[0037] Lower boundary (LB) determination module 336 in some embodiments also employs a maneuver determination sub-module 338 to identify the lower boundary as the minimum area point (351 in FIG. 9) in a maneuver area trace in substantially the same manner that upper boundary determination sub-module 350 identifies the upper boundary. For example, lower boundary determination may be made via sniff maneuver, or any other maneuver that reduces the IVC size, using methodology described above. Alternatively lower boundary prediction 342b uses individual patient or population area and collapse data to predict lower boundary using a method similar to upper boundary prediction 342a using Eq. [7]:

$$[7] \qquad LB = (-1/slope) \cdot C + A_{mean}$$

Futher alternative sub-modules 339 may also be provided to derive the lower boundary value from a population basis as the average minimum sensor size measured in the IVC, or sensor information regarding IVC area at given equivalent pressures, such as by comparing sensor derived area/pressure curves with standard area/pressure curves (determined from radial or flat plate force information) and be a programed constant for all patients.

[0038] Upper and lower boundaries generated by boundary generator 110 are provided to index generator 112, shown in FIG. 10. These boundary values enable normalizing the area measurement of the vessel to return a number ranging from 0% to 100% or 0 to 10, with 0% being close to 0 mmHg internal filling pressure or low volume / low congestion / hypovolemia and 100% being close to the maximal possible filling pressure in this vessel (~20 mmHg) or high volume / high congestion / hypervolemia. Index generator 112 assigns the boundaries to a relative scale with the lower boundary set as the scale minimum and the upper boundary set as the scale maximum. In some embodiments, the relative scale is established as a 0–100% scale. Once the relative scale is established, current area readings are scored on the relative scale, for example, an area reading falling half way between the upper and lower boundaries would be scored as 50%. Because each patient is capable of displaying a range of IVC areas based on a number of factors including, but not limited to, anatomical size, current fluid status, body position, vascular tone status, and cardiac and abdominal pressures, normalization as described herein accounts for these parameters to produce a more standardized Congestion Index that is comparable across time for the patient and comparable across patients to help facilitate more