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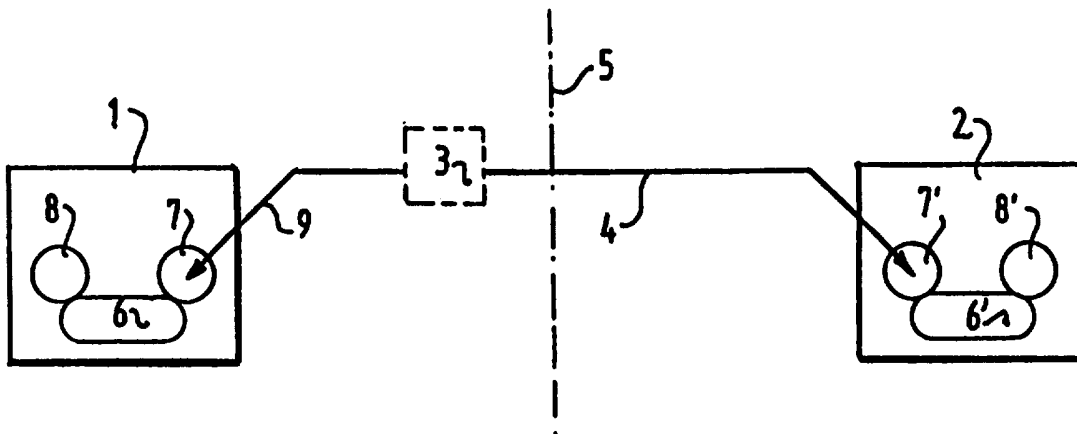


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INTERNATIONAL APPLICATION PUBLISHED UN

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<p>(21) International Application Number: PCT/EP95/03089</p> <p>(22) International Filing Date: 1 August 1995 (01.08.95)</p> <p>(30) Priority Data: 9401262 1 August 1994 (01.08.94) NL</p> <p>(71) Applicant (for all designated States except US): SONY TELECOM (EUROPE) N.V. [BE/BE]; Sint Stevens Woluwestraat 55, B-1130 Brussel (BE).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): BARRAUD, Claude, George [BE/BE]; Sint Stevens Woluwestraat 55, B-1130 Brussel (BE).</p> <p>(74) Agent: 'T JONG, Bastiaan, Jacobus; Arnold &amp; Siedsma, Sweelinckplein 1, NL-2517 GK The Hague (NL).</p>		<p>(81) Designated States: AM, AU, BB, BG, BR, BY, CA, CN, CZ, EE, FI, GE, HU, JP, KG, KP, KR, KZ, LK, LR, LT, LV, MD, MG, MN, MX, NO, NZ, PL, RO, RU, SI, SK, TJ, TT, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, 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), ARIPO patent (KE, MW, SD, SZ, UG).</p> <p><b>Published</b> With international search report.</p>

(54) Title: SYSTEM AND METHOD FOR TELECOMMUNICATION



(57) Abstract

The invention relates to a system and method for telecommunication, specifically interactive telecommunication, said system mainly comprising at least one transmission medium; user apparatus connectable to the transmission medium; server apparatus connectable to the transmission medium for exchange of information with the user apparatus; and coupling means for connecting the user apparatus and the transmission medium as desired, whereby said coupling means comprise means for controlling said user apparatus based on information from said server apparatus and for controlling said server apparatus based on information from said user apparatus; and means for creating and for performing communication with said server apparatus and said user apparatus. As a result of the above-mentioned characteristic properties of the system according to the invention, adjustment is achieved on two levels, namely adjustment of said Set-Top Unit to said transmission medium by said physical medium converter and adjustment of the communication between said Set-Top Unit and said server apparatus by programs in said Set-Top Unit originating from said server apparatus.

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## System and method for telecommunication

The present invention relates to a system and method for telecommunication, specifically interactive telecommunication, said system mainly comprising:

-at least one transmission medium;

5 -user apparatus connectable to the transmission medium;

-server apparatus connectable to the transmission medium for exchange of information with the user apparatus; and

10 -coupling means for connecting the user apparatus and the transmission medium as desired.

In technology such systems are known, however, communication between said user apparatus and said server is often not possible as a result of differences in the ways said apparatuses communicate.

15 The object of the present invention is to provide means enabling interactive communication along any chosen transmission medium between user apparatuses of various kinds and a server apparatus.

20 It is also an object of the present invention to provide means performing a minimum number of functions to enable communication between said user apparatus and said server apparatus.

25 According to the present invention a system is provided, characterized in that said coupling means comprise means for controlling said user apparatus based on information from said server apparatus and for controlling said server apparatus based on information from said user apparatus; and means for creating and for performing

30 communication with said server apparatus and said user apparatus.

Furthermore, said system according to the present invention is characterized in that said coupling means comprise a Set-Top Unit (Set-Top Unit) and a

physical medium converter, in that the means for  
controlling said user apparatus are present in said Set-  
Top Unit and comprise mainly a program for a dynamic  
process down-loaded from said server apparatus and stored  
5 in a RAM memory and in that means for creating  
communicating is a program for a static process stored in  
a ROM memory of said Set-Top Unit.

As a result of the above mentioned  
characteristic properties of the system according to the  
10 invention, adjustment is achieved on two levels, namely  
adjustment of said Set-Top Unit to said transmission  
medium by said physical medium converter and adjustment of  
the communication between said Set-Top Unit and said  
server apparatus by programs in said Set-Top Unit  
15 originating from said server apparatus.

According to the present invention a lign-up of  
Set-Top Units can be developed as commercial products.  
Also, in order to promote the development of interactive  
digital audio-video services, Set-Top Unit manufacturers  
20 will be left as free as possible to compete in the supply  
of these Set-Top Units. Therefore, only a minimal set of  
functionalities is defined in order to be incorporated in  
a standard. This set can be viewed as a "smart gateway" to  
interactive digital audio-video services.

25 The invention will now be explained in detail  
with the following description of a preferred embodiment  
of the invention with reference to the accompanying  
drawings, in which:

Fig. 1 is a schematic representation of the  
30 configuration of elements in the system on both sides of a  
transmission medium;

Fig. 2 is a schematic representation of the Set-  
Top Unit shown in fig. 1;

Fig. 3 is a schematic representation of the  
35 physical medium converter shown in fig. 1.

The portion of a telecommunication system accor-  
ding to the present invention shown in fig. 1 comprises  
mainly:

- a Set-Top Unit 1;
- a physical medium converter 3;
- a connection channel 9;
- a transmission medium 4; and
- server apparatus 2.

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15  
The coupling means are formed by the Set-Top Unit 1, together with the connection channel 9 and the physical medium converter 3, the coupling means forming a connection between the user apparatus 10 and the transmission medium 4. The transmission medium 4 is a connection between the coupling means and the server apparatus 2, the server apparatus 2 having a similar configuration as the Set-Top Unit 1, which is emphasized with the mirror-line 5 and the representation of the physical medium converter 3 by a dashed line.

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25  
30  
35  
The Set-Top Unit 1 contains memory space divided mainly into three parts. The "Operating System" is located in the first part 6 of the memory space, the "Operating System" controlling communication between the physical apparatus of the Set-Top Unit 1 and the programs for static or dynamic processes running in the Set-Top Unit 1. It should be noted that an application program interface (API) can run between the Operating System and the programs for static or dynamic processes. In the case of interactive communication, for which the telecommunication system according to the present invention is particularly suited, the Operating System is preferably of the Real Time, Multi Tasking, Object Oriented type and comprises a minimal number of basic instructions. The operating system mainly handles memory management and communication between processes by "message handling". The second part 8 of the memory space contains programs for static processes, which ensure correct functioning of the Set-Top Unit 1. The third part 7 of the memory space contains programs for dynamic processes, which ensure correct communication with the server apparatus 2 chosen by the user.

As the server apparatus 2 has a similar configuration as the Set-Top Unit 1, corresponding parts of the memory space of the server apparatus 2 are denoted in a similar way by 6',8',7', respectively.

5           At initiation of the communication between the Set-Top Unit 1 and the server apparatus 2 the dynamic processes are sent to the Set-Top Unit 1 by the server apparatus 2. Therefore, initiation of the communication can be represented by the following sequence:

10           1. Initiation by the user.

          2. Relevant static processes become active in the Set-Top Unit 1.

          3. Static processes create a connection with said user apparatus 10 and with said server apparatus 2.

15           4. Static process sends relevant information concerning the Set-Top Unit 1 in the form of a "Identification Format" to the server apparatus 2. This identification format declares the performance capabilities of the Set-Top Unit 1 to the server apparatus 20           2 at the beginning of the session. These performance capabilities relate to memory size available for dynamic processes, screen driver type or the type of another user apparatus, remote control type, whether additional programs for static processes are available (namely the I/O 25           driver and/or a keyboard driver).

          5. Static process in the server apparatus 2 assembles programs for dynamic processes suited to the present Set-Top Unit 1, where suitability is determined by the information in the "Identification Format", the server 30           apparatus 2 assuming certain parameters for the present Set-Top Unit 1 in the case, when the "Identification Format" contains insufficient information, where these assumed parameters are for example fixed as a result of standardization. These parameters comprise preferably a 35           minimum standardized screen driver or other adjustment unit for a user apparatus, a minimum standardized memory size for dynamic processes, a minimum standardized physical user control, being an elementary remote control,

and no additional optional programs for static processes. These minimum performance requirements are predetermined, for instance: minimum screen driver in the form of teletext overlay; minimum memory size for dynamic processes, for example 4Mbits; minimum physical user control, preferably a four-"button" cursor plus a select/unselect "button", where these "buttons" need not be physical buttons.

6. The server apparatus 2 sends the programs for dynamic processes required by the Set-Top Unit 1 to the Set-Top Unit 1, where these programs are stored in the memory space of the Set-Top Unit 1.

7. Dynamic processes in the Set-Top Unit 1 and dynamic processes in the server apparatus 2 communicate to regulate a stream of data between the Set-Top Unit 1 and the server apparatus 2.

Fig. 2 is a schematic representation of the configuration of an Set-Top Unit 1 comprising:

-a processor 11;

-memory space formed by a ROM memory 12 and a RAM memory 13; and

-a port 14 for input and output of data.

The programs for static processes are present in the ROM memory 12 and are copied to RAM memory 13 when the need arises for such a static process. Programs for static processes resident in the Set-Top Unit 1 mainly comprise programs for controlling functioning of an adjustment unit for a user apparatus like a screen driver, a keyboard driver or an I/O port driver, reaction to calls, decoding, handling of remote control, handling of "downloaded" programs and a Resident User Interface (RUI).

In the case, where existing display devices only provide an extremely embedded and elementary mechanism for overlay, a screen driver controlling functioning of the display device may be needed. This process will only remain active as long as a dynamic process does not take over. Similarly a keyboard driver can control functioning of a terminal. An I/O port driver can for example control

functioning of a connected game console.

A Resident User Interface process is necessary when the Set-Top Unit 1 is switched on. This process is then automatically started, for which it is loaded into RAM memory 13, where this process should be minimal. In the case of a network application this process merely enables the Set-Top Unit 1 to connect to one or a very limited number of server apparatuses 2 or only to the navigation systems supplied by the network provider (level 1 in US terminology). Once the Set-Top Unit 1 gains access to the server apparatus 2 or to the network provider navigation system, the latter downloads the application software at the beginning of the session, including a user interface. An active Resident User Interface process is then put on stand-by and only becomes active again, when the session is terminated for whatever reason. This mechanism enables service providers to tailor their user-interfaces to their needs (and also compete for better user-interfaces). The functionality of the RUI is in any case very simple; it merely enables the user to connect to server apparatuses, which will have their own user-interfaces. It should be noted here, that the Resident User Interface processes could also be used to enable definition of some functions, such as user profile, home profile, etc.

The static process for controlling reaction to calls is activated, when the user has chosen a server apparatus 2 he wishes to be connected to, or when for example a first access to a network and a connection to the network is required. The call handler is such a process, which manages all network and protocol tasks (for example SDH/ATM) in order to establish the connection. If all messages to and from the network are to be handled by this process, it will run as long as the connection to the network (the session with the server apparatus 2) is active. Alternatively, when the downloaded software communicates with the network directly (and, upper-layer protocol-wise with the server apparatus 2), the call



handler is terminated at the moment the call is set-up and the connection has been established. Intermediate scenarios are possible, where the call handler process at all times manages the lower-layer protocols and network signalling, whereas the downloaded application software manages the end-to-end protocols. The call handler process depends on the selected network protocols.

In the case of interactive digital telecommunication, for example MPEG 2 coding can be selected for digital A/V coding, preferably as a standard. If the A/V decoding process is performed by a dedicated piece of hardware, a resident A/V MPEG 2 decoder manager is called for. Microprocessing performance permitting, one could, however, envisage the downloading of the A/V decoding scheme in software.

A program controlling the remote control process is needed to perform at least initial remote control operations. It could also include the process responsible for initial conditional access (including a smart card interface driver). Additionally, some resident "accounting" functions could be performed by this process, monitoring the user's expenditure. In a similar way as the Resident User Interface downloaded application software could take over these functions, in which case this remote control handler would be deactivated, and would only be reactivated when the session is terminated for whatever reason.

A resident program for "download" handling manages processes in the memory space 7 for dynamic processes. It is activated when the user has selected a server apparatus 2 to be connected to. The application software is then downloaded from the server apparatus 2 into the part 7 of the memory space containing programs for dynamic processes, after which control is handed over to this process. The download process runs as long as a dynamic process is active. When the last dynamic process is completed, control is returned to the Resident User Interface process.

Programs for dynamic processes originating from the server apparatus 2 are stored in the RAM memory 13, from where these dynamic processes can run on the processor 11. Dynamic processes themselves are not resident in the Set-Top Unit 1. All dynamic processes originate from various server apparatuses 2 (for example navigation, service providers or content providers). Dynamic processes are loaded in to the Set-Top Unit 1 by the download process, which then notifies the operating system of their presence. A downloaded process can then start and carry out its functions by, for instance (and if needed), communicating with the static processes through the operating system. Such dynamic processes are for example a tailored user interface, monitor functions, end-to-end protocols, etc. Dynamic processes can use static processes, when necessary. The operating system and the download process are preferably able to accommodate any number of dynamic processes, where the number of downloaded processes simultaneously available will only be limited by memory (RAM 13) capacity. Preferably, it is possible to have more than one dynamic process downloaded, for example, if the user pauses one dynamic process to run another, resuming the first after completion of the second. For example, a user may pause his "video on demand" movie in order to book a flight to where the movie was filmed. The download process is active and ensures that only one process has access to the video/audio decoder hardware.

Preferably, the Set-Top Unit 1 contains the following interfaces: network interface (down and return channels); RGB/PAL/SECAM/NTSC interface; analog/digital audio interface; and a UHF interface. As an option an interface can be placed between the MPEG 2 demultiplexer and the video and audio decoders. Also, an I/O (data) interface can be added. The user control/smart card interfaces for remote control are not specifically mentioned here.

For the network interfaces ATM logical protocols (format and signalling - including call set-up) independently of the physical medium are used, either for the down channel or the return channel, which can be different channels.

In this case an ATM adaptation layer (AAL) 5 is needed for signalling. For the transport of the audio-video data an MPEG transport stream can be used. Two MPEG 2 transport packets could then be contained in eight AAL 5 cells, optimising overhead. The MPEG 2 system layer for transport streams provides all necessary means for source clock recovery through time stamps mechanisms. Alternatively, it is possible to use an AAL 1 for transporting the MPEG 2 transport stream by containing one MPEG 2 transport packet in four AAL 1 cells. An FEC above the current AAL 1 is optional, as tests have shown, that flagging an MPEG 2 transport packet loss (or even better, a cell loss through the use of the cell sequence numbering available in AAL 1) to the MPEG 2 decoder enables proprietary error concealment techniques to make any picture artefact hardly detectable by any viewer.

The programs for dynamic processes should however be downloaded error-free at the beginning of the session between the server apparatus 2 and the Set-Top Unit 1. In this case real-time processing is not required, as no isochronicity is required, unlike in A/V streams. It is therefore possible to use an ARQ-type end-to-end recovery protocol. The express transport protocol (XTP), which is less complex than the TCP/IP recovery protocol, can be used to provide such an error-detection mechanism.

The RGB/PAL/SECAM/NTSC interface is intended to be connected to a standard scart interface, which is also the case for analog/digital audio interfaces.

A UHF interface can be used for old televisions, to which current and more modern standard audio/video interfaces cannot be connected.

An I/O (data) interface, which can optionally be added, is a transparent interface (bit stream) allowing connection of other terminals, for example a game console, to the Set-Top Unit 1. In this case the Set-Top Unit 1 is really a "smart gateway" to interactive digital audio/video services.

The schematic representation shown in fig. 3 of the physical medium converter 3 comprises:

- a converter 21 for the connection channel 9;
- a converter 22 for the transmission medium 4;

and

-a connection between the converters 21 and 22, which comprises the connection channels 25 and 26.

The connection channel 9 between the Set-Top Unit 1 and the first converter 21 is usually not of the same kind as the transmission medium 4 between the second converter 22 and the server apparatus 2. The converter 3 has a modular configuration in the embodiment shown here, so as to enable simple adjustment to the present transmission medium 4 by using a other converter 22 in the converter 3. It is also possible to make the converter 3 suitable for several transmission media 4,4' by adding a converter 22' represented by dashed lines, necessitating the use of a selector 24 provided in the connection between the converters 21 and 22,22', between the connection channels 25 and 26.

The connection channel 9 is preferably of one type so that at this side of the converter 3 there is no need for measures, like those taken at the other side of the converter 3 to allow for the variety of possible transmission media 4.

Communication along the connection channel 9 between the physical medium converter 3 and the Set-Top Unit 1 can for instance be performed with SDH/Sonnet 155 Mbps. However, the output of the physical medium converter 3 to the Set-Top Unit 1 is subject to some minimum performance requirements, namely in terms of the Bit Error Rate (BER), regardless of the physical transmission medium

4 used as an access network (coaxial cable, fiber cable, ADSL, etc.). As a result of this mechanism, the Set-Top Unit 1 is completely independent of the type of physical transmission media 4 used as access networks.

5           It is obvious, that the physical medium  
converter 3 can be incorporated in the Set-Top Unit 1,  
even though they have been represented by individual  
elements in fig. 1 and fig. 2. Further the coupling means  
formed by the Set-Top Unit 1 or by the Set-Top and the  
10 physical medium converter 3 can be incorporated in the  
user-apparatus 10 to form a unit therein.

**CLAIMS**

1. System for telecommunication, comprising:  
-at least one transmission medium;  
-user apparatus connectable to the transmission  
medium;  
5 -server apparatus connectable to the  
transmission medium for exchange of information with the  
user apparatus; and  
-coupling means for connecting the user  
apparatus and the transmission medium as desired,  
10 **characterized in that**, said coupling means comprise means  
for controlling said user apparatus based on information  
from said server apparatus and for controlling said server  
apparatus based on information from said user apparatus;  
and  
15 -means for creating and for performing  
communication with said server apparatus and said user  
apparatus.
2. Telecommunication system according to claim  
1, **characterized in that**, said coupling means comprise a  
20 Set-Top Unit (Set-Top Unit) and a physical medium  
converter, said Set-Top Unit comprises means for  
controlling said user apparatus, said means mainly compri-  
sing programs for dynamic processes down-loaded from said  
server apparatus and stored in a RAM memory, and said  
25 means for creating communication is a program for a static  
process recorded in a ROM memory of the Set-Top Unit.
3. Telecommunication system according to claims  
1 and 2, **characterized in that**, said physical medium  
converter is placed between said Set-Top Unit and said  
30 transmission medium.
4. Telecommunication system according to claim  
2, **characterized in that**, said ROM memory further contains  
a controlprogram for recording into said RAM memory.
5. Telecommunication system according to claim  
35 2, **characterized in that**, said ROM memory contains further  
programs for controlling an adjustment unit for a user

apparatus, a program for handling calls, a decoding program and a program for remote control.

6. Telecommunication system according to claim 1, characterized in that, said coupling means are incorporated in said user apparatus.

7. Set-Top Unit apparatus adapted to be used in the telecommunication system according to claims 1-6, comprising means for controlling user apparatus, comprising a RAM-memory for storing programs for dynamic processes and a ROM-memory for storing programs for static processes.

8. Set-Top Unit apparatus according to claim 7, further comprising a physical medium converter for creating and performing communication with a server apparatus.

9. Method for telecommunication between a user apparatus and a server apparatus, where information is transmitted and received via a coupling means and through a transmission medium, where transmission of information between said server and said coupling means is regulated in accordance with dynamic processes characterised by supplying said coupling means with programs for dynamic processes and storing said programs in a memory means of said coupling means.

10. Method according to claim 9, characterised by activating relevant static processes in said coupling means for connecting said user apparatus to said server apparatus and supplying information concerning said coupling means to said server apparatus.

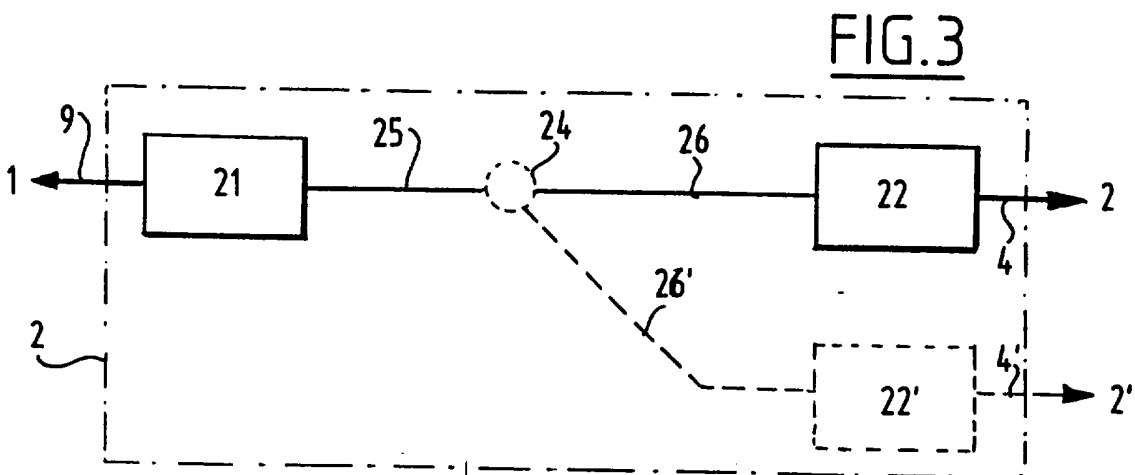
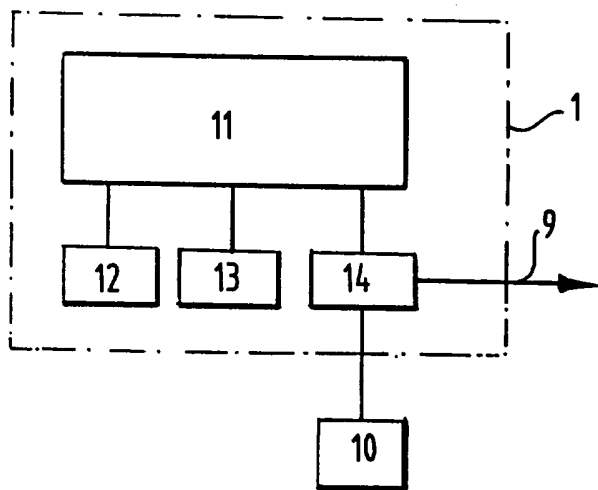
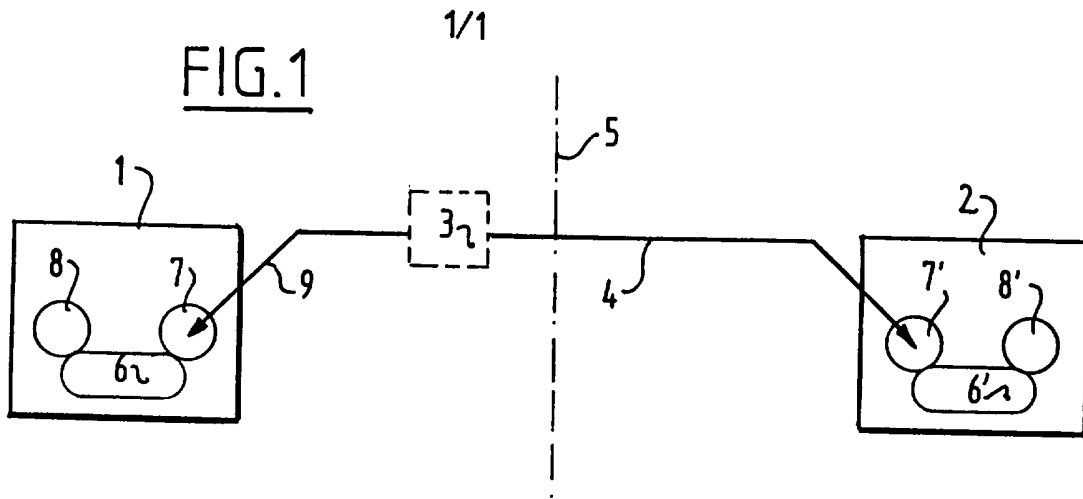
11. Method according to one of the preceding claims 9 - 10, characterised in that said information to be transmitted comprises interactive digital video-audio data.

12. Method for telecommunication, comprising the steps of:

- activating relevant static processes in a coupling means for connecting a user apparatus and a server apparatus through a transmission medium;

- sending relevant information concerning said coupling means to said server apparatus;
- receiving programs for dynamic processes from said server apparatus at said coupling means and storing said programs in a memory means thereof; and
- communicating between said server apparatus and said coupling means to regulate a stream of data in accordance with said dynamic processes.





# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP 95/03089

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 H04N7/173

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 H04N

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.
X	WO,A,94 13107 (DISCOVERY COMMUNICATIONS INC) 9 June 1994 see page 5, line 14 - page 6, line 32 see page 10, line 5 - page 23, line 24 see page 26, line 22 - page 41, line 26 see page 57, line 18 - page 58, line 32 see figures 1-17 ---	1-12
A	16TH INTERNATIONAL TV SYMPOSIUM- CATV SESSIONS- SYMPOSIUM RECORD, 17 June 1989 MONTREUX, CH, pages 554-559, XP 000093967 S. ROBERTS ET AL 'VIDEOTEX AND INTERFACE SERVICES ON TREE & BRANCH CABLE TV NETWORKS' -----	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Date of the actual completion of the international search

27 October 1995

Date of mailing of the international search report

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Name and mailing address of the ISA

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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International Application No

PCT/EP 95/03089

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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