

IN THE CANADIAN PATENT OFFICE

Serial No. : 558,504
 Filed : February 9, 1988
 Applicant : British Telecommunications
 Public Limited Company

 Allowed : July 19, 1994
 Classif. : D-2 354/49
 Our File : 917-188C

Commission of Patents Consumer and Corporate Affairs CANADA	
5	JAN 18 1995
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The Commissioner of Patents,
 OTTAWA/HULL, Canada.

JAN 18 1995

Dear Sir:

The Applicant submits herewith the Issue and Printing Fees in the amount of Seven Hundred Dollars.

The Office is requested to apply the enclosed Fees against this application and ensure issuance of a Patent hereon in due course.

If any further Fees are required additional to those submitted herewith in order to satisfy Office Fee requirements, please deduct any such additional fees from our Deposit Account No. 27B05, and promptly advise us thereof.

Respectfully submitted,

Bell, Walter & Brousseau

BELL, WALTER & BROUSSEAU

:djw
 Encl.

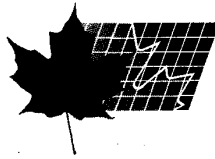
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Visa	J1000-32301		700.00		
Mastercard					
Cpte dépôt					
Deposit Acct					
Prepared par	Input		Approuvé par		
			Approved by		

CA 1335002 1995-01-18

CONFIDENTIAL

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CA 1335002 1995-01-18



(11) (C) **1,335,002**
(21) 558,504
(22) 1988/02/09
(45) 1995/03/28
(52) 354-49

BREVETS

MARQUES
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(51) Intl.Cl. ⁵ G10L 5/06

(19) (CA) **CANADIAN PATENT** (12)

(54) Multi-User Speech Recognition System

(72) Tchorzewski, Kazimierz , U.K.

(73) BRITISH TELECOMMUNICATIONS public limited company , U.K.

(30) (GB) U.K. 8702910 1987/02/10

(57) 16 Claims



FIELD OF THE INVENTION

This invention relates to a speech recognition system capable of dealing with a plurality of users.

BACKGROUND OF THE INVENTION

5 Single-speaker dependent speech recognisers are known, for example for connection to a telephone, in which the user "trains" the recogniser with his or her voice patterns. These patterns are stored as "templates" in Random Access Memory (RAM) within the speech recogniser.
10 When a user wishes to make a phone call, he activates the recogniser, for example by lifting the receiver, and the recogniser uses his templates to interpret voiced instructions, for example of the telephone number the user wishes to dial. When other users wish to use the speech
15 recogniser, they have to go through the training procedure, and when this happens the original user's templates are deleted. Therefore, if the original user needs to use the speech recogniser again, he must retrain the recogniser first.

20 In multi-user environments, for example a Private Automatic Branch Exchange (PABX), one recogniser could be provided to serve all the extensions connected to the PABX. However, in this case, the user at every extension would probably have to go through the tedium of training
25 the recogniser every time he wished to make a call.

 An alternative arrangement would be to provide a speech recogniser at each extension, so that each will be trained only by that extension's user. However, such an arrangement would be prohibitively expensive.

30 A better alternative is to provide a few recognisers, connected to the PABX and shared between the many users.



In such a system, a common database is provided containing the templates of all the users. When any particular user activates his extension, one of the quiescent recognisers is arbitrarily selected and assigned to his use, and his
5 templates are then loaded into that recogniser. A micro-processor is provided to control the loading of the templates. The rate at which templates are loaded into the recognisers depends upon the speed of the micro-processor, and the more recognisers wanting access to the database
10 there are, the more complex the micro-processor is required to be. Every recogniser is assigned a priority, and the micro-processor deals with requests for service in strict priority order; so if a lower priority recogniser has access and is loading templates, and a higher priority recogniser
15 requests access, service to the lower device is suspended while the higher device is served. Only when the higher priority device has finished is the lower priority device allowed to continue. This type of interruption may continually occur, so that a low priority device may be
20 delayed while several higher priority devices are served, and the overall system suffers from the disadvantage of not being totally user transparent.

Accordingly, the present invention provides a speech-recognition system for the provision of a speech
25 recognition facility to a multiplicity of user terminals, the system comprising: speech recognition means connected via a switching node to a plurality of user terminals, there being a smaller number of speech recognition means than there are user terminals; and a database containing
30 respective templates for each of the user terminals; wherein there is provided a plurality of speech recognition means, arranged such that when a user terminal is activated, one of the recognition means is assigned to deal with voiced instructions input via that user terminal; the database
35 being arranged, in use, to provide a copy of relevant speaker-dependent templates to the assigned recognition means and in that there is provided control means connected

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to the speech recognition means and arranged, in use, to receive requests for templates from the recognition means, and to instruct the database to provide complete copies of the requested templates in the order in which they are
5 requested.

The present invention further provides a telephone exchange for connection to a multiplicity of telephone instruments, the exchange including speech recognition means for the provision of a speech recognition
10 facility to telephone instruments connected to the exchange, the speech recognition means being provided with a store for speaker-dependent templates for use in recognition, wherein there are a plurality of speech recognition means but many fewer than the number of telephone instruments which the
15 exchange can serve; the exchange including control means which, in use, provide that when a telephone instrument connected to the exchange is activated one of the recognition means is assigned to deal with voiced instructions input via that instrument, and the store, in
20 which, in use, speaker-dependent templates are stored, is arranged to provide copies of relevant speaker-dependent templates to the assigned recognition means, the control means being arranged, in use, to receive requests for templates and to instruct the database to provide complete
25 copies of the requested templates in the order in which they are requested.

The present invention yet further provides a speech recognition system comprising a plurality of user terminals connected to a plurality of single-speaker
30 dependent speech recognisers, there being a smaller number of speech recognisers than there are user terminals, the speech recognisers being arranged such that, when a user terminal is activated, one of the recognisers is assigned to deal with voiced instructions input via that user terminal;
35 a database containing respective single-speaker dependent templates for each of the user terminals, the database being arranged, in use, to send a copy of one of the templates

corresponding to a particular user terminal to a recogniser assigned to deal with instructions input via that user terminal; and control means connected to the speech recognisers and arranged, in use, to control the transfer of
5 copies of templates from the database to the recognisers; wherein the control means is arranged, in use, to receive a request for a copy of one of the templates from one of the recognisers, and to instruct the database to send a complete copy of the requested template without interruption by
10 another such request from another terminal.

Further yet, the present invention provides in a multi-user single-speaker dependent speech recognition system having m speech recognition processors shared by a larger number of n users and having n corresponding speaker
15 dependent speech recognition templates stored in a common data base shared by the m speech recognition processors, an improvement comprising means for assigning particular ones of the m speech recognition processors to particular ones of the n users on a first-come first-served basis; and means
20 for transferring a complete requesting user template to the correspondingly assigned speech recognition processor in response to the assignment and without interruption by any other requesting user.

Advantageously, the control means comprises a
25 cyclic channel selector and a clock, the cyclic channel selects and the clock being interconnected by a switch which is controlled by the requests for copies of templates from the recognisers.

A preferred embodiment of the invention will now
30 be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows a schematic illustration of a preferred embodiment of the invention;

Figure 2a shows a schematic illustration of a
35 controller according to a preferred embodiment of the invention; and

Figure 2b shows a realisation of the controller of Figure 2a.

Referring to the drawings, Figure 1 shows a PABX 1 having n extensions 2 connected to a bank of m speech recognisers 3. The bank of speech recognisers 3 has access to a database 4a containing n sets of templates 4, one set corresponding to each extension 2, all stored in a memory device 5, for example a Winchester disk drive. A controller 6 is also connected to the bank of recognisers 3.

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When one of the extensions 2 is activated, by a user picking up the receiver, one of the quiescent speech recognisers 3 in the bank is assigned to that extension. That recogniser 3 then ceases to be available for
5 assignment to another extension 2. Once a speech recogniser 3 has been assigned, it requests the templates 4 associated with the relevant activated extension 2, and these templates are fetched from the memory device 5, and loaded into the recogniser. The user may then give voiced
10 instructions to the recogniser 3 for handling the call.

Once no more instructions are expected from an extension 2, for example once a call has been set up, the recogniser 3 assigned to deal with that extension is returned to its quiescent state.

15 The requests from the recognisers 3 are handled by the controller 6 on a first-come first-served basis. The controller 6 assigns all the recognisers 3 equal priority, and all subsequent requests are stacked, in order of arrival, until previously-requested templates 4 have been
20 loaded.

The controller 6, shown in more detail in Figure 2a, comprises a cyclic channel selector 7 having a parallel output which is connected to all the recognisers 3 in the bank. The controller 6 also comprises a clock 8 having an
25 output connected to the channel selector 7. Every clock pulse received by the selector 7 causes the parallel output to be incremented. Every recogniser 3 has an output, and these outputs are connected together to perform OR-logic, and thus to provide a control signal
30 which stops the channel selector 7 from continuing to cycle. This is shown schematically as a control signal to a switch 9 which opens the circuit between the clock 8 and the selector 7.

Each recogniser 3 has a user-selectable channel identification number. When access to the memory device 5 is required, to load a set of templates 4, a given recogniser 3 scans the parallel output of the channel selector 7, and compares this with the identification number until there is a match. At this point, the recogniser 3 sends a high control signal, and freezes the selector's parallel output. The recogniser 3 then has complete uninterrupted access to the memory device 5. Once the templates 4 have been loaded into the recogniser 3, it ceases to send the high control signal, and the selector 7 continues to cycle until it is again halted.

One of the advantages of this system is that the controller 6 does not require any intelligence, and may be realised with passive devices, as shown in Figure 2b. In this realisation, open-collector drivers 10 are installed on the output lines of the recognisers 3, the lines all being connected together to perform OR logic; and the resulting single line, shown connected to a pull-up resistor 11, is fed to the switch 9, embodied by a D-type flip-flop.

Of course, the system may be arranged to operate when more than one user is expected to use any particular extension 2. In this case, each extension 2 may indicate to a recogniser 3 a series of users in a preferred order. The recogniser 3 will then request the templates 4 of the most preferred user, and check if these match the actual user. If not, the templates 4 of the second most preferred user may be requested, and so on.

It should be appreciated that the user terminals (extensions 2) and the recognisers 3 do not have to be wire-linked as shown in Figure 1. The user terminals 2 could be portable transceivers, for example in a cellular

radio system, connected to the recognisers 3 by radio
channels. In this case, a PABX would be inappropriate,
but any suitable type of switching node could be provided
within box 1. In any event, the user terminals 2 would
5 not necessarily be activated by lifting the receiver, but
other means, for example a switch, could be used.

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THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A speech-recognition system for the provision of a speech recognition facility to a multiplicity of user terminals, the system comprising: speech recognition means connected via a switching node to a plurality of user terminals, there being a smaller number of speech recognition means than there are user terminals; and

a database containing respective templates for each of the user terminals;

wherein there is provided a plurality of speech recognition means, arranged such that, when a user terminal is activated, one of the recognition means is assigned to deal with voiced instructions input via that user terminal; the database being arranged, in use, to provide a copy of relevant speaker-dependent templates to the assigned recognition means and in that there is provided control means connected to the speech recognition means and arranged, in use, to receive requests for templates from the recognition means, and to instruct the database to provide complete copies of the requested templates in the order in which they are requested.

2. A speech recognition system as claimed in claim 1, wherein voiced instructions input by any one of a known group of users via a particular user terminal can be dealt with.

3. A speech recognition system as claimed in claim 2, wherein when a user terminal is activated by a particular user the speech recognition means assigned to the terminal identifies the templates relevant to the user.

4. A speech recognition system as claimed in claim 3, wherein the user terminal, when activated by any of the known group of users, identifies the members of the known group of users to the assigned speech recognition means, indicating the preferred order of these users, the arrangement being such that the recognition means then

requests the templates of the most preferred user and, when a copy of these is received from the database, tests if they correspond to the current user and, if they do not, requests the templates of the next most preferred users, tests for correspondence with these and continues this process until the current user's templates are identified.

5. A speech recognition system as claimed in claim 1, 2, 3, or 4, wherein the control means comprises a cyclic channel selector and a clock, the cyclic channel selector and the clock being interconnected by a switch which is controlled by the requests for copies of the templates from the recognition means.

6. A system as claimed in claim 1, 2, 3, or 4, wherein the user terminals comprise portable transceivers.

7. A system as claimed in claim 5, wherein the user terminals comprise portable transceivers.

8. A system as claimed in claim 1, 2, 3, 4, or 7, wherein the switching node is configured as a telephone exchange.

9. A system as claimed in claim 6, wherein the switching node is configured as a telephone exchange.

10. A system as claimed in claim 8, wherein the switching node is a private automatic branch exchange and the user terminals are telephone extensions of that exchange.

11. A system as claimed in claim 9, wherein the switching node is a private automatic branch exchange and the user terminals are telephone extensions of that exchange.

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12. A telephone exchange for connection to a multiplicity of telephone instruments, the exchange including speech recognition means for the provision of a speech recognition facility to telephone instruments connected to the exchange, the speech recognition means being provided with a store for speaker-dependent templates for use in recognition, wherein there are a plurality of speech recognition means but many fewer than the number of telephone instruments which the exchange can serve;

the exchange including control means which, in use, provide that when a telephone instrument connected to the exchange is activated one of the recognition means is assigned to deal with voiced instructions input via that instrument, and the store, in which, in use, speaker-dependent templates are stored, is arranged to provide copies of relevant speaker-dependent templates to the assigned recognition means, the control means being arranged, in use, to receive requests for templates and to instruct the database to provide complete copies of the requested templates in the order in which they are requested.

13. A speech recognition system comprising: a plurality of user terminals connected to a plurality of single-speaker dependent speech recognisers, there being a smaller number of speech recognisers than there are user terminals,

the speech recognisers being arranged such that, when a user terminal is activated, one of the recognisers is assigned to deal with voiced instructions input via that user terminal;

a database containing respective single-speaker dependent templates for each of the user terminals, the database being arranged, in use, to send a copy of one of said templates corresponding to a particular user terminal to a recogniser assigned to deal with instructions input via that user terminal; and

control means connected to the speech recognisers and arranged, in use, to control the transfer of copies of templates from the database to the recognisers;

wherein the control means is arranged, in use, to receive a request for a copy of one of said templates from one of the recognisers, and to instruct the database to send a complete copy of the requested template without interruption by another such request from another terminal.

14. A speech recognition system as claimed in claim 13, wherein the control means comprises a cyclic channel selector and a clock, the cyclic channel selector and the clock being interconnected by a switch which is controlled by the requests for copies of templates from the recognisers to stop the cyclic channel selector for the duration of said transfer of a complete requested template.

15. In a multi-user single-speaker dependent speech recognition system having m speech recognition processors shared by a larger number of n users and having n corresponding speaker dependent speech recognition templates stored in a common data base shared by said m speech recognition processors, the improvement comprising:

means for assigning particular ones of said m speech recognition processors to particular ones of said n users on a first-come first-served basis; and

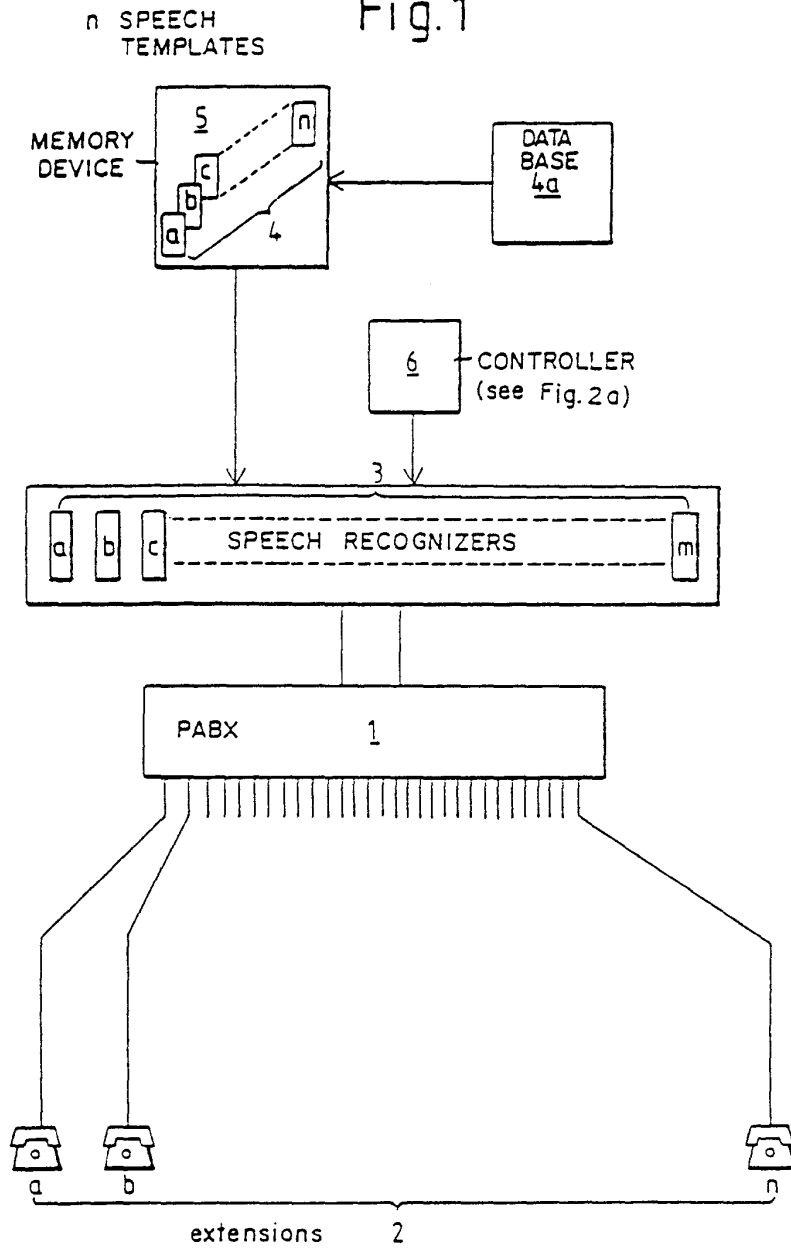
means for transferring a complete requesting user template to the correspondingly assigned speech recognition processor in response to said assignment and without interruption by any other requesting user.

16. An improved multi-user single-speaker dependent speech recognition system as in claim 15 wherein said means for assigning comprises means for cyclically addressing unassigned ones of said speech recognition processors to effect temporary connection to a common memory device containing said data base.



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Fig.1



BELL, WALTER A. 19690809

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Fig. 2a

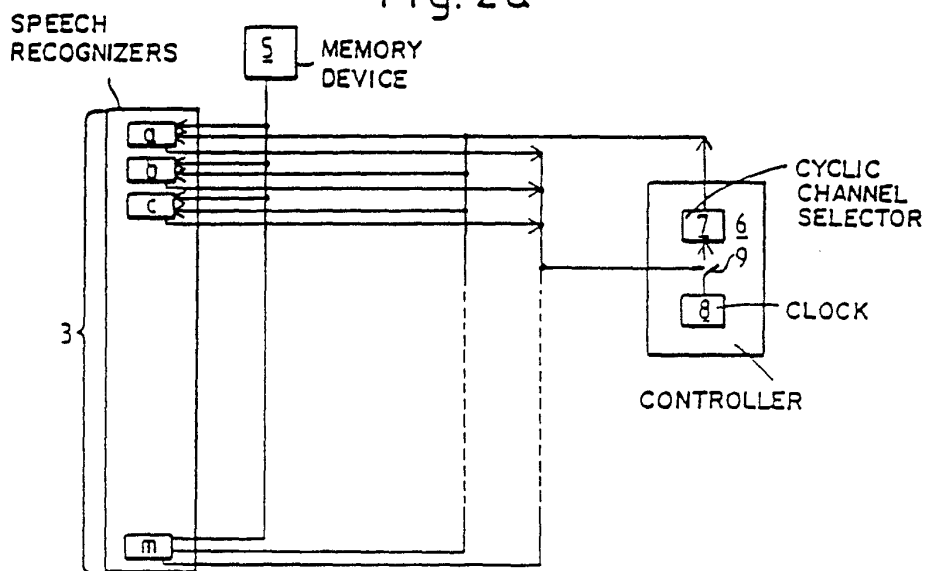
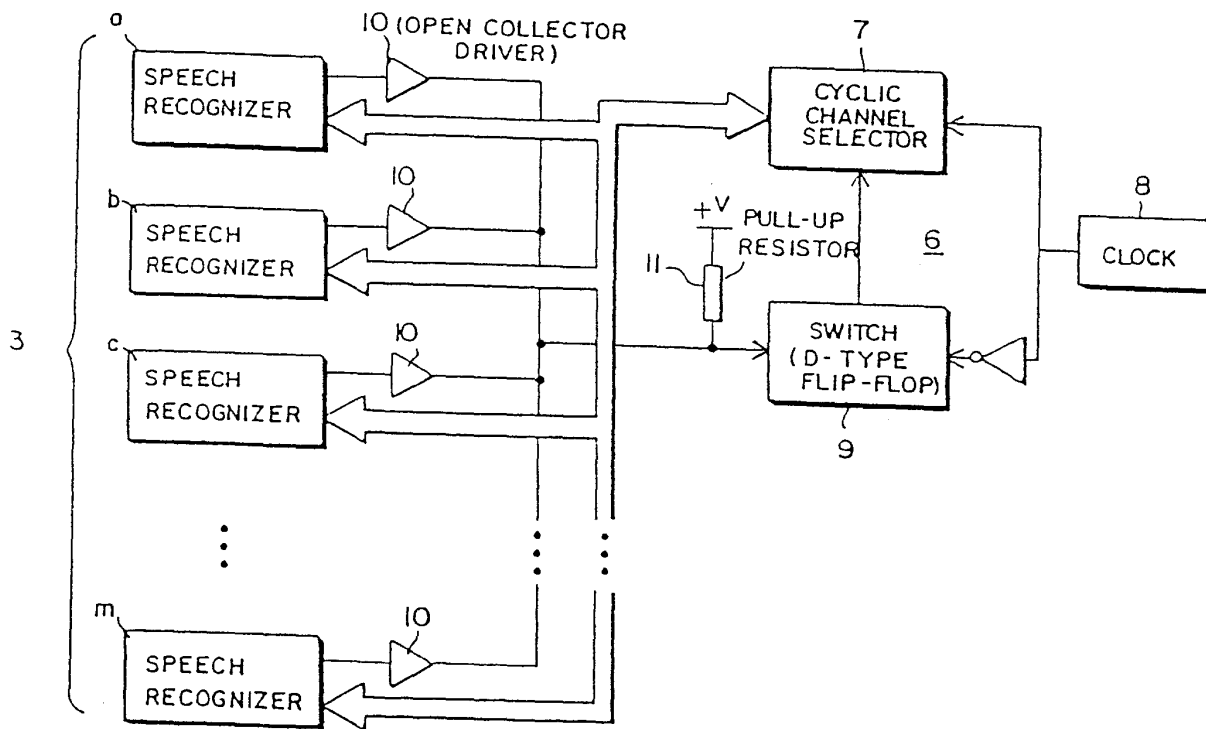


Fig. 2b



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ABSTRACT OF THE DISCLOSURE

A multi-user speech recognition system includes several speech recognisers which are shared between many user terminals. When a user terminal is activated, one of the recognisers is assigned to deal with voiced instructions received via that user terminal. This recogniser requests the respective "templates" from a memory device. A controller handles requests from the recognisers on a first-come first-served basis, and prevents later requests from interrupting earlier ones.

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Page 51

We enclose our remittance in payment of the annuities and/or nominal working listed.
Veuillez trouver ci-jointe notre remise en paiement des annuités mentionnés ci-après.
Beiliegend finden Sie unsere Überweisung zur Zahlung der unten aufgeführten Jahresgebühren.

PATENTEE BRITISH TELECOM
-MUNICATIONS PLC

01/0050/01

06/02/97

Number Numéro Nummer	Patentee Titulaire Inhaber	Due Date Echéance Fälligkeit	Tax	Fee/Montant/Betrag Echance	Fine/Surtaxe/Zuschlag	Working Charge	Total
				CDN \$	CDN \$	CDN \$	CDN \$
1328085	⑨ 32	29/03/97	04	100.00	200.00	to LISE	100.00
1328130		29/03/97	04	100.00			100.00
1334690		07/03/97	03	100.00			100.00
1335002		28/03/97	03	100.00			100.00
1335003		28/03/97	03	100.00			100.00
2046321		02/02/97	08	150.00			350.00
2048616		16/03/97	08	150.00			150.00
2078994		26/03/97	07	150.00			150.00
2080020		26/03/97	07	150.00			150.00
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Page Total				CDN \$	1300.00		

UT ITJ	Transit 08415	Patentee 558	Due Date FEB 17 1997	EST
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Visa	71000			
Mastercard	7501	1300		

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Via				Andre montant
Mastercard				Comdramt
Cpte dépôt				
Deposit Acct				
Préparé par	Input	Approuvé par		
Prepared by		Specified by		

Regd Office as Company Address
Regd in London No. 1085809
VAT Reg No. GB 158 3231 69
Directors: J.J. Dennemeyer (USA)
S.H. Miller
P.A. Dennemeyer (USA)

Bankers: Lloyds Bank Plc
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£ No. 3030333 S Frs No. 24006010
US \$ No. 11144529 Yen No. 35006528
F Mks No. 37002848 N Fls No. 26016420

CA 01335002 1997-02-13

IN THE CANADIAN PATENT OFFICE

Serial No.: 558,504
Filed : February 9, 1988
Applicant : Kazimierz Tchorzewski
Classif. : D-2, 354/49
Our File : 917-188C

The Commissioner of Patents,
Ottawa/Hull, Canada.

May 3, 1988

Dear Sir:

The applicant submitted formal drawings upon the filing of the above-identified Canadian patent application.

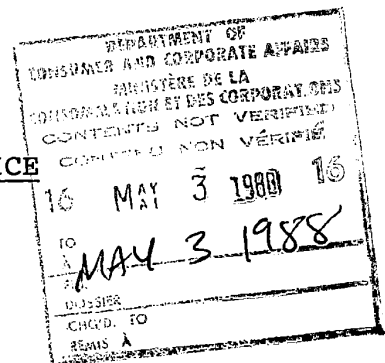
The applicant now submits herewith a further set of formal drawings and requests that the Office replace the formal drawings originally filed herein with those now submitted herewith.

The formal drawings submitted herewith are of superior quality to those originally filed and it is believed that they will be more acceptable to the Office for patent reproduction purposes. It is emphasized that no changes have been made to the formal drawings originally filed and no subject matter has been added thereto.

Respectfully submitted,

Bell & Arkin
BELL & ARKIN

/smu
Encls.



Bell, Walter & Brousseau
P.O. Box 2450, Station D
Ottawa, Ontario
K1P 5W6

SEP 8 1992

SEP - 8 1992

Application No.: 558,504
Classification: 6fl. Cl.354/Sub.Cl.49
Examiner: A. Armstrong

Telephone: (819) 997-1043
Your File No.: 917-188C
Applicant: Kazimierz Tchorzewski
Title: MULTI-USER SPEECH RECOGNITION SYSTEM

FAILURE TO REPLY TO THE REQUIREMENTS OF THIS REPORT WITHIN 4 MONTHS OF THE DATE
HEREOF WILL RESULT IN ABANDONMENT OF THE APPLICATION UNDER RULE 138 OF THE
PATENT RULES.

M. LEESTI
COMMISSIONER OF PATENTS

Prior to the formal examination of this application for patentable subject
matter, certain features require amendment to conform to the Patent Act and the
Patent Rules.

Correction(s) under the following Patent Rules and Sections of the Patent Act
is/are required.

This application contains the specification as originally filed.

The number of claims in this application is 2.

The applicant is required pursuant to Section 37 of the Patent Act to affix
descriptive labelling to all blank "blocks" throughout Figure 1 of the
drawings.

Under Rule 40 of the Patent Rules, the examiner requires the particulars of the
prior art cited in the prosecution of the corresponding United States and
European Patent Office applications and the patent numbers if granted.

Applicant, at this time, may wish to amend the claims of the application in
view of foreign prosecution, such action may possibly expedite the prosecution
of this application.

G. Boyer
Examination Assistant

jf/pre/s1

IN THE CANADIAN PATENT OFFICE

Serial No.: 558,504
Title : MULTI-USER SPEECH RECOGNITION SYSTEM
Filed : February 9, 1988
Applicant : Kazimierz Tchorzewski
Classif. : Cl. 354 Sub.Cl. 49 Div. 2 6fl.
Examiner : A. Armstrong
Our File : 917-188C

Commission of Patents and Industrial Property Consumer and Corporate Affairs CANADA	
JAN 8 1993	
File	Declarer
Chargé	Recevoir

The Commissioner of Patents,
Ottawa/Hull, Canada

January 8, 1993

Dear Sir:

In response to the outstanding Office Action dated September 8, 1992, the applicant wishes to amend the above identified application as follows:

IN THE DISCLOSURE

Please cancel pages 2 and 3 of record, and substitute therefor amended pages 2, 3, 3a and 3b submitted herewith.

IN THE CLAIMS

Please cancel claims 1 and 2 of record, and substitute therefor claims 1 to 16.

IN THE DRAWINGS

Please cancel the drawing sheets bearing Figure 1 and Figures 2a and 2b of record, and substitute therefor the drawing sheets bearing amended Figure 1 and Figures 2a and 2b submitted in duplicate herewith.

REMARKS

The Applicant appreciates the Examiner's attention to the above-identified application.

The Examiner has required the Applicant to provide particulars of prior art under Rule 40 of the Patent Rules.

The Examiner is advised that the corresponding

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United States application matured to United States Patent No. 4,922,538 on May 1, 1990. The applicant submits herewith a copy of the front page of the corresponding United States patent aforesaid which lists the art cited during the prosecution process.

Regarding the prior art cited against the now allowed corresponding European Patent application, the Applicant attaches hereto a copy of a European Search Report issued with respect to the corresponding European Patent application. Further, attached hereto is a copy of each of the references listed in the European Search Report excepting the first thereof. It is noted that each reference cited therein is designated as being of technological background interest only.

If the Examiner elects to cite against this application any one of the references now made of record herein, he is respectfully urged to particularize his objections in full and complete detail so that any issues involved with respect thereto may become fully and clearly defined and of the prosecution record herein.

The Applicant submits herewith as required by the Examiner an amended Figure 1 wherein the previously blank "blocks" bear descriptive labelling. Further, Figures 2a and 2b have also been amended to include descriptive labelling for the "blocks" therein and have further been amended to conform with the equivalent figures of the corresponding United States patent. The specific amendments effected to the drawings are indicated in red ink on the attached prints of the original drawings.

The claims now made of record correspond substantially to those which have been allowed in the corresponding European Patent application and those which issued in the corresponding United States patent.

The Applicant has also amended the disclosure to introduce statements of invention corresponding in scope to the independent claims now made of record. The precise amendments to the disclosure are as follows:

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CA 1335002 1993-01-08

Page 2 lines 24-34 and

Page 3 lines 1-10 have been deleted and statements of invention have been inserted in lieu thereof.

It is submitted that no new subject matter is been introduced by way of the amendments undertaken to the disclosure, claims or drawings.

It is believed this application is now in good condition for substantive examination and early action in that respect is accordingly courteously solicited.

Respectfully submitted,

Bell, Walter & Brousseau

BELL, WALTER & BROUSSEAU

Enclosures.
GRB\DRC

B



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
A	ELECTRICAL COMMUNICATION, vol. 59, no. 3, 1985, pages 273-280, New York, US; H. MULLA et al.: "Application of speech recognition and synthesis to PABX services" * Page 274, left-hand column, lines 32-38 *	1	G 10 L 5/06
A	NACHRICHTENTECHNISCHE ZEITSCHRIFT NTZ, vol. 37, no. 8, August 1984, pages 496-499, Berlin, DE; M. IMMENDÖRFER et al.: "Sprachgesteuertes Telefon mit elektronischem Telefonregisterspeicher" * Page 498: "Verschiedene Referenzmustersätze für mehrere Benutzer" *	1	
A	US-A-3 638 198 (E. BALOGH) * Abstract *	1	
A	EP-A-0 038 189 (SPERRY CORP.) * Abstract *	1	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	US-A-4 385 359 (M. WATARI) * Abstract *	1	G 10 L 5/06
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 01-06-1988	Examiner ARMSPACH J.F.A.M.
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