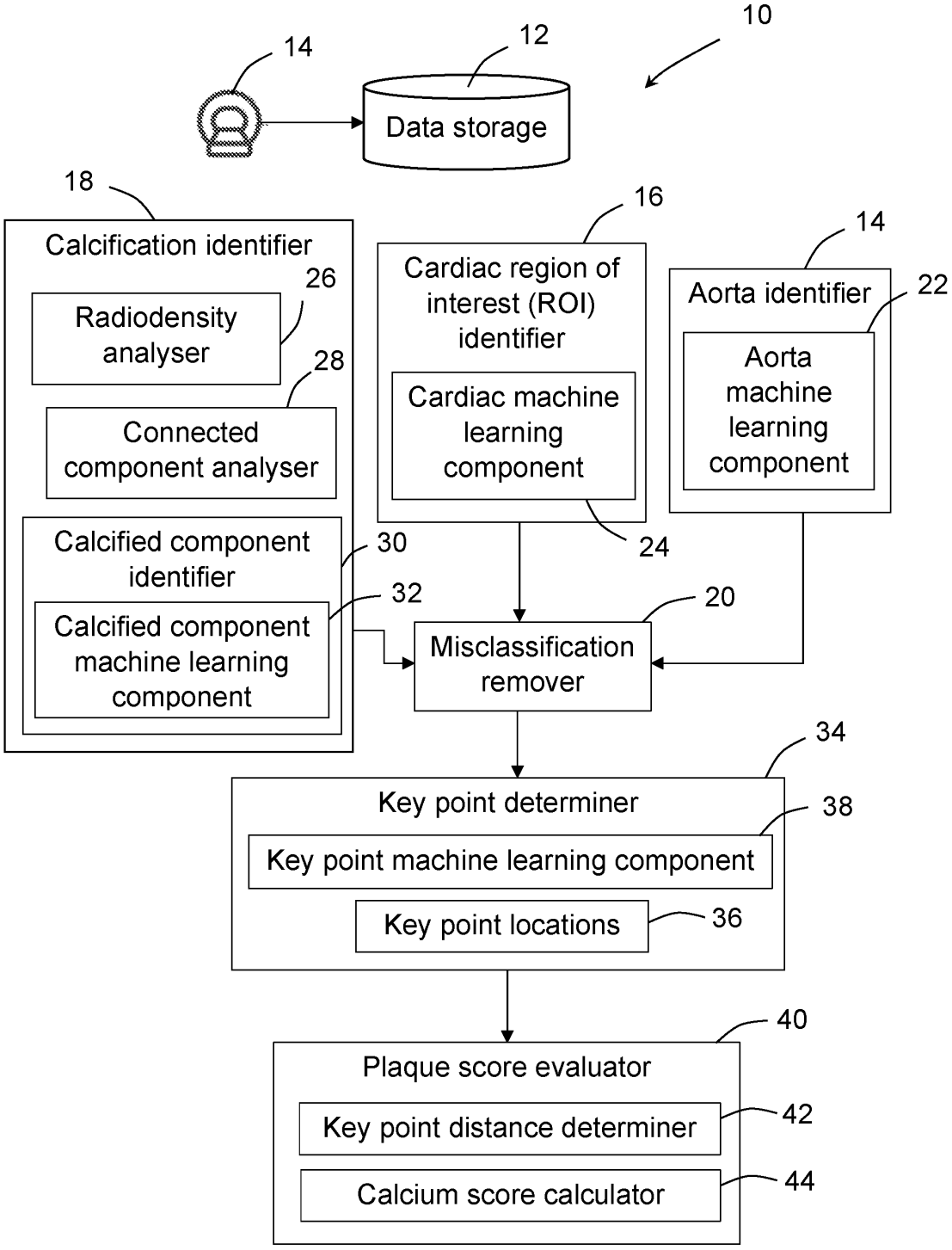
10
14
12
Data storage
18
Calcification identifier
26
Radiodensity analyser
28
Connected component analyser
Calcified component identifier
30
32
Calcified component machine learning component
16
Cardiac region of interest (ROI) identifier
Cardiac machine learning component
24
14
Aorta identifier
22
Aorta machine learning component
20
Misclassification remover
34
Key point determiner
38
Key point machine learning component
Key point locations
36
40
Plaque score evaluator
Key point distance determiner
42
Calcium score calculator
44

Fig. 1

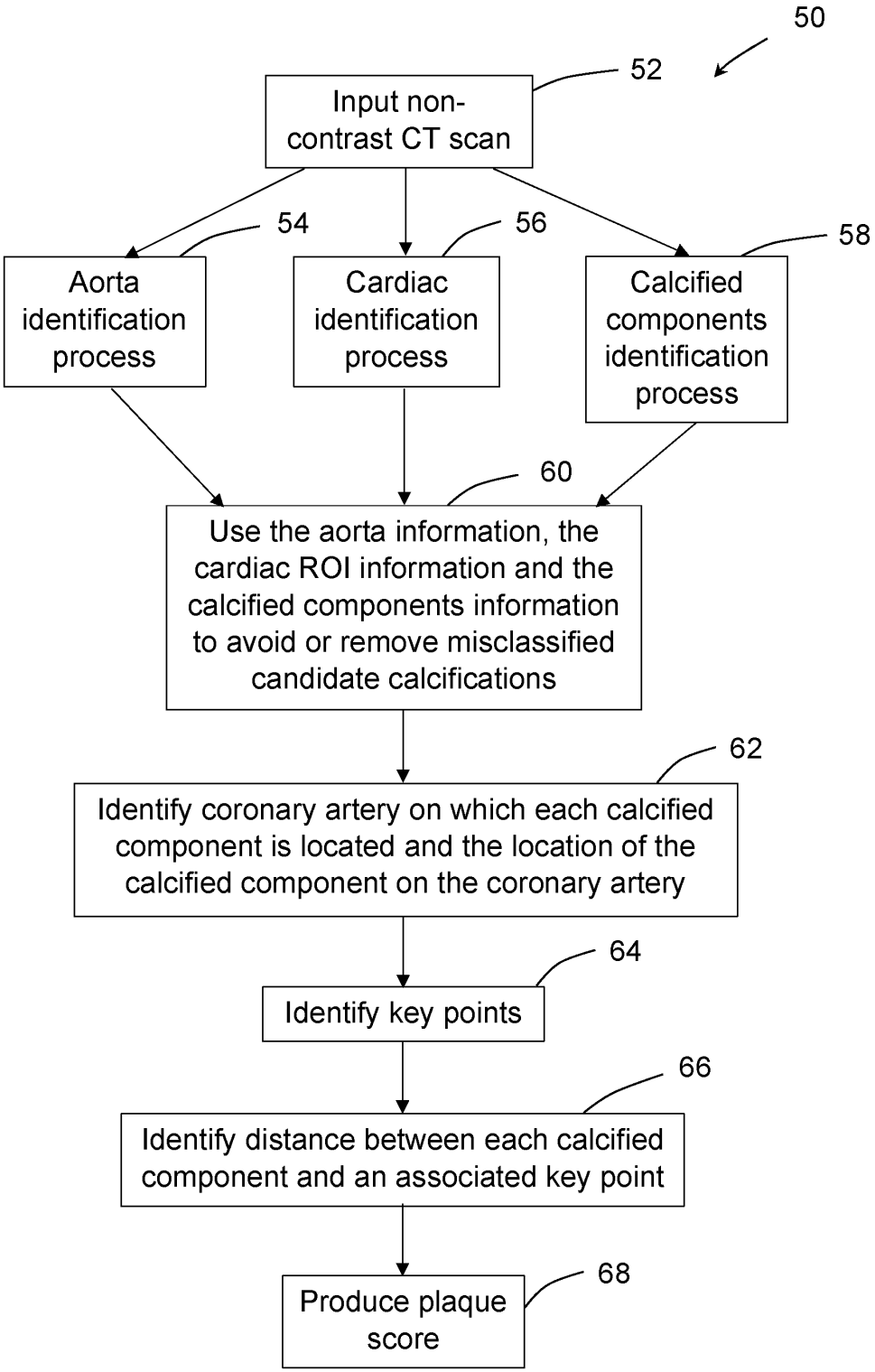
50
52
Input non-contrast CT scan
54
56
58
Aorta identification process
Cardiac identification process
Calcified components identification process
60
Use the aorta information, the cardiac ROI information and the calcified components information to avoid or remove misclassified candidate calcifications
62
Identify coronary artery on which each calcified component is located and the location of the calcified component on the coronary artery
64
Identify key points
66
Identify distance between each calcified component and an associated key point
68
Produce plaque score

Fig. 2

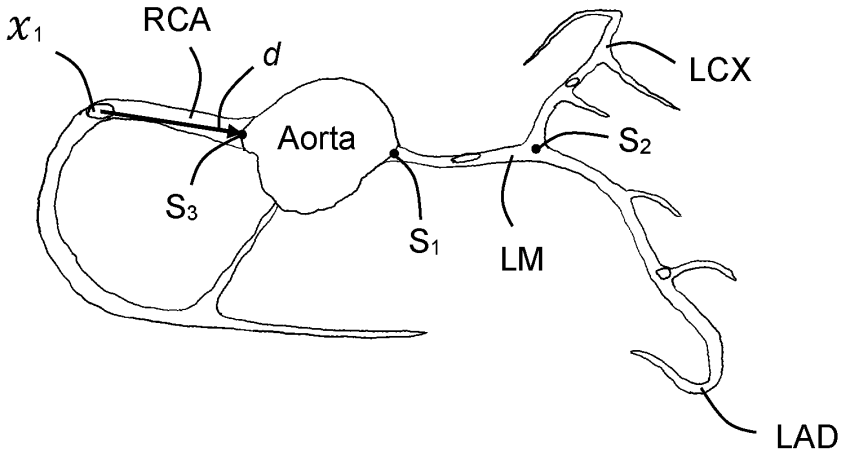
$x_1$
RCA
d
LCX
Aorta
$S_2$
$S_3$
$S_1$
LM
LAD

Fig. 3

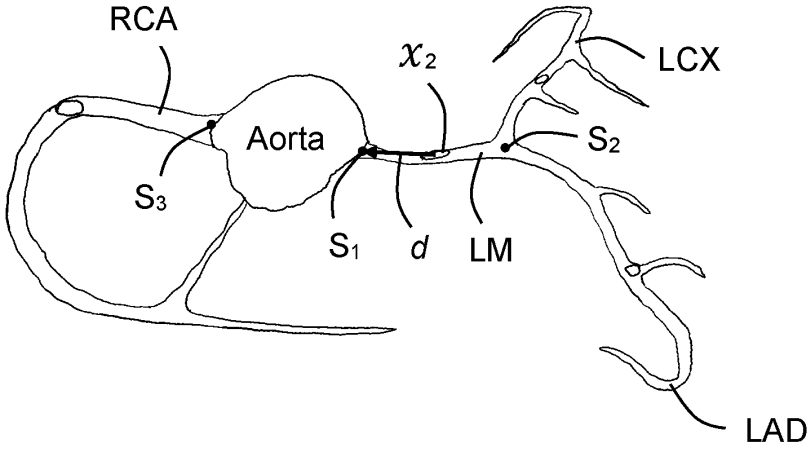
RCA
$x_2$
LCX
Aorta
$S_2$
$S_3$
$S_1$
d
LM
LAD

Fig. 4

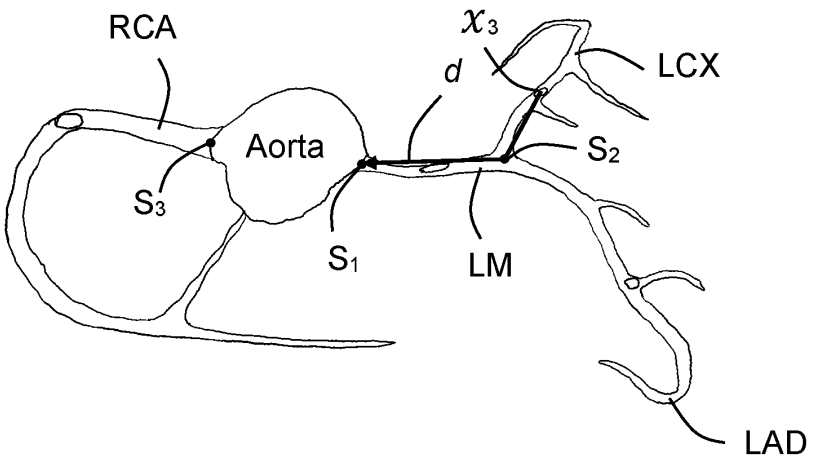
RCA
$x_3$
d
LCX
Aorta
$S_2$
$S_3$
$S_1$
LM
LAD

Fig. 5

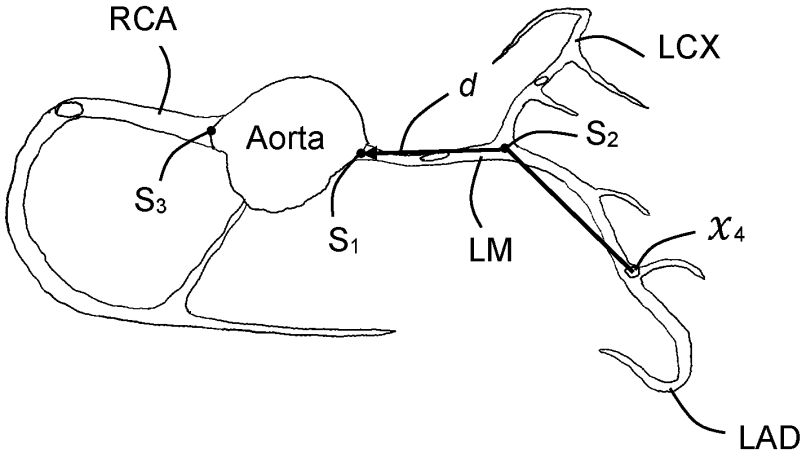
RCA
LCX
d
Aorta
$S_2$
$S_3$
$S_1$
LM
$x_4$
LAD

Fig. 6

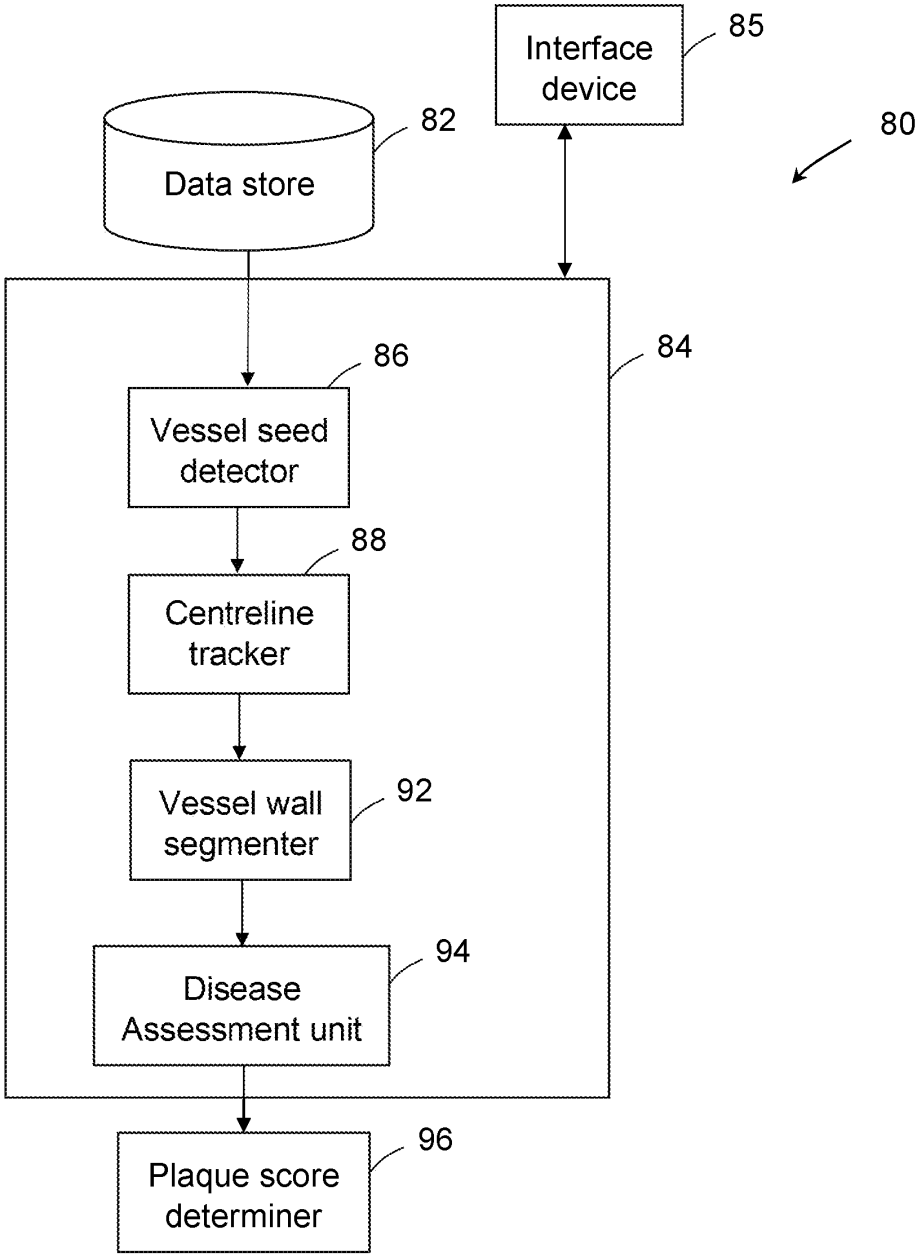
Interface device
85
80
82
Data store
84
86
Vessel seed detector
88
Centreline tracker
92
Vessel wall segmenter
94
Disease Assessment unit
96
Plaque score determiner

Fig. 7

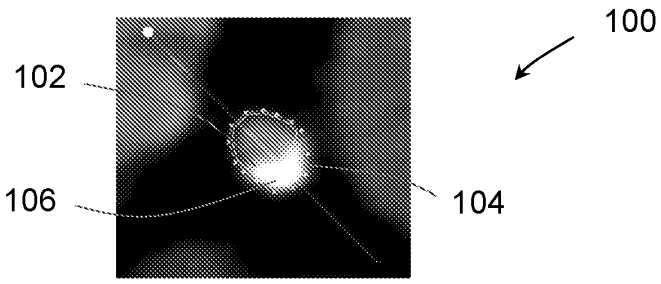
100
102
104
106

Fig. 8

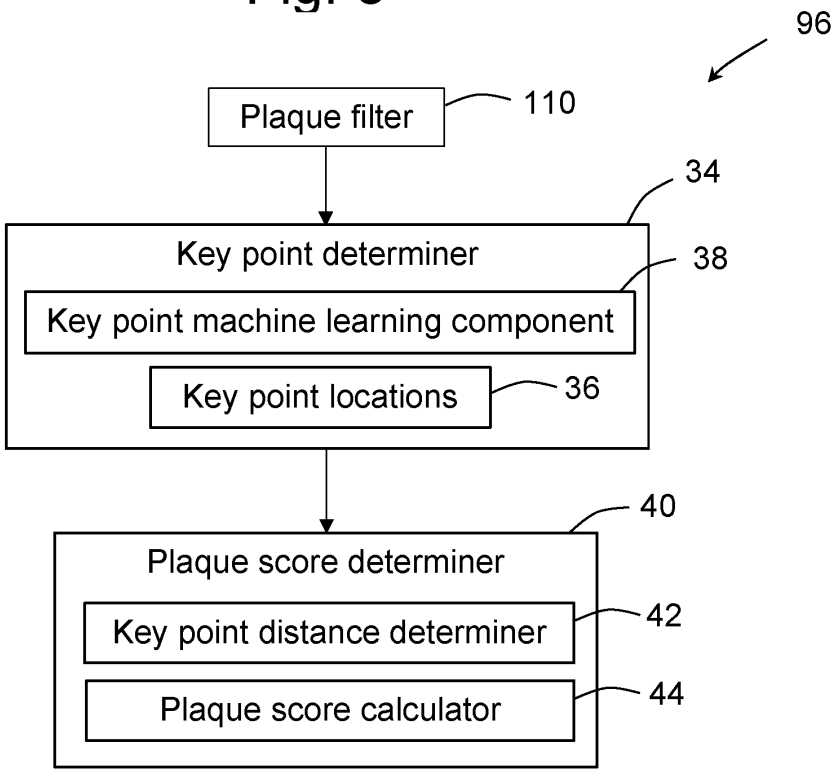
96
Plaque filter
110
34
Key point determiner
38
Key point machine learning component
Key point locations
36
40
Plaque score determiner
Key point distance determiner
42
Plaque score calculator
44

Fig. 9

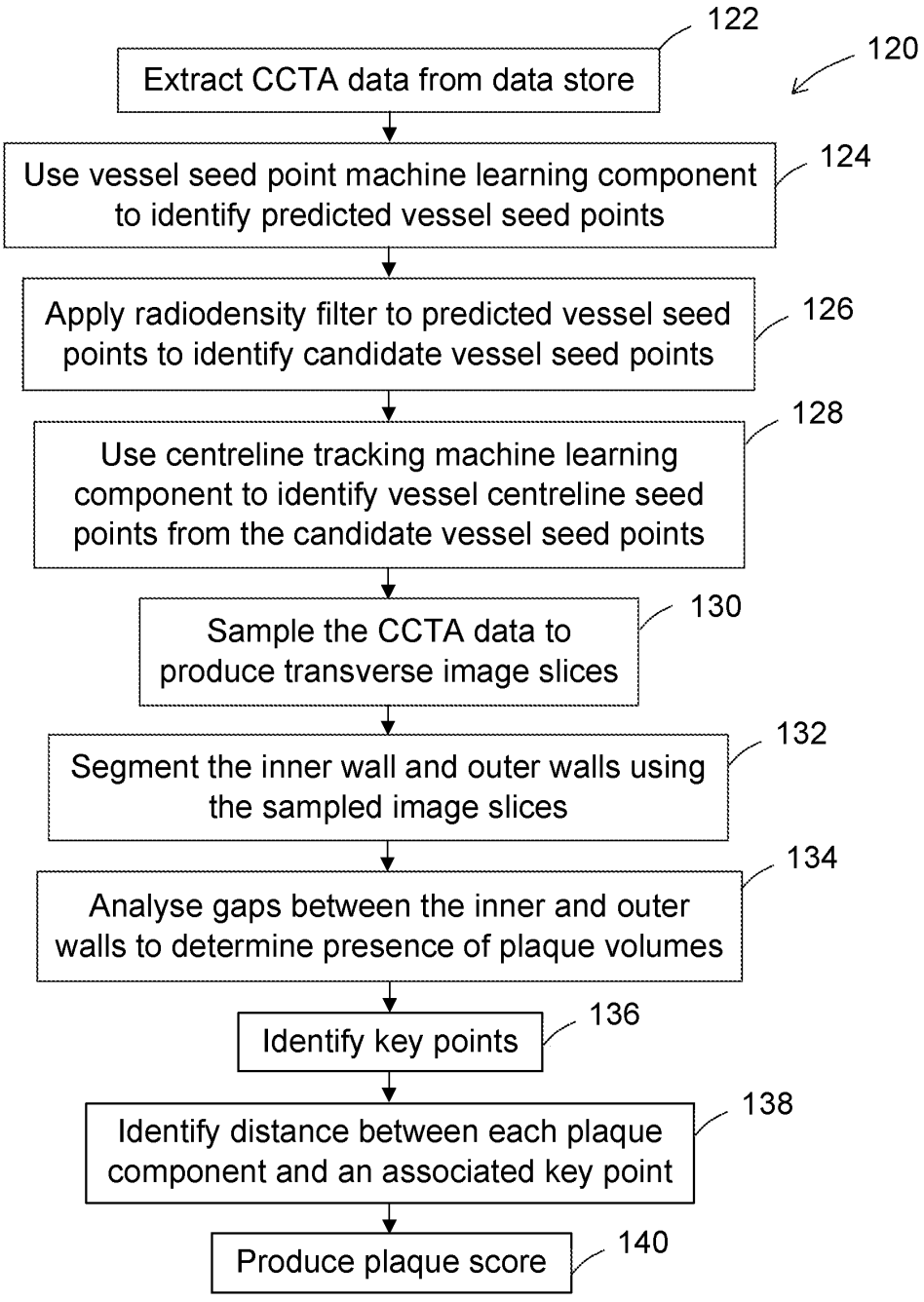
122
120
Extract CCTA data from data store
Use vessel seed point machine learning component to identify predicted vessel seed points
124
Apply radiodensity filter to predicted vessel seed points to identify candidate vessel seed points
126
Use centreline tracking machine learning component to identify vessel centreline seed points from the candidate vessel seed points
128
Sample the CCTA data to produce transverse image slices
130
Segment the inner wall and outer walls using the sampled image slices
132
Analyse gaps between the inner and outer walls to determine presence of plaque volumes
134
Identify key points
136
Identify distance between each plaque component and an associated key point
138
Produce plaque score
140

Fig. 10