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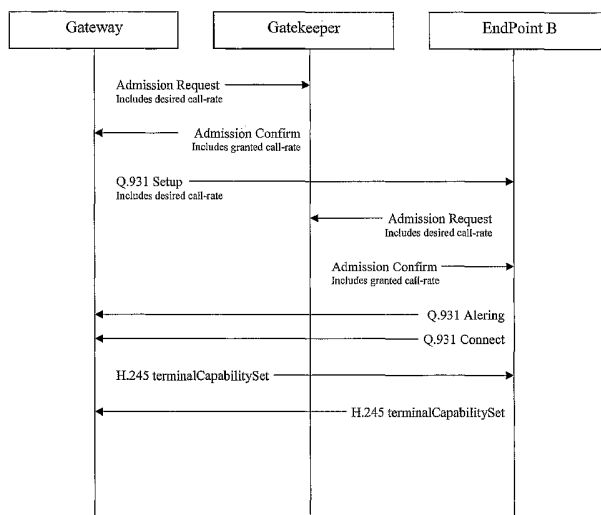
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[Continued on next page]

(54) Title: METHOD FOR BITRATE ADJUSTMENT



(57) Abstract: The present invention discloses a method and a gateway for down speeding the data rate at the circuit switched side of a call being translated in the gateway if the packet switched side do not have sufficient bandwidth capabilities for matching the circuit switched data rate. According to one embodiment of the present invention, the gateway will compare the bandwidth of the H.320 and the H.323 side of a call after establishing the connection, i.e preferably directly after signalling has been completed. Then, if the H.323 side of the call is connected at a lower rate than the H.320 side e.g. because of insufficient capabilities of the H.323 endpoint, the gateway will initiate a down speeding procedure at the H.320 side e.g. by means of the features of the BONDING™ technique. The down speeding procedure disconnects a number of B-channels of the H.320 connection to make the call rate equal or lower than the call rate of the H.323 side of the call.

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LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

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Method for bitrate adjustment

Field of the invention

The present invention relates to conferencing, in particular to conferencing calls between terminals of heterogeneous network connected through a gateway.

Background of the invention

Videoconferencing systems are conventionally adjusted to employ both circuit switched and packet switched networks. Thus, great efforts have been made to achieve interoperability between circuit switched and packet switched terminals allowing interactions and communication without loss of quality or introduction of delay. A common standard for multimedia communications over circuit switched networks like ISDN is the H.320 standard from the International Telecommunications Union (ITU). H.320 is an umbrella standard with several sub standard defining the different protocol layers. An example is H.221. H.221 is the framing protocol of H.320. The purpose of this recommendation is to define a frame structure for audiovisual teleservices.

The H.323 is the corresponding umbrella recommendation for packet switched networks from the International Telecommunications Union (ITU). Such networks are pervasive on many corporate terminals and include TCP/IP and IPX (Inter network packet exchange) over Ethernet, Fast Ethernet and Token Ring network technologies. The H.323 standard provides a foundation for audio, video, and data communications across IP-based networks, including the Internet. Multimedia products and applications complying with the H.323 standard are interoperable, can communicate with each other, and thus are compatible. The H.323 standard or protocol is also made out of many sub standards, one of which is the H.245 standard. The H.245

standard defines the control protocol part of the H.323 standard.

When systems use different protocols, they have to make the video conferencing calls through an H.320/H.323 gateway, which performs the task of "translating" between H.320 and H.323. A typical scenario is where an enterprise, because of cost and management, implements IP as the network to use internally, where they have control of the bandwidth resources available, but use ISDN externally, where they will not be guaranteed the quality of service on the IP network that they require. Hence, they use a gateway for external calls.

A gateway provides a connection between the IP and the circuit switched side of the communication path between endpoints in a multimedia conference. Seen from the endpoints residing at the IP side, the endpoints at the circuit switched side are virtually being converted to IP endpoints, and vice versa. The main tasks of the gateway is consequently to translate and re-pack the data stream across the networks in real-time. The packets transmitted from the H.323 endpoints are temporarily stored in a buffer before they are fetched and arranged in H.320 frames of a fixed size.

A video conferencing call setup from an H.320-based system to an H.323-based system through a gateway typically includes the following steps:

The H.320-based system (A) dials an ISDN-number defined for the gateway.

The gateway accepts the call, and connects the first ISDN B-channel to use.

A BONDING™ procedure is performed, including negotiation of which bandwidth to use for the call, and resolving of

which ISDN-numbers A should use to dial the remaining B-channels for the call.

A dials the remaining B-channels to use. The gateway accepts these incoming channels.

5 An in band communication channel is set up according to H.221 exchanging audio, video and possibly other capabilities.

When the video channel is open, a still image may be encoded in the gateway, and transmitted to A. The image
10 may include text requesting the user of system A to enter the other party's extension (H.323 alias). A voice message may also be presented.

A user of A enters the extension, which may be transmitted to the gateway using DTMF (dual tone multi-
15 frequency) in the audio channel, or through H.320's TCS-4 signal.

When the gateway has received the full extension, the gateway will try to establish an H.323 call to the endpoint registered with this extension (B).

20 The gateway then initiate a H.323-setup of a call to the called party B by means of RAS-messages (Registration, Admission and Status), Q.931 messages and H.245 messages with the bandwidth used for the H.320 side of the call already initiated. An example of a signal flow at H.323-
25 setup is illustrated in figure 1. Normally, the setup is supported by a gatekeeper at the called part (B) side of the connection, i.a. for translating aliases to IP addresses. The setup is also finished by an exchange of the capability information i.a. indicating the bandwidth
30 capability of the endpoint.

When the H.323 call is established, the still image presented to A is removed and the audio and video is repacked and forwarded from A to B and from B to A.

However, if the gateway is unable to set up the call to B on the requested bandwidth (because of lack of resources on B, or in the network), the calls are connected on different bandwidth. A H.320 system and a H.323 system connected through a gateway are not able to use end-to-end flow control. It is only possible for the gateway to send flow control messages to the H.323 system. This bandwidth imbalance is for many reasons an unwanted situation.

A problem also occurs when the H.320 system transmits video at a higher rate than the H.323 system can handle, the H.323 system may fail to handle the call. This may occur if the call is initiated from the H.320 side and the call rate on the H.323 side does not end up being greater or equal to the rate of the H.320 side.

Further, the H.320 call will not utilize its full bandwidth, as the gateway will have to transmit idle pattern to adjust to the lower bandwidth from the H.323 call. This leads to higher ISDN-costs and unnecessary use of resources.

When operating on different bandwidths in the same call, some sort of transcoding has to be performed to adjust the bandwidth used for video data from the H.320 call to the H.323 call. Transcoding uses more resources in the gateway than conventional gateway re-packing, and additionally, full bandwidth of the H.320 call will not be utilized.

Summary of the invention

The features defined in the independent claims enclosed characterize this arrangement and method.

In particular, the present invention discloses a method allowing communication between a first and a second terminal by establishing a packet switched connection between the first terminal and a node, and a circuit switched H.320 connection between the second terminal and the node, creating the circuit switched connection from a first number of ISDN B-channels according to a BONDING protocol, and mutually translating and/or repacking data of the communication between the circuit switched and the packet switched connection, including the steps of requesting the first terminal for a first data rate reflecting a receiving data rate capability of the first terminal, comparing said first data rate with a second data rate being a data rate of the circuit switched H.320 connection, and if said first data rate is lower than said second data rate, disconnecting a second number of the first number of ISDN B-channels and executing a BONDING resynchronization procedure on the remaining ISDN B-channels to form the circuit switched connection.

Brief description of the drawings

In order to make the invention more readily understandable, the discussion that follows will refer to the accompanying drawings,

Figure 1 shows an example of the message flow between gateway, gatekeeper and endpoint at H.323 call setup,

Figure 2 is a flow sheet showing the superior steps of an example embodiment of the present invention.

Best modes of carrying out the invention

In the following, the present invention will be discussed by describing a preferred embodiment, and by referring to the accompanying drawings. However, people skilled in the art will realize other applications and modifications

within the scope of the invention as defined in the enclosed independent claims.

According to the present invention, the gateway will compare the bandwidth of the H.320 and the H.323 side of the gateway after establishing the connection, i.e. preferably directly after signalling has been completed. Then, if the H.323 side of the call is connected at a lower rate than the H.320 side e.g. because of insufficient capabilities of the H.323 endpoint, the gateway will initiate a down speeding procedure at the H.320 side. The down speeding procedure disconnects a number of B-channels of the H.320 connection to make the call rate equal or lower than the call rate of the H.323 side of the call. Figure 2 illustrates the present invention by means of a flow sheet with the main steps of an example embodiment of the invention.

The comparison between H.323 and H.320 bandwidth being used in the already established call may be implemented in various ways. In one embodiment of the present invention, the capability set defined in H.245 is being investigated for this purpose. According to H.245, the capability of a H.323 terminal is disclosed in a number of capability tables, which may be externally accessible by request as indicated at the bottom of figure 1. The capability of interest in relation with the present invention is the H.323 endpoint's capability for receiving video at which data rate. This capability resides in a receiveVideoCapability entry of one of the tables. This information may be provided to the gateway by transmitting a TerminalCapabilitySet message to the terminal. The capability is presented for H.261, H.263 and H.264, respectively. In this embodiment, the lowest video data rate capability among these three protocols, on which the terminal in question is operable, is selected as the basis of comparison with the data rate on the H.320 side.

The selected magnitude of the H.323 bandwidth is then compared with the magnitude of the H.320 bandwidth of the call, already stored in the gateway. Then, if it is found that this magnitude is lower than the bandwidth of the H.320 side of the call, the gateway initiates a down speeding procedure of the H.320 connection between the H.320 endpoint and the gateway. To make sure that the bandwidth of the H.320 is reduced below the H.323 bandwidth, the magnitude of the H.323 bandwidth being used for comparison is converted to the nearest declining magnitude divisible to 64, as 64 kbit/s is the bandwidth of one single B-channel. The multiple of 64 kbit/s of the H.320 bandwidth exceeding the converted magnitude of the H.323 bandwidth would then indicate the redundant number of B-channels that the down speeding procedure should remove from the H.320 connection.

Several ways of executing the down speeding procedure could be imaginable. However, as the establishment of the H.320 side of the call includes BONDINGTM, as described in the background section, it would be convenient to use BONDINGTM as a tool for the down speeding procedure. BONDINGTM is a technique drafted by the BONDING consortium creating frame structures and procedures for establishing a wideband communications connection by combining multiple switched 56/64 kbit/s channels. BONDINGTM is described in the specification "Interoperability Requirements for Nx56/64 kbit/s Calls" issued by the BONDING consortium.

The main task of a BONDINGTM technique is to align data octets of the individual channels. Channels used for the wideband connection is routed independently of each other, thus the data in each channel might be individually delayed relative to the data in other channels. The defined frame structure for each 56/64 kbit/s bearer channel provides for the alignment of data octets from the individual channels to their original sequence before reforming the individual

channels into a composite serial data stream at the terminating end.

However, the BONDING™ technique also includes a procedure for down speeding an already established connection by removing one or more channel of which the connection is composed. This procedure is originally meant to remove channels that erroneously not have reach synchronization. However, the now discussed embodiment of the present invention utilizes this procedure for adjusting the bandwidth at the H.320 side according to the bandwidth of the H.323 side. After determining that down speeding is required, as described above, the down speeding procedure is initiated and follows the one described for the BONDING™ technique. The redundant channels are disconnected, the new speed is reflected in the Information Channel, and the remaining channels are resynchronized by equalizing the delays.

The resynchronization of the down speeded H.320 connection will take some time. In this time, the gateway should preferably encode a still image, and possibly a voice response to transmit to the H.323 endpoint, informing the user that down speeding is in progress.

Then, when resynchronization is completed, the still images that have been presented to the respective endpoints during down speeding are removed, the call will be connected, and video, audio and other data may be forwarded through the gateway in a conventional way with the bandwidth of the H.320 side adjusted to the H.323 side.

Note that even if only H.323 is mentioned in the description, the present invention can also be utilized when the packet switched terminal is a SIP (Session Initiated Protocol). SIP is also a protocol for IP video conferencing. The two protocols are very similar, and are only distinguished in the signalling and controlling

procedures. Thus, what is described for H.323 above, also applies for SIP.

C l a i m s

1. A method allowing communication between a first and a second terminal by establishing a packet switched connection between the first terminal and a node, and a
5 circuit switched H.320 connection between the second terminal and the node, creating the circuit switched connection from a first number of ISDN B-channels according to a BONDINGTM protocol, and mutually translating and/or repacking data of the communication between the circuit
10 switched and the packet switched connection,
c h a r a c t e r i z e d i n

requesting the first terminal for a first data rate reflecting a receiving data rate capability of the first terminal,

15 comparing said first data rate with a second data rate being a data rate of the circuit switched H.320 connection,

if said first data rate is lower than said second data rate, disconnecting a second number of the first number of ISDN B-channels and executing a BONDINGTM resynchronization
20 procedure on the remaining ISDN B-channels to form the circuit switched connection.

2. A method according to claim 1,
c h a r a c t e r i z e d i n the following additional step:

25 determining said second number of ISDN B-channels by converting said first data rate to a multiple of the fixed data rate and subtracting said multiple from the first number of ISDN B-channels.

3. A method according to claim 1 or 2,
30 c h a r a c t e r i z e d i n that the packet switched connection is a H.323 connection.

4. A method according to claim 1 or 2,
c h a r a c t e r i z e d i n that the packet
switched connection is a SIP connection.

5. A method according to one of the claims 1-4,
5 c h a r a c t e r i z e d i n that the terminals
participate in a video-, web-, and/or teleconference.

6. A method according to one of the claims 1 - 6,
c h a r a c t e r i z e d i n that the step of
establishing the circuit switched H.320 connection includes
10 storing said second data rate.

7. A gateway adjusted to connect a first and a second
terminal by establishing a packet switched connection
between the first terminal and the gateway, and a circuit
switched H.320 connection between the second terminal and
15 the gateway, wherein the circuit switched H.320 connection
is created from a first number of ISDN B-channels according
to a BONDING protocol,
c h a r a c t e r i z e d i n

a determination means adjusted to select a first data
20 rate amount from one or more data rate amounts
requested from the first terminal reflecting bandwidth
capabilities of the first terminal,

a comparison means adjusted to compare said first data
rate with a second data rate being a data rate of the
25 circuit switched H.320 connection,

a channel controller adapted to disconnecting a second
number of the first number of ISDN B-channels and to
adjust the remaining ISDN B-channels to form the
circuit switched H.320 connection if said first data
30 rate is lower than said second data rate.

8. A gateway according to claim 7,
c h a r a c t e r i z e d i n that it is adapted to
determine said second number of ISDN B-channels by
converting said first data rate to a multiple of the fixed
5 data rate and subtracting said multiple from the first
number of ISDN B-channels.

9. A gateway according to claim 7 or 8,
c h a r a c t e r i z e d i n that the packet
switched connection is a H.323 connection.

10 10. A gateway according to claim 7 or 8,
c h a r a c t e r i z e d i n that the packet
switched connection is a SIP connection.

11. A gateway according to one of the claims 7 - 10,
c h a r a c t e r i z e d i n that the terminals
15 participate in a video-, web-, and/or teleconference.

12. A gateway according to one of the claims 7 - 11,
c h a r a c t e r i z e d i n that it is adapted to
store said second data rate when establishing the circuit
switched connection.

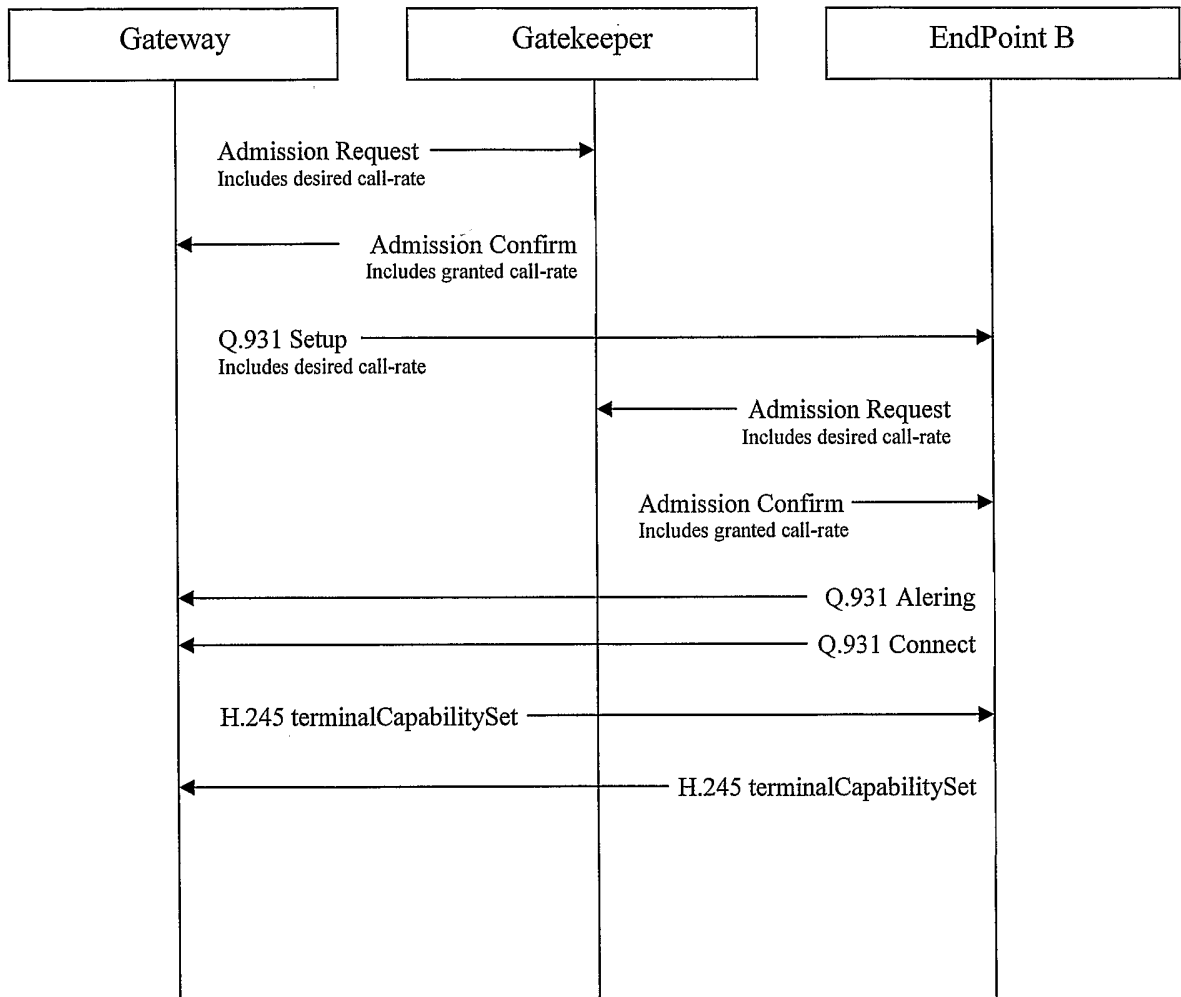


Fig. 1

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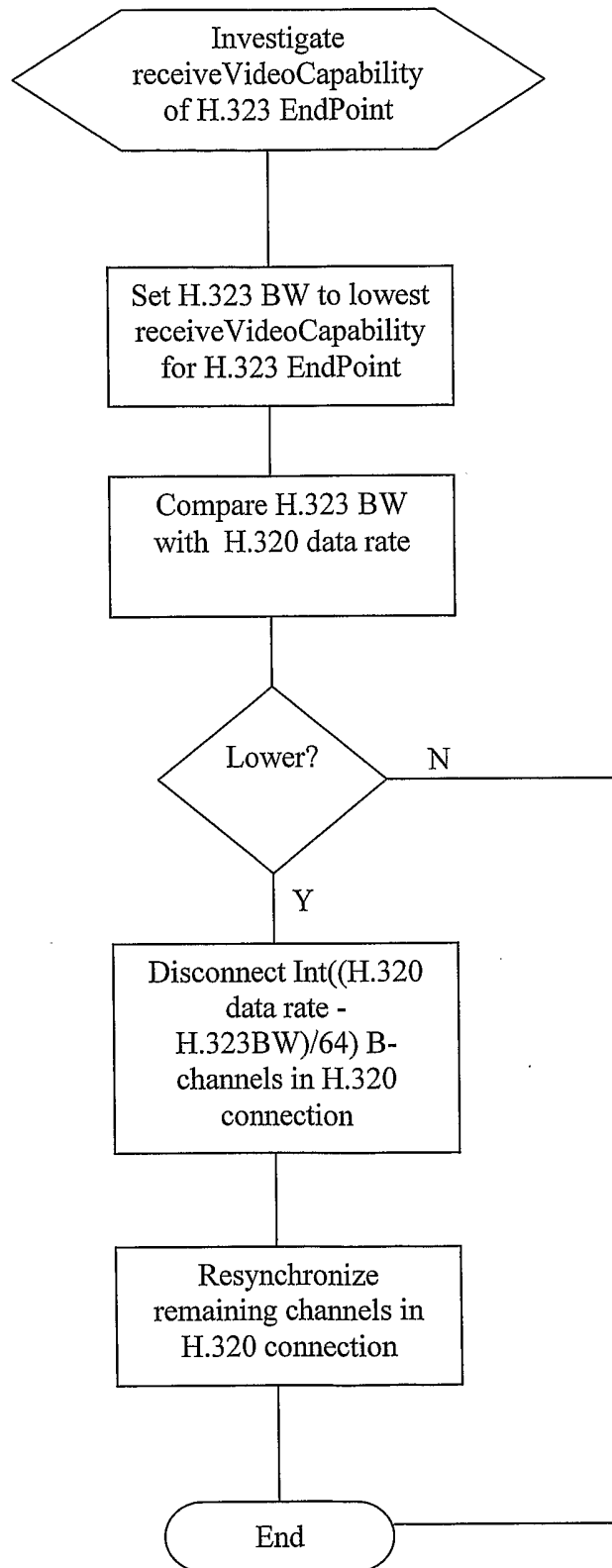


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 2004/000077

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04N 7/15, H04L 12/66

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)

IPC7: H04L, H04N, H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2002199203 A1 (DUFFY, J. ET AL), 26 December 2002 (26.12.2002), [0001]-[0016]; [0359]-[0360]; [0363]-[0367], figure 1, abstract --	1-12
A	US 2003058836 A1 (EVEN, R.), 27 March 2003 (27.03.2003), figure 2, abstract --	1-12
A	WO 0165780 A1 (ACCORD NETWORKS LTD), 7 Sept 2001 (07.09.2001), page 3, line 8 - line 25; page 6, line 26 - page 7, line 5, figure 2, claims 1,11,12, abstract --	1-12

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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INTERNATIONAL SEARCH REPORT

International application No.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2003028535 A1 (SHELDON, R.D. ET AL), 6 February 2003 (06.02.2003), [0072]; claim 1, abstract --	1-12
A	WO 02063840 A1 (PALTALK HOLDINGS, INC), 15 August 2002 (15.08.2002), abstract --	1-12
A	US 6426948 B1 (BOWMAN-AMUAH, M.K.), 30 July 2002 (30.07.2002), column 29, line 38 - line 49; column 57, line 13 - line 29, figures 8b,19, abstract -- -----	1-12

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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US	2002199203	A1	26/12/2002	NONE		
US	2003058836	A1	27/03/2003	AU	3594701 A	12/09/2001
				WO	0165780 A	07/09/2001
WO	0165780	A1	07/09/2001	AU	3594701 A	12/09/2001
				US	2003058836 A	27/03/2003
US	2003028535	A1	06/02/2003	NONE		
WO	02063840	A1	15/08/2002	EP	1366607 A	03/12/2003
				US	2002107923 A	08/08/2002
US	6426948	B1	30/07/2002	AU	5595500 A	18/12/2000
				WO	0074359 A	07/12/2000