



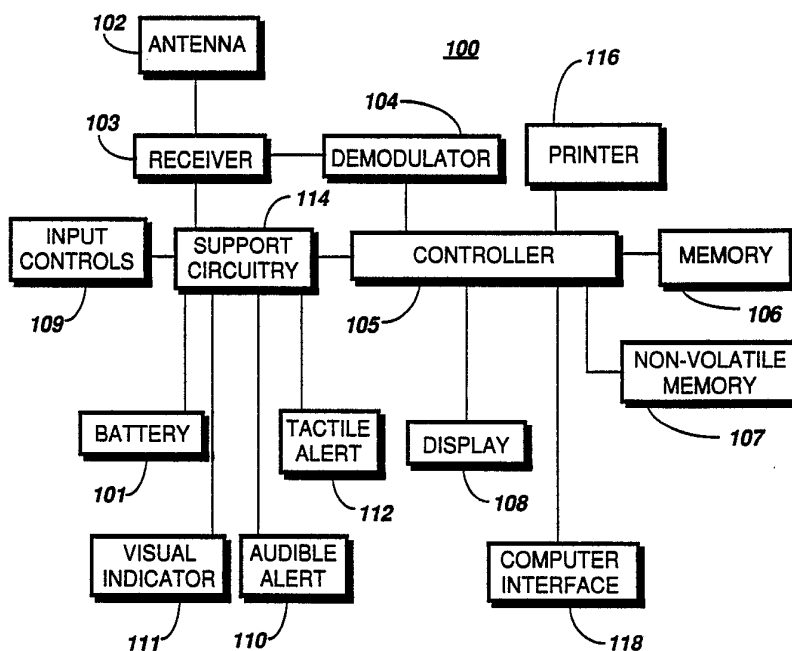
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : G08B 5/22	A1	(11) International Publication Number: WO 92/15971 (43) International Publication Date: 17 September 1992 (17.09.92)
<p>(21) International Application Number: PCT/US91/09339</p> <p>(22) International Filing Date: 12 December 1991 (12.12.91)</p> <p>(30) Priority data: 663,507 4 March 1991 (04.03.91) US</p> <p>(71) Applicant: MOTOROLA, INC. [US/US]; 1303 East Algonquin Road, Schaumburg, IL 60196 (US).</p> <p>(72) Inventors: BODET, Paul, Walter ; P.O. Box 3943, Boynton Beach, FL 33424 (US). JOHNSON, John, J. ; P.O. Box 3566, Boynton Beach, FL 33424 (US). SUAREZ, Hector ; 6802 S.W. 34th Court, Miramar, FL 33023 (US).</p> <p>(74) Agents: INGRASSIA, Vincent, B. et al.; Motorola, Inc., Intellectual Property Dept., 1500 N.W. 22nd Avenue, Boynton Beach, FL 33426-8292 (US).</p>		<p>(81) Designated States: AT (European patent), BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), KR, LU (European patent), MC (European patent), NL (European patent), SE (European patent).</p> <p>Published <i>With international search report.</i></p>

(54) Title: SELECTIVE CALL RECEIVER HAVING USER DEFINED MESSAGE INFORMATION IN MEMORY AND PRESENTATION METHODS THEREOF

(57) Abstract

A user of a selective call receiver (100) is capable of inputting and storing user defined search key information and user defined corresponding information into non-volatile memory (107), via user input control (109). Subsequent to receiving and decoding a message having a message information and storing the message information into memory (106), the selective call receiver (100) is capable of searching the message information for an occurrence of the user defined search key information, and presenting the message information and at least a portion of corresponding information for an occurrence of corresponding user defined search key information in the message information.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	FI	Finland	ML	Mali
AU	Australia	FR	France	MN	Mongolia
BB	Barbados	GA	Gabon	MR	Mauritania
BE	Belgium	GB	United Kingdom	MW	Malawi
BF	Burkina Faso	GN	Guinea	NL	Netherlands
BG	Bulgaria	GR	Greece	NO	Norway
BJ	Benin	HU	Hungary	PL	Poland
BR	Brazil	IE	Ireland	RO	Romania
CA	Canada	IT	Italy	RU	Russian Federation
CF	Central African Republic	JP	Japan	SD	Sudan
CG	Congo	KP	Democratic People's Republic of Korea	SE	Sweden
CH	Switzerland	KR	Republic of Korea	SN	Senegal
CI	Côte d'Ivoire	LI	Liechtenstein	SU	Soviet Union
CM	Cameroon	LK	Sri Lanka	TD	Chad
CS	Czechoslovakia	LU	Luxembourg	TC	Togo
DE	Germany	MC	Monaco	US	United States of America
DK	Denmark	MG	Madagascar		
ES	Spain				

SELECTIVE CALL RECEIVER HAVING
USER DEFINED MESSAGE INFORMATION IN MEMORY
AND PRESENTATION METHODS THEREOF

5

Field of the Invention

This invention relates generally to selective call receivers capable of receiving and presenting messages, and including but not limited to those selective call receivers capable of storing and subsequently presenting received messages including user defined message information.

Background of the Invention

15

A conventional selective call receiver commonly receives a display message page comprising address information (i.e., for selecting the particular receiver) coupled with display message information. The display message information is typically presented to a user of the receiver via a display. One common form of display message information includes numeric characters, such as the numbers 1 thru 9, and 0. To enhance message readability, optional characters, such as a "blank space" character or a dash character (i.e., "-"), are embedded in the display message information. These characters are typically entered into a paging system by a caller, preferably using a dual tone multi-frequency (DTMF) telephone set. For example, an occurrence of an optional character within the display message information may coincide with a caller pushing the asterisk button (i.e., "*") on the telephone set and a paging terminal sending the corresponding optional character. In this way, a user of the conventional selective call receiver is capable of receiving a numeric display message page.

A newer form of display message information includes alphanumeric characters. The alphanumeric characters (i.e., typically including most of the characters found on a conventional typewriter keyboard) allow significantly more information to be conveyed between the caller and the user of the selective call receiver. Because telephone sets normally constrain the display message information to numeric

characters, the caller usually calls an answering service that enters the alphanumeric display message page into the paging system via a console directly connected to a paging terminal. However, this method of conveying the display message information lacks confidentiality.

- 5 Further, the answering service can erroneously send their own interpretation of the message information, and not necessarily what was intended by the caller.

An alternative way to send the alphanumeric message is for the caller to enter the alphanumeric display message directly into the paging
10 system. This normally requires the caller to be equipped with an alphanumeric page entry terminal. This entry device (e.g., the Motorola Page Entry Terminal) is capable of modem communication with a remotely located paging terminal via the public switched telephone network (PSTN). In this way, the caller can convey a full alphanumeric
15 display message to the user of the selective call receiver. However, the caller may not always have access to a page entry terminal for sending the alphanumeric display message.

Regrettably, even when a caller has access to a page entry terminal, conventional paging system resources (e.g., available paging terminal
20 memory, and paging channel throughput capacity) can significantly limit the message length allowed for the alphanumeric display message information. For example, in some paging systems a maximum of 40 alphanumeric characters are permitted in a display message page. This limitation can severely restrict the presentation of sufficient message
25 information to effectively convey the message to the user.

Moreover, a conventional paging system normally may not have access to specific message information within a display message page, other than such attributes as the number of characters in a message or the type of characters allowed. The right to interpret the content of the
30 display message information is usually reserved for the caller and for the user of the selective call receiver. For example, a caller may enter from a telephone set the display message information "555-1234 911" intended for a user of an alphanumeric display pager. The user then interprets the received numeric display message as "CALL JOHN SMITH AT HOME AT
35 212-555-1234 IMMEDIATELY!". Hence, the conventional paging system normally is not capable of interpreting the display message entered by the

caller and sending the alphanumeric display message to the user in its intended final form (i.e., defined for the particular user).

Furthermore, it is undesirable to maintain a centrally located paging terminal data base of user defined message information mapped to selective call display receivers in the paging system. First, due to security and privacy concerns, user defined message information (i.e., the interpretation of display message information) may best be stored at the individual selective call display receiver. Second, changing an interpretation of display message information (i.e., redefining the interpretation and presentation of display message information) would normally be easier and more convenient to perform locally at the selective call receiver rather than remotely at the paging terminal data base.

Thus, for all the reasons discussed above, it is regrettable that no conventional paging system or selective call receiver allows a user of the selective call receiver to define the interpretation and the presentation of message information by the selective call receiver.

Summary of the Invention

20

In carrying out one form of this invention, there is provided a selective call receiver comprising an antenna for receiving an RF signal including a message having address information and message information, means for decoding the message having address information and message information, means for storing the message information, means for inputting user defined search key information and user defined corresponding information directly by a user of the selective call receiver, means for storing the user defined search key information and the user defined corresponding information, means for searching the message information for an occurrence of the user defined search key information, and means for presenting the message information and at least a portion of corresponding information for an occurrence of corresponding user defined search key information in the message information.

Brief Description of the Drawings

FIG. 1 is a block diagram of a selective call receiver in accordance with an embodiment of the present invention.

5 FIG. 2 is a first flow diagram for the selective call receiver of FIG. 1, according to the present invention.

FIG. 3 is a second flow diagram for the selective call receiver of FIG. 1, according to the present invention.

10	Description of a Preferred Embodiment
----	---------------------------------------

Referring to FIG. 1, a block diagram of a selective call receiver 100 is shown, in accordance with an embodiment of the present invention. The selective call receiver 100 is battery 101 powered and operates to receive a radio frequency (RF) signal via an antenna 102. A receiver 103 couples the received signal to a demodulator 104, which recovers any information signal present using conventional techniques. The recovered information signal is coupled to a controller 105 that interprets and decodes the recovered information.

20 In the preferred embodiment, the controller 105 comprises a microprocessor having a signal processor (decoder) implemented in both hardware and software. The signal processor checks the recovered information signal for address information and correlates a recovered address with a predetermined address stored in the selective call
25 receiver's non-volatile memory 107. Hence, the selective call receiver 100 correlates the recovered address and the predetermined address associated with the selective call receiver 100 to determine selection, preferably following a conventional signalling protocol such as Post Office Code Standardisation Advisory Group (POCSAG) or Golay
30 Sequential Coding (GSC). When the addresses correlate, and in accordance with settings associated with user input control 109 (e.g., a keypad, buttons, or switches), the controller 105 normally stores a recovered message information in memory 106. In this way, the selective call receiver 100 is capable of receiving a message and storing the message
35 information in memory 106.

Subsequently, the selective call receiver 100 typically presents at least a portion of the received message information to a user, such as by a

display 108 (e.g., a liquid crystal display) or a printer 116 (e.g., a thermal printer). Usually, an audible alert indicator 110, a visual alert indicator 111 (e.g., a lamp, a light emitting diode, or an icon representation on the display 108), a tactile alert indicator 112, or a combination of the
5 aforementioned indicators signals to the user that a message has been received. The user may then view at least a portion of the message information presented on the display 108 by activating the user input control 109. Alternatively, the message information is presented on
hardcopy using the printer 116, preferably using a thermal printer.

10 The non-volatile memory 107 typically includes a plurality of registers for storing configuration words that characterize the operation of the selective call receiver 100, including the predetermined address information for the signal processor. Preferably, a collection of user defined search key information coupled to user defined corresponding
15 information is organized in the non-volatile memory 107 to allow the inventive selective call receiver 100 to interpret and present the received message information in a user defined form, as will be more fully discussed below.

 The user defined search key information is coupled with the user
20 defined corresponding information in non-volatile memory 107, organized as a data base. For example, search key information "555-1234" may be coupled with corresponding information "CALL JOHN SMITH AT HOME AT 212-555-1234" as a first data base entry. A second exemplary data base entry could be the search key information "911"
25 coupled with corresponding information "IMMEDIATELY!". Naturally, additional entries in the data base would progressively define the data base and increase the potential opportunities for interpretation of a received message information.

 Upon receiving a message having message information such as
30 "555-1234 911", the selective call receiver 100 searches the message information using the exemplary data base. An occurrence of the user defined search key information (e.g., matching either "555-1234" or "911") is interpreted by the selective call receiver 100 to represent the respective corresponding information. Therefore, in the example above, the
35 received message information "555-1234 911" is interpreted by the selective call receiver 100 and presented to the user as "CALL JOHN SMITH AT HOME AT 212-555-1234 IMMEDIATELY!". Accordingly, for

the example, the caller is capable of entering the former numeric message information, optionally via a telephone set, and the latter alphanumeric message information is presented to the user to more fully convey the intended message.

5 Another important advantage of the inventive selective call receiver 100 is that the paging system remains unencumbered from maintaining a central data base of user defined message information and from interpreting the message information for the users. The interpretation of message information is reserved for the caller and for
10 the user of the inventive selective call receiver 100, thereby providing additional security to the communication. Moreover, the user defined data base is conveniently inputted and maintained by the user locally at the selective call receiver 100, as will be more fully discussed below.

15 The user defined search key information and the user defined corresponding information are preferably inputted into the non-volatile memory 107 via the user input control 109, in a known way. For example, the user may input data base entries in the selective call receiver 100 by responding to prompts on the display 108 with typing on the keypad (i.e., via the user input control 109).

20 In a second means for inputting data base information, a computer interface 118, preferably following conventional RS-232 or RS-422 serial communication protocol, couples instructions from a personal computer (PC) (not shown) to the controller 105 to input the user defined data base information. A user of the selective call receiver 100 therefore is capable
25 of conveniently downloading information into the selective call receiver 100 from a computer. In this case, a user interface for the selective call receiver 100 may be significantly simplified, since a more elaborate user input control is provided by the personal computer (e.g., a keyboard connected to the PC). Thus, the user defined search key information and
30 the user defined corresponding information may be entered via the computer interface 118 using computer communication.

35 Lastly, a support circuit 114 preferably comprises a conventional signal multiplexing integrated circuit, a voltage regulator and control mechanism, a current regulator and control mechanism, environmental sensing circuitry such as for light or temperature conditions, audio power amplifier circuitry, control interface circuitry, and display illumination

circuitry. These elements are arranged to provide support for the functions of the selective call receiver 100 as may be requested by a user.

A selective call receiver 100 that is responsive to multiple addresses provides additional advantages to the user, according to the present invention. Similar to the single address selective call receiver 100 discussed earlier, each predetermined address is stored in non-volatile memory 107. Likewise, an independent user defined data base may be stored in non-volatile memory 107 for each predetermined address. Hence, a selective call receiver 100 that is responsive to multiple addresses is also capable of interpreting recovered message information using the respective user defined data base. For example, a user of a selective call receiver 100 having two addresses for receiving alphanumeric display messages may provide a first address to business associates and a second address to personal acquaintances. Two independent user defined data bases may be entered in non-volatile memory 107, the first for interpreting message information received from business associates and the second for interpreting message information received from personal acquaintances. Therefore, the user of the selective call receiver 100 may customize the interpretation and presentation of received message information for the type of caller sending the message, as represented by the received address information.

Once the user defined data base information is stored in non-volatile memory 107, the controller 105 may operate to present the received message information, including presenting the user defined corresponding information for an occurrence of the user defined search key information in the message information. Accordingly, a number of methods for interpreting and presenting the message information in a user defined form are discussed below.

A first method of interpreting received message information may be accomplished by the user of the inventive selective call receiver 100, as follows. Initially, a message information may be read by the user from, say, a display. The user then enters a manual information retrieval mode where a search key criteria is entered via the user input control (e.g., via the keypad), the selective call receiver 100 searches the data base for a match in a user defined search key information, and upon locating a match displays the user defined corresponding information from the data base. In this way, the user is capable of simply searching the data base for

any occurrence of a user defined search key information and displaying the user defined corresponding information to interpret a received message information.

Referring to FIG. 2, a first flow diagram for the selective call receiver of FIG. 1 is shown, according to the present invention. In this case, a user of the selective call receiver 100 is capable of relatively automatically searching a received message information. For example, a message is received and the message information is stored (200 and 202), as discussed earlier. Upon detection of a user input control requesting a search of the particular message information 204, the selective call receiver 100 searches the message information using the data base to identify a match between a text string found within the message information and a user defined search key information 206. A successful match stores the user defined corresponding information in a temporary "memo" buffer and presents the message information and the contents of the "memo" buffer (208, 210, 212, and 216), such as by a display 108. In this example, any unsuccessful attempt simply displays the message information with no indication of a match (208, 214, 216). Hence, a user of the selective call receiver 100 is capable of conveniently searching a received message information and having an occurrence of a user defined search key information in the message information cause a display of the user defined corresponding information.

Referring to FIG. 3, a second flow diagram for the selective call receiver of FIG. 1 is shown, according to the present invention. In this alternative, a user of the selective call receiver 100 is capable of interactively searching a received message information by first selecting at least a portion of the information displayed (e.g., the received message information being displayed on the liquid crystal display), and subsequently having the selective call receiver 100 search the selected at least a portion of information displayed for any matches with the data base user defined search key information (300, 302, 304, 306, 308, 310). Selection of at least a portion of the information displayed is preferably accomplished by prompting the user to select at least a portion of the information displayed, and allowing the user to input the information to be searched via the user input control 109 while viewing the message information on the display. A successful match on the selected at least a portion of the information displayed with a user defined search key

information in the data base will display the user defined corresponding information, in accordance with the invention (310 and 312). An unsuccessful search displays the message "NO MATCH" (310 and 314). In the interactive mode, the user is prompted to continue searching a new
5 selection of the displayed information (316, 306, etc...).

Therefore, the inventive selective call receiver is capable of receiving message information, searching the message information for an occurrence of a user defined search key information, and presenting the message information and at least a portion of corresponding
10 information, customized for the user.

What is claimed is:

CLAIMS

1. A selective call receiver comprising:
 - 5 an antenna for receiving an RF signal including a message having address information and message information;
means for decoding the message having address information and message information;
means for storing the message information;
 - 10 means for inputting user defined search key information and user defined corresponding information directly by a user of the selective call receiver;
means for storing the user defined search key information and the user defined corresponding information;
 - 15 means for searching the message information for an occurrence of the user defined search key information; and
means for presenting the message information and at least a portion of corresponding information for an occurrence of corresponding user defined search key information in the message information.
- 20 2. The selective call receiver of claim 1, wherein the inputting means includes a keypad.
3. The selective call receiver of claim 1, wherein the inputting means
25 includes computer interface means for inputting the user defined search key information and the user defined corresponding information via computer communication.
4. The selective call receiver of claim 1, wherein the presenting means
30 comprises means for printing the message information and at least a portion of corresponding information.
5. The selective call receiver of claim 1, wherein the presenting means
35 comprises means for displaying the message information and at least a portion of corresponding information.

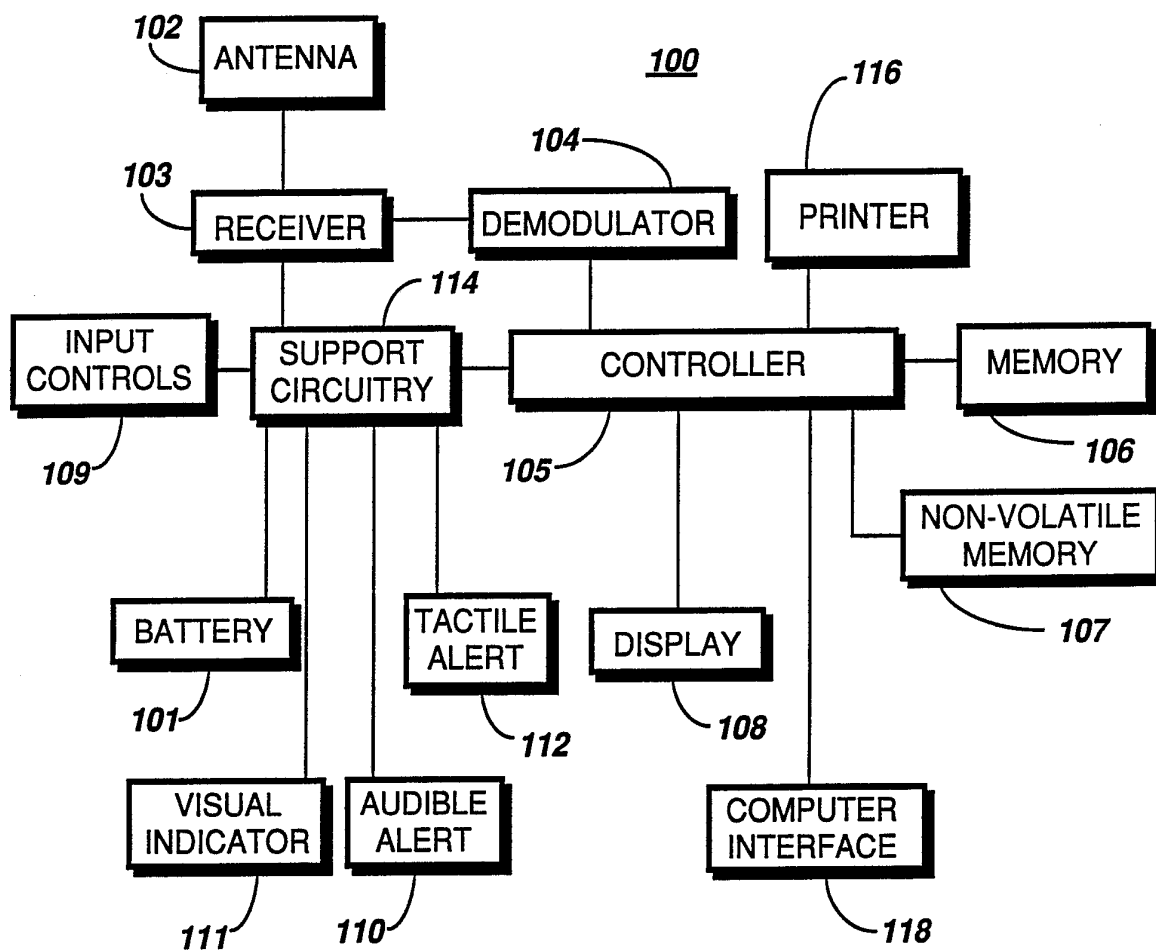
6. The selective call receiver of claim 5, wherein the displaying means includes a liquid crystal display.
7. The selective call receiver of claim 5, further comprising:
- 5 means for selecting at least a portion of information displayed;
 means for searching the selected at least a portion of information displayed for an occurrence of the user defined search key information;
and
 means for displaying at least a portion of corresponding
10 information for an occurrence of corresponding user defined search key information in the selected at least a portion of information displayed.
8. A method for a selective call receiver comprising the steps of:
- 15 receiving an RF signal including a message having address information and message information;
 decoding the message having address information and message information;
 storing the message information;
 inputting user defined search key information and user defined
20 corresponding information directly by a user of the selective call receiver;
 storing the user defined search key information and the user defined corresponding information;
 searching the message information for an occurrence of the user defined search key information; and
25 presenting the message information and at least a portion of corresponding information for an occurrence of corresponding user defined search key information in the message information.
9. The method of claim 8, wherein the inputting step includes the step of
30 inputting the user defined search key information and the user defined corresponding information via a keypad.
10. The method of claim 8, wherein the inputting step includes the step of inputting the user defined search key information and the user
35 defined corresponding information via computer interface means using computer communication.

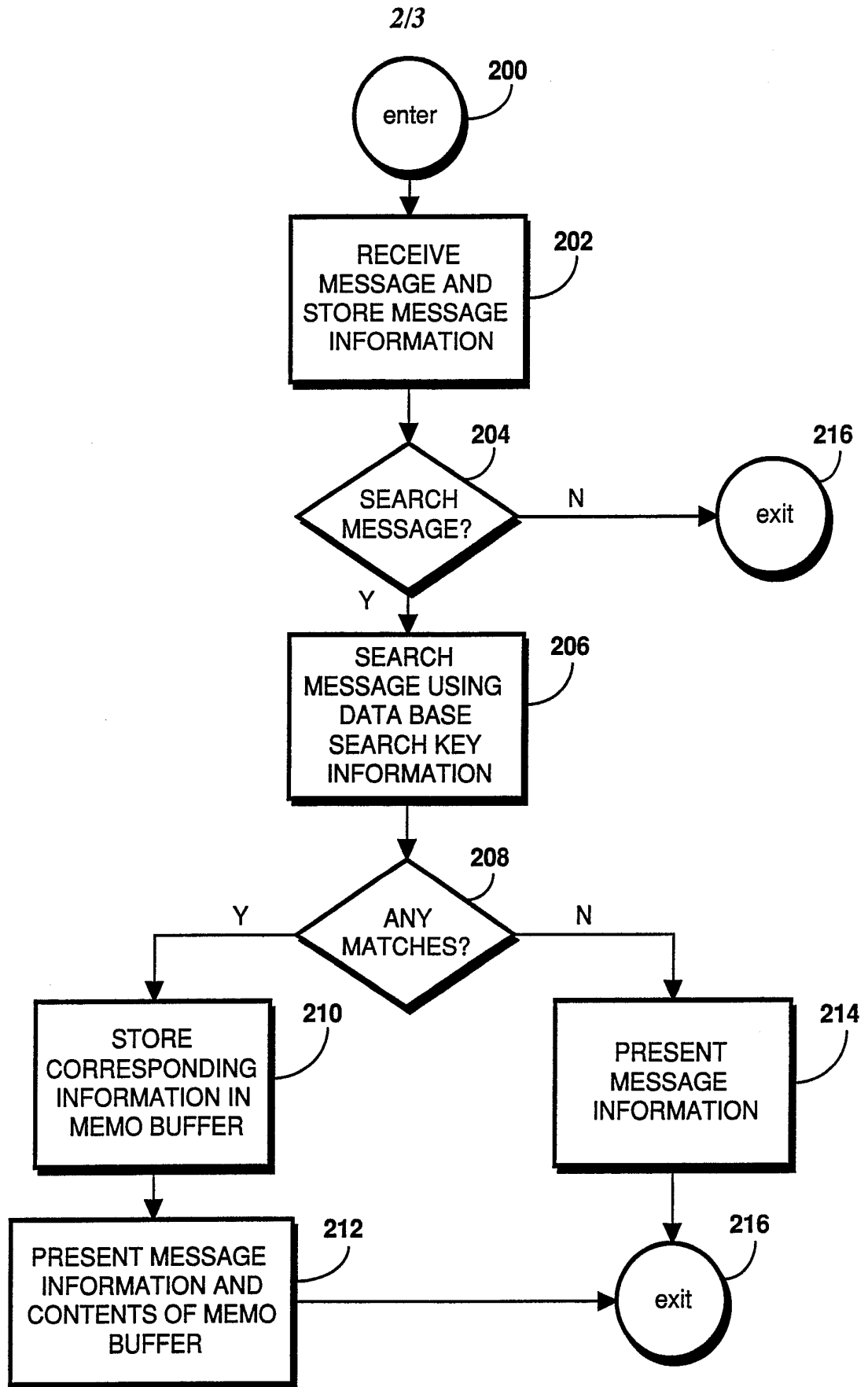
11. The method of claim 8, wherein the presenting step includes the step of printing the message information and at least a portion of corresponding information.
- 5 12. The method of claim 8, wherein the presenting step includes the step of displaying the message information and at least a portion of corresponding information.
13. The method of claim 12, wherein the displaying step includes the
10 steps of:
 accepting a user input control from a user of the selective call receiver; and
 displaying the message information including displaying the user defined corresponding information in response to the accepted user
15 input control.
14. The method of claim 12, further comprising the steps of:
 selecting at least a portion of information displayed;
 searching the selected at least a portion of information displayed
20 for an occurrence of the user defined search key information; and
 displaying at least a portion of corresponding information for an occurrence of corresponding user defined search key information in the selected at least a portion of information displayed.
- 25 15. A selective call receiver comprising:
 an antenna for receiving an RF signal including a message having address information and message information;
 means for decoding the message having address information and message information;
30 means for storing the message information;
 means for keypad inputting user defined search key information and user defined corresponding information directly by a user of the selective call receiver;
 means for non-volatile storing the user defined search key
35 information and the user defined corresponding information;
 means for searching the message information for an occurrence of the user defined search key information; and

means for liquid crystal displaying the message information and at least a portion of corresponding information for an occurrence of corresponding user defined search key information in the message information, the liquid crystal displaying means being responsive to a user input control.

16. A selective call receiver comprising:
- an antenna for receiving an RF signal including a message having address information and message information;
 - means for decoding the message having address information and message information;
 - means for storing the message information;
 - means for keypad inputting user defined search key information and user defined corresponding information directly by a user of the selective call receiver;
 - means for non-volatile storing the user defined search key information and the user defined corresponding information;
 - means for liquid crystal displaying the message information;
 - means for selecting at least a portion of information displayed;
 - means for searching the selected at least a portion of information displayed for an occurrence of the user defined search key information;
 - and
 - means for displaying at least a portion of corresponding information for an occurrence of corresponding user defined search key information in the selected at least a portion of information displayed.

1/3

**FIG. 1**

**FIG. 2**

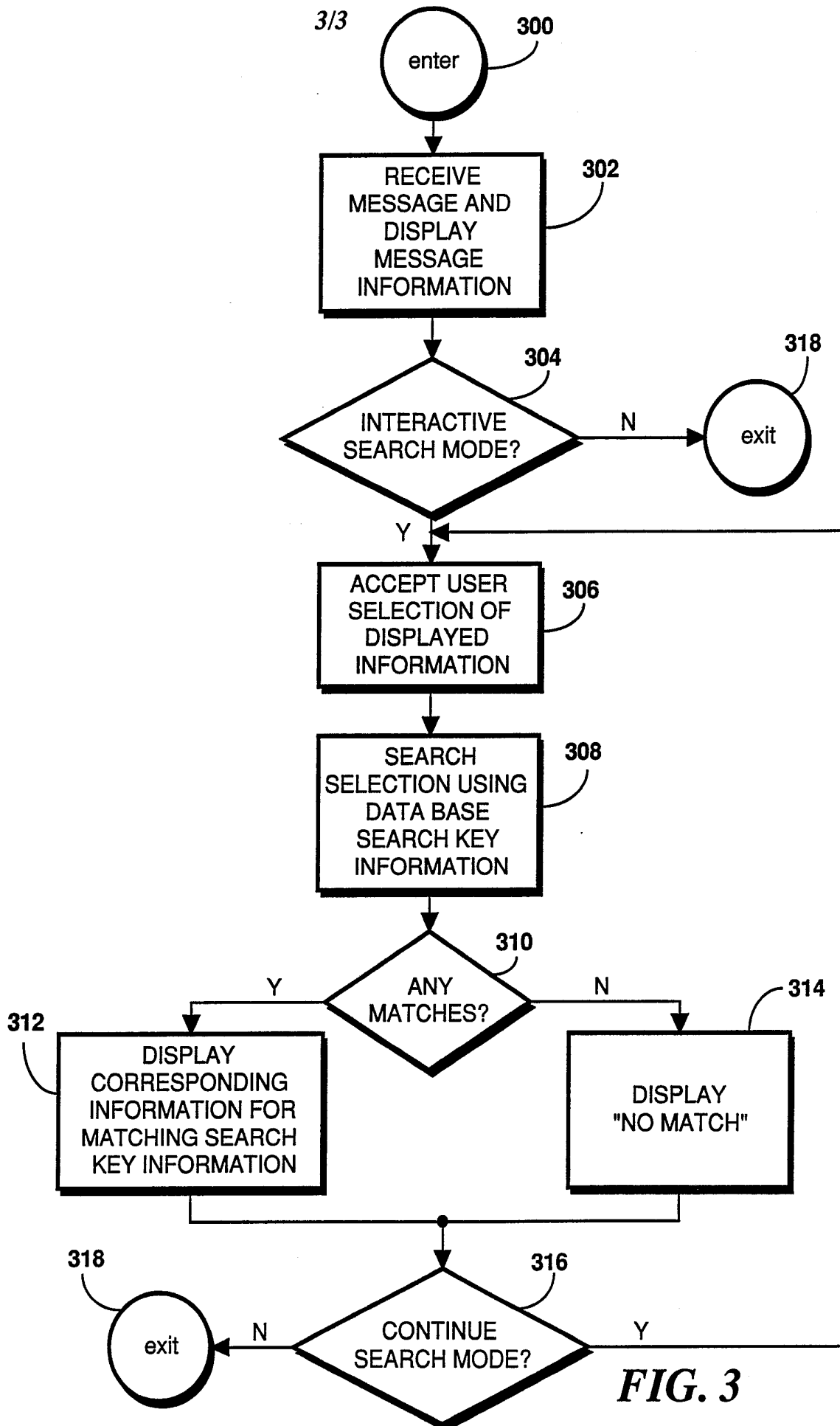


FIG. 3

INTERNATIONAL SEARCH REPORT

International Application No. **PCT/US91/09339**

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC(5): G08B 5/22 U.S.CL.: 340/825.440																										
II. FIELDS SEARCHED <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black; margin: 5px 0;">Minimum Documentation Searched ⁷</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 25%; border-bottom: 1px solid black;">Classification System</th> <th style="border-bottom: 1px solid black;">Classification Symbols</th> </tr> <tr> <td style="vertical-align: top; padding: 5px;">U.S. CL.</td> <td style="padding: 5px;">340/825.440, 825.448, 311.1; 358/84; 455/200 364/705.01, 705.05, 705.06, 705.07, 705.08, 709.09, 235/375, 380</td> </tr> </table> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black; margin: 5px 0;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸</div>			Classification System	Classification Symbols	U.S. CL.	340/825.440, 825.448, 311.1; 358/84; 455/200 364/705.01, 705.05, 705.06, 705.07, 705.08, 709.09, 235/375, 380																				
Classification System	Classification Symbols																									
U.S. CL.	340/825.440, 825.448, 311.1; 358/84; 455/200 364/705.01, 705.05, 705.06, 705.07, 705.08, 709.09, 235/375, 380																									
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹ <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%; border-bottom: 1px solid black;">Category [*]</th> <th style="border-bottom: 1px solid black;">Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²</th> <th style="width: 15%; border-bottom: 1px solid black;">Relevant to Claim No. ¹³</th> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">US, A, 4,382,256 (NAGATA) 03 May 1983, Note Abstract, figure 1, item 6.</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-16</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">US, A, 4,750,036 (MARTINEZ) 07 June 1988, Note figure 1; col. 10, lines 28-60.</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-16</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">US, A, 4,117,542 (KLAUSNR, ET AL.) 26 September 1978, Note col. 7, lines 15-20, col 8, lines 45-50, col. 14, lines 35-70, col. 18, lines 45, col 19, abstract; figure 1.</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1,2,5,7-9, 12-16</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">US, A 4,402,056 (SADO, ET AL) 30 AUGUST 1983 NOTE 3/(1-10), 7/(30-40); 8/(19-30); 9/45-50); 16/ (25-30); 17/(19-52); abstract, 1/(50-60)</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1,2,5,7-9, 12-16</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">US, A, 4,7870,604 (TATSUNO) 26 September 1989, Note figure 1, item 11; col. 3, line 20.</td> <td style="text-align: center; vertical-align: top; padding: 5px;">4,11</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">US, A, 4,806,906 (ODA, ET AL.) 21 February 1989, Note abstract, col. 1, lines 5-15.</td> <td style="text-align: center; vertical-align: top; padding: 5px;">3-4,10-11</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">P,Y</td> <td style="padding: 5px;">US, A, 5,043,721 (MAY) 27 August 1991, See Abstract.</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-16</td> </tr> </table>			Category [*]	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	Y	US, A, 4,382,256 (NAGATA) 03 May 1983, Note Abstract, figure 1, item 6.	1-16	Y	US, A, 4,750,036 (MARTINEZ) 07 June 1988, Note figure 1; col. 10, lines 28-60.	1-16	Y	US, A, 4,117,542 (KLAUSNR, ET AL.) 26 September 1978, Note col. 7, lines 15-20, col 8, lines 45-50, col. 14, lines 35-70, col. 18, lines 45, col 19, abstract; figure 1.	1,2,5,7-9, 12-16	Y	US, A 4,402,056 (SADO, ET AL) 30 AUGUST 1983 NOTE 3/(1-10), 7/(30-40); 8/(19-30); 9/45-50); 16/ (25-30); 17/(19-52); abstract, 1/(50-60)	1,2,5,7-9, 12-16	Y	US, A, 4,7870,604 (TATSUNO) 26 September 1989, Note figure 1, item 11; col. 3, line 20.	4,11	Y	US, A, 4,806,906 (ODA, ET AL.) 21 February 1989, Note abstract, col. 1, lines 5-15.	3-4,10-11	P,Y	US, A, 5,043,721 (MAY) 27 August 1991, See Abstract.	1-16
Category [*]	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³																								
Y	US, A, 4,382,256 (NAGATA) 03 May 1983, Note Abstract, figure 1, item 6.	1-16																								
Y	US, A, 4,750,036 (MARTINEZ) 07 June 1988, Note figure 1; col. 10, lines 28-60.	1-16																								
Y	US, A, 4,117,542 (KLAUSNR, ET AL.) 26 September 1978, Note col. 7, lines 15-20, col 8, lines 45-50, col. 14, lines 35-70, col. 18, lines 45, col 19, abstract; figure 1.	1,2,5,7-9, 12-16																								
Y	US, A 4,402,056 (SADO, ET AL) 30 AUGUST 1983 NOTE 3/(1-10), 7/(30-40); 8/(19-30); 9/45-50); 16/ (25-30); 17/(19-52); abstract, 1/(50-60)	1,2,5,7-9, 12-16																								
Y	US, A, 4,7870,604 (TATSUNO) 26 September 1989, Note figure 1, item 11; col. 3, line 20.	4,11																								
Y	US, A, 4,806,906 (ODA, ET AL.) 21 February 1989, Note abstract, col. 1, lines 5-15.	3-4,10-11																								
P,Y	US, A, 5,043,721 (MAY) 27 August 1991, See Abstract.	1-16																								
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>[*] Special categories of cited documents: ¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p> </div> </div>																										
IV. CERTIFICATION <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top; padding: 5px;"> Date of the Actual Completion of the International Search <div style="text-align: center; font-size: 1.2em;">07 APRIL 1992</div> </td> <td style="width: 50%; vertical-align: top; padding: 5px;"> Date of Mailing of this International Search Report <div style="text-align: center; font-size: 1.2em;">11 MAY 1992</div> </td> </tr> <tr> <td style="vertical-align: top; padding: 5px;"> International Searching Authority <div style="text-align: center;">ISA/US</div> </td> <td style="vertical-align: top; padding: 5px;"> Signature of Authorized Officer <div style="text-align: center;">JOHN GIUST</div> </td> </tr> </table>			Date of the Actual Completion of the International Search <div style="text-align: center; font-size: 1.2em;">07 APRIL 1992</div>	Date of Mailing of this International Search Report <div style="text-align: center; font-size: 1.2em;">11 MAY 1992</div>	International Searching Authority <div style="text-align: center;">ISA/US</div>	Signature of Authorized Officer <div style="text-align: center;">JOHN GIUST</div>																				
Date of the Actual Completion of the International Search <div style="text-align: center; font-size: 1.2em;">07 APRIL 1992</div>	Date of Mailing of this International Search Report <div style="text-align: center; font-size: 1.2em;">11 MAY 1992</div>																									
International Searching Authority <div style="text-align: center;">ISA/US</div>	Signature of Authorized Officer <div style="text-align: center;">JOHN GIUST</div>																									

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

P,Y

WO, A, WO91/11889 (GASKILL) 08 August 1991,
see figure 3.

1-16

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE¹

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers _____, because they relate to subject matter¹² not required to be searched by this Authority, namely:

2. ☐ Claim numbers _____, because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out¹³, specifically:

3. ☐ Claim numbers _____, because they are dependent claims not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING²

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

☐ The additional search fees were accompanied by applicant's protest.

☐ No protest accompanied the payment of additional search fees.