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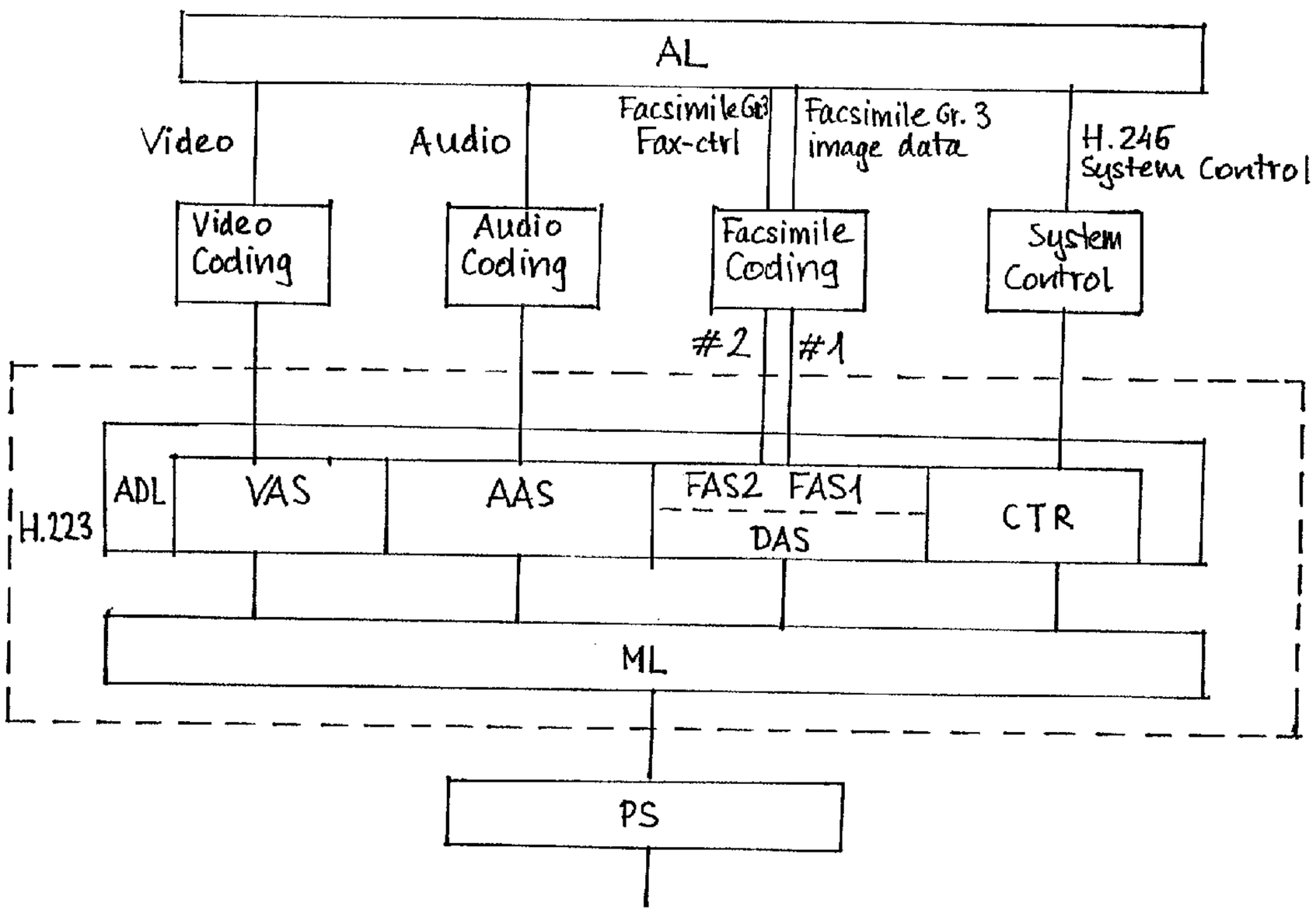
(54) **PROCEDE ET DISPOSITIF POUR LA TRANSMISSION DE DONNEES TELECOPIEUR CODEES ENTRE DES TERMINAUX DE COMMUNICATION A CAPACITE MULTIMEDIA**

(54) **METHOD AND SYSTEM FOR TRANSMITTING FACSIMILE-CODED DATA BETWEEN COMMUNICATIONS TERMINALS WITH MULTIMEDIA CAPABILITY**



(57) Télécopieur et procédé pour la transmission de données télécopieur codées, par l'intermédiaire d'un réseau de communication, d'un terminal de communication émetteur à un terminal de

(57) A facsimile device and a method for transmitting facsimile coded information from a transmitting communications terminal, through a communications network, to a receiving communications terminal by

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communication récepteur, avec utilisation d'un protocole de transmission télécopieur UIT-T T.T4 et UIT-T T.30 et d'un protocole visiophone mobile adapté pour réseau téléphonique public commuté, comportant les étapes suivantes: a) les données d'entrée numériques télécopieur sont comprimées dans un terminal de communication; b) les données codées télécopieur comprimées sont réparties par une couche d'adaptation télécopieur et adaptées à la couche multiplexage de paquets multimédia sous-jacente; c) chaque bloc de données est identifié sous la forme d'un bloc de données télécopieur et transmis à la couche de multiplexage; d) tous les blocs de données sont multiplexés à partir des terminaux de communication émetteurs, avec utilisation d'un protocole visiophone mobile pour réseau téléphonique public commuté UIT-T H.223 et H.224.5 (du 11-1995), à l'aide de la couche de multiplexage, conjointement avec d'autres blocs de données, éventuellement présents, pour la voix, la vidéo, les données, etc.; ils sont alors transmis au terminal de communication récepteur et démultiplexés dans celui-ci; e) les blocs de données d'informations démultiplexés sont acheminés chacun à la couche d'adaptation associée appropriée au type de données (vidéo, voix, données ou télécopieur); la couche d'adaptation télécopieur est envoyée aux blocs de données télécopieur pour être soumise à une décompression télécopieur IUT-T T.4, T6 ou T.30, et les données télécopieur décomprimées sont sorties ou soumises à un traitement ultérieur.

using the facsimile transmission protocol based on ITU-T T.T4 and ITU-T T.30 and an adapted PSTN mobile videophone protocol, said method involving the following steps: a) digital facsimile input data are compressed in the transmitting communications terminal; b) the compressed facsimile coded data are divided up by an adaptation layer and adapted to the underlying multimedia packet multiplex layer (ML) in accordance with H.223; c) each data block is flagged as a facsimile information control block or facsimile information data block and forwarded to the multiplex layer; d) all the information data blocks are multiplexed by the transmitting communication terminal using a PSTN/mobile video protocol based on ITU-T H.223 and H.224.5 (in the version of 11/95) using the multiplex layer, together with any other information blocks for speech, video, data, etc., that may be present; they are then transmitted to the receiving communications terminal, where they are demultiplexed; e) the demultiplexed data blocks are each routed to the appropriate dedicated adaptation layer (voice, video, data, or facsimile); the facsimile adaptation layer forwards the facsimile data to undergo a facsimile decompression process according to ITU-T T.4, T.6 or T.30, and the decompressed facsimile data are output or undergo further processing.

Abstract

A facsimile device and a method for transmitting facsimile coded information from a transmitting communications terminal, through a communications network, to a receiving communications terminal by using the facsimile transmission protocol based on ITU-T T.T4 and ITU-T T.30 and an adapted PSTN mobile videophone protocol, said method involving the following steps:

a) digital facsimile input data are compressed in the transmitting communications terminal;

b) the compressed facsimile coded data are divided up by an adaptation layer and adapted to the underlying multimedia packet multiplex layer (ML) in accordance with H.223;

c) each data block is flagged as a facsimile information control block or facsimile information data block and forwarded to the multiplex layer;

d) all the information data blocks are multiplexed by the transmitting communication terminal using a PSTN/mobile video protocol based on ITU-T H.223 and H.224.5 (in the version of 11/95) using the multiplex layer, together with any other information blocks for speech, video, data, etc.; that may be present; they are then transmitted to the receiving communications terminal, where they are demultiplexed;.

e) the demultiplexed data blocks are each routed to the appropriate dedicated adaptation layer (voice, video, data, or facsimile); the facsimile adaptation layer forwards the facsimile data to undergo a facsimile decompression process according to ITU-T T.4, T.6 or T.30, and the decompressed facsimile data are output or undergo further processing.

METHOD AND SYSTEM FOR TRANSMITTING FACSIMILE-CODED DATA BETWEEN COMMUNICATIONS TERMINALS WITH MULTIMEDIA CAPABILITY

The present invention relates to a method and a system for transmitting facsimile-coded information between communications terminals with multimedia capability, such as those that are known and used for transmitting data, video, and audio signals, for the transmission of such signals using a protocol based on ITU-T H.223 and H.245 (i.e., the version dated November 1995).

The Group 3 telefax terminals that can be connected to a communications network through analog interfaces are mainly used for transmitting still images. The images that are to be transmitted over telecommunications networks are made up of a large number of small black and white mosaic squares (pixels) that are of identical shape and size. The originals of these still images are either input by way of a scanner and broken down into black and white pixels or else result from a document/drawing generated by a computer. The pixels are converted into digital code in the transmitting communication terminal. They are first compressed in order to reduce the quantity of information that is to be transmitted and are then broken down into information data blocks and transmitted block by block over the telecommunications network. In the receiving communications terminal, the information that has been received is decompressed and decoded into the original black and white pixels, which then make an image that is identical to the original (and for this reason is referred to as a "facsimile"). The image that is received is usually printed out on paper by the receiving terminal or, in some

cases, displayed on a video terminal or stored on local digital storage devices such as magnetic disks.

The method that is used by telefax Group 3 terminals has been standardized according to the International Telecommunications Union into the corresponding ITU-T recommendations for Group 3 (ITU-T T.4, ITU-T T.6, ITU-T T.30) (final revision 1995).

As a rule, a facsimile Group 3 apparatus is a single-mode communications device, i.e., in the normal course of events it can only transmit one specific type of information (namely, a facsimile pixel image).

In contrast to this, communications terminals that are multimedia capable can transmit at least two types of information, e.g., a facsimile pixel image accompanied by speech, at the same time.

It is the task of the present invention to describe a secure and simple method for facsimile-image transmission within the framework of multimedia communications, over a communications network, that makes additional communications services possible regardless of whether the communication terminals are connected to the communications network through analog or digital interfaces. Systems for using such a method are also described.

Summary of the Invention

It is proposed that within the data flow that is transmitted between facsimile terminals, in place of the know half-duplex or full duplex (T.30 Annex C) according to ITU-T T.30, a new full-duplex protocol based "packet media mode" of the ITU PSTN/mobile videophone (ITU-T H.324 or ITU-T H.32P/M series of the ITU-T Recommendations) be used and that the facsimile protocol ITU-T T.30 with voice (e.g., based on ITU-T G.723, G.729, or G.dsdv coded) be multiplexed with ITU-T H.233. Control, i.e., opening the facsimile channel, transmission, and closing of the channels is effected by an ITU-T multimedia channel control based on ITU-T H.245.

A method according to the present invention for the transmission of facsimile coded information from a transmitting communications terminal through a communications network to a receiving communications terminal using the facsimile transmission protocol based on ITU-T T.40 and ITU-T T.30 and a PSTN/mobile videophone protocol (based at present on ITU-T H.223) that is flexible with respect to the user channels can have the following steps for facsimile Group 3 transmission with half-duplex facsimile protocol based on ITU-T T.30:

1a) Digital facsimile input data are compressed in the transmitting communications terminal;

1 b) The data, facsimile coded (according to ITU-T T.4, T.6) are divided up by a facsimile adaptation layer and adapted to the underlying multimedia packet multiplex layer (Figure 1). Using ITU-T H.245, two data channels (data channel #1, and #2) are allocated and opened. Data channel 2 is used as a full-duplex channel for transmitting facsimile control data according to ITU-T. T.50. In this channel, amongst other things, the equipment parameters and the common transmission parameters (e.g., image resolution, facsimile compression methods, error correction procedures, facsimile transmission or reception) are exchanged, selected, and set up; the successful/or unsuccessful transmission of the page and/or the facsimile transmission is confirmed; after transmission of the facsimile message, communication is terminated and control reverts to ITU-T H.245. Data channel number 1 is allocated for the transmission of facsimile coded information as a half-duplex channel, and opened. The facsimile data are coded and sent in accordance with the settings via data channel number 2.

1c) each data block of data channel #2 and data channel #1 is flagged as an information control blocks or a facsimile information data block and forwarded to the multiplex layer;

1d) all the data blocks are multiplexed by the transmitting communication terminal using a PSTN/mobile video protocol based on ITU-T H.223 and H.224.5 by the multiplex layer, together with any other information blocks for speech, video, data,

etc. that may be present; they are then sent to the receiving communications terminal, where they are demultiplexed.

1e) the demultiplexed information data blocks are each routed to the appropriate dedicated adaptation layer (video, voice, data, or fax); the facsimile adaptation layer forwards the facsimile information blocks to data channel #1 and #2 of the receiver to undergo a facsimile decompression process according to ITU-T T.4, T.6 or T.30, and the decompressed facsimile information is output or undergoes further processing. The facsimile adaptation layer can also be part of a data adaptation layer as in the cases described below.

2) In the case of Group 3 facsimile transmission with the new optional full-duplex facsimile protocol based on ITU-T T.30, Annex C, the following steps may be involved:

2a) Digital facsimile input information is compressed in the transmitting communications terminal;

2b) The facsimile information, coded according to ITU-T T.4, T.6) is divided up by a facsimile adaptation layer and adapted to the underlying multimedia packet multiplex layer; only one data channel (data channel #1) is allocated and opened for this purpose, using ITU-T H.245.

Data channel #1 is also used as a full-duplex channel for transmitting the facsimile control data according to ITU-T T.30 Annex C. In the case of facsimile control, the equipment parameters, and the common transmission parameters (e.g., image resolution, facsimile compression methods, facsimile send or receive, amongst others) are exchanged, selected, and set up; the successful or unsuccessful transmission of the page or facsimile transmission is confirmed; after transmission of the facsimile message the communications is terminated and control reverts to the ITU-T H.245.

Within data channel #1, the channel is allocated, opened, and transmitted according to T.30 Annex C in order to transmit the facsimile coded data.

2c) Each data block of data channel #1 is flagged as a facsimile information data block and forwarded to the multiplex layer;

2d) All information data blocks are multiplexed by the transmitting communications terminal using PSTN/mobile videophone protocol--according to ITU-T H.223 and H.245--with the help of the multiplex layer, together with any other information blocks for voice, video, data, and the like that may be present, and transmitted to the receiving communications terminal, in which they are demultiplexed;

2e) The demultiplexed information data blocks are routed to an adaptation layer that is allocated to the information data type, video, speech, data or facsimile, the facsimile adaptation layer passes on the facsimile information blocks to undergo facsimile

decompression based on ITU-T T.4, T.6, T.30 to data channel #1 of the receiver, and the decompressed facsimile information is output or undergoes further processing.

The invention may be summarized, in one broad aspect, as a method for transmitting facsimile coded information from a transmitting communications terminal (KES) via a communications network (KN) to a receiving communications terminal (KEE) by using the facsimile transmission protocol based on ITU-T T.4 and ITU-T T.30 and a PSTN/mobile videophone protocol ITU-T H.223 adapted with H.245, with the following steps: a) digital facsimile input information is compressed in a transmitting communications terminal (KES); b) the compressed facsimile coded information data and the facsimile control data are divided up in the case of half duplex Group 3 facsimile transmission through an adaptation layer (FAS 1) for facsimile data (image data) and through an adaptation layer (FAS 2) for the facsimile control and adapted to the underlying multimedia packet multiplex layer (ML) in accordance with H.223; c) each data block of data channel #2 and data channel #1 is flagged as a facsimile information control block or a facsimile information data block and forwarded to the multiplex layer (H.223) that contains the multimedia packet multiplex layer (ML); d) all the data blocks are multiplexed by the transmitting communication terminal (KES) using a PSTN/mobile

video protocol based on ITU-T H.223 and H.224.5 by using the multiplex layer (H.223) referred to, together with any other information blocks (AAS, VAS, DAS) for speech, video, data, etc.; they are then sent to the receiving communications terminal (KEE), where they are demultiplexed; e) the demultiplexed information data blocks are each routed to the appropriate dedicated adaptation layer (VAS, AAS, DAS, FAS1, FAS2); the two facsimile adaptation layers (FAS1, FAS2) forward the facsimile information blocks or facsimile control blocks to undergo a facsimile decompression process according to ITU-T T.4, T.6 or T.30, and the decompressed facsimile information is output or undergoes further processing.

In another broad aspect, the invention provides a method for transmitting facsimile coded information from a transmitting communications terminal (KES) via a communications network (KN) to a receiving communications terminal (KEE) by using the facsimile transmission protocol based on ITU-T T.4 and ITU-T T.30 and a PSTN/mobile videophone protocol ITU-T H.223 adapted with H.245, said method involving the following steps: a) digital facsimile input information is compressed in a transmitting communications terminal (KES); b) in the case of a full duplex transmission, the compressed facsimile coded information data and the facsimile control data are transported through a common adaptation layer and adapted to the underlying

multimedia packet multiplex layer (ML) in accordance with H.223; c) each facsimile data block is flagged as a facsimile information data block or a facsimile information control block and forwarded to the multiplex layer (H.233) that contains a multimedia packet multiplex layer (ML); d) all the information data blocks are multiplexed by the transmitting communication terminal (KES) using the PSTN/mobile by using the multiplex layer (H.223) referred to, together with any other information blocks for speech, video, data, etc. that may be present, and are then sent to the receiving communications terminal (KEE), where they are demultiplexed; e) the demultiplexed information data blocks are each routed to the appropriate dedicated adaptation layer (VAS, AAS, FAS, DAS), the facsimile adaptation layer (FAS) forwards the facsimile information data blocks or facsimile control data blocks to undergo a facsimile decompression process according to ITU-T T.4, or T.30, and the decompressed facsimile information is output or undergoes further processing.

In one configuration, in addition, for purposes of flagging for facsimile information and facsimile control data blocks there is also a flag for audio (speech), video, data, and control information data blocks. It is preferred that the facsimile

transmission protocol based on ITU-T T.4, T.6, ITU-T T.30, and the PSTN/mobile videophone protocol based on ITU-T H.223 adapted to ITU-T H.245 be used.

A facsimile device used for performing the method according to the present invention incorporates an image scanning device, a printer, and fax modem, a communication control program based on ITU-T T.30 and H.245, a multimedia multiplexer (H.223), and a facsimile coder/decoder (ITU-T T.4, T.6, T.81, T.82), as well as an audio input/output device such as a loudspeaker and a microphone. In addition, it also incorporates a coding/decoding device for compressing and decompressing audio input/output signals. Optionally, it can also incorporate a PC or a data display.

The present invention will be described in greater detail below on the basis of the drawings appended hereto. These drawings show the following:

Figure 1: the protocol layers of the multimedia facsimile as in Claim 1;

Figure 2: The protocol layers of the multimedia facsimile as in Claim 1;

Figure 3: A block diagram of the embodiment of a facsimile device for using the method according to the present invention.

Depending on the individual forms in which it is realized, the present invention utilizes some special features of the telefax Group 3 standard and the upcoming PSTN/mobile videophone standard ITU-T H.324, ITU-T H.223, and ITU-T H.245 of the ITU, i.e., the use of the full-duplex protocol based on "packet media mode" of the PSTN/mobile videophone that is to be introduced, the protocol layer of which is shown in Figure 1 or Figure 2. This is a two-layer multiplex method. The physical connection is effected in the physical layer PS. This contains V.8, V.8 bis, and V.34, which is used to form the connection and for modem communications. In the lower layer ML (multimedia packet multiplex layer, Multiplex Layer, layer 2, as in the OSI reference model) of the multiplex-layer H.223 based on H.223, information packets according to the different types of information (video, audio/speech, data, facsimile data, facsimile control, multimedia terminal control) are flagged and multiplexed in different length. In addition, an adaptation layer ADL for "Group 3 facsimile" (facsimile group 3 adaptation layer) takes care of the protocol adaptation for facsimile communication such as, for example, error correction mode, on the lower multiplex layer ML. This means that the multiplex layer H.223 is completely independent of the protocols for applications (e.g., facsimile). In addition, Figure 1 shows the physical layer PS that is arranged beneath the multiplex layer, the video adaptation layer VAS, the data adaptation layer DAS, the audio adaptation layer AAS and facsimile adaptation layers FAS1 for facsimile data and FAS2 for facsimile control and the associated higher layers for video coding, for data coding, for audio coding and for facsimile coding/control, are also shown. The latter are formed, as required, as coder/decoder layers ADL and connect the adaptation layer with an application layer AL. The protocols based on H.223 contain the physical layer PS and the individual adaptation

layers ADL. Figure 1 shows a data channel # 1 for transmitting facsimile data from the facsimile adaptation layer FAS1 to the application layer AL and a data channel #2 for transmitting facsimile control instructions from the facsimile adaptation layer FAS2 to the application layer AL. Figure 1 and Figure 2 also show a special data channel for transmitting H.245 system control data from the system adaptation layer CTR to the application layer AL.

The protocol layers of the multimedia facsimile shown in Figure 2 differ from those shown in Figure 1 only in that because of the full transmission to the facsimile coder/decoder, only one data channel #1 is used, and similarly only one facsimile adaptation layer FAS is provided.

In addition, it is advantageous for the present invention that the transmission speed of telefax Group 3 can be increased by the optional addition of a high-speed modem, based for example on ITU-T V.34, to speeds as high as 33.6 kBits/s. This has an effect on all data channels.

The present invention is also enhanced in that the present standardization of voice coding at very low bit rates for videotelephony in the public telephone dial network in ITU-T dedicated voice coding is performed at transmission speeds of 5 - 8 kBits/s (ITU-T G.723, ITU-T G.729, ITU-T G.dsvd). These require a secured type of transmission, for example, in accordance with the packet media multiplexing method (ITU-T H.223).

The method described in the present ITU-T recommendations can be so expanded through including the above features on an as-needed basis, that the above described essential functionality, namely the movement of facsimile images by way of PSTN/videophone protocols, can be achieved effectively.

In addition to the foregoing, the present invention permits the simultaneous transmission of multimedia information (e.g., voice, facsimile image, data, moving image). As an example, the present invention makes it possible to add a simultaneous commentary to a written telefax message by appending a spoken message; such a commentary could offer an introduction or serve as an additional explanation of the individual parts of a telefax message that is received. Figure 3 shows a facsimile device, an H.324 platform for using the method according to the present invention. This contains a scanner 14, a printer 13, a modem 10, a communications controller 2 and 7 based on ITU-T T.30 and H.245, H.223, a multimedia multiplexer/demultiplexer 8, and a coder/decoder 4 as well as an audio input/output device 11 such as a loudspeaker or microphone. It also incorporates an audio signal coder/decoder 1 (ITU-T G.723, G.729, or an G.dsvd) for compressing and decompressing audio input/output signals. Figure 3 also shows a network interface through which the facsimile and multimedia device PSTN network is connected through modem 10 and telephone 16 to a PSTN communications network. In addition, in the example shown there is a switch 17 that simplifies mono-media operation. A communications switcher 9 is also shown.

Patent Claims

1. A method for transmitting facsimile coded information from a transmitting communications terminal (KES) via a communications network (KN) to a receiving communications terminal (KEE) by using the facsimile transmission protocol based on ITU-T T.4 and ITU-T T.30 and a PSTN/mobile videophone protocol ITU-T H.223 adapted with H.245, with the following steps:

a) digital facsimile input information is compressed in a transmitting communications terminal (KES);

b) the compressed facsimile coded information data and the facsimile control data are divided up in the case of half duplex Group 3 facsimile transmission through an adaptation layer (FAS 1) for facsimile data (image data) and through an adaptation layer (FAS 2) for the facsimile control and adapted to the underlying multimedia packet multiplex layer (ML) in accordance with H.223;

c) each data block of data channel #2 and data channel #1 is flagged as a facsimile information control block or a facsimile information data block and forwarded to the multiplex layer (H.223) that contains the multimedia packet multiplex layer (ML);

d) all the data blocks are multiplexed by the transmitting communication terminal (KES) using a PSTN/mobile video protocol based on ITU-T H.223 and H.224.5 by using the multiplex layer (H.223) referred to, together with any other information blocks (AAS, VAS, DAS) for speech, video, data, etc.; they are then sent to the receiving communications terminal (KEE), where they are demultiplexed.

e) the demultiplexed information data blocks are each routed to the appropriate dedicated adaptation layer (VAS, AAS, DAS, FAS1, FAS2); the two facsimile adaptation layers (FAS1, FAS2) forward the facsimile information blocks or facsimile control blocks to undergo a facsimile decompression process according to ITU-T T.4, T.6 or T.30, and the decompressed facsimile information is output or undergoes further processing.

2. A method for transmitting facsimile coded information from a transmitting communications terminal (KES) via a communications network (KN) to a receiving communications terminal (KEE) by using the facsimile transmission protocol based on ITU-T T.4 and ITU-T T.30 and a PSTN/mobile videophone protocol ITU-T H.223 adapted with H.245, said method involving the following steps:

a) digital facsimile input information is compressed in a transmitting communications terminal (KES);

b) in the case of a full duplex transmission, the compressed facsimile coded information data and the facsimile control data are transported through a common adaptation layer and adapted to the underlying multimedia packet multiplex layer (ML) in accordance with H.223;

c) each facsimile data block is flagged as a facsimile information data block or a facsimile information control block and forwarded to the multiplex layer (H.233) that contains a multimedia packet multiplex layer (ML);

d) all the information data blocks are multiplexed by the transmitting communication terminal (KES) using the PSTN/mobile by using the multiplex

layer (H.223) referred to, together with any other information blocks for speech, video, data, etc. that may be present, and are then sent to the receiving communications terminal (KEE), where they are demultiplexed;

e) the demultiplexed information data blocks are each routed to the appropriate dedicated adaptation layer (VAS, AAS, FAS, DAS), the facsimile adaptation layer (FAS) forwards the facsimile information data blocks or facsimile control data blocks to undergo a facsimile decompression process according to ITU-T T.4, or T.30, and the decompressed facsimile information is output or undergoes further processing.

3. A method as defined in Claim 1 or Claim 2, characterized in that in addition to flagging for facsimile information data blocks and facsimile control data blocks, flagging for audio, video, data, and multimedia terminal control information data blocks is also provided.

4. A method as defined in one of the preceding claims, characterized by the use of the facsimile transmission protocol based on ITU-T T.4, ITU-T T.30.

5. A facsimile device for using the method as defined in one of the Claims 1 to 4, with a scanner (14), a printer (13), a modem (10), a communications control (7), a multimedia multiplexer (8), and a facsimile coder/decoder (4), as well as an audio input/output device (11, 12), characterized by an audio signal coder/decoder (1) for compressing and decompressing an audio input/output signal.

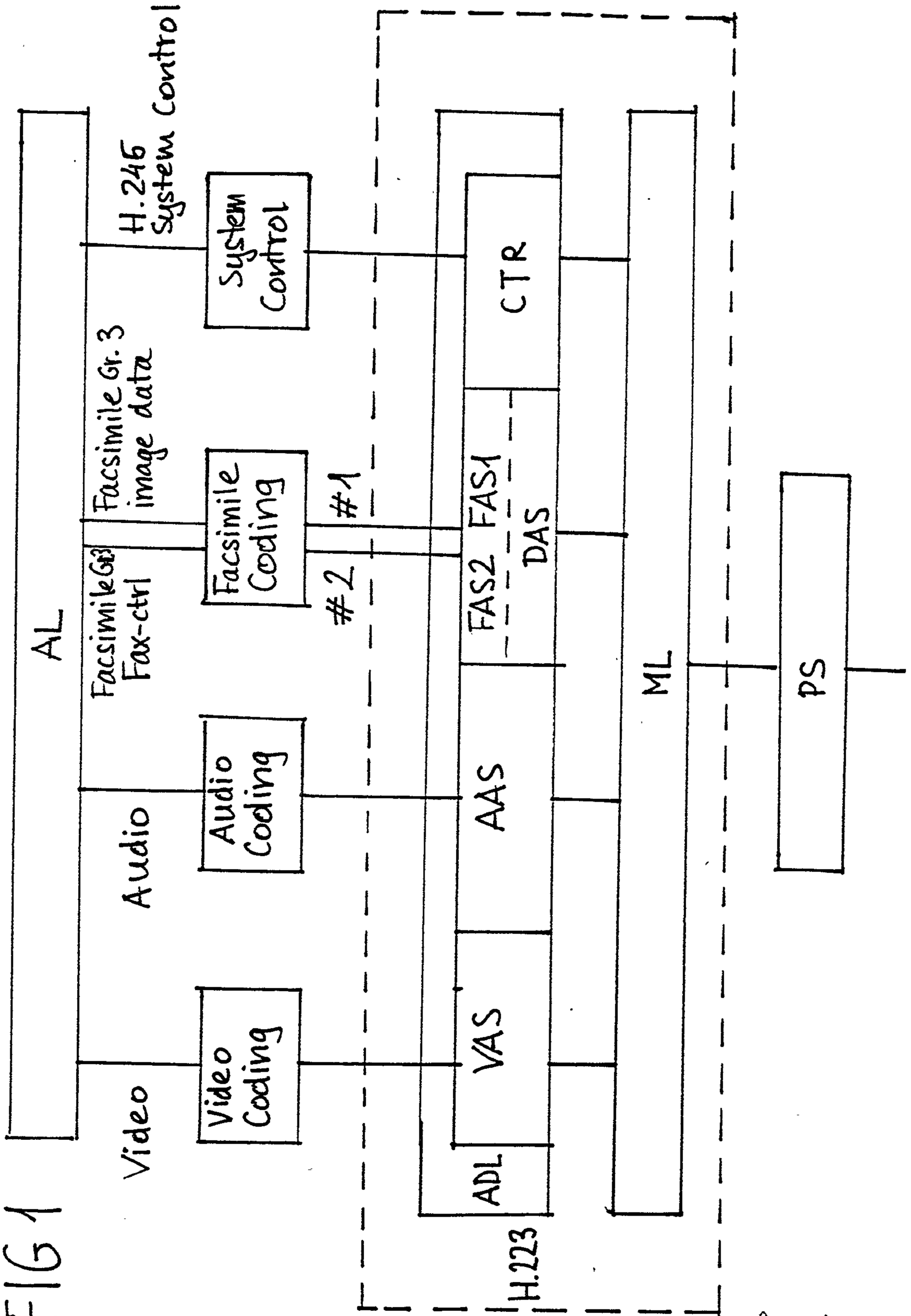

FIG 1

Patent Agents
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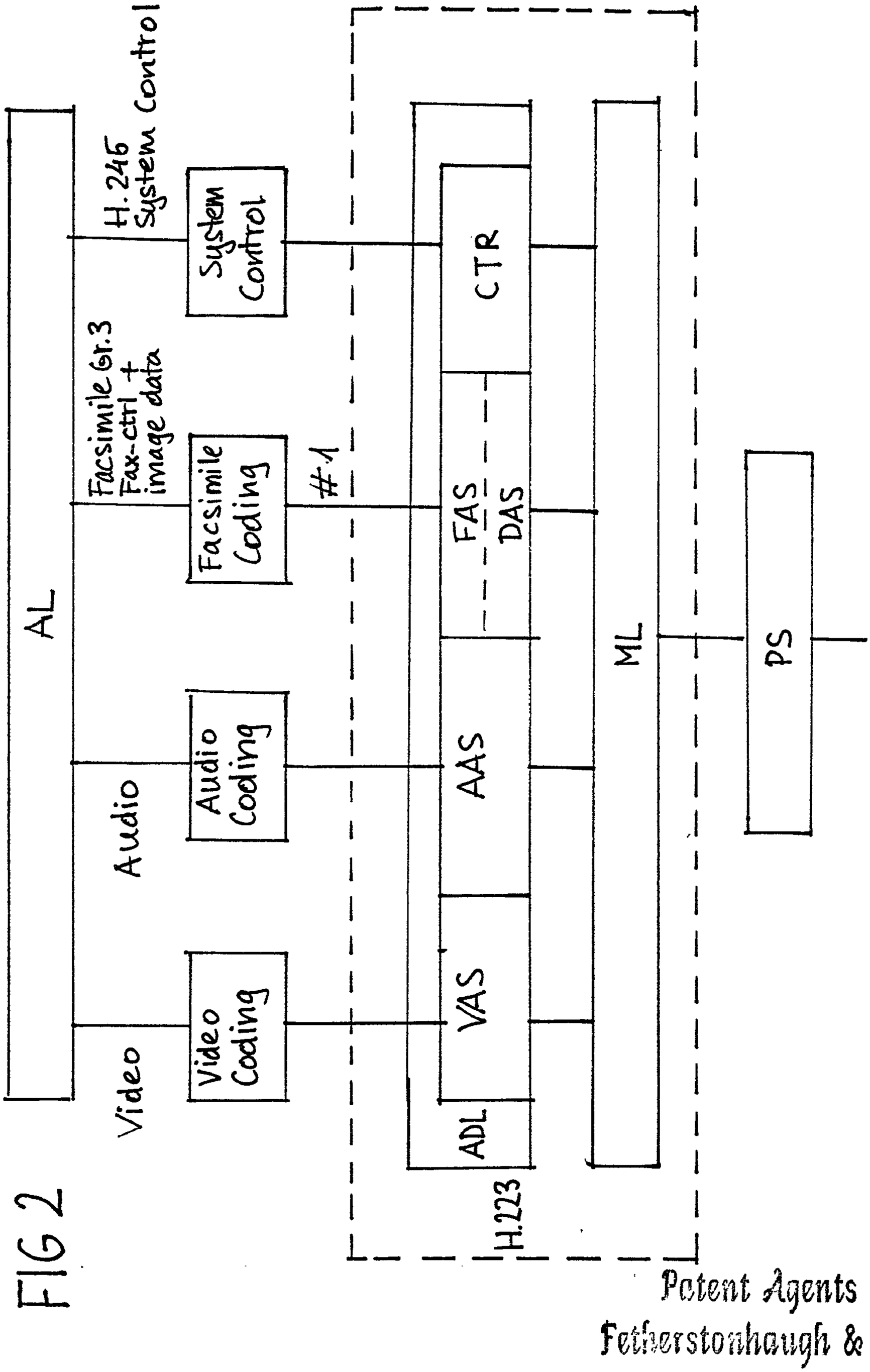

FIG 2

Patent Agents
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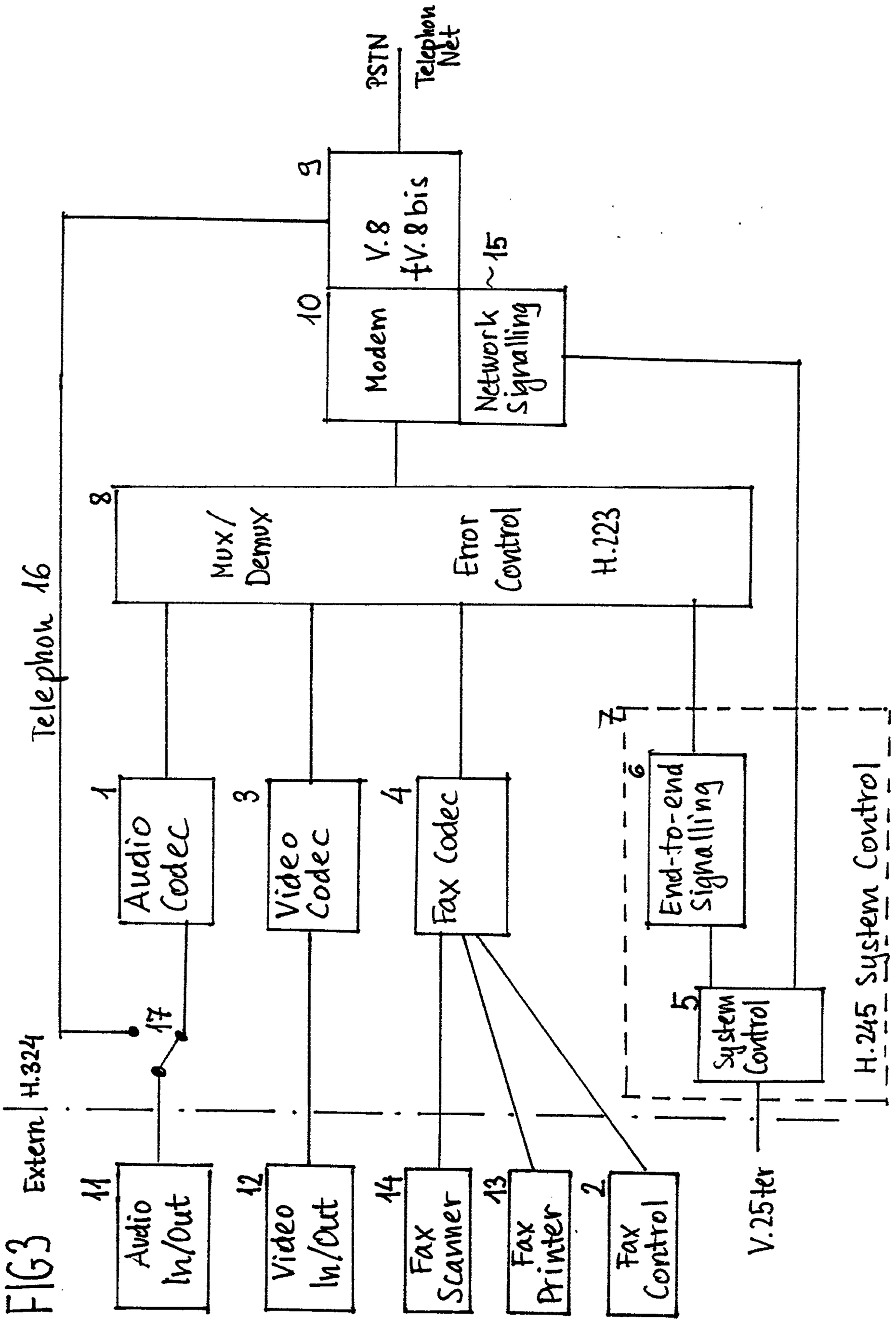
PSTN
Telephon Net
9
V.8 +V.8 bis
10
Modem
~15
Network signalling
8
Mux / Demux
Error Control
H.223
16
Telephon
1
Audio Codec
3
Video Codec
4
Fax Codec
7
6
End-to-end signalling
5
System Control
H.245 System Control
17
H.324
11
Audio In/Out
12
Video In/Out
14
Fax Scanner
13
Fax Printer
2
Fax Control
V.25ter

FIG3 Extern