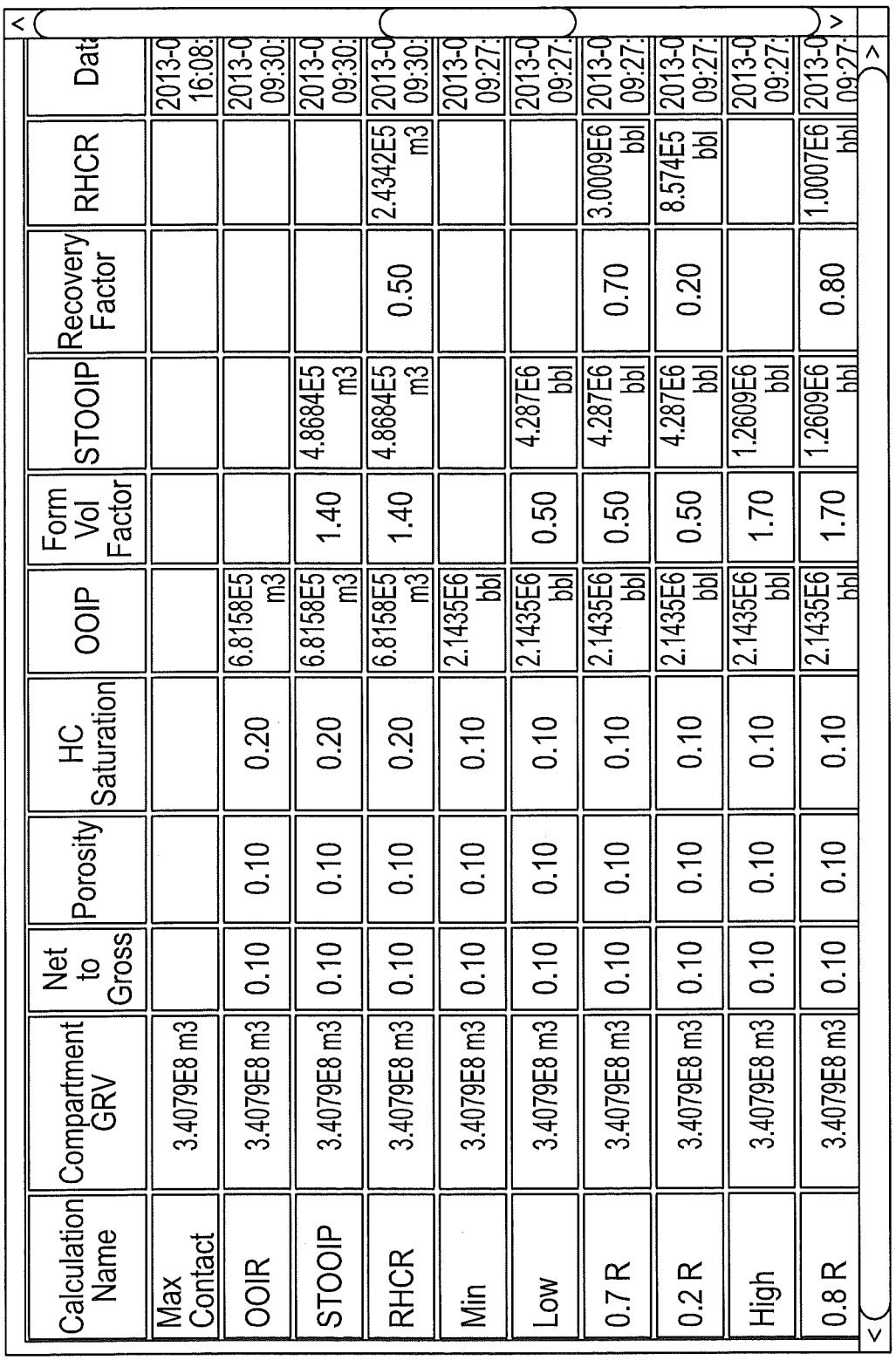
900
Calculation Name
Compartment GRV
Net to Gross
Porosity
HC Saturation
OOIP
Form Vol Factor
STOOIP
Recovery Factor
RHCR
Dat
Max Contact
3.4079E8 m3
2013-0 16:08:
OOIR
3.4079E8 m3
0.10
0.10
0.20
6.8158E5 m3
2013-0 09:30:
STOOIP
3.4079E8 m3
0.10
0.10
0.20
6.8158E5 m3
1.40
4.8684E5 m3
2013-0 09:30:
RHCR
3.4079E8 m3
0.10
0.10
0.20
6.8158E5 m3
1.40
4.8684E5 m3
0.50
2.4342E5 m3
2013-0 09:30:
Min
3.4079E8 m3
0.10
0.10
0.10
2.1435E6 bbl
2013-0 09:27:
Low
3.4079E8 m3
0.10
0.10
0.10
2.1435E6 bbl
0.50
4.287E6 bbl
2013-0 09:27:
0.7 R
3.4079E8 m3
0.10
0.10
0.10
2.1435E6 bbl
0.50
4.287E6 bbl
0.70
3.0009E6 bbl
2013-0 09:27:
0.2 R
3.4079E8 m3
0.10
0.10
0.10
2.1435E6 bbl
0.50
4.287E6 bbl
0.20
8.574E5 bbl
2013-0 09:27:
High
3.4079E8 m3
0.10
0.10
0.10
2.1435E6 bbl
1.70
1.2609E6 bbl
2013-0 09:27:
0.8 R
3.4079E8 m3
0.10
0.10
0.10
2.1435E6 bbl
1.70
1.2609E6 bbl
0.80
1.0007E6 bbl
2013-0 09:27:

FIG. 9

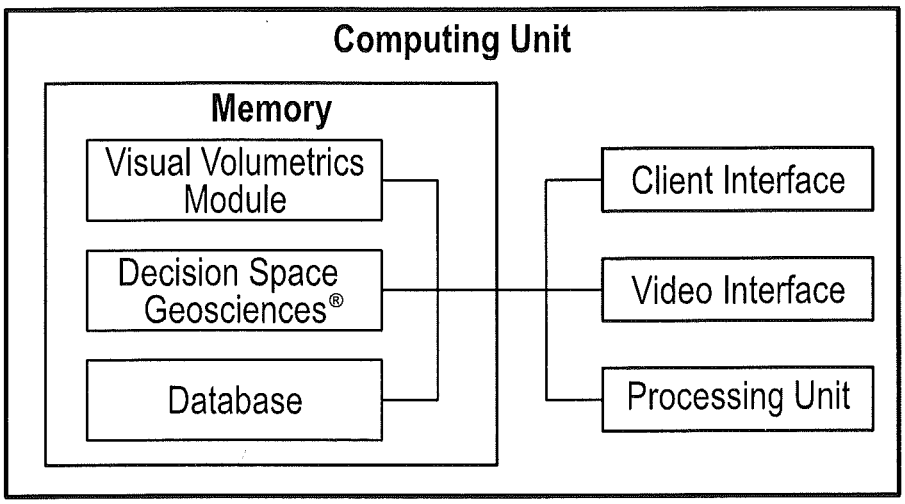
Computing Unit
Memory
Visual Volumetrics Module
Decision Space Geosciences®
Database
Client Interface
Video Interface
Processing Unit

FIG. 10