P/00/001 28/5/91
Section 29

AUSTRALIA 652269
Patents Act 1990

PATENT REQUEST: STANDARD PATENT/PATENT OF ADDITION

We, being the person(s) identified below as the Applicant, request the grant of a patent to the person identified below as the Nominated Person, for an invention described in the accompanying standard complete specification.
Full application details follow.

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Address Strawinskylaan 341, 1077 XX, Amsterdam, The Netherlands
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Address Strawinskylaan 341, 1077 XX, Amsterdam, The Netherlands
(54) Invention Title - **"REMOTE TERMINAL FOR AN OPTICAL FIBRE COMMUNICATION SYSTEM"**

(72) Name(s) of actual inventor(s) **Joseph Edward SUTHERLAND; Paul Motoi MATSUMURA;**

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ASSOCIATED PROVISIONAL APPLICATION(S) DETAILS
(60) Application Number(s) and Date(s)

BASIC CONVENTION APPLICATION(S) DETAILS

(31) Application Number	(33) Country	Country Code	(32) Date of Application
07/739,603	U.S.A.	US	31 July 1991

DIVISIONAL APPLICATION DETAILS
(62) Original application number:

PARENT INVENTION DETAILS (Patent of Addition requests only)
(61) Application Number *Patent Number*

Drawing number recommended to accompany the abstract..3.

ALCATEL N.V.
S031091 29/07/92

(Signature)

July 28th, 1992

P/00/008
Section 29(1)
Regulation 3.1(2)

AUSTRALIA

Patents Act 1990

NOTICE OF ENTITLEMENT

We, ALCATEL N.V.
of Strawinskylaan 341, 1077 xx Amsterdam, The Netherlands,
being the applicant in respect of Application No.
for an invention entitled "REMOTE TERMINAL FOR AN OPTICAL FIBRE COMMUNICATIONS SYSTEM"

described in the accompanying specification, state the following:

1. The company nominated for the grant of the patent has entitlement from the actual inventor by mesne assignment.

2. The company nominated for the grant of the patent has entitlement from the applicant of the basic application listed on the patent request form by assignment.

3. The basic application listed on the request form is the first application made in a Convention country in respect of the invention.

ALCATEL N.V.

July 28th, 1992

P.M. CONRICK

PATENT SUB OFFICE
29 JUL 1992
SYDNEY

AU9220644

(12) PATENT ABRIDGMENT (11) Document No. AU-B-20644/92
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 652269

(54) Title
REMOTE TERMINAL FOR AN OPTICAL FIBRE COMMUNICATIONS SYSTEM

International Patent Classification(s)
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(21) Application No. : **20644/92** (22) Application Date : **29.07.92**

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739603	**31.07.91**	**US UNITED STATES OF AMERICA**

(43) Publication Date : **04.02.93**

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ALCATEL N.V.

(72) Inventor(s)
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(74) Attorney or Agent
ALCATEL AUSTRALIA LIMITED , BOX 525 G.P.O., SYDNEY N.S.W. 2001

(56) Prior Art Documents
US 5134614
US 5054050
US 4977593

(57) Claim

1. An optical fibre communications network having a remote terminal fed by a high-rate optical fibre signal, wherein the remote terminal includes an internal electrical link having a payload of 24 channels, said network including:

- means for converting electrical signals on the internal electrical link to optical signals; and

- means for transmitting the optical signals along a distribution fibre to a network unit located within the subscriber neighborhood.

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P/00/011 28/5/91
Regulation 3.2

AUSTRALIA
Patents Act 1990

ORIGINAL
COMPLETE SPECIFICATION
STANDARD PATENT

Invention Title:
"REMOTE TERMINAL FOR AN OPTICAL FIBRE COMMUNICATIONS SYSTEM"

The following statement is a full description of this invention, including the best method of performing it known to us:-

This invention relates to an optical fibre telecommunications network and more particularly, towards a method and apparatus for extending optical fibre in such a network to the subscriber's neighborhood.

Optical fibres are rapidly becoming the preferred means for transmission in telecommunications networks. The advantages of using optical fibres are well known and are fully accepted as being desirable. Optical fibre transmission provides the potential for exceedingly wide bandwidths which will allow for the future provision of broadband services directly to individual subscribers on a relatively universal basis. Such broadband services may include data transmission; however, there is a broader market for the distribution of video services over the telecommunications network to the vast number of residential subscribers.

In order to achieve the benefits of this broadband capability of optical fibres, it is essential that the fibres be deployed relatively close to the subscriber, as it is difficult to sustain the broadband transmission over great distances using electrical signals. At present, feeder fibres are used to bring telecommunications signals to a Digital Loop Carrier (DLC) Remote Terminal (RT); however, commercially acceptable methods for providing optical signals closer to the subscriber have not yet been achieved on a reasonably broad basis.

There have been many proposals for providing fibre optic services to residential subscribers in both narrowband and broadband format. Some of these proposals have been described in the Description of the Prior Art set forth in the aforementioned co-pending application entitled, "Switched Video Architecture for an Optical fibre-to-the-Curb Telecommunication System". Various articles have been published describing the advantages of fibre optic systems, and in particular, the advantages of certain types of broadband fibre optic systems.

An article entitled: "A Future Switched Video System" by John R. Gunter, IEEE LCS Magazine, February, 1990, at page 66 and following, describes the desirability of providing video services over the telecommunications network. Another article entitled: "A High-Quality Switched FM Video System" by David E. Robinson and David Grubb, III, IEEE LCS Magazine, also published February, 1990, at page 53 and following describes a proposed system architecture wherein the various video channels are frequency multiplexed onto a carrier; however, the carrier uses wavelength division multiplexing for upstream and downstream transmissions.

Other articles describing the simultaneous transmission of narrowband and broadband signals are as follows: "A Hybrid Lightwave Transmission System for

Subcarrier Multiplexed Video and Digital B-ISDN Services in the Local Loop", by Charles N. Lo, Journal of Lightwave Technology, Vol. 7, No. 11, November 1989, pp. 1839-1848; and "fibre Optic Analog-Digital Hybrid Signal Transmission Employing Frequency Modulation", by K. Sato et al, IEEE Transactions on Communications, Vol. COM-33, No. 5, May 1985, pp. 433-441.

The present invention contemplates a method and apparatus for providing optical fibre transmission directly to the neighborhood of the subscriber.

The specification of Australian Patent Application No. 20648/92 discloses a truly integrated fibre optic telecommunications system providing switched video and standard narrowband telephone services. The system is integrated, in that it transmits video services on the same fibre as the narrowband services and uses common equipment to support both services.

In said system, the feeder fibre from a Central Office (CO) services a Remote Terminal (RT) over a single fibre pair (Tx and Rx) operating at a SONET OC-1 (51.84 Mb/s) or OC-3 (155.52 Mb/s) data rate. The RT includes Loop Carrier cross-Connect (LCX) hardware for cross-connecting and distributing DSO channels. The system uses a star distribution network where optical fibres radiate from the RT to active Optical Network Units (ONU) located in residential areas. Each residential ONU serves up to eight living units, with three DSO (64 Kb/s) channels. For residential applications, two channels are typically used for Plain Old Telephone Service (POTS), with the third channel reserved for future applications, such as the D-channel for an Integrated Services Digital Network (ISDN).

The system provides a Loop Carrier Cross-connect- fibre-To-The-Curb (LCX-FTC) system, which is an advanced SONET-compliant Digital Loop Carrier system that offers telephone companies immediate and future access to narrowband and broadband functionality. The system is designed around a family of SONET access products produced and sold by Alcatel NA Network Systems Corp., the assignee of the present invention, under product designations LCX-50 and LCX-150. The LCX- FTC system utilizes optical fibres instead of metallic lines in the local loop. The fibre-to-the-curb components of the system are built upon the LCX hardware and software platforms of Alcatel to provide an easy migration to the FTC services. The system is modular by design and can be configured to accommodate many different applications.

The present invention contemplates the extending of fibre with its tremendous bandwidth capacity closer to the end user than presently achieved with fibre feeders to remote terminals. The architecture of Alcatel's SONET Access Products, particularly the LCX, lends itself to such fibre extension.

In the existing LCX design, 24 DS0 groups of subscriber line circuits are connected to the LCX core by an internal proprietary electrical link called the Serial Bus Interface (SBI). This four-wire link was originally designed for short-range electrical communications between shelves and racks at a single site. With the addition of electro-optical transceivers, the baseband SBI signal can be used to relocate the line circuit functions of an LCX RT to optical network units at subscriber neighborhoods via distribution fibre in a star-typology. Thus, the implementation of a fibre-to-the-curb system with minimum change to the LCX architecture is quite possible.

The advantages of extending the SBI over fibre are manyfold. The SBI payload already supports the Bellcore recommendation for service to an appropriate number of Living Units (LU) to be supported by a residential ONU at a curb site, with 3 DS0s to each of eight LUs. The necessary timing, including sync word and embedded Manchester code are already included in the SBI structure. Channel-associated ABCD signaling for 24 DS0 channels is already implemented in the SBI. Independent, non-aligned TX and RX framing is permitted within the SBI. An interprocessor communication link known as the VI channel is already provided within the SBI system. Performance monitoring, diagnostics and protection switching subsystems are already features of the LCX SBI system. The system further supports a 32- word frame structure that can accommodate a SONET VT- 1.5 tributary.

A primary objective of the present invention is to provide for the extension of the baseband SBI in an optical mode along distribution fibres to remotely- located ONUs.

In order that the invention may be readily carried into effect, an embodiment thereof will now be described in relation to the accompanying drawings, in which:

Figure 1 is a block diagram of a basic narrowband FTC architecture which can be upgraded to provide broadband service.

Figure 2 is a block diagram illustrating one embodiment of the overall system of the present invention.

Figure 3 is a block diagram showing a remote terminal of an LCX-FTC equipped for narrowband service.

Figure 4 is a block diagram of an optical distribution shelf as shown in Figure 3.

Figure 5 is a block diagram showing how an ONU fits into the overall system.

Figure 6 is a block diagram of an ONU.

Referring to Figure 1 there is shown a CO 10 connected to remote terminals 12 via SONET OC-1 or OC-3 optical feeders 14 which function as a digital transport link therebetween. The carrier rate used for transport depends upon the current and anticipated channel capacity required. The CO 10 may include either an LCX-50 or LCX-150 Central Office Terminal (COT) for UDLC arrangements or a TM-50 or ADM-150 for IDLC arrangements. The UDLC system is suited for COs with an analog switch using metallic line shelves to provide the analog interface to the switch. The IDLC system arrangement provides a DSX-1 interface with TM-50 or ADM-150 units for COs using a digital switch. Both TR-8 and TR-303 digital interfaces are supported by the LCX-FTC system. An LCX-50 core provides the platform for OC-1 rate transmission and an LCX-150 core will provides a platform for OC-3 rate transmission. The structures necessary for LCX-50 and LCX-150 cores are disclosed in Australian Patent Application No. 67871/90.

The telecommunications system uses a star distribution network where the optical fibres radiate from the RTs 12 to active ONUs 16 via point to point optical distribution links 18. Each LCX-50 equipped RT 12 can serve up to 24 or 28 ONUs, depending on whether broadband service is being offered. The RT serves the ONUs through optical links 18. When the RT is equipped with an LCX-150, 168 ONUs can be served with narrowband and broadband services. Each ONU 16 can service up to eight living units or homes 20 and is connected thereto through the use of metallic twisted pairs or coaxial drops 22 depending on the service required in each living unit. Typically each living unit will be provided with three DS0 channels, two channels for providing (POTS) and a third channel reserved for future applications such as the D-channel for ISDN.

Referring to Figure 2 there is shown greater detail of the LCX-50 core 24 as used in the CO 10 and RT 12. The LCX-50 core 24 utilizes a non-blocking switch fabric in the form of a time slot interchanger 26 which allows for switching of the various subscriber channels. In the RT 12 the time slot interchanger 26 allows the subscriber channels from ONUs 16 to be loaded and groomed over the RT to CO feeder 14 for optimum capacity and ease of administration. As shown in Figure 2 several RT cores 24 can share the same feeder 14 to provide a distributed arrangement for additional flexibility and channel density. The ability of the RT to groom and reassign subscriber channels to different time slots allows more flexibility in the planning and placement of ONUs. The time slot interchanger 26 utilized in the core is constructed as shown in Australian Patent Application No. 54681/90.

The configuration shown in Figure 2 is adapted for use with a voice-grade analog switch interface and is thus a UDLC system based on a LCX-50 core. It is to be understood that a LCX-50 core can also support a system for use with an IDLC configuration and that the LCX-150 core could be used in an IDLC configuration that provides TR-303 compatibility.

The system shown in Figure 2 includes a COT in CO 10 and a RT 12 having a plurality of cores 24 connected to the COT via a SONET OC-1 feeder 14. Optical distribution links 18 extend to the ONUs 16. Interface to the analog switch is provided by metallic line shelves 28 which accommodate channel unit plug-ins to perform the analog/digital conversions on the transmission signal and present voice frequency and baseband interfaces to the switching system. Up to seven line shelves 28 can be serviced by an LCX-50 core 24, with each line shelf providing 96 subscriber lines, for a total of 672 lines. When CO 10 is updated to a digital switch providing an integrated TR 303 interface, the LCX-FTC system can easily be upgraded to the new digital switching environment.

In the RT 12, the core 24 is connected to an Optical Distribution Shelf (ODS) 30 which provides the housing for plug-in electronics that provide the fibre optic interfaces to the ONUs. The ODS 30 is used in place of the metallic line shelves 28; however, if some metallic lines are terminated at the RT 12, a number of shelves may be equipped for metallic lines, as shown at 32. However, each metallic line shelf reduces the number of ONUs served by the ODS by four. A fully- equipped ODS has positions for 28 optical interfaces; however, only 24 are used for residential applications.

The residential ONUs 16 are sealed enclosures contemplated for use in a neighborhood right-of-way near the subscriber residence that it serves. The ONU provides electronics that perform the optical/electrical conversions required and also houses channel plug-in units that provide the narrowband interface to the living units. The narrowband channel plug-in units utilized in the ONU are substantially identical to those used in the LCX-50 metallic line shelves.

In many instances, a living unit containing customer premises equipment may be connected directly to the CO 10 without the need of a digital loop carrier system, such as the feeder link between RT 12 and CO 10. In such instances the equivalent of RT 12 would be co-located with the CO equipment. When the RT is co- located in the CO, economical electrical STS-1 connections may be used in place of the optical OC-1 feeder.

In Figure 2, there is shown a Power Services Module (PSM) 34 associated with groups of ONUs 16. The PSM 34 is a free-standing cabinet designed to provide power to the active elements contained in the ONUs. Alarm connections 36 are also provided between the PSM and an ONU for providing alarm signals back to the RT or CO in the event of a failure in the PSM 34.

It should be noted that up to seven LCX-50 cores 24 may be connected together in one RT site, utilizing OC-1 or STS-1 interconnections. Switched video signals may be provided to the ODS 30 in each LCX-50 core 24.

Figure 3 shows an arrangement wherein an OC-1 feeder 14 from the CO 10 is terminated at one LCX RT core 24, with additional LCX RT cores 25 interconnected with electrical STS-1 high-speed links 38. With this type of add-drop arrangement, the timeslots or channels in the OC-1 feeder 14 from the CO can be efficiently utilized, even when the channel capacity of all ONUs is not fully utilized. The last LCX RT core 25 in the add- drop string of cores may be equipped with an FTM-OC1 interface 40 to continue the string of cores to another RT site via another OC-1 feeder 42.

The ODS 30 is responsible for providing an interface between the LCX RT core 24 and the distribution fibres 18 to the ONUs 16. The transport and control connections between the LCX RT cores 24 and 25 and the ODS 30s are via 4 Mb/s balanced serial bus links referred to as Serial Bus Interfaces (SBI) 44. The SBI is an internal electrical bus used in the SONET access products of Alcatel and is fully described in Australian Patent Application No. 54686/90. The SBI includes a usable payload of 24 DS0 channels or one DS1 signal. The SBI is uniquely used to supply the distribution fibres 18 for the local loops. The optical signal transmitted over distribution fibres 18 is also at a 4 Mb/s serial data link, and is essentially an optical extension of the SBI.

It should be noted that the OC-1 feeder line 14 is redundant and comprises lines A and B, said redundancy is carried through the LCX-50 core and also in the SBIs 44 which are also shown as A and B SBIs. It should be further noted that in Figure 2, there are provided fibre optic transceivers (FTM) 43, which may be replaced by STS-1 electrical transceivers (STT) if the feeder line is a limited distance electrical

STS-1 line, as opposed to an optical carrier. In addition, the LCX-50 cores include Serial Bus Transceivers (SBT) 46 for interfacing with the SBIs 44. The LCX-50 core 24 located within the CO 10 also includes a Serial Bus Expansion unit (SBE) 48 to facilitate connection to additional line shelves 28.

Referring to Figure 4, there is shown greater detail of the ODS 30 used with the cores 24 of the RT 12. The ODS 30 is used in place of a metallic line shelf and provides for the optical connection to the ONUs 16. The ODS includes, for residential purposes, 24 Optical Distribution Units (ODU 101) 50, each connected with a fibre pigtail 52 for connection to the distribution fibres 18. Each ODU 50 is connected to the LCX 50 core 24 via a pair of redundant SBIs 44. The ODU 50 essentially performs an electro-optical conversion of the electrical SBI signal to an optical SBI signal. The ODU 50 is also adapted to receive switched video signals from broadband equipment and to Frequency Division Multiplex the video signals with electrical SBI signals, which will be described hereinafter.

Each ODS 30 is further provided with a Common Shelf Alarm Unit (CSAU) 53. A Remote Measurement Unit Interface (RMUI) 54 may be provided in the ODS, only one RMUI is necessary per RT. The components of the ODS 30 are interconnected by a Low-Speed Serial Link Interface (LSSLI) 56 and receive power via a line 58. A Balanced Serial Link Interface (BSLI) 60 connects the CSAU 53 and the RMUI 54 with the LCX-50 core. A line 62 connects the RMUI 54 with the remote measuring unit and functions as a Test Access Path (TAP).

Referring to Figure 5, there are shown details of how an ONU 16 fits into the overall system. Two optical fibres 18, one active and one spare, are received from RT 12. The active fibre carries narrowband and broadband signals, while the spare fibre is provided to carry broadband video service to any additional living unit over four units provided with video service. The narrowband and broadband signals on the active fibre are combined at the RT using Frequency-Division Multiplexing (FDM). The narrowband data occupies the spectrum from 0-50 MHz is reserved for narrowband data, while the broadband signal occupies the spectrum from 60-780 MHz.

The ONU 16 can serve up to eight living units, with three DS0 channels available per living unit. For each living unit, two subscriber drops, typically used for POTS, are available, with the third DS0 channel reserved for future applications, such as the D-channel for ISDN. The POTS subscriber drops are provided at outputs 64 and are represented by 16 twisted wire pairs. The third DS0 channel output is not shown in Figure 5.

The ONU also provides video coax cable drops 66 for subscriber access to high-quality broadband signals. It is contemplated that a business ONU will provide more channel capacity and services per ONU than the residential ONU shown in Figure 5. The ONU 16 receives its power from the PSM 34 over line 35 at a nominal voltage of -130 VDC. Line 36 connects the power service module 34 with the ONU 16 to provide PSM alarm and status information. Line 36 is only used between the PSM 34 and one ONU, it is not needed for all ONUs. The ONU is also provided with an output 68 as a craft port for an RS-232 connection. If desired, the -130 VDC power could be provided from a local power source, such as residential power.

Referring to Figure 6, there is shown a more detailed block diagram of an ONU 16. The integrated narrowband and broadband signal is received from the RT 30 over a distribution fibre 18 which is connected to an Optical Distribution Unit (ODU 201) 70. The ODU 70 converts the optical signal to an electrical signal and includes a lowpass filter which separates out the narrowband signal from the integrated signal. The narrowband signal is in the form of an encoded serial bus interface (SBI) data stream, which signal is sent to a Line Shelf Access (LSA) 72 which functions to distribute the signal to various time slots assigned to cards inserted in the line shelf. The broadband video is filtered from the electrical signal and then sent to a Switched Video Distribution (SVD) card 74. The SVD 74 provides video coax drops 66 to four living units 20 requiring video service. When more than four living units are to be serviced with video, a second distribution fibre 19 must be utilized and is connected to a Switched Video Distribution Receiver (SVDR) 76, which provides video coax drops 66 for four additional living units 20.

The ODU 70 has a video input for receiving upstream video from the living units 20.

Many of the components of the ONU 16 are substantially identical to the standard metallic line shelf components utilized in the Alcatel Access Products and are described in the afore-mentioned U. S. Patents and Patent Applications. The LSA 72 is described in Australian Patent Application No. 67871/90, which application also describes the Line Shelf Processor (LSP) 73, In the present invention, the LSP 73 has additional control functions due to the video distribution handled by the ONU. The LSA 72 is connected to most components of the ONU via a Line Unit

Interface Bus (LUIB) 76. The LUIB is described in detail in Australian Patent Application No. 67833/90. and is incorporated herein by reference.

The narrowband metallic DS0 service is provided by line cards 78 which are connected to a terminal block 80 for connection to twisted pairs 64 to be provided to the living units 20. A standard Test Access Unit (TAC) 82 is connected to an ONU Test Unit (OTU) 84 for test purposes. A Broadband Interface Unit (BIU) 86 is provided for controlling the distribution of the broadband signals. A terminal block 88 is provided to receive the DC power input and the alarm information from the PSM 34. Terminal block 88 is connected to a DC/DC converter and ring generator 90 which provides ring signals, alarm and control information.

An ONU Port Unit (OPU) 75 provides an RS-232C craft port for provisioning channel units or to logon to the RT DNC. The OPU collects local ONU alarms and provides an alarm communications interface between the PSM 34 and the CO 10.

Thus, the present invention uniquely extends the baseband SBI of the LCX core to an optical feeder fibre for extending the optical transmission to the neighbourhood of the subscribers.

The claims defining the invention are as follows:

1. An optical fibre communications network having a remote terminal fed by a high-rate optical fibre signal, wherein the remote terminal includes an internal electrical link having a payload of 24 channels, said network including:

- means for converting electrical signals on the internal electrical link to optical signals; and

- means for transmitting the optical signals along a distribution fibre to a network unit located within the subscriber neighborhood.

2. An optical fibre communications network as claimed in claim 1, wherein the internal electrical link transmits a 32-word frame structure that can accommodate a SONET VT-1.5 tributary.

3. An optical fibre communications network as claimed in claim 1, wherein the internal electrical link includes sync word and embedded Manchester coding.

4. An optical fibre communications network as claimed in claim 3, wherein the internal electrical link includes channel- associated ABCD signaling for 24 telephony DS0 channels.

5. An optical fibre communications network, substantially as herein described with reference to Figures 1 - 6 of the accompanying drawings.

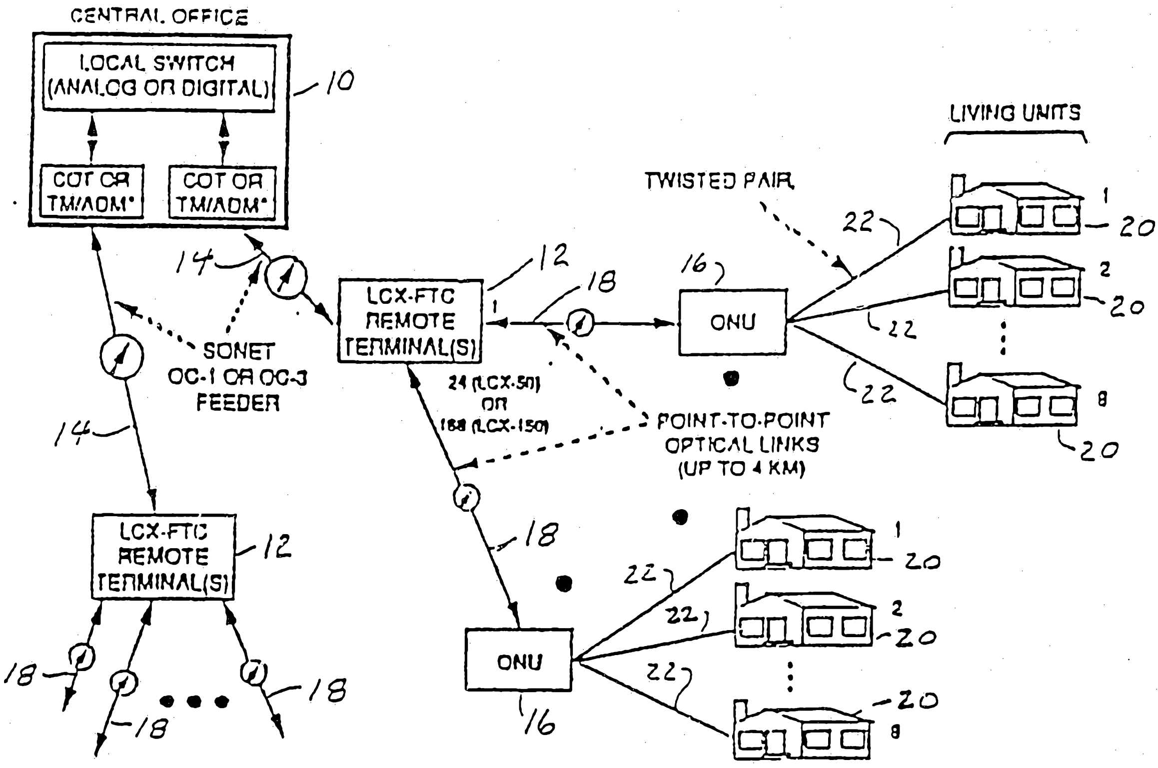
DATED THIS TWENTY-THIRD DAY OF MAY 1994

ALCATEL N.V.

ABSTRACT

In an optical fibre transmission network, a remote terminal fed by a high-rate optical signal includes an internal electrical link called a serial bus interface (SBI) carrying 24 DS0 channels. The optical transmission network is extended by converting the SBI baseband signal from electrical to optical and transmitting the SBI optical signal over a distribution fibre to a network unit located in the neighborhood of the subscribers.

Figure 3.



* LCX-50/150 CENTRAL OFFICE TERMINAL (COT) FOR ANALOG SWITCH OR TM-50 (OC-1)/ADM-150 (OC-3) FOR DIGITAL SWITCH

NOTE: EACH (RESIDENTIAL) OPTICAL NETWORK UNIT (ONU) SUPPORTS UP TO 8 LIVING UNITS (2 POTS LINES PER LIVING UNIT)

FIG. 1

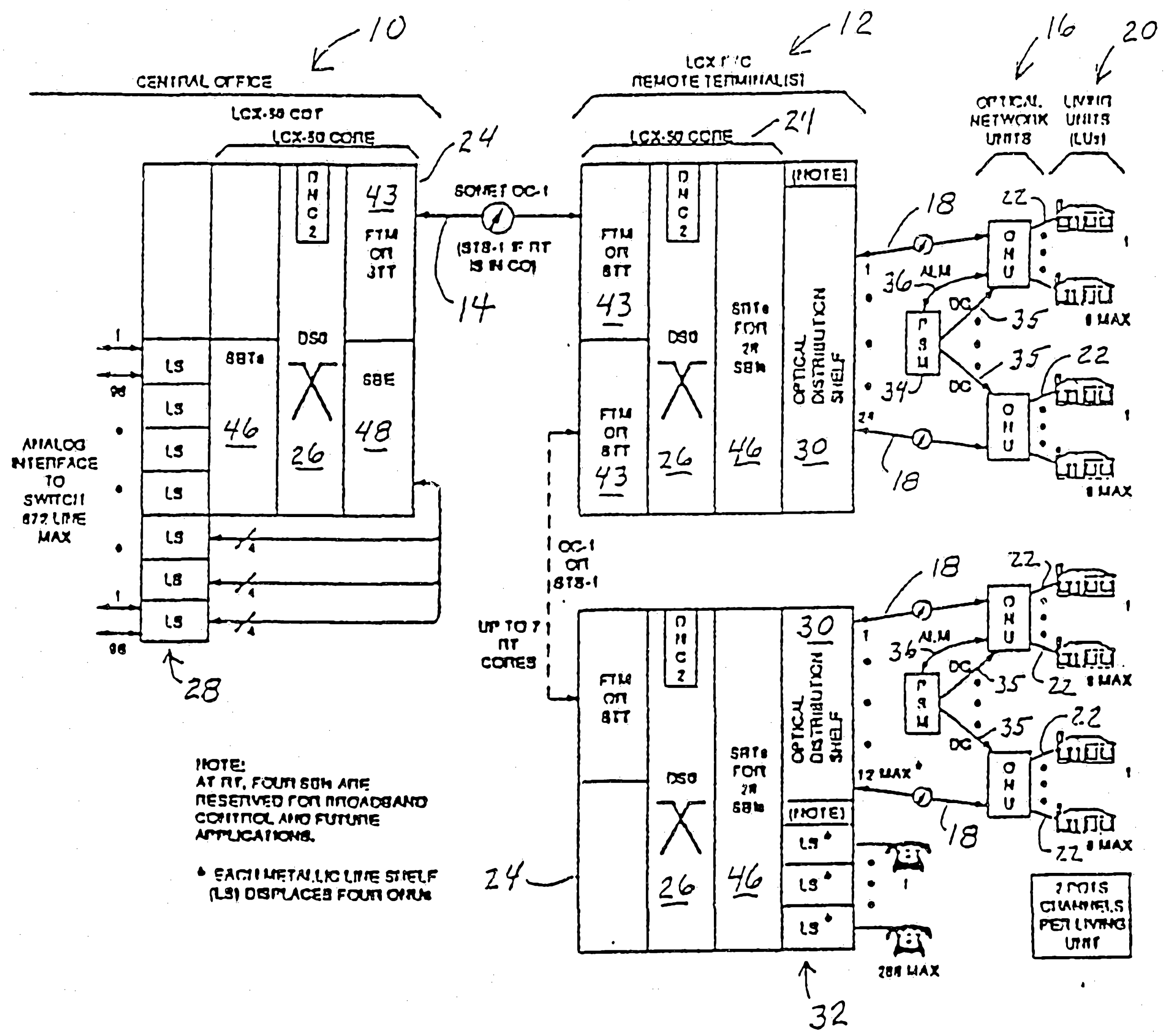

CENTRAL OFFICE
LCX-50 COT
LCX-50 CORE
SONET OC-1
(STS-1 IF RT IS IN CO)
LCX r/c REMOTE TERMINAL(S)
OPTICAL NETWORK UNITS
LIVING UNITS (LUs)
ANALOG INTERFACE TO SWITCH 672 LINE MAX
OC-1 OR STS-1
UP TO 7 RT CORES
NOTE:
AT RT, FOUR SBS ARE RESERVED FOR BROADBAND CONTROL AND FUTURE APPLICATIONS.
* EACH METALLIC LINE SHELF (LS) DISPLACES FOUR ONUs
OPTICAL DISTRIBUTION SHELF
2 POTS CHANNELS PER LIVING UNIT
288 MAX
12 MAX
8 MAX

FIG. 2

20644/92

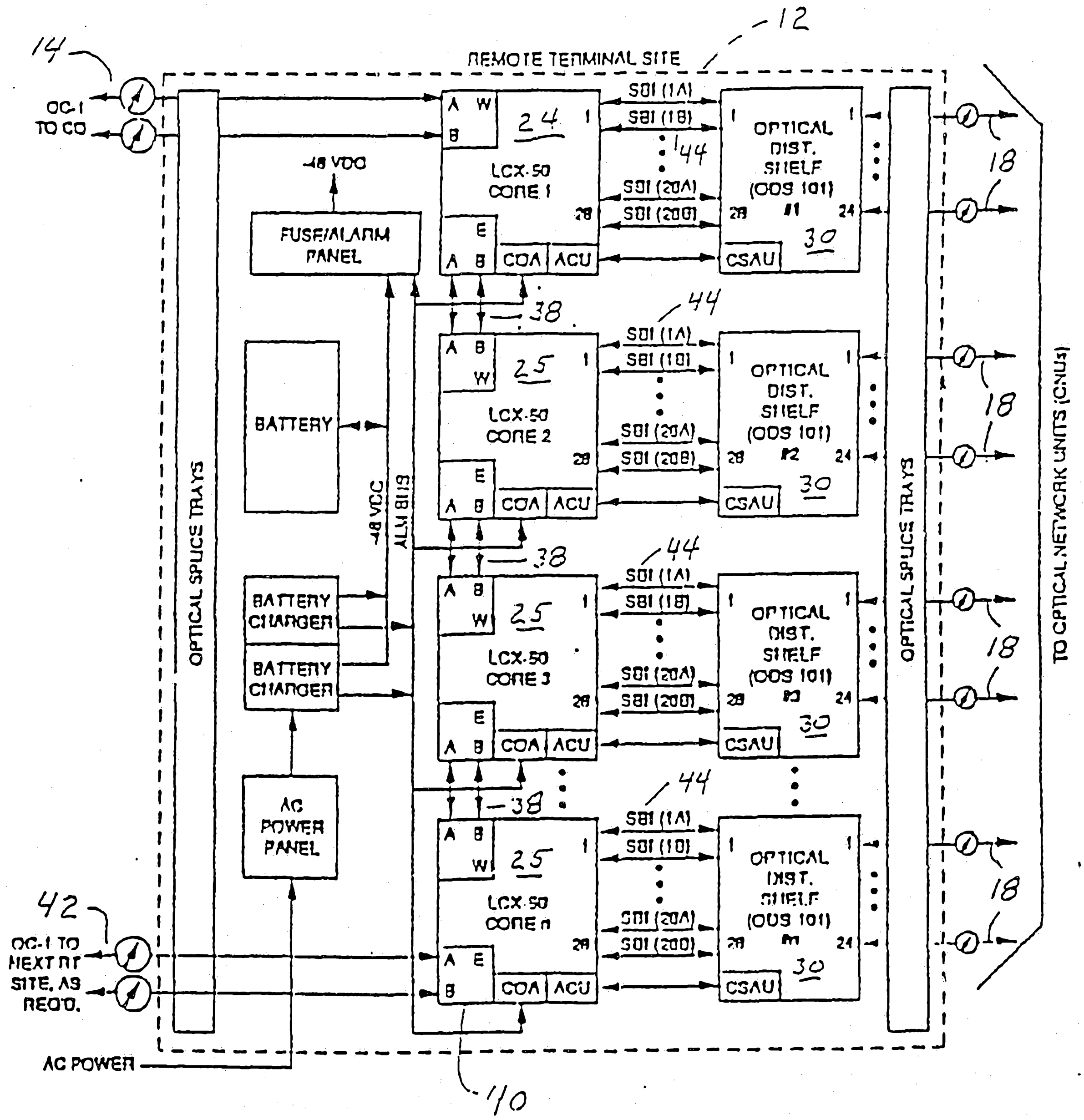


FIG. 3

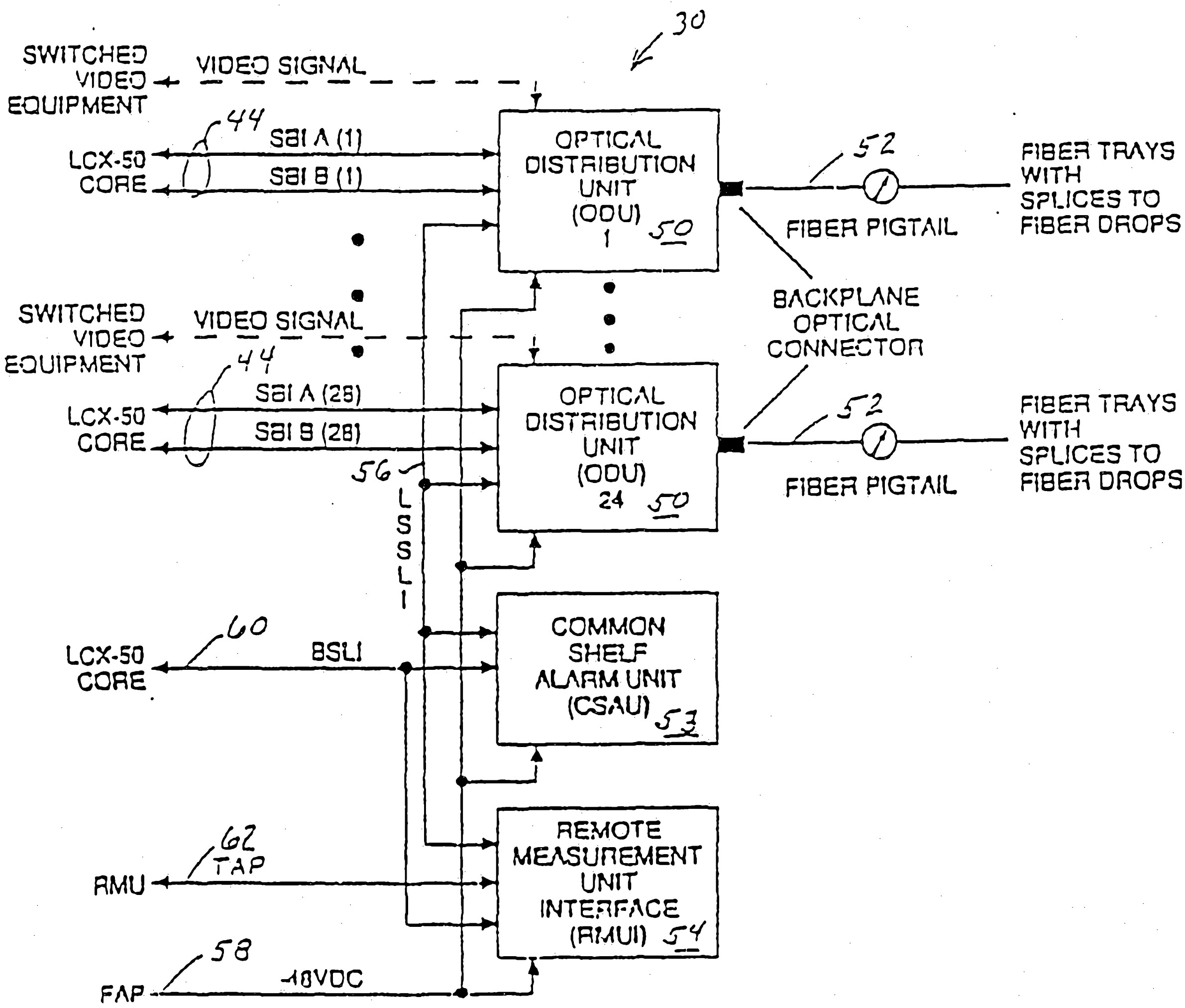
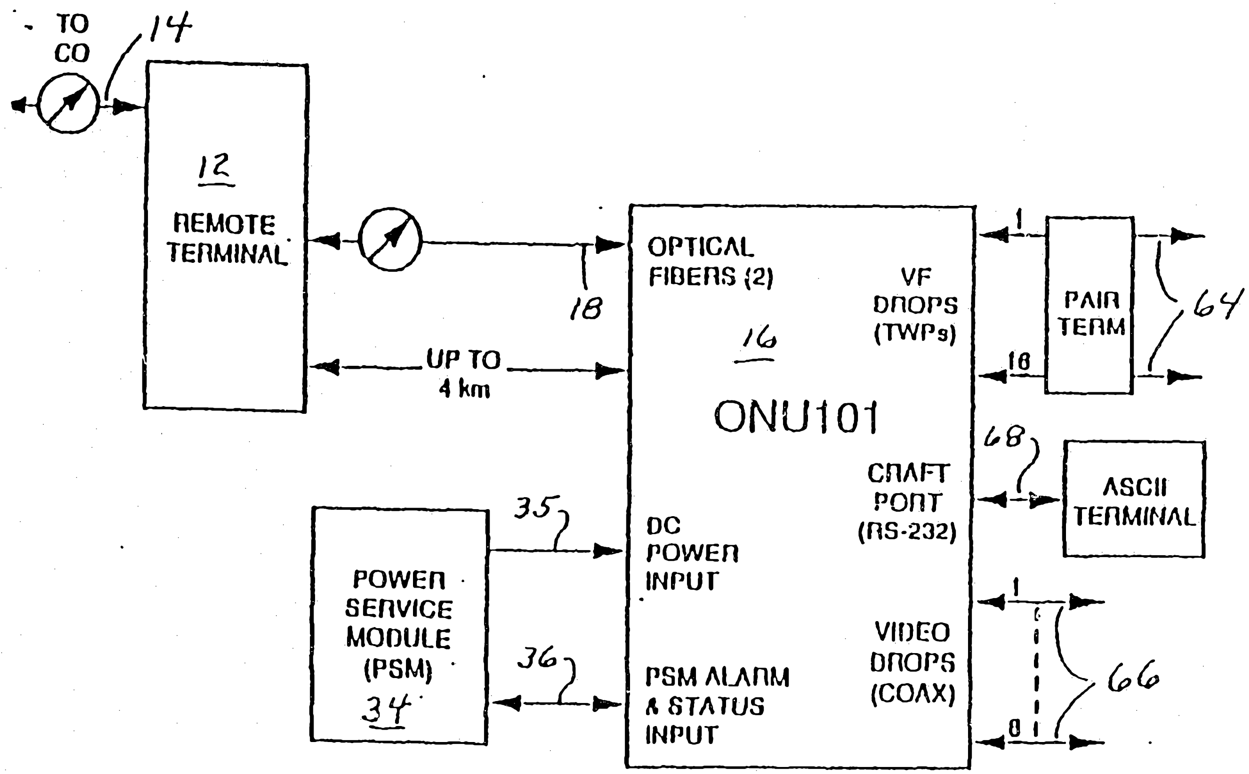

30
SWITCHED VIDEO EQUIPMENT
VIDEO SIGNAL
44
SBI A (1)
SBI B (1)
LCX-50 CORE
OPTICAL DISTRIBUTION UNIT (ODU) 1 50
52
FIBER PIGTAIL
FIBER TRAYS WITH SPLICES TO FIBER DROPS
BACKPLANE OPTICAL CONNECTOR
SWITCHED VIDEO EQUIPMENT
VIDEO SIGNAL
44
SBI A (28)
SBI B (28)
LCX-50 CORE
OPTICAL DISTRIBUTION UNIT (ODU) 24 50
52
FIBER PIGTAIL
FIBER TRAYS WITH SPLICES TO FIBER DROPS
56
LSSLI
60
LCX-50 CORE
BSLI
COMMON SHELF ALARM UNIT (CSAU) 53
62
TAP
RMU
REMOTE MEASUREMENT UNIT INTERFACE (RMUI) 54
58
FAP
-48VDC

FIG. 4


TO
CO
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UP TO
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FIBERS (2)
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CRAFT
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ASCII
TERMINAL
35
36
DC
POWER
INPUT
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DROPS
(COAX)
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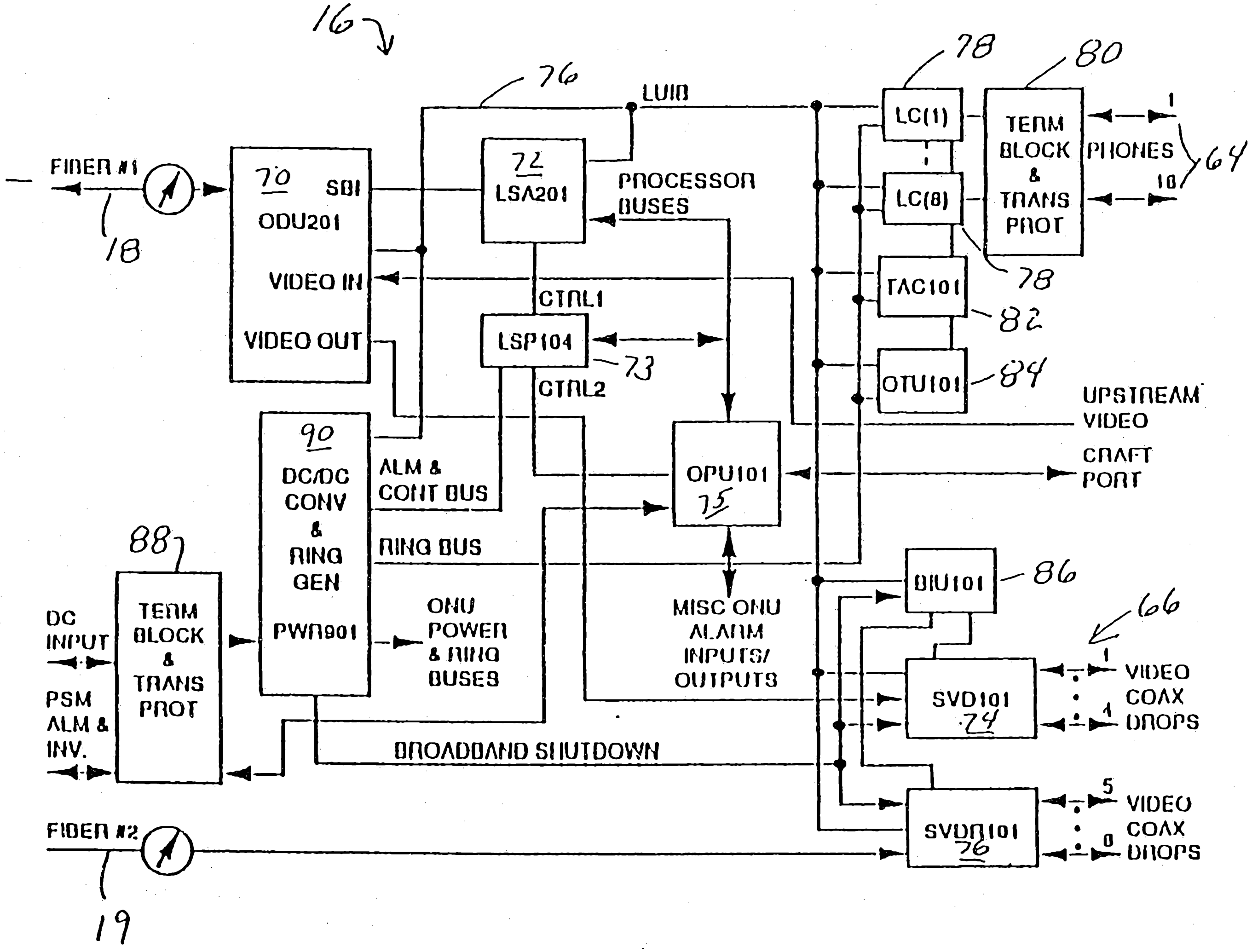
8
66

FIG. 5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CTRL1
LSP104
73
CTRL2
LC(1)
LC(8)
TERM
BLOCK
&
TRANS
PROT
PHONES
1
10
64
78
TAC101
82
OTU101
84
UPSTREAM
VIDEO
90
DC/DC
CONV
&
RING
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PWR901
ALM &
CONT BUS
RING BUS
OPU101
75
CRAFT
PORT
88
TERM
BLOCK
&
TRANS
PROT
DC
INPUT
PSM
ALM &
INV.
ONU
POWER
& RING
BUSES
MISC ONU
ALARM
INPUTS/
OUTPUTS
BIU101
86
66
SVD101
74
VIDEO
COAX
DROPS
1
4
BROADBAND SHUTDOWN
FIBER #2
19
SVDR101
76
5
8
VIDEO
COAX
DROPS

FIG. 6