anion concentrations, $[H^+]$, $[OH^-]$, and the temperature corrected equivalent conductances, and calculate a strong acid temperature compensated cation conductivity using the temperature corrected equivalent conductances and equation (6) below.

$$cc = [H^+]\Lambda_{H+} + [OH^-]\Lambda_{OH-} + \sum_{i=1}^{n} [A_i^-]\Lambda_i + \sum_{i=1}^{m} [B_j^-]\Lambda_j \quad (6)$$

wherein

cc is the cation conductivity;

ΛH^+ is the equivalent conductance of the hydrogen ion;

ΛOH^- is the equivalent conductance of the hydroxide ion;

Λi is the equivalent conductance of the conjugate base of the ith weak acid; and

Λj is the equivalent conductance of the jth strong acid anion.

Since the concentrations of the weak acids determined by organic acid chromatograph are represented by $[A_i^-]$ and $[HA_i]$, only equations (1), (3) and (5) must be solved to calculate the strong acid anion concentrations for the strong acids determined by anion chromatography. Thus, to determine the strong acid anion concentrations, $[A_i^-]=0$ for all i.

To obtain the cation conductivity which includes both weak acid and strong acid anion concentrations, equation. (1)–(6) are solved simaltaneously for cc.

Step **1090**: Determine if organic acid analysis was performed during the run. If organic acid analysis was performed processing proceeds to flow G, and if organic acid analysis was not performed, processing proceeds to flow I (FIG. **13**).

The flowchart of FIG. **13** relates to the calculation of a cation conductivity, including the organic acid concentrations determined by organic acid chromatography, at the monitored temperature.

Step **1092**: Obtain concentrations of all of the ionic species, including organic acids, determined by ion chromatography by solving equations (1)–(5) including all Fi values obtained by organic acid chromatography.

Step **1094**: Calculate cation conductivity at monitored temperature using concentrations of ionic species, including organic acids, obtained in step **1092**.

Step **1096**: Determine if the calculated cation conductivity at the monitored temperature, including organic acids, is approximately equal to the monitored cation conductivity, within the range of experimental error. If the calculated cation conductivity at the monitored temperature is not approximately equal to the monitored conductivity, processing proceeds to flow K (FIG. **15**) for calibration. If the calculated cation conductivity at the monitored temperature is approximately equal to the monitored cation conductivity, processing proceeds to flow J (FIG. **14**).

Step **1098**: Determine if strong acid temperature compensated cation conductivity is approximately equal to the monitored cation conductivity. If these two values are not approximately equal, it is determined that organic acid analysis is required in the next, or subsequent, run and processing proceeds to step **1100**; otherwise, processing proceeds to step **1102**.

Step **1100**: Set flag for organic acid analysis in subsequent run.

Step **1102**: The measured composition of the sample fluid is used to calculate the cation conductivity at 25° C. This prediction is based on known parameters referenced in step **1082**.

Step **1104**: Display and record temperature corrected cation conductivity.

Step **1106**: Display and record all other analytical results and proceed to flow D (FIG. **8**) to perform subsequent run.

Flow K, shown in FIG. **15**, relates to calibration and malfunction diagnosis.

Step **1108**: If the calculated cation conductivity is not determined to be approximately equal to the detected conductivity at step **1096**, the calibration subroutine is instructed to calibrate the continuous on-line monitors **68–73** in the continuous monitor module **20** corresponding to the influent fluid sample stream being analyzed during the run and the ion chromatograph unit **42**.

Step **1110**: Determine if the monitored chemical characteristics during calibration are within expected values, i.e., are the monitored chemical characteristics in the range of the predetermined chemical characteristics of the conditioned influent fluid sample stream.

Step **1112**: If it is determined, at step **1110**, that the chemical characteristic monitored by a particular instrument is not within the range of expected values during calibration, the operator is alerted of the malfunction of the particular instrument. The processing then proceeds to flow J (FIG. **14**).

Step **1114**: If the responses during calibration are all within the expected values, the cation conductivity is recalculated using the new calibration factors.

Step **1116**: Determine if the monitored and calculated cation conductivities are approximately equal. If the conductivities are approximately equal, processing proceeds to flow J.

Step **1118**: If the measured and calculated cation conductivities do not match, the operator is alerted of the presence of an unmeasured anion and processing continues to flow J.

The many features and advantages of the automatic continuous on-line monitoring system of the present invention will be apparent to those skilled in the art from the detailed specification. Further, since numerous modifications and changes will readily occur to those skilled in the art, the claims are intended to cover all suitable modifications and equivalents falling within the true spirit and scope of the invention.

We claim as our invention:

1. Apparatus for automatic, continuous on-line monitoring of a power plant steam cycle water system having a plurality of points where the chemical characteristics of the water in the system are to be measured, said water in the system at each said point having characteristic temperature conditions and cation conductivity levels in addition to said chemical characteristics, said apparatus comprising:

means at each point for extracting a respective extracted fluid sample stream to be monitored;

continuous monitor module means for each extracted fluid sample stream, each said continuous monitor module means comprising:

means for monitoring the temperature conditions of the corresponding extracted fluid sample stream and generating a temperature signal rep-