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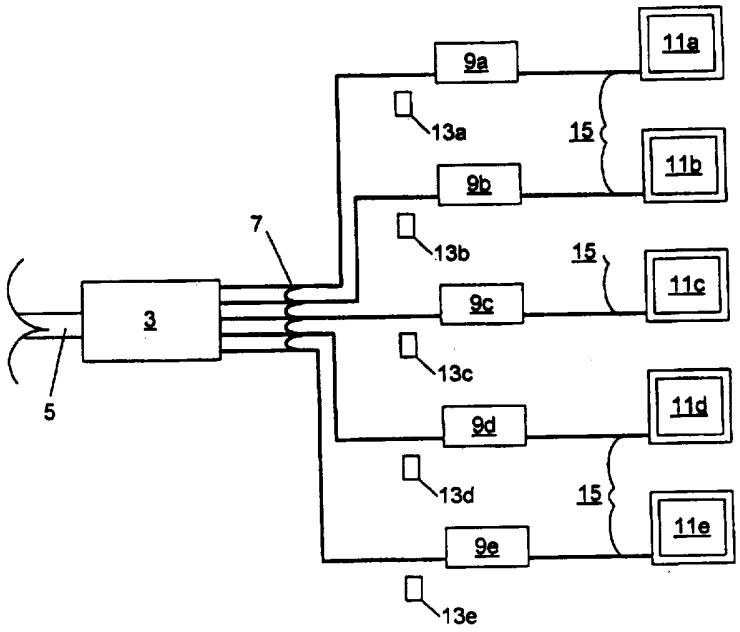
(54) Title: MULTI-MEDIA DISTRIBUTION APPARATUS FOR DISTRIBUTING VIDEO SIGNALS FROM A BROADBAND NETWORK TO SUBSCRIBERS USING TWISTED PAIR CABLES



(57) Abstract

A multi-media distribution apparatus (1) for supplying a plurality of video monitors (11a-e) with information derived from a multi-channel broadband R.F. pipe (5), comprises a hub (3) including a tuner (23) connected to the pipe (5). The hub (3) is connected via twisted pair cabling (7) to a number of video monitor interfaces (9a-e) each having a channel selection means (13). The channel selection means (13) can be operated to control the tuner (23) via the twisted pair cabling (7), and so select the required channel information for display on the respective video monitor (11a-e).

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Multi-Media Distribution Apparatus for Distributing Video Signals from a Broadband Network to Subscribers Using Twisted Pair Cables

The present invention relates to a multi-media distribution apparatus for dissemination of video, audio and/or data information within an office environment.

It has become usual to provide, particularly for use in a dealing room, the very latest news and financial market information. Such information is typically collected centrally, perhaps via a satellite downlink, and then distributed to monitors located around the room. Disadvantageously, the cabling necessary to distribute the information is not only bulky and expensive, but ultimately its bandwidth will place a restriction on the number of channels available at each monitor despite having a bandwidth in excess of 800MHz.

Twisted pair wiring has been proposed as a means of delivering such information. However, the limited bandwidth available with such a cabling system has prevented its widespread acceptance as a low cost cabling alternative to the present bulky type because of the expensive and often signal degrading compression techniques which must be utilised.

It is an object of the present invention to provide an improved Multi-media distribution apparatus which overcomes the problems of the prior art.

According to the present invention there is provided a multi-media distribution apparatus for supplying a plurality of video display devices with information derived from a multi-channel broadband R.F. pipe, comprising:

a hub including a tuner connected in use to said pipe, and said hub being connected via twisted pair cabling to a plurality of video display device interfaces each

having a channel selection means; said channel selection means being operable to control said tuner via said twisted pair cabling, and so select the required channel information.

Preferably, the hub includes differential line drivers for video and, conveniently, audio components of said selected channel information, whilst said video display device interface includes corresponding differential to single ended-conversion means.

Again preferably, the tuner is programmable to store frequency information for the channels selectable by said channel selection means. Conveniently the channel selection means includes an audio component level control for use with a speaker and/or headphones. Advantageously, the channel selection means is remotely operable, conveniently by infra-red control means.

In order to aid in understanding the invention a specific embodiment thereof will now be described by way of example and with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic view of a multi-media distribution apparatus according to the invention shown connected to a number of video monitors;

Figure 2 is a similar view of a hub chassis of the apparatus of Figure 1; and

Figure 3 is a similar view showing a monitor interface of the apparatus of Figure 1.

The multi-media distribution apparatus 1 shown in the Figures, comprises a hub chassis 3 which receives seventy-two separate video sources modulated onto a broadband R.F. pipe 5 by head end equipment (not shown), and which provides a selected channel via twisted pair structured

wiring 7 to each one of five monitor interfaces 9a-e. A video monitor 11a-e is connected to each monitor interface, via conventional coaxial cable 15, to allow the selected channel to be viewed. An infra-red remote control unit 13a-e, provides channel selection and volume control codes to a corresponding monitor interface 9a-e which communicates the channel selection via the structured wiring 7 to the hub chassis 3.

The hub chassis 3, has a 3U backplane 17 mounted within a standard 6U 19" rack (not shown). The backplane accommodates a pair of DC power supply cards 19a,19b which are themselves supplied with AC mains power, an R.F. input card 21, a plurality of tuner cards 23 each of which supports up to five video monitor interfaces 9a-e, and a power monitor card (not shown). The backplane 17 provides the requisite interconnections between the cards as described below.

Each power supply card 19a,19b accepts a mains supply 25 in the range of 100-250VAC, 50-60Hz and provides a set of DC power output 27 at different voltages for use by the R.F. input card 21 and tuner cards 23, via connections on the backplane 17. The entire hub 3 may be run off one power supply card 19, but two are provided so that failure of a single card 19 will not prevent the apparatus 1 from functioning correctly.

The R.F. input card 21, receives and buffers the signal carried by the broadband R.F. pipe 5 before amplification prior to providing the broadband signal to the backplane 17 for distribution to each of the tuner cards 23 via a passive splitter (not shown) which provides impedance matching. The input card 21 incorporates an RS-232, or similar programming terminal 27 for connection to an external programming device (not shown), in addition to

separate TTL input and output card intercommunication connections 35,37 to the backplane 17. An LED 29 provides a visual indication of the state of the power supply to the card 21 and a buzzer circuit (not shown) drives a buzzer 31 should power fail. The buzzer 31 may be silenced by a push-button 33. The terminal 27 in conjunction with a microcontroller (not shown) provides communication and protocol conversion between the external programming device and, via an intercommunication link on the backplane 17, each tuner card 23. By using simple text commands entered via the terminal 27, a non-volatile memory on each tuner card 23 may be programmed with channel and corresponding frequency information. In addition, each card 23 may be programmed via the terminal 27, using management commands to provide user identity codes and to restrict/allow access to certain channels.

Each tuner card 23 has a broadband R.F. input 39 from the R.F card 23 via the backplane 17, and separate TTL input and output card intercommunication connections 41,43 from the backplane 17. Broadband input is amplified to compensate for any loss in signal level which may occur during splitting on the backplane 17. The amplified input is once again split and distributed to five tuner modules (not shown) sufficient to support up to five separate video monitor interfaces 9a-e. Channel selection data for each tuner module is input from the structured wiring 7 via a corresponding serial port 45 forming part of an RJ45 terminal 47. The channel selection data thus received is processed by a micro-controller which then reads the frequency for the desired channel from the non-volatile memory and programs a synthesizer in the tuner with the corresponding frequency if access to that channel is allowed. The tuner module extracts the desired channel from the broadband R.F. signal to an I.F. stage which provides baseband composite video and demodulated

intercarrier audio. The video and audio signals are each then converted from single-ended to differential format and provided at the RJ45 terminal 47 for transmission over twisted pair structured wiring 7.

Referring to Figure 3, in particular, the monitor interface 9 which is powered by an external adaptor (not shown), has an RJ45 terminal 51 for differential video and audio inputs 53,57 from the structured wiring 7 and a serial port 59. Respective amplifiers 61,63 convert the differential video and audio signals to a single ended format. An equaliser 65 provides compensation for the high frequency loss to the video signal caused by the capacitive and resistive loss of the structured wiring 7. The output from the equaliser 65 is then buffered in a buffer 67 to provide a standard baseband composite video output into a BNC or other suitable connector 69.

The single ended video signal is passed through a band-pass filter 71 to remove to remove any high and low frequency noise. The filtered output is then provided to a digitally controlled potentiometer 77. The potentiometer 77 output is then split and provided firstly, to an input to a buffer 73 which provides line level audio into an RCA connector 75, and secondly, to an amplifier 79 which feeds speaker audio into an 8ohm, 3.5mm mono mini jack 81.

Channel selection and speaker audio level or volume control is provided by an infra-red (IR) remote control 13. The remote control 13 has push button controls the operation of which causes codes in the Plessey PPM format, or equivalent, to be transmitted to an IR receiver 83 mounted in the interface 9. The codes are passed to a microcontroller 85 where they are decoded. Decoded channel selection commands cause the microcontroller 85 to update a pair of seven segment LEDs 89 which normally show the

selected channel. When the first code is received the left hand display will show a dash and the right hand display will show the digit received. Only digits 0 to 7 are valid as a first digit, any other digits or the cancel code will be ignored. When a second digit code is received the left hand display will show the digit corresponding to the first code and the right hand display will show the second digit received. If the second digit code is cancel the first digit is discarded and the current channel selection is displayed. When complete the new channel selection is displayed and corresponding channel selection data is encoded and sent by the microcontroller to the serial port 59 where it is transmitted via the structured wiring 7 for reception by the tuner card as described above, thereby causing a new channel to be provided on the differential video and audio inputs 53,57.

Volume control codes cause the microcontroller 85 to update the setting of a non-volatile store 87 which is read by the digitally controlled potentiometer 77. When a repeated volume control code is detected the update is performed every 0.2s, the entire volume range being coverable in 6s. The non-volatile store 87 ensures that the most recently selected volume is maintained when power is removed from the interface.

It will be appreciated by one skilled in the art that the channel capacity of the apparatus 1, may be increased by utilising a multi-layer board and/or extending the backplane 17 to accommodate further R.F. pipes, which could be provided on any form of suitable cabling, such as coaxial and/or fibre optic cable, for example. Furthermore, provision could be made for interrogating the hub via the terminal 27 and/or via the remote control, in order to obtain management e.g. billing information

relating to the frequency and use of the channels provided thereby to one or more of the video monitors 11.

To provide a more aesthetically pleasing design the monitor interface 9 may be incorporated in the monitor 11, in which case there would be no requirement for the coaxial cable 15, and the structured wiring 7 could be connected directly to an RJ45 socket provided in the monitor 11.

Furthermore, the functions provided by the remote control 13, may be replicated by "hard controls" on the interface 9 or on the monitor 11 when integrated with the interface 9.

CLAIMS

1. A multi-media distribution apparatus for supplying a plurality of video display devices with information derived from a multi-channel broadband R.F. pipe, comprising:

a hub including a tuner connected to said pipe, and said hub being connected via twisted pair cabling to a plurality of video display device interfaces each having a channel selection means; said channel selection means being operable to control said tuner via said twisted pair cabling, and so select the required channel information.

2. An apparatus as claimed in Claim 1, wherein the hub includes differential line drivers for video component(s) of said selected channel information, whilst said video display device interface includes corresponding differential to single ended-conversion means.

3. An apparatus as claimed in Claim 2, which further includes differential line drivers for an audio component(s) of said selected channel information, whilst said video display device interface includes corresponding differential to single ended-conversion means.

4. An apparatus as claimed in any preceding Claim, in which the tuner is programmable to store frequency information for the channels selectable by said channel selection means.

5. An apparatus as claimed in any preceding Claim, in which the tuner is programmable to store user identity codes and to restrict or allow access to certain channels by reference thereto.

6. An apparatus as claimed in Claim 3 or any Claim appendant thereto, wherein the channel selection means

includes an audio component level control for use with a speaker and/or headphones.

7. An apparatus as claimed in any preceding Claim, wherein the channel selection means is operable by remote control means.

8. An apparatus as claimed in Claim 7, wherein the remote control means utilises infra-red light.

9. An apparatus as claimed in any preceding Claim, which includes means for interrogating the hub in order to determine the usage of information derived from the broadband R.F. pipe.

10. An apparatus as claimed in any preceding Claim, in which the video display device interface is incorporated within the video display device.

11. An apparatus as claimed in any preceding Claim, wherein the video display device is a video monitor.

12. A multi-media distribution apparatus, substantially as hereinbefore described with reference to the accompanying drawings.

13. The features herein described or illustrated, or their equivalents, in any patentably novel selection.

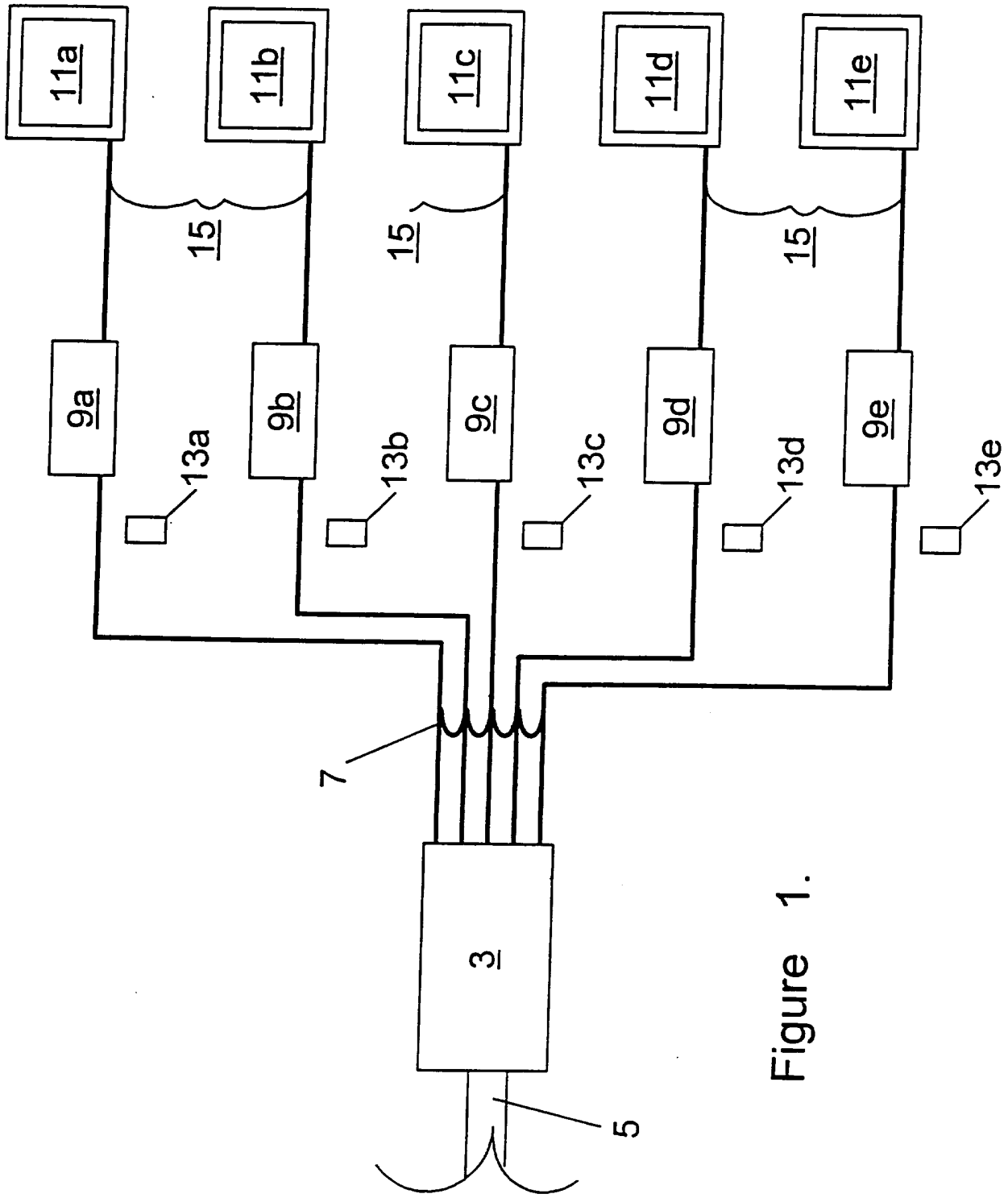

Figure 1.

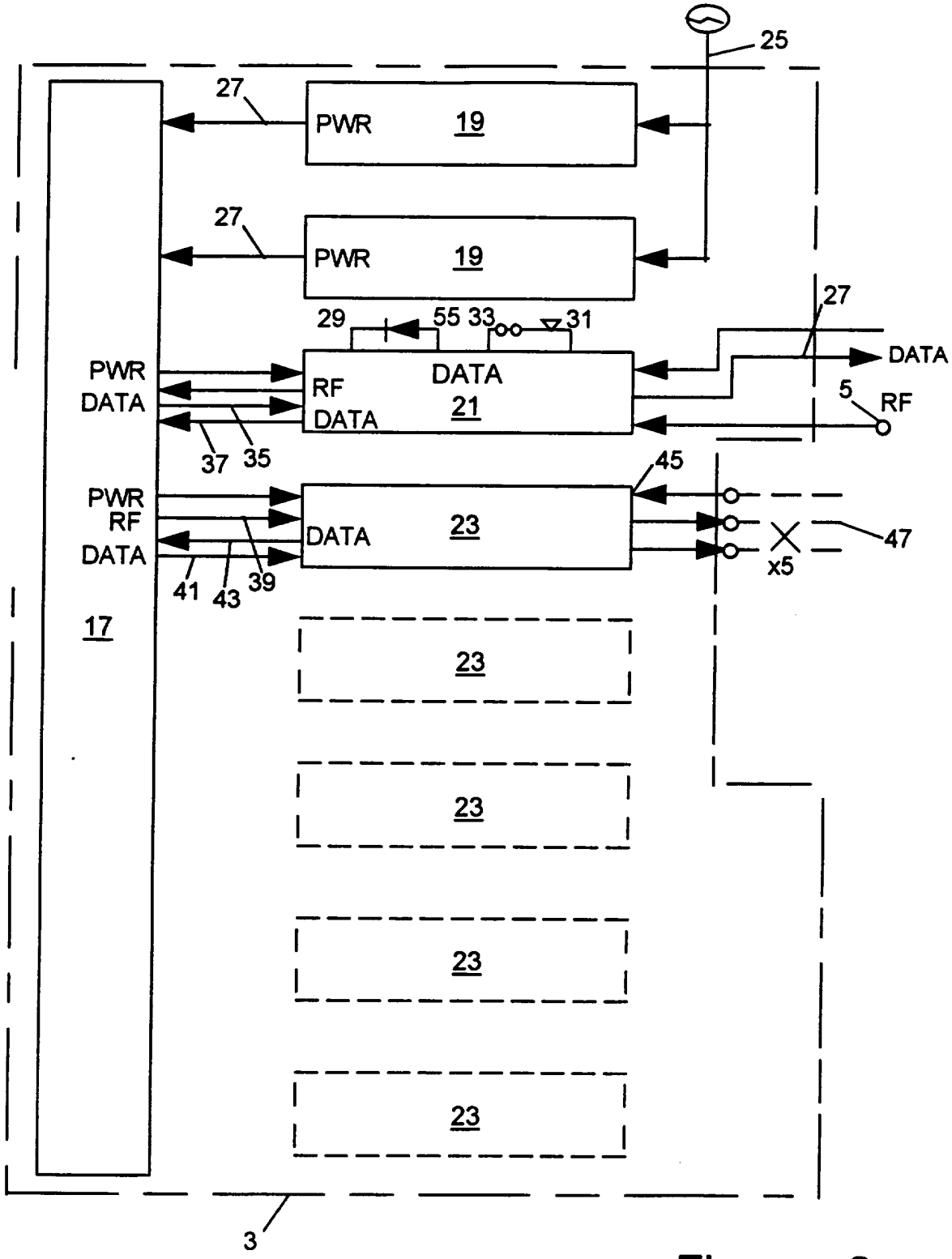
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Figure 2.

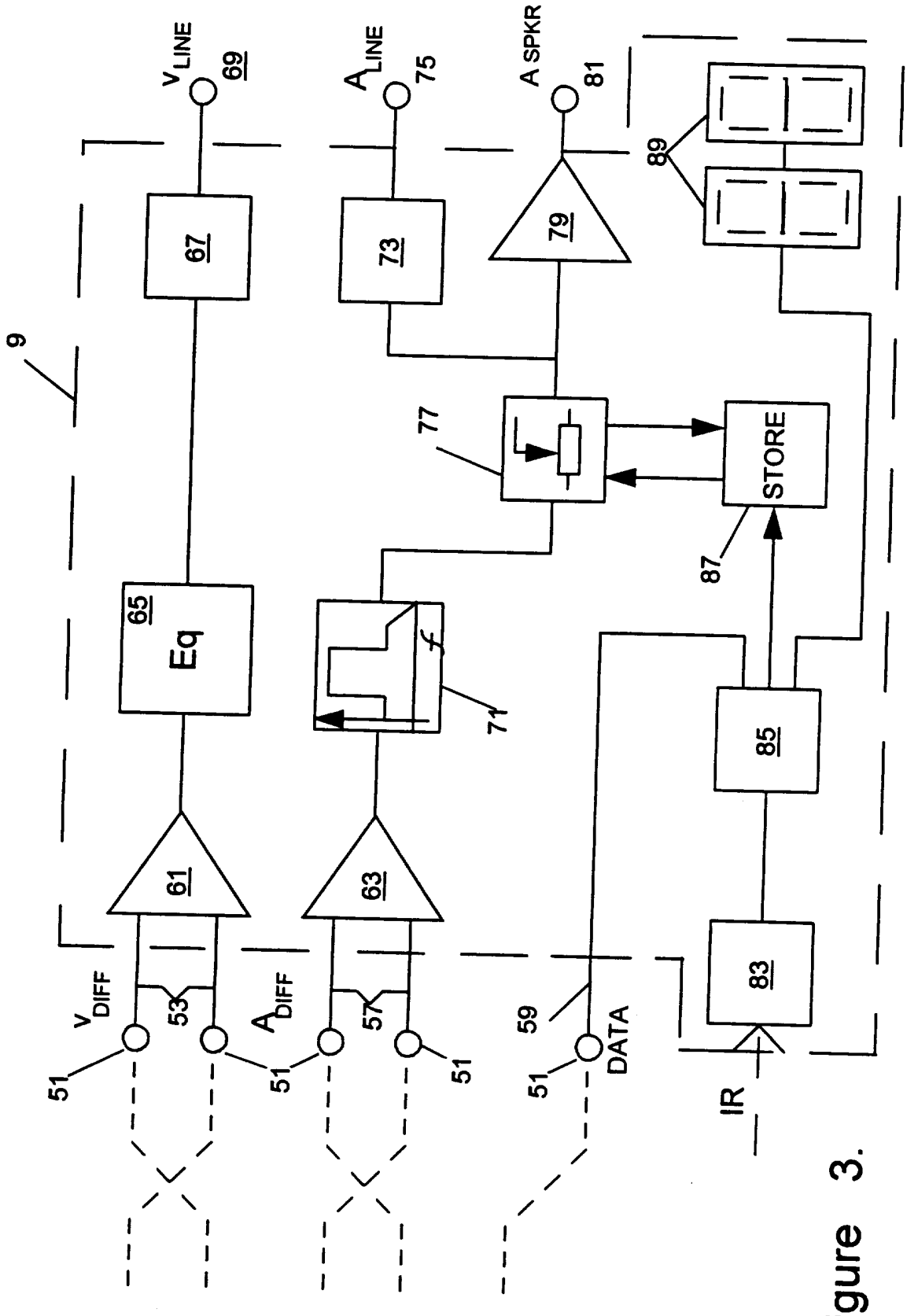
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Figure 3.

INTERNATIONAL SEARCH REPORT

Internation pplication No
PCT/GB 95/02198

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04H1/02

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)
IPC 6 H04H

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.
A	EP,A,0 137 158 (TOCOM INC.) 17 April 1985 see page 2, line 12 - page 3, line 24 see page 5, line 25 - page 6, line 29; claims 1-4,7,8,15,21; figures 1,2	1
A	US,A,4 302 771 (GARGINI) 24 November 1981 see column 1, line 1 - column 2, line 40; claims 1,3,4; figures 1,2	1
A	US,A,5 283 637 (GOOLCHARAN) 1 February 1994 see column 1, line 1 - column 5, line 39; claims 1,11,18; figure 1	1
A	GB,A,2 166 328 (INTERNATIONAL STANDARD ELECTRIC CORPORATION) 30 April 1986 see page 1, line 128 - page 2, line 8; claim 1; figures 1,2,5	8

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/GB 95/02198

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP-A-137158	17-04-85	US-A-	4574305	04-03-86
		DE-A-	3484972	02-10-91
		JP-A-	60048635	16-03-85
US-A-4302771	24-11-81	AU-B-	539540	04-10-84
		AU-B-	6074380	26-02-81
		BE-A-	884724	01-12-80
		CA-A-	1142244	01-03-83
		CH-A-	650885	15-08-85
		DE-A-	3028994	12-03-81
		FR-A,B	2463995	27-02-81
		GB-A,B	2063026	28-05-81
		JP-A-	56031285	30-03-81
		NL-A-	8004774	24-02-81
		SE-B-	447860	15-12-86
		SE-A-	8005699	23-02-81
US-A-5283637	01-02-94	NONE		
GB-A-2166328	30-04-86	DE-A-	3439399	30-04-86