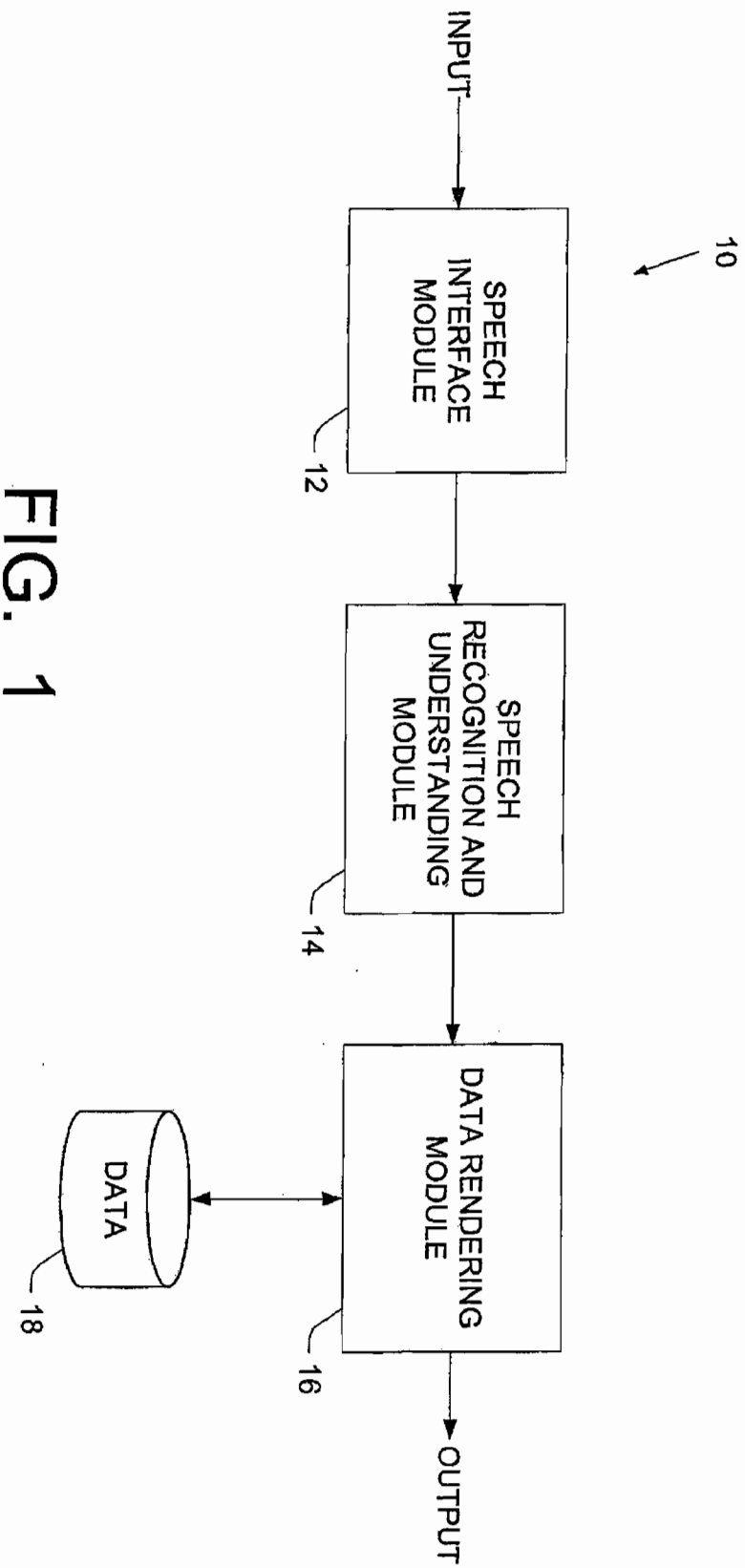

INPUT
SPEECH INTERFACE MODULE
12
10
SPEECH RECOGNITION AND UNDERSTANDING MODULE
14
DATA RENDERING MODULE
16
OUTPUT
DATA
18

FIG. 1

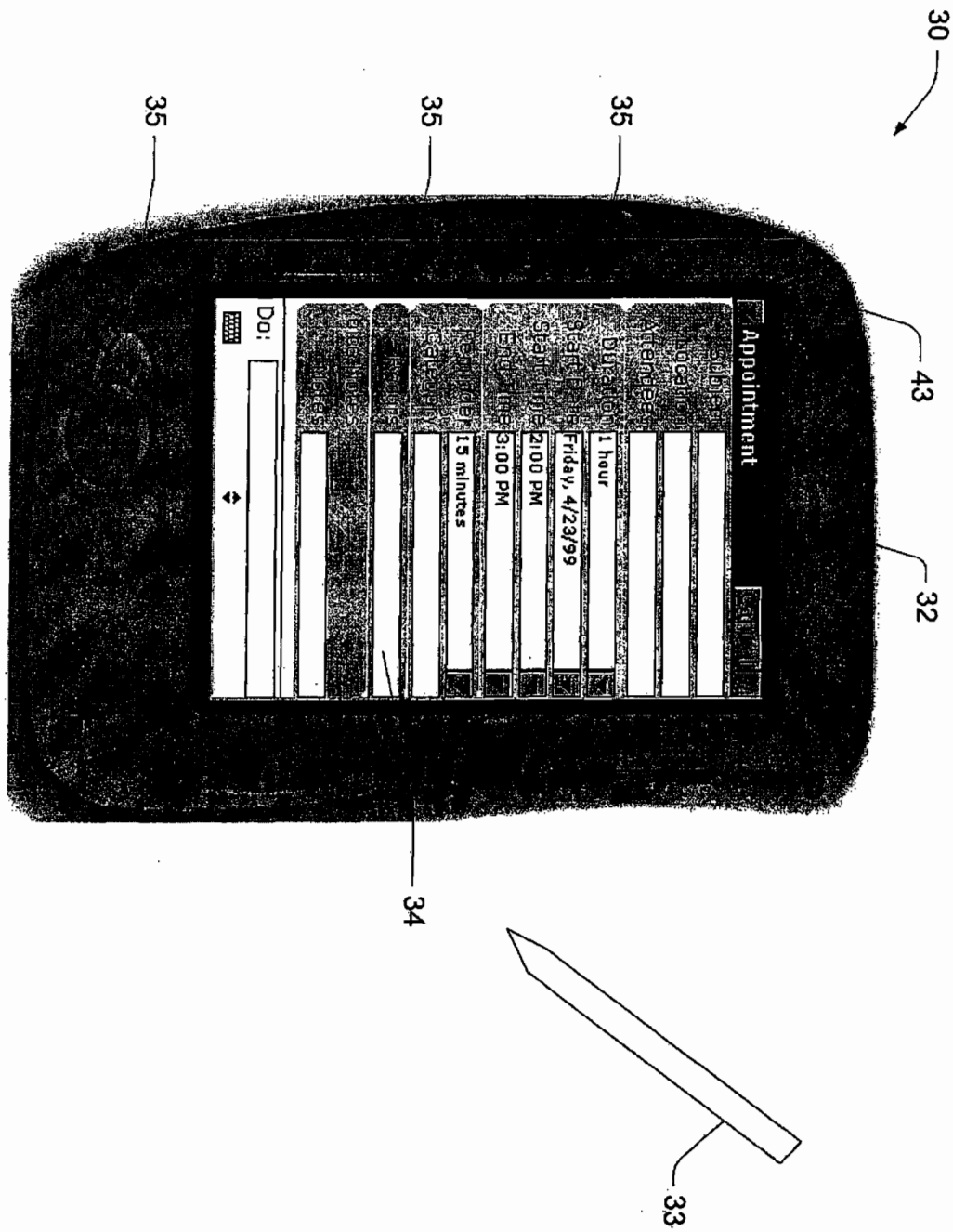

30
35
35
35
Appointment
1 hour
Friday, 4/23/99
2:00 PM
3:00 PM
15 minutes
Do:
43
32
34
33

FIG. 2

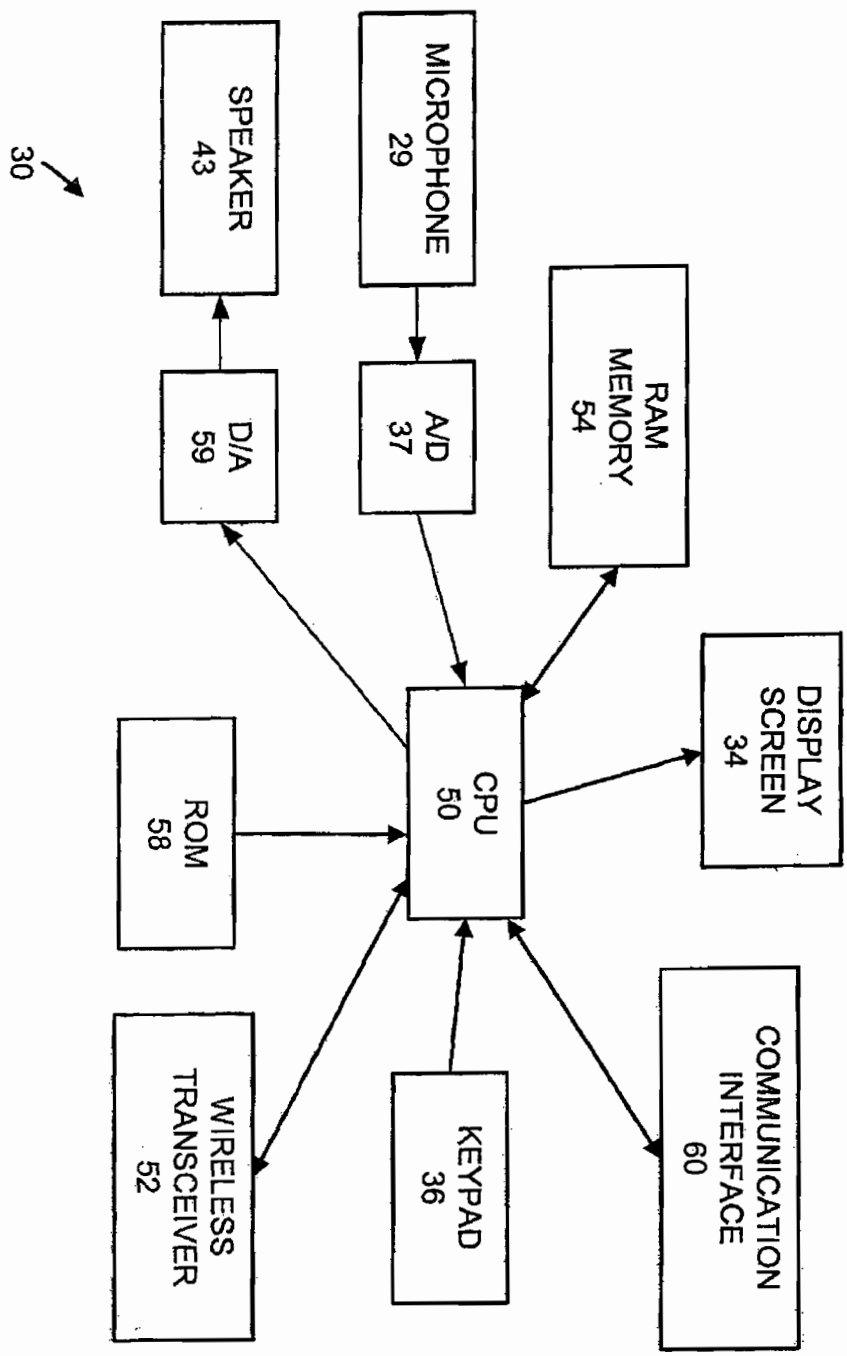

30
SPEAKER
43
MICROPHONE
29
RAM
MEMORY
54
D/A
59
A/D
37
DISPLAY
SCREEN
34
CPU
50
ROM
58
COMMUNICATION
INTERFACE
60
KEYPAD
36
WIRELESS
TRANSCEIVER
52

FIG. 3

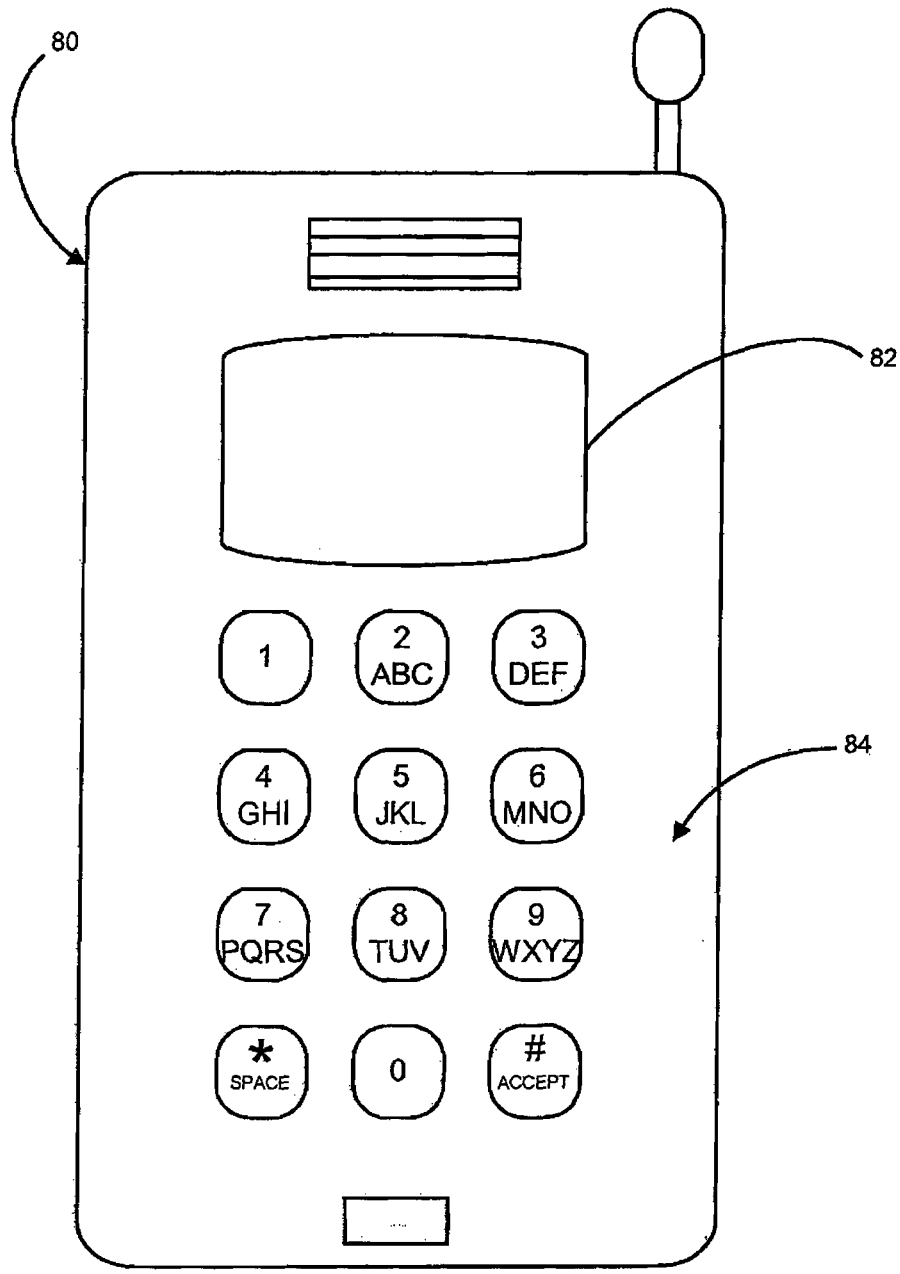

80
82
84
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
* SPACE
0
ACCEPT

FIG. 4

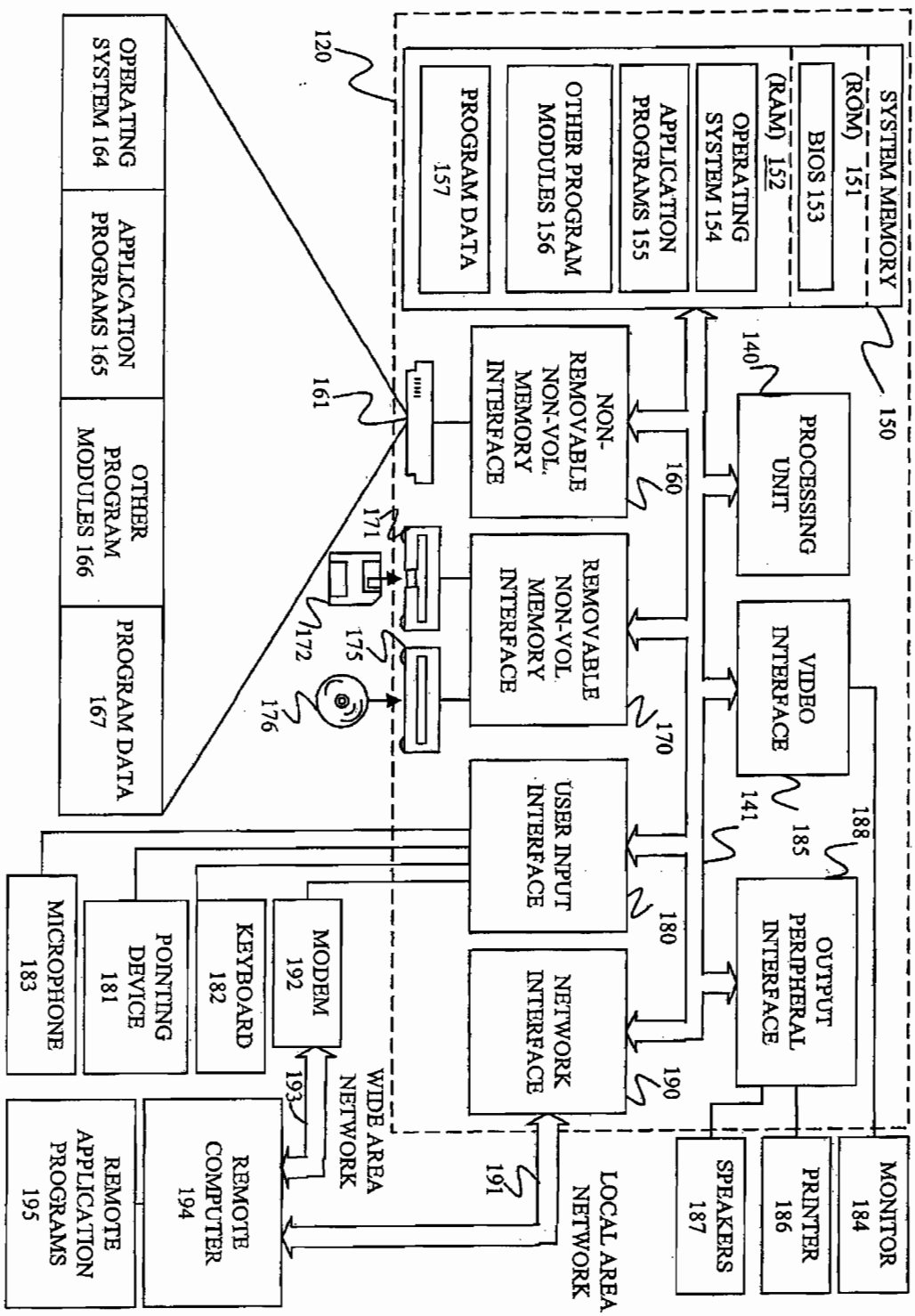

SYSTEM MEMORY (ROM) 151
BIOS 153
(RAM) 152
OPERATING SYSTEM 154
APPLICATION PROGRAMS 155
OTHER PROGRAM MODULES 156
PROGRAM DATA 157
150
PROCESSING UNIT
140
VIDEO INTERFACE
141
OUTPUT PERIPHERAL INTERFACE
NON-REMOVABLE NON-VOL. MEMORY INTERFACE
160
REMOVABLE NON-VOL MEMORY INTERFACE
170
USER INPUT INTERFACE
180
NETWORK INTERFACE
190
188
185
MONITOR 184
PRINTER 186
SPEAKERS 187
LOCAL AREA NETWORK
191
WIDE AREA NETWORK
193
MODEM 192
KEYBOARD 182
POINTING DEVICE 181
MICROPHONE 183
REMOTE COMPUTER 194
REMOTE APPLICATION PROGRAMS 195
120
OPERATING SYSTEM 164
APPLICATION PROGRAMS 165
OTHER PROGRAM MODULES 166
PROGRAM DATA 167
161
171
172
175
176

FIG. 5

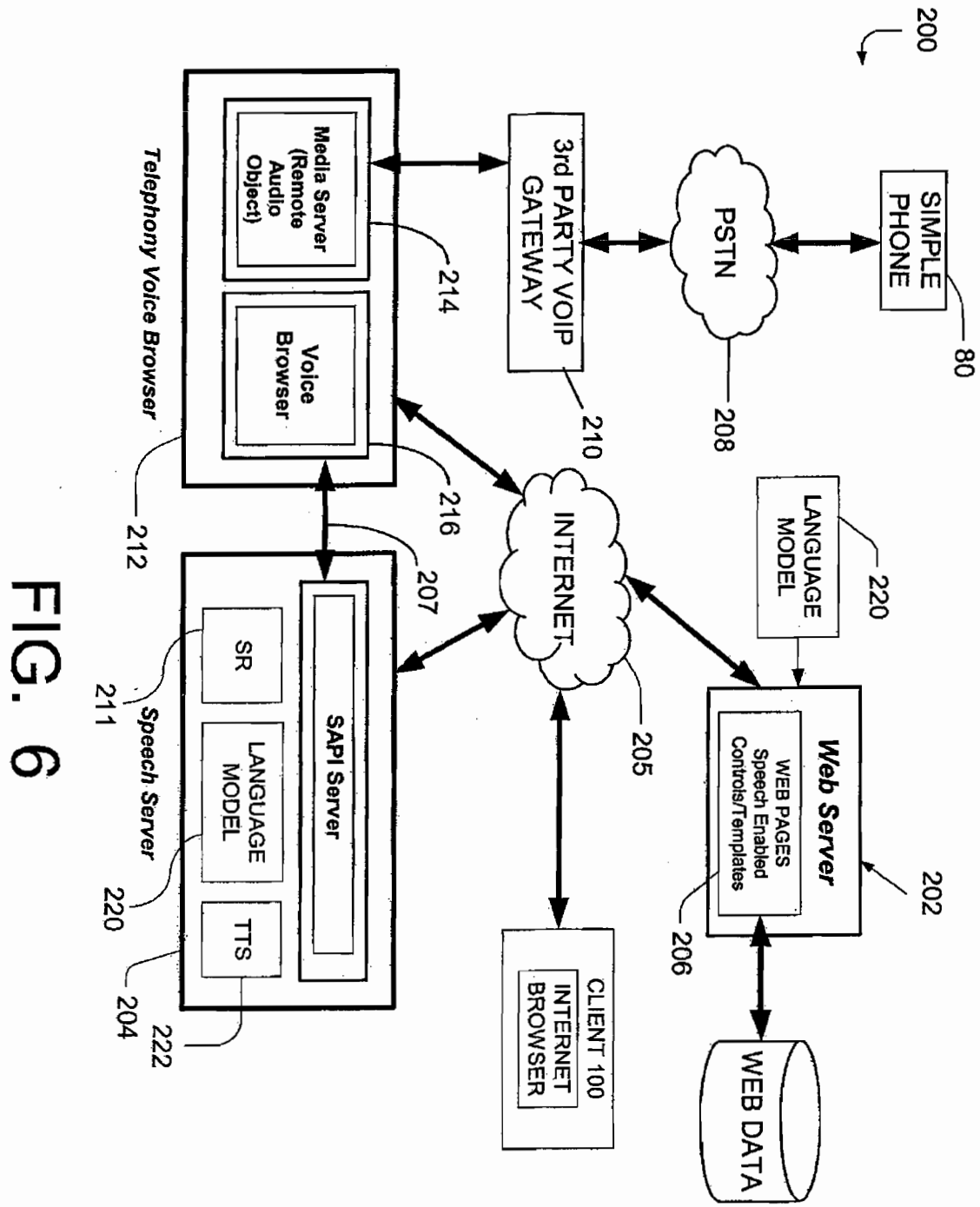

200
SIMPLE PHONE
80
PSTN
208
3rd PARTY VOIP GATEWAY
210
Media Server (Remote Audio Object)
214
Voice Browser
216
Telephony Voice Browser
212
INTERNET
207
205
LANGUAGE MODEL
220
Web Server
WEB PAGES Speech Enabled Controls/Templates
206
202
WEB DATA
CLIENT 100
INTERNET BROWSER
SAPI Server
SR
211
Speech Server
LANGUAGE MODEL
220
TTS
204
222

FIG. 6

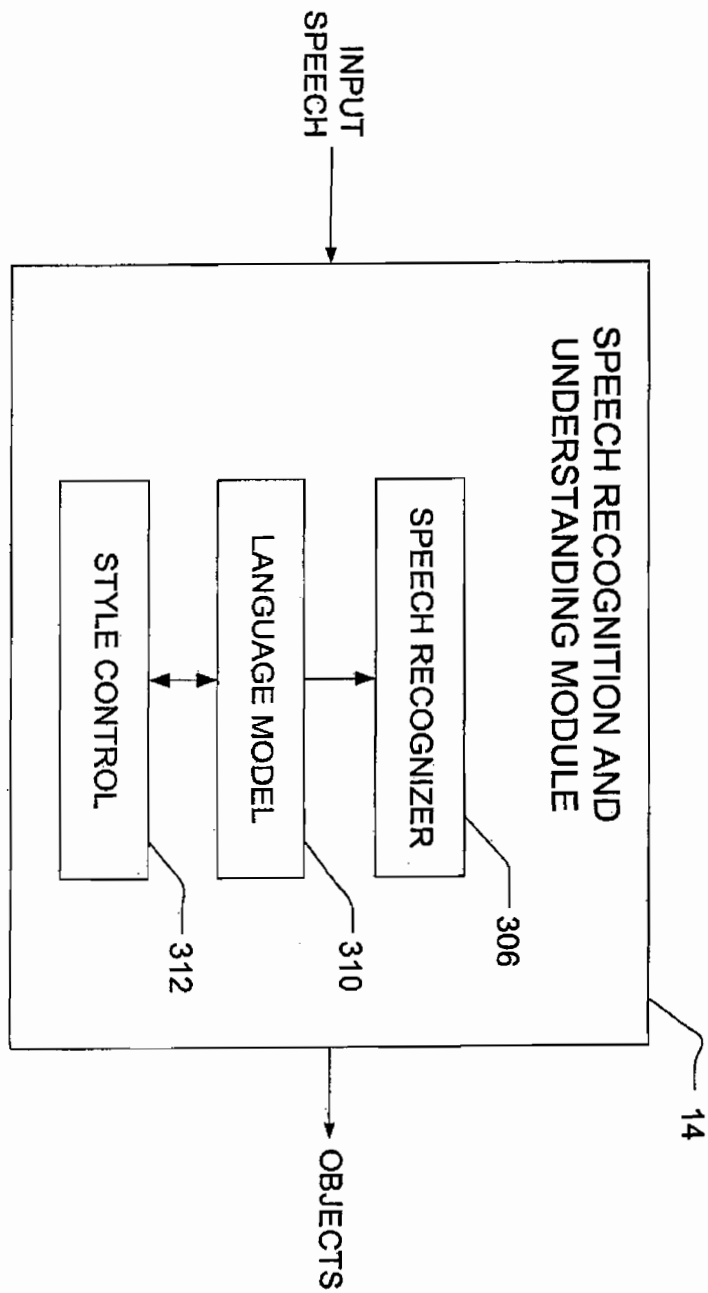

INPUT SPEECH
SPEECH RECOGNITION AND UNDERSTANDING MODULE
SPEECH RECOGNIZER
306
LANGUAGE MODEL
310
STYLE CONTROL
312
14
OBJECTS

FIG. 7

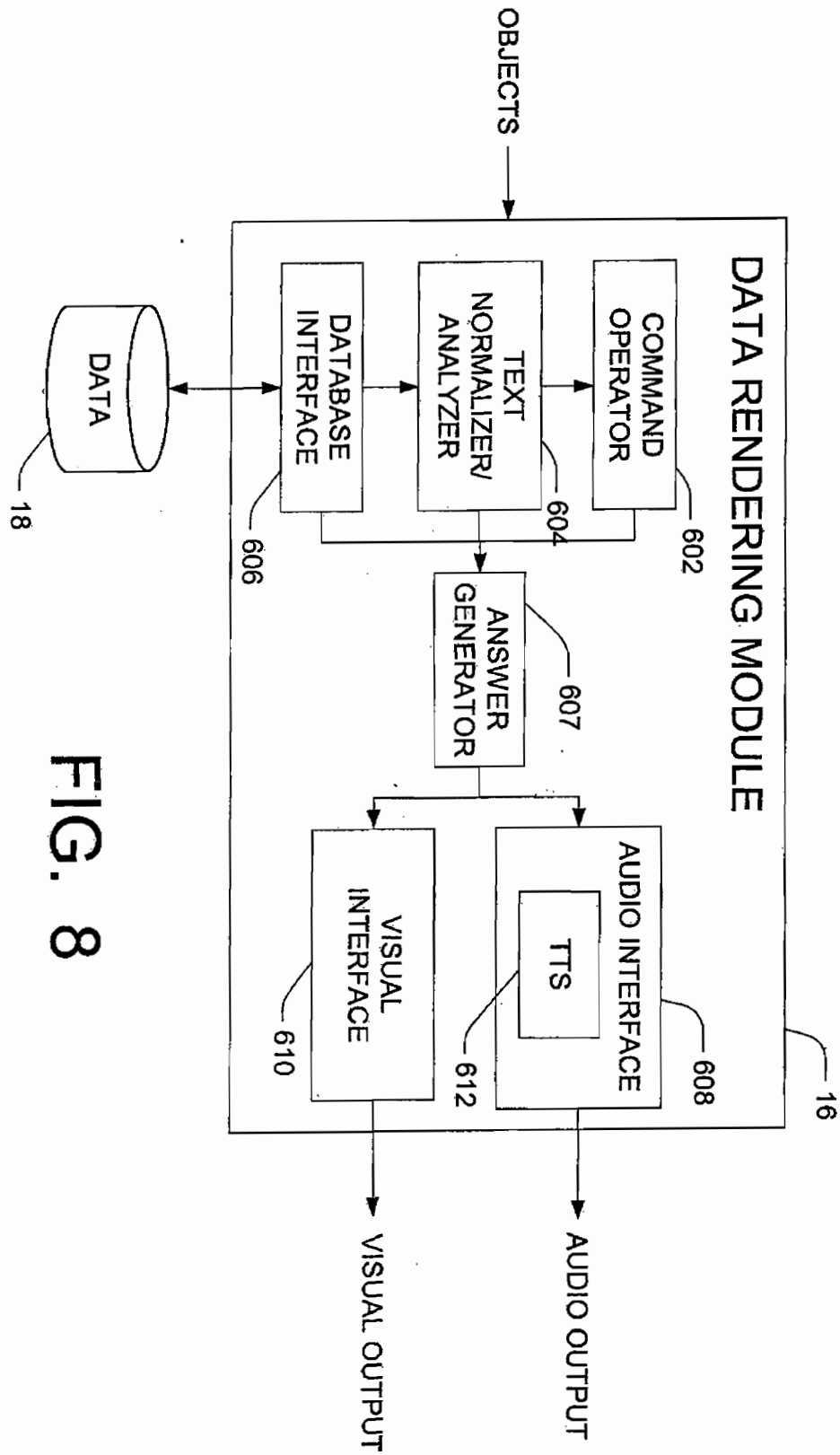
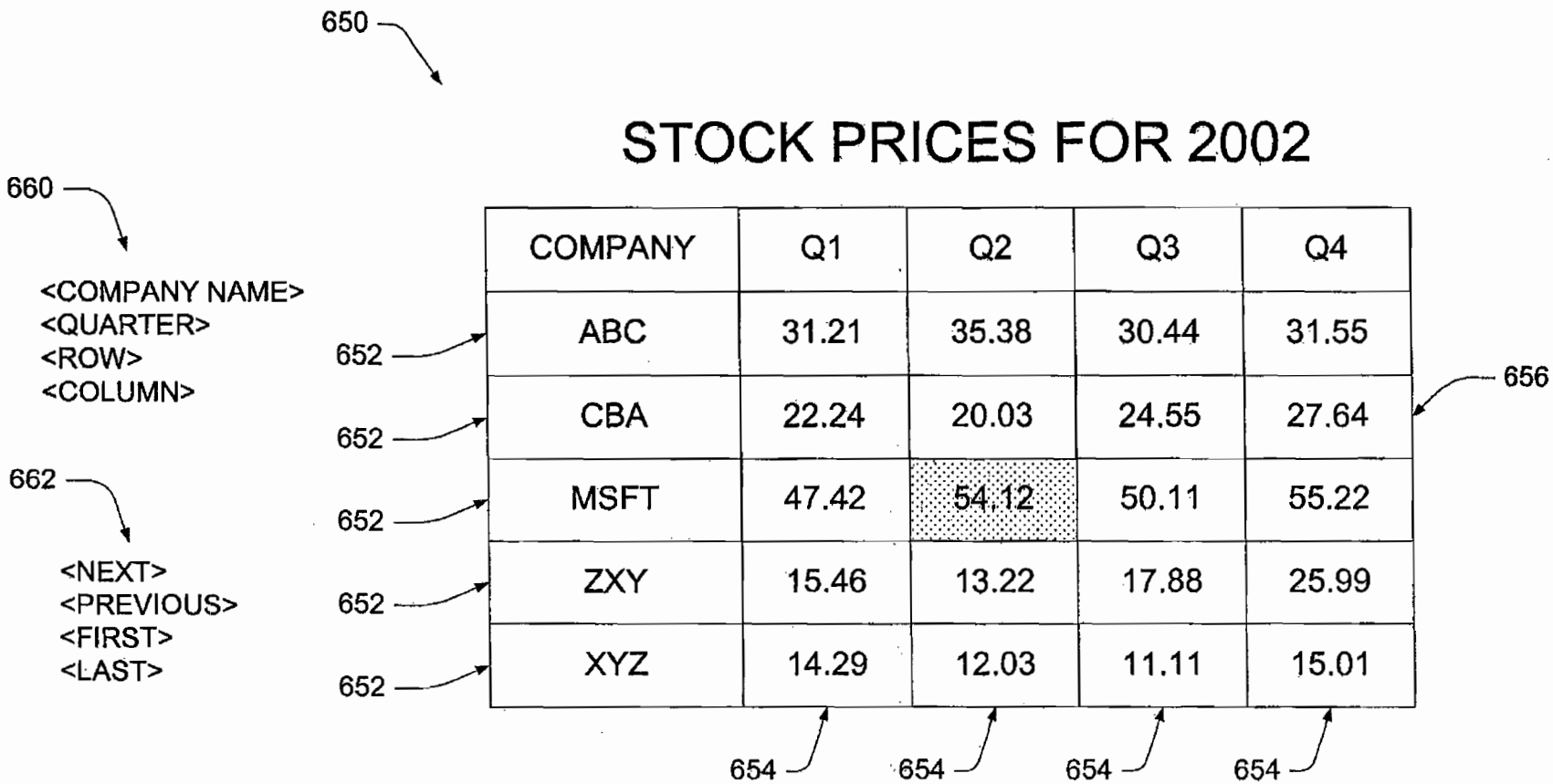

OBJECTS
DATA RENDERING MODULE
COMMAND OPERATOR
602
TEXT NORMALIZER/ ANALYZER
604
DATABASE INTERFACE
606
DATA
18
ANSWER GENERATOR
607
AUDIO INTERFACE
TTS
608
612
VISUAL INTERFACE
610
16
AUDIO OUTPUT
VISUAL OUTPUT

FIG. 8



COMPANY	Q1	Q2	Q3	Q4
ABC	31.21	35.38	30.44	31.55
CBA	22.24	20.03	24.55	27.64
MSFT	47.42	54.12	50.11	55.22
ZXY	15.46	13.22	17.88	25.99
XYZ	14.29	12.03	11.11	15.01

FIG. 9

```
<html xmlns:salt="http://www saltforum org/2002/07">
<head>
<title>Simply SALT Demo</title>
<object id="MS-SALT" CLASSID="clsid:33cbfc53-a7de-491a-90f3-0e782a7e347a">
</object>
</head>
<?import namespace="salt" implementation="#MS-SALT">
<body onload="welcome.Start()">
 <xml id="database">
  <table>
        <company>
         <name>ABC</name>
         <q1>31.21</q1><q2>35 38</q2><q3>30.44</q3><q4>31 55</q4>
        </company>
        <company>
         <name>CBA</name>
         <q1>22.24</q1><q2>20.03</q2><q3>24.55</q3><q4>27.64</q4>
        </company>
        <company>
677      <name>MSFT</name>
         <q1>47.42</q1><q2>54.12</q2><q3>50.11</q3><q4>55.22</q4>
        </company>
        <company>
         <name>ZXY</name>
         <q1>15.46</q1><q2>13.22</q2><q3>17.88</q3><q4>25.99</q4>
        </company>
        <company>
         <name>XYZ</name>
         <q1>14.29</q1><q2>12 03</q2><q3>11.11</q3><q4>15.01</q4>
        </company>
  </table>
</xml>

<input id="querySubject">
<input id="queryObject">
<input id="queryResult">
```

676

678

670

672

674

FIG. 10A

```
<salt:listen id="command"                                    ← 680
   onReco="doQuery()"
   onError="alert('Error code='+ event.srcElement.status)">
   <salt:grammar id="mainGrammar">                           ← 682
         <grammar langid="409">
          <rule name="start" toplevel="active">
           <phrase>what is ?the <ruleref name="object"/> result of <ruleref name="subject"/></phrase>
          </rule>
          <rule name="subject">
           <list propname="subject">
                  <phrase valstr="ABC">A. B  C </phrase>
                  <phrase valstr="CBA">C. B. A.</phrase>
                  <phrase valstr="MSFT">?the Microsoft ?Corporation</phrase>
                  <phrase valstr="MSFT">M. S. F. T.</phrase>
                  <phrase valstr="ZXY">Z. X. Y.</phrase>
                  <phrase valstr="XYZ">X. Y. Z.</phrase>
           </list>                                                    } 688
          </rule>
          <rule name="object">
           <list propname="object">
                  <phrase valstr="q1"> first quarter</phrase>
                  <phrase valstr="q1"> Q. one</phrase>
                  <phrase valstr="q2"> second quarter</phrase>
                  <phrase valstr="q2"> Q. two </phrase>
                  <phrase valstr="q3"> third quarter </phrase>
                  <phrase valstr="q3"> Q. three< /phrase>
                  <phrase valstr="q4"> fourth quarter </phrase>
                  <phrase valstr="q4"> Q  four </phrase>
           </list>                                                    } 690
          </rule>
         </grammar>
  </salt:grammar>
 </salt:listen>

 <salt:prompt id="tts">The <salt:value targetElement="queryObject"/> of   ← 684
         <salt:value targetElement="querySubject"/> is
         <salt:value targetElement="queryResult"/>
 </salt:prompt>

 <salt:prompt id="welcome" oncomplete="command Start()">Please say your query.</salt:prompt>   ← 686

</body>
```

FIG. 10B

```
<script>
        function doQuery() {
          var obj = command.recoresult.selectSingleNode("/sml/object");
          var sub = command.recoresult.selectSingleNode("/sml/subject");
                // compose query string to search for the data
          var queryString = "company/name='"+ sub text + "' and company/"
+ obj.text;
          queryResult.value = database.selectSingleNode(queryString) text;
                // compose answer string with user's own wording
          queryObject.value = obj.attributes.selectSingleNode("text").value;
          querySubject.value =
sub.attributes.selectSingleNode("text") value;
                // activate TTS
          tts.Start();
        }
</script>
</html>
```

692

FIG. 10C

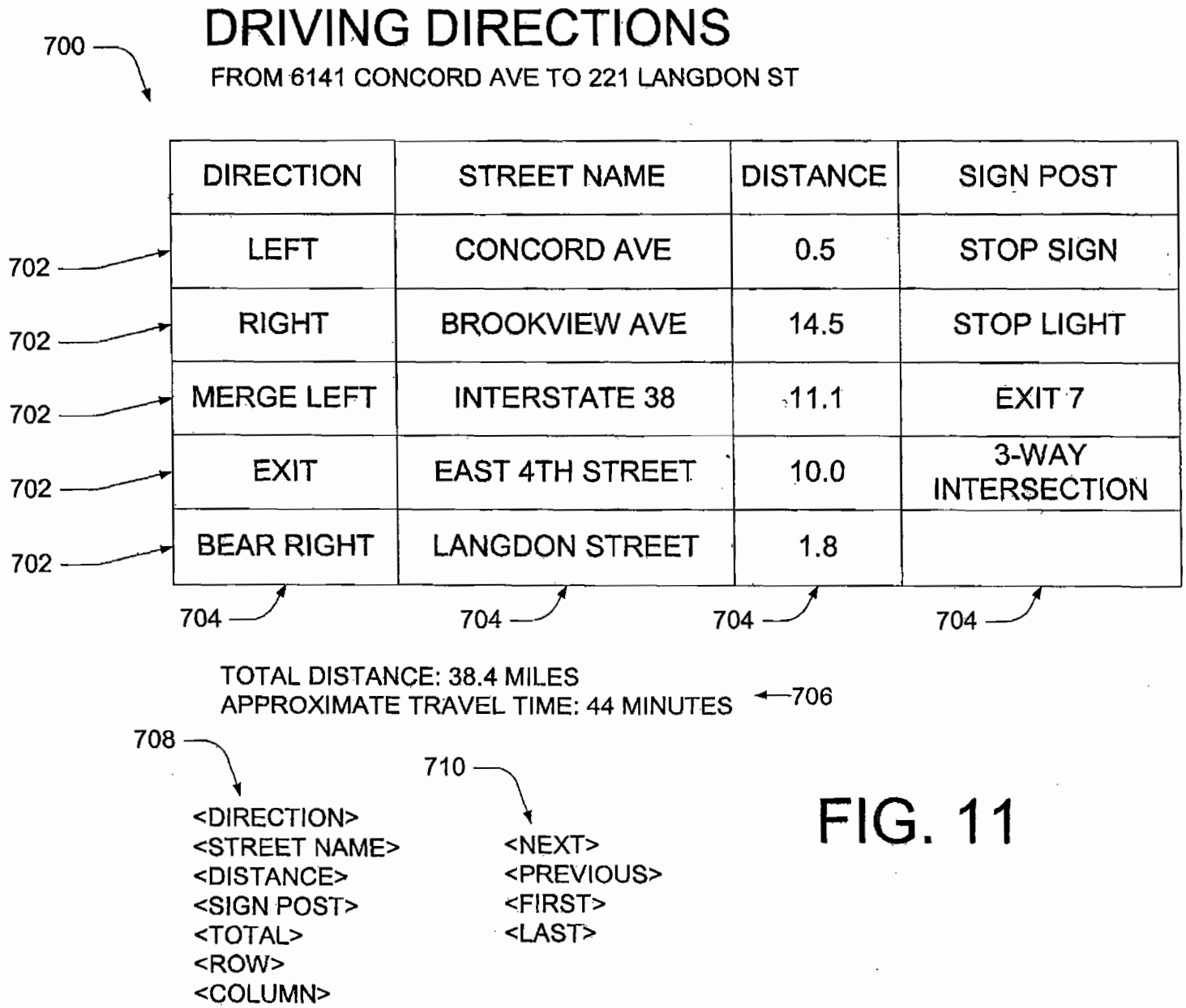

700
DRIVING DIRECTIONS
FROM 6141 CONCORD AVE TO 221 LANGDON ST
DIRECTION
STREET NAME
DISTANCE
SIGN POST
LEFT
CONCORD AVE
0.5
STOP SIGN
RIGHT
BROOKVIEW AVE
14.5
STOP LIGHT
MERGE LEFT
INTERSTATE 38
11.1
EXIT 7
EXIT
EAST 4TH STREET
10.0
3-WAY INTERSECTION
BEAR RIGHT
LANGDON STREET
1.8
702
704
TOTAL DISTANCE: 38.4 MILES
APPROXIMATE TRAVEL TIME: 44 MINUTES
706
708
<DIRECTION>
<STREET NAME>
<DISTANCE>
<SIGN POST>
<TOTAL>
<ROW>
<COLUMN>
710
<NEXT>
<PREVIOUS>
<FIRST>
<LAST>

FIG. 11

760

<PART NUMBER>
<QUARTER>
<YEAR>

762

<NEXT>
<PREVIOUS>
<FIRST>
<LAST>
<ROW>
<COLUMN>

764

<COMPARE>
<ADD>
<SUBTRACT>
<PERCENT>

750

SALES FOR 2001

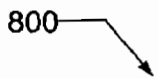
PART NUMBER	Q1	Q2	Q3	Q4
SKU# 1001	$4597.05	$3048.26	$4651.02	$3120.04
SKU# 1002	$1122.01	$1425.31	$1008.42	$1038.22
SKU# 1003	$542.22	$804.25	$1144.33	$1982.54

752

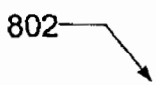
SALES FOR 2002

PART NUMBER	Q1	Q2	Q3	Q4
SKU# 1001	$3321.40	$4125.06	$5122.20	$4432.10
SKU# 1002	$1100.23	$903.12	$1124.11	$884.22
SKU# 1003	$2024.11	$2345.10	$3011.55	$4125.02

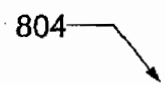
FIG. 12



The Dow Jones Industrial Average tumbled two hundred thirty eight point four two, or two point eight five percent, to eight thousand one hundred thirty one point zero one, while the Standard and Poor's five hundred stock index lost twenty five point nine four, or two point nine percent. to eight hundred sixty one point four zero. Meanwhile, the Nasdaq Composite Index slumped about fourty six point one four, or three point three percent, to one thousand three hundred fourty two point one three. The selling was broad based. All thirty stocks that make up the industrial average closed lower, with J. P. Morgan, Honeywell, Intel, Microsoft, American Express, and Alcoa leading the blue chips with losses near or above four point five percent. The index again fell below last year's closing point of eight thousand three hundred fourty one point six three, dropping to levels last seen in late October.



<NUMBER>
<DATE>
<MONTH>
<PERCENT>
<COMPANY NAME>
<STOCK INDEX>



<BACK>
<REPEAT>
<RESTART>
<NEXT>

FIG. 13

```
<html xmlns:salt="http://www.saltforum.org/2002/07">
<head>
<title>News Reader Demo</title>
<object id="MS-SALT" CLASSID="clsid:33cbfc53-a7de-491a-90f3-0e782a7e347a">
</object>
</head>
<?import namespace="salt" implementation="#MS-SALT">
<body onload="init()">

<!-- The following XML is the outcome of passing WSJ article through a text analyzer that tags
name
        entities and normalizes text for prosody assignments.
-->
<xml id="news">
 <metadata>
  <sentence>The <entity name="stock index">Dow Jones Industrial Average </entity>tumbled
<entity name="number">two hundred thirty eight point four two, </entity>or <entity
name="percent">two point eight five percent, </entity>to <entity name="number">eight
thousand one hundred thirty one point zero one, </entity>while the <entity name="stock
index">Standard and Poor's five hundred stock index </entity>lost <entity
name="number">twenty five point nine four, </entity>or <entity name="percent">two point nine
percent. </entity>to <entity name="number">eight hundred sixty one point four zero. </
entity></sentence>
  <sentence>Meanwhile, the <entity name="stock index">Nasdaq Composite Index </
entity>slumped about <entity name="number">fourty six point one four, </entity>or <entity
name="percent">three point three percent, </entity>to <entity name="number">one thousand
three hundred fourty two point one three</entity>. </sentence>
  <sentence>The selling was broad based. </sentence>
  <sentence>All <entity name="number">thirty </entity>stocks that make up the industrial
average closed lower, with <entity name="company name">J. P. Morgan, </entity><entity
name="company name">Hoenywell, </entity><entity name="company name">Intel, </
entity><entity name="company name">Microsoft, </entity><entity name="company
name">American Express, </entity>and <entity name="company name">Alcoa </
entity>leading the blue chips with losses near or above <entity name="percent">four point five
percent. </entity></sentence>
  <sentence>The index again fell below last year's closing point of <entity
name="number">eight thousand three hundred fourty one point six three, </entity>dropping to
levels last seen in late <entity name="month">October. </entity></sentence>
 </metadata>
</xml>

<div id="debug"></div> <!-- display the text being played here -->
```

810

812

FIG. 14A

```
<salt:listen id="reco"                                          ← 814
  onReco="execute_cmd()" onNoReco="reprompt.Start()" onsilence="move_next()">
 <salt:grammar id="name">                                       ← 816
        <grammar langid="409">
         <rule name="cmds" toplevel="active">
          <l>
                <ruleref name="navigate"/>
                <ruleref name="query"/>
          </l>
         </rule>
         <rule name="navigate">
          <l propname="navigate">
                <p valstr="back">go back <o>one sentence</o></p>
                <p valstr="repeat"><l> <p>replay</p><p>repeat</p></l> <o>?the sentence</o> </p>
                <p valstr="restart"><l><p>restart</p><p>repeat from ?the beginning</p></l></p>
                <p valstr="next"><l><p>next ?sentence</p><p>continue</p></l></p>
          </l>
         </rule>
         <rule name="query">
         <p>
          <l><p>repeat</p><p>say ?the</p></l>
          <l propname="query">
                <p valstr="number"> ?the number </p>
                <p valstr="date"> ?the date </p>
                <p valstr="month"> ?the month </p>
                <p valstr="percent"> ?the percentage </p>
                <p valstr="company name"> ?the company names </p>
                <p valstr="stock index"> ?the stock index </p>
          </l>
          <o>again</o>
         </p>
        </rule>
       </grammar>
 </salt:grammar>
</salt:listen>

<salt:prompt id="reprompt" onComplete="reco.Start()">  ← 818
Sorry, I missed that. Please say the command again.
</salt:prompt>

<salt:prompt id="tts" onComplete="reco.Start()"></salt:prompt>  ← 820
```

822

824

FIG. 14B

```
</body>

<script>
        var curSent, curPrompt;
        function execute_cmd() {
        // the event handler for recognizing navigation or query commands
          var node = reco.recoresult.firstChild;
          if (node.nodeName == "query") {
                  extract_item(node.text);
          } else if (node.nodeName == "navigate") {
                  if (node.text == "back")
                          move_back();
                  else if (node.text == "repeat")
                          display();
                  else if (node.text == "restart")
                          init();
                  else move_next();
          } else
                  move_next();
        }
        function init() { // event handler to play the text from the very beginning
                  curSent = news.XMLDocument.selectSingleNode("metadata/sentence");
                  curPrompt = curSent.text;
                  display();
        }
        function move_back() { // move back one sentence
                  if (curSent.previousSibling != null) {
                          curSent = curSent.previousSibling;
                          curPrompt = curSent.text;
                  }
                  display();
        }
        function move_next() { // move on to the next sentence
                  if (curSent.nextSibling != null) {
                          curSent = curSent.nextSibling;
                          curPrompt = curSent.text;
                  }
                  display();
        }
```

828

830

832

834

FIG. 14C

```
function extract_item(target) { // processing query items
        var str = "./entity[@name='";
        str += target;
        str += "']";
        var candidates = curSent.selectNodes(str);
        str = "For " + target + " I mentioned ";
        var count = candidates.length;
        if (count == 0)
                str += "nothing.";
        else {
          for (var i = 0; i < count; ++i)
                str += candidates.item(i).text + " ";
        }
        curPrompt = str;
        display();
}
function display() {
        debug.innerText = curPrompt;
        tts.Start(curPrompt);
}
</script>
```

836

838

FIG. 14D

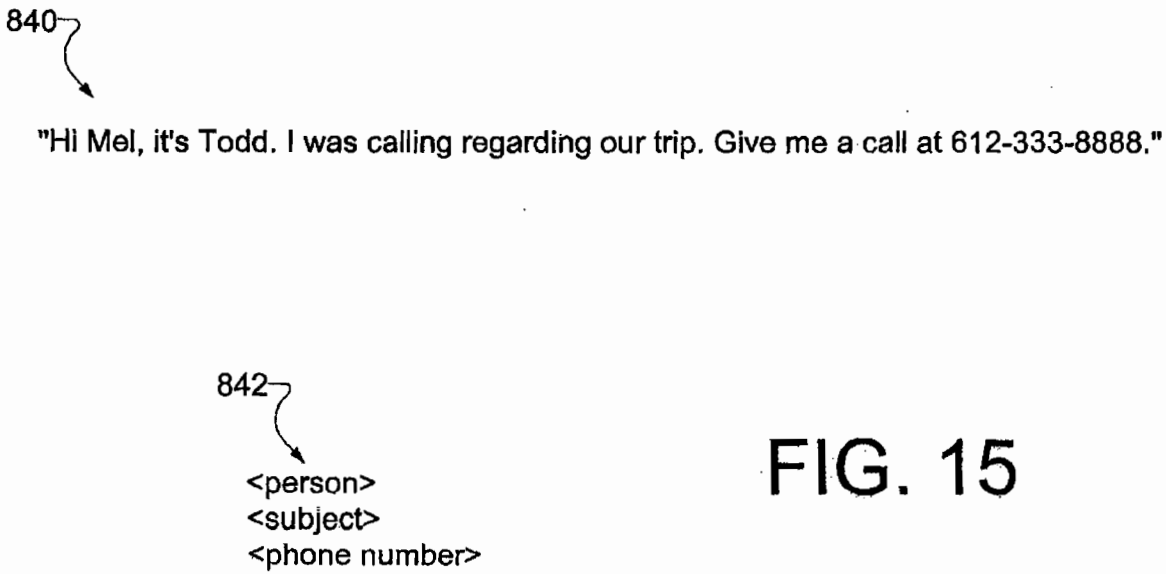

840
"Hi Mel, it's Todd. I was calling regarding our trip. Give me a call at 612-333-8888."
842
<person>
<subject>
<phone number>

FIG. 15