

(12) **United States Patent**
Bristol

(20) Patent No.: **US 6,690,274 B1**
(45) Date of Patent: **Feb. 10, 2004**

(54) **ALARM ANALYSIS TOOLS METHOD AND APPARATUS**

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(73) Assignor: **Intervox Systems, Inc., Falmouth, MA (US)**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 254(b) by 0 days.

(20) Appl. No.: **09/040,319**

(22) Filed: **Apr. 28, 1999**

Related U.S. Applications Data

(86) Provisional application No. 60/113,215, filed on Mar. 8, 1999, provisional application No. 60/119,323, filed on Feb. 8, 1999, and provisional application No. 60/289,909, filed on May 1, 2000.

(51) Int. Cl.⁷ **G08B 29/00**

(52) U.S. Cl. **340/886; 340/921; 340/922; 340/923; 340/924**

(58) Field of Search **340/505, 507, 340/511, 517, 521, 523, 525, 526, 5.1**

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Bristol, E., "Alarm Sequence Analyzer", Report No. 12672-71.95, The Forster Company, Dec. 7, 1971.

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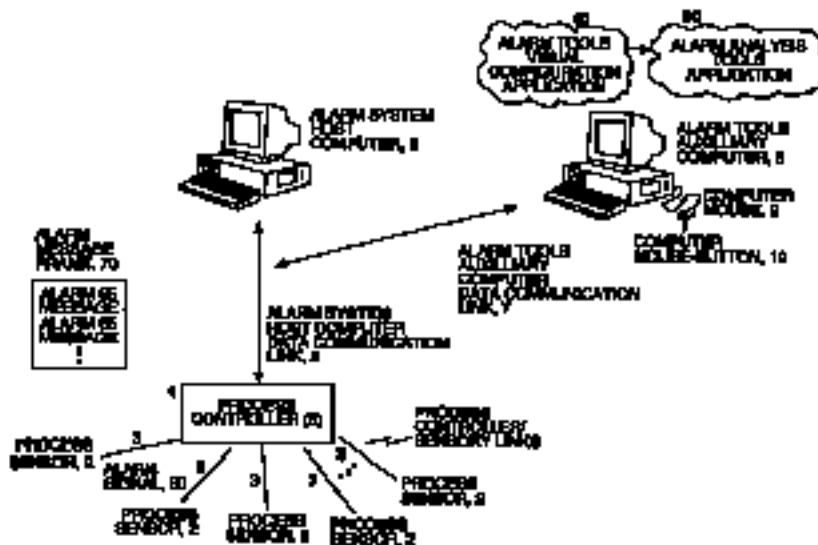
Patent Attorney—Darryl Pope

(74) Attorney Agent, or Firm—Hamilton, Brook, Smith & Reynolds, P.C.

(57) **ABSTRACT**

The disclosed alarm analysis tool uses with intelligently understood process characteristics. The configuration of the alarms and their associated displays are governed by generalized display policies applicable to groups of alarms rather than by detailed configuration of individual alarm action. To aid an operator in the configuration process, another aspect of the invention concerns an alarm selection method and apparatus operating on a computer, which comprises an application window displaying a main alarm list, a selection means to select the alarm indications displayed in the alarm list, and an operations means producing a main alarm list subset having characteristics of the selected alarm indications.

13 Claims, 26 Drawing Sheets



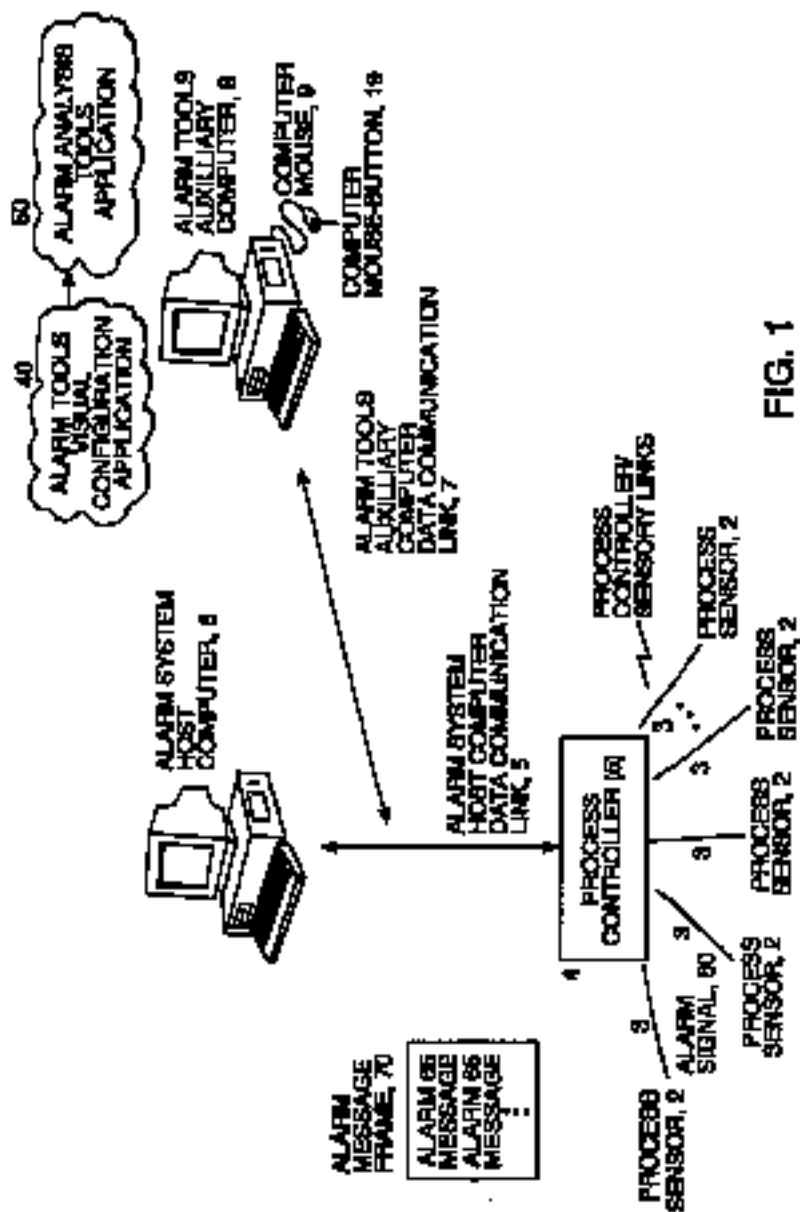


FIG. 1

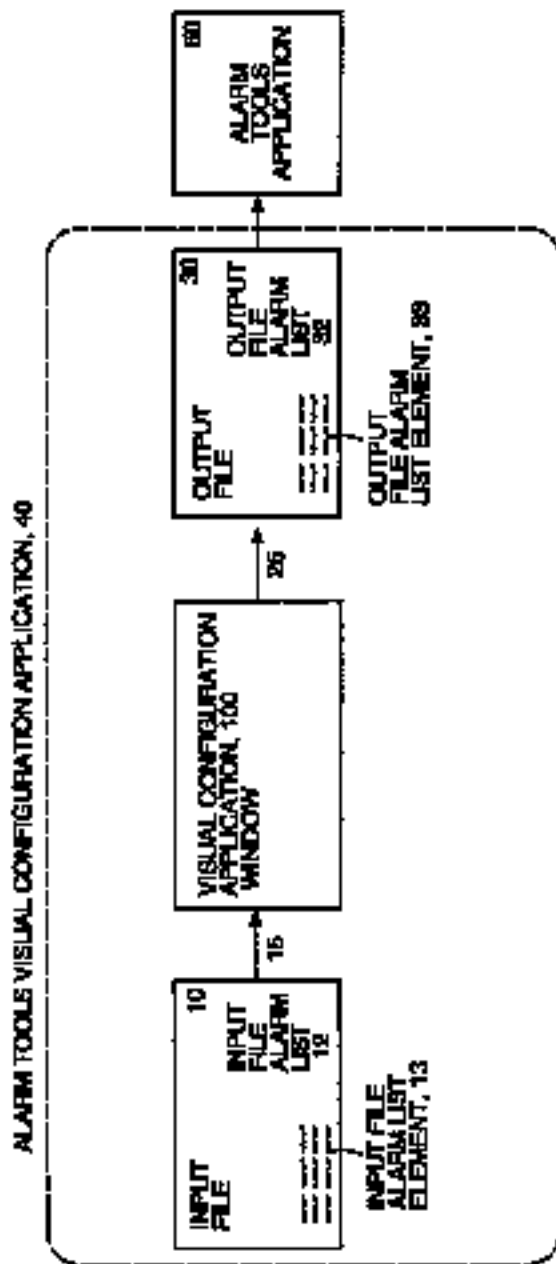


FIG. 2A

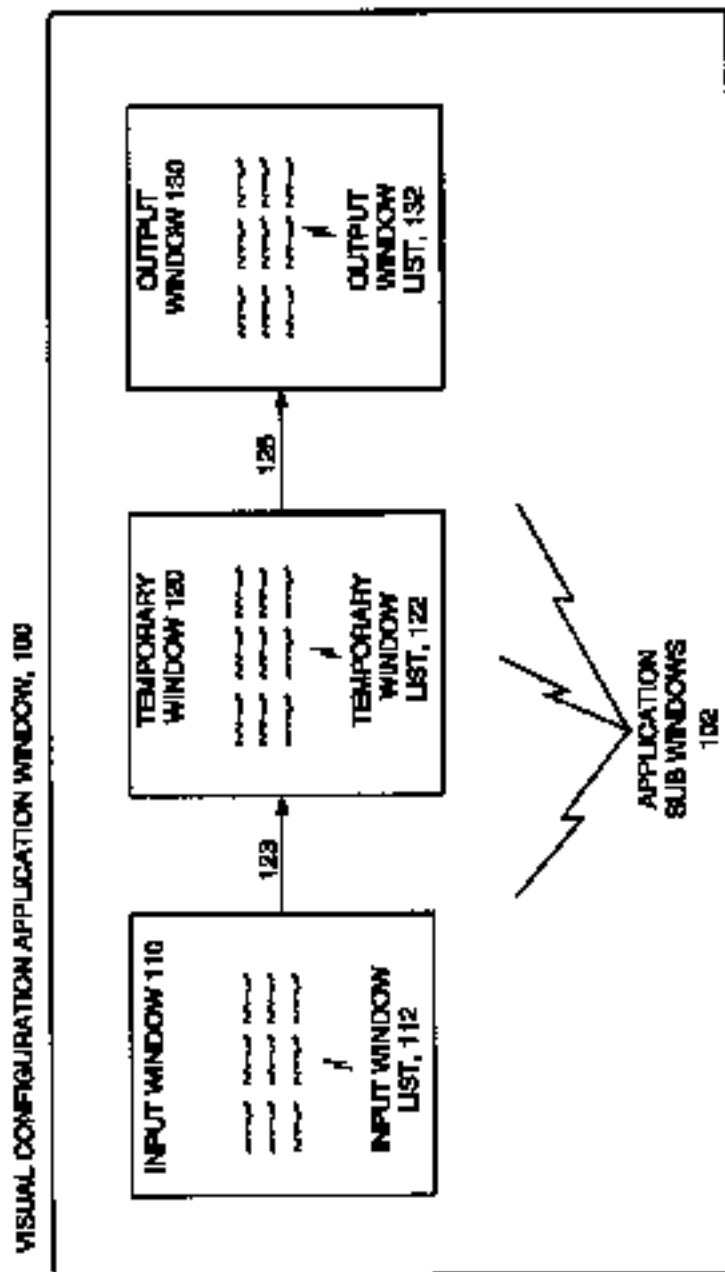


FIG. 2B

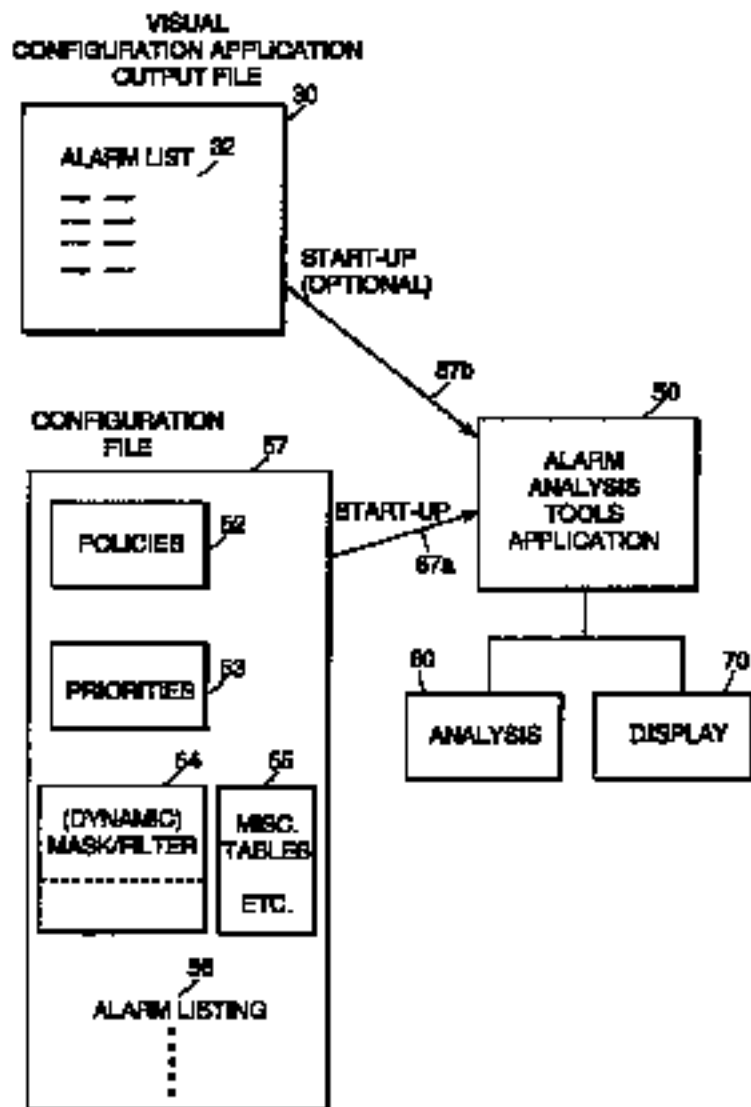


FIG. 2C

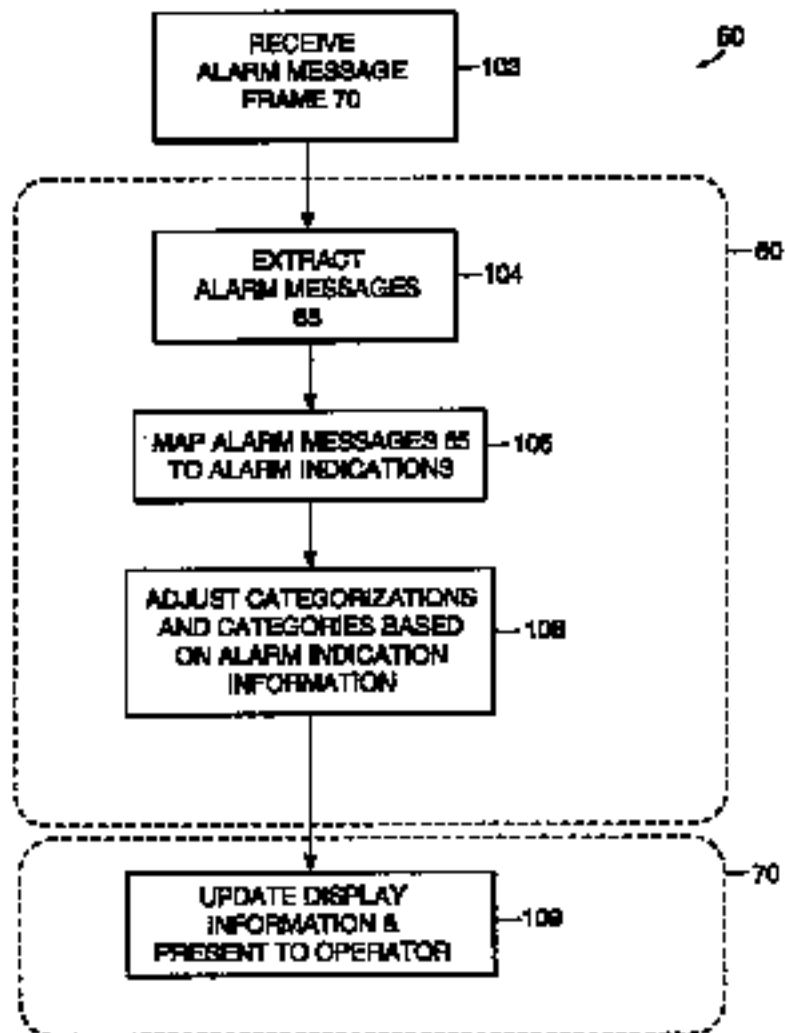


FIG. 2D

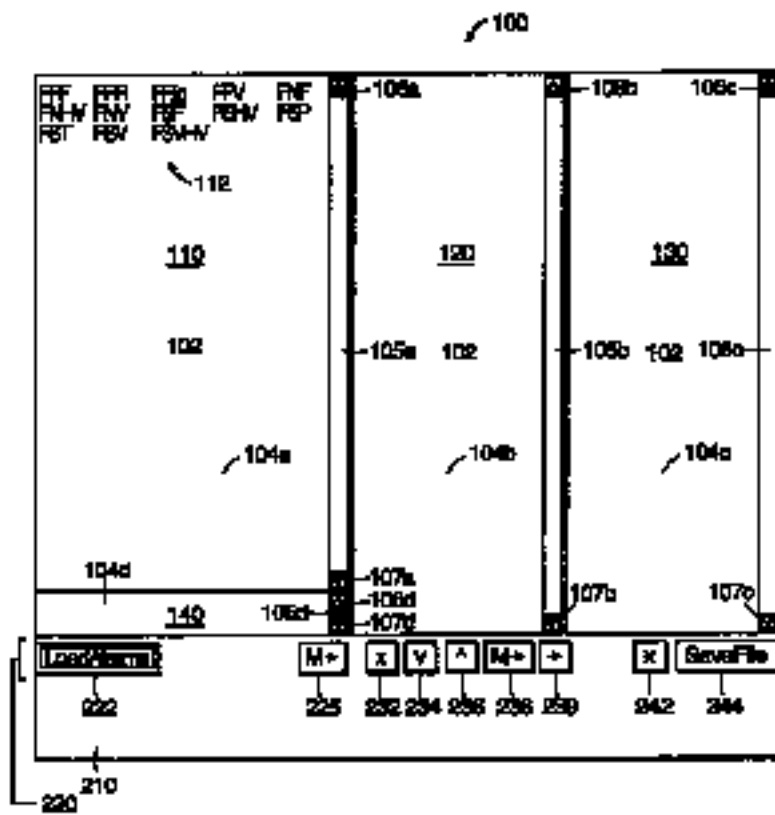


FIG. 3

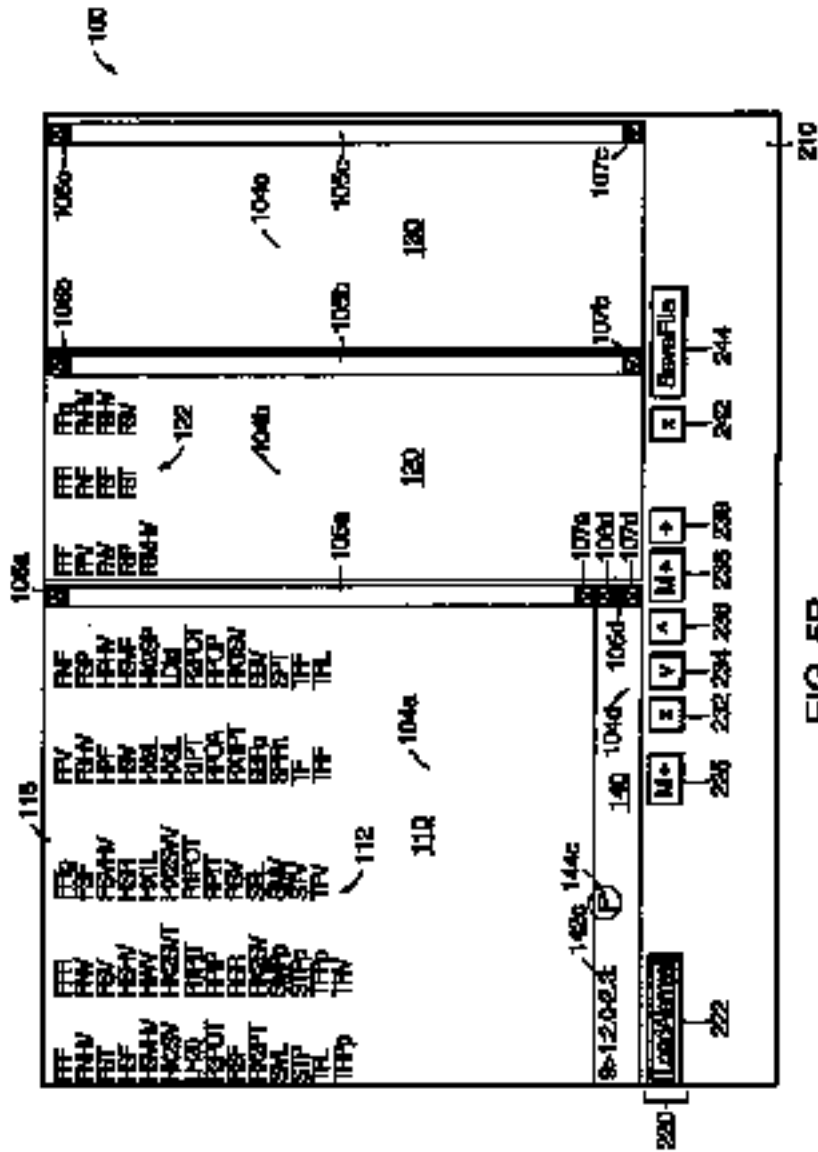


FIG. 5B

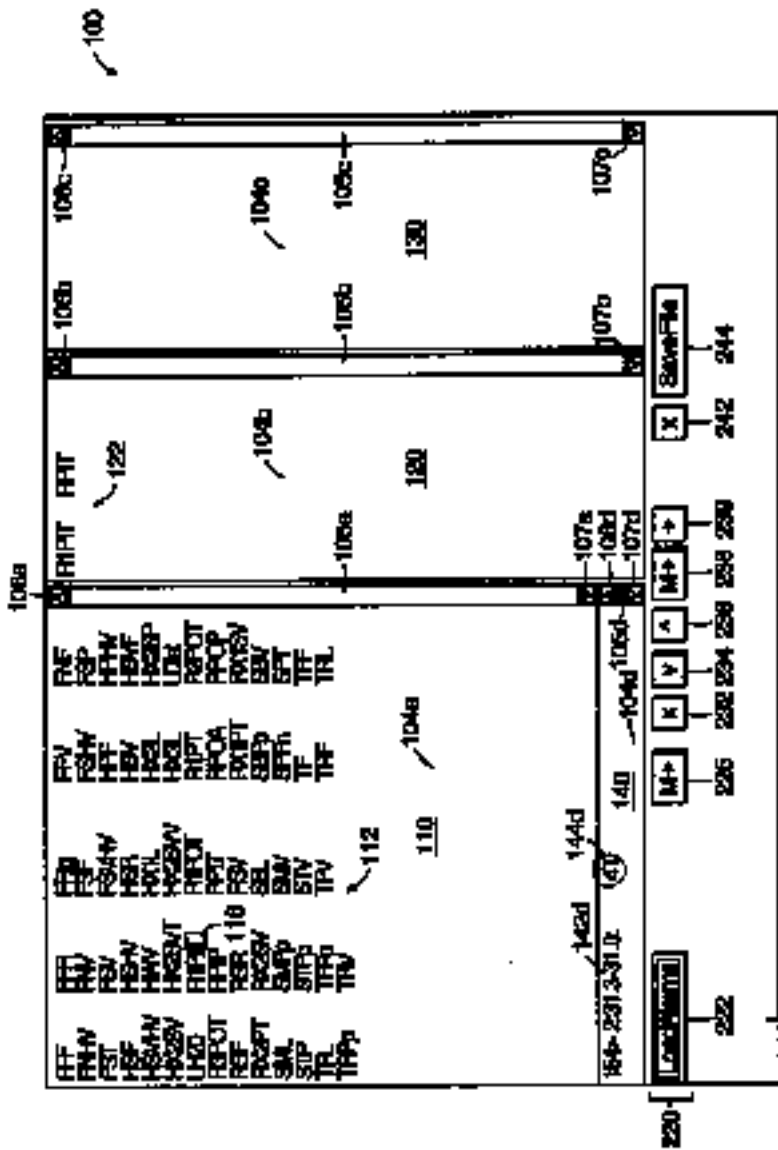


FIG. 5C

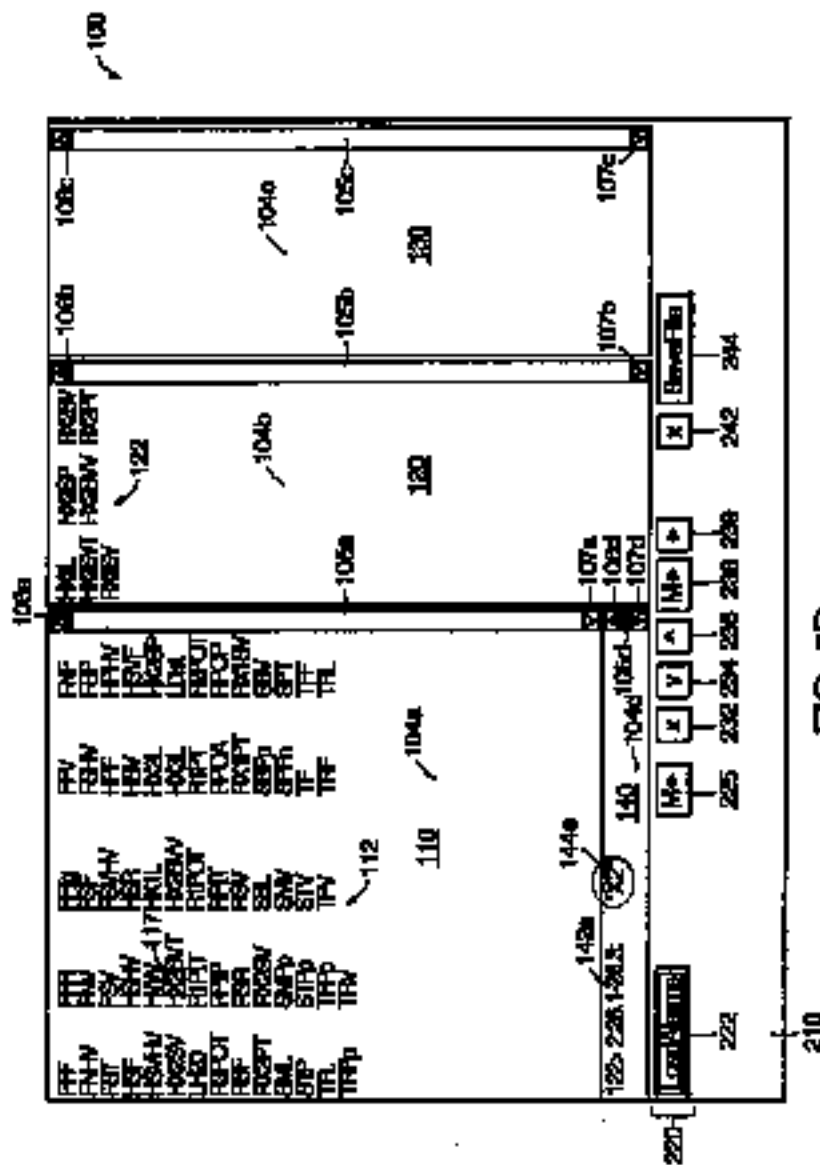


FIG. 5D

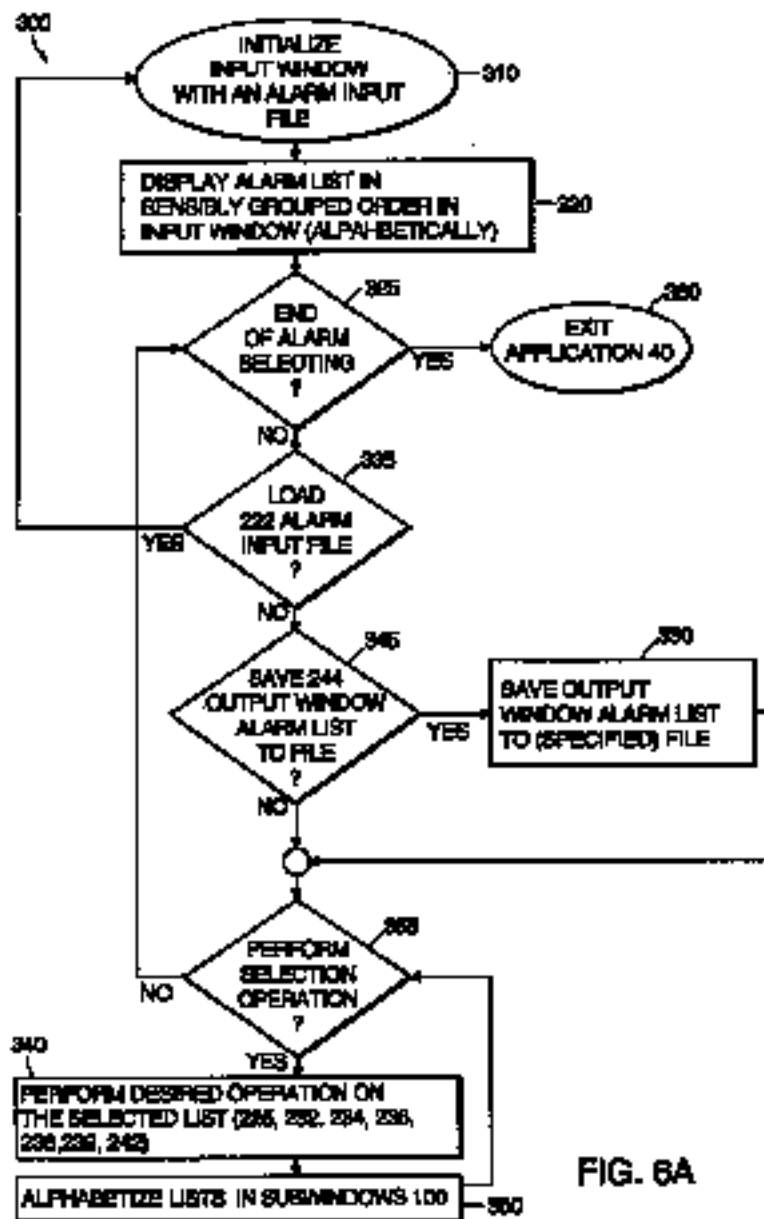


FIG. 6A

222

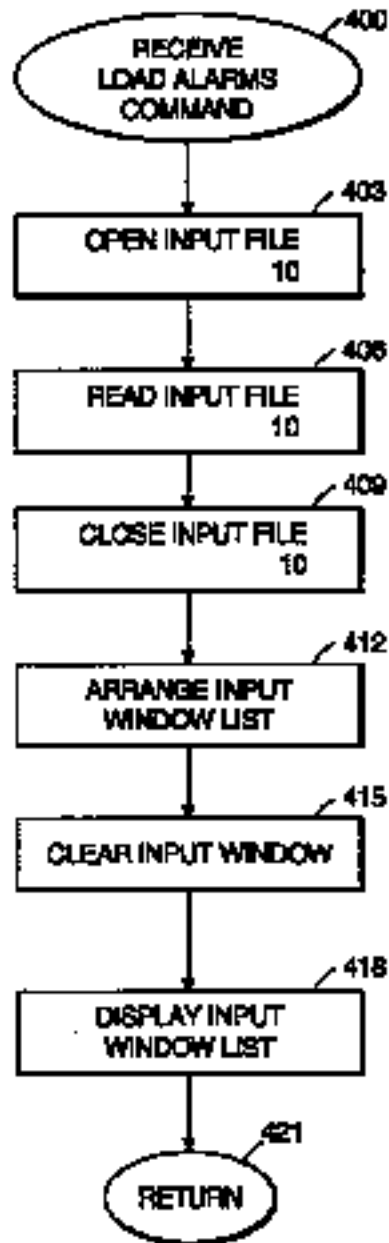


FIG. 6B

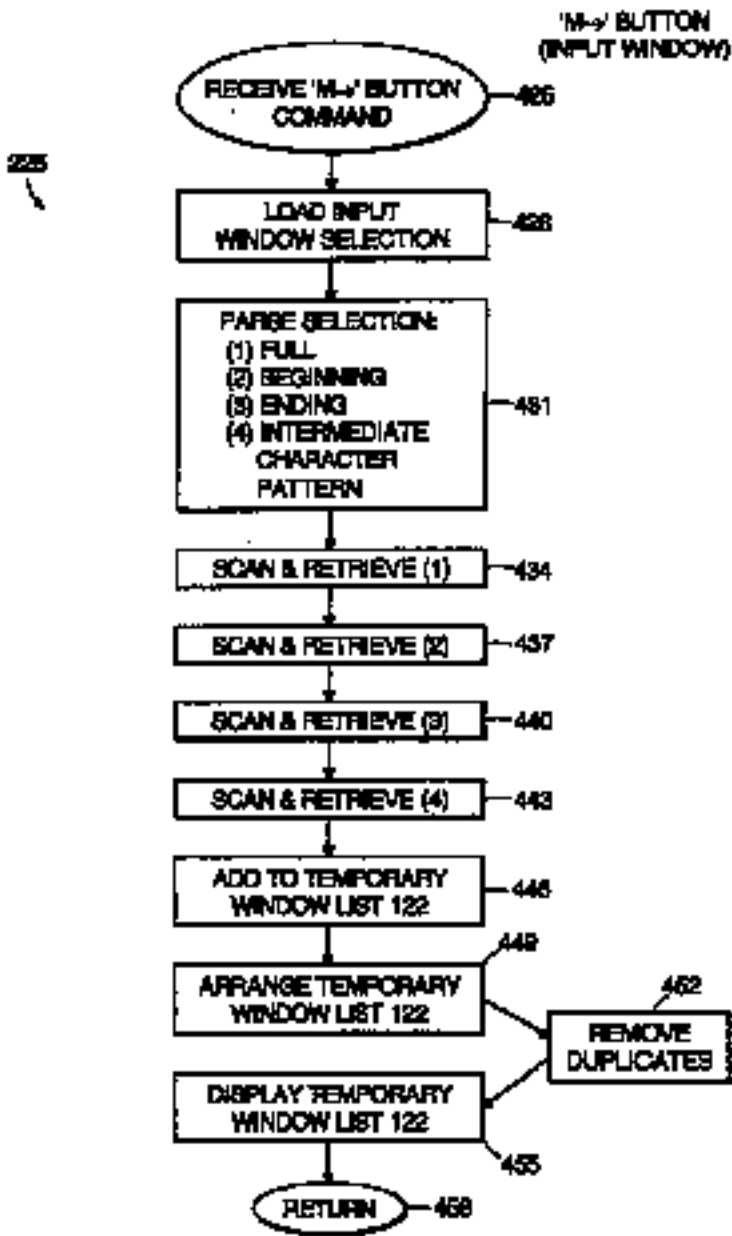


FIG. 8C

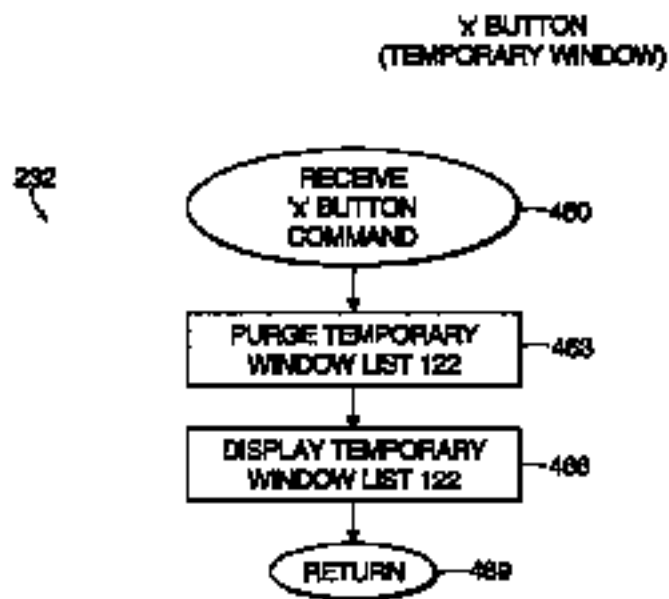


FIG. 6D

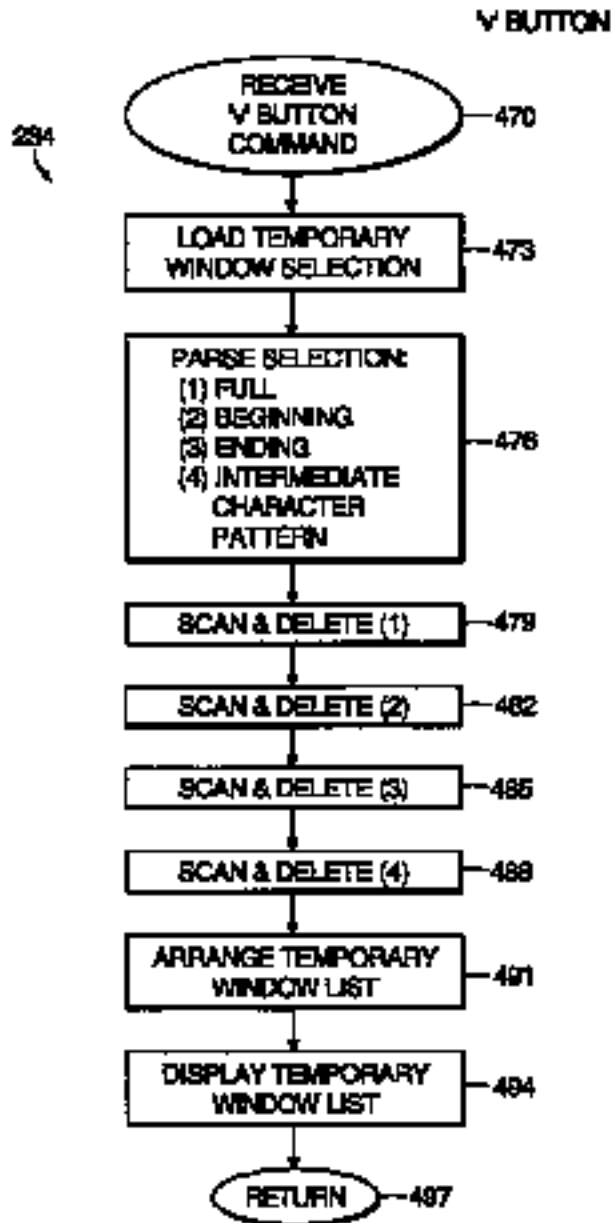


FIG. 6E

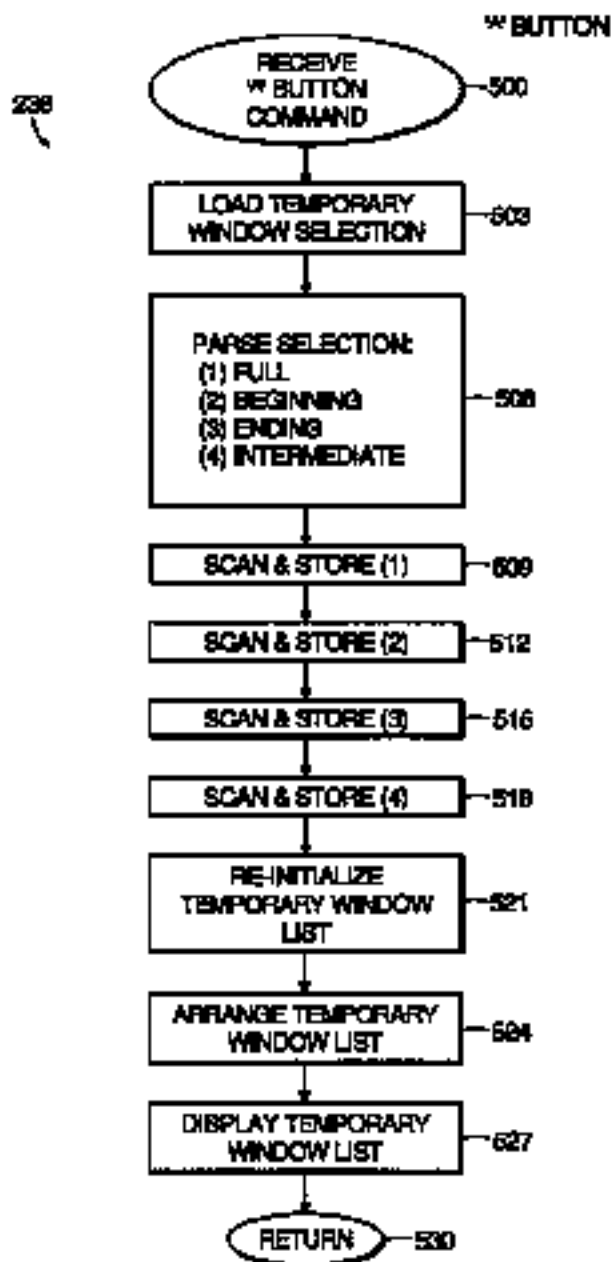


FIG. 8F

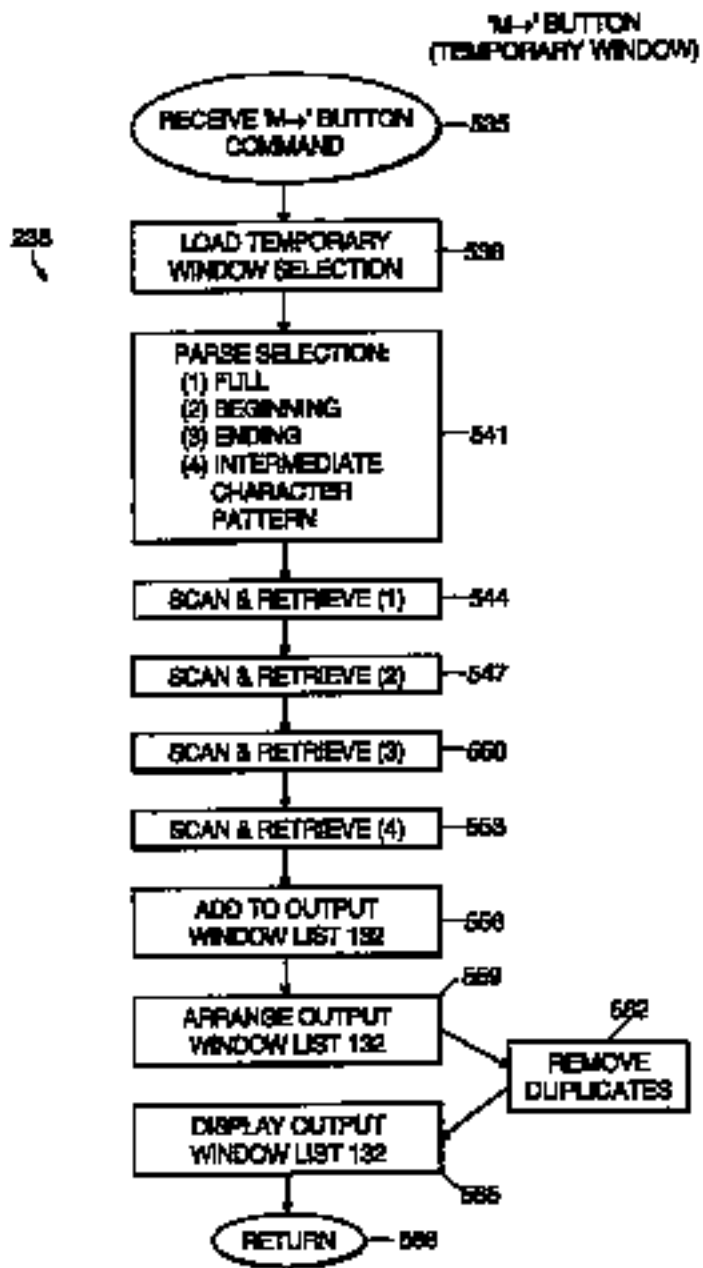


FIG. 6G

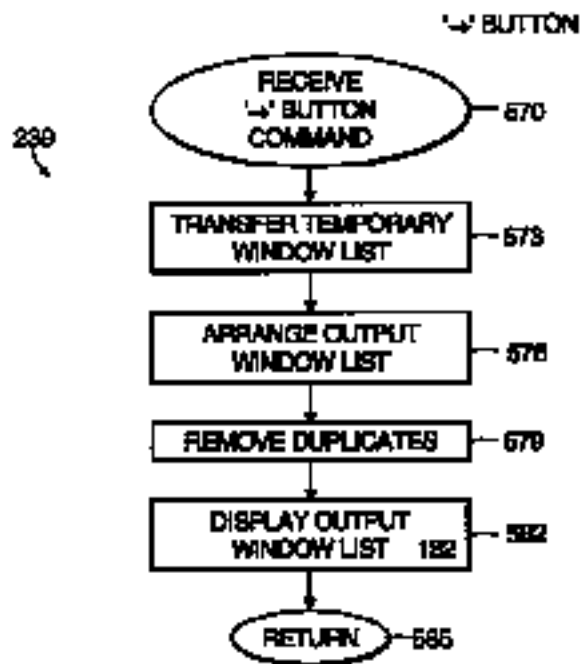


FIG. 6H

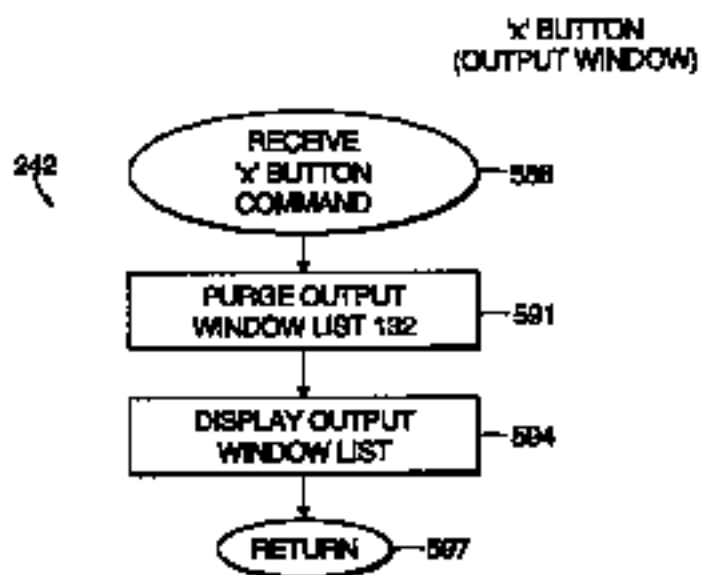


FIG. 6I

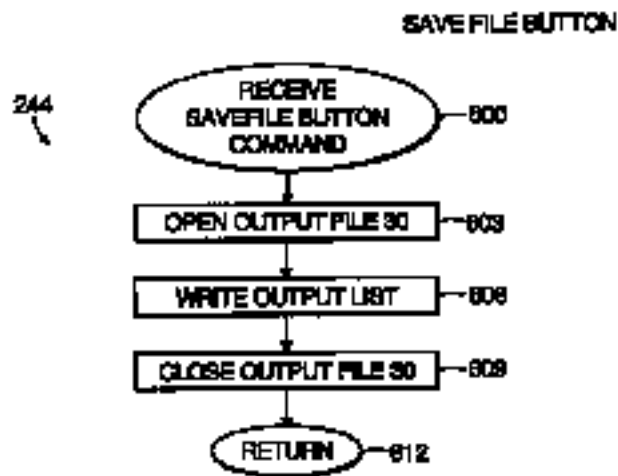
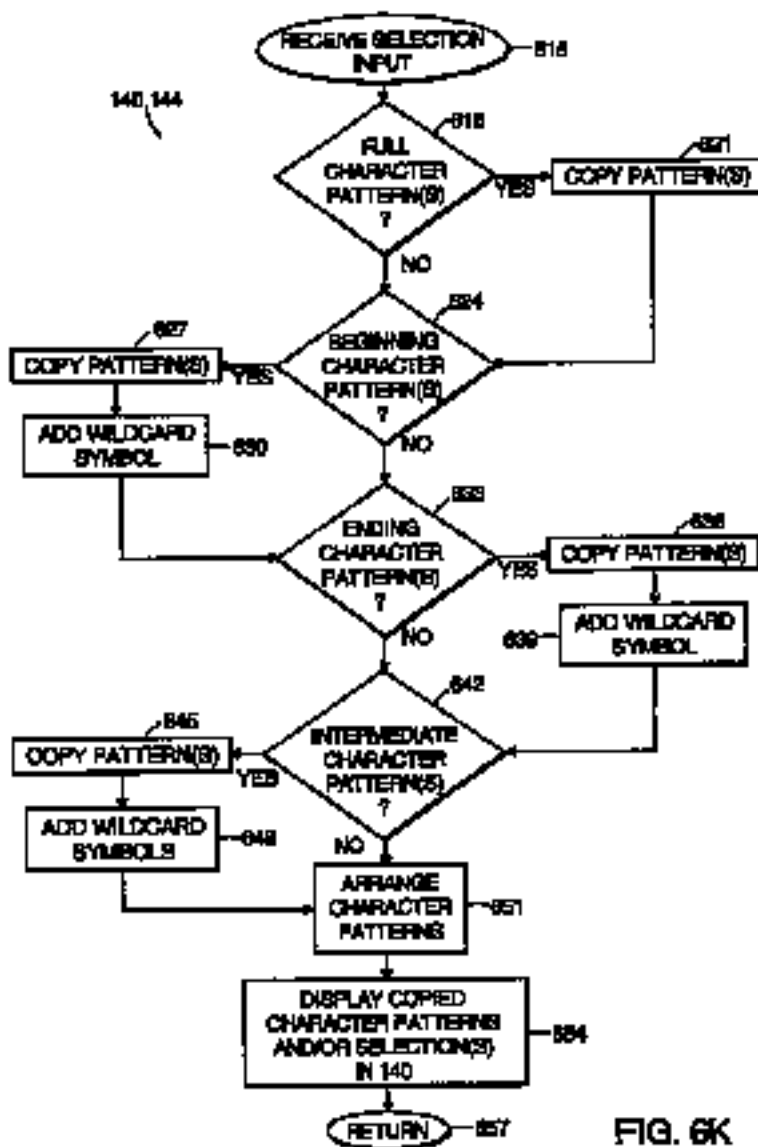


FIG. 6J



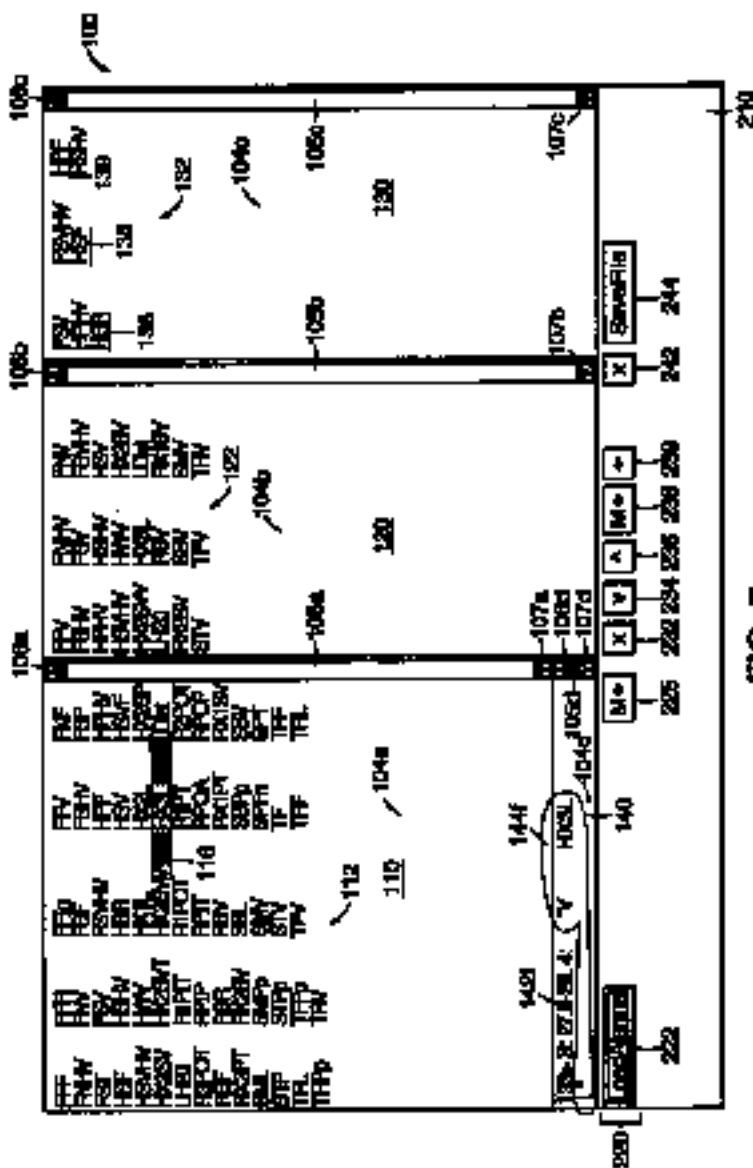


FIG. 7

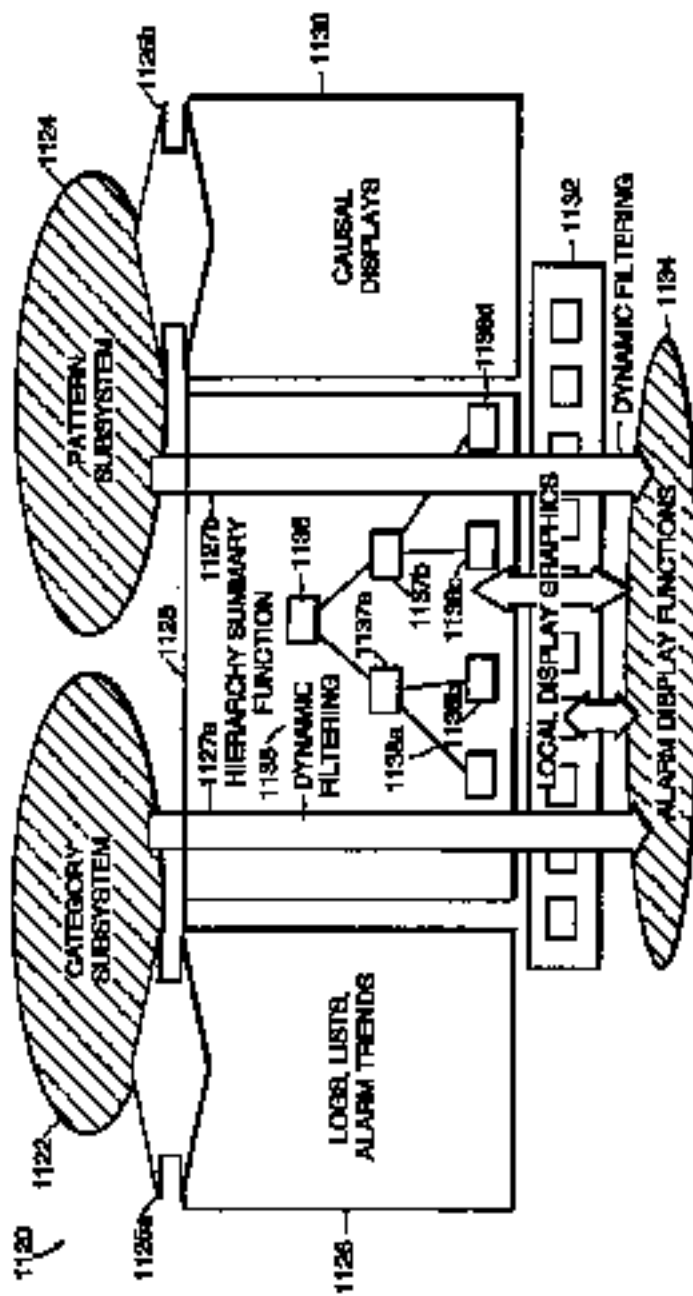


FIG. 8

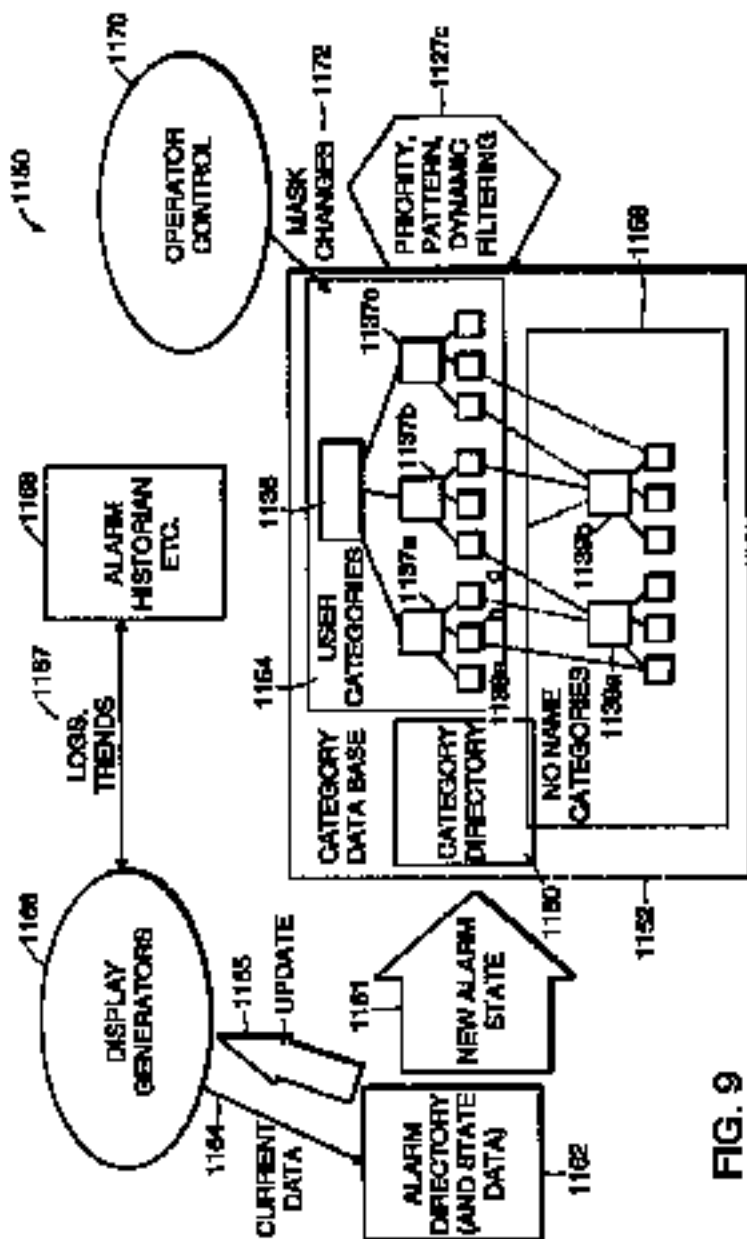


FIG. 9

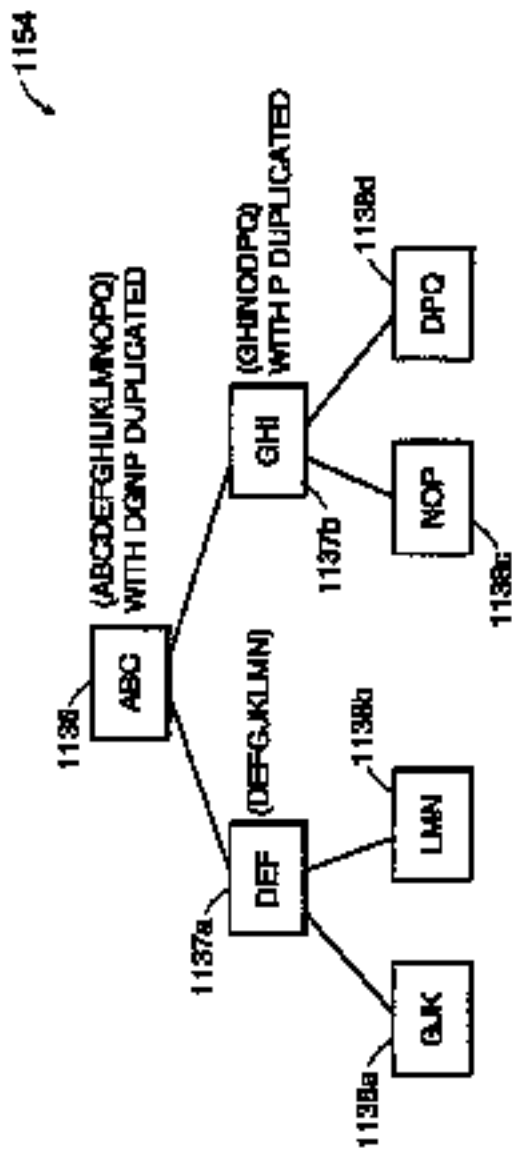


FIG. 10

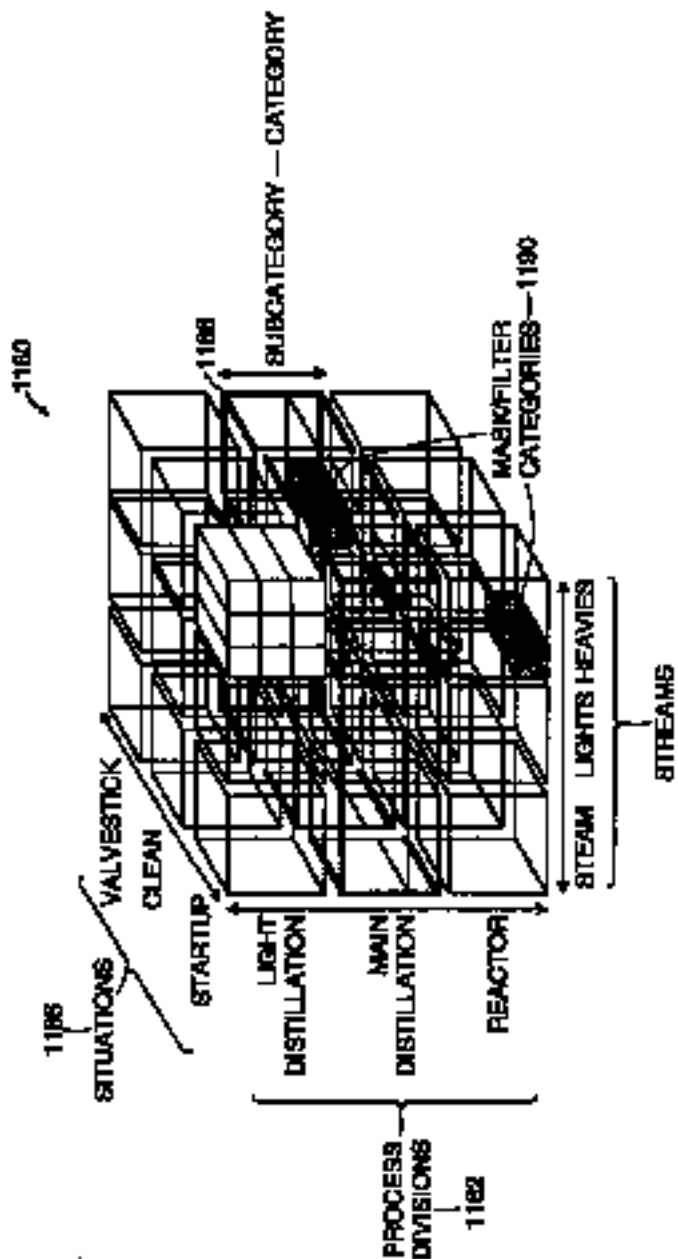


FIG. 11

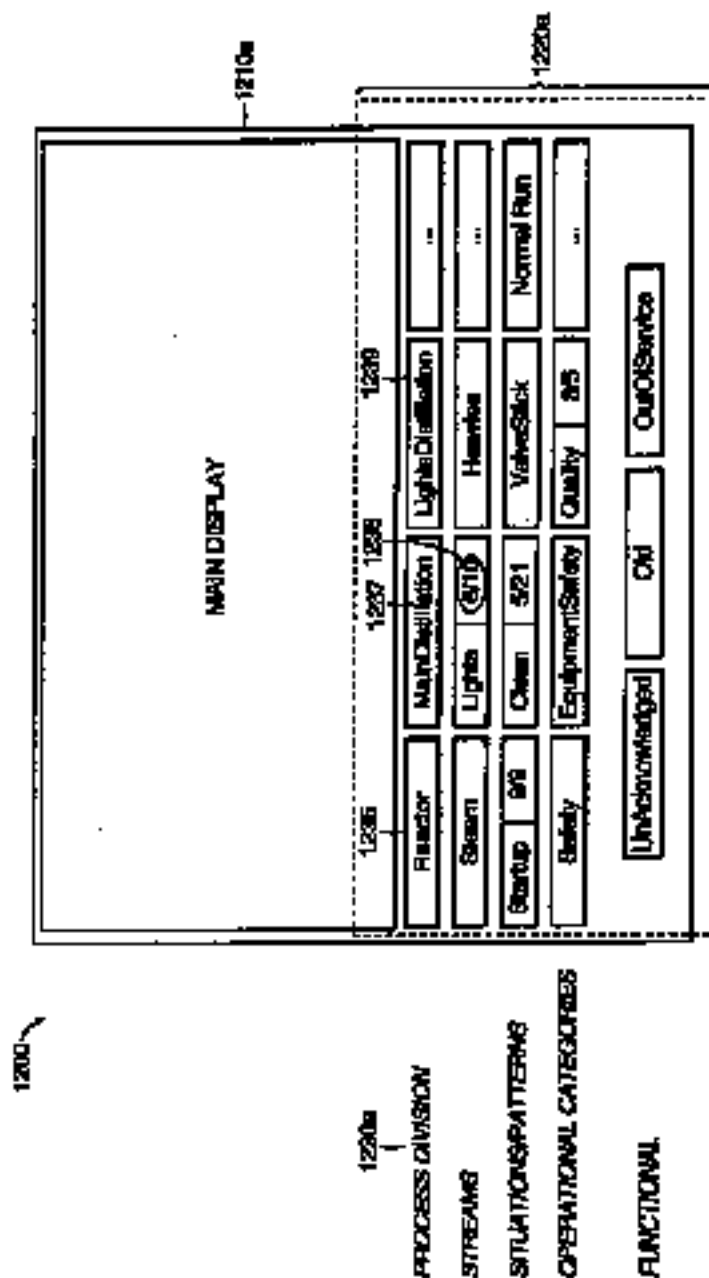


FIG. 12

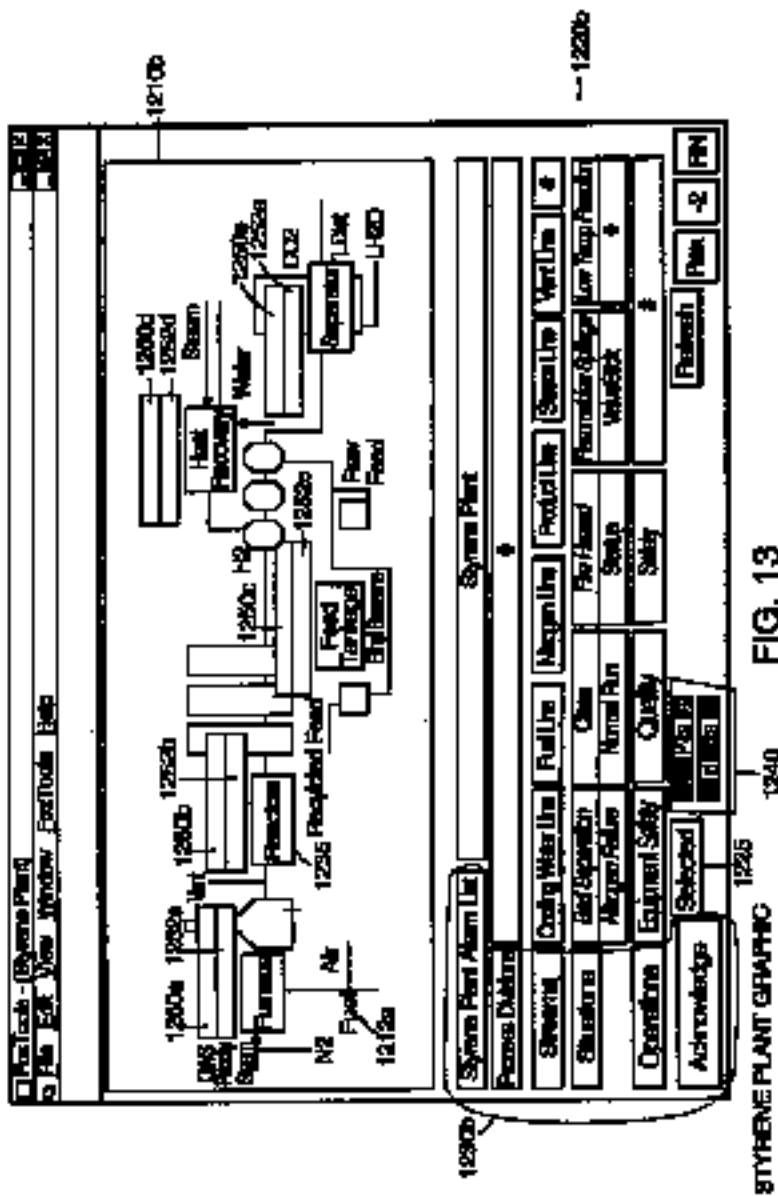


FIG. 13

STYRENE PLANT GRAPHIC

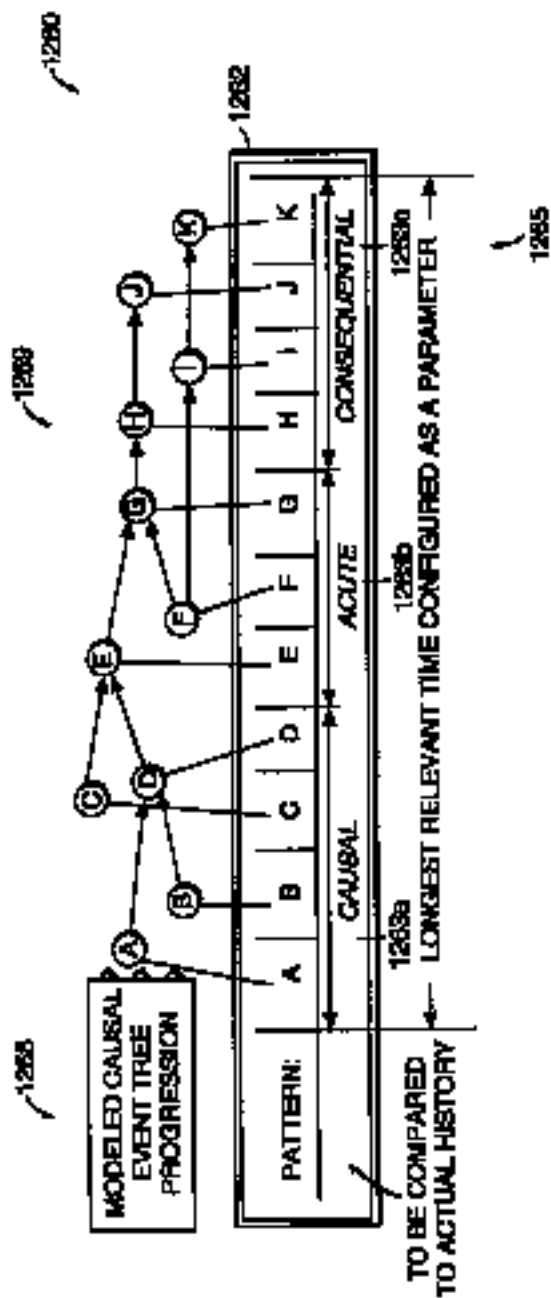


FIG. 14

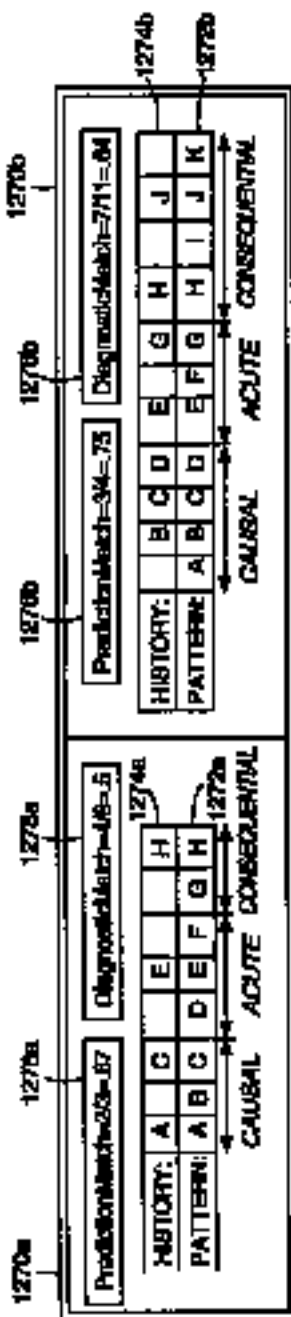


FIG. 15

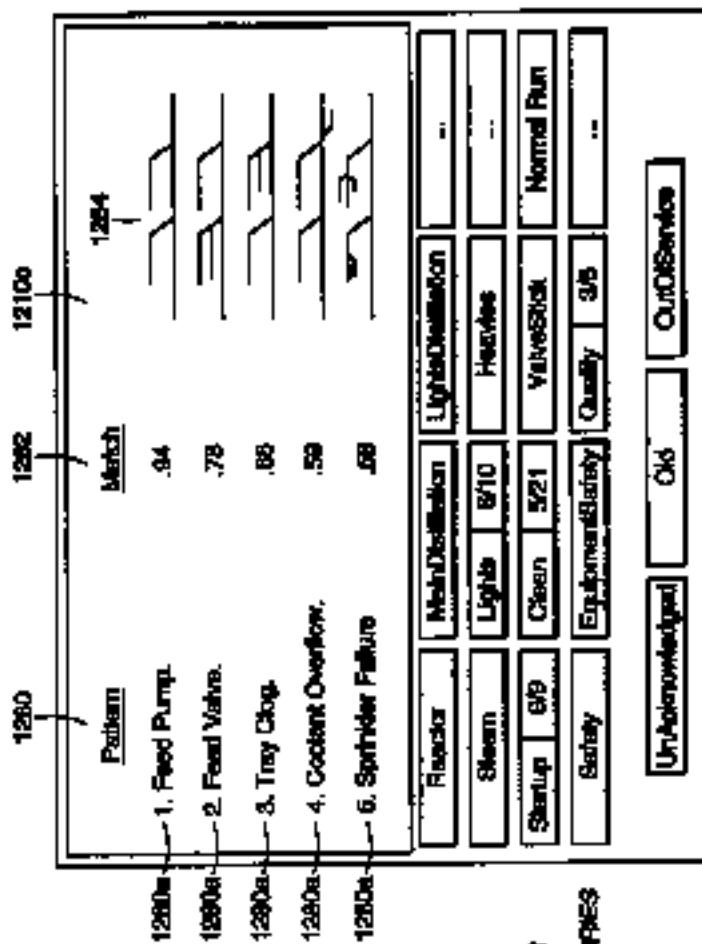
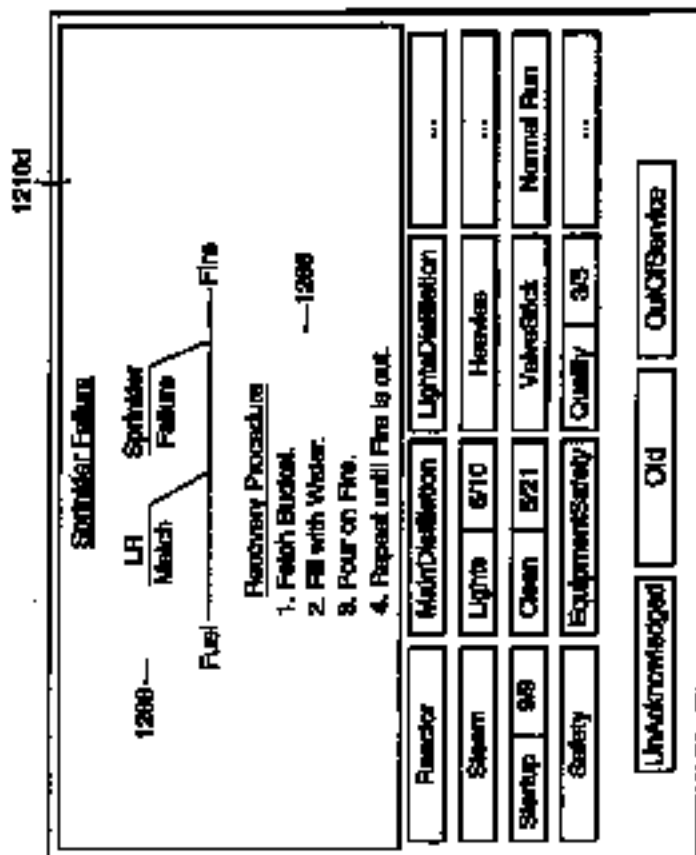


FIG. 16A



PROCESS DIVISION
 STREAMS
 SITUATIONAL PATTERNS
 OPERATIONAL CATEGORIES
 FUNCTIONAL

FIG. 16B

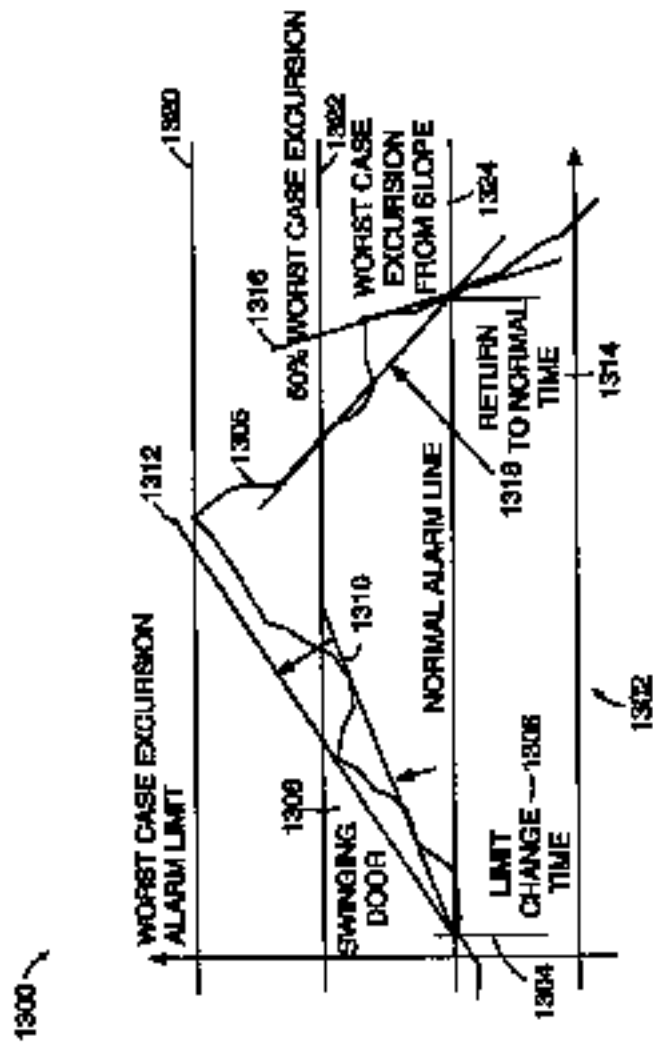


FIG. 17A

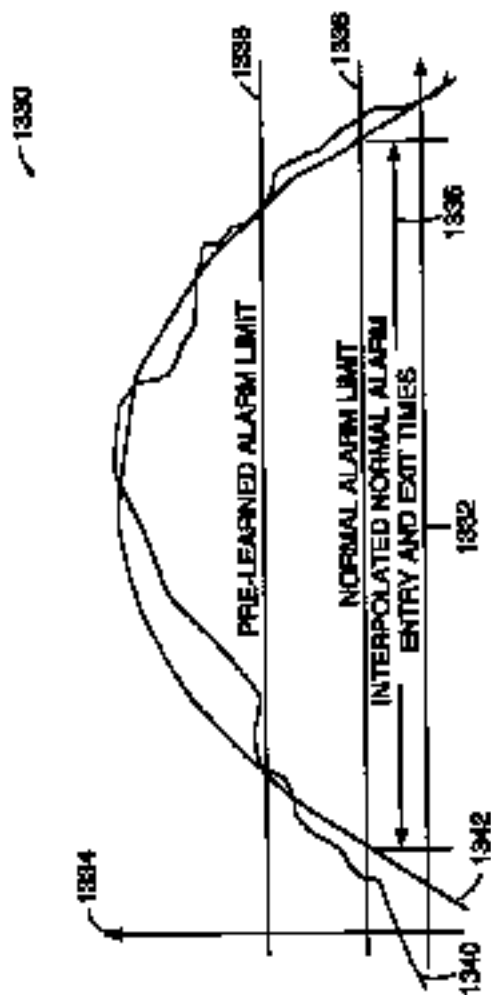


FIG. 17B

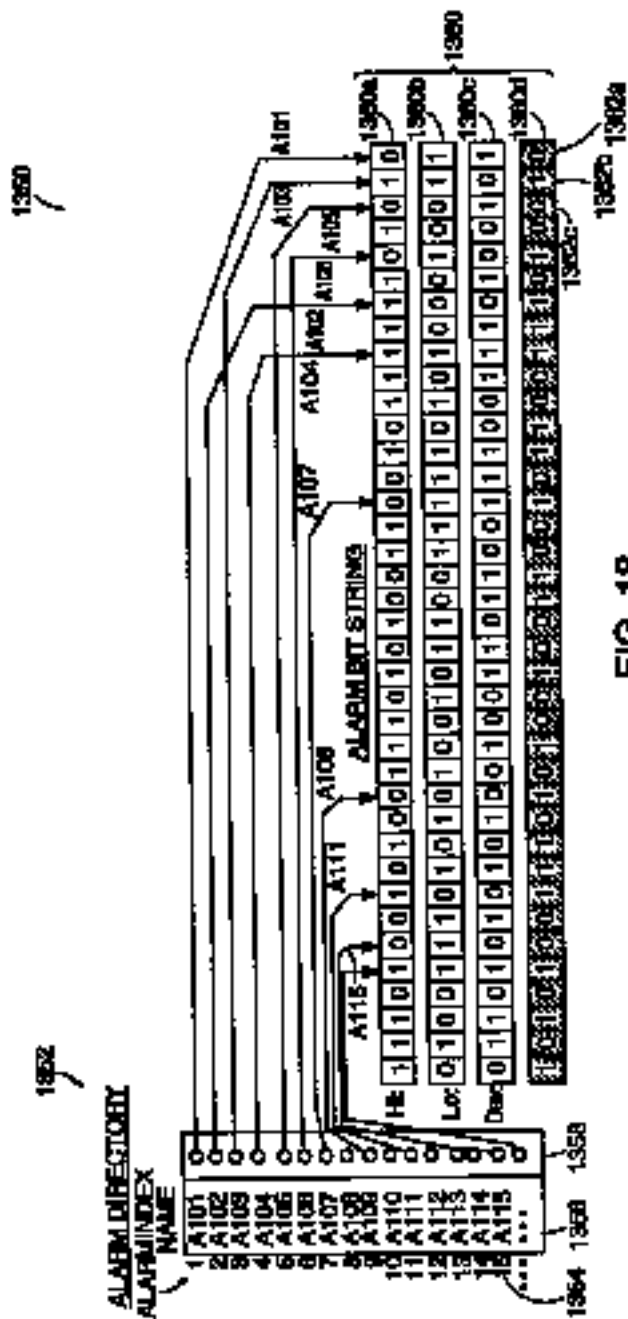


FIG. 18

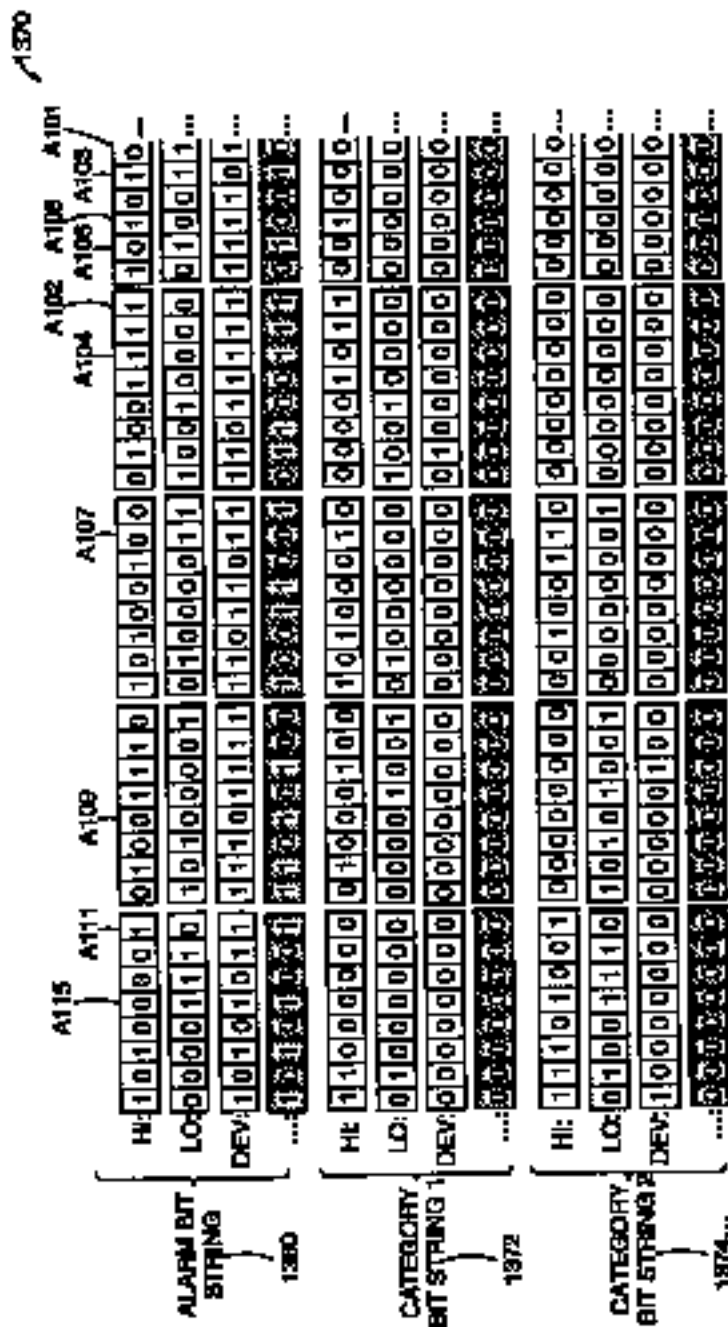


FIG. 19

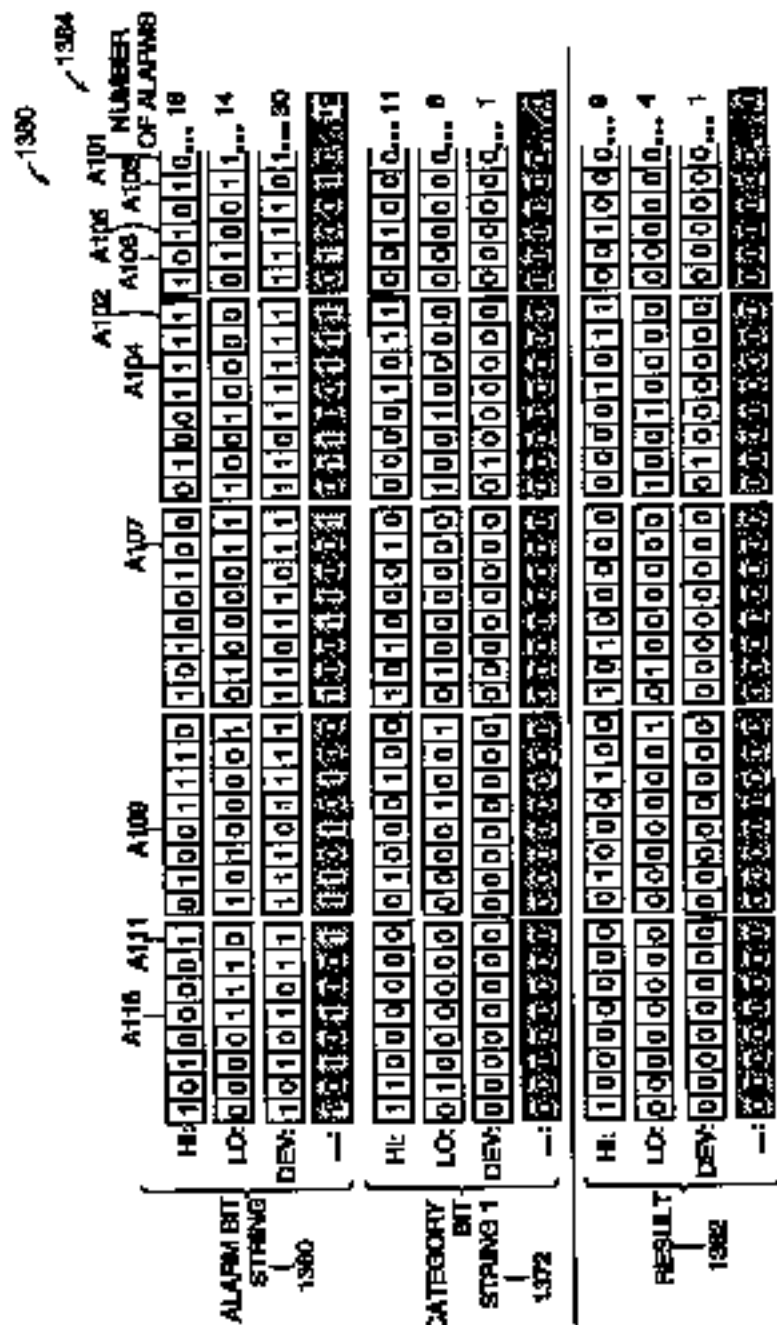


FIG. 20

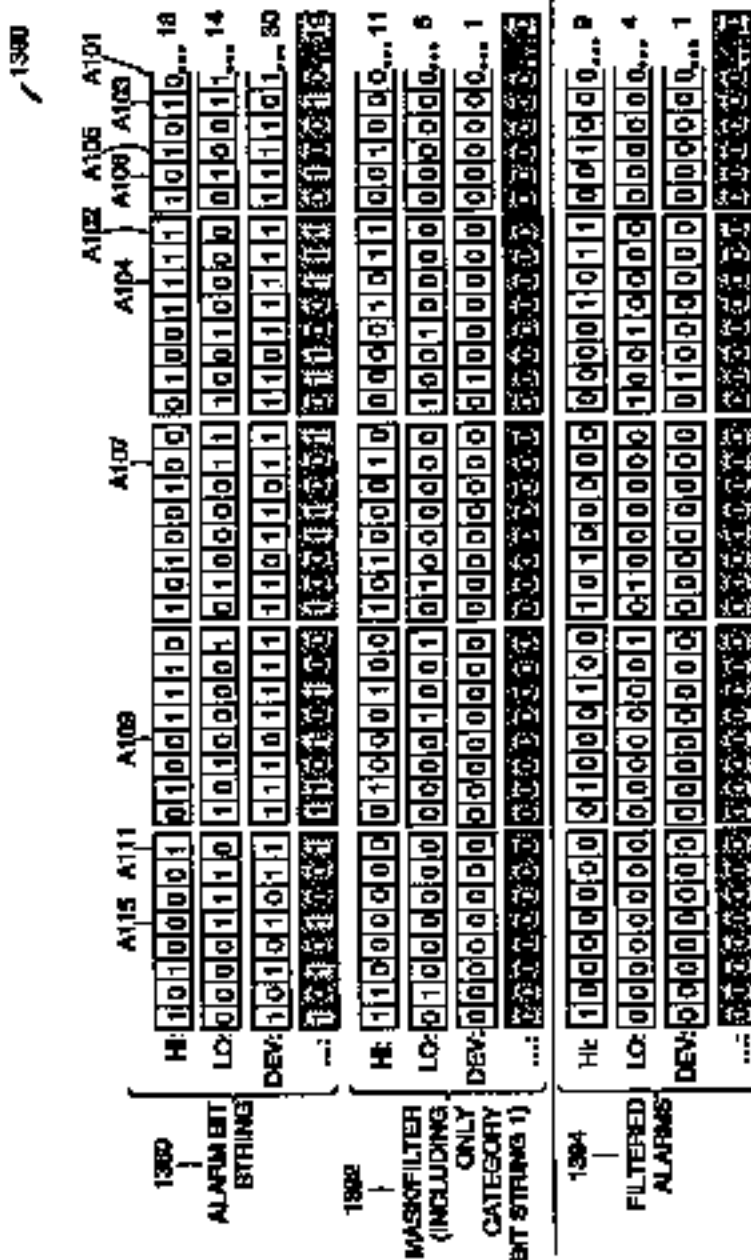


FIG. 21

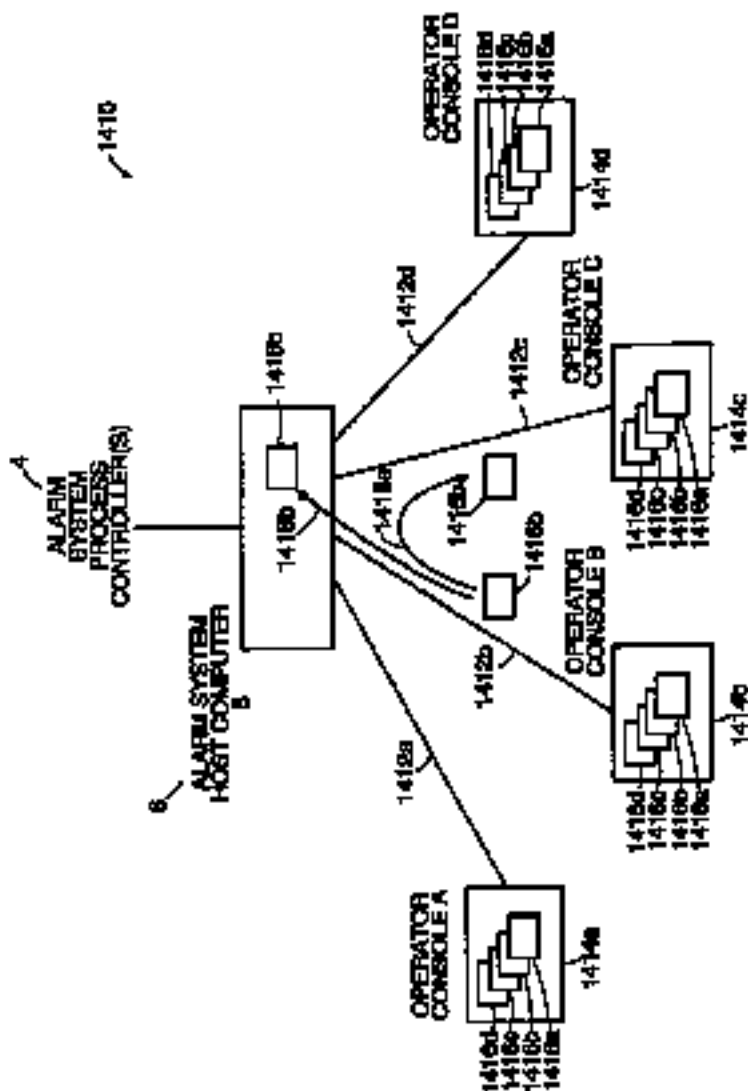
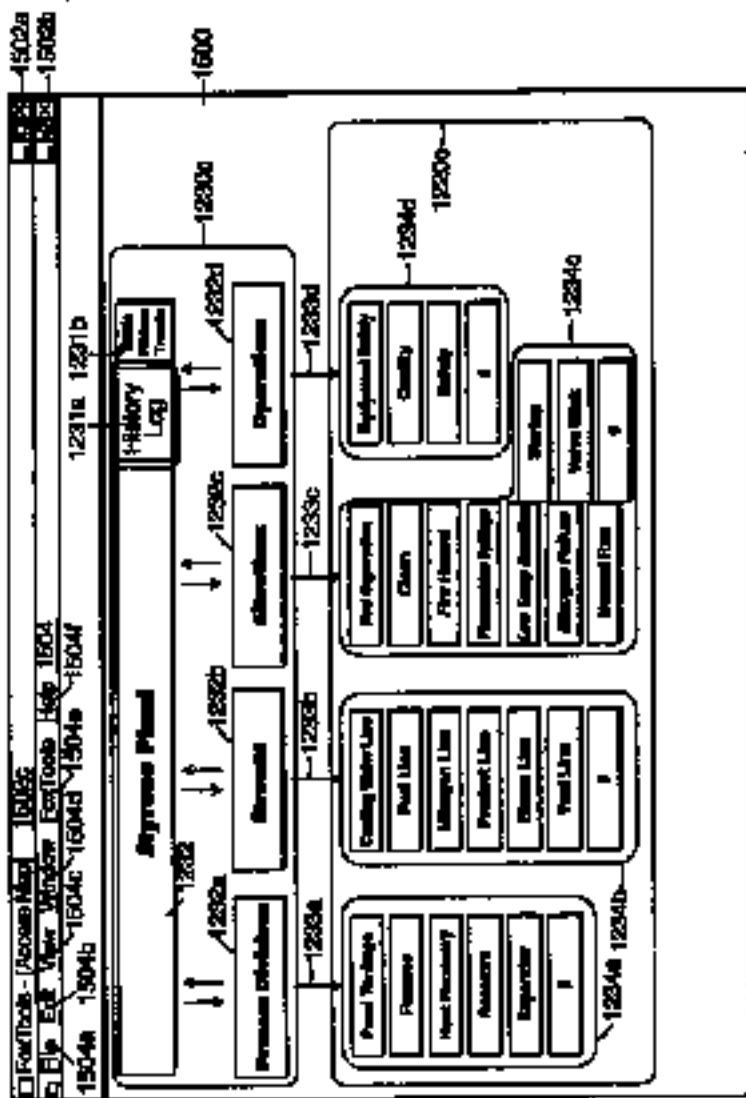


FIG. 23



Access Map: Categories (Normal), Categories (Bold), Patterns (In Italic)
 FIG. 24

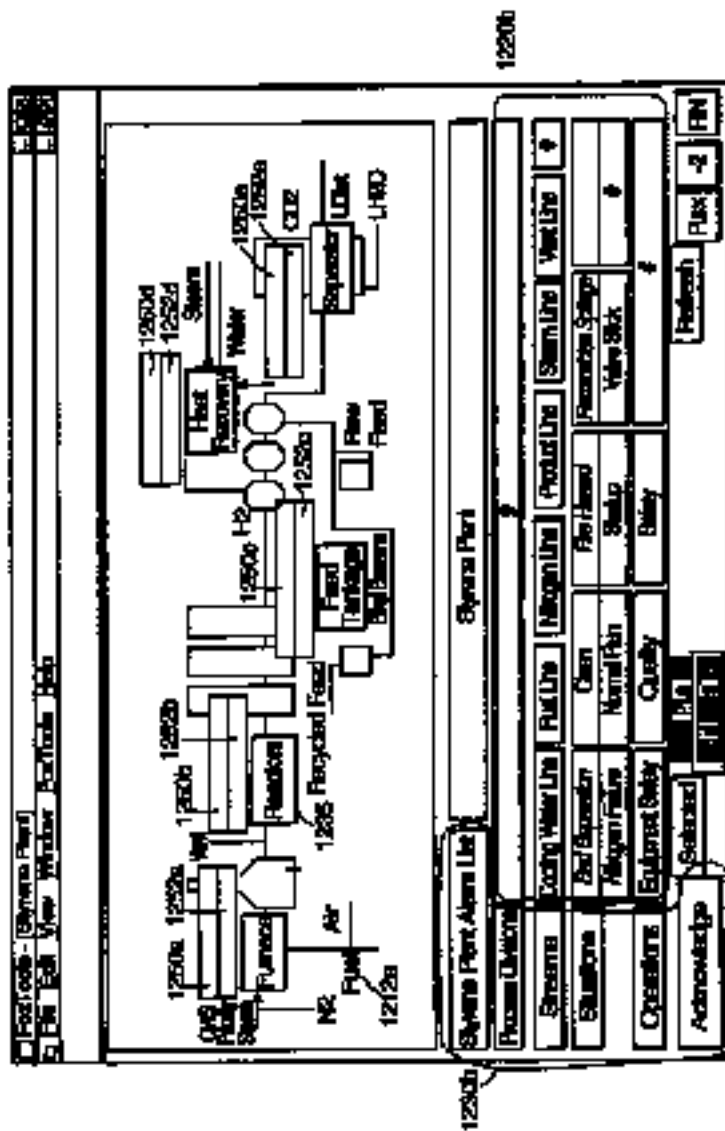


FIG. 25

STYRENE PLANT GRAPHIC

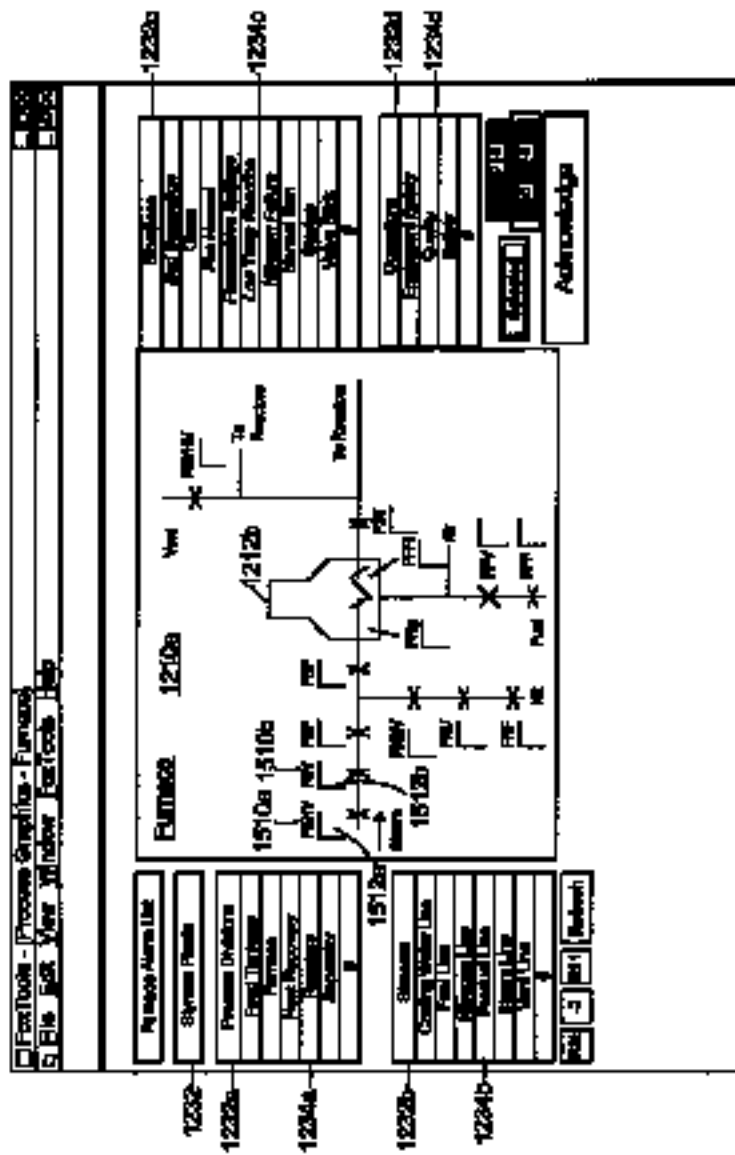
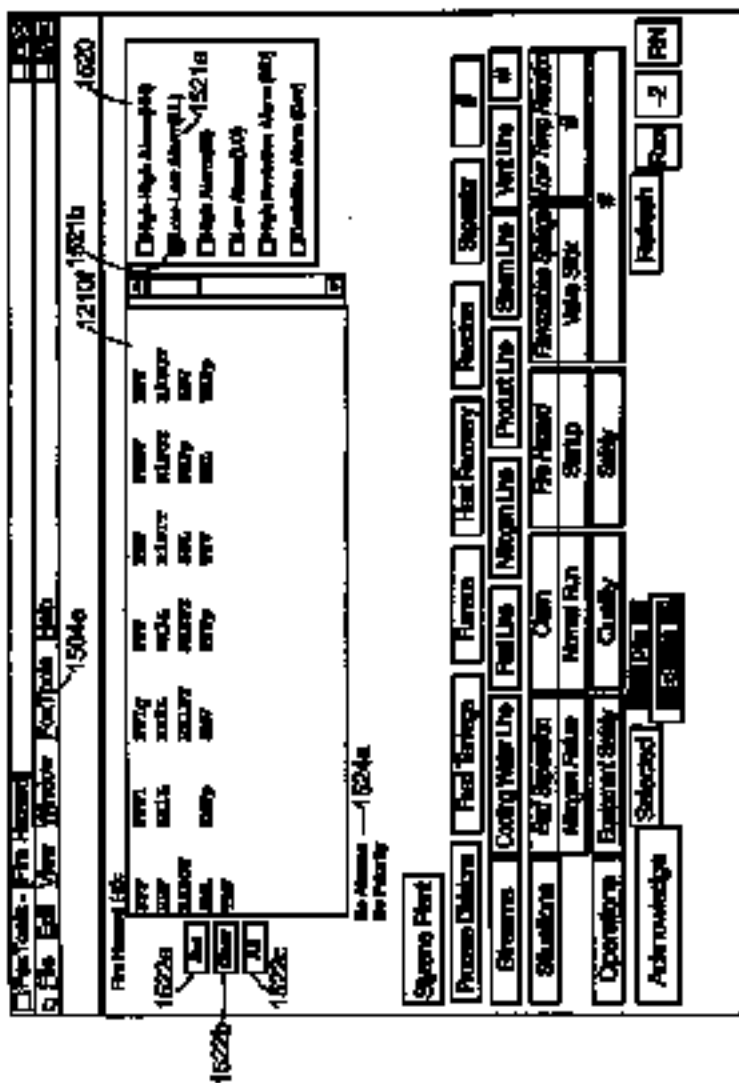
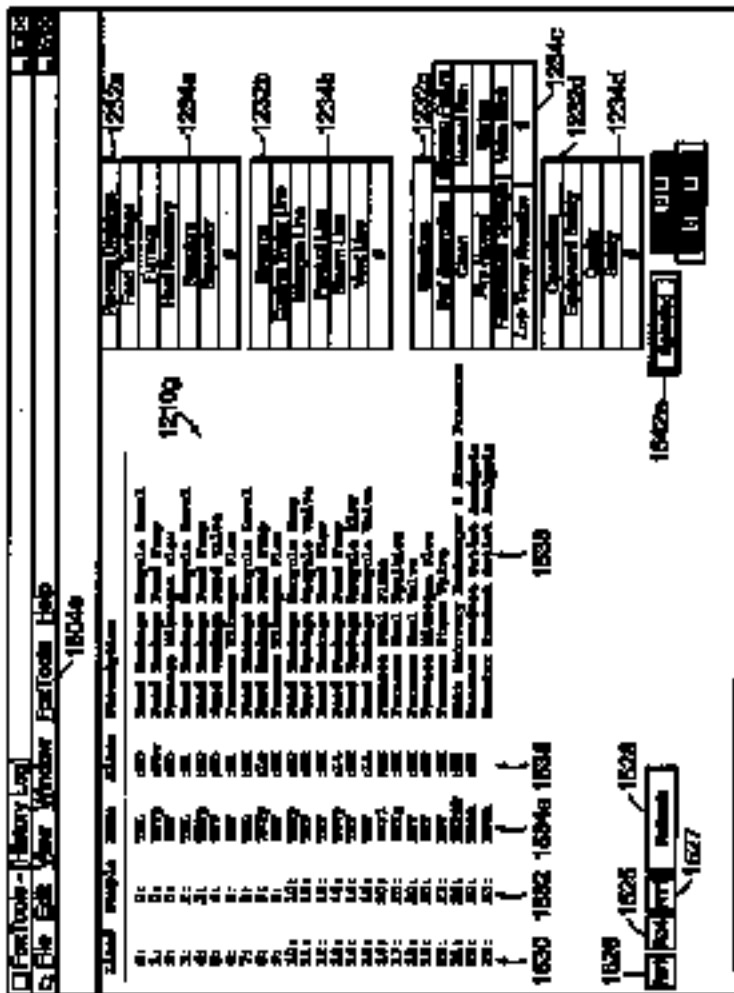


FIG. 26

Furnace Graphic



Default (non Graphic) Display (for Fire Hazard Problem)
FIG. 27



History Log (advanced to the 34th sample time) FIG. 28

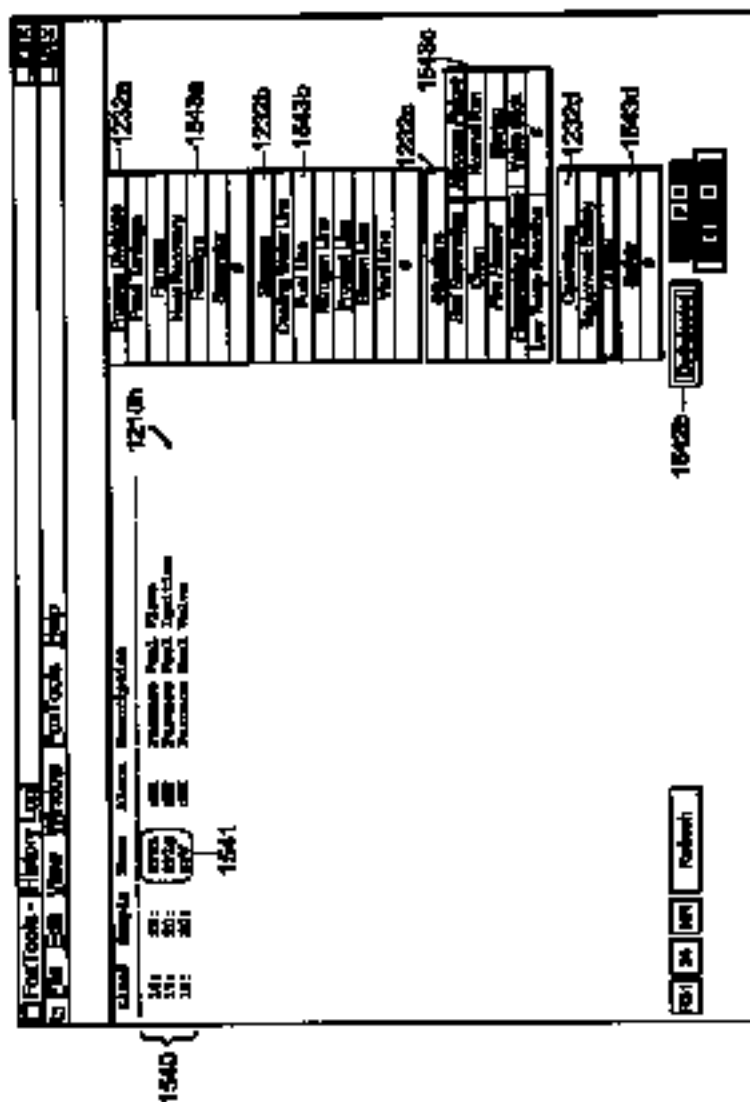
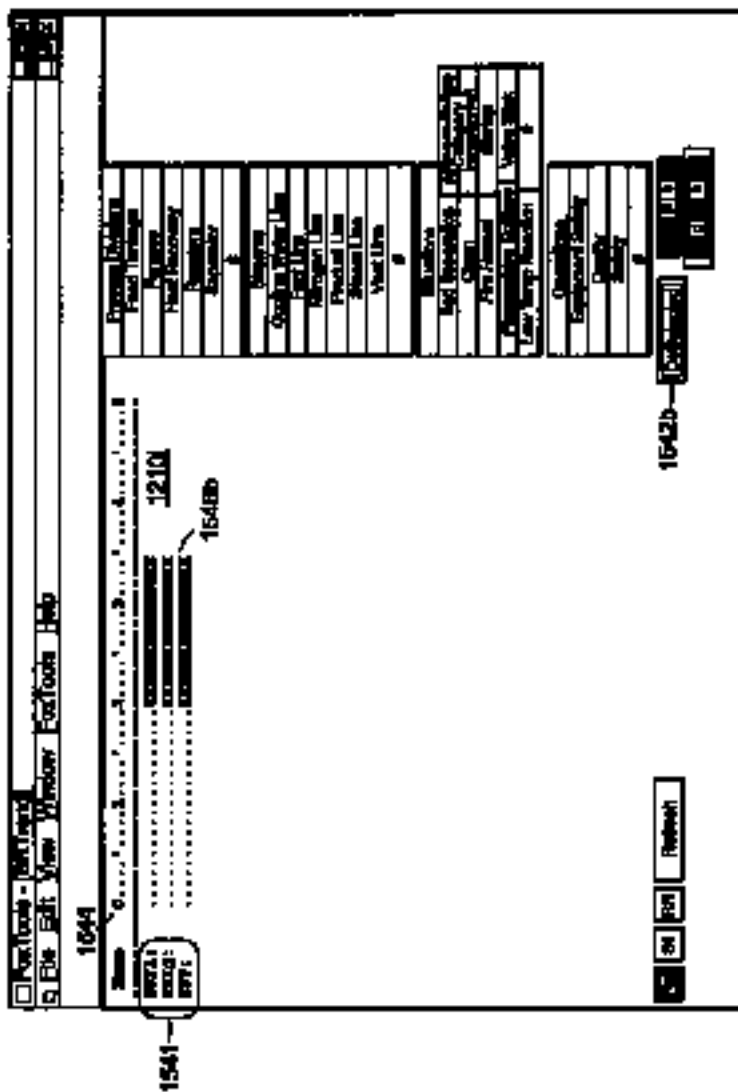
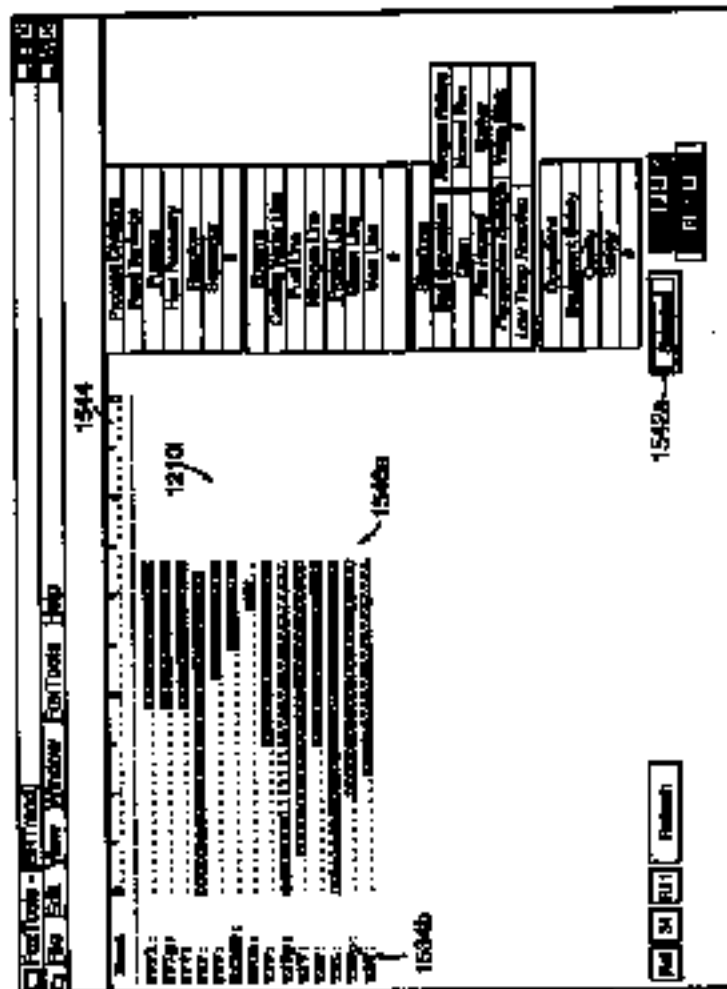


FIG. 29



Ribbon Trend display (color coded instead of color coded) with MenuBar carried over from log

FIG. 30



Bottle Ribbon: Trend (Music/Film removed) FIG. 31

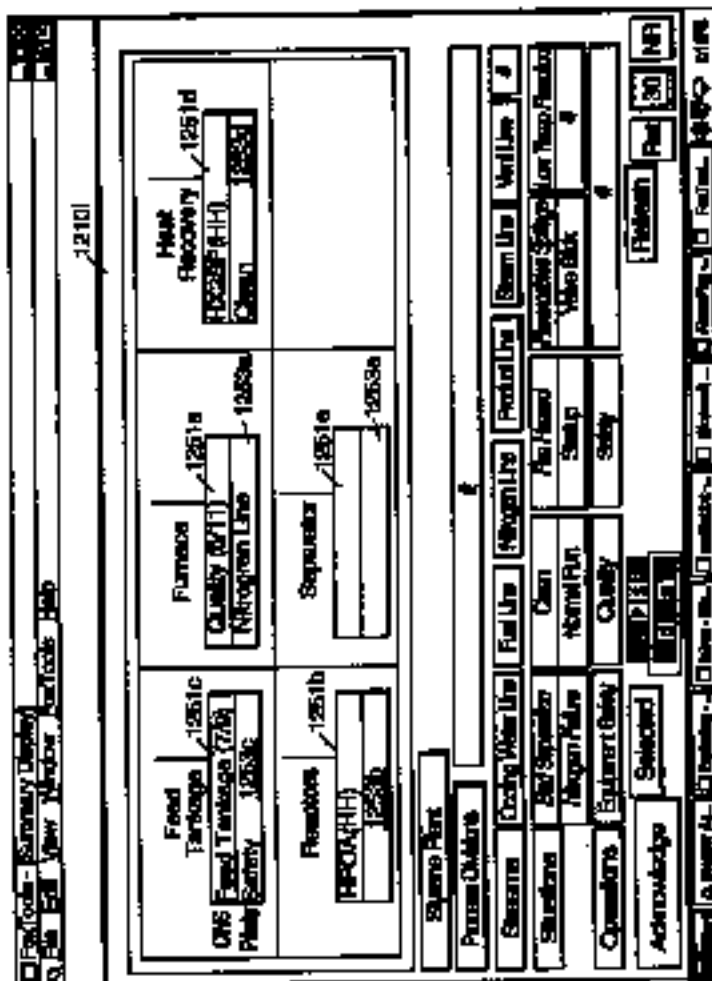
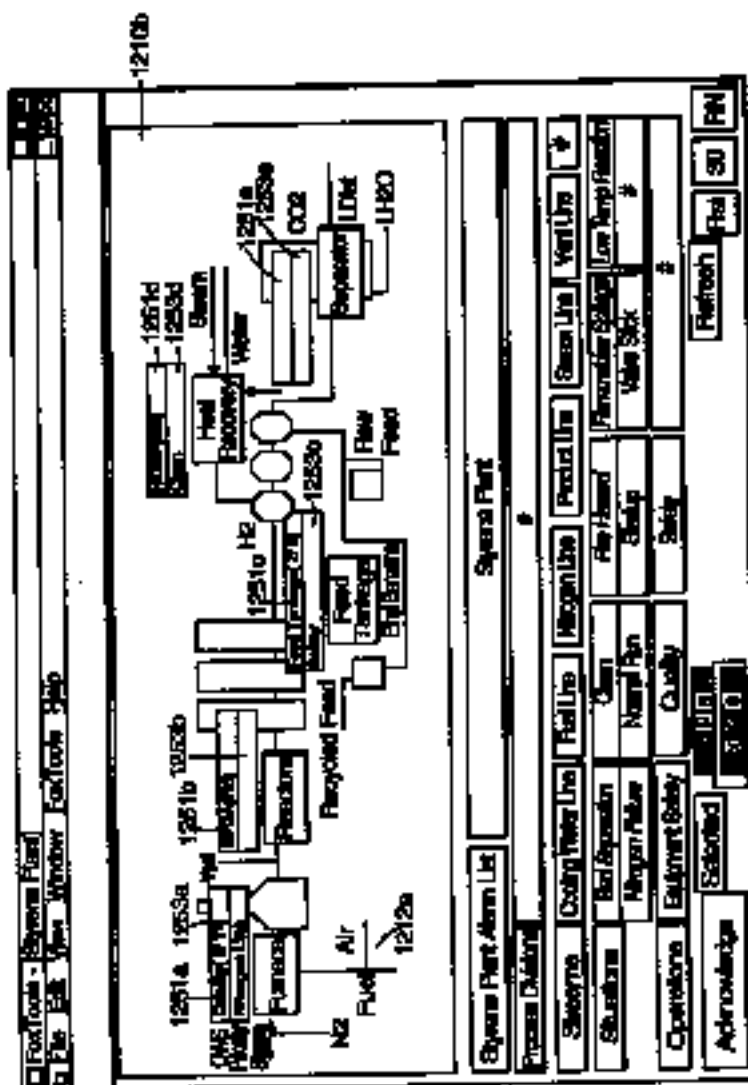
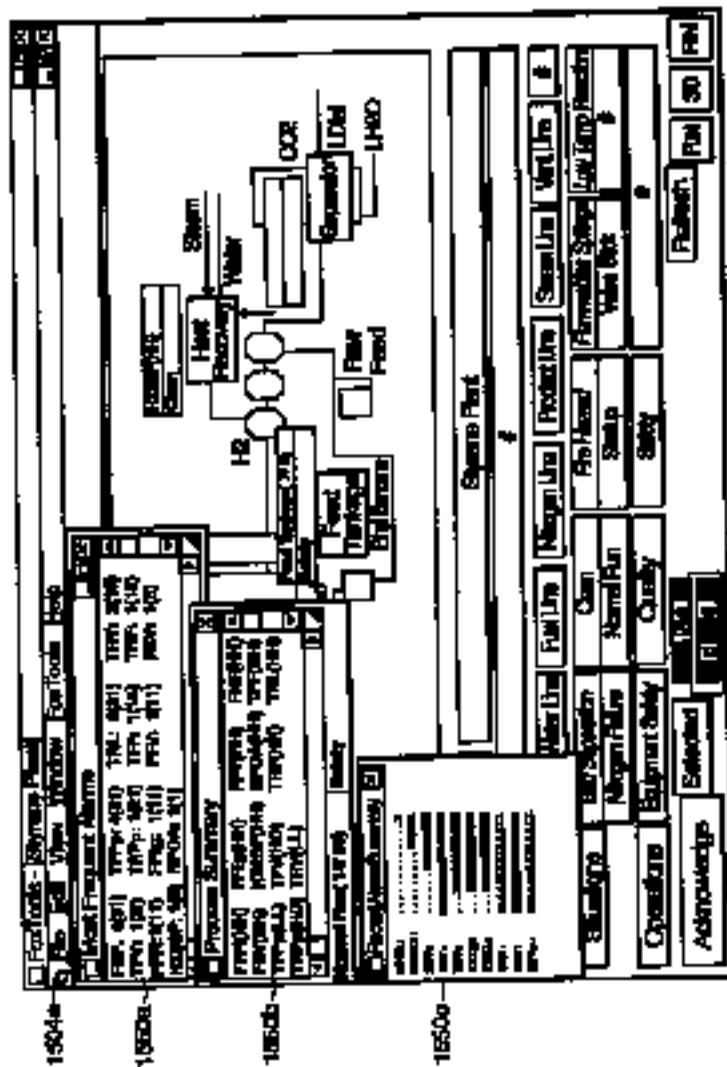


FIG. 32



STYRENE PLANT GRAPHIC showing Summary, OMS and Priority Summary

FIG. 33



Optional Inlet Most Frequent Alarms, Process Summary, Most Recent Alarm Displays

FIG. 34

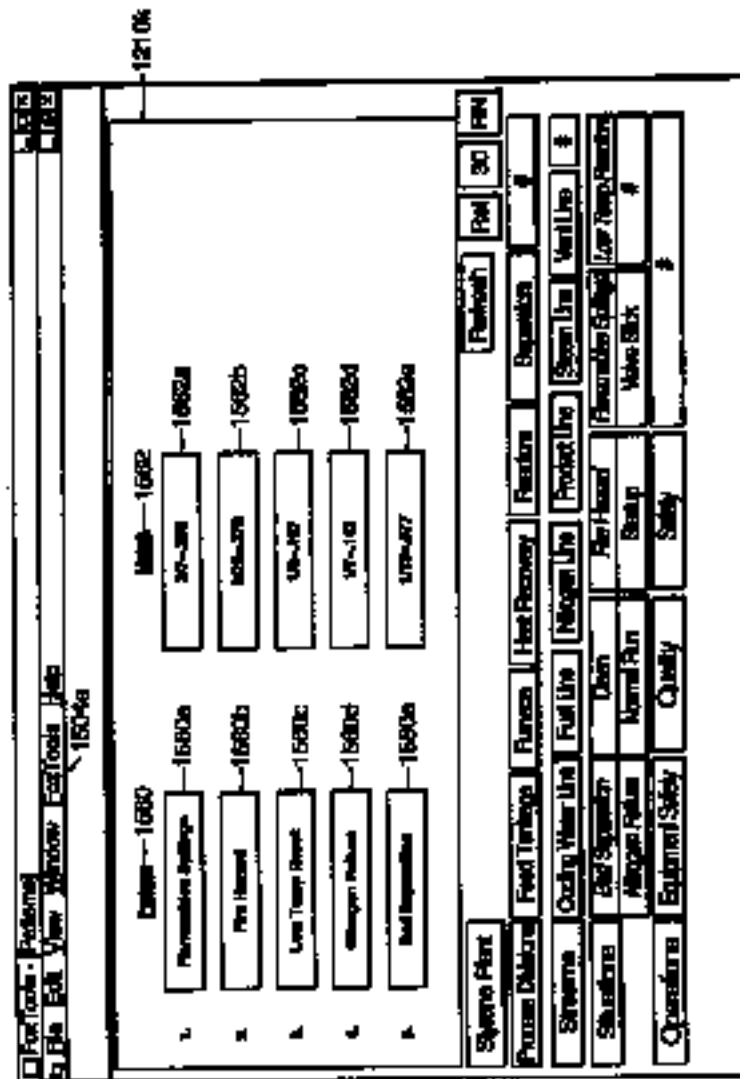


FIG. 35

Pattern Summary

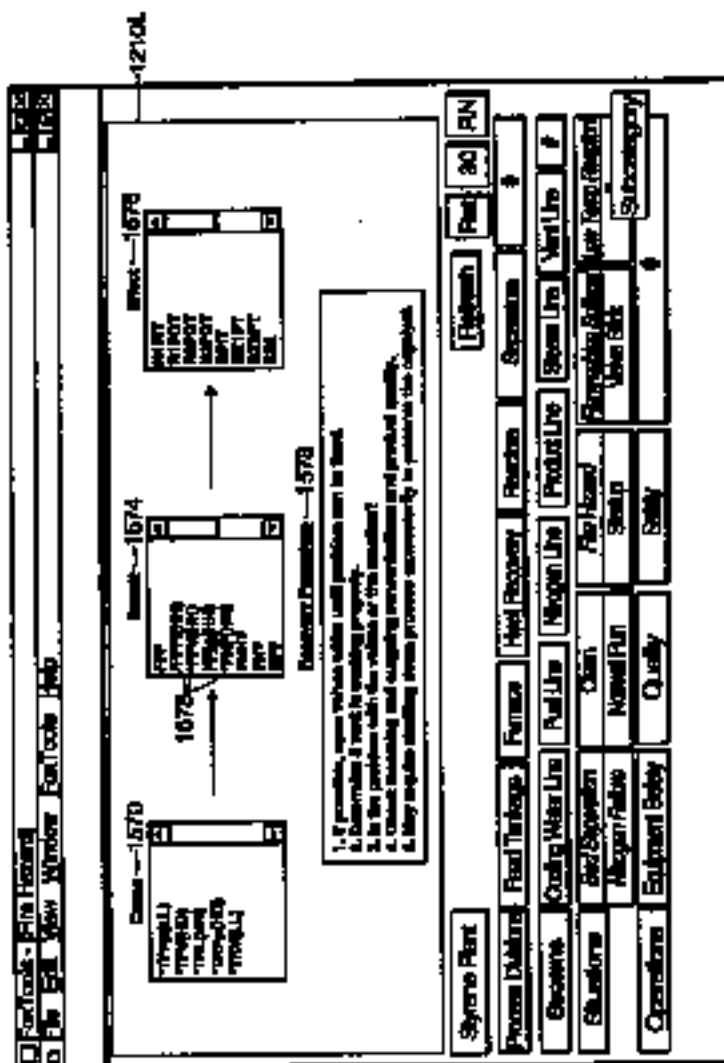


FIG. 36

Fire Hazard Pattern Display

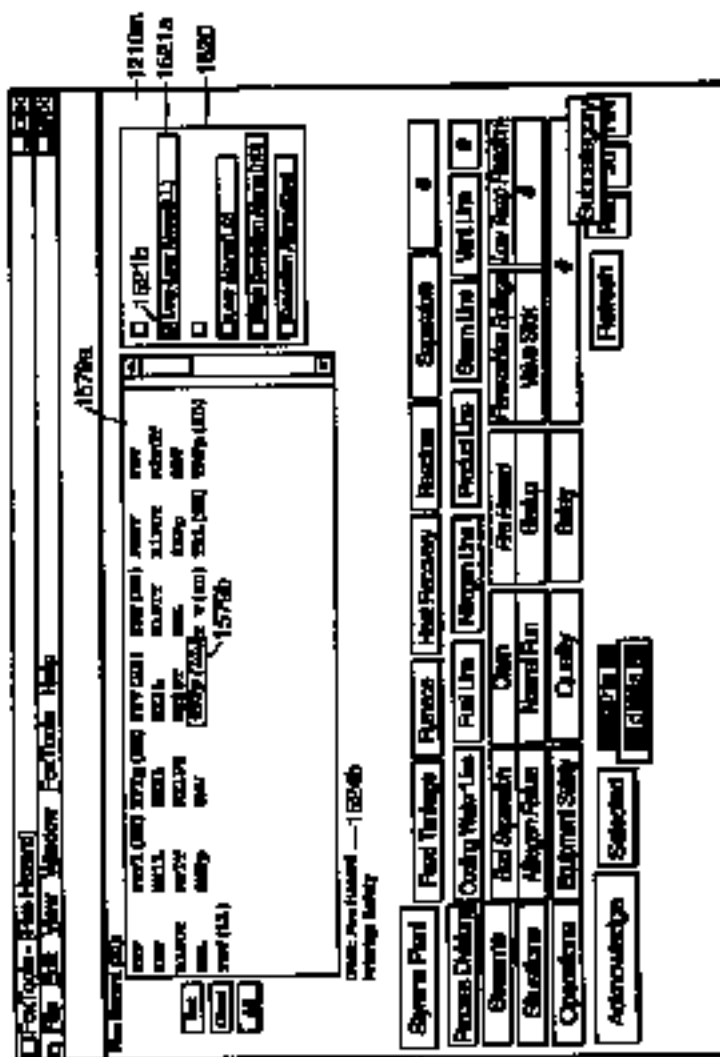
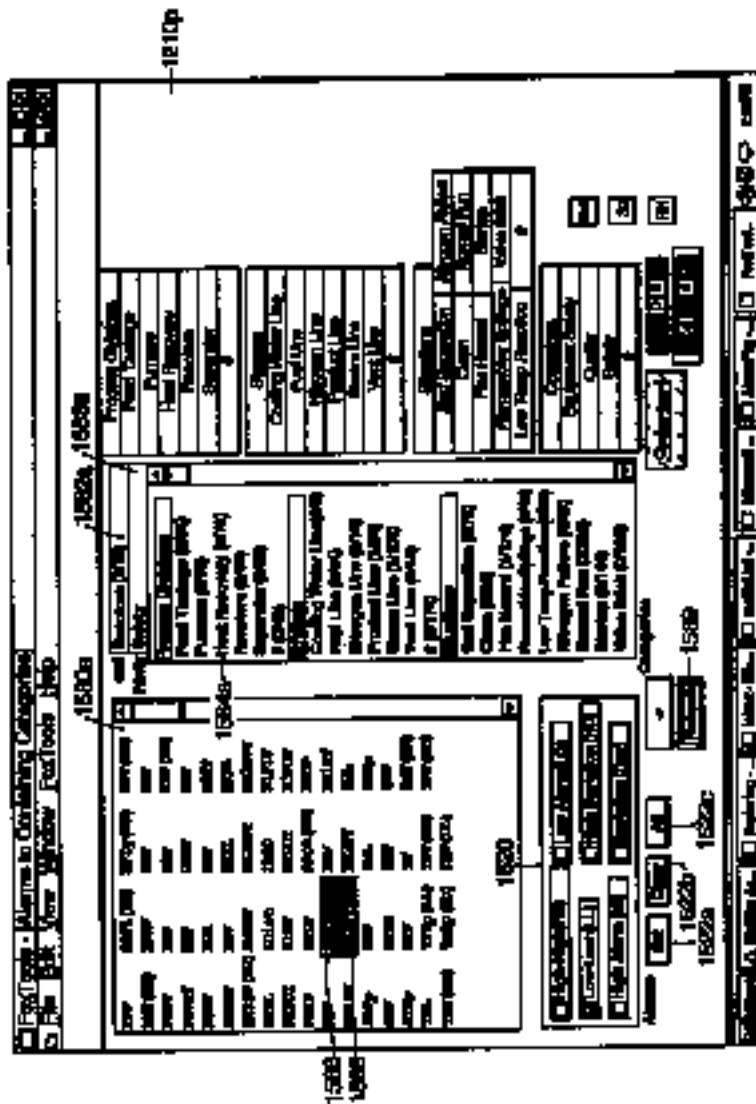
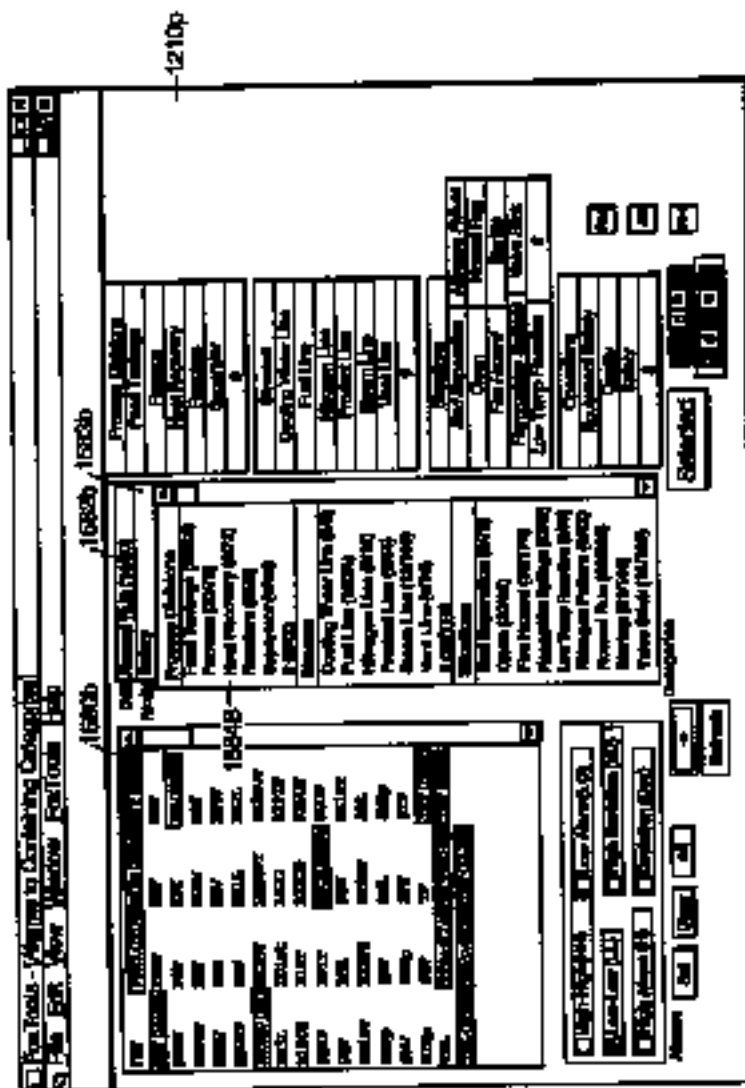


FIG. 37
Fire Hazard Default Alarm Display with Alarms, Preconditions, and Check Boxes displayed. Shows Mask Filter Toggle



What if Display with FBR and FBSY selected in Low Low Basin (FBSY also shows Prediction in this Check Basin) FIG. 39



What is Display with the actual Alarm Status indicated.

FIG. 40