PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H04J 3/02 — A1

(11) International Publication Number: **WO 00/11818**

(43) International Publication Date: 2 March 2000 (02.03.00)

(21) International Application Number: PCT/US98/17422

(22) International Filing Date: 25 August 1998 (25.08.98)

(71) Applicant: HARRIS CORPORATION [US/US]; 1025 West NASA Boulevard, Melbourne, FL 32919 (US).

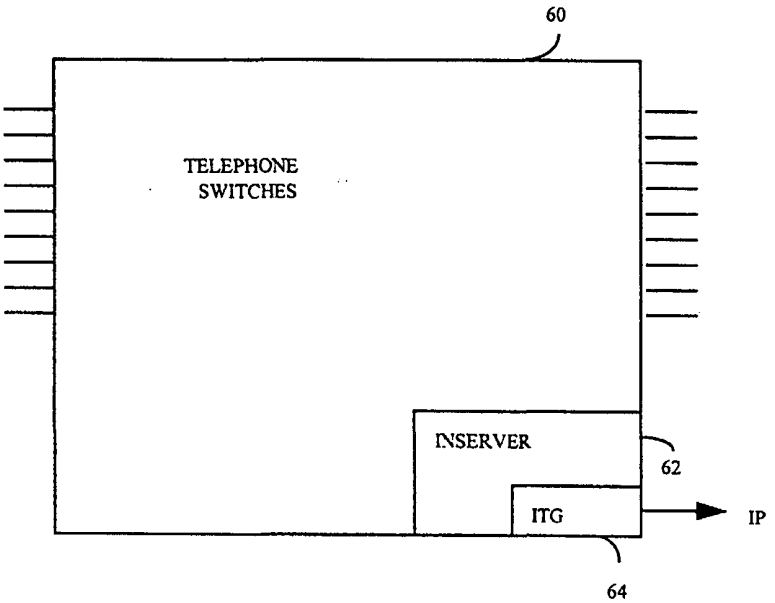
(72) Inventor: BAILIS, Jason; 40 Bridle Path Lane, Novato, CA 94945 (US).

(74) Agents: ROGERS, L., Lawton, III et al.; Rogers & Killeen, Suite 400, 510 King Street, Alexandria, VA 22314 (US).

(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: INTEGRATION OF INTERNET TELEPHONY GATEWAY HARDWARE



(57) Abstract

Integration of packet based internet telephony gateways (ITG) (64) to circuit based such as the Harris corporation 20/20 switch (60) by use of an industry standard architecture adaptor card (ISAAC) (62) which translates the pulse code modulated (PCM) output signal of a circuit switch, such as a private branch exchange (PBX) or tandem, to signal computing system architecture (SCSA) or multi-vendor integration protocol (MVIP) acceptable to an internet protocol (IP) translator connected to an LAN or the internet. Integration into the telephone switch cabinet also protects the ITG from external electromagnetic radiation, while at the same time reducing the emission of electromagnetic radiation.

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.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

INTEGRATION OF INTERNET TELEPHONY GATEWAY HARDWARE

BACKGROUND OF THE INVENTION

The present invention relates generally to internet telephony and more particularly to the integration of the internet telephony gateway ("ITG") into the telephony switch.

In prior art computer telephony integration systems, subscriber telephones are connected through a switching platform and an internet telephony gateway (ITG) to an Internet network. As shown in Figure 1, the Internet 10 is conventionally available to a number of different types of equipment by connection through ITGs 12, 14, 16 and 18.

By integration of the ITG 18 into the telephone switch 20, significant resources are saved and the robustness of the ITG is significantly enhanced.

Higher level of control over the conversion of IP to PCM format is available because of the integrated microprocessor control.

The flow control provided by the integration allows the switch microprocessor to utilize multiple IP connections in an efficient manner, avoiding overflowing an IP connection and distorting the encoded voice conversations. Flow control also permits the use of alternate routes when IP connections fail or are overloaded, least cost routing, and out of band DTMF detection.

Further, the problems associated with obtaining type approval of ITGs throughout the world of the Internet are significantly reduced by integration of the ITG into a telephony switch which already enjoys type approval.

It is accordingly an object of the present invention to

provide a novel integrated telephony switch and internet gateway or interface and method.

It is accordingly an object of the present invention to provide a novel method and integrated telephony switch and internet gateway or interface.

It is another object of the present invention to provide a novel method and integrated telephony switch and internet gateway which significantly reduces the number of components and thus the expense of the system.

It is yet another object of the present invention to provide a novel method and integrated telephony switch and internet gateway in which administration is provided from a single point thus reducing the real cost of system operation.

It is still another object of the present invention to provide a novel method and integrated telephony switch and internet gateway in which the robustness of the ITG is significantly enhanced.

It is yet still another object of the present invention to provide a novel method and integrated telephony switch and internet gateway in which a higher level of flow control is achieved.

These and many other objects and advantages will be readily apparent to one skilled in this art from a perusal of the claims and the following detailed description when read in conjunction with the appended drawings.

THE DRAWINGS

Figure 1 is pictorial representation of the prior art internet illustrating some of the users.

Figure 2 is a pictorial representation of a portion of Figure 1 showing a typical prior art internet telephone system.

Figure 3 is a pictorial representation of a prior art telephony switch in use in an Internet telephone system.

Figure 4 is a pictorial representation of one embodiment of the ITG of the present invention;

Figure 5 is schematic diagram representing one way of implementing the ITG of the present invention.

THE DETAILED DESCRIPTION

As shown in more detail in the prior art system of Figure 2, a telephone 22 is connected conventionally to a circuit switch 24 which in turn is connected through an ITG 26 to an IP network such as the Internet or a private LAN 28. A second telephone 30 is also connected to a circuit switch 32 and through an ITG 34 to the IP network 28. In this way, the first telephone 22 may communicate with the telephone 30 via the IP network. The references hereinafter to the Internet are intended to be generic to the Internet and to any other IP network.

With reference to the prior art system illustrated in Figure 3, a conventional telephony switch 40 includes the telephone switches 42 which receive the incoming calls and apply them through an interface circuit I1 to provide a T1 or other conventional telephone truck which is in turn connected to the public switched telephone network ("PSTN") 44.

The telephony switch 40 also includes a microprocessor 46 which controls the switching, signaling detection and signaling generation (trunking) of the calls in the interface I1 and

which also provides control signals, converted in an interface I3 to a sophisticated inter-switch signaling format such as Signaling System 7 ("SS7") for application to the Intelligent Network ("IN") 48 overlay to the PSTN.

With continued reference to Figure 3, the circuit switched T1 signal from the telephony switch is applied through an Internet Telephone Gateway ("ITG") 50 to provide one or more signals in the packet switched Internet Protocol ("IP") suitable for application to the Internet 52 overlay on the PSTN. As will readily be understood, the ITG 50 provides a T1 to IP conversion which is outside the control of the microprocessor of the telephone switch.

With reference to Figure 4 where an embodiment of the present invention is illustrated, like numerical designations are used for like elements in the prior art system of Figure 3 to facilitate an understanding of the differences therebetween.

The telephone switch 40 of Figure 3 becomes an ITG 54. More specifically, the incoming calls are routed through the telephone switches 42 to the interface I1 for conversion in to a telephone trunk signal TI for application to the PSTN 44 in the same way illustrated in Figure 3. Likewise, the microprocessor 46 controls the trunking in the interface I1 and sends control signals through the interface I3 in the SS7 protocol for application to the IN 48.

However, the addition of an interface I2 integral with the ITG 54 and under the control of the microprocessor 46 converts the circuit switched telephone signals directly to the IP for

application to the Internet. This direct conversion of the outgoing calls to the IP before converted to a trunk format within the telephony switch converts the telephony switch to an ITG and obviates the need to convert the trunk signal T1 output from the interface I1 to IP.

The implementation of the ITG 54 shown in Figure 4 may be as shown in Figure 5 where a conventional telephone switch 60 such as the Harris Corporation 20/20 may be provided with an Integrated Network Server ("INServer") 62 as a card which can be inserted into the back plane of the switch 60.

The INServer 62 has access to all of the voice paths within the switch 60, thereby eliminating the need for trunk interfaces for interactive control of the IP packets.

An ITG card 64 such as the IP Telephony Card available from Analogic Corporation may be inserted into the INServer 62, thereby effecting the direct conversion of the PCM signal from the telephone switch to the internet packets necessary for acceptance by the Internet. By the use of this card, the switch itself may provide a IP trunk directly, making the telephony switch an ITG.

This integration of the ITG into the telephony switch reduces the number of expensive parts and the cost of administration of the system. In addition, it increases the robustness of the system by making the redundant power supplies of the switch available to the ITG, protects the ITG by inclusion in the large and strong physical case of the telephone switch, protects the ITG from electromagnetic radiation, limits the potential of electromagnetic radiation from the ITG, etc.

The higher level of flow control provided by the integrated conversion permits multiple IP connections, alternate routes and least cost routing.

A further advantage is realized in obtaining type approval of the equipment in that existing telephone equipment has generally been approved for service throughout the world and a modification to such a switch is easier than obtaining approval of additional equipment.

While preferred embodiments of the present invention have been described, it is to be understood that the embodiments described are illustrative only and the scope of the invention is to be defined solely by the appended claims when accorded a full range of equivalence, many variations and modifications naturally occurring to those of skill in the art from a perusal hereof.

WHAT IS CLAIMED IS:

1. In a method in which a telephone subscriber is connected through a circuit switched telephone switch to an internet gateway, which gateway converts switched packets of time division multiplexed data from the telephone switch into transmission controlled packets of data to which internet address data is attached to form a signal in an internet protocol for application to the internet, the improvement comprising the conversion of the circuit switched data into the packet switched internet protocol within the software of the telephone switch so as to eliminate the necessity for an external the internet telephony gateway.

2. In a method in which a telephone subscriber is connected through a circuit switched telephone switch to a telephony trunk, and from the telephony truck to an internet telephone gateway external to the telephone switch which converts the switched packets of data from the telephony trunk to transmission controlled packets of data and which attaches internet address data to form a signal in an internet protocol suitable for application to the internet, the improvement comprising the integration of an internet protocol trunk to the telephone switch thereby provide a data signal in an internet protocol directly from the telephone switch, thereby eliminating the necessity for the internet gateway.

3. A telephone switch comprising:

a plurality of input terminals each adapted to receive a PCM subscriber originated signal from a telephone line;

a plurality of output terminals each adapted to provide one of the PCM subscriber originated signals received by a

selected one of said input terminals;

switching means for selectively connecting one of said input terminals to one of said output terminals in response to data carried by the received signal;

a telephony trunk operably connected to said plural output terminals and responsive to data carried by the subscriber originated signal for selectively converting the subscriber originated signal into a telephony protocol for transmission over a telephone network; and

an internet package trunk operably connected to said plural output terminals and responsive to data carried by the subscriber originated signal for selectively converting the subscriber originated signal into an internet protocol for transmission over an internet compatible network.

4. A telephony switch comprising:

a plurality of input terminals each adapted to receive a pulse code modulated ("PCM") subscriber originated signal from a telephone line;

a plurality of output terminals each adapted to provide one of the PCM subscriber signals received by a selected one of said input terminals;

switching means for selectively connecting one of said input terminals to one of said output terminals in response to data carried by the received signal;

an application programming interface circuit for converting PCM subscriber originating signals received from said output terminals into data packets;

an integrated network server operably connected to receive the data packets from said application programming interface

circuit for providing host functions of a prepaid telephone system; and

an internet protocol interface circuit operably connected to said integrated network server to add internet routing and destination information to the data packets thereby to form an internet protocol trunk internal of said switching circuit.

5. An ITG comprising:

telephone switches;

a microprocessor;

a first interface circuit for converting the PCM output of the telephone switches to a telephone trunk protocol for application to a public switched telephone network under control of said microprocessor; and

a second interface circuit for converting the PCM output of the telephone switches to Internet compatible packet switched protocol for application to the Internet under the control of said microprocessor.

6. The ITG of Claim 5 including a third interface for converting signals from said microprocessor to a protocol suitable for application to in intelligent network overlay for a PSTN.

7. A telephone switch comprising:

a first plurality of input terminals each adapted to receive a pulse code modulated subscriber originated signal from a telephone line;

a second plurality of input terminals each adapted to receive a special control signal (e.g., digit gathering, dial tone, DTMF conversion, voice, and BS);

a plurality of output terminals each adapted to provide

one of the PCM subscriber signals received by a selected one of said input terminals;

switching means for selectively connecting one of said input terminals to one of said output terminals;

computer means (a) adapted to be operably connected to a remote prepaid data base and (b) operably connected with said input and said output terminals for (i) controlling the operation of said switching means, (ii) for providing all of the host functions of a prepaid telephone system in response to data received from the subscriber originated signals and the remote prepaid data base and (iii) for converting the PCM subscriber originating signals received from said output terminals to data packets in an internet protocol, whereby an internet protocol trunk internal of said switching circuit is formed and the need of trunk interfaces is eliminated.

8. The telephone switch of Claim 7 wherein said computer means includes an integrated network server having a distributed application computing system architecture ("SCSA") card, an internet protocol interface circuit to add internet routing and destination information to the data packets.

9. An integrated telephone exchange and internet gateway comprising:

a telephone exchange connected to a plurality of individual telephones using PCM protocol signals and providing a PCM output signal;

a translator operably connected to said telephone exchange for converting the PCM output signal from the telephone exchange into a T1 output signal;

a server operably connected to said translator for converting the T1 formatted signal therefrom into either a SCSA or MVIP format signal; and

a transducer operably connected to said server to convert the SCSA or MVIP format signal from said server into an IP format signal for direct application to a local area computer network and to the internet.

10. The method of increasing the robustness of a system in which a telephone subscriber is connected through a circuit switched telephone switch to an internet gateway connected to the internet, the improvement comprising the step of:

(a) effecting within the physical cabinet of the telephone switch the translation of the conventional PCM output signal from the telephone switch into a T1 format, the translation of the T1 formatted signal into either a SCSA or MVIP format signal and the translation of the SCSA or MVIP format signal into a IP format signal acceptable by a local area network for direct application to the internet

thereby affording the translator circuits the physical protection of the telephone switch cabinet, making the redundant power supplies of the telephone switch available to the translator circuits and reducing susceptibility to electromagnetic radiation.

11. In a system in which a telephone subscriber is connected through a circuit switched telephone switch to an internet gateway operably connected to the internet, the improvement comprising means within the telephone switch (i) for translating the conventional PCM output signal from the telephone switch into a T1 format, and (ii) translating the T1

formatted signal into a IP format acceptable by a local area network for direct application to the internet.

12. An integrated telephone exchange and internet gateway comprising:

a telephone exchange connected to a plurality of individual telephones using PCM protocol signals and providing a PCM output signal;

a translator operably connected to said telephone exchange for converting the PCM output signal from the telephone exchange into a T1 output signal;

a server operably connected to said translator for converting the T1 formatted signal therefrom into either a SCSA or MVIP format signal; and

a transducer operably connected to said server to convert the SCSA or MVIP format signal from said server into an IP format signal for direct application to a local area computer network and to the internet.

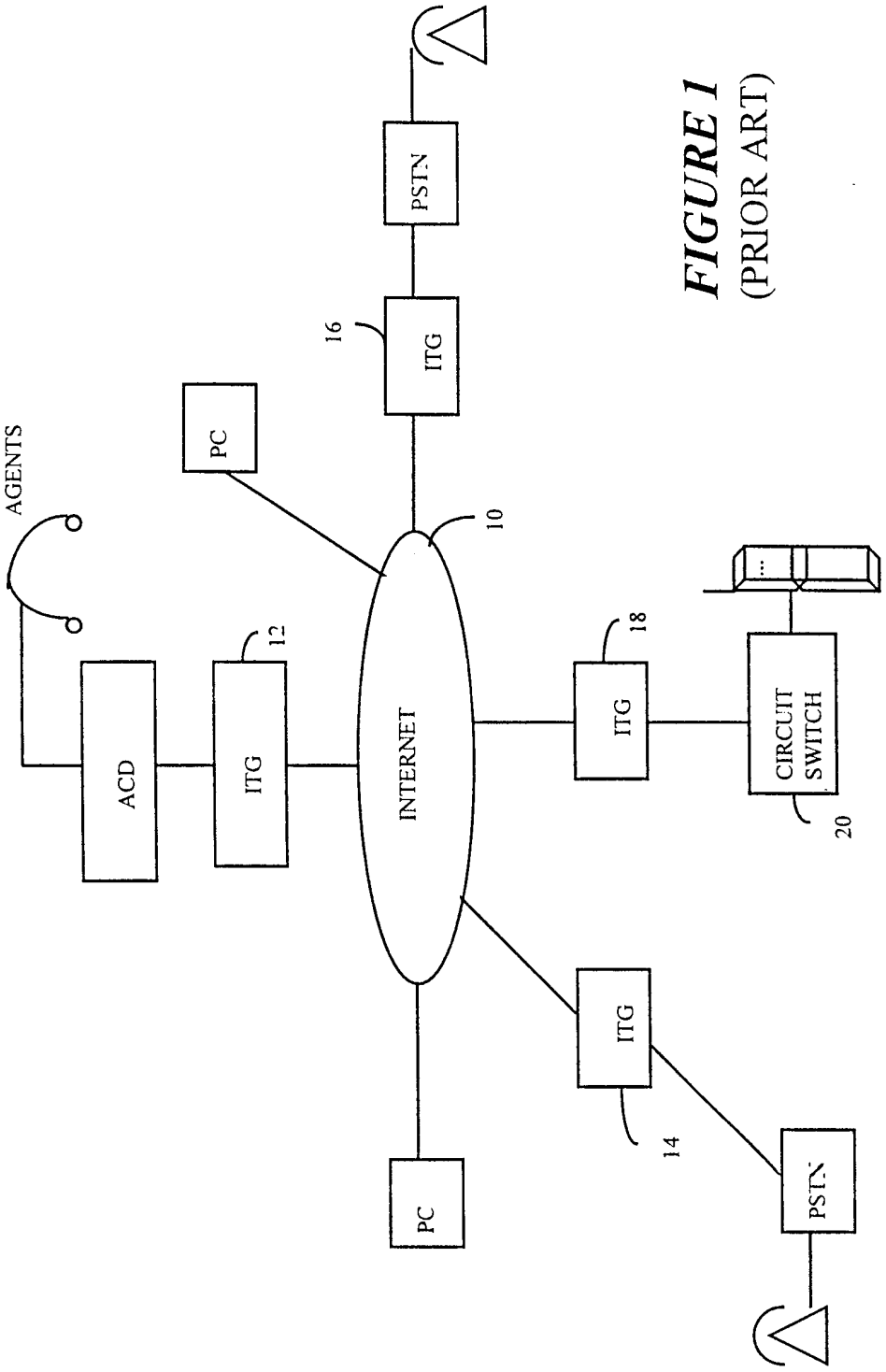


FIGURE 1
(PRIOR ART)

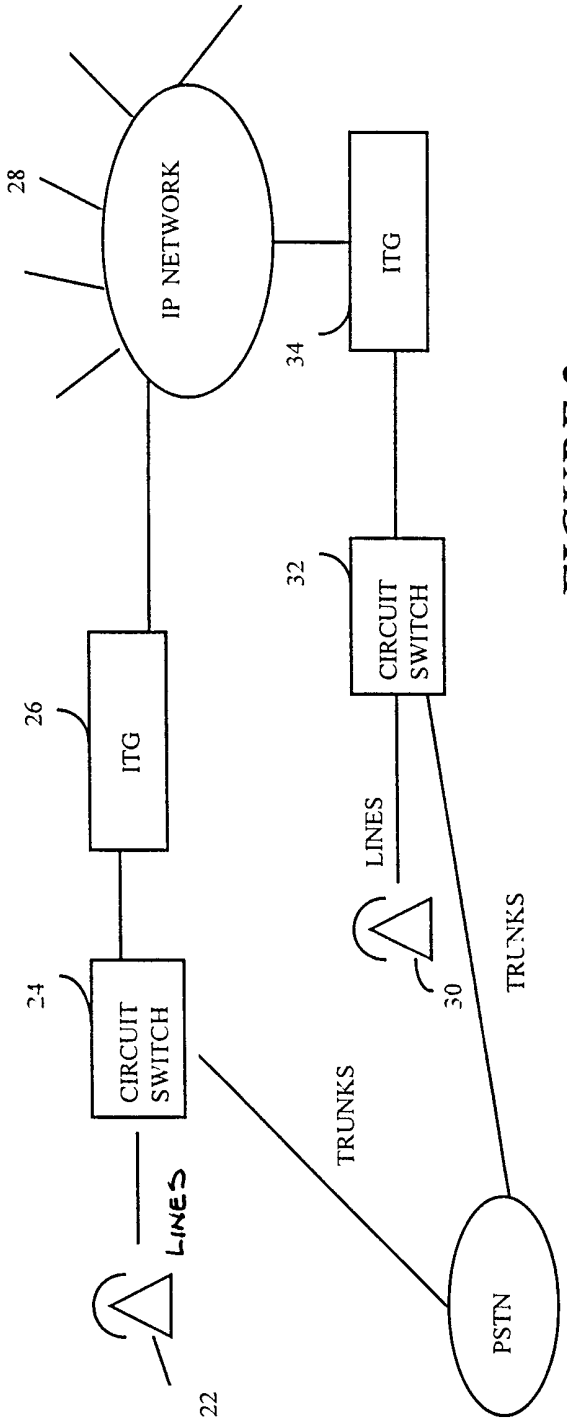


FIGURE 2
(PRIOR ART)

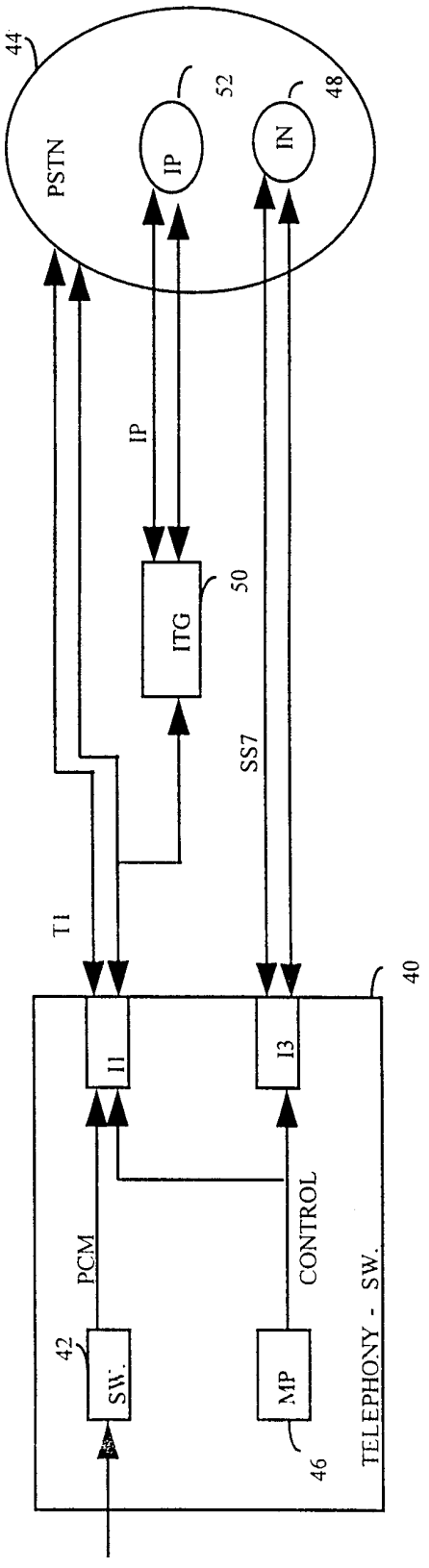


FIGURE 3 (PRIOR ART)

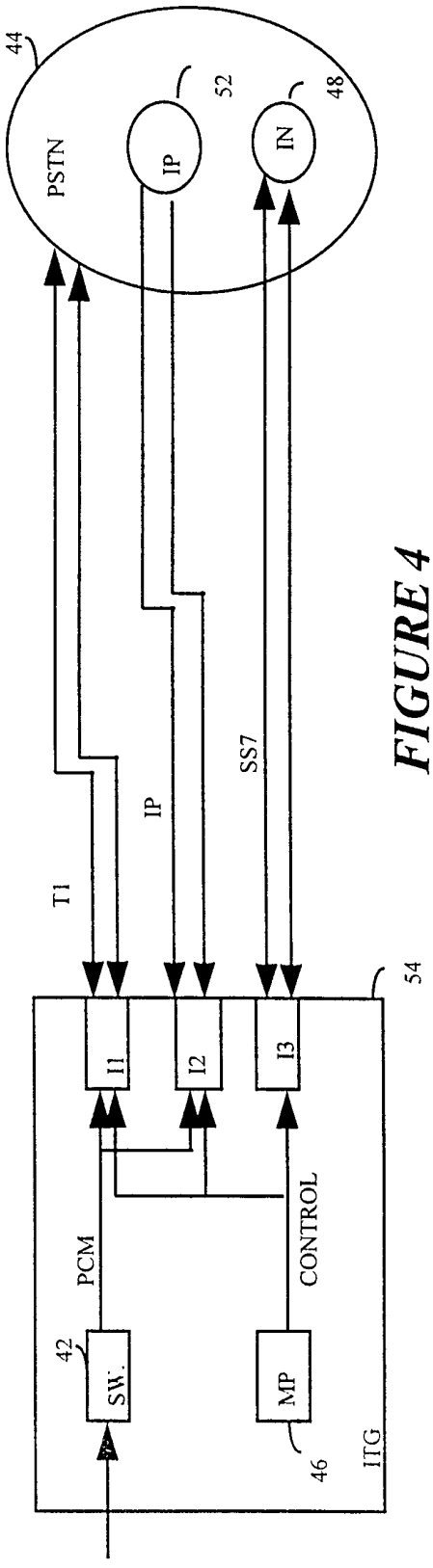


FIGURE 4

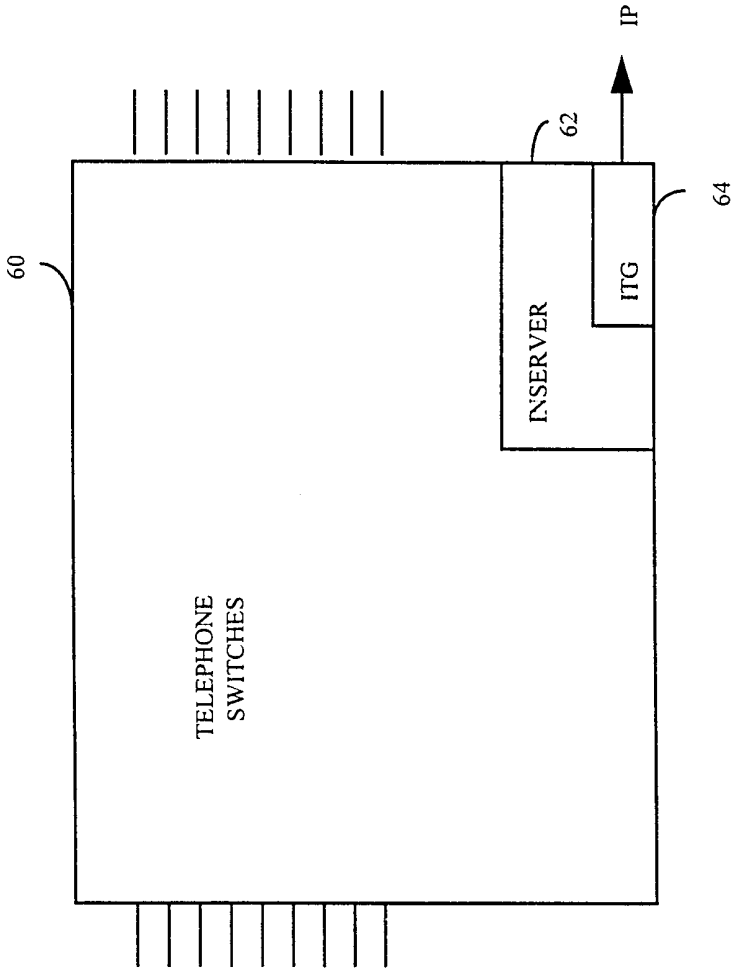


FIGURE 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/17422

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :H04J 3/02
US CL :370/352

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 370/352, 353, 354, 355, 356, 401, 402; 379/90.01, 93.01, 93.14, 93.15

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,487,103 A (RICHARDSON, JR. et al) 23 January 1996, figure 2.	1-7 and 11
A	US 5,712,907 A (WEGNER et al) 27 January 1998, figures 2, 5 and 6.	1-12
A	US 5,793,762 A (PENNERS et al) 11 August 1998, figure 1.	1-12

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"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
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"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
"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)	"&"	document member of the same patent family
"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		

Date of the actual completion of the international search 25 OCTOBER 1998	Date of mailing of the international search report 15 JUN 1999
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer HUY D. VU Telephone No. (703) 308-6602

Form PCT/ISA/210 (second sheet)(July 1992)★