



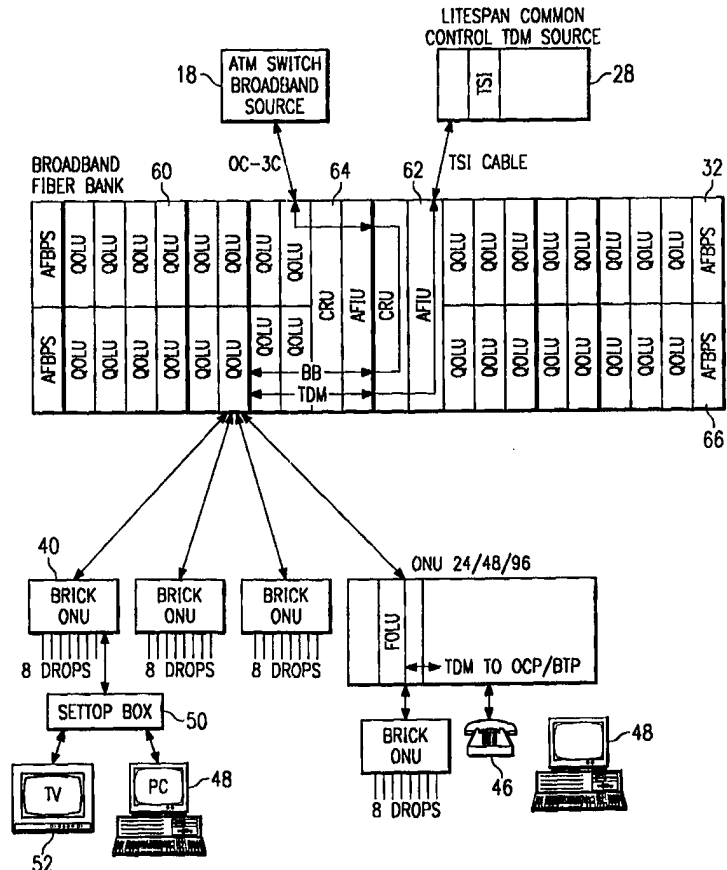
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/US97/21553 (22) International Filing Date: 25 November 1997 (25.11.97) (30) Priority Data: 60/031,895 27 November 1996 (27.11.96) US (71) Applicant: DSC TELECOM L.P. [US/US]; 1000 Coit Road, Plano, TX 75075 (US). (72) Inventors: LEWIS, Stephen; 7500 Silverado Trail, Napa, CA 94558 (US). STEVENSON, K., Martin, III; 7 Cabrillo Court, San Rafael, CA 94903 (US). NABAVI, Farzad, S.; 168 Graylawn Avenue #D, Petaluma, CA 94952 (US). MILLET, Catherine, A.; 547 Lydia Court, Rohnert Park, CA 94928 (US). DOVE, Jason; 10 Jeffrey Court, Novato, CA 94945 (US). (74) Agent: FISH, Charles, S.; Baker & Botts, L.L.P., 2001 Ross Avenue, Dallas, TX 75201-2980 (US).</p>	<p>(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, 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, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report.</p>	

(54) Title: TELECOMMUNICATIONS SWITCH FOR PROVIDING TELEPHONY TRAFFIC INTEGRATED WITH VIDEO INFORMATION SERVICES

(57) Abstract

A telephony and video telecommunications distribution network (10) includes a broadband fiber bank section (32) within a digital loop carrier system (22). The broadband fiber bank section (32) receives video information from a stored video information provider (12) through a broadband asynchronous transfer mode switch (18). The video information is received in an asynchronous transfer mode cell format. The digital loop carrier system (22) receives telephony traffic from a telephony network (24) at a common control section (28). The common control section (28) passes the telephony traffic to the broadband fiber bank section (32) where it is converted into asynchronous transfer mode cell form. The broadband fiber bank section (32) multiplexes video asynchronous transfer mode cells and telephony asynchronous transfer mode cells for transport to an optical network unit (40) over a fiber optic communication link (38).



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TELECOMMUNICATIONS SWITCH FOR
PROVIDING TELEPHONY TRAFFIC INTEGRATED
WITH VIDEO INFORMATION SERVICES

TECHNICAL FIELD OF THE INVENTION

The present invention relates in general to telecommunications networks and more particularly to a telecommunications switch for providing telephony traffic
5 integrated with video information services.

BACKGROUND OF THE INVENTION

Over the past decade, telephone companies have been confronted with increasing competition for their core
10 businesses. Revenues from telephone services are either flat or in a declining state. In order to improve profit margins, telephone companies have dramatically reduced staff levels and diversified their businesses to reduce their reliance on telephone service profits. Telephone
15 companies desire to expand revenue opportunities through the offering of new services. The most significant new service with respect to the residential customer is the delivery of video services such as analog multicast, digital multicast, and switched digital capabilities.
20 Telephone companies look to gain a share of the cable television and video cassette rental revenue streams and to grow the total available market through successful

marketing and distribution of new on-demand video services. Therefore, it is desirable that video services can be provided by telephone companies along with telephony services that are currently offered.

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SUMMARY OF THE INVENTION

From the foregoing, it may be appreciated that a need has arisen for a telecommunications switch that can provide both telephony traffic and video information. In accordance with the present invention, a telecommunications switch for providing telephony traffic integrated with video information services is provided that substantially eliminates or reduces disadvantages and problems associated with conventional telecommunications switches.

According to an embodiment of the present invention, there is provided a telecommunications switch that includes a common control section for processing telephony traffic received from a telephony network. The telecommunications switch also includes a broadband fiber bank section that receives video information carried in asynchronous transfer mode cells from a video information provider. The common control section provides telephony traffic to the broadband fiber bank section. The broadband fiber bank section places the telephony traffic into asynchronous transfer mode cells and multiplexes telephony asynchronous transfer mode cells with video asynchronous transfer mode cells for transport to an optical network unit.

The present invention provides various technical advantages over convention telecommunications switches. For example, one technical advantage is to integrate

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telephony traffic and video information. Another technical advantage is to place telephony traffic into asynchronous transfer mode cells for multiplexing with video asynchronous transfer mode cells. Yet another technical advantage is to integrate video services into a conventional telecommunications switch. Other technical advantages are readily apparent to one skilled in the art from the following figures, description and claims.

10 BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and the advantages thereof, reference is now made to the following description taken in conjunction with the accompanying drawings, wherein like reference numerals represent like parts, in which:

FIGURE 1 illustrates a block diagram of a telephony and video telecommunications distribution network;

FIGURE 2 illustrates a block diagram showing information flow through a broadband fiber bank section within a telecommunications switch of the telephony and video telecommunications distribution network;

FIGURE 3 illustrates a block diagram of the broadband fiber bank section;

FIGURE 4 illustrates a block diagram of a fiber bank interface unit of the broadband fiber bank section;

FIGURE 5 illustrates a block diagram of a programmable gate array within the fiber bank interface unit;

FIGURE 6 illustrates a block diagram of a cell routing unit of the broadband fiber bank section;

FIGURE 7 illustrates a block diagram of an optical line unit in the broadband fiber bank section;

DETAILED DESCRIPTION OF THE INVENTION

5 FIGURE 1 is a block diagram of a telephony and video telecommunications distribution network 10. Telephony and video telecommunication distribution network 10 includes a stored video information provider 12 and a broadcast video information provider 14 that each generate video signals. 10 Video signals generated by stored video information provider 12 and broadcast video information provider 14 are transferred to a video operation center 16. Video operation center 16 includes a broadband asynchronous transfer mode switch 18 that receives switched digital 15 video signals from stored video information provider 12. Broadband asynchronous transfer mode switch 18 places the switched digital video signals into asynchronous transfer mode cells for transfer to a telephony and video serving office 20. Similarly, video operation center 16 includes 20 a real-time motion picture experts group encoder 19 that receives broadcast digital video signals from broadcast video information provider 14. Real-time motion picture experts group encoder 19 places the broadcast digital video signals into asynchronous transfer mode cells for transfer 25 to telephony and video serving office 20.

 Telephony and video serving office 20 includes a digital loop carrier system 22 that receives switched digital video information from broadband asynchronous transfer mode switch 18, broadcast digital video 30 information from real-time motion pictures experts group

encoder 19, and telephony traffic from a telephone network 24 through a voice switch 26. Digital loop carrier system 22 includes a common control section 28, a channel bank section 30, a broadband fiber bank section 32, a digital
5 multicast bank section 34, and a broadband channel bank section 36.

Common control section 28 provides processing, control, memory, craft interfaces, and operating system interfaces in order to control telephony and video traffic
10 through each section of digital loop carrier system 22. Narrowband channel bank section 30 provides for the processing of telephony only traffic for local and remote customers. Broadband fiber bank section 32 receives switched digital video signals from broadband asynchronous
15 transfer mode switch 18 and telephony signals from common control section 28 in order to provide integrated video and telephony information transfer. Digital multicast bank 34 terminates the broadcast digital video information from real-time motion pictures expert group encoder 19 for
20 delivery to broadband fiber bank section 32. Though shown as terminating on separate sections, the switched digital video signals and broadcast digital video signals could terminate on the same section of digital loop carrier system 22. Separate termination provides flexibility to
25 respond to the needs and requirements of the area serviced by digital loop carrier system 22. Broadband channel bank 36 provides for the delivery of video information to customers in the local area of digital loop carrier system 22 as provided by broadband fiber bank section 32.

For remote delivery of video and telephony information, broadband fiber bank section 32 places telephony information into telephony asynchronous transfer mode cells and video information into video asynchronous transfer mode cells. Telephony asynchronous transfer mode cells and video asynchronous transfer mode cells are multiplexed onto optical fiber links 38 for distribution to optical network units 40. Optical network units 40 may provide cable to the home, twisted pair to the home, and fiber to the home distribution capability to provide for the delivery of telephony and video information to a customer 42 through a network termination unit 44 for operation of telephones 46, computers 48, and other office machines, and set top boxes 50 for television monitors 52. Telephony and video control information may be generated at customers 42 and appropriately transferred through a return path for processing by telephony and video telecommunications distribution network 10.

FIGURE 2 is a block diagram showing a simplified information flow through broadband fiber bank section 32. Broadband fiber bank section 32 includes a plurality of optical line units 60, redundant fiber bank interface units 62, and redundant cell routing units 64. Operating power is provided to broadband fiber bank section 32 through a fiber bank power supply 66. A fiber bank backplane 68 provides the interconnections for each unit of broadband fiber link section 32. Optical line units 60 provide an optical interface between broadband fiber bank section 32 and a video information source such as broadband asynchronous transfer mode switch 18. Optical line unit 60

also provides an interface between broadband fiber bank section 32 and a variety of optical network unit 40 configurations. Cell routing unit 64 provides an asynchronous transfer mode switching fabric and asynchronous transfer mode cell distribution function for broadband fiber bank section 32. Fiber bank interface unit 62 provides a time slot interchange communication interface for the delivery of telephony traffic between common control section 28 and optical line unit 60.

Video information in asynchronous transfer mode cells is received from broadband asynchronous transfer mode switch 18 at optical line unit 60. Optical line unit 60 transfers the video asynchronous transfer mode cells to cell routing unit 64 for appropriate switching to an output optical line unit 60. Time division multiplexed telephony traffic is received from a time slot interchanger 69 of common control section 28 at fiber bank interface unit 62. The narrowband telephony traffic is routed through fiber bank interface unit 62 to the appropriate output optical line unit 60. Output optical line unit 60 places the narrowband telephony traffic into asynchronous transfer mode cells and multiplexes the generated telephony asynchronous transfer mode cells with the video asynchronous transfer mode cells received from cell routing unit 64 for distribution to optical network units 40. Optical network units 40 distribute video information from the video asynchronous transfer mode cells to television 52 and/or computer 48 through set top box 50. Optical network units 40 also provide telephony traffic from telephony asynchronous transfer mode cells to telephone 46 and

computer 48. For more information on the operation of optical network units 40 and the different configurations thereof, please refer to co-pending U.S. Patent Application Serial No. _____, entitled "Optical Network Unit
5 for Communicating Telephony and Video Information", which is hereby incorporated by reference herein.

FIGURE 3 is a simplified block diagram of the interconnections between each unit within broadband fiber bank section 32. Fiber bank interface units 62 terminate
10 signals from time slot interchangers 69 within common control section 28. A host control bus interface 70 allows for communications between fiber bank interface unit 62 and cell routing unit 64. A TDM interface 72 is also provided between fiber bank interface unit 62 and cell routing unit
15 64. Redundant fiber bank interface units 62 communicate with each other over a simplex control bus 74. Telephony traffic is transferred between fiber bank interface unit 62 and optical line unit 60 over an octal bus 76. Control and interrupt communications between fiber bank interface
20 unit 62 and optical line unit 60 are carried over a datalink bus 78. Video traffic is carried between cell routing units 64 and optical line units 60 over a cell bus 80. Fiber bank interface unit 62 communicates with fiber bank power supply unit 66 over a serial peripheral
25 interface 82. Fiber bank back plane 68 provides the distribution network for all the clock and synchronization signals as well as the buses and communication links discussed above between each unit within broadband fiber bank section 32.

FIGURE 4 is a block diagram of fiber bank interface unit 62. Fiber bank interface unit 62 includes a processor unit 90, time slot interchange interface units 92, and a programmable gate array unit 94. Processor unit 90 provides the supervision and control for fiber bank unit 62. Time slot interchange interface units 92 terminate telephony data between fiber bank interface unit 62 and time slot interchangers 69 of common control section 28. Thirty-two subscriber bus interface signals and thirty-two octal bus signals are extracted from the time slot interchange signals. The subscriber bus interface signals carry control signals that are distributed to optical line unit 60. The octal bus signals carry the telephony traffic that is distributed to optical line units 60. Programmable gate array unit 94 provides control links for communications with cell routing unit 64 and optical line unit 60. Programmable gate array unit 94 also distributes cell bus clocks to optical line units 60 and cell routing units 62 and synchronous optical network clocks to optical line unit 60.

FIGURE 5 is a block diagram of programmable gate array 94. Programmable gate array unit 94 includes a processor interface 100 that allows programmable gate array unit 94 to communicate with processor unit 90 and a gate array interface 102 provides communications with time slot interchanger interface unit 92. A time division multiplex interface 104 allows for time division multiplex communications with cell routing unit 64. Maintenance and test capability is performed through a JTAG unit 106. A host control bus interface 108 provides for the

communications of control information between fiber bank interface unit 62 and cell routing units 64. Host control bus interface 108 also includes a simplex control bus that allows one cell routing unit 64 to communicate with both
5 fiber bank interface units 62 within broadband fiber bank 32. A serial peripheral interface selector 110 provides the chip selects for fiber bank power supply 66 as controlled by processor unit 90 through processor interface 100. A fiber bank datalink interface 112 provides the
10 capability for path layer messaging and code download from cell routing unit 64 through fiber bank interface unit 62.

A cell frame generator 114 generates and distributes a cell bus clock to optical line unit 60. A cell frame synchronization pulse is also distributed along with the
15 cell bus clock. A cell bus clock is synthesized from a free-running 25 MHz voltage controlled oscillator if fiber bank interface unit 62 is active. Otherwise, the redundant fiber bank interface unit 62 will frequency and phase lock with the cell bus clock synthesized from the active fiber
20 bank interface unit 62. The cell frame synchronization pulse synthesizes every 68 cell clock cycles based on the local cell clock if the fiber bank interface unit 62 is in the active mode. Otherwise, the redundant fiber bank interface unit 62 phase locks its cell frame
25 synchronization pulse to the cell frame synchronization pulse from the active fiber bank interface unit 62.

A SONET clock down generator 116 generates a SONET clock that is distributed to optical line unit 60. The SONET clock is synthesized from the 16.384 MHz octal bus
30 clock provided by time slot interchangers 69 of common

control section 28. The redundant fiber bank interface unit 62 will frequency and phase lock its SONET clock with the SONET clock from the active fiber bank interface unit 62. A SONET clock up monitor receives SONET upstream
5 clocks from optical line unit 60 and monitors them for integrity. One of the SONET upstream clocks is selected and a fractionalized SONET reference clock of 6.48 MHZ is transmitted to common control section 28 as TTL logic level balance line pairs.

10 FIGURE 6 is a block diagram of cell routing unit 64. Cell routing unit 64 includes a common memory 120, a switch chip set 122, upstream bus interface controllers 124, downstream bus interface controllers 126, a clock synthesizer 128, a switch processor 130, and a cell routing
15 unit programmable logic device 132. Common memory 120 queues all asynchronous transfer mode cell header, payload and switch-related attributes that is shared across all thirty-two ports of switch chip set 122. Queuing structures within common memory 120 are independent of data
20 path and cell scheduling memory. Common memory 120 preferably stores asynchronous transfer mode cells in a 64K word deep and a 57 byte wide memory area implemented in a 64K by 16 asynchronous static random access memory.

Switch chip set 122 includes memory access buffers
25 140, port interfaces 142 and switch controllers 144. Memory access buffers 140 interface common memory 120 to port interfaces 142. Each memory access buffer 140 consists of two identical elements. Each memory access buffer 140 element interfaces bi-directional serial data
30 from each of thirty-two cell bus ports through eight port

interfaces into a 32-bit parallel word. The 32-bit words from memory access buffers 140 form the 48-byte wide payload word that is written to and read from common memory 120.

5 Port interfaces 142 provide a point-to-point connection from memory access buffers 140 to utopia buses coupled to upstream bus interface controllers 124 and downstream bus interface controllers 126. Eight port
10 interfaces 142 through the eight upstream bus interface controllers 124 and downstream bus interface controllers 126 provide communications to thirty-two optical line units 60. Only payload information within asynchronous transfer mode cells are passed to and from memory access buffers 140. Header information within asynchronous transfer mode
15 cells is transferred to and from switch controllers 144 over a dedicated serial interface. Port interfaces 142 include first in, first out buffers that queue payload data for asynchronous transfer mode cells.

Switch processor 130 has access to port interface 142
20 registers through switch controllers 144. Switch controllers 144 manage and maintain queues in common memory 120. Preferably, 130 queues are maintained - four for each of the thirty-two ports, one CPU queue for access by switch processor 130, and one reset queue which is used for
25 returning used buffers back to the empty queue. Switch controllers 144 are also responsible for transferring cell header to and from port interfaces 142. Switch controllers 144 use this header information to access control and data structures. Switch controllers 144 also handle

asynchronous transfer mode cells generated at switch processor 130.

Upstream bus interface controllers 124 and downstream bus interface controllers 126 provide the interface to cell bus 80 for the transfer of video asynchronous transfer mode cells between cell routing unit 64 and optical line unit 60. The cell bus is a full duplex 8 bit wide data path to and from optical line unit 60. The data rate of the cell bus is selectable to support various bandwidths of service. Upstream bus interface controllers 124 and downstream bus interface controllers 126 adapt the utopia bus protocol of port interface 140 to the cell bus protocol. Gunning transistor logic buffers 146 buffer and real-time signals to and from the cell bus.

Cell routing unit programmable logic device 132 controls the interface with fiber bank interface unit 62 over the host control bus, timing generation or common memory 120, include logic functions for cell routing unit 64. Switch processor 130 communicates over the host control bus with processor unit 90 of fiber bank interface unit 62 through a message buffer memory located at fiber bank interface unit 62. The host control bus interface appears an 8 bit slave to switched processor 130. This 8 bit data bus is multiplexed with a 16 bit address in one direction control bit into two phases, address phase and data phase. Six additional control signals are transported without multiplex for a total of 23 host control bus interface pins to a message queue at fiber bank interface unit 62. Clock synthesizer 128 provides the clock distribution for cell routing unit 64 in response to cell

bus clocks received from fiber bank interface unit 62. Clock synthesizer 128 includes a series of phase lock loop drivers to generate the appropriate clock frequencies for cell routing unit 64.

5 Switch processor 130 is the main control processor within broadband fiber bank section 32. Switch processor 130 includes four independent serial communication controllers 150 that provide an Ethernet port, an R-Link port, and two TDM ports.

10 FIGURE 7 is a block diagram of optical line unit 60. Optical line unit 60 includes a cell bus interface controller 160, a clock recovery unit 162, a field programmable gate array 164, dual SONET physical layer interface units 166, a POTS gate array unit 168, a
15 microcontroller unit 170, and memory 172. Cell bus interface controller 160 receives cell bus information from and transfers cell bus information to redundant cell routing units 64 over cell bus connections. The necessary synchronization and clock signals for the cell bus are
20 provided by fiber bank interface unit 62. On the inbound side, cell bus interface controller 160 buffers and multiplexes cell bus information for transfer to programmable gate array 164. For the outbound side, cell bus interface controller 160 receives cell bus information
25 from programmable gate array 164, buffers, and demultiplexes the cell bus information for placement onto the cell bus. Cell bus buffers 161 provide real time gunning transistor logic signal conversion for the cell bus.

Programmable gate array 164 includes a cell bus interface 180 to interface asynchronous transfer mode cell traffic between optical line unit 60 and cell routing units 64. Cell bus interface 180 typically expects data from both cell routing units 64 and selects one of them for input. The multiplexing function is controlled by active and protect control signals from fiber bank interface unit 62. Cell bus interface 180 transmits redundant data to both cell routing units 64. Though shown separately, cell bus buffers 161 and cell bus interface controller 160 may be incorporated into cell bus interface 180. Cell bus interface 180 provides a full duplex, a bit-wide data path to and from optical line unit 60. The data rate for cell bus interface 180 is selectable between 25 MHZ or 100 MHZ to support ECR 2-3 or ECR-12, respectively. Local cell array within optical line unit 60 is synthesized from the system cell bus clock. Cell bus interface 180 provides a minimal amount of buffering in both the upstream and downstream directions for rate adaptation.

Programmable gate array 164 also includes an asynchronous transmitter mode adaptation layer interface 182 that provides the means for converting telephony time division multiplexed data to and from asynchronous transfer mode cells. Telephony time division multiplexed data is received from and transferred to fiber bank interface unit 62 over an octal bus. The octal bus is full duplex and may operate at 16 Mbits per second in either direction. The octal bus contains eight subscriber bus interfaces. The two octal buses may be terminated per optical line unit 60 wherein one octal bus is used for a

fiber bank datalink function. Asynchronous transfer mode adaptation layer interface 182 maps each subscriber bus interface of the octal bus into an appropriate asynchronous transfer mode cell format for transmission through a cell flow controller 184 and a utopia interface 186 to dual SONET physical layer interface 166.

An appropriate asynchronous transfer mode cell header and payload field is created for each cell destined for utopia interface 186. The header of the telephony asynchronous transfer mode cell created by asynchronous transfer mode adaptation layer interface 182 contains a valid time division multiplex macro address, containing GFC, VPI, VCI, PTI, and CLP fields. The HEC field is calculated and inserted by dual SONET physical layer interface 166. Header values are programmed by microcontrollers 170. For more information on the mapping of telephony traffic into and from asynchronous transfer mode cells, please refer to co-pending U.S. Patent Application Serial No. _____, entitled "Method and Apparatus for Placing Time Division Multiplexed Telephony Traffic into an Asynchronous Transfer Mode Format", which is hereby incorporated herein by reference. For an example of specific circuitry that maps telephony traffic to and from asynchronous transfer mode cells, please refer to co-pending U.S. Patent Application Serial No. _____, entitled "Optical Network Unit for Communicating Telephony and Video Information", which is hereby incorporated by reference herein.

Thus, it is apparent that there has been provided, in accordance with the present invention, a telecommunications

switch for providing telephony traffic integrated with video information services that satisfies the advantages set forth above. Although the present invention has been described in detail, it should be understood that various changes, substitutions, and alterations can be made herein. For example, though discussed in terms of video information generated by a video information provider, the present invention may equally be applicable to other types of packet data, including information from an information service provider in an Internet environment. Other examples are readily ascertainable to one skilled in the art and can be made herein without departing from the spirit and scope of the present invention as defined by the following claims.

WHAT IS CLAIMED IS:

1. A digital loop carrier system, comprising:
a common control section operable to process telephony traffic received from a telephony telecommunications network;
5 a broadband fiber bank section operable to process packet data traffic received from an information service provider, the common control section operable to provide telephony traffic to the broadband fiber bank section, the
10 broadband fiber bank section operable to integrate packet data traffic with telephony traffic into a common transport structure for transfer to a plurality of subscribers over a single communication link.
- 15 2. The digital loop carrier system of Claim 1, wherein packet data traffic is processed in asynchronous transfer mode cells, the broadband fiber bank section operable to place telephony traffic received from the common control section in asynchronous transfer mode cells,
20 the broadband fiber bank section operable to provide a stream of asynchronous transfer mode cells carrying packet data traffic and telephony traffic to the plurality of subscribers over the single communication link.
- 25 3. The digital loop carrier system of Claim 1, wherein the packet data traffic includes video information generated by a video information provider.

4. The digital loop carrier system of Claim 1, wherein the single communication link is an optical fiber carrying traffic at an OC-n rate.

5 5. The digital loop carrier system of Claim 1, further comprising:

a broadband channel bank operable to receive packet data traffic from the broadband fiber bank section, the broadband channel bank operable to provide packet data traffic to subscribers local to the digital loop carrier system separate from the single communication link.

6. The digital loop carrier system of Claim 1, wherein the broadband fiber bank is operable to receive the common transport structure from the plurality of subscribers over the single communication link, the broadband fiber bank operable to identify and separate telephony traffic in the common transport structure packet data traffic in the common transport structure, the broadband fiber bank operable to distribute packet data traffic to the information service provider and telephony traffic to the common control section.

7. A broadband fiber bank for a digital loop carrier system, comprising:

a first optical line unit operable to receive packet data traffic from an information service provider;

5 a fiber bank interface unit operable to receive telephony traffic from a telephony telecommunications network, the fiber bank interface unit operable to provide time slot interchange distribution for telephony traffic;

10 a routing unit operable to receive packet data traffic from the first optical line unit, the routing unit operable to provide distribution for the packet data traffic;

15 a second optical line unit operable to receive telephony traffic distributed from the fiber bank interface unit and packet data traffic distributed from the routing unit, the second optical line unit operable to place telephony traffic and packet data traffic into a common transport structure, the second optical line unit operable to transport the common transport structure carrying telephony traffic and packet data traffic over a single communication link.

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8. The broadband fiber bank of Claim 7, wherein the common transport structure is an asynchronous transfer mode cell.

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9. The broadband fiber bank of Claim 7, wherein the single communication link is an optical fiber carrying telephony traffic and packet data traffic at an OC-n rate.

10. The broadband fiber bank of Claim 7, wherein the first optical line unit is operable to receive packet data traffic in asynchronous transfer mode cells from an asynchronous transfer mode switching source.

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11. The broadband fiber bank of Claim 7, wherein the packet data traffic includes video information generated by a video information provider.

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12. The broadband fiber bank of Claim 7, wherein the second optical line unit is operable to receive the common transport structure carrying telephony traffic and packet data traffic over the single communication link from a plurality of subscribers, the second optical line unit operable to identify, separate, and extract telephony traffic carried in the common transport structure from packet data traffic carried in the common transport structure, the second optical line unit operable to transport telephony traffic to the fiber bank interface unit and packet data traffic to the routing unit.

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13. A method of transporting telephony traffic with packet data traffic, comprising steps of:

receiving packet data traffic from an information service provider;

5 receiving telephony traffic from a telephony telecommunications network;

placing packet data traffic and telephony traffic into a common transport structure;

10 transferring the common transport structure carrying telephony traffic and packet data traffic to a plurality of subscribers over a single communication link.

14. The method of Claim 13, further comprising steps of:

15 receiving the common transport structure from the plurality of subscribers over the single communication link;

separating the telephony traffic carried in the common transport structure from packet data traffic carried in the common transport structure;

20 providing telephony traffic carried in the common transport structure to the telephony telecommunications network; and

25 providing packet data traffic carried in the common transport structure to the information service provider.

15. The method of Claim 13, wherein the common transport structure is an asynchronous transfer mode cell format.

16. The method of Claim 13, wherein packet data traffic includes video information generated by a video information provider.

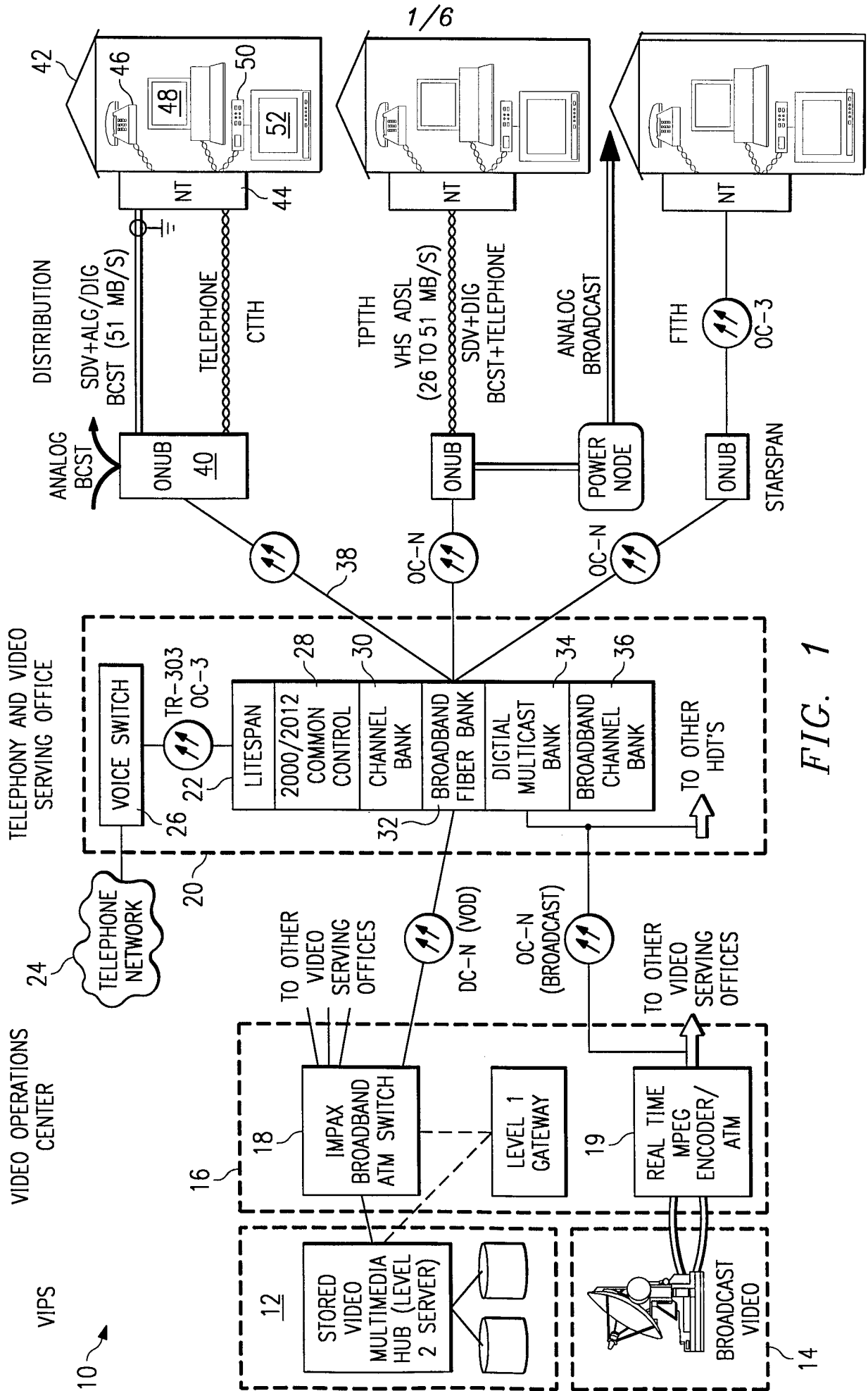


FIG. 1

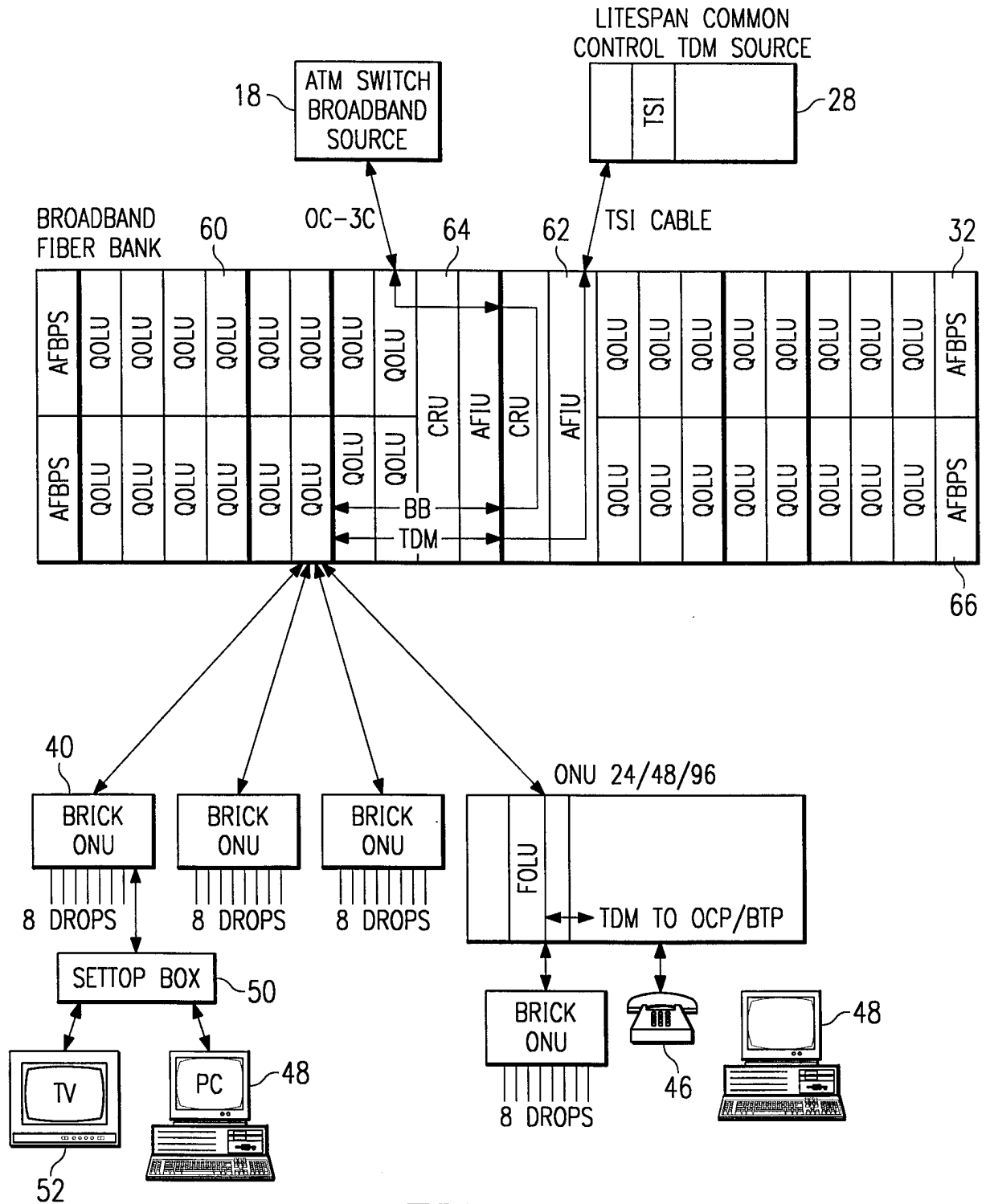


FIG. 2

FIG. 3

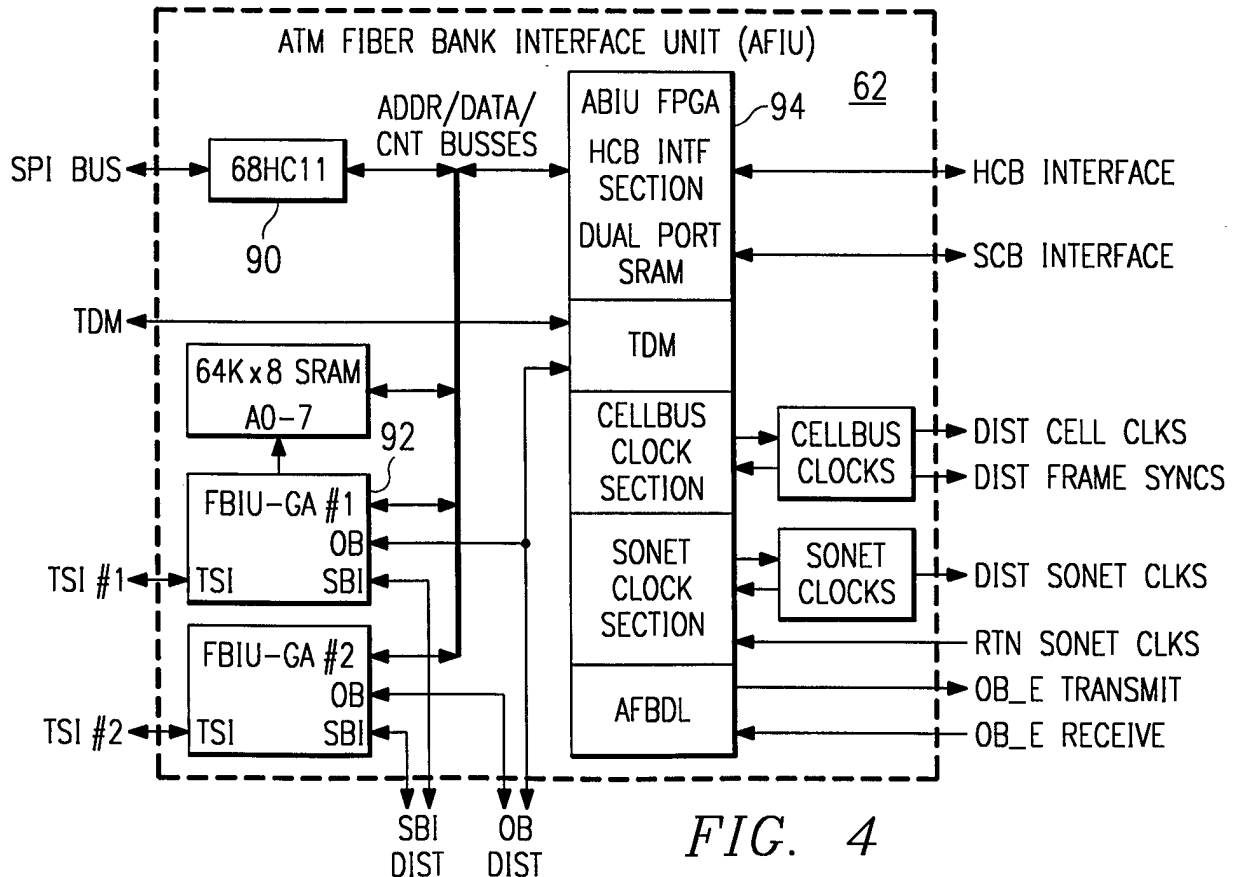
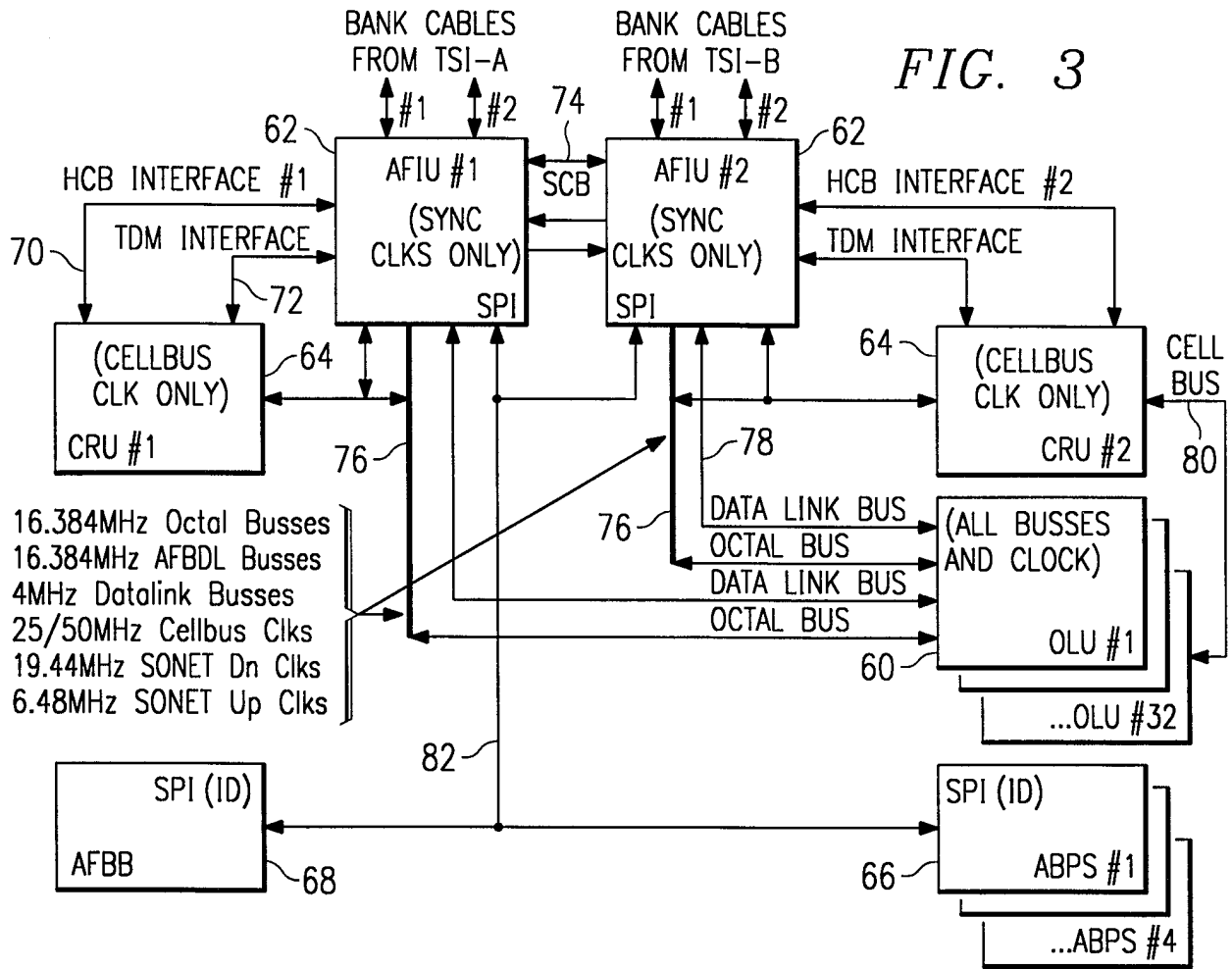


FIG. 4

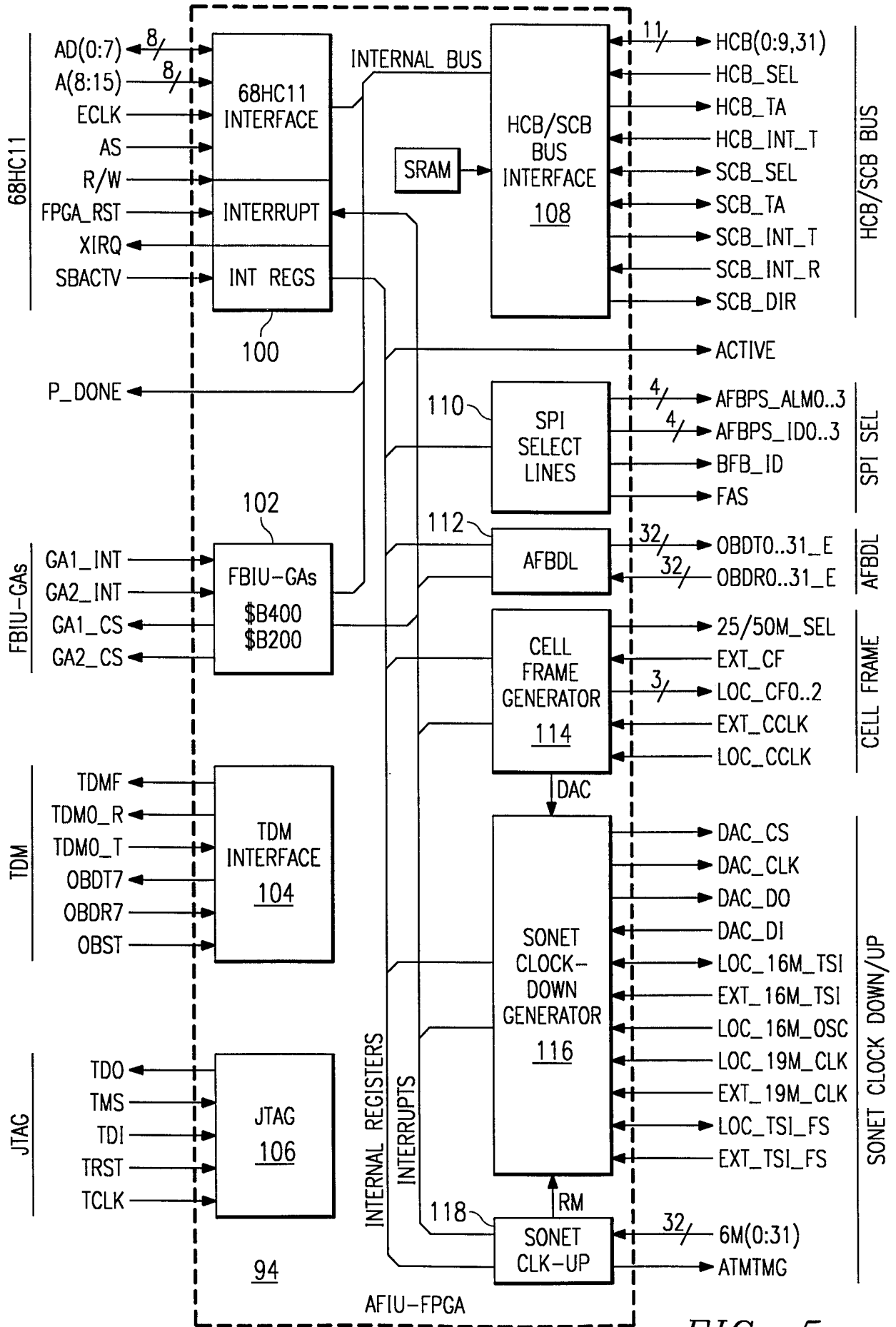


FIG. 5

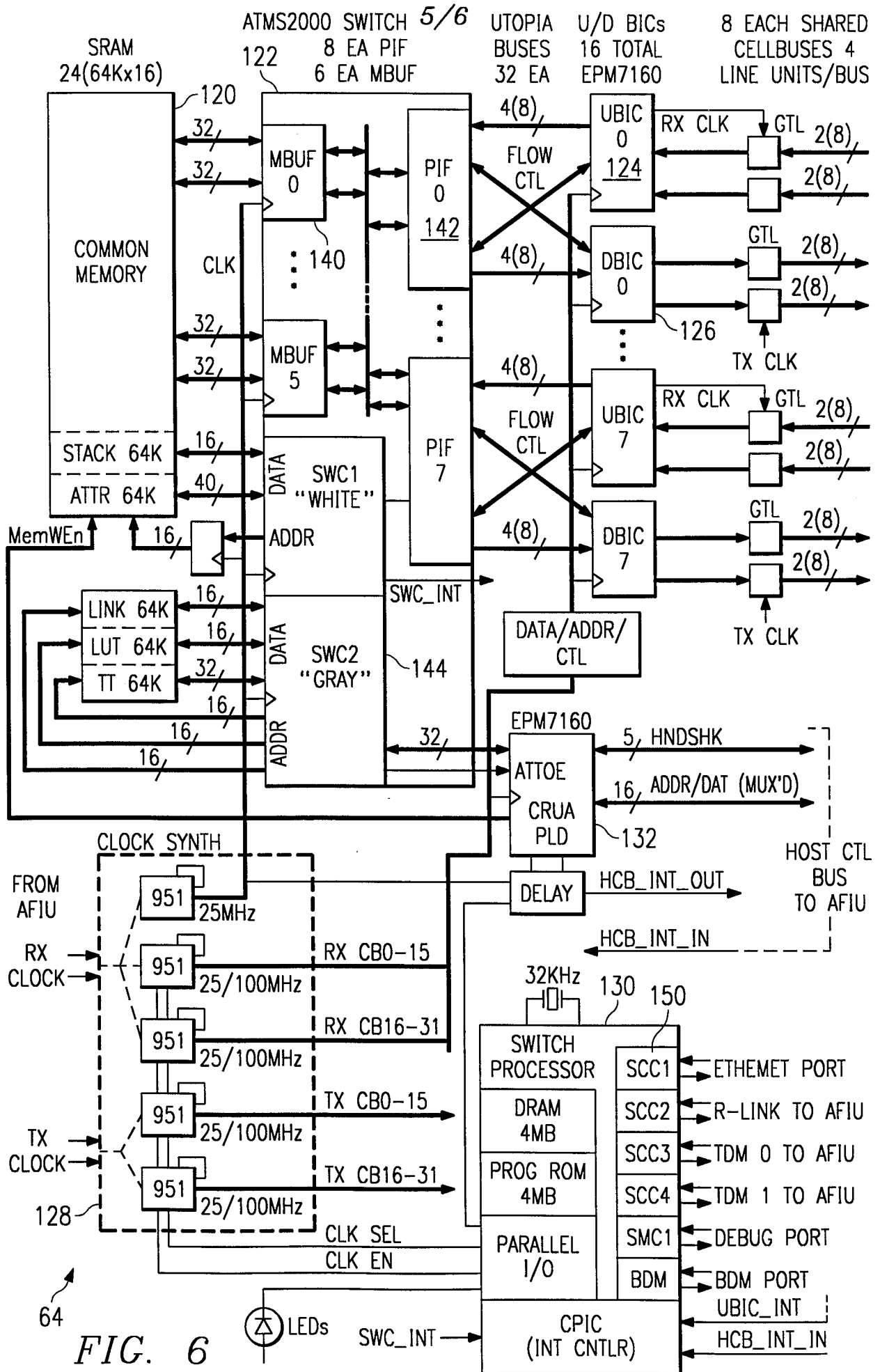
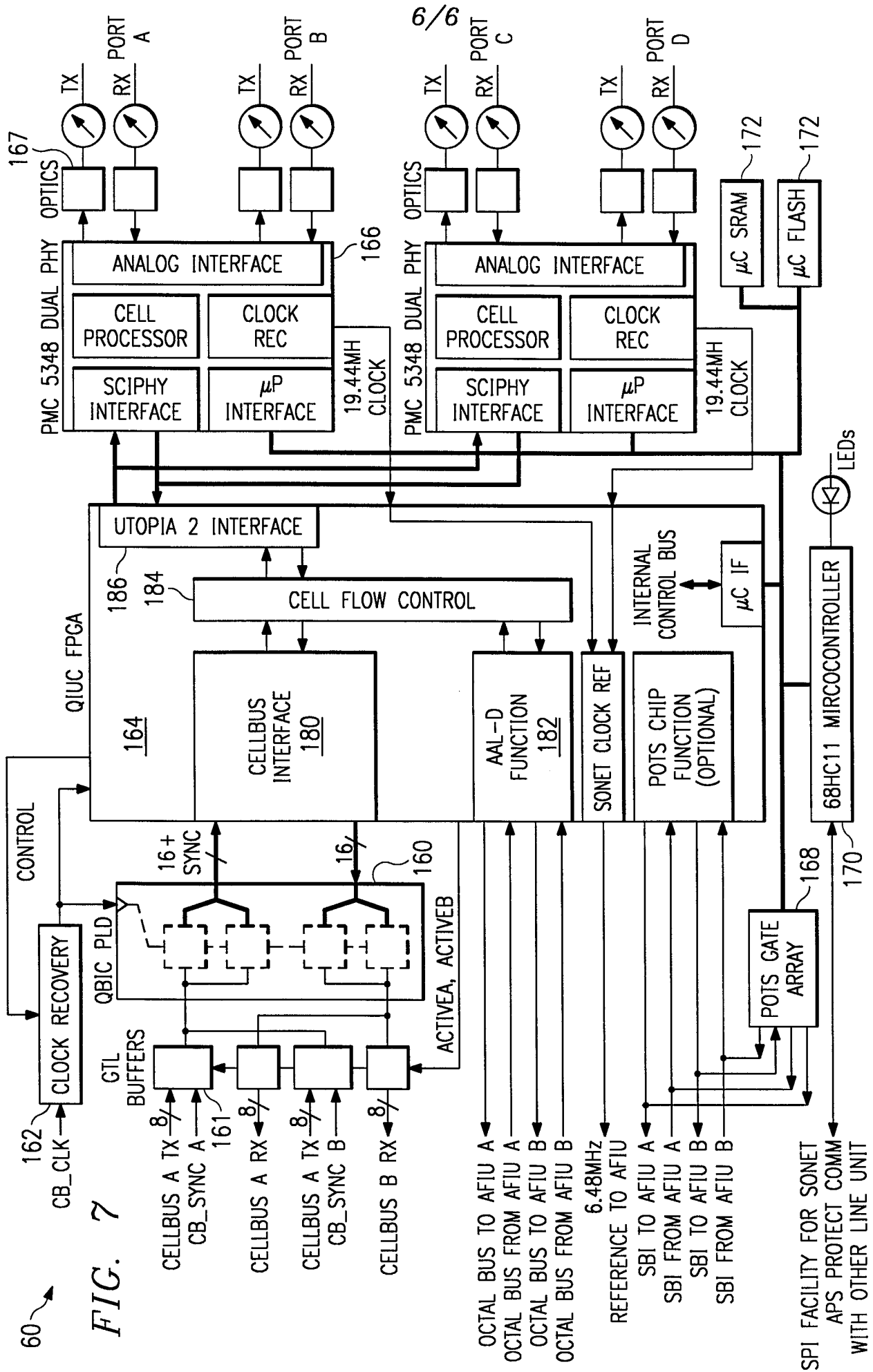


FIG. 6



INTERNATIONAL SEARCH REPORT

International Application No.
PCT/US 97/21553

A. CLASSIFICATION OF SUBJECT MATTER

H 04 Q 11/04, H 04 J 3/02, H 04 L 12/56

According to International Patent Classification (IPC) or to both national classification and IPC⁶

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H 04 Q, H 04 J, H 04 L

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 practical, 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.
Y	US 5341374 A (LEWEN et al.) 23 August 1994 (23.08.94), column 1, line 1 - column 2, line 24, column 5, line 63 - column 6, line 58, fig. 1.	1, 13
A	--	3, 7, 16
Y	US 5355362 A (GORSHE et al.) 11 October 1994 (11.10.94), column 1, lines 1-49, column 3, line 34 - column 4, line 17, column 7, line 60 - column 8, line 25, fig. 1-5.	1, 13
A	--	4, 7, 9
A	WO 95/35008 A1 (NORTHERN TELECOM)	1-3, 7, 8, 13,

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
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- *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
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Date of the actual completion of the international search
23 February 1998

Date of mailing of the international search report

18.03.98

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,
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HAJOS e.h.

INTERNATIONAL SEARCH REPORT

-2-

Internatio .pplication No
PCT/US 97/21553

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	21 December 1995 (21.12.95), abstract, page 1, lines 2-14, page 2, line 25 - page 3, line 32, fig. 1-3. -----	15, 16

ANHANG

zum internationalen Recherchenbericht über die internationale Patentanmeldung Nr.

ANNEX

to the International Search Report to the International Patent Application No.

ANNEXE

au rapport de recherche international relatif à la demande de brevet international n°

PCT/US 97/21553 SAE 178148

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentedokumente angegeben. Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The Office is in no way liable for these particulars which are given merely for the purpose of information.

La présente annexe indique les membres de la famille de brevets relatifs aux documents de brevets cités dans le rapport de recherche international visée ci-dessus. Les renseignements fournis sont donnés à titre indicatif et n'engagent pas la responsabilité de l'Office.

Im Recherchenbericht angeführtes Patentedokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
US A 5341374	23-08-94	keine - none - rien	
US A 5355362	11-10-94	CA AA 2109131 JP A2 6237479	27-04-94 23-08-94
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