PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : H04Q 7/04

A1

(11) International Publication Number: WO 91/07065

(43) International Publication Date: 16 May 1991 (16.05.91)

(21) International Application Number: PCT/GB90/01467

(22) International Filing Date: 24 September 1990 (24.09.90)

(30) Priority data:
8924145.9 26 October 1989 (26.10.89) GB

(71) Applicant *(for all designated States except US):* MOTOROLA LIMITED [GB/GB]; Jays Close, Viables Industrial Estate, Basingstoke, Hants RG22 4PD (GB).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)* : JOHN, Philip, Brinley [GB/GB]; 9 Veronica Close, Kempshott, Basingstoke RG22 5NW (GB).

(74) Agent: DUNLOP, Hugh, Christopher; Motorola, European Intellectual Property Operations, Jays Close, Viables Industrial Estate, Basingstoke, Hants RG22 4PD (GB).

(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent)*, DK (European patent), ES (European patent), FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent), US.

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: INFORMATION NETWORK

(57) Abstract

This invention relates to an information network such as a telepoint network, having discrete communications units, such as telephone communications handsets (14), where each unit has a user-inaccessible memory. The invention also applies to networks of other units, such as smart cards. The network has regional controllers (11 and 12) for funnelling information from base stations (10) into a central controller (13). At the central controller, analysis of past communications is carried out and, based upon this, instructions are sent out to selected regional controllers for programming the memories of selected discrete units when those discrete units next communicate with base stations associated with the selected regional controllers.

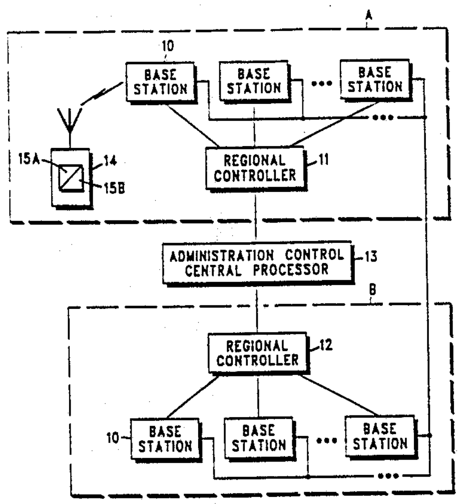

TABLE 2

UIN	ACTION	REGION
1234567	CODE 1=ZAPP	A
6543210	CODE 2	B

TABLE 1

MR. A. SMITH 1234567		
DETAILS OF CALL	BASE STATION	COST
	20	$0.70
	20	$1.32
	22	$0.60
	21	$0.30

* See back of page

DESIGNATIONS OF "DE"

Until further notice, any designation of "DE" in any international application whose international filing date is prior to October 3, 1990, shall have effect in the territory of the Federal Republic of Germany with the exception of the territory of the former German Democratic Republic.

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

Information Network

Background of the Invention

This invention relates to an information network which communicates with discrete communications units, such as telephone communications handsets, "smart" cards or other discrete devices having internal memory which is inaccessible by the user of that device, but is only accessible by the network itself.

Summary of the Prior Art

In the field of telepoint communications, i.e. cordless public telephone communications, handsets are provided which have a user programmable memory, such as for programming frequently used telephone numbers, and a user non-programmable memory, i.e. an r.f. programmable memory, which can only be programmed over the r.f. interface from a base station.

In a telepoint system, a large number of base stations are provided, distributed across a wide area, e.g. across the whole of the United Kingdom. It is necessary periodically to communicate with each base station to down-load to a central controller information regarding activity at that base station, such as billing information. It has been proposed that terminal management computers are provided at regional points to provide a regional centre for down-loading of information from base stations in a region, and for the terminal management computers to in turn down-load their information to a central billing processor. Such an arrangement has the advantage of reducing telephone charges from the public switched telephone network, because it reduces the number of long distance calls required to complete a down-loading cycle.

Summary of the Invention

According to the present invention, there is provided an information network comprising:

a central controller;

a plurality of regional controllers connected for communication with the central controller;

a plurality of remote communications terminals divided into regions, each region comprising a plurality of such terminals served by a regional controller by being connected for communication therewith; and

a plurality of discrete information units, each comprising a user-inaccessible memory programmable only by means of a remote terminal characterised in that:

the central controller comprises means for generating a list of user identification numbers (U.I.N.s), each U.I.N. uniquely identifying a discrete information unit, means for correlating each U.I.N. with at least one regional controller based upon past communications between the discrete information unit and remote communications terminals in the region served by the regional controller, and means for transmitting the U.I.N.s on the list to only those regional controllers with which they are individually correlated,

each regional controller comprises means for storing those U.I.N.s in a regional list and means for transmitting its regional list to terminals in the region it serves and

each remote terminal comprises means for programming a user-inaccessible memory of a discrete information unit on the regional list stored thereby when that discrete information unit next communicates with that remote terminal.

Brief Description of the Drawings

Figure 1 shows a block diagram of an information system in accordance with the present invention.

Detailed Description of the Preferred Embodiment

Referring to Figure 1, there is shown a telepoint network comprising a plurality (e.g. 2000) of base stations 10 located in two regions A and B in approximately equal numbers. Each region has a regional controller 11 and 12 and the whole network has a single administration and control central processor 13. There are a large number (e.g. 25000) of discrete communications handsets 14 distributed throughout the regions A and B. A user of a handset may carry his handset from region A into region B and may use his handset in both regions, according to circumstances which are described below. Each handset 14 has a memory which is divided into a user accessible part 15A and a user inaccessible part 15B.

Each of the base stations 10 communicates with its regional controller 11 or 12 via the public switched telephone network (PSTN) using an automatic dialler in the base station (or in the regional controller). Communications between a base station and its regional controller is periodic (e.g. once a day at off-peak times). At all other times the base station is connected to the PSTN for a user of a handset to communicate into the PSTN. Of course, if a base station has more than one telephone line connected to the PSTN, then that base station can be open for communication with a handset 14 even at the time that it is communicating with its regional controller.

For an explanation of the invention, it is convenient first to consider the activity of a subscriber (i.e. a user) purchasing a handset 14.

A user purchases a handset from a registered dealer and is signed onto the system by means of a telephone conversation between the dealer and an operator of the administration and control central processors. The dealer quotes a seven digit unit identification number (U.I.N.) which uniquely identifies the handset and from this number the central processor 17 generates a four-digit registration number which the dealer enters into the handset. The registration number is algorithmically related to the U.I.N. and a random number. The random number can be changed periodically so the registration number has a limited lifetime. This registration number is only used for the first successful attempt by the user to access a base station 10.

When the user first accesses a base station 10 (by coming within range of the base station and activating a call), a prerecorded message is transmitted across the air interface to the user 15 saying "please enter 4-digit PIN". This message is generated by the base station itself. The user enters a 4-digit number of his own devising and the base station 10 records this PIN for future use. The previously entered 4-digit registration number provided by the dealer is now obsolete, and is replaced by the 4-digit PIN. If this initial activation sequence is not carried out within a predetermined minimum time of purchase of the handset, the originally provided number exceeds its lifetime and the user must apply for a new number.

When the user has entered his 4-digit PIN, the base station 10 programs this into the secure (user inaccessible) memory 15B via the r.f. interface. By this means, it is not possible for an unauthorised user to change the PIN. In future communications, a user enters his PIN and the base station checks that this corresponds to the number programmed in the secure memory 15B.

Following the above sequence, the handset 14 is active and can immediately be used to communicate with any other base station.

In addition to the down-loading of information from the base stations to the administration and control central processor via the regional controllers, the present invention provides for a flow of information in the opposite direction and ultimately for the programming of the secure memory 15B of a handset from control information generated at the central processor 13. This information falls into three principal categories:

1. Deactivation and reactivation of handsets (commonly referred to as zapping and unzapping);

2. programming of the new service PIN; and

3. programming of the class of service permitted for the handset in question.

Different classes of service may include, for example, national or local calls only, maximum of two hours access for a single call etc.

A list is stored in the central processor 13, called the work order, which defines actions to be taken in programming secure memories of handsets. Each entry in the list contains at least a U.I.N. of a handset and an instruction code identifying the action to be carried out. Thus, if the administration and control central processor identifies that a particular user is a bad debtor, an action can be entered on the work order to deactivate (zap) that handset when it next accesses the network.

It is a feature of the regionalisation of the network that the central processor 13 can identify, from its billing procedure, that a unit 14 predominantly operates in a particular region A. It is thus necessary to transfer this particular work order instruction to regional controller 11 only. Since the handset is unlikely to operate in region B it is not necessary to transfer this instruction to regional controller 12. This cuts down the amount of overhead traffic in the system.

When the base station 10 next communicates with its regional controller 11, the regional controller 11 down-loads its regional work order into the base station 10 (and every other base station in turn in region A). Because the work order has been regionalised, the amount of data to be transferred to the base stations in region A is reduced, and the amount of information that needs to be stored at the base stations in region A is also reduced. Each of these features reduces the equipment cost and the operating costs of the system.

When the handset 14 next attempts to communicate through a base station in region A, its unique 7-digit registration number is matched with the same number stored in the work order at the base station and the programmed action is carried out, e.g. the handset 14 is deactivated (zapped) over the r.f. interface. Deactivation is carried out by programming into the secure memory 15B.

Of course, a bad debtor unit could satisfactorily operate in region B, however as soon as billing information is down-loaded from the base stations in region B to the administration control central processor 13 via regional controller 12, the central processor 13 can identify that the zap instruction must be programmed to the base stations in region B. Any liability accrued for telephone charges in the interim time is a small price to pay for the overall cost reduction in the system.

By way of further illustration of the invention, reference is made to Tables 1 and 2.

Table 1 shows an example of a customer's bill, as generated by the administration and control central processor 13. The customer's U.I.N. is 1234567. Let it be supposed that this customer fails to pay his bill in due time. The processor 13 will analyse the bill according to the base stations listed against previous calls. The base stations listed are nos. 20, 21 and 22. Let it be supposed that all these base stations are in region A. The processor 13 will add the customers U.I.N. to its work order. This is shown in Table 2. The code "1" is an instruction to zapp (deactivate). The central work order has a data field for identifying a region. The instruction outlined in bold lines is transferred to the work order of the regional controller 11 of region A. Other instructions are sent to other regional controllers. Thus the amount of data that a regional controller must pass to all the base stations in its region is reduced. The corresponding data to be stored at a base station is reduced, as is the amount of processing required each time a handset trys to initiate communication with a base station.

Reactivation of a deactivated handset is carried out in the same manner as deactivation. The instruction is sent to the regional controller(s) where that handset was last known to operate, or where it previously predominantly operated.

A decision as to which regional controller(s) an instruction is to be sent to is reached on the basis of analysis of billing instructions received from various base stations. When a base station down-loads a billing instruction to the central processor via its regional controller, a single billing instruction identifies the handset in question and the base station where a call was made. When an action is to be added to the work order, the distribution of previous calls on the account of that user can be examined. If, for example, it is found that more than 90% of previous calls made by that unit were in a single region, it can be decided that the action instruction need only be sent to the regional controller for that region.

An instruction from the work order at the central processor may be sent to more than one regional controller, for example, in the case where a handset operates in an area bordering on two adjacent regions and previous billing instructions have been received from base stations in those regions, or, for example, where the user of a handset is highly mobile and travels throughout several regions.

Another type of instruction that may be generated on the work order of the central processor is the class of service to which a particular user is permitted. The following classes of service may be provided:

1. Full dialling facilities, maximum call length 2 hours;

2. Full dialling facilities, maximum international or trunk call 2 minutes, local 2 hours;

3. Trunk and local calls only, maximum call length 2 hours;

4. Trunk and local calls only, maximum call length - trunk 2 minutes, local 2 hours;

5. Local calls only, maximum call length 2 hours;

6. Local calls only, maximum call length 2 minutes; and

7. Free and emergency calls only.

Handsets are provided with a default class preprogrammed in their secure memory 15B. This default class is class 1. If the class of service is to be reduced, e.g. where a manager wishes to restrict the calls which can be made by his employees using such handsets, the instructions to reduce the class of service are added to the central work order and distributed to the appropriate regional controller(s). A change of class of service takes a day to implement, because the base stations communicate with their regional controller once a day. Reduction of call service can be made at the decision of the network operator, e.g. as a result of bad payment of debt.

When a subscriber wishes to terminate his subscription to the system, he must be de-registered. This is carried out in the same way as zapping. It is unrealistic to hold a list of de-registrations at a base station indefinitely. If an action on the work order is not carried out within a predetermined period of time, it is removed from the work order.

Each handset has a user programmable memory 15A. This can be used for storing frequently used numbers for automatic dialling, as is commonly used in hardwired telephones.

The invention has been described above in respect of a cordless public telephone network, however it is applicable to other information networks where discrete units communicate with base stations across a wide area. Such systems include automatic banking machines and cash dispensers for banks. In this case, the discrete communications unit may be a smart card i.e. a card having a microprocessor and a nonvolatile semiconductor memory. Base stations in a cash dispenser network need to communicate with the network more frequently than in the case of a telepoint network, because if a user withdraws a large sum of money from one dispenser, it may not be permissible to allow him to withdraw a large sum from another dispenser in the same day. It is thus not a problem to regionalise zapping of dispenser cards because if an unauthorised card is used in a region where the identification of that card is not stored on the work order for zapping, a single use of that care can trigger the transfer of the zapp instruction to the region in which is it used. The liability that such a system gives rise to is limited to the maximum sum that can be dispensed at any cash dispenser. Other actions which may be stored on the work order of a cash dispenser network may include a class of service instruction, which may determine the maximum amount of cash that may be dispensed or may determine what other facilities are available to that card (e.g. credit transfer, issuing of bank statements, issuing of cheque books etc.).

Another system to which the invention is applicable would be a cable television system.

Claims

1. An information network comprising:

a central controller;

a plurality of regional controllers connected for communication with the central controller;

a plurality of remote communications terminals divided into regions, each region comprising a plurality of such terminals served by a regional controller by being connected for communication therewith; and

a plurality of discrete information units, each comprising a user-inaccessible memory programmable only by means of a remote terminal characterised in that:

the central controller comprises means for generating a list of unit identification numbers (U.I.N.s), each U.I.N. uniquely identifying a discrete information unit, means for correlating each U.I.N. with at least one regional controller based upon past communications between the discrete information unit and remote communications terminals in the region served by the regional controller, and means for transmitting the U.I.N.s on the list to only those regional controllers with which they are individually correlated,

each regional controller comprises means for storing those U.I.N.s in a regional list and means for transmitting its regional list to terminals in the region it serves and

each remote terminal comprises means for programming a user-inaccessible memory of a discrete information unit on the regional list stored thereby when that discrete information unit next communicates with that remote terminal.

2. A network according to claim 1, wherein means are provided at the discrete unit for activating or deactivating the ability of that unit to carry out predetermined further communications when a remote unit writes to the second memory of that unit.

3. A network according to claim 2, wherein the remote unit is provided with means for connecting the discrete unit to a communications network and the predetermined further communications include all connecting of the discrete unit to that network.

4. A network according to claim 2, wherein the remote unit is provided with means for connecting the discrete unit to a communications network and the predetermined further communications include all connecting of the discrete unit to that network for more than a predetermined time.

5. A network according to claim 2, wherein the remote unit is provided with means for connecting the discrete unit to a communications network and the predetermined further communications include all connecting of the discrete unit to at least certain parts of that network.

6. A network according to any of claims 1 to 5, further comprising means for communicating U.I.N.s from the central processing unit to a regional processor for adding or removing from the list stored at the regional processor.

7. A network according to claim 6, further comprising means for communicating information in addition to U.I.N.s from the remote units to the regional processors and from the regional processors to the central processor and means at the central processor for processing said information, generating information in response, including U.I.N.s to be added to or removed from the lists stored at the regional processors, and communicating said information to selected regional processors.

8. A method of controlling the use of discrete information units in an information network comprising a central controller, a plurality of regional controllers

connected for communication with the central controller and a plurality of remote communications terminals divided into regions, each region comprising a plurality of such terminals served by a regional controller by being connected for communication therewith, the method comprising the steps of:

generating a list of unit identification numbers (U.I.N.s) at the central controller, each number uniquely identifying a discrete information unit,

correlating, at the central controller, each U.I.N. with at least one regional controller based upon past communications between the discrete information unit and remote communications terminals in the region served by the regional controller,

transmitting the U.I.N.s on the list to only those regional controllers with which they are individually correlated,

storing those U.I.N.s at the regional controllers in regional lists,

transmitting the regional list stored by each regional controller to terminals in the region served thereby and storing that list at those terminals and

programming a user-inaccessible memory of a discrete information unit on the regional list of a remote terminal when that discrete information unit next communicates with that remote terminal.

FIG.1

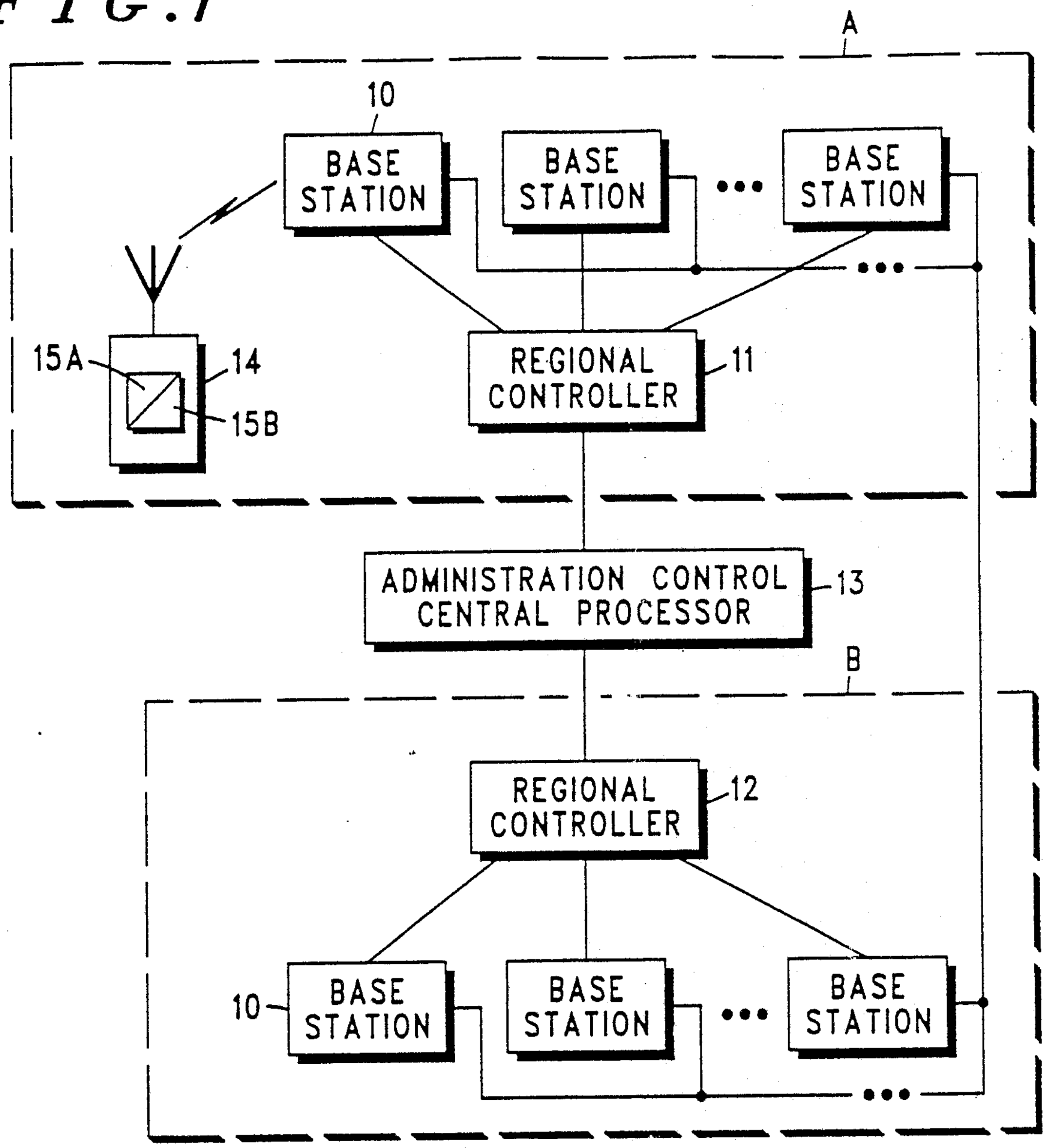

TABLE 2

	UIN	ACTION	REGION
I	1234567	CODE 1=ZAPP	A
	6543210	CODE 2	B

TABLE 1

MR. A. SMITH 1234567		
DETAILS OF CALL	BASE STATION	COST
	20	$0.70
	20	$1.32
	22	$0.60
	21	$0.30

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 90/01467

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

Int.Cl. 5 H04Q7/04

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	H04Q

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category °	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No.[13]
Y	WO,A,8907380 (MOTOROLA) 10 August 1989 see page 4, lines 1 - 21 see page 5, line 1 - column 6, line 9 see page 6, line 29 - page 8, line 2 see page 8, lines 12 - 23 see page 9, line 27 - page 12, line 25 ---	1-8
Y	US,A,4860341 (D'AVELLO ET AL) 22 August 1989 see column 2, lines 47 - 61 see column 3, line 43 - column 7, line 58 see column 6, line 14 - column 7, line 58 see column 8, line 24 - column 8, line 52 see column 9, lines 4 - 16 see column 12, line 19 - column 13, line 12 see column 14, lines 12 - 19 see column 14, line 67 - column 17, line 3 --- -/--	1-8

° Special categories of cited documents : [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"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.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
21 MARCH 1991	18. 04. 91
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	GERLING J.C.J.

1

Form PCT/ISA/210 (second sheet) (January 1985)

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category °	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	GB,A,2193861 (BRITISH TELECOMMUNICATIONS) 17 February 1988 see page 1, lines 37 - 55 see page 1, lines 64 - 80 see page 1, lines 106 - 121 see page 2, line 9 - page 3, line 80 ---	1-8
A	US,A,4670905 (SANDVOS ET AL) 02 June 1987 see column 2, line 60 - column 4, line 14 see column 4, line 33 - column 5, line 13 see column 5, line 57 - column 8, line 60 ---	1-8
A	PROCEEDINGS OF THE NATIONAL COMMUNICATIONS FORUM. vol. 42, no. 2, September 88, OAK BROOK, ILLINOIS pages 1706 - 1713; P.E.JACKSON et al: "PORTABLE COMMUNICATION" ---	
X,P	GB,A,2225689 (PHILIPS) 06 June 1990 see the whole document ---	1-8

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. GB9001467

SA 40600

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on 21/03/91
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
WO-A-8907380	10-08-89	US-A-	4833701	23-05-89
		AU-A-	2933589	25-08-89
		EP-A-	0398911	28-11-90
US-A-4860341	22-08-89	None		
GB-A-2193861	17-02-88	None		
US-A-4670905	02-06-87	CA-A-	1259660	19-09-89
		EP-A-	0247192	02-12-87
		WO-A-	8703438	04-06-87
GB-A-2225689	06-06-90	None		

EPO FORM P0479

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82