AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Northern District of California on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
3:14-cv-04312	9/24/2014	Northern District of California

PLAINTIFF	DEFENDANT
Straight Path IP Group, Inc.,	Cisco Systems, Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,009,469	12/28/1999	Straight Path IP Group, Inc.,
2	6,108,704	8/22/2000	Straight Path IP Group, Inc.,
3	6,131,121	10/10/2000	Straight Path IP Group, Inc.,
4	6,701,365	3/2/2004	Straight Path IP Group, Inc.,
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
Richard W.Wieking	Sheila Rash	9/25/2015

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

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☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
3:14-cv-04309	9/24/2014	Northern District of California

PLAINTIFF	DEFENDANT
Straight Path IP Group, Inc.	Avaya Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,009,469	12/28/1999	Straight Path IP Group, Inc.
2	6,108,704	8/22/2000	Straight Path IP Group, Inc.
3	6,131,121	10/10/2000	Straight Path IP Group, Inc.
4	6,701,365	3/2/2004	Straight Path IP Group, Inc.
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
RICHARD WIEKING	D. MERRY	9/25/14

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

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TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas, Tyler Division on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:14-cv-534	6/4/2014	Eastern District of Texas, Tyler Division

PLAINTIFF	DEFENDANT
STRAIGHT PATH IP GROUP, INC.	BLACKBERRY LTD. & BLACKBERRY CORP.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,009,469	12/28/1999	STRAIGHT PATH IP GROUP, INC.
2	6,108,704	8/22/2000	STRAIGHT PATH IP GROUP, INC.
3	6,131,121	10/10/2000	STRAIGHT PATH IP GROUP, INC.
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court ARIZONA, Phoenix Division on the following

☑ Trademarks or ☐ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	6/3/2014	ARIZONA, Phoenix Division

PLAINTIFF	DEFENDANT
All In Wear, Inc. and Romel Bako 6/3/2014	Dallas Basketball Limited, d/b/a The Dallas Mavericks

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	2911757	4/15/2003	Romel Bako
2			
3			
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
		6/3/2014

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

Trials@uspto.gov
Tel: 571-272-7822

Paper 12
Entered: May 2, 2014

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SONY CORPORATION
Petitioner

v.

STRAIGHT PATH IP GROUP, INC.
Patent Owner

Case IPR2014-00229 (Patent 6,131,121)
Case IPR2014-00230 (Patent 6,108,704)
Case IPR2014-00231 (Patent 6,009,469)[1]

Before BRYAN F. MOORE, MIRIAM L. QUINN, and STACEY G. WHITE, *Administrative Patent Judges.*

WHITE, *Administrative Patent Judge.*

ORDER
Motion to Terminate
37 C.F.R. § 42.72

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1 This Order addresses scheduling that is identical in the listed cases. We exercise our discretion to issue a single paper to be filed in each case. The parties are not authorized to use this style heading for any subsequent papers.

On April 28, 2014, the parties filed joint motions to terminate the trial in each of the instant proceedings under 35 U.S.C. § 317(a).[2] Along with the motions, the parties filed copies of a document they describe as the written settlement agreement,[3] as well as separate joint requests to treat the settlement agreement as business confidential information under the provisions of 35 U.S.C. § 317(b) and 37 C.F.R. § 42.74(c).[4] As the motions and exhibits in all three proceedings are substantially similar, we refer herein to the papers filed in IPR2014-00229 for convenience.

The instant proceedings are in the preliminary stage. Patent Owner has filed preliminary responses in each of the instant proceedings.[5] The Board, however, has not determined whether trial will be instituted for any of the requests for *inter partes* review.

Under 35 U.S.C. § 317(a), "[a]n inter partes review instituted under this chapter shall be terminated with respect to any petitioner upon the joint request of the petitioner and patent owner, unless the Office has decided the merits of the proceeding before the request for termination is filed." In the motions to terminate, the parties state that they have settled their dispute with respect to the patents involved in the proceedings, and have reached agreement to terminate these proceedings. Paper 9, 1. Furthermore, the joint motion indicates that the parties have agreed to dismiss Petitioner and other real parties-in-interest identified by

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2 IPR2014-00229, Paper 9; IPR2014-00230, Paper 10, IPR2014-00231, Paper 9.

3 IPR2014-00229, Ex. 1047; IPR2014-00230, Ex. 1047, IPR2014-00231, Ex. 1047.

4 IPR2014-00229, Paper 10; IPR2014-00230, Paper 11, IPR2014-00231, Paper 10.

5 IPR2014-00229, Paper 7; IPR2014-00230, Paper 8; IPR2014-00231, Paper 7.

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 6

Petitioner as respondents in *Certain Point-to-Point Network Communication Devices and Products Containing Same*, Inv. No. 337-TA-892 (U.S.I.T.C.) and *Straight Path IP Group, Inc. v. Sony Corp.*, No. 1:13-cv-01071-AJT (E.D. Va.). Paper 9, 1-2. The parties argue that no other petitioner would remain in the instant proceedings, and that termination of these proceedings promotes judicial economy and furthers the policy of the Board. *Id.*

The Board generally expects that a proceeding will terminate after the filing of a settlement agreement. *See, e.g., Office Patent Trial Practice Guide*, 77 Fed. Reg. 48,756, 48,768 (Aug. 14, 2012). Upon consideration of the parties' arguments and the early stage of these proceedings, we agree with the parties that terminating the instant proceedings with respect to both Petitioner and Patent Owner, at this early juncture, promotes efficiency and minimizes unnecessary costs. The Board is persuaded that, under these circumstances, it is appropriate to enter judgment[6] without rendering a final written decision. *See* 35 U.S.C. § 317(a); 37 C.F.R. § 42.72.

Accordingly, it is:

ORDERED that the joint motions to terminate these proceedings are *granted,* and that these proceedings are hereby terminated as to all parties, including Petitioner and Patent Owner;

FURTHER ORDERED that the parties' joint requests that the settlement agreement (Ex. 1047) be treated as business confidential information, kept separate from the file of the involved patents, and made available only to Federal

---

6 A *judgment* means a final written decision by the Board, or a *termination of a proceeding*. 37 C.F.R. § 42.2.

Government agencies on written request, or to any person on a showing of good cause under the provisions of 35 U.S.C. § 317(b) and 37 C.F.R. § 42.74(c), are *granted.*

PETITIONERS:

Michael Rader
Edmund Walsh
Randy Pritzker
WOKF GREENFIELD & SACKS, P.C.
MRader-PTAB@wolfgreenfield.com
EWalsh-PTAB@wolfgreenfield.com
RPritzker-PTAB@wolfgreenfield.com

PATENT OWNER:

Patrick Lee
Michelle Chatelain
FISCH HOFFMAN SIGLER LLP
patrick.lee@fischllp.com
michelle.chatelain@fischllp.com

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 9

AO 120 (Rev. 08/10)

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☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:13-cv-604	8/23/2013	Eastern District of Texas, Tyler Division

PLAINTIFF	DEFENDANT
STRAIGHT PATH IP GROUP, INC.	BLACKBERRY LTD. & BLACKBERRY CORP.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,009,469	12/28/1999	STRAIGHT PATH IP GROUP, INC.
2	6,108,704	8/22/2000	STRAIGHT PATH IP GROUP, INC.
3	6,131,121	10/10/2000	STRAIGHT PATH IP GROUP, INC.
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

AO 120 (Rev. 08/10)

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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas, Tyler Division on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:13-cv-605	8/23/2013	Eastern District of Texas, Tyler Division

PLAINTIFF	DEFENDANT
STRAIGHT PATH IP GROUP, INC.	HUAWEI INVESTMENT & HOLDING CO., LTD., ET AL

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,009,469	12/28/1999	STRAIGHT PATH IP GROUP, INC.
2	6,108,704	8/22/2000	STRAIGHT PATH IP GROUP, INC.
3	6,131,121	10/10/2000	STRAIGHT PATH IP GROUP, INC.
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DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

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Mail Stop 8 **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas, Tyler Division on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:13-cv-606	8/23/2013	Eastern District of Texas, Tyler Division

PLAINTIFF	DEFENDANT
STRAIGHT PATH IP GROUP, INC.	SAMSUNG ELECTRONICS CO., LTD., ET AL

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,009,469	12/28/1999	STRAIGHT PATH IP GROUP, INC.
2	6,108,704	8/22/2000	STRAIGHT PATH IP GROUP, INC.
3	6,131,121	10/10/2000	STRAIGHT PATH IP GROUP, INC.
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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DECISION/JUDGEMENT

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TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas, Tyler Division on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:13-cv-607	8/23/2013	Eastern District of Texas, Tyler Division

PLAINTIFF	DEFENDANT
STRAIGHT PATH IP GROUP, INC.	ZTE CORPORATION and ZTE USA, INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,009,469	12/28/1999	STRAIGHT PATH IP GROUP, INC.
2	6,108,704	8/22/2000	STRAIGHT PATH IP GROUP, INC.
3	6,131,121	10/10/2000	STRAIGHT PATH IP GROUP, INC.
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Virginia on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
1:13cv936	8/1/2013	Eastern District of Virginia

PLAINTIFF	DEFENDANT
Straight Path IP Group, Inc.	Sharp Corp., et al.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,009,469	12/28/1999	NetSpeak Corporation
2	6,108,704	8/22/2000	NetSpeak Corporation
3	6,131,121	10/10/2000	NetSpeak Corporation
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
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Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the Eastern District of Virginia - Alexandria on the following

☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
1:13cv935-GBL/TCB	8/1/2013	Eastern District of Virginia - Alexandria Division

PLAINTIFF	DEFENDANT
Straight Path Group, Inc.	Panasonic Corporation of North America, et al.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,009,469	12/28/1999	NetSpeak Corporation
2	6,108,704	8/22/2000	NetSpeak Corporation
3	6,131,121	10/10/2000	NetSpeak Corporation
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
FERNANDO GALINDO		

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
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☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
1:13cv933	8/1/2013	Eastern District of Virginia

PLAINTIFF	DEFENDANT
Straight Path IP Group, Inc.	LG Electronics, Inc. LG Electronics U.S.A., Inc. LG Electronics MobileComm U.S.A., Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,009,469	12/28/1999	Netspeak Corporation
2	6,108,704	8/22/2000	NetSpeak Corporation
3	6,131,121	10/10/2000	NetSpeak Corporation
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading		
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FILED
AUG - 6 2013
CLERK, U.S. DISTRICT COURT
ALEXANDRIA, VIRGINIA

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
Fernando Galindo		8/6/2013

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☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
3:13CV503	8/2/2013	Richmond

PLAINTIFF	DEFENDANT
Straight Path IP Group, Inc.	Toshiba Corporation Toshiba America, Inc. Toshiba America Information Systems, Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,009,469		
2	6,108,704		
3	6,131,121		
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading		
	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
Fernando Galindo	Robert L. Walker	8/8/2013

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AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Virginia on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
1:13cv934	8/1/2013	Eastern District of Virginia

PLAINTIFF	DEFENDANT
Straight Path IP Group, Inc.	Vizio, Inc., et al.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,009,469	12/28/1999	NetSpeak Corporation
2	6,108,704	8/22/0200	NetSpeak Corporation
3	6,131,121	10/10/2000	NetSpeak Corporation
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the Eastern District of Virginia - Norfolk Division on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:13cv427	8/1/2013	for the Eastern District of Virginia - Norfolk Division

PLAINTIFF	DEFENDANT
STRAIGHT PATH IP GROUP, INC.	SONY CORPORATION, et al

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,009,469	12/28/1999	Straight Path IP Group, Inc.
2	6,108,704	8/22/2000	Straight Path IP Group, Inc.
3	6,131,121	10/10/2000	Straight Path IP Group, Inc.
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading		
	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1			
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5			

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
Fernando Galindo	Brad Newell	8/2/2013

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Virginia on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:12cv8	1/4/2012	Eastern District of Virginia

PLAINTIFF	DEFENDANT
Innovative Communications Technologies, Inc.	ooVoo, LLC

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,513,066	12/28/1999	Innovative Communications Technologies, Inc.
2	6,701,365	3/2/2004	Innovative Communications Technologies, Inc.
3	6,009,469	1/28/2003	Innovative Communications Technologies, Inc.
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
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5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
10/11/2012 Stipulation of Dismissal filed

CLERK	(BY) DEPUTY CLERK	DATE
Fernando Galindo	R. Simmons	10/12/2012

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the Eastern District of Virginia on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:12cv8	1/11/12	for the Eastern District of Virginia 600 Granby St, Norfolk, VA 23510

PLAINTIFF	DEFENDANT
INNOVATIVE COMMUNICATIONS TECHS., INC.	OOVOO, LLC

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,009,469	12/28/1999	INNOVATIVE COMMUNICATIONS TECHNOLOGIES, INC.
2	6,701,365	3/2/2004	INNOVATIVE COMMUNICATIONS TECHNOLOGIES, INC.
3	6,513,066	1/28/2003	INNOVATIVE COMMUNICATIONS TECHNOLOGIES, INC.
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

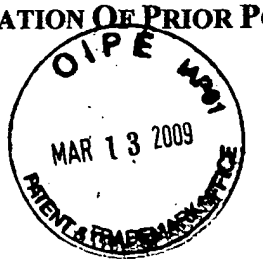
DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
Fernando Galindo	R. Simmons	1/11/2012

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

POWER OF ATTORNEY, CORRESPONDENCE ADDRESS AND REVOCATION OF PRIOR POWERS



Hon. Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Revocation: I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

Power of Attorney: I hereby appoint the practitioners associated with customer number **42624**, individually and collectively, as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

I authorize Davidson Berquist Jackson & Gowdey, LLP to delete names/numbers of persons no longer with the Firm and to act and rely on instructions from and communicate directly with the entity who first sent this case to them and by whom I hereby declare that I have consented after full disclosure to be represented unless/until I instruct Davidson Berquist Jackson & Gowdey, LLP in writing to the contrary.

Correspondence Address: Please recognize or change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to the address associated with Customer Number **42624**.

Assignee Name and Address:

Net2Phone, Inc.
520 Broad Street, 8th Floor
Newark, New Jersey 07102

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record The individual whose signature and title is supplied below is authorized to act on behalf of the assignee			
Signature		Date	3/12/09
Name	JAMES RAPANTH	Telephone	9734383253
Title	VP & DIRECTOR		

OIPE
MAR 13 2009
PATENT & TRADEMARK OFFICE

08721316

IFW

STATEMENT UNDER 37 CFR 3.73(B)

Applicant / Patent Owner: Net2Phone, Inc. Docket No. 2655-0063

Patent No. 6,009,469 Filed / Issued Date: 12/28/1999

Entitled: GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION

Assignee: Net2Phone, Inc. A corporation
(Name of assignee) (Type of Assignee: corporation, partnership, university, government agency, etc.)

States that it is:

1. ☒ the assignee of the entire right, title, and interest; or

2. ☐ an assignee of less than the entire right, title and interest.
(The extent (by percentage) of its ownership interest is %)

in the patent application / patent identified above by virtue of either:

A. ☐ An assignment from the inventor(s) of the patent application / patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel , Frame , or for which a copy thereof is attached.

OR

B. ☒ A chain of title from the inventor(s), of the patent application / patent identified above, to the current assignee shown below:

1.	From: MATTAWAY, Shane D. et al. To: Netspeak Corporation The document was recorded in the United States Patent and Trademark Office at Reel 008311 Frame 0785, or for which a copy thereof is attached.
2.	From: HUTTON, Gleen W. To: Netspeak Corporation The document was recorded in the United States Patent and Trademark Office at Reel 008448 Frame 0779, or for which a copy thereof is attached.
3.	From: Netspeak Corporation To: VOIP Technology Holdings, LLC The document was recorded in the United States Patent and Trademark Office at Reel 016522 Frame 0205, or for which a copy thereof is attached.

☒ Additional documents in the chain of title are listed on a supplemental sheet.

☒ Copies of assignments or other documents in the chain of title are attached.

As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[Note: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, if the assignment is to be recorded in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

Signature — 3/13/09 (Date)

Michael R. Casey, Ph.D — 703-894-6400

Printed or Typed Name — Telephone Number

Attorney, Registration No. 40,294
Title: _____

STATEMENT UNDER 37 CFR 3.73(B)
Continued

4.	From: VOIP Technology Holdings, LLC To: Net2Phone, Inc. The document was recorded in the United States Patent and Trademark Office at Reel 016945 Frame 0858, or for which a copy thereof is attached.
5.	From: Netspeak Corporation To: Net2Phone, Inc. The document was recorded in the United States Patent and Trademark Office at Reel 016945 Frame 0890, or for which a copy thereof is attached.
6.	From: VOIP Technology Holdings, LLC To: Net2Phone, Inc. The document was recorded in the United States Patent and Trademark Office at Reel 017105 Frame 0240, or for which a copy thereof is attached.

UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER SECRETARY OF COMMERCE FOR
INTELLECTUAL PROPERTY AND
DIRECTOR OF THE UNITED STATES PATENT
AND TRADEMARK OFFICE
Alexandria, Virginia 22313

Patent No. 6,009,469 Paper No. ____

NOTICE OF *EX PARTE* REEXAMINATION

Notice is hereby given that a request for *ex parte* reexamination of U.S. Patent No. 6,009,469 was filed on 2-26-09 under 35 U.S.C. 302 and 37 CFR 1.510(a).

The reexamination proceeding has been assigned Control No. 90/ 010,422

This Notice incorporates by reference into the patent file, all papers entered into the reexamination file.

Note: This Notice should be entered into the patent file and given a paper number.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
08/721,316	09/25/1996	SHANE D. MATTAWAY	

CONFIRMATION NO. 2693

OC000000019645740

JEFFREY S. GINSBERG, ESQ.
KENYON & KENYON
ONE BROADWAY
NEW YORK, NY 10004

Date Mailed: 07/18/2006

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/24/2006.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

D. Durham

DESHAWN D DURHAM
OIPE (703) 308-9010

OFFICE COPY

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
08/721,316	09/25/1996	SHANE D. MATTAWAY	2655-0063

CONFIRMATION NO. 2693

OC000000019645760

42624
DAVIDSON BERQUIST JACKSON & GOWDEY LLP
4300 WILSON BLVD., 7TH FLOOR
ARLINGTON, VA 22203

Date Mailed: 07/18/2006

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/24/2006.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

D. Durham

DESHAWN D DURHAM
OIPE (703) 308-9010

OFFICE COPY

RECEIVED
CENTRAL FAX CENTER
FEB 24 2006

FACSIMILE TRANSMISSION

COMPLETED

To: United States Patent and Trademark Office
Facsimile No.: (571) 273-8300

From: Davidson Berquist Jackson & Gowdey, LLP

No. of Pages (including this page): 4

IF YOU DO NOT RECEIVE CLEARLY ALL PAGES, PLEASE CONTACT US IMMEDIATELY BY TELEPHONE AT (703) 894-6400.

USPTO: PLEASE ACKNOWLEDGE CLEAR RECEIPT OF ALL PAGES INDICATED ABOVE BY FAXING THIS PAGE BACK TO (703) 894-6430

In re Patent Application of:	Attorney Docket No. 2655-0063
Shane D. Mattaway et al.	Group Art Unit: 2757
Patent No. 6,009,469	Confirmation No.: 2693
Issue date: December 28, 1999	Examiner: RAMIREZ, Ellis B.
Application Serial No. 08/721,316	Date: February 24, 2006
Filing date: September 25, 1996	
Title: GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION	

Name(s) of paper(s) being transmitted:
- Transmittal
- General Power of Attorney
- Statement under 37 CFR 3.73(b)

CERTIFICATE OF FACSIMILE TRANSMISSION				
I hereby certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office at the above facsimile number on the date shown below.				
Name:	Amanda Sandusky	Signature: Amanda Sandusky	Date:	02/24/2006

CUSTOMER NUMBER

42624

DAVIDSON BERQUIST JACKSON & GOWDEY, LLP
4300 WILSON BLVD., 7TH FLOOR, ARLINGTON, VA 22203
703.894.6400 (main) • 703.894.6430 (Fax)

PAGE 1/4 * RCVD AT 2/24/2006 7:03:03 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-5/6 * DNIS:2738300 * CSID:7038946430 * DURATION (mm-ss):01-28

RECEIVED
CENTRAL FAX CENTE
FEB 2 4 2006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION OF:

Shane D. Mattaway et al.		Atty. Dkt. No.:	2655-0063
Patent No.:	6,009,469	Art Unit:	2757
Issue Date:	December 28, 1999	Confirmation No.	2693
Appln. No.:	08/721,316	Examiner:	RAMIREZ, Ellis B.
Filing Date:	September 25, 1996	Date:	February 24, 2006
Title:	GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION		

TRANSMITTAL

Hon. Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Attached please find the following documents, submitted for filing in connection with the above-identified application:

☒ General Power of Attorney

☒ Statement under 37 C.F.R. § 3.73(b)

Our Deposit Account No.: 501860 Our Order No. (Client-Matter No.): 2655-0063

CHARGE STATEMENT: The Commissioner is hereby authorized to charge any fee specifically authorized hereafter, or any missing or insufficient fee(s) filed, or asserted to be filed, or which should have been filed herewith or concerning any paper filed hereafter, and which may be required under Rules 16-18 (missing or insufficiencies only) now or hereafter relative to this application and the resulting Official document under Rule 20, or credit any overpayment, to our Account/Order Nos. (or Attorney Docket No.) shown in the heading hereof for which purpose a duplicate copy of this paper is attached.

This Charge Statement does not authorize charge of the issue fee until/unless an issue fee transmittal form is filed.

CUSTOMER NUMBER
42624

Respectfully submitted,

By: Michael R. Casey

Michael R. Casey, Ph.D.
Registration No. 40,294

Davidson Berquist Jackson & Gowdey LLP

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 29

PTO/SB/80 (04-05)
Approved for use through 11/30/2005, OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:

[X] Practitioners associated with the Customer Number: **42624**

OR

[ ] Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

[X] The address associated with Customer Number: **42624**

OR

[ ] Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address:

NET2PHONE, INC.
520 Broad Street, 8th Floor
Newark, New Jersey 07102

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature		Date	9/1/2005
Name	Glenn J. Williams	Telephone	(973) 438-6066
Title	Executive Vice President, General Counsel		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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FEB 24 2006

STATEMENT UNDER 37 CFR 3.73(b)

Applicant / Patent Owner: Net2Phone, Inc. Attorney Docket No.: 2655-0063

Application No. / Patent No. 6,009,469 Filed / Issue Date: December 28, 1999

Entitled: GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION

Assignee: Net2Phone, Inc. A Delaware Corporation

States that it is:

1. ☒ the assignee of the entire right, title, and interest; or
2. ☐ an assignee of less than the entire right, title and interest.
   The extent (by percentage) of its ownership interest is % in the patent application / patent identified above by virtue of either:

A. ☐ An assignment from the inventor(s) of the patent application / patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

OR

B. ☒ A chain of title from the inventor(s), of the patent application / patent identified above, to the current assignee shown below:

1. From: Shane D. Mattaway, Craig Strickland To: NetSpeak Corporation
   The document was recorded in the United States Patent and Trademark Office at Reel 008311 Frame 0785, or for which a copy thereof is attached.
2. From: Glenn W. Hutton To: NetSpeak Corporation
   The document was recorded in the United States Patent and Trademark Office at Reel 008448 Frame 0779, or for which a copy thereof is attached.
3. From: NetSpeak Corporation To: VoIP Technology Holdings, LLC
   The document was recorded in the United States Patent and Trademark Office at Reel 016522 Frame 0205, or for which a copy thereof is attached.
4. From: VoIP Technology Holdings, LLC To: Net2Phone, Inc.
   The document was recorded in the United States Patent and Trademark Office at Reel 016945 Frame 0858, or for which a copy thereof is attached.

☐ Copies of assignments or other documents in the chain of title are attached.

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

By: Michael R Casey

Michael R. Casey, Ph.D.
Registration No. 40,294

Date: February 24, 2006

Telephone No.: (703) 894-6406

Title: Attorney

COMC
#15
DGO
3-19-01

TRANSMITTAL LETTER	Docket No. N0003/7002

Applicant:	Shane D. Mattaway, Glenn W. Hutton and Craig B. Strickland
Serial No:	08/721,316
Patent No:	6,009,469
Filed:	September 25, 1996
For:	GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner:	E. Ramirez
Art Unit:	2757

OIPE JC104 JAN 0 2 2001 PATENT & TRADEMARK OFFICE

RECEIVED JAN 21 2001 CERTIFICATES OF CORRECTION

Assistant Commissioner for Patents
Washington, D.C. 20231

Enclosures

- ☐ Affidavit under 37 C.F.R. 1.131
- ☐ Assignment Papers
- ☐ Change of Correspondence Address
- ☐ Extension of Time Request
- ☐ Declaration/Power of Attorney
- ☐ Fee Transmittal Form
- ☐ Information Disclosure Statement
- ☐ Invention Disclosure Document
- ☐ Notice of Appeal
- ☐ Petition and Petition Routing Slip
- ☐ Power of Attorney Form
- ☐ PTO-1449 Form(s)
- ☒ Request for Certificate of Correction
- ☐ Request for Corrected Filing Receipt
- ☐ Copy of Original Filing Receipt
- ☐ Request for Reconsideration
- ☐ Request for Refund
- ☐ Response to Missing Parts
- ☒ Return Receipt Postcard
- ☐ Sheets Formal Drawing(s)
- ☐ Small Entity Statement
- ☐ Status Letter
- ☐ Terminal Disclaimer
- ☒ Other: Certificate of Correction; Copy of Amendment After Allowance; Copy of Approval of Amendment After Allowance

OK to issue.
DGO
3-19-01

Date: 12/29/00

Bruce D. Jobse, Esq. Reg. No. 33,518
KUDIRKA & JOBSE, LLP
Customer Number 021127
Tel: (617) 367-4600 Fax: (617) 367-4656

APPROVED
MAR 29 2001 LW
FOR THE DIRECTOR OF USPTO

REQUEST FOR CERTIFICATE OF CORRECTION	Docket No. N0003/7002

Applicant:	Shane D. Mattaway, Glenn W. Hutton and Craig B. Strickland
Serial No:	08/721,316
Patent No:	6,009,469
Filed:	September 25, 1996
For:	GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner:	E. Ramirez
Art Unit:	2757

CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8(a)

The undersigned hereby certifies that this document is being placed in the United States mail with first-class postage attached, addressed to Assistant Commissioner for Patents, Washington, DC 20231 on December 29, 2000.

Frances M. Cunningham

Frances M. Cunningham

Assistant Commissioner for Patents
Washington, D.C. 20231

OIPE JC104 JAN 02 2001 PATENT & TRADEMARK OFFICE

ATTENTION: Decision and Certificate of Correction
Branch of the Patent Issue Division

REQUEST FOR CERTIFICATE OF CORRECTION OF PATENT FOR PTO MISTAKE (37 C.F.R. 1.322(a))

Applicant hereby requests the issuance of a Certificate of Correction for the above-referenced patent, the corrections being shown on the attached Certificate of Correction form. The corrections, as outlined on the Certificate of Correction, were previously submitted by Applicants with an Amendment After Allowance mailed July 20, 1999, a copy of which is attached. Such Amendment After Allowance was entered by the Examiner as indicated by the Office Action, Paper No. 14, dated November 16, 1999, a copy of which is also attached. Unfortunately, the amendments from the approved and entered Amendment after Allowance were not present in the above-identified patent at issuance. Since these errors in the text of the patent is the fault of the PTO, no fees are due for the filing of this request. The Commissioner is hereby authorized to charge any additional fees to Deposit Account No. 02-3038. Any questions regarding this matter may be directed to Attorney Bruce D. Jobse at the below-referenced number.

Respectfully submitted,

Bruce D. Jobse Date: 12/29/00

Bruce D. Jobse, Reg. No. 33,518
KUDIRKA & JOBSE, LLP
Customer Number 021127
Tel: (617) 367-4600 Fax: (617) 367-4656

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO :6,009,469

DATED :December 28, 1999

INVENTOR(S) :Shane D. Mattaway, Glenn W. Hutton and Craig B. Strickland

It is certified that errors appear in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

IN THE CLAIMS:

In claim 1, column 41, line 23, after "having a display", please delete "and an audio transducer"; C

In claim 1, column 41, line 43, after "program code", please delete "means"; C

In claim 3, column 41, line 60, after "program code", please delete "means"; C

In claim 4, column 42, line 1, after "program code", please delete "means"; C

In claim 4, column 42, line 5, after "program code", please delete "means"; C

In claim 5, column 42, lines 8 and 9, after "having a display", please delete "and an audio transducer"; C

MAILING ADDRESS OF SENDER: KUDIRKA & JOBSE, LLP
Two Center Plaza
Boston, MA 02108

PATENT NO. 6,009,469

No. of additional copies

⇒ 10

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address : COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
08/721,316	09/25/96	MATTAWAY S	

N0003/7002

021127
KUDIRKA & JOBSE
TWO CENTER PLAZA
BOSTON MA 02108

LM51/1116

EXAMINER	
RAMIREZ, E	
ART UNIT	PAPER NUMBER
2757	14

DATE MAILED: 11/16/99

The amendment filed 7/20/99 under Rule 312 has been considered, and has been:

1. ☒ entered.
2. ☐ entered as directed to matters of form not affecting the scope of the invention (0.3311).
3. ☐ disapproved. A report appears below.
4. ☐ entered in part. A report appears below.

By Direction of the Commissioner

OIPE JAN 0 2 2001 PATENT & TRADEMARK OFFICE TC1104

Report:

MOUSTAFA M. MEKY
PRIMARY EXAMINER

AMENDMENT TRANSMITTAL	Docket No. N0003/7002

Applicant:	Shane D. Mattaway, et al.
Serial No.	08/721,316
Filed:	September 25, 1996
For:	GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner:	E. Ramirez
Art Unit:	2757

CERTIFICATE OF EXPRESS MAILING

"Express Mail" mailing label number: EL445948665US
Date of Deposit: July 20, 1999

I hereby certify that the following Correspondence is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service pursuant to 37 C.F.R. §1.10 on the date indicated above in an envelope addressed to Commissioner of Patents and Trademarks, Box Issue Fee, Washington, D.C. 20231.

Frances M. Cunningham

Frances M. Cunningham

Assistant Commissioner for Patents
BOX ISSUE FEE
Washington, DC 20231

Transmitted herewith for filing is the following:

Enclosures

- ☒ Amendment After Allowance
- ☐ Petition for a month Extension of Time
- ☒ Return Receipt Postcard

Small Entity

- ☐ A small entity statement under 37 C.F.R. §1.27 has already been filed.
- ☐ A small entity statement under 37 C.F.R. §1.27 is attached

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 36

Fees

Claims as Filed					
	Claims Filed	Highest Number Paid for	Number of Extra Claims	Rate	Additional Fees Due
Total Claims (37 CFR §1.16(c))	18	- 20 =	0 X	$18.00 =	$ 0.00
Independent Claims (37 CFR §1.16(b))	3	- 3 =	0 X	$78.00 =	$ 0.00
Extension Fee					$ 0.00
Reduction by 50% for filing by small entity					$ 0.00
Total Filing Fee					**$ 0.00**

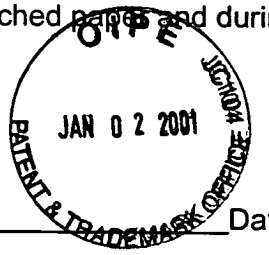
Payment

☐ Check in the amount of the total filing fee.

☐ Charge Account No. 02-3038 in the amount of the total filing fee. A duplicate of this transmittal sheet is attached.

Authorization to Charge Additional Fees

☒ The Commissioner is hereby authorized to charge any additional fees under 37 C.F.R. §1.16 and §1.17 required by the attached papers and during the entire pendency of this application to Account No. 02-3038.



Bruce D. Jobse

Date: 7/20/99

Bruce D. Jobse, Esq. Reg. No. 33,518
KUDIRKA & JOBSE, LLP
Customer Number 021127
Tel: (617) 367-4600 Fax: (617) 367-4656

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 37

AMENDMENT AFTER ALLOWANCE UNDER 37 CFR §1.312(a)	Docket No. N0003/7002

Applicant: Shane D. Mattaway, et al.
Serial No. 08/721,316
Filed: September 25, 1996
For: GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner: E. Ramirez
Art Unit: 2757

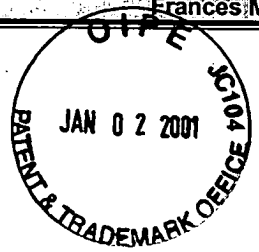
CERTIFICATE OF EXPRESS MAILING

"Express Mail" mailing label number: EL445948665US
Date of Deposit: **July 20, 1999**

I hereby certify that the following Correspondence is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service pursuant to 37 C.F.R. §1.10 on the date indicated above in an envelope addressed to Commissioner of Patents and Trademarks, BOX ISSUE FEE, Washington, D.C. 20231.

Frances M. Cunningham

Frances M. Cunningham



Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to issuance, Applicants request the above-identified application be amended as follows:

In the Claims

1. (Thrice Amended) A computer program product for use with a computer system having a display [and an audio transducer], the computer system capable of executing a first process and connecting to other processes and a server process over a computer network, the computer program product comprising a computer usable medium having computer readable code means embodied in the medium comprising:

a. program code for generating a user-interface enabling control a first process executing on the computer system;

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b. program code for determining the currently assigned network protocol address of the first process upon connection to the computer network;

c. program code responsive to the currently assigned network protocol address of the first process, for establishing a communication connection with the server process and for forwarding the assigned network protocol address of the first process and a unique identifier of the first process to the server process upon establishing a communication connection with the server process; and

d. program code [means], responsive to user input commands, for establishing a point-to-point communications with another process over the computer network.

3. (Thrice Amended) The computer program product of claim 2 wherein the program code for establishing a point-to-point communication link further comprise:

d.2 program code for transmitting, from the first process to the server process, a query as to whether the second process is connected to the computer network; and

d.3 program code [means] for receiving a network protocol address of the second process from the server process, when the second process is connected to the computer network.

4. (Thrice Amended) The computer program product of claim 2 wherein the program code for establishing a point-to-point communication link further comprises:

d.2 program code [means] for transmitting an E-mail message containing a network protocol address from the first process to the server process over the computer network;

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Straight Path - Ex. 2025 - Page 39

d.3 program code [means] for receiving a second network protocol address from the second process over the computer network.

7. (Twice Amended) In a computer system having a display [and an audio transducer], the computer system capable of executing a first process and communicating with other processes and a server process over a computer network, a method for establishing point-to-point communications with other processes comprising:

A. determining the currently assigned network protocol address of the first process upon connection to the computer network;

B. establishing a communication connection with the server process once the assigned network protocol of the first process is known;

C. forwarding the assigned network protocol address of the first process to the server process upon establishing a communication connection with the server process; and

D. establishing a point-to-point communication with another process over the computer network.

Remarks

This application is currently under Allowance. A Notice of Allowance dated June 22, 1999 was mailed indicating that claims 1-4 and 7-20 are allowed. Applicants submit this Amendment to resolve minor informalities in the claim language.

Applicants have amended claims 1 and 7 to eliminate superfluous language. Specifically, the phrase "and an audio transducer" provided a basis for limitations recited in claims 5-6, previously cancelled. This term does not occur elsewhere in claims 1-4 and should be deleted. A similar change has been made to claim 7. The phrase "and an audio transducer" does not occur elsewhere in claims 7-9 and should be deleted. In the previous response mailed March 3,1999, claims 1-4 were amended to eliminate the term "means" from the claim language, however, several occurrences were overlooked. Applicant's

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Straight Path - Ex. 2025 - Page 40

submit additional amendments to claims 1, 3 and 4 to eliminate the term "means" from the claim language. These amendments are offered to conform the claims to 35 U.S.C. §112, 2nd paragraph, and are not necessitated or made in response to any rejection by the Examiner, or, in light of any reference cited by the Examiner.

No new matter or substantive issues are believed raised by this amendment. In light of the foregoing amendments and remarks, this application is now believed in condition for issuance and the Examiner is respectfully requested to advance this application to issuance. If the Examiner has any further questions regarding this Amendment, he is invited to call Applicants' attorney at the number listed below.

The Commissioner is hereby authorized to charge any fees or credits under 37 C.F.R. §1.16 and 1.17 to our deposit account No. 02-3038.

Respectfully submitted

Bruce D. Jobse Date: 7/20/99

Bruce D. Jobse, Esq. Reg. No. 33,518
KUDIRKA & JOBSE, LLP
Customer Number 021127
Tel: (617) 367-4600 Fax: (617) 367-4656

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 41

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address : COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
08/721,316	09/25/96	MATTAWAY	S

021127
KUDIRKA & JOBSE
TWO CENTER PLAZA
BOSTON MA 02108

LM51/1116

EXAMINER	
RAMIREZ,E	
ART UNIT	PAPER NUMBER
2757	14

DATE MAILED: 11/16/99

The amendment filed 7/20/99 under Rule 312 has been considered, and has been:

1. [X] entered.
2. [ ] entered as directed to matters of form not affecting the scope of the invention (0.3311).
3. [ ] disapproved. A report appears below.
4. [ ] entered in part. A report appears below.

By Direction of the Commissioner

Report:

Moustafa M. Meky

MOUSTAFA M. MEKY
PRIMARY EXAMINER

PLEASE FURNISH YOUR ZIP CODE IN ALL CORRESPONDENCE

FORM PTOL-271 (REV. 4/81)

OIPE JC16
OCT 25 1999
PATENT & TRADEMARK OFFICE

LETTER TO OFFICIAL DRAFTSPERSON	Docket No. N0003/7002

Applicant:	Shane D. Mattaway, Glenn W. Hutton and Craig B. Strickland
Serial No:	08/721,316
Filed:	September 25, 1996
For:	GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner:	E. Ramirez
Art Unit:	2757

CERTIFICATE OF EXPRESS MAILING

"Express Mail" mailing label number: **EL401821480US**
Date of Deposit: **October 22, 1999**

I hereby certify that the following Correspondence is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service pursuant to 37 C.F.R. §1.10 on the date indicated above in an envelope addressed Assistant Commissioner for Patents, Box Issue Fee, Washington, D.C. 20231.

Jan L. Mellen

Jan L. Mellen

Assistant Commissioner for Patents
Box Issue Fee
Washington, DC 20231

1. Upon approval of the Examiner in charge of the above-identified application, please substitute the enclosed drawing sheets containing formal versions of Figures 5-7, 9, 15A and 15B for the corresponding drawing sheets currently in the application.

2. The Commissioner is hereby authorized to charge any other fees under 37 CFR §1.16 and §1.17 that may be required , or credit any overpayment, to our Deposit Account No. 02-3038.

Respectfully submitted,

Bruce D. Jobse

Date: 10/22/99

Bruce D. Jobse, Esq. Reg. No. 33,518
KUDIRKA & JOBSE, LLP
Customer Number 021127
Tel: (617) 367-4600 Fax: (617) 367-4656

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LG V. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 43

TRANSMITTAL LETTER	Docket No. N0003/7002

Applicant:	Shane D. Mattaway, Glenn W. Hutton and Craig B. Strickland
Serial No:	08/721,316
Filed:	September 25, 1996
For:	GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner:	E. Ramirez
Art Unit:	2757

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OCT 25 1999
PATENT & TRADEMARK OFFICE 9100

Assistant Commissioner for Patents
Washington, D.C. 20231

Enclosures

☐	Affidavit under 37 C.F.R. 1.131	☐	Request for Certified Copies
☐	Assignment Papers	☐	Request for Corrected Filing Receipt
☐	Change of Correspondence Address	☐	Copy of Original Filing Receipt
☒	Extension of Time Request	☐	Request for Reconsideration
☐	Declaration/Power of Attorney	☐	Request for Refund
☐	Fee Transmittal Form	☐	Response to Missing Parts
☐	Information Disclosure Statement	☐	Return Receipt Postcard
☐	Invention Disclosure Document	☒	5 Sheets Formal Drawing(s)
☐	Notice of Appeal	☐	Small Entity Statement
☐	Petition and Petition Routing Slip	☐	Status Letter
☐	Power of Attorney Form	☐	Terminal Disclaimer
☐	PTO-1449 Form(s)	☒	Other: Letter to Official Draftsperson; and Check for $110.00

Bruce D. Jobse Date: 10/22/99

Bruce D. Jobse, Esq. Reg. No. 33,518
KUDIRKA & JOBSE, LLP
Customer Number 021127
Tel: (617) 367-4600 Fax: (617) 367-4656

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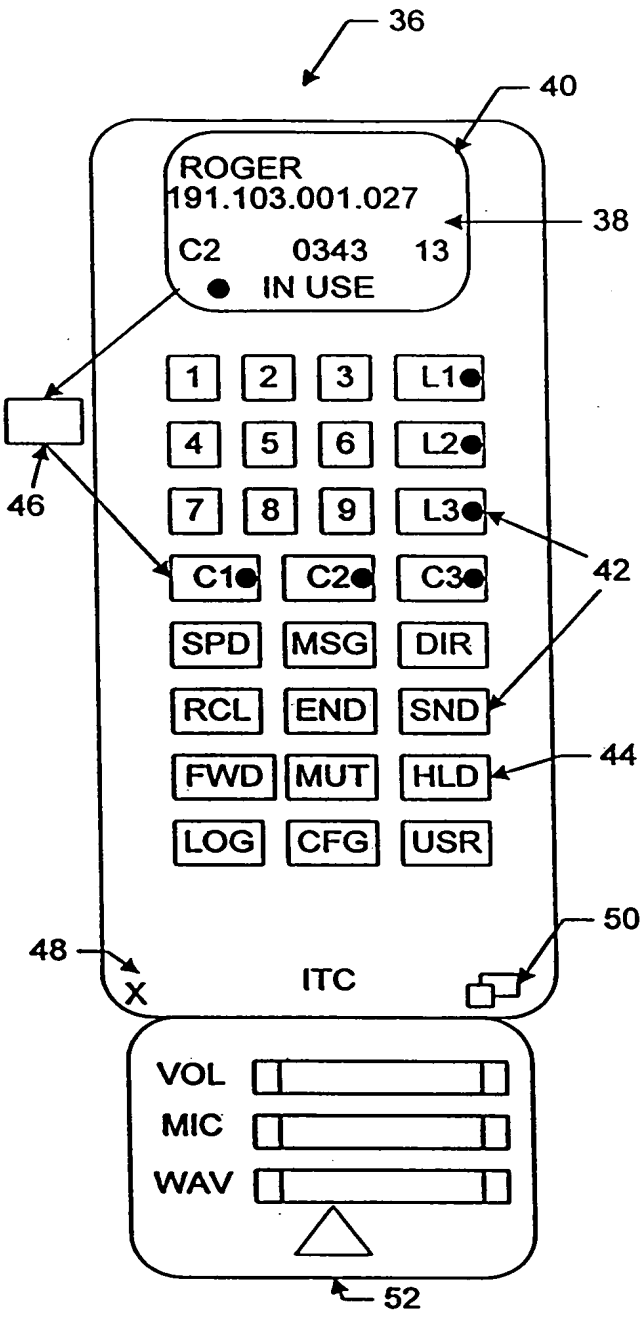


FIG. 5

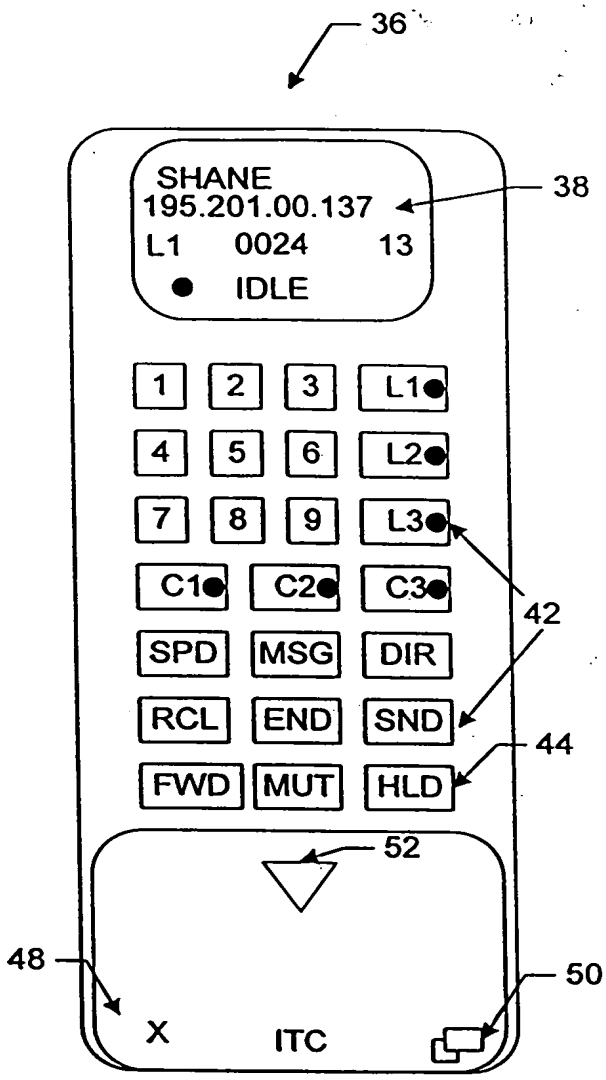


FIG. 6

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 45

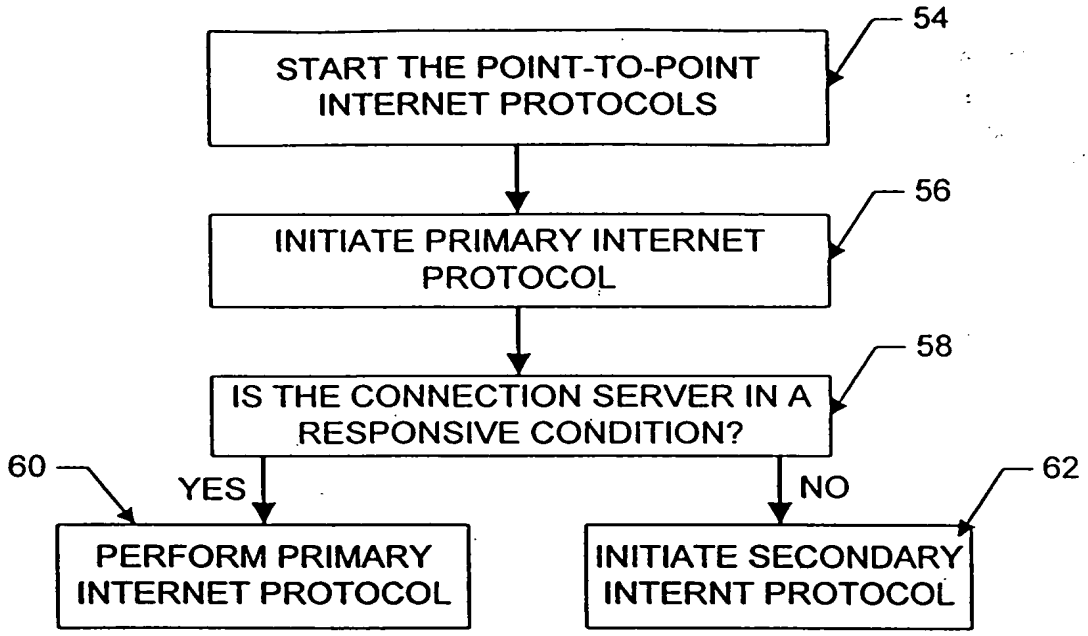


FIG. 7

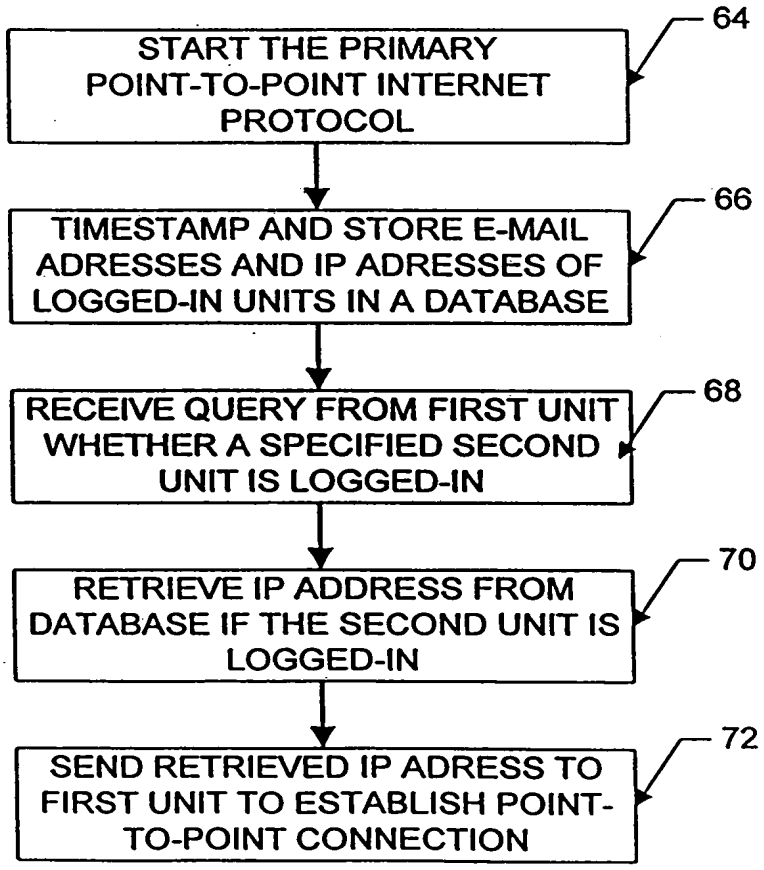


FIG. 8

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 46

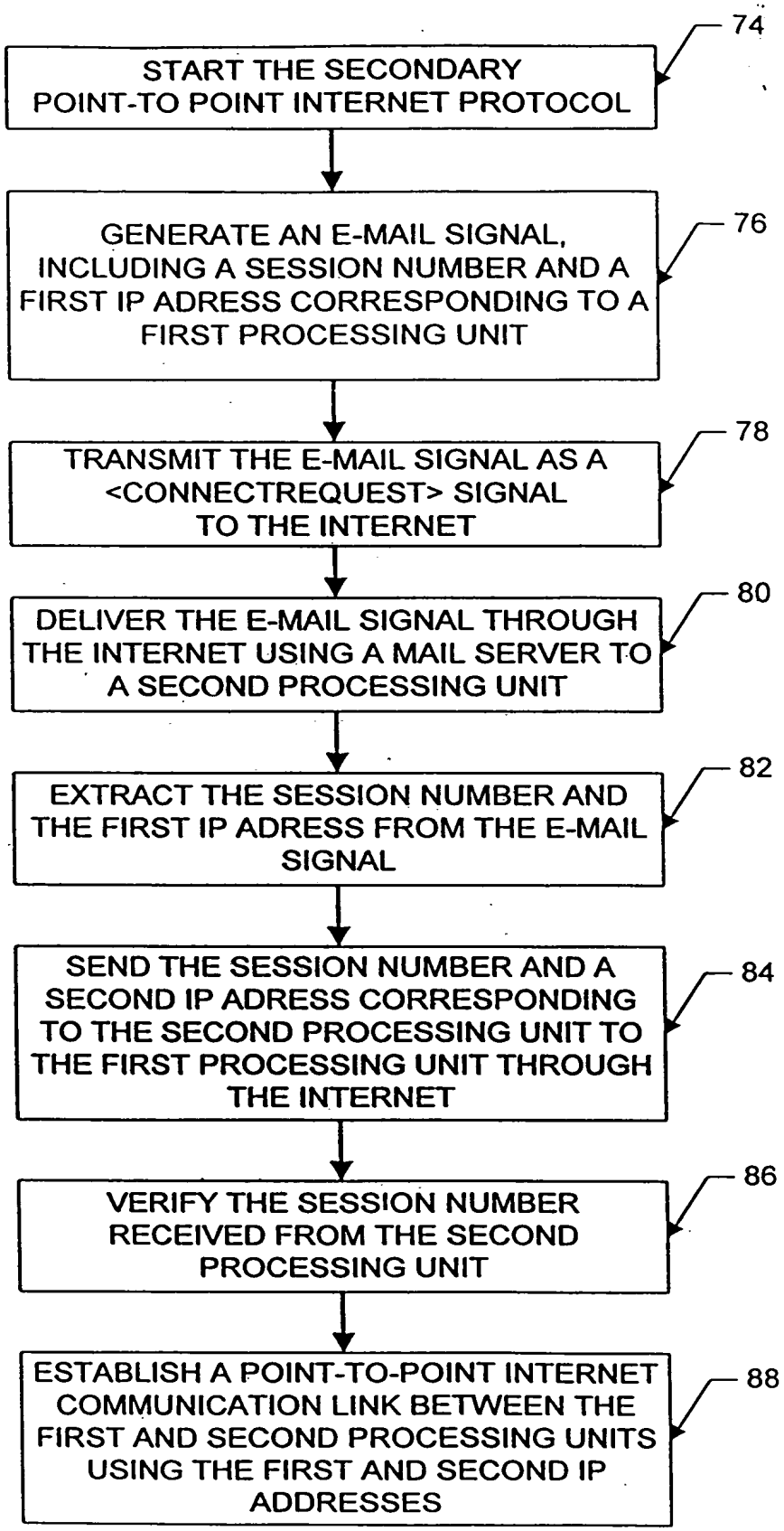
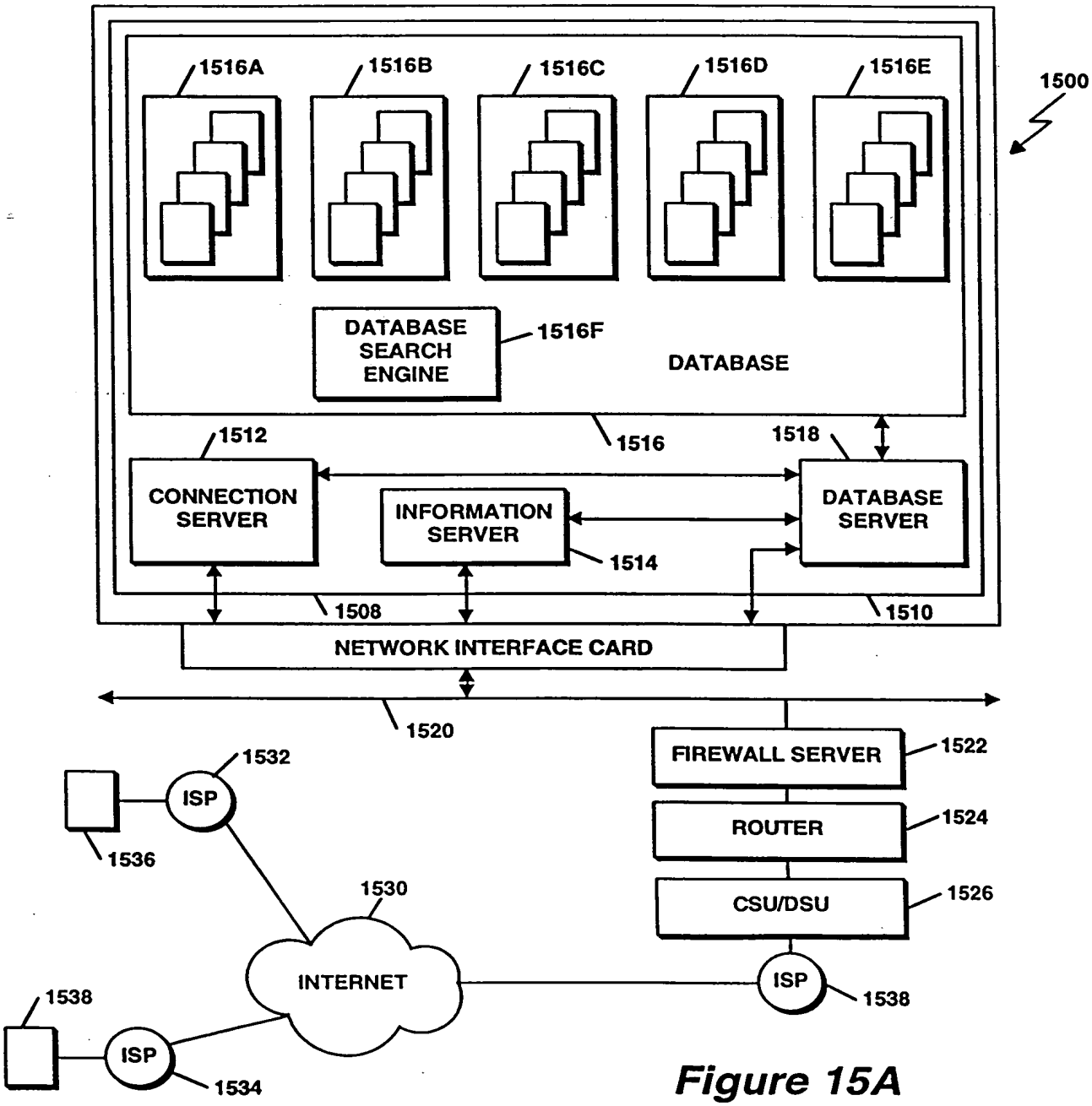


FIG. 9

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 47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1516B
1516C
1516D
1516E
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1516F
DATABASE
1516
1512
CONNECTION SERVER
1518
DATABASE SERVER
INFORMATION SERVER
1514
1508
1510
NETWORK INTERFACE CARD
1520
FIREWALL SERVER
1522
ROUTER
1524
CSU/DSU
1526
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ISP
1536
1530
INTERNET
ISP
1538
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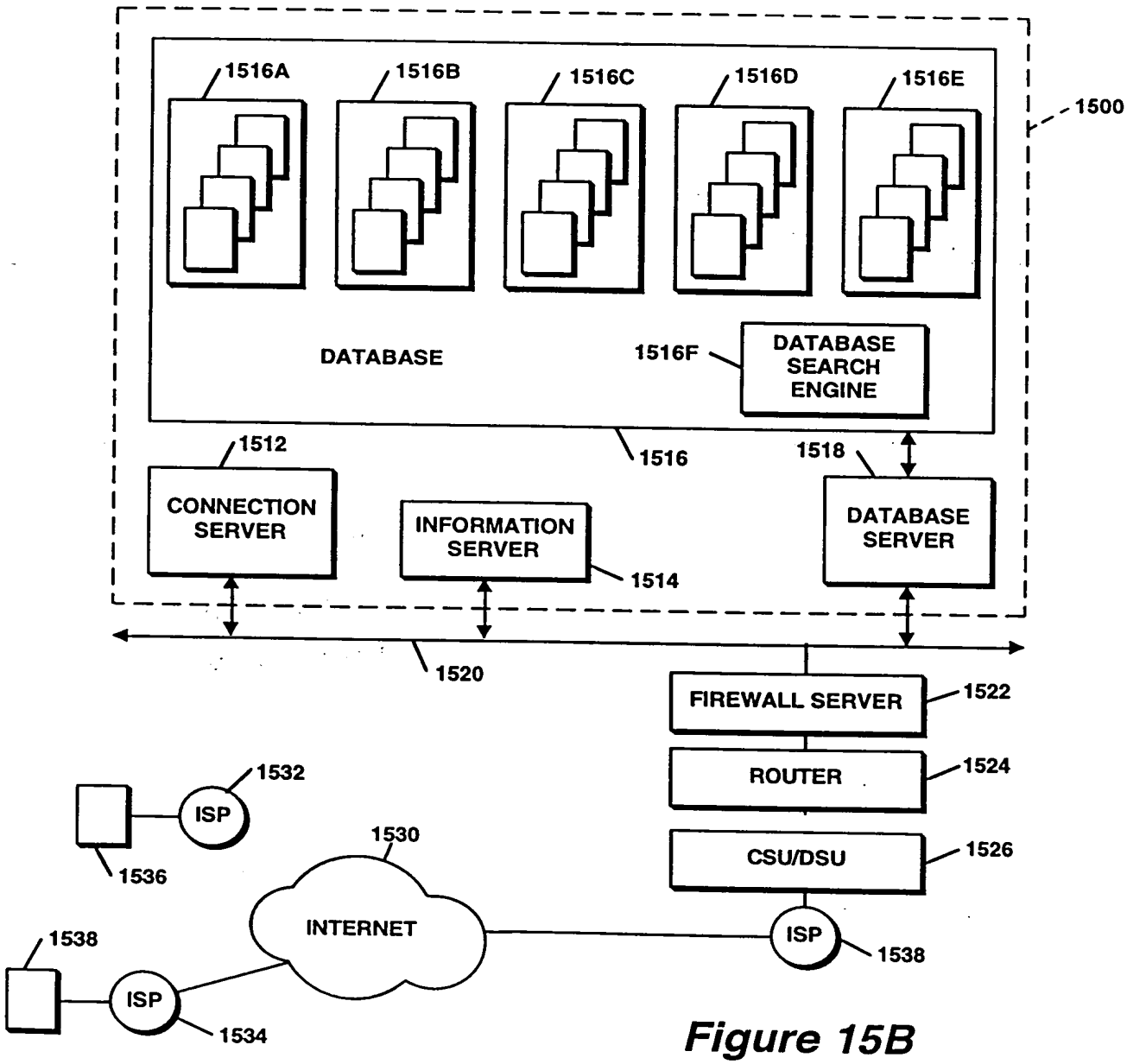
ISP
1534

Figure 15A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INFORMATION SERVER
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DATABASE SERVER
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FIREWALL SERVER
1522
ROUTER
1524
CSU/DSU
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ISP
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INTERNET
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ISP
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ISP
1534

Figure 15B

OIPE JC16
OCT 25 1999
PATENT & TRADEMARK OFFICE

PETITION FOR EXTENSION OF TIME UNDER 37 CFR §1.136(a)	Docket No. N0003/7002

Applicant:	Shane D. Mattaway, Glenn W. Hutton and Craig B. Strickland
Serial No:	08/721,316
Filed:	September 25, 1996
For:	GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner:	E. Ramirez
Art Unit:	2757

CERTIFICATE OF EXPRESS MAILING

"Express Mail" mailing label number: **EL401821480US**
Date of Deposit: **October 22, 1999**

I hereby certify that the following Correspondence is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service pursuant to 37 C.F.R. §1.10 on the date indicated above in an envelope addressed Assistant Commissioner for Patents, Box Issue Fee, Washington, D.C. 20231.

Jan L. Mellen

Jan L. Mellen

Assistant Commissioner for Patents
Box Issue Fee
Washington, D.C. 20231

This is a request under the provisions of 37 C.F.R. §1.136(a) to extend the period for filing a response in the above-identified application up to, and including, October 22, 1999.

Small Entity

☐ A small entity statement under 37 C.F.R. §1.27 has already been filed.
☐ A small entity statement under 37 C.F.R. §1.27 is attached

Extension

The requested extension and the appropriate fee are as follows:

☒	One month (37 C.F.R. §1.17(a)(1))	$110.00
☐	Two months (37 C.F.R. §1.17(a)(2))	
☐	Three months (37 C.F.R. §1.17(a)(3))	
☐	Four months (37 C.F.R. §1.17(a)(4))	
☐	Five months (37 C.F.R. §1.17(a)(5))	
	Reduction by one-half for request by small entity	
	Total Fee:	$110.00

Payment

☒ A check in the amount of the extension fee is enclosed.
☐ The extension fee is included in a fee payment made in connection with papers accompanying this petition.

☐ Charge the extension fee to deposit account no. 02-3038. A duplicate of this sheet is attached.

☒ The Commissioner is hereby authorized to charge any other fees under 37 C.F.R. §1.16 and §1.17 that may be required, or credit any overpayment, to deposit account no. 02-3038.

Bruce D. Jobse Date: 10/22/99

Bruce D. Jobse, Esq. Reg. No. 33,518
KUDIRKA & JOBSE, LLP
Customer Number 021127
Tel: (617) 367-4600 Fax: (617) 367-4656

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 51

OCT 25 1999

PETITION FOR EXTENSION OF TIME UNDER 37 CFR §1.136(a)	Docket No. N0003/7002

Applicant:	Shane D. Mattaway, Glenn W. Hutton and Craig B. Strickland
Serial No:	08/721,316
Filed:	September 25, 1996
For:	GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner:	E. Ramirez
Art Unit:	2757

CERTIFICATE OF EXPRESS MAILING

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Date of Deposit: **October 22, 1999**

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Jan L. Mellen

Jan L. Mellen

Assistant Commissioner for Patents
Box Issue Fee
Washington, D.C. 20231

This is a request under the provisions of 37 C.F.R. §1.136(a) to extend the period for filing a response in the above-identified application up to, and including, October 22, 1999.

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☐	Three months (37 C.F.R. §1.17(a)(3))	
☐	Four months (37 C.F.R. §1.17(a)(4))	
☐	Five months (37 C.F.R. §1.17(a)(5))	
	Reduction by one-half for request by small entity	
	Total Fee:	$110.00

Payment

☒ A check in the amount of the extension fee is enclosed.
☐ The extension fee is included in a fee payment made in connection with papers accompanying this petition.

10/26/1999 HLE222 00000008 08721316 110.00 OP
01 FC:115

☐ Charge the extension fee to deposit account no. 02-3038. A duplicate of this sheet is attached.

☒ The Commissioner is hereby authorized to charge any other fees under 37 C.F.R. §1.16 and §1.17 that may be required, or credit any overpayment, to deposit account no. 02-3038.

Bruce D. Jobse Date: 10/22/99

Bruce D. Jobse, Esq. Reg. No. 33,518
KUDIRKA & JOBSE, LLP
Customer Number 021127
Tel: (617) 367-4600 Fax: (617) 367-4656

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO
08/721,316	09/25/96	MATTAWAY	S

021127
KUDIRKA & JOBSE
TWO CENTER PLAZA
BOSTON MA 02108

LM51/1019

EXAMINER	
RAMIREZ,E	
ART UNIT	**PAPER NUMBER**
2757	12

DATE MAILED: 10/19/99

This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS

Supp. **NOTICE OF ALLOWABILITY**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance and Issue Fee Due or other appropriate communication will be mailed in due course.

☒ This communication is responsive to the filing of formal drawings on 8/24/99.

☐ The allowed claim(s) is/are _____.

☐ The drawings filed on _____ are acceptable.

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____.

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

A SHORTENED STATUTORY PERIOD FOR REPLY to comply with the requirements noted below is set to EXPIRE **THREE MONTHS FROM THE "DATE MAILED"** of this Office action. Failure to timely comply will result in ABANDONMENT of this application. Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

☐ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION, PTO-152, which discloses that the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.

☒ Applicant MUST submit NEW FORMAL DRAWINGS

☐ because the originally filed drawings were declared by applicant to be informal.

☒ including changes required by the Notice of Draftperson's Patent Drawing Review, PTO-948, attached hereto or to Paper No. 12.

☐ including changes required by the proposed drawing correction filed on _____, which has been approved by the examiner.

☐ including changes required by the attached Examiner's Amendment/Comment.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the reverse side of the drawings. The drawings should be filed as a separate paper with a transmittal letter addressed to the Official Draftperson.

☐ Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Any reply to this notice should include, in the upper right hand corner, the APPLICATION NUMBER (SERIES CODE/SERIAL NUMBER). If applicant has received a Notice of Allowance and Issue Fee Due, the ISSUE BATCH NUMBER and DATE of the NOTICE OF ALLOWANCE should also be included.

Attachment(s)

☐ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☒ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

☐ Interview Summary, PTO-413

☐ Examiner's Amendment/Comment

☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

☐ Examiner's Statement of Reasons for Allowance

MOUSTAFA M. MEKY
PRIMARY EXAMINER

PTOL-37 (Rev. 8/97)

*U.S. GPO: 1998-433-221/62108

Form PTO 948 (Rev. 8-98) U.S. DEPARTMENT OF COMMERCE - Patent and Trademark Office Application No. 08/721316

NOTICE OF DRAFTSPERSON'S PATENT DRAWING REVIEW

The drawing(s) filed (insert date) 8/24/99 are:

A. ☐ approved by the Draftsperson under 37 CFR 1.84 or 1.152.

B. ☒ objected to by the Draftsperson under 37 CFR 1.84 or 1.152 for the reasons indicated below. The Examiner will require submission of new, corrected drawings when necessary. Corrected drawing must be submitted according to the instructions on the back of this notice.

1. DRAWINGS. 37 CFR 1.84(a): Acceptable categories of drawings:
Black ink. Color.
___ Color drawings are not acceptable until petition is granted.
Fig(s) _____
___ Pencil and non black ink not permitted. Fig(s) _____

2. PHOTOGRAPHS. 37 CFR 1.84 (b)
___ 1 full-tone set is required. Fig(s) _____
___ Photographs not properly mounted (must use brystol board or photographic double-weight paper). Fig(s) _____
___ Poor quality (half-tone). Fig(s) _____

3. TYPE OF PAPER. 37 CFR 1.84(e)
___ Paper not flexible, strong, white, and durable. Fig(s) _____
___ Erasures, alterations, overwritings, interlineations, folds, copy machine marks not accepted. Fig(s) _____
___ Mylar, velum paper is not acceptable (too thin). Fig(s) _____

4. SIZE OF PAPER. 37 CFR 1.84(f): Acceptable sizes:
___ 21.0 cm by 29.7 cm (DIN size A4)
___ 21.6 cm by 27.9 cm (8 1/2 x 11 inches)
___ All drawing sheets not the same size. Sheet(s) _____
___ Drawings sheets not an acceptable size. Fig(s) _____

5. MARGINS. 37 CFR 1.84(g): Acceptable margins:
Top 2.5 cm Left 2.5cm Right 1.5 cm Bottom 1.0 cm
SIZE: A4 Size
Top 2.5 cm Left 2.5 cm Right 1.5 cm Bottom 1.0 cm
SIZE: 8 1/2 x 11
Margins not acceptable. Fig(s) 5, 7, 9, 15A, 15B
☒ Top (T) ☒ Left (L)
___ Right (R) ___ Bottom (B)

6. VIEWS. 37 CFR 1.84(h)
REMINDER: Specification may require revision to correspond to drawing changes.
Partial views. 37 CFR 1.84(h)(2)
___ Brackets needed to show figure as one entity. Fig(s) _____
___ Views not labeled separately or properly. Fig(s) _____
___ Enlarged view not labeled separetely or properly. Fig(s) _____

7. SECTIONAL VIEWS. 37 CFR 1.84 (h)(3)
___ Hatching not indicated for sectional portions of an object. Fig(s) _____
___ Sectional designation should be noted with Arabic or Roman numbers. Fig(s) _____

8. ARRANGEMENT OF VIEWS. 37 CFR 1.84(i)
___ Words do not appear on a horizontal, left-to-right fashion when page is either upright or turned so that the top becomes the right side, except for graphs. Fig(s) _____

9. SCALE. 37 CFR 1.84(k)
___ Scale not large enough to show mechanism without crowding when drawing is reduced in size to two-thirds in reproduction. Fig(s) _____

10. CHARACTER OF LINES, NUMBERS, & LETTERS. 37 CFR 1.84(l)
___ Lines, numbers & letters not uniformly thick and well-defined, clean, durable, and black (poor line quality). Fig(s) _____

11. SHADING. 37 CFR 1.84(m)
___ Solid black areas pale. Fig(s) _____
___ Solid black shading not permitted. Fig(s) _____
___ Shade lines, pale, rough and blurred. Fig(s) _____

12. NUMBERS, LETTERS, & REFERENCE CHARACTERS. 37 CFR 1.84(p)
___ Numbers and reference characters not plain and legible. Fig(s) _____
___ Figure legends are poor. Fig(s) _____
___ Numbers and reference characters not oriented in the same direction as the view. 37 CFR 1.84(p)(1) Fig(s) _____
___ English alphabet not used. 37 CFR 1.84(p)(2) Figs _____
___ Numbers, letters and reference characters must be at least .32 cm (1/8 inch) in height. 37 CFR 1.84(p)(3) Fig(s) _____

13. LEAD LINES. 37 CFR 1.84(q)
___ Lead lines cross each other. Fig(s) _____
___ Lead lines missing. Fig(s) _____

14. NUMBERING OF SHEETS OF DRAWINGS. 37 CFR 1.84(t)
___ Sheets not numbered consecutively, and in Arabic numerals beginning with number 1. Sheet(s) _____

15. NUMBERING OF VIEWS. 37 CFR 1.84(u)
___ Views not numbered consecutively, and in Arabic numerals, beginning with number 1. Fig(s) _____

16. CORRECTIONS. 37 CFR 1.84(w)
___ Corrections not made from prior PTO-948 dated _____

17. DESIGN DRAWINGS. 37 CFR 1.152
___ Surface shading shown not appropriate. Fig(s) _____
___ Solid black shading not used for color contrast. Fig(s) _____

COMMENTS

REVIEWER AD DATE 10/15/99 TELEPHONE NO. _____

ATTACHMENT TO PAPER NO. 12

#11

KUDIRKA & JOBSE, LLP

Two Center Plaza
Boston MA 02108
Tel: (617) 367-4600
Fax: (617) 367-4656

FACSIMILE COVER SHEET

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	Company:	United States Patent & Trademark Office
	Facsimile No:	(703) 308-6642
	Telephone No:	
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RE:	**Our File Number:**	N0003/7002
	Your File Number:	

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Tel.: (617) 367-4600

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BRUCE D. JOBSE
PHILIP L. CONRAD
VINCENT J. FROIO*

OF COUNSEL
GARY E. ROSS

SPECIALIZING IN
INTELLECTUAL PROPERTY LAW

FAX: (617) 367-4656
E-MAIL: K-JPAT.COM

* NOT ADMITTED IN ANY JURISDICTION

August 31, 1999

VIA FACSIIMLE

Ms. Terry Dyson
United States Patent & Trademark Office
Washington, DC 20231

Re: U.S. Patent Application Serial No. 08/721,316
GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Our File No.: N0003/7002

Dear Ms. Dyson,

This is to confirm our telephone conversation today that the letters "X" as found on page 4, lines 15-16 and page 15, lines 10-12 of United States Patent Appln. Serial No. 08/721,316 do not require further modification before the application advances to printing and issuance.

Do not hesitate to contact me or have the Examiner contact me if there are any further questions regarding this matter.

Cordially yours,

KUDIRKA & JOBSE, LLP

Bruce D. Jobse, Esq.
Attorney of Record for Applicants

BDJ:fmc

7530
9/1/99

95

OIPE
AUG 24 1999
PATENT & TRADEMARK OFFICE JC19

B

#11
SSK.
10-13-99

TRANSMITTAL LETTER	Docket No. N0003/7002

Applicant: Shane D. Mattaway, et al.
Serial No. 08/721,316
Filed: September 25, 1996
For: GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner: E. Ramirez
Art Unit: 2757

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Frances M. Cunningham
Frances M. Cunningham

Assistant Commissioner for Patents
Box Issue Fee
Washington, D.C. 20231

Enclosures

- ☐ Affidavit under 37 C.F.R. 1.131
- ☐ Assignment Papers
- ☐ Change of Correspondence Address
- ☐ Extension of Time Request
- ☐ Declaration/Power of Attorney
- ☐ Fee Transmittal Form
- ☐ Information Disclosure Statement
- ☐ Invention Disclosure Document
- ☐ Notice of Appeal
- ☐ Petition and Petition Routing Slip
- ☐ Power of Attorney Form
- ☐ PTO-1449 Form(s)
- ☐ Request for Certified Copies
- ☐ Request for Reconsideration
- ☐ Request for Refund
- ☐ Response to Missing Parts
- ☒ Return Receipt Postcard
- ☒ 27 Sheets Formal Drawing(s)
- ☐ Small Entity Statement
- ☐ Status Letter
- ☐ Terminal Disclaimer
- ☒ Letter to Official Draftsperson

Bruce D. Jobse

Date: 8/24/99

Bruce D. Jobse, Esq. Reg. No. 33,518
KUDIRKA & JOBSE, LLP
Customer Number 021127
Tel: (617) 367-4600 Fax: (617) 367-4656

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AUG 24 1999
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PATENT AND TRADEMARK OFFICE

LETTER TO OFFICIAL DRAFTSPERSON	Docket No. N0003/7002

Applicant: Shane D. Mattaway, et al.
Serial No 08/721,316
Filed: September 25, 1996
For: GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner: E. Ramirez
Art Unit: 2757

CERTIFICATE OF EXPRESS MAILING

"Express Mail" mailing label number: EL401821635US
Date of Deposit: August 24, 1999

I hereby certify that the following Correspondence is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service pursuant to 37 C.F.R. §1.10 on the date indicated above in an envelope addressed to Commissioner of Patents and Trademarks, Box Issue Fee, Washington, D.C. 20231.

Frances M. Cunningham
Frances M. Cunningham

Assistant Commissioner for Patents
BOX ISSUE FEE
Washington, DC 20231

1. Upon approval of the Examiner in charge of the above-identified application, please substitute the enclosed drawing sheets containing formal versions of Figures 1-20D for the corresponding drawing sheets currently in the application.

2. The Commissioner is hereby authorized to charge any other fees under 37 CFR §1.16 and §1.17 that may be required, or credit any overpayment, to our Deposit Account No. 02-3038.

Respectfully submitted,

Bruce D. Jobse Date: 8/24/99

Bruce D. Jobse, Esq. Reg. No. 33,518
KUDIRKA & JOBSE, LLP
Customer Number 021127
Tel: (617) 367-4600 Fax: (617) 367-4656

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 59

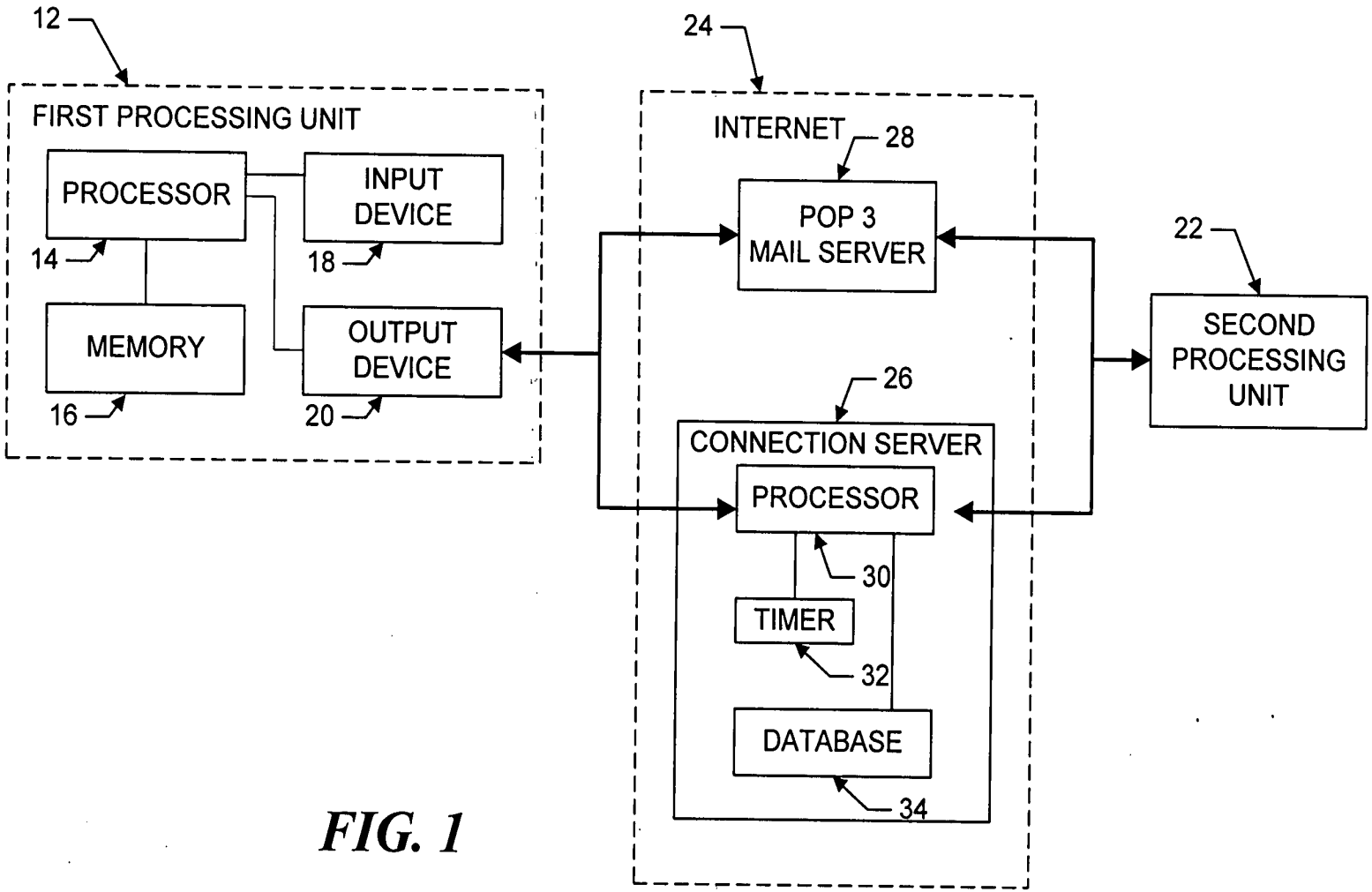


FIG. 1

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 60

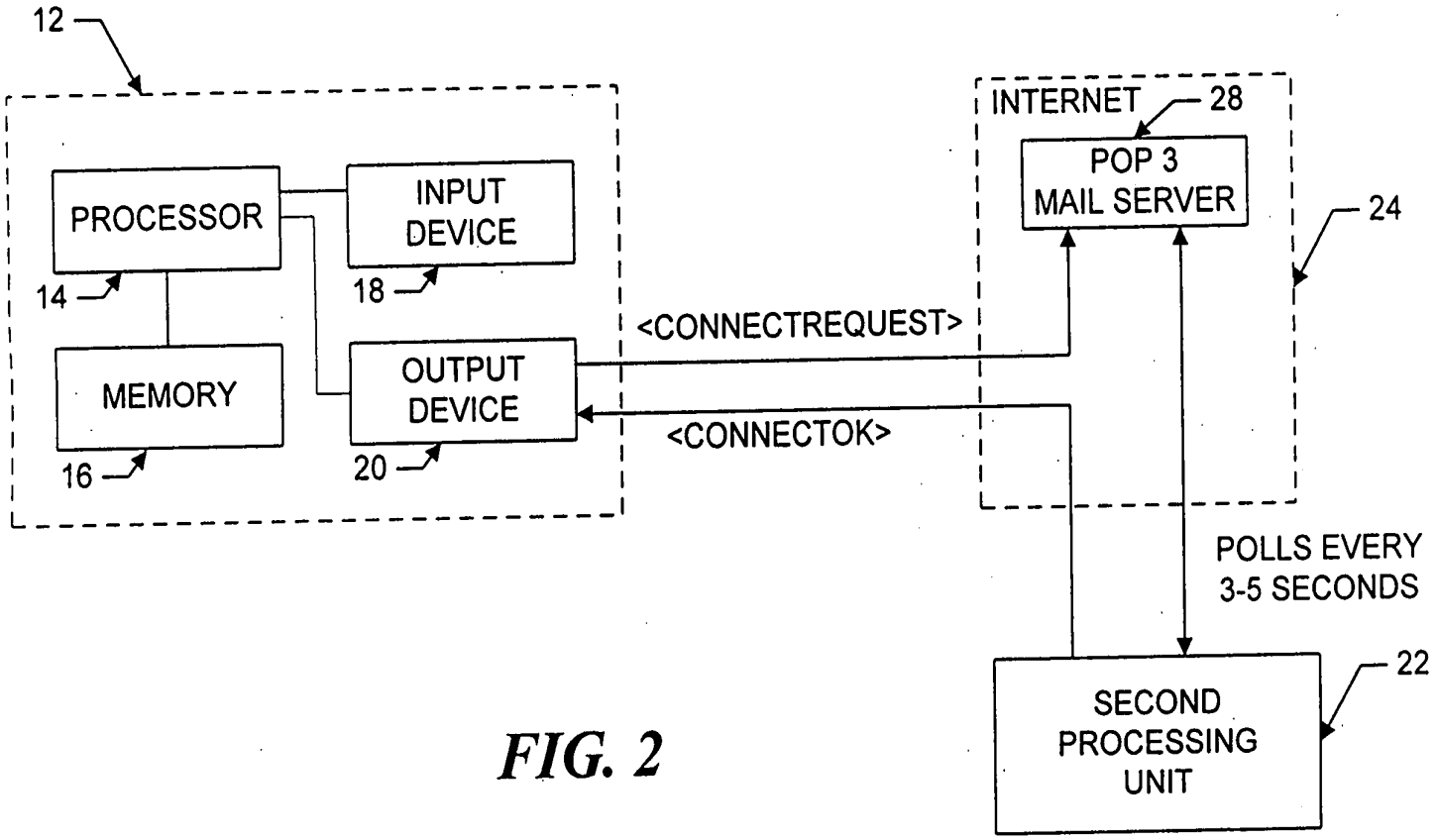
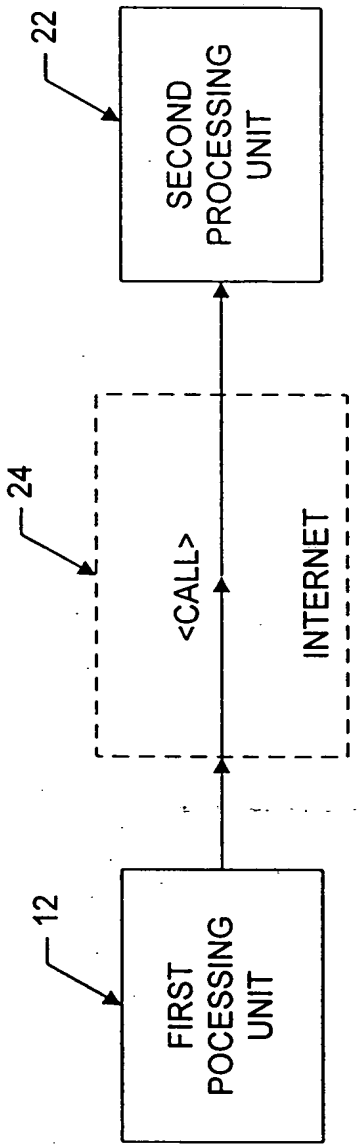


FIG. 2

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 61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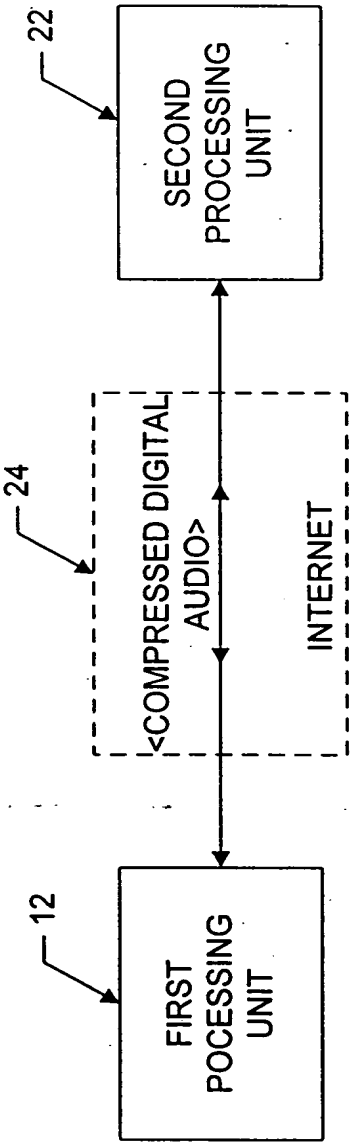
24
<CALL>
INTERNET
12
FIRST POCESSING UNIT

FIG. 3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INTERNET
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FIRST POCESSING UNIT

FIG. 4

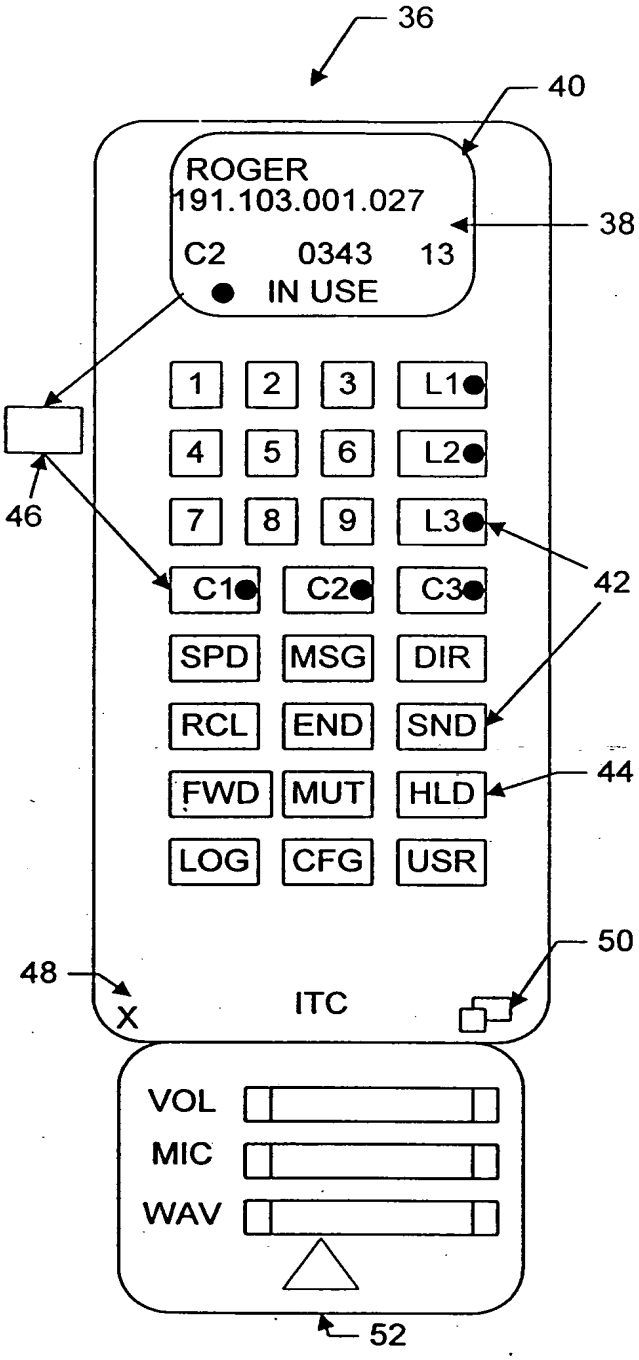


FIG. 5

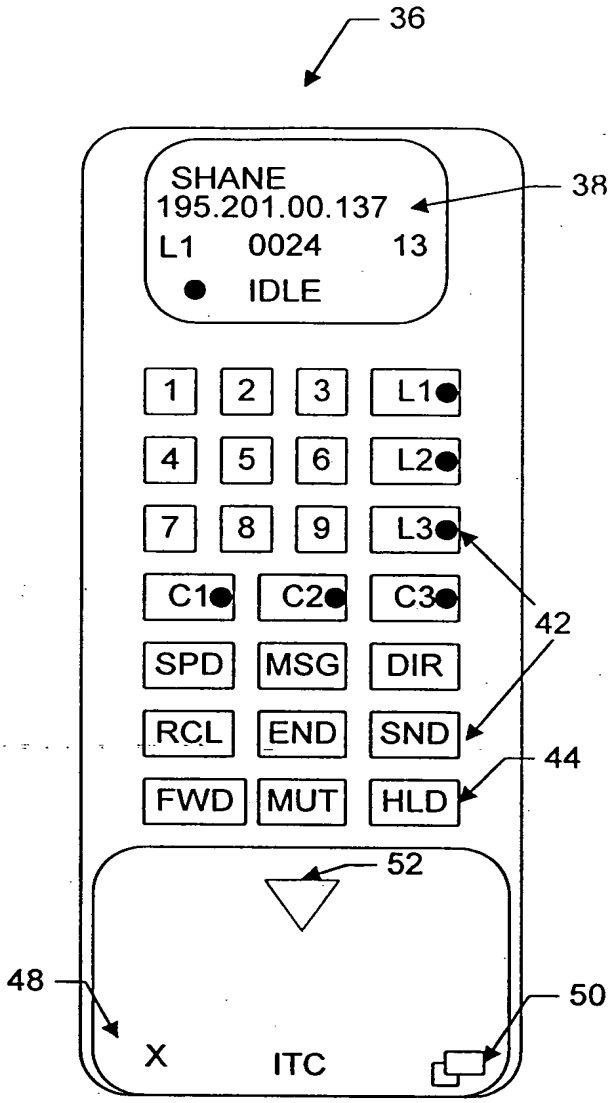


FIG. 6

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 63

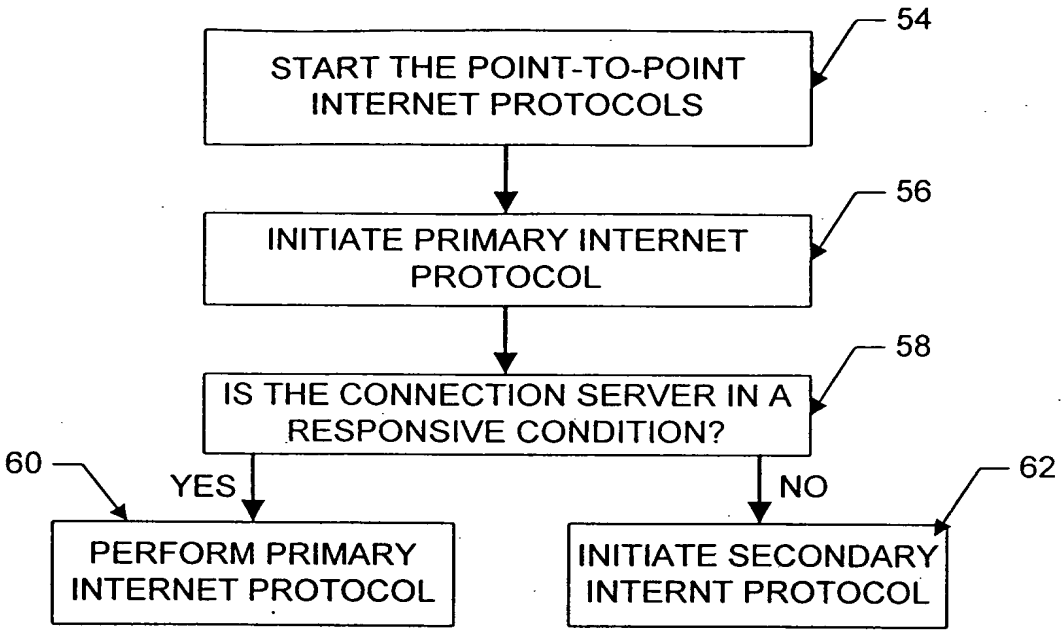


FIG. 7

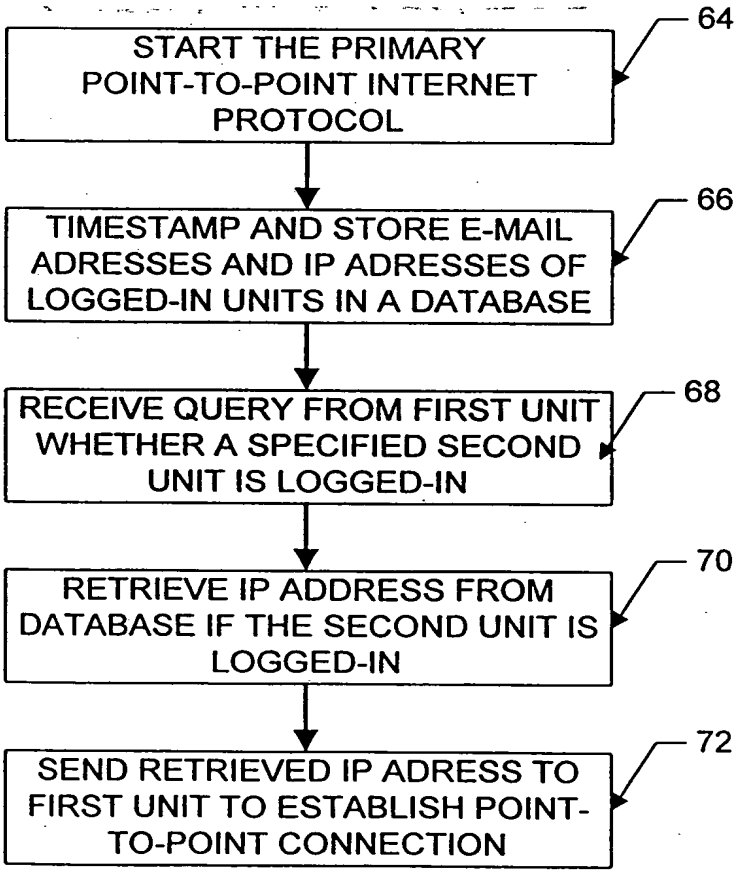


FIG. 8

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 64

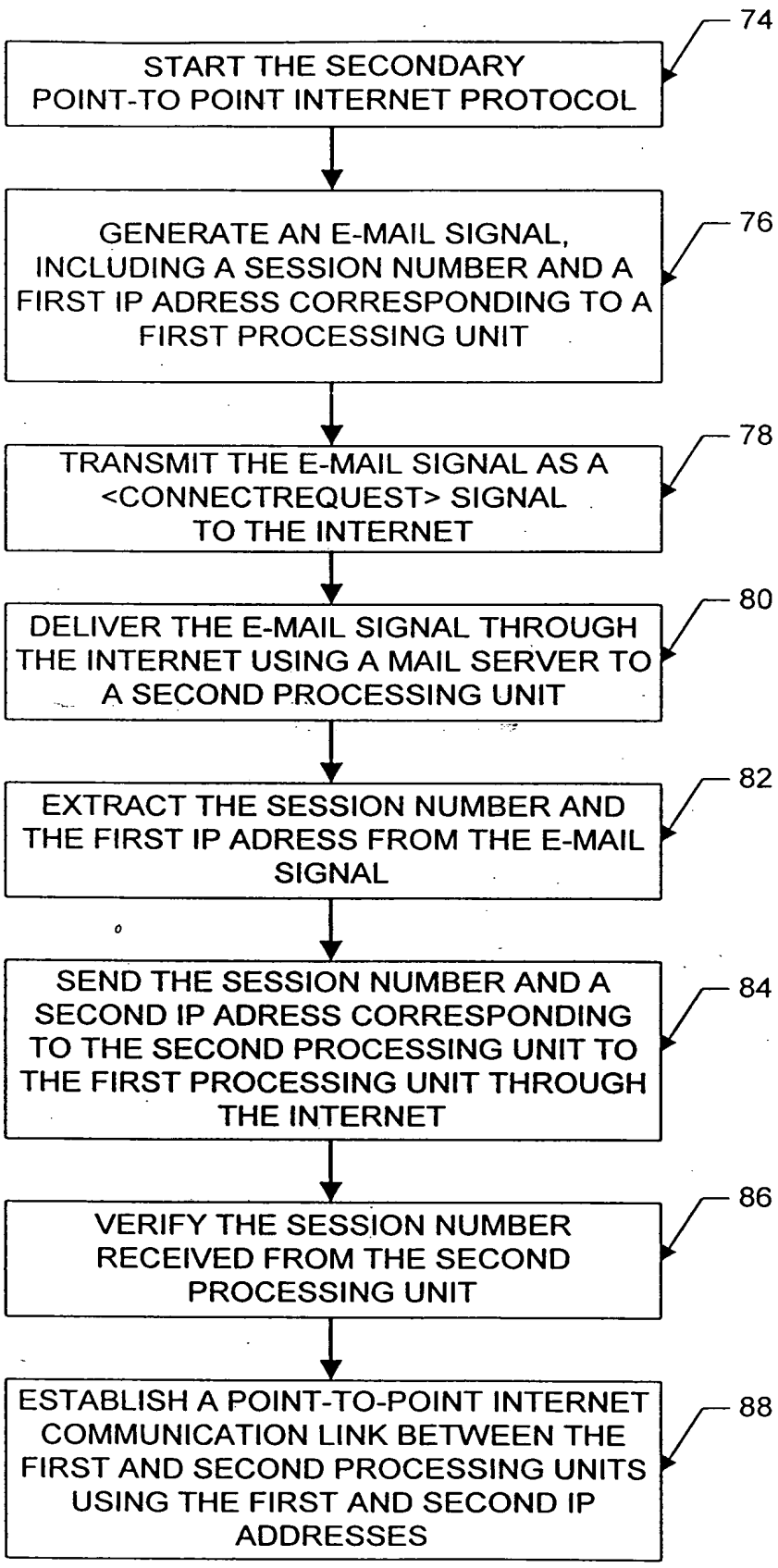


FIG. 9

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 65

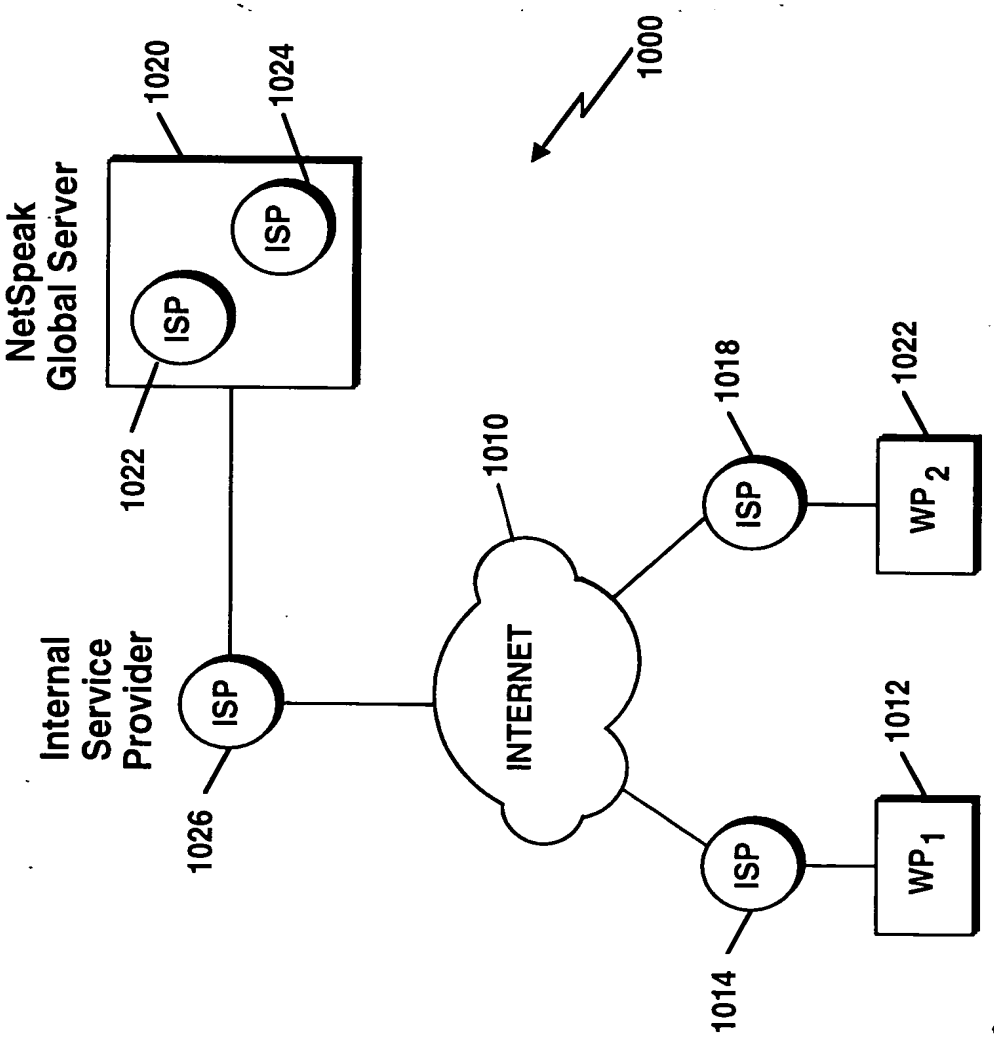

1000
NetSpeak Global Server
1020
1024
ISP
ISP
1022
Internal Service Provider
ISP
1026
INTERNET
1010
ISP
1018
ISP
1014
WP 2
1022
WP 1
1012

Figure 10

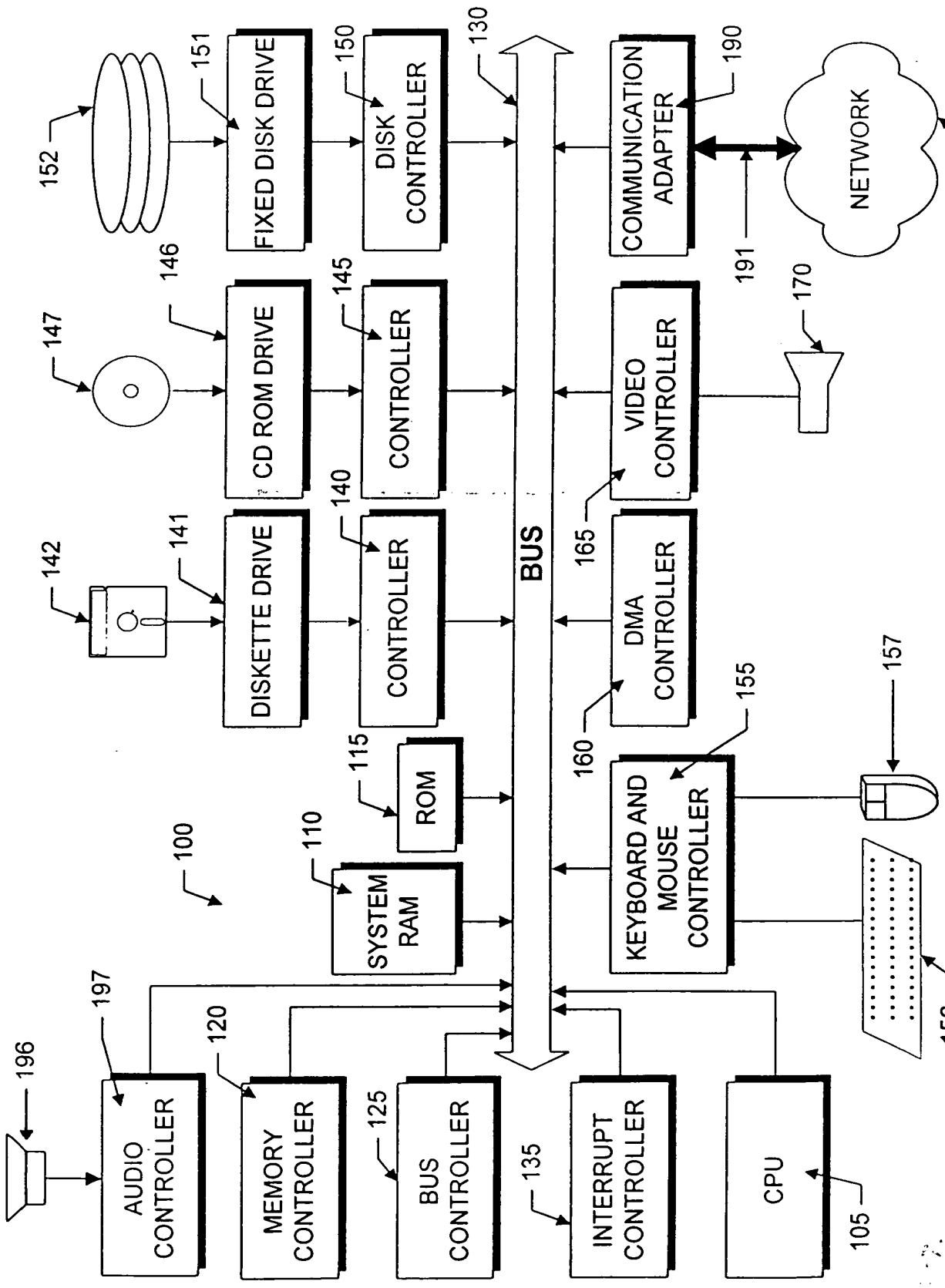


Figure 11 *(PRIOR ART)*

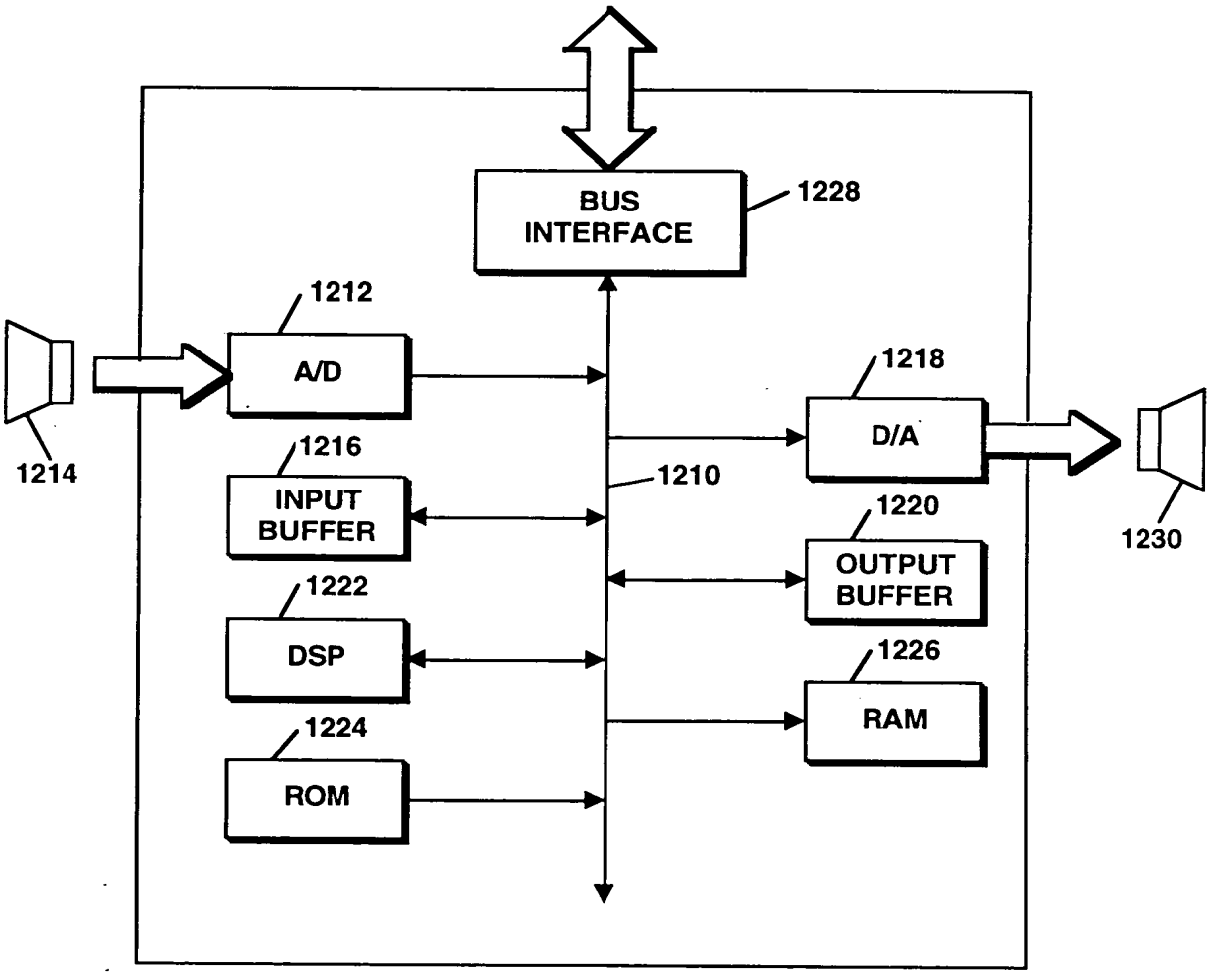


FIGURE 12 **(PRIOR ART)**

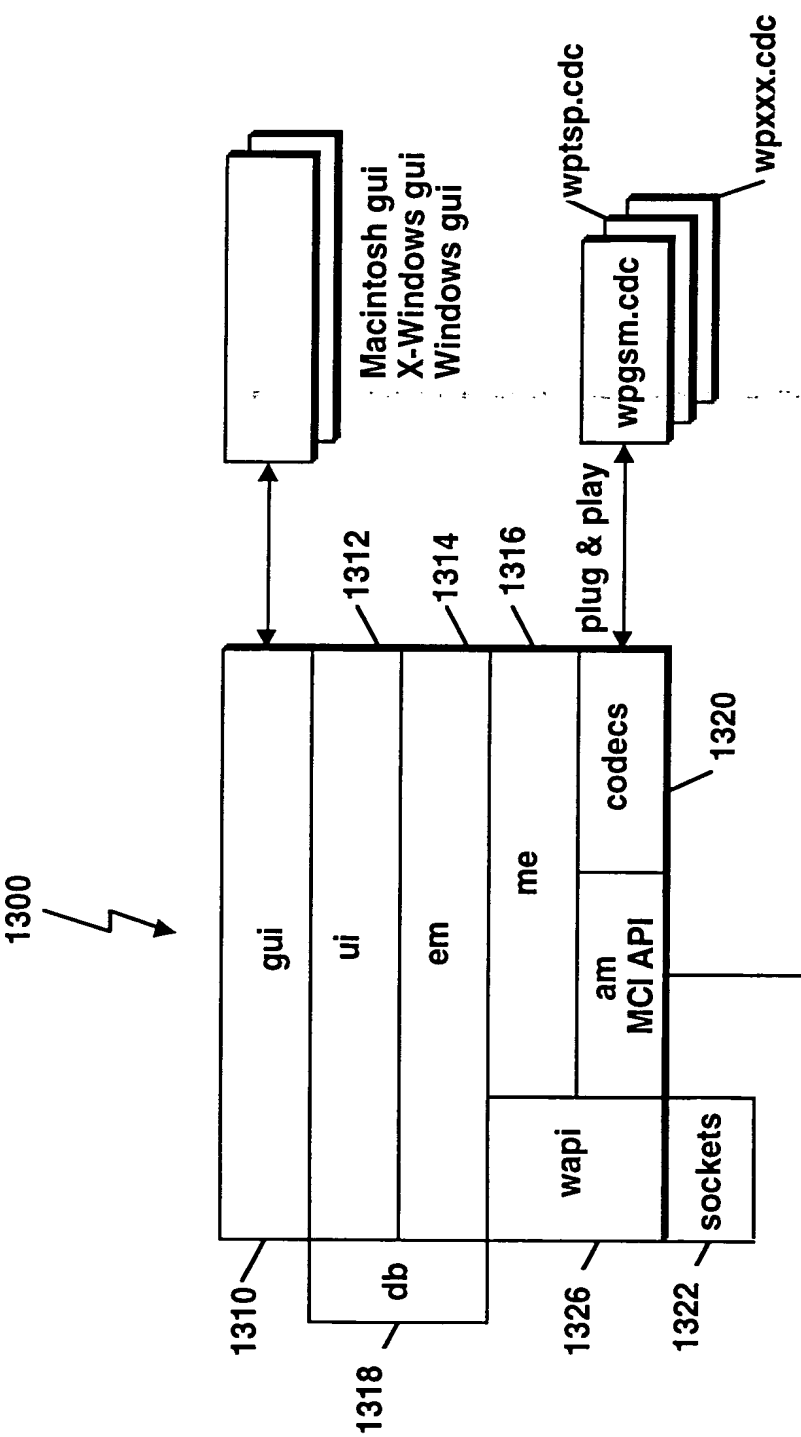

1300
gui
ui
em
me
codecs
am
MCI API
wapi
sockets
db
1310
1312
1314
1316
1318
1320
1322
1324
1326
plug & play
Macintosh gui
X-Windows gui
Windows gui
wpgsm.cdc
wptsp.cdc
wpxxx.cdc
Macintosh
UNIX
Windows

Figure 13 A

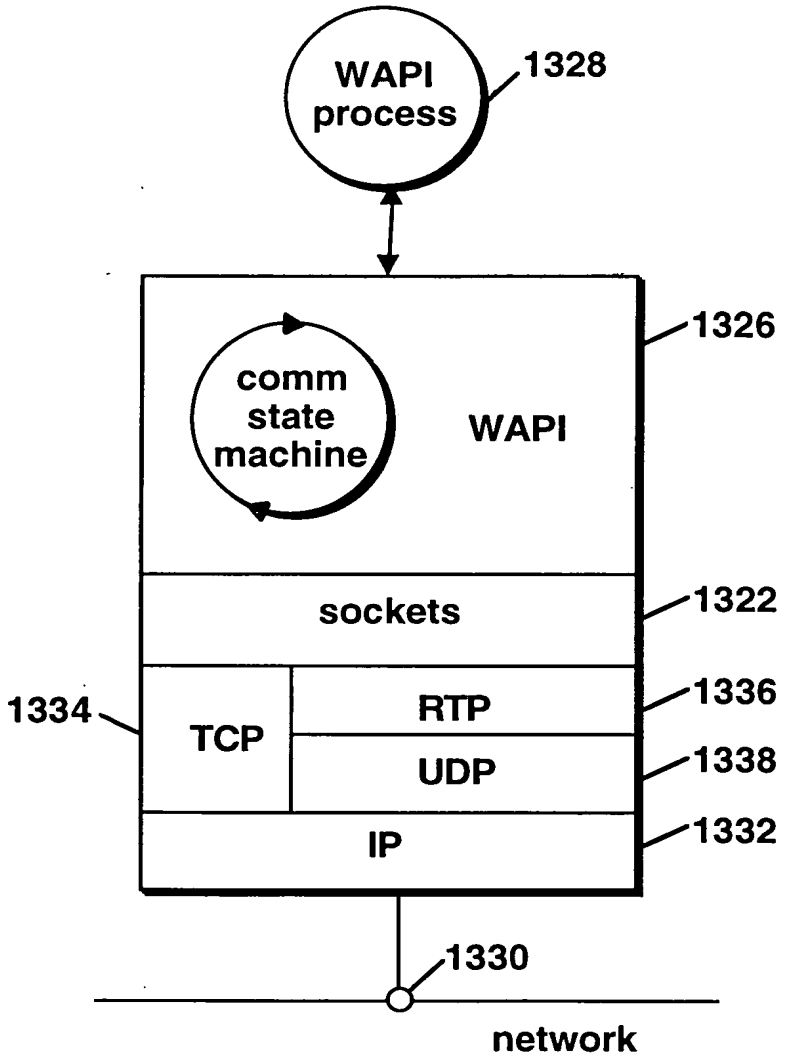
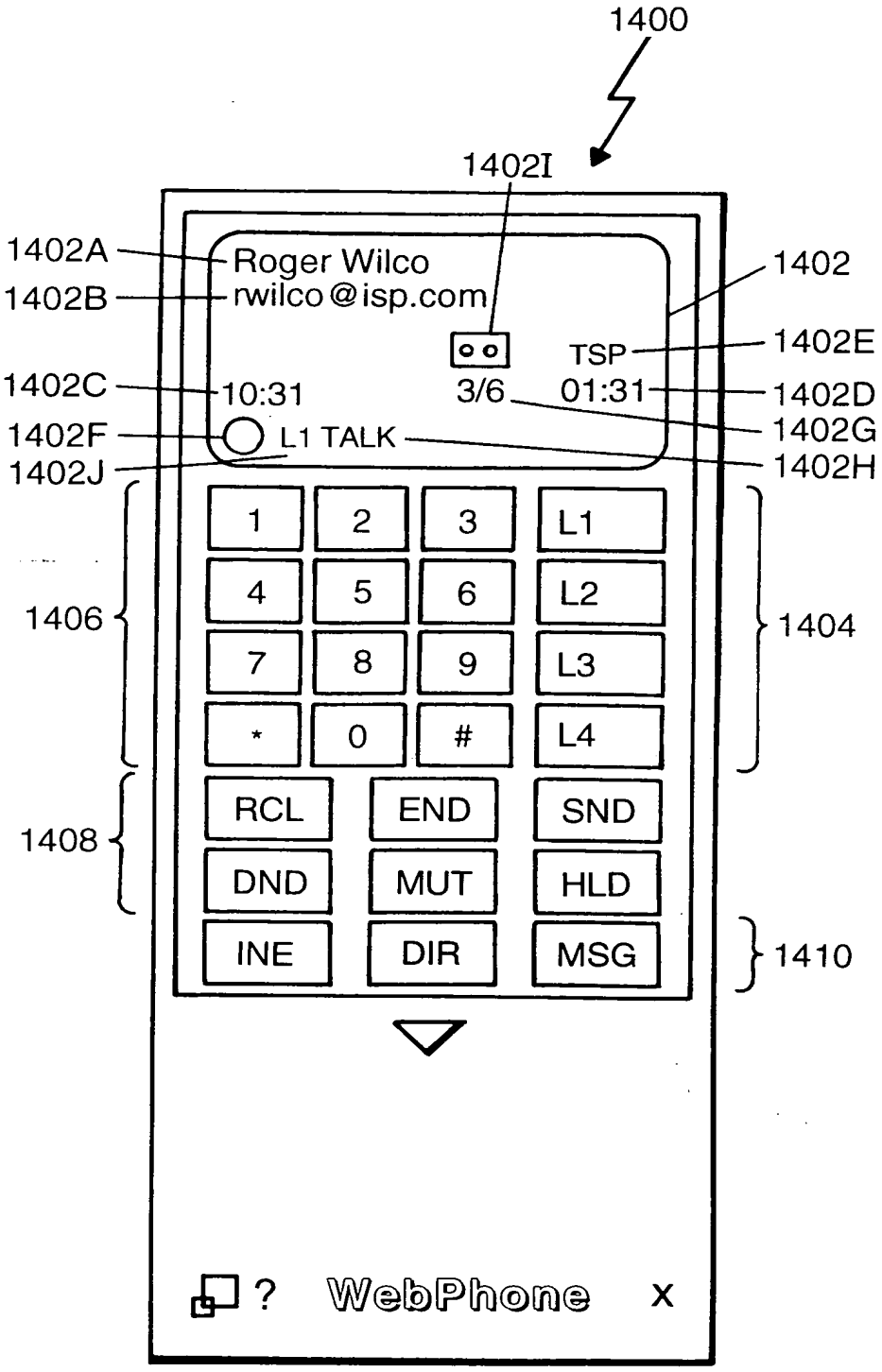

WAPI process
1328
comm state machine
WAPI
1326
sockets
1322
1334
TCP
RTP
1336
UDP
1338
IP
1332
1330
network

FIGURE 13 B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1402I
1402A
Roger Wilco
1402B
rwilco@isp.com
1402
TSP
1402E
1402C
10:31
3/6
01:31
1402D
1402F
L1 TALK
1402G
1402J
1402H
1
2
3
L1
4
5
6
L2
1406
1404
7
8
9
L3
*
0
#
L4
RCL
END
SND
1408
DND
MUT
HLD
INE
DIR
MSG
1410
?
WebPhone
X

Figure 14

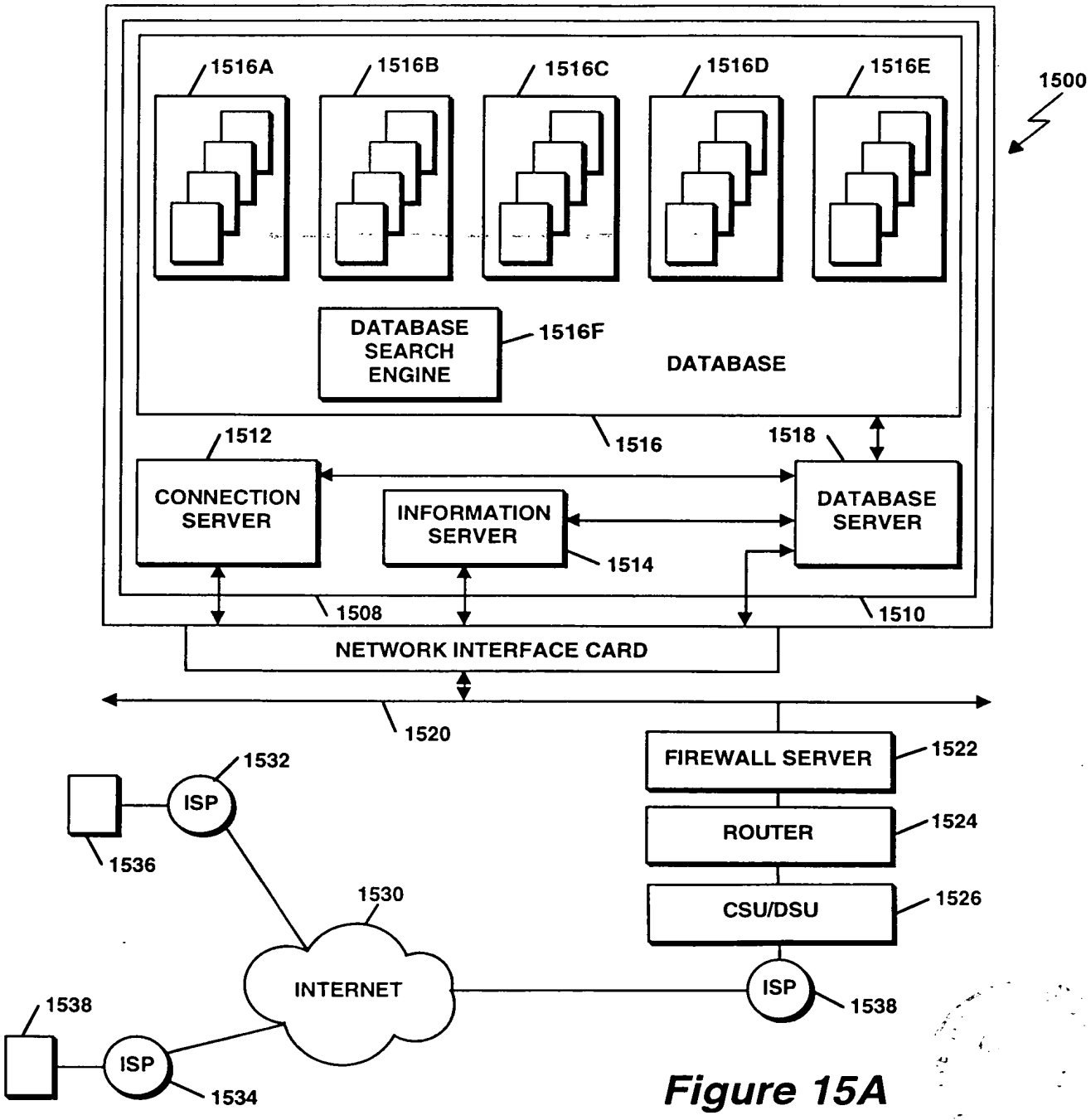
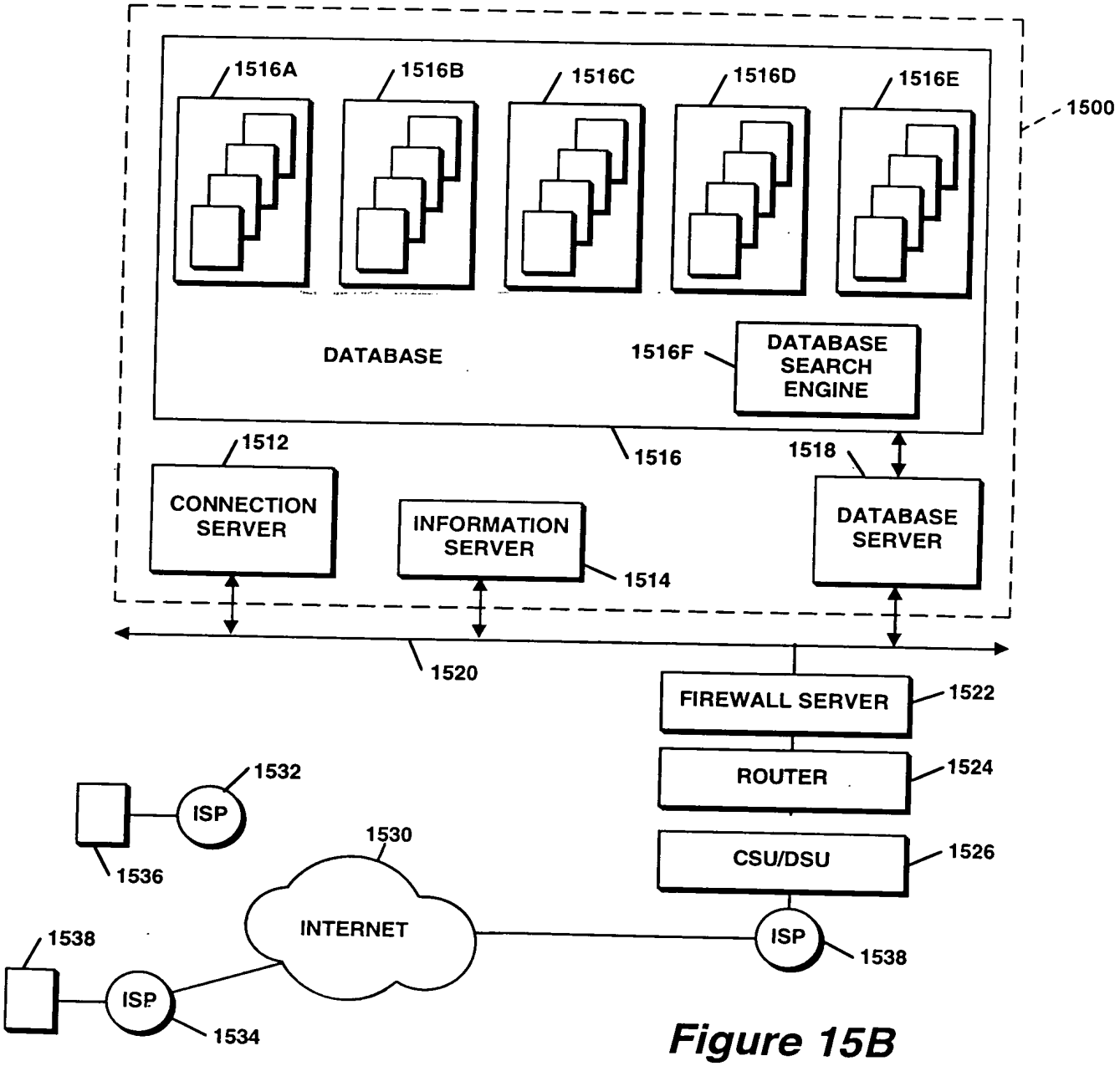

1500
1516A
1516B
1516C
1516D
1516E
DATABASE SEARCH ENGINE
1516F
DATABASE
1516
1512
1518
CONNECTION SERVER
INFORMATION SERVER
1514
DATABASE SERVER
1508
1510
NETWORK INTERFACE CARD
1520
FIREWALL SERVER
1522
ROUTER
1524
CSU/DSU
1526
1532
ISP
1536
1530
INTERNET
ISP
1538
1538
ISP
1534

Figure 15A


1516A
1516B
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1516D
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1500
DATABASE
1516F
DATABASE SEARCH ENGINE
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CONNECTION SERVER
INFORMATION SERVER
1514
1518
DATABASE SERVER
1520
FIREWALL SERVER
1522
ROUTER
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ISP
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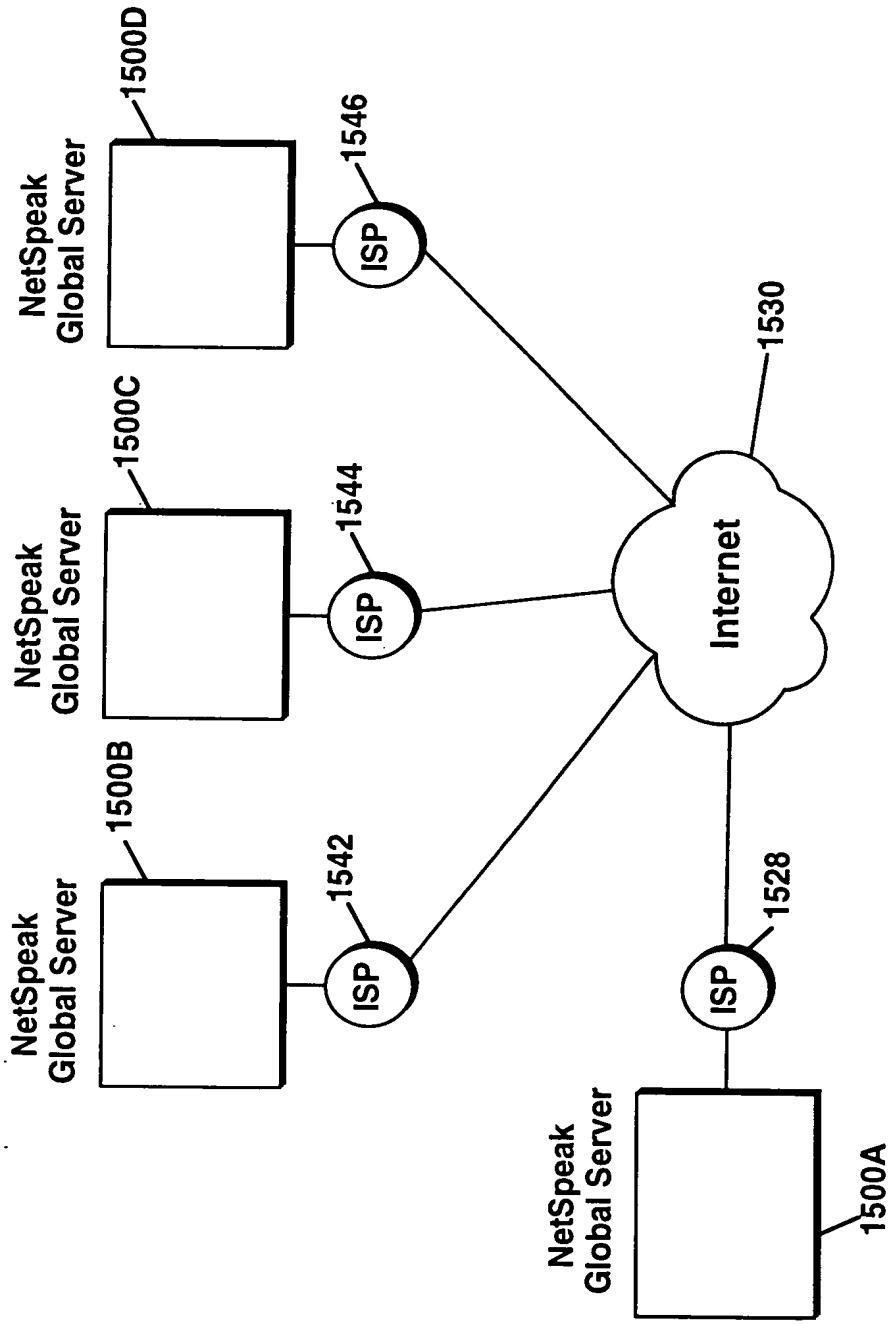
Figure 15B


NetSpeak Global Server
1500D
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ISP
NetSpeak Global Server
1500C
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ISP
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1500B
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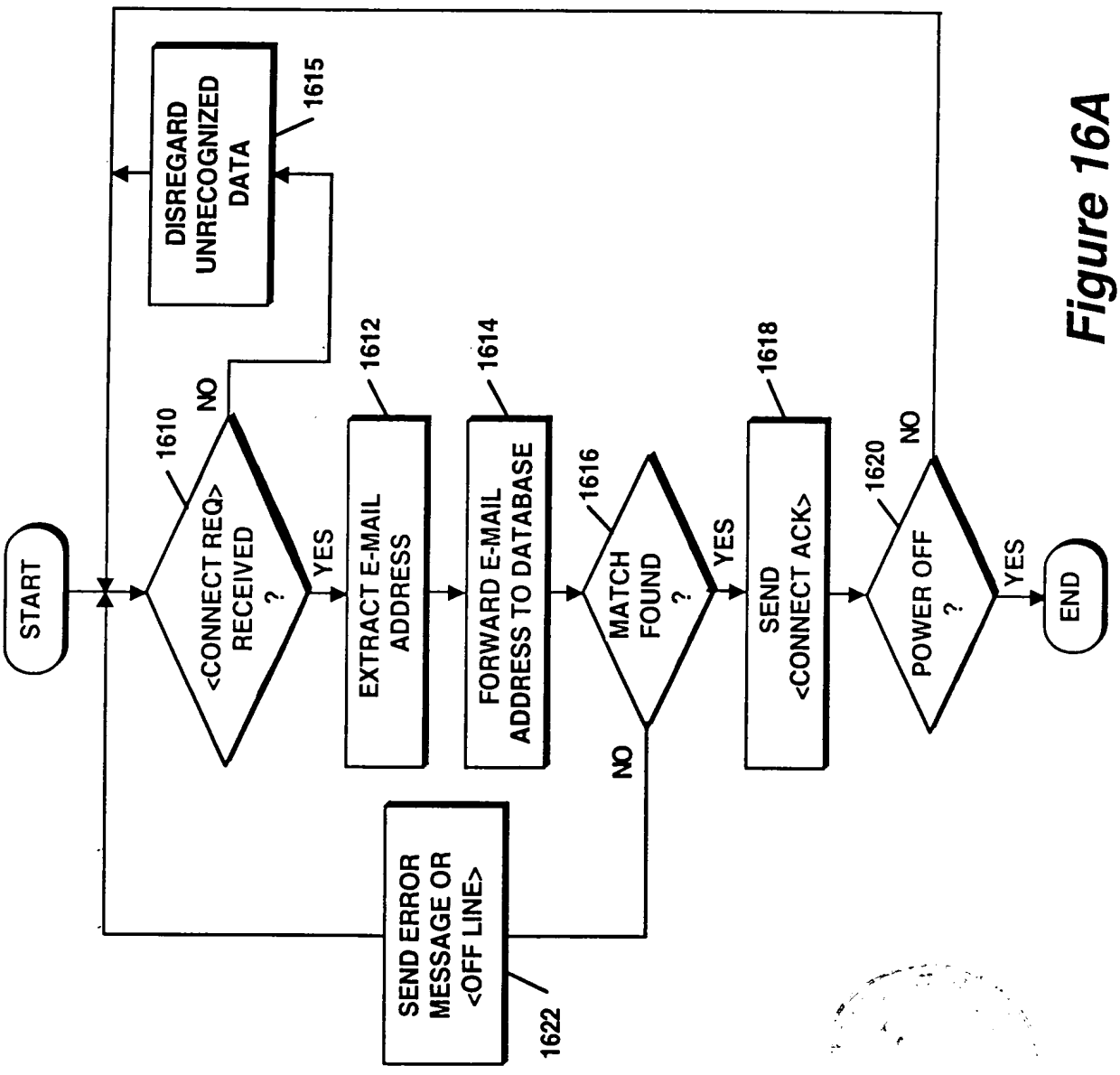
ISP
Internet
1530
ISP
1528
NetSpeak Global Server
1500A

Figure 15C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NO
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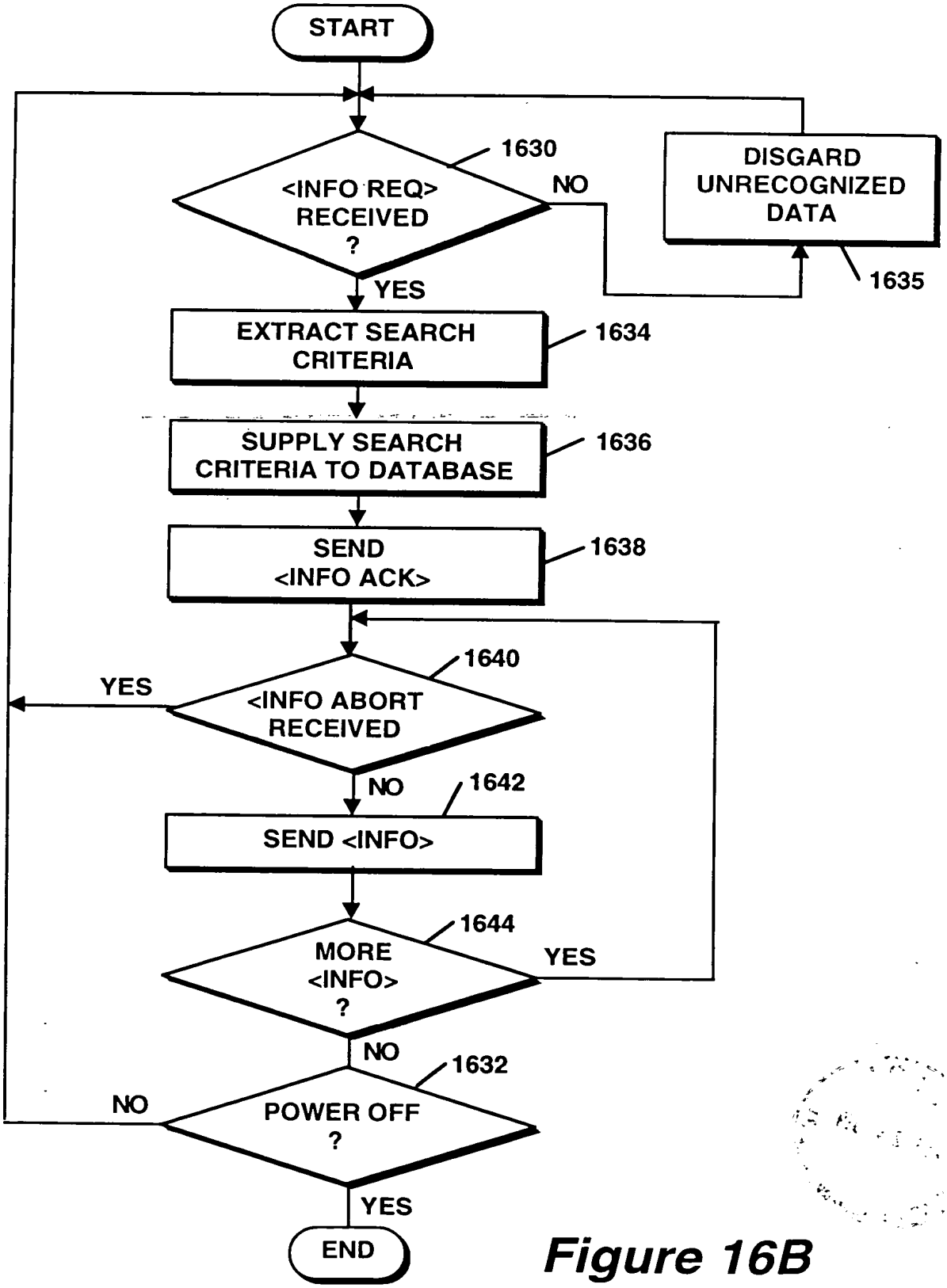
DISREGARD UNRECOGNIZED DATA
1615
EXTRACT E-MAIL ADDRESS
1612
FORWARD E-MAIL ADDRESS TO DATABASE
1614
MATCH FOUND ?
1616
NO
YES
SEND ERROR MESSAGE OR <OFF LINE>
1622
SEND <CONNECT ACK>
1618
POWER OFF ?
1620
NO
YES
END

Figure 16A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1630
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DISGARD UNRECOGNIZED DATA
1635
YES
EXTRACT SEARCH CRITERIA
1634
SUPPLY SEARCH CRITERIA TO DATABASE
1636
SEND <INFO ACK>
1638
1640
YES
<INFO ABORT RECEIVED
NO
1642
SEND <INFO>
1644
MORE <INFO> ?
YES
NO
1632
NO
POWER OFF ?
YES
END

Figure 16B

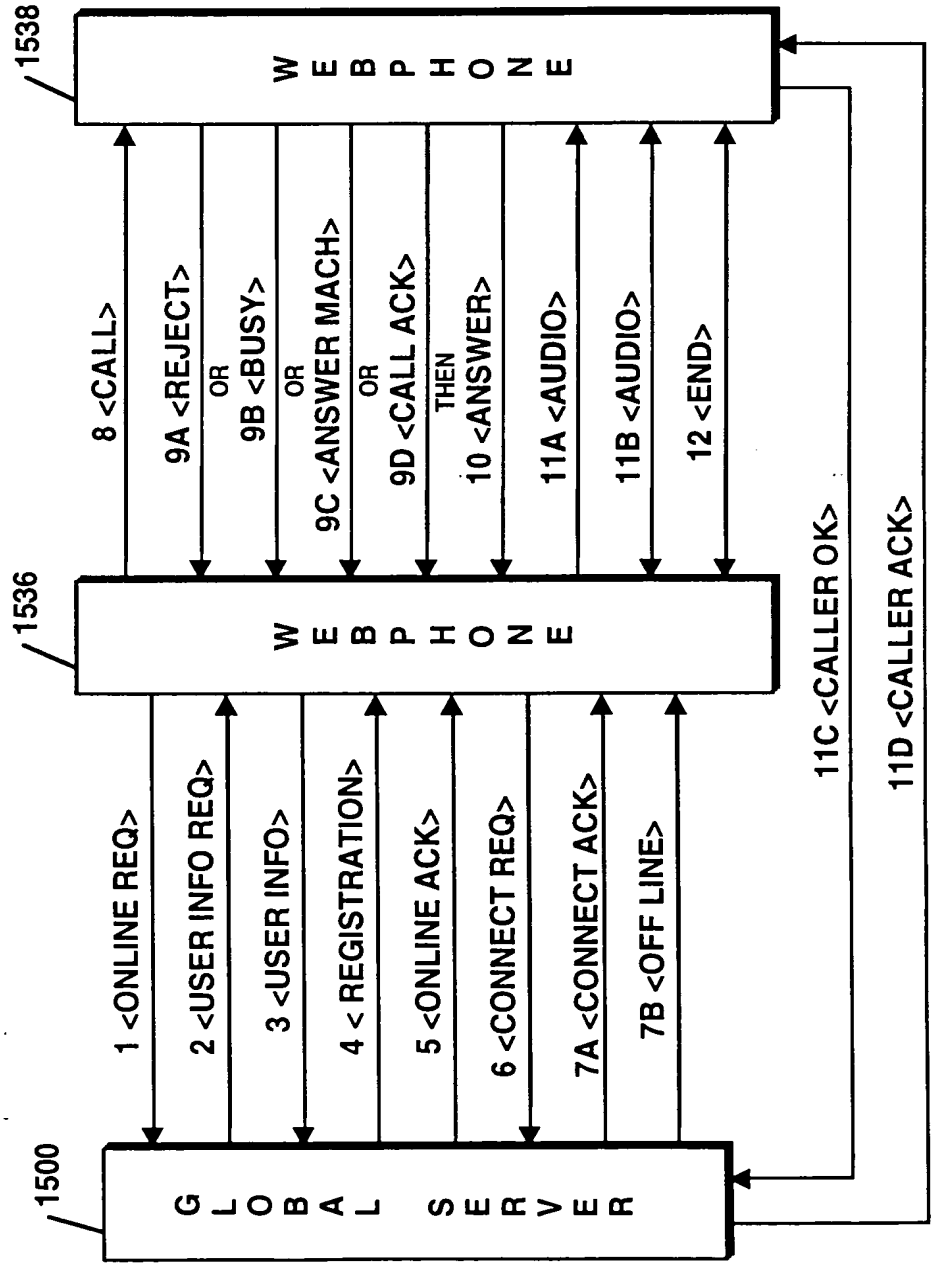
1538
WEB PHONE
1536
WEB PHONE
1500
GLOBAL SERVER
8 <CALL>
9A <REJECT>
OR
9B <BUSY>
OR
9C <ANSWER MACH>
OR
9D <CALL ACK>
THEN
10 <ANSWER>
11A <AUDIO>
11B <AUDIO>
12 <END>
1 <ONLINE REQ>
2 <USER INFO REQ>
3 <USER INFO>
4 < REGISTRATION>
5 <ONLINE ACK>
6 <CONNECT REQ>
7A <CONNECT ACK>
7B <OFF LINE>
11C <CALLER OK>
11D <CALLER ACK>

Figure 17A

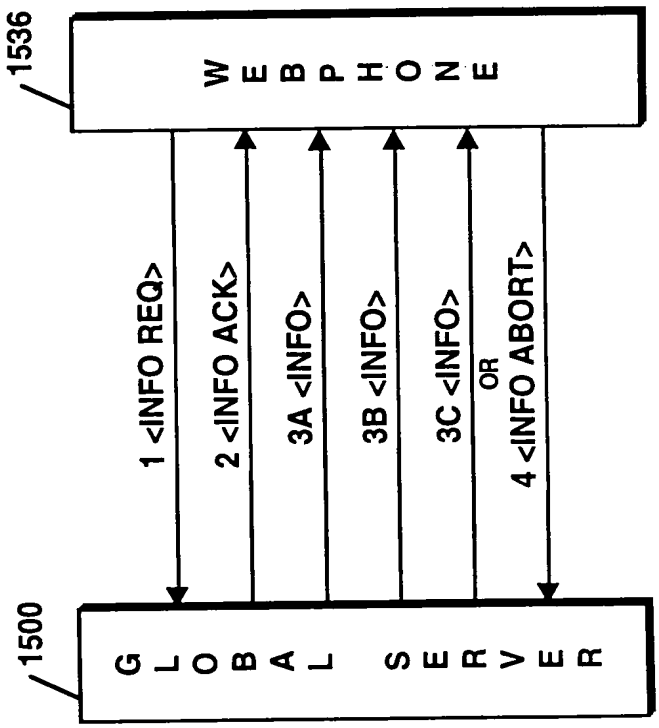
1536
WEBPHONE
1 <INFO REQ>
2 <INFO ACK>
3A <INFO>
3B <INFO>
3C <INFO>
OR
4 <INFO ABORT>
1500
GLOBAL SERVER

Figure 17B

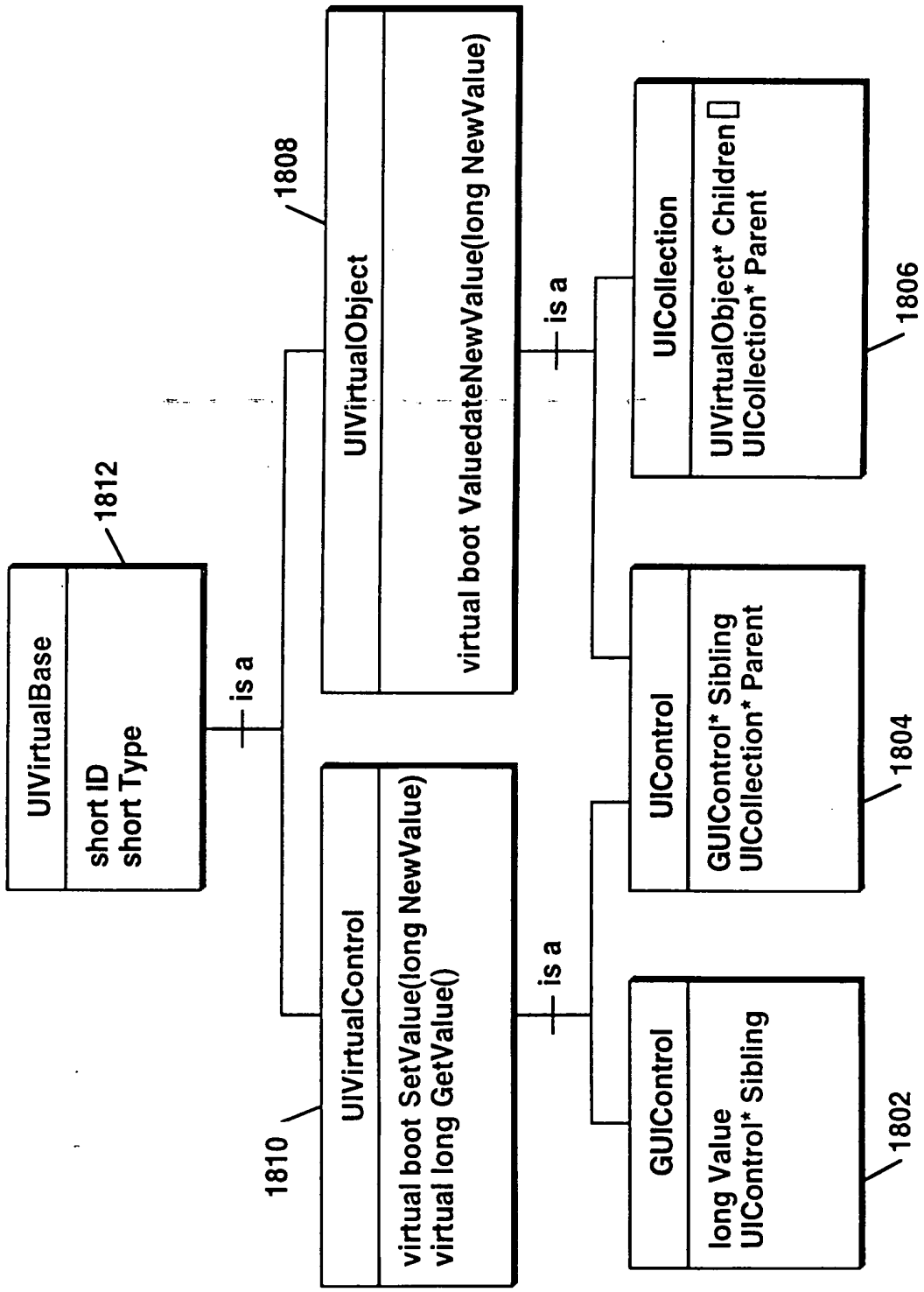
UIVirtualBase
short ID
short Type
1812
is a
UIVirtualObject
virtual boot ValuedateNewValue(long NewValue)
1808
UIVirtualControl
virtual boot SetValue(long NewValue)
virtual long GetValue()
1810
is a
UICollection
UIVirtualObject* Children[]
UICollection* Parent
1806
is a
UIControl
GUIControl* Sibling
UICollection* Parent
1804
GUIControl
long Value
UIControl* Sibling
1802

Figure 18A

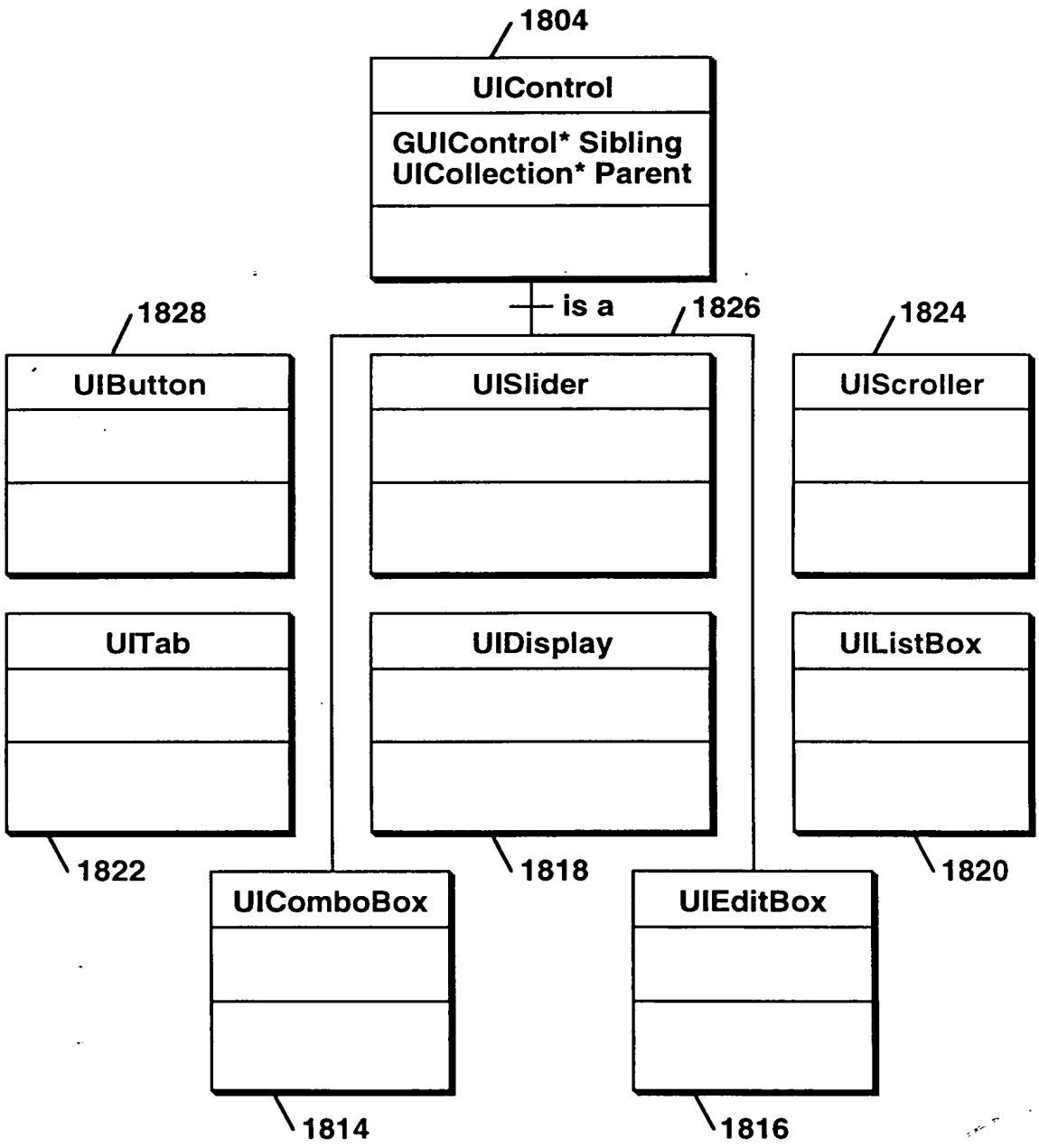
1804
UIControl
GUIControl* Sibling
UICollection* Parent
is a
1828
1826
1824
UIButton
UISlider
UIScroller
UITab
UIDisplay
UIListBox
1822
1818
1820
UIComboBox
UIEditBox
1814
1816

Figure 18B

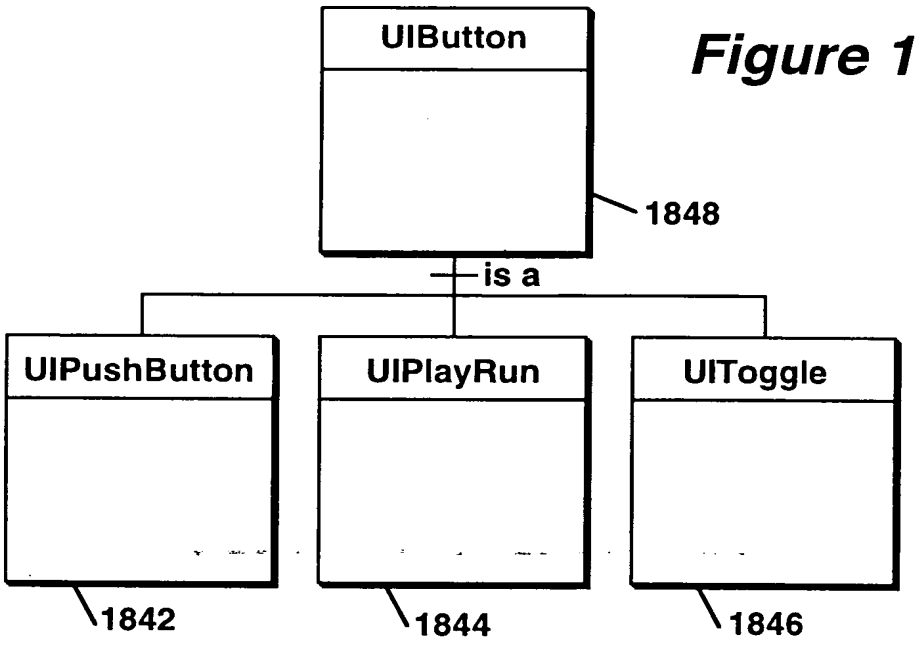

Figure 18C

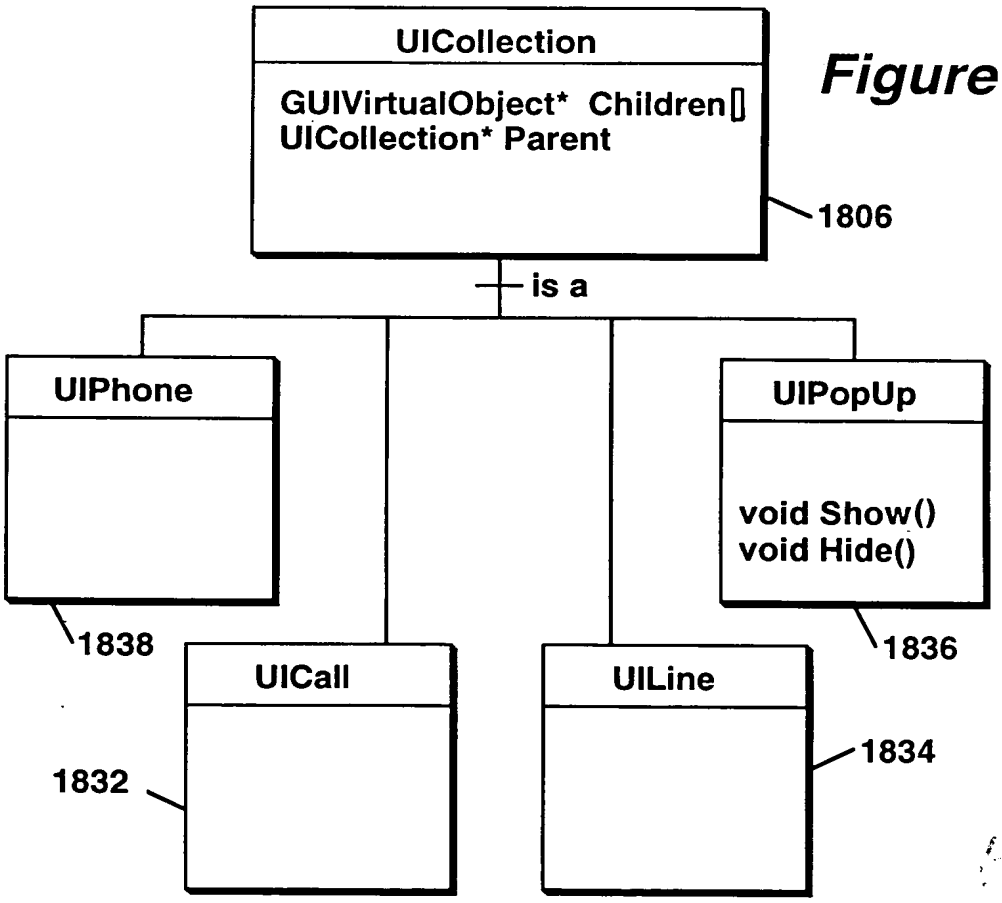

Figure 18D

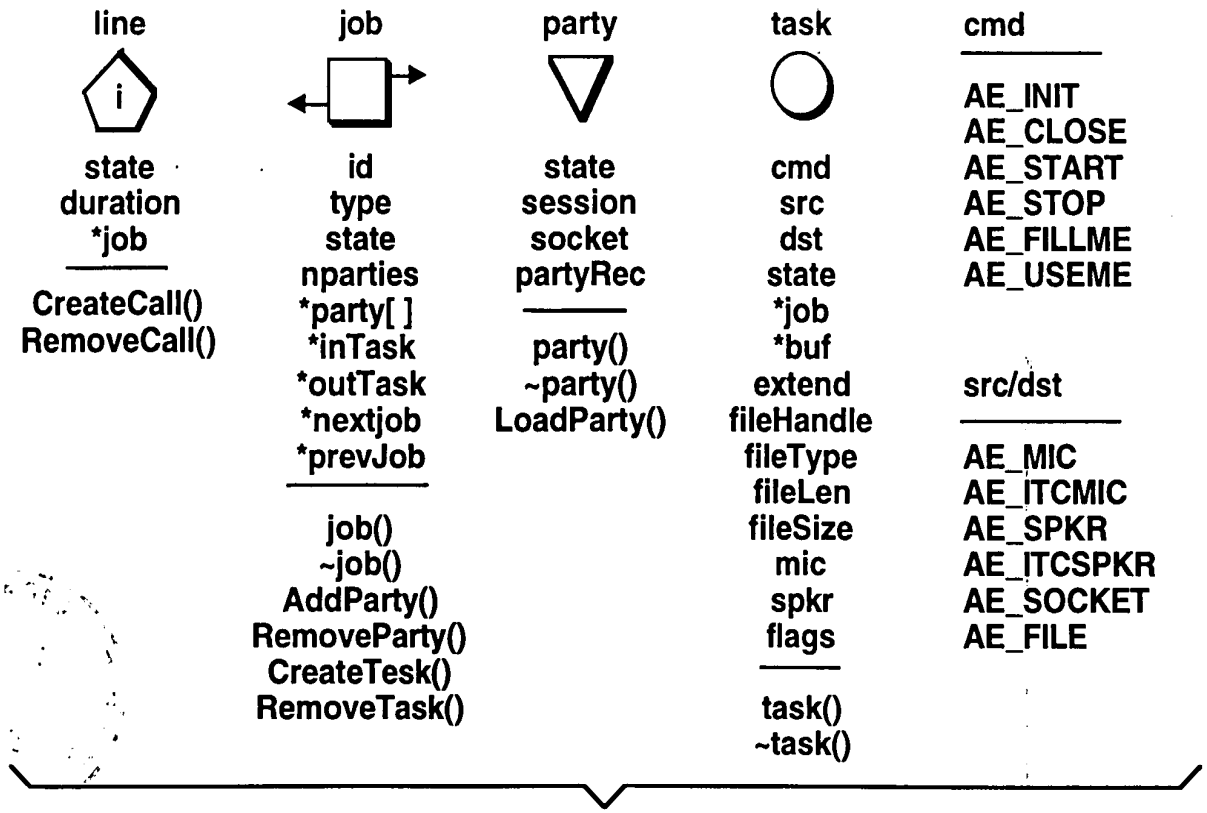

Figure 19A

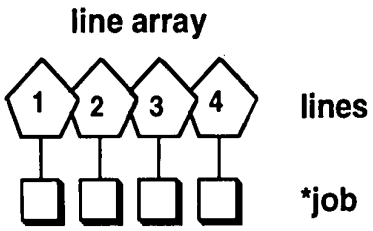

Figure 19B

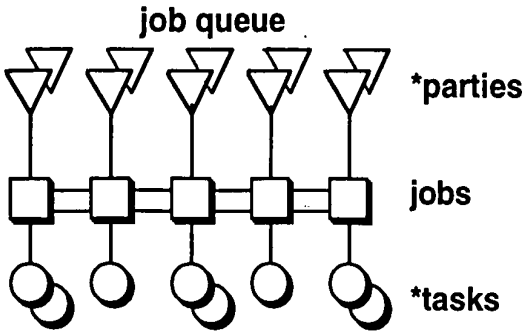

Figure 19C

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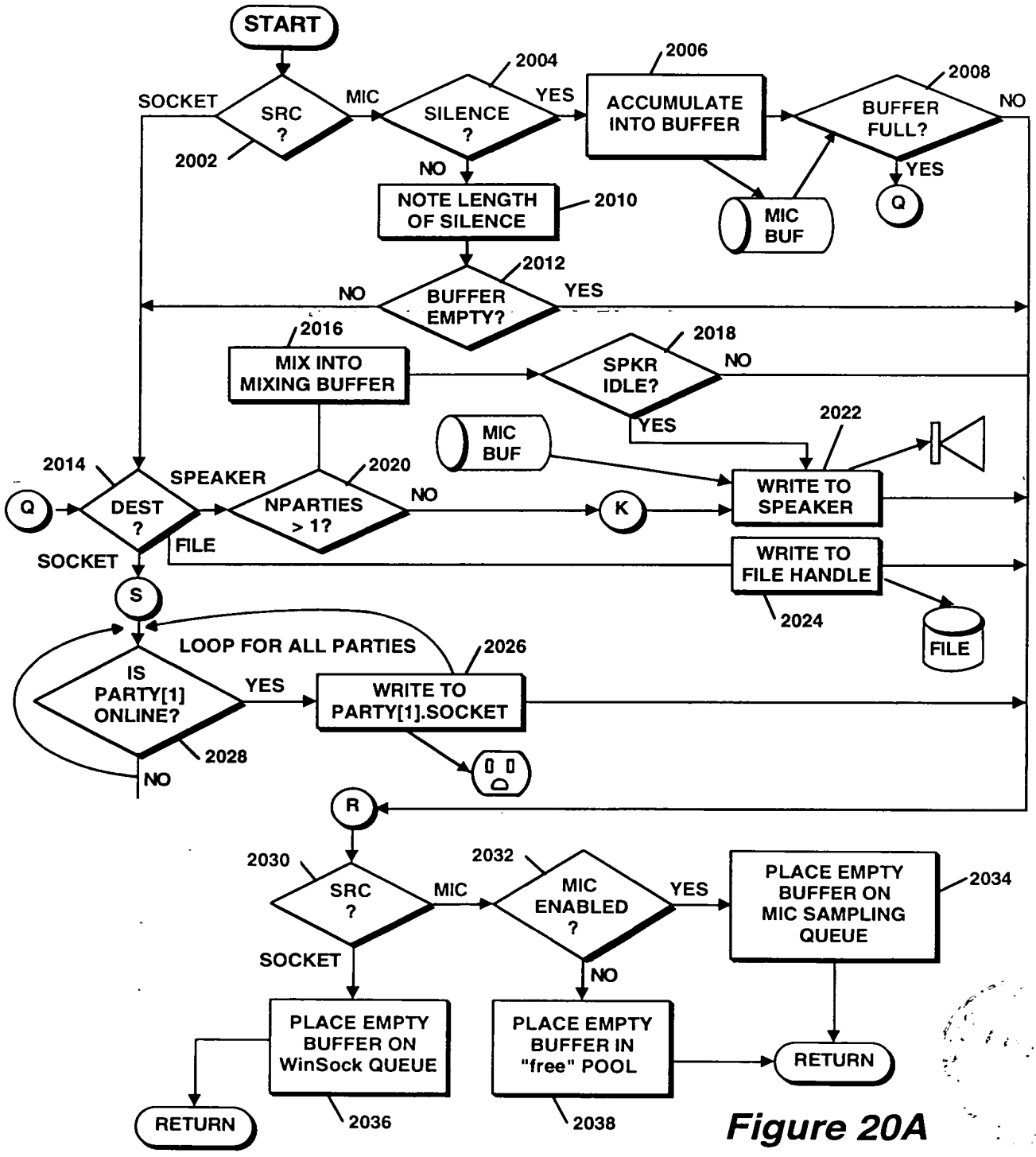
START
SOCKET
SRC ?
2002
MIC
SILENCE ?
2004
YES
ACCUMULATE INTO BUFFER
2006
BUFFER FULL?
2008
NO
YES
Q
MIC BUF
NO
NOTE LENGTH OF SILENCE
2010
BUFFER EMPTY?
2012
NO
YES
MIX INTO MIXING BUFFER
2016
SPKR IDLE?
2018
NO
YES
MIC BUF
2022
WRITE TO SPEAKER
2014
Q
DEST ?
SPEAKER
NPARTIES > 1?
2020
NO
K
FILE
SOCKET
WRITE TO FILE HANDLE
2024
FILE
S
LOOP FOR ALL PARTIES
2026
IS PARTY[1] ONLINE?
YES
WRITE TO PARTY[1].SOCKET
2028
NO
R
2030
SRC ?
MIC
2032
MIC ENABLED ?
YES
PLACE EMPTY BUFFER ON MIC SAMPLING QUEUE
2034
SOCKET
NO
PLACE EMPTY BUFFER ON WinSock QUEUE
PLACE EMPTY BUFFER IN "free" POOL
RETURN
RETURN
2036
2038

Figure 20A

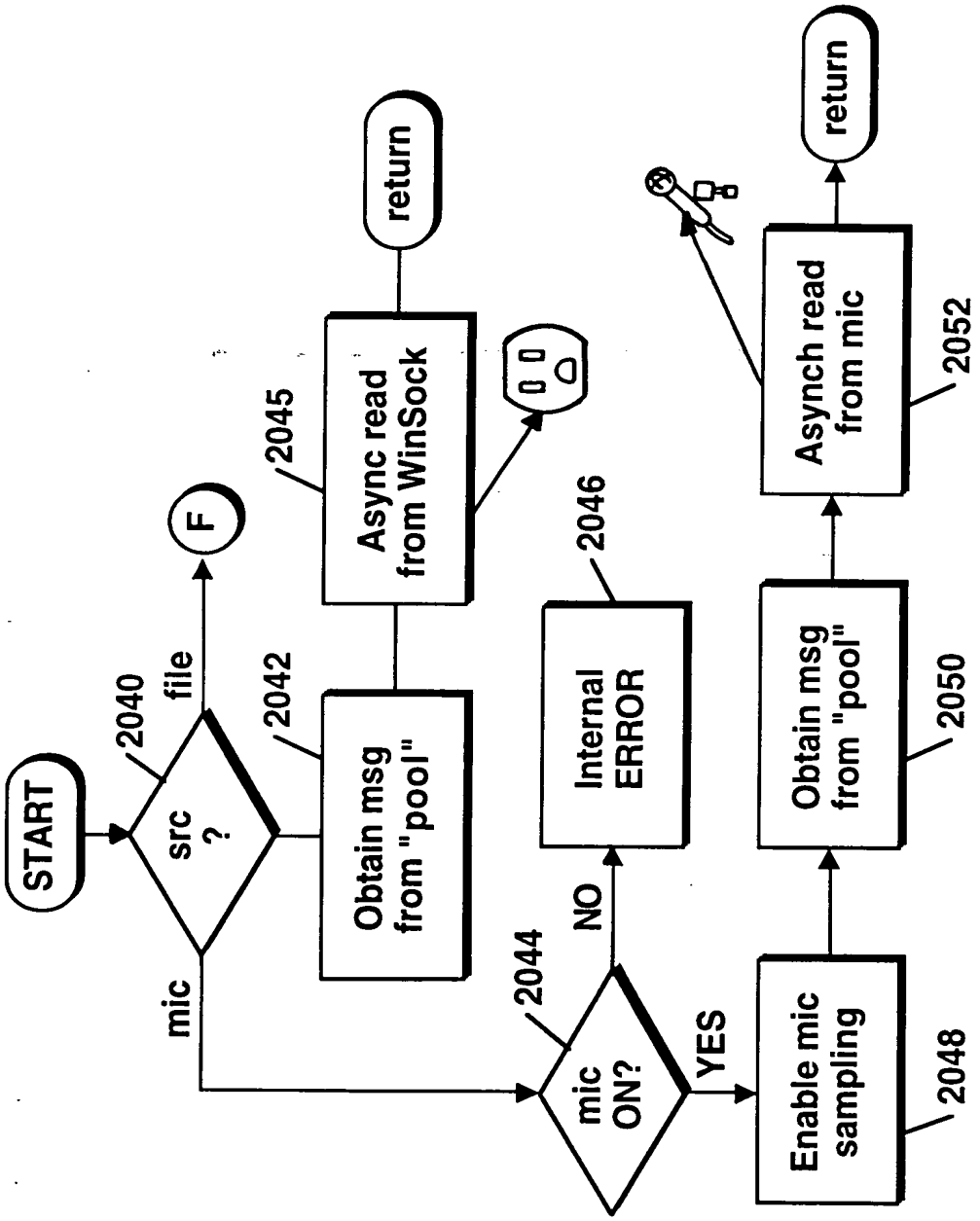
START
src ?
2040
file
F
mic
Obtain msg from "pool"
2042
Async read from WinSock
2045
return
Internal ERROR
2046
NO
mic ON?
2044
YES
Enable mic sampling
2048
Obtain msg from "pool"
2050
Asynch read from mic
2052
return

Figure 20B

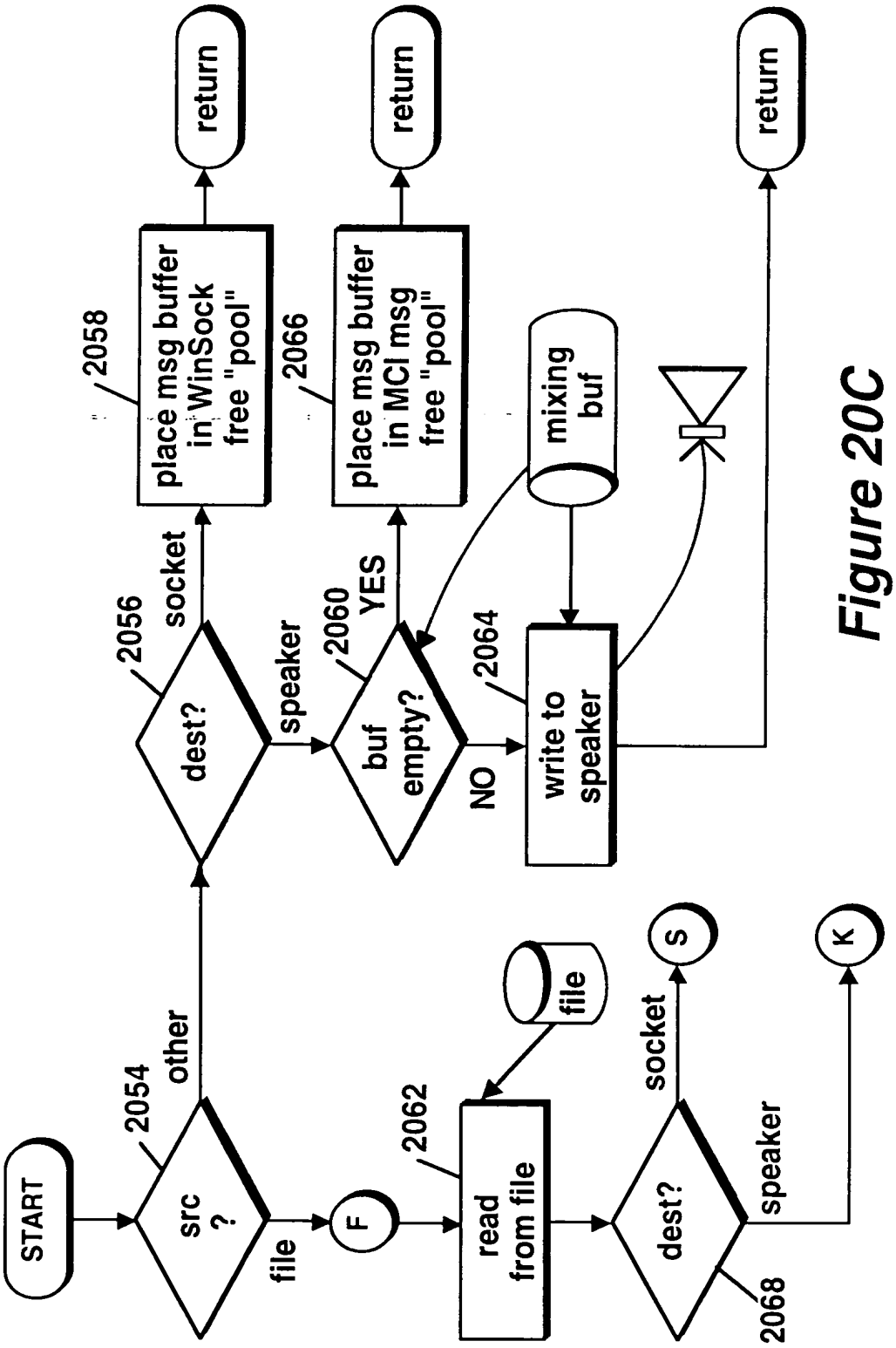
START
2054
src ?
other
file
F
2062
read from file
file
socket
S
dest?
speaker
K
2068
2056
dest?
socket
speaker
2058
place msg buffer in WinSock free "pool"
return
2060
buf empty?
YES
2066
place msg buffer in MCI msg free "pool"
return
NO
2064
write to speaker
mixing buf
return

Figure 20C

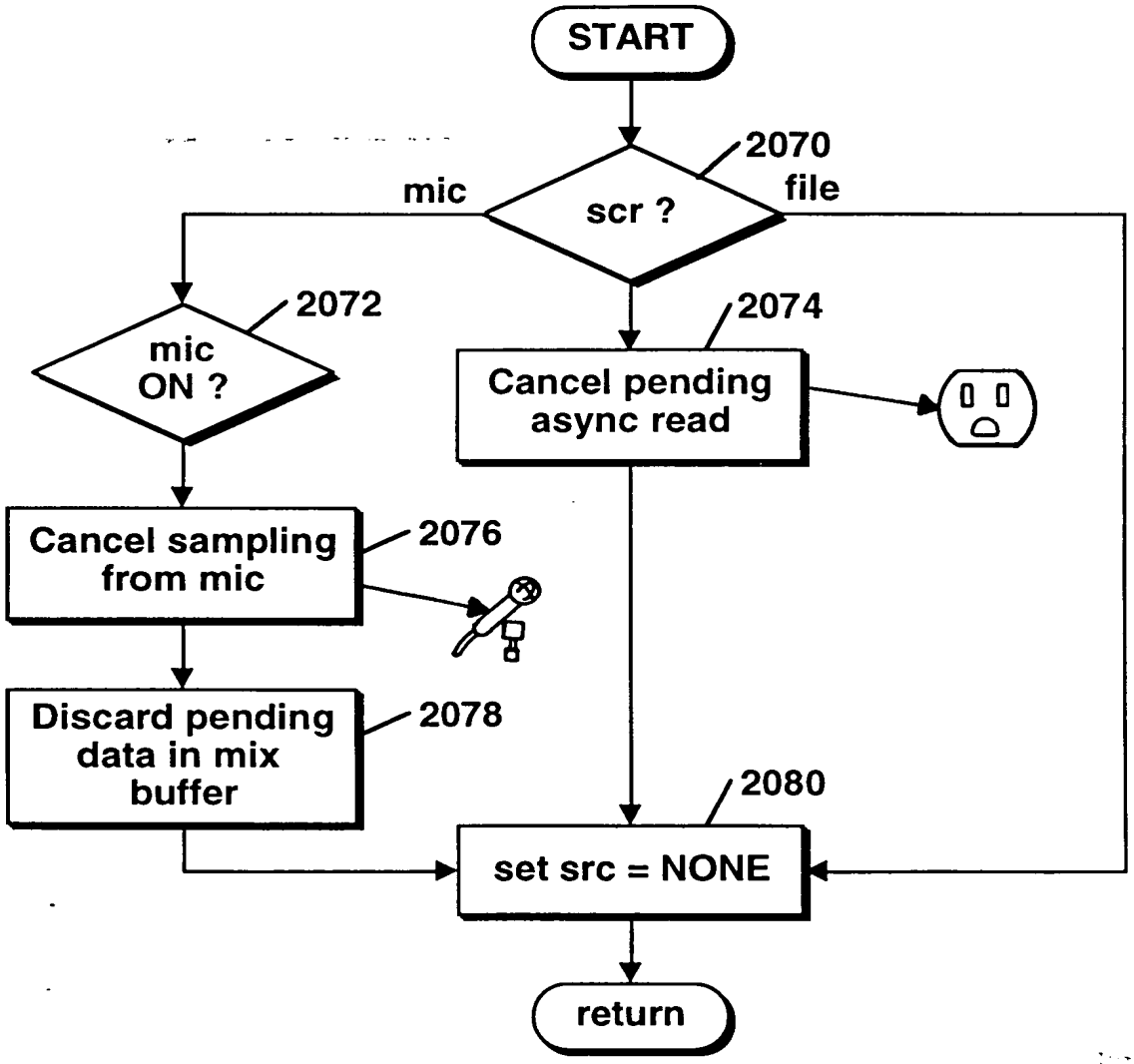
START
2070
scr ?
mic
file
2072
mic
ON ?
2074
Cancel pending
async read
Cancel sampling
from mic
2076
Discard pending
data in mix
buffer
2078
2080
set src = NONE
return

Figure 20D

PART B—ISSUE FEE TRANSMITTAL

Complete and mail this form, together with applicable fees, to: **Box ISSUE FEE**
Assistant Commissioner for Patents
Washington, D.C. 20231

MAILING INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE. Blocks 1 through 4 should be completed where appropriate. All further correspondence including the Issue Fee Receipt, the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Legibly mark-up with any corrections or use Block 1)

021127
KUDIRKA & JOBSE
TWO CENTER PLAZA
BOSTON MA 02108

LM51/0621
AUG 0 4 1999
PATENT & TRADEMARK OFFICE

Note: The certificate of mailing below can only be used for domestic mailings of the Issue Fee Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing.

Certificate of Mailing

I hereby certify that this Issue Fee Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Box Issue Fee address above on the date indicated below.

(Depositor's name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
08/721,316	09/25/96	018	RAMIREZ, E 2757	06/22/99

First Named Applicant: MATTAWAY,

35 USC 154(b) term ext. = 0 Days.

TITLE OF INVENTION: GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
2 N0003/7002	709-227.000	U91	UTILITY	NO	$1210.00	09/22/99

1. Change of correspondence address or indication of " Fee Address" (37 CFR 1.363). Use of PTO form(s) and Customer Number are recommended, but not required.

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47) attached.

2. For printing on the patent front page, list (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 KUDIRKA & JOBSE, LLP
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)
PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. Inclusion of assignee data is only appropiate when an assignment has been previously submitted to the PTO or is being submitted under separate cover. Completion of this form is NOT a subsititue for filing an assignment.

(A) NAME OF ASSIGNEE
NetSpeak Corporation
(B) RESIDENCE: (CITY & STATE OR COUNTRY)
Boca Raton, Florida

Please check the appropriate assignee category indicated below (will not be printed on the patent)
☐ individual ☒ corporation or other private group entity ☐ government

4a. The following fees are enclosed (make check payable to Commissioner of Patents and Trademarks):
☒ Issue Fee
☒ Advance Order - # of Copies 10

4b. The following fees or deficiency in these fees should be charged to:
DEPOSIT ACCOUNT NUMBER _____
(ENCLOSE AN EXTRA COPY OF THIS FORM)
☐ Issue Fee
☐ Advance Order - # of Copies _____

The COMMISSIONER OF PATENTS AND TRADEMARKS IS requested to apply the Issue Fee to the application identified above.

(Authorized Signature) Bruce D. Jobse (Date) 8/4/99

NOTE; The Issue Fee will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the Patent and Trademark Office.

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending on the needs of the individual case. Any comments on the amount of time required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, D.C. 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND FEES AND THIS FORM TO: Box Issue Fee, Assistant Commissioner for Patents, Washington D.C. 20231

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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08/06/1999 TTRANH2 00000017 08721316
01 FC:142 1210.00 OP
02 FC:561 30.00 OP

TRANSMIT THIS FORM WITH FEE

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KS 7/29/99 BF

ISSUE FEE TRANSMITTAL

Docket No. N0003/7002

Applicant:	Shane D. Mattaway, et al.
Serial No.	08/721,316
Filed:	September 25, 1996
For:	GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner:	E. Ramirez
Art Unit:	2757

AUG 0 4 1999 JC3

CERTIFICATE OF EXPRESS MAILING

"Express Mail" mailing label number: EL107667370US
Date of Deposit: **August 4, 1999**

I hereby certify that the following Correspondence is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service pursuant to 37 C.F.R. §1.10 on the date indicated above in an envelope addressed to Commissioner of Patents and Trademarks, BOX ISSUE FEE, Washington, D.C. 20231.

Frances M. Cunningham

Frances M. Cunningham

Assistant Commissioner for Patents
Box Issue Fee
Washington, D.C. 20231

In response to the Notice of Allowance and Base Issue Fee Due dated June 22, 1999 for the above-identified application, enclosed are the following documents (indicated by a checked box):

Documents

- ☒ Issue Fee Transmittal
- ☐ Letter to Official Draftsperson accompanied by formal drawings of Figures 1-20D comprising drawing sheets.
- ☒ Advance order of 10 soft copies of letters patent

Small Entity

- ☐ A small entity statement under 37 C.F.R. §1.27 has already been filed.
- ☐ A small entity statement under 37 C.F.R. §1.27 is attached.
- ☐ Small entity status is no longer claimed.

Payment

- ☒ A check in the amount of **$1,240.00** is enclosed to cover the issue fee due and advance order of patent copies.
- ☐ The Commissioner is hereby authorized to charge any fees under 37 C.F.R. 1.16-1.19 to Deposit Account No. 02-3038. A duplicate of this sheet is attached.

The Commissioner is hereby authorized to charge any additional fees under 37 C.F.R. §§1.16-1.19 that may be required, or credit any overpayment, to Deposit Account No. 02-3038.

Bruce D. Jobse Date: 8/4/99

Bruce D. Jobse, Esq. Reg. No. 33,518
KUDIRKA & JOBSE, LLP
Customer Number 021127
Tel: (617) 367-4600 Fax: (617) 367-4656

OIPE JC78 JUL 20 1999 PATENT & TRADEMARK OFFICE

413/C 554 11-8-99

AMENDMENT AFTER ALLOWANCE UNDER 37 CFR §1.312(a)	Docket No. N0003/7002

Applicant: Shane D. Mattaway, et al.
Serial No. 08/721,316
Filed: September 25, 1996
For: GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner: E. Ramirez
Art Unit: 2757

CERTIFICATE OF EXPRESS MAILING

"Express Mail" mailing label number: EL445948665US
Date of Deposit: **July 20, 1999**

I hereby certify that the following Correspondence is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service pursuant to 37 C.F.R. §1.10 on the date indicated above in an envelope addressed to Commissioner of Patents and Trademarks, BOX ISSUE FEE, Washington, D.C. 20231.

Frances M. Cunningham

Frances M. Cunningham

OK to enter MMM 11/10/99

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to issuance, Applicants request the above-identified application be amended as follows:

In the Claims

1. (Thrice Amended) A computer program product for use with a computer system having a display [and an audio transducer], the computer system capable of executing a first process and connecting to other processes and a server process over a computer network, the computer program product comprising a computer usable medium having computer readable code means embodied in the medium comprising:

C1

a. program code for generating a user-interface enabling control a first process executing on the computer system;

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b. program code for determining the currently assigned network protocol address of the first process upon connection to the computer network;

c. program code responsive to the currently assigned network protocol address of the first process, for establishing a communication connection with the server process and for forwarding the assigned network protocol address of the first process and a unique identifier of the first process to the server process upon establishing a communication connection with the server process; and

d. program code [means], responsive to user input commands, for establishing a point-to-point communications with another process over the computer network.

3. (Thrice Amended) The computer program product of claim 2 wherein the program code for establishing a point-to-point communication link further comprise:

d.2 program code for transmitting, from the first process to the server process, a query as to whether the second process is connected to the computer network; and

d.3 program code [means] for receiving a network protocol address of the second process from the server process, when the second process is connected to the computer network.

4. (Thrice Amended) The computer program product of claim 2 wherein the program code for establishing a point-to-point communication link further comprises:

d.2 program code [means] for transmitting an E-mail message containing a network protocol address from the first process to the server process over the computer network;

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d.3 program code [means] for receiving a second network protocol address from the second process over the computer network.

7. (Twice Amended) In a computer system having a display [and an audio transducer], the computer system capable of executing a first process and communicating with other processes and a server process over a computer network, a method for establishing point-to-point communications with other processes comprising:

A. determining the currently assigned network protocol address of the first process upon connection to the computer network;

B. establishing a communication connection with the server process once the assigned network protocol of the first process is known;

C. forwarding the assigned network protocol address of the first process to the server process upon establishing a communication connection with the server process; and

D. establishing a point-to-point communication with another process over the computer network.

Remarks

This application is currently under Allowance. A Notice of Allowance dated June 22, 1999 was mailed indicating that claims 1-4 and 7-20 are allowed. Applicants submit this Amendment to resolve minor informalities in the claim language.

Applicants have amended claims 1 and 7 to eliminate superfluous language. Specifically, the phrase "and an audio transducer" provided a basis for limitations recited in claims 5-6, previously cancelled. This term does not occur elsewhere in claims 1-4 and should be deleted. A similar change has been made to claim 7. The phrase "and an audio transducer" does not occur elsewhere in claims 7-9 and should be deleted. In the previous response mailed March 3,1999, claims 1-4 were amended to eliminate the term “means” from the claim language, however, several occurrences were overlooked. Applicant's

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submit additional amendments to claims 1, 3 and 4 to eliminate the term "means" from the claim language. These amendments are offered to conform the claims to 35 U.S.C. §112, 2nd paragraph, and are not necessitated or made in response to any rejection by the Examiner, or, in light of any reference cited by the Examiner.

No new matter or substantive issues are believed raised by this amendment. In light of the foregoing amendments and remarks, this application is now believed in condition for issuance and the Examiner is respectfully requested to advance this application to issuance. If the Examiner has any further questions regarding this Amendment, he is invited to call Applicants' attorney at the number listed below.

The Commissioner is hereby authorized to charge any fees or credits under 37 C.F.R. §1.16 and 1.17 to our deposit account No. 02-3038.

Respectfully submitted

Bruce D. Jobse Date: 7/20/99

Bruce D. Jobse, Esq. Reg. No. 33,518
KUDIRKA & JOBSE, LLP
Customer Number 021127
Tel: (617) 367-4600 Fax: (617) 367-4656

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 93

OIPE JC78 3001 JUL 20 1999 PATENT & TRADEMARK OFFICE

B

AMENDMENT TRANSMITTAL	Docket No. N0003/7002

Applicant:	Shane D. Mattaway, et al.
Serial No.	08/721,316
Filed:	September 25, 1996
For:	GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner:	E. Ramirez
Art Unit:	2757

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Date of Deposit: July 20, **1999**

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Frances M. Cunningham
Frances M. Cunningham

Assistant Commissioner for Patents
BOX ISSUE FEE
Washington, DC 20231

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Transmitted herewith for filing is the following:

Enclosures

- ☒ Amendment After Allowance
- ☐ Petition for a month Extension of Time
- ☒ Return Receipt Postcard

Small Entity

- ☐ A small entity statement under 37 C.F.R. §1.27 has already been filed.
- ☐ A small entity statement under 37 C.F.R. §1.27 is attached

Fees

Claims as Filed					
	Claims Filed	Highest Number Paid for	Number of Extra Claims	Rate	Additional Fees Due
Total Claims (37 CFR §1.16(c))	18	- 20 =	0 X	$18.00 =	$ 0.00
Independent Claims (37 CFR §1.16(b))	3	- 3 =	0 X	$78.00 =	$ 0.00
Extension Fee					$ 0.00
Reduction by 50% for filing by small entity					$ 0.00
Total Filing Fee					**$ 0.00**

Payment

☐ Check in the amount of the total filing fee.

☐ Charge Account No. 02-3038 in the amount of the total filing fee. A duplicate of this transmittal sheet is attached.

Authorization to Charge Additional Fees

☒ The Commissioner is hereby authorized to charge any additional fees under 37 C.F.R. §1.16 and §1.17 required by the attached paper and during the entire pendency of this application to Account No. 02-3038.

Bruce D. Jobse

Date: 7/20/99

Bruce D. Jobse, Esq. Reg. No. 33,518
KUDIRKA & JOBSE, LLP
Customer Number 021127
Tel: (617) 367-4600 Fax: (617) 367-4656

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

NOTICE OF ALLOWANCE AND ISSUE FEE DUE

LM51/0622

021127
KUDIRKA & JOBSE
TWO CENTER PLAZA
BOSTON MA 02108

APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT		DATE MAILED
08/721,316	09/25/96	018	RAMIREZ, E	2757	06/22/99
First Named Applicant MATTAWAY,			35 USC 154(b) term ext. =	0 Days.	

TITLE OF INVENTION: GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
2	709-227.000	U91	UTILITY	NO	$1210.00	09/22/99

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED.

THE ISSUE FEE MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED.

HOW TO RESPOND TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.
If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is changed, pay twice the amount of the FEE DUE shown above and notify the Patent and Trademark Office of the change in status, or
B. If the status is the same, pay the FEE DUE shown above.

If the SMALL ENTITY is shown as NO:

A. Pay FEE DUE shown above, or

B. File verified statement of Small Entity Status before, or with, payment of 1/2 the FEE DUE shown above.

II. Part B-Issue Fee Transmittal should be completed and returned to the Patent and Trademark Office (PTO) with your ISSUE FEE. Even if the ISSUE FEE has already been paid by charge to deposit account, Part B Issue Fee Transmittal should be completed and returned. If you are charging the ISSUE FEE to your deposit account, section "4b" of Part B-Issue Fee Transmittal should be completed and an extra copy of the form should be submitted.

III. All communications regarding this application must give application number and batch number.
Please direct all communications prior to issuance to Box ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PATENT AND TRADEMARK OFFICE COPY

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 96

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO
08/721,316	09/25/96	MATTAWAY	

EXAMINER

021127
KUDIRKA & JOBSE
TWO CENTER PLACE
BOSTON MA 02108

LM51/0622

ART UNIT	PAPER NUMBER

DATE MAILED: 06/22/99

This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS

NOTICE OF ALLOWABILITY

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance and Issue Fee Due or other appropriate communication will be mailed in due course.

☒ This communication is responsive to Amendment B filed on 3/8/99.

☒ The allowed claim(s) is/are 1-4, and 7-26.

☐ The drawings filed on _____ are acceptable.

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____.

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

A SHORTENED STATUTORY PERIOD FOR RESPONSE to comply with the requirements noted below is set to EXPIRE **THREE MONTHS** FROM THE "DATE MAILED" of this Office action. Failure to timely comply will result in ABANDONMENT of this application. Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

☐ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION, PTO-152, which discloses that the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.

☒ Applicant MUST submit NEW FORMAL DRAWINGS

☐ because the originally filed drawings were declared by applicant to be informal.

☐ including changes required by the Notice of Draftperson's Patent Drawing Review, PTO-948, attached hereto or to Paper No. _____.

☐ including changes required by the proposed drawing correction filed on _____, which has been approved by the examiner.

☐ including changes required by the attached Examiner's Amendment/Comment.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the reverse side of the drawings. The drawings should be filed as a separate paper with a transmittal letter addressed to the Official Draftperson.

☐ Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Any response to this letter should include, in the upper right hand corner, the APPLICATION NUMBER (SERIES CODE/SERIAL NUMBER). If applicant has received a Notice of Allowance and Issue Fee Due, the ISSUE BATCH NUMBER and DATE of the NOTICE OF ALLOWANCE should also be included.

Attachment(s)

☐ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

☐ Interview Summary, PTO-413

☐ Examiner's Amendment/Comment

☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

☐ Examiner's Statement of Reasons for Allowance

ELLIS B. RAMIREZ
PRIMARY EXAMINER

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1. The response filed on October 26, 1998 is informal or not fully responsive to the prior Office action because of the following omission(s) or matter(s):

Applicants have failed to clearly point out the patentable novelty which they think each of the claims presents, particularly newly added claims 10-20, in view of the state of the art disclosed by the references cited, as required by 37 CFR 1.111.

Applicants are respectfully reminded that they must present arguments pointing out the specific distinctions believed to render the claims, including any newly presented claims, patentable over any applied references. A general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references is not sufficient. See 37 CFR 1.111, as well as MPEP 714.02 and 714.04.

In the present case, despite the substantial differences in claim language, applicants generally state that "none of the art of record ... disclose or suggest the subject matter as recited in claims 10-20" (response at page 10). Applicants only generally discuss claims 10-20 as being directed to a "user interface" and refer to a passage spanning nine pages in the specification as providing support for these claims, but do not discuss the references at all, and do not point out the specific claim language believed to render the claims patentable.

Also, given the differences in claim language, applicants should also point out how the newly added claims are related to the original claims, i.e., why the newly added claims including claims directed to a "method for establishing point to point communications," including steps of

generating "elements" and establishing a communication link, are believed to be directed to the same invention as the original claims, which are directed to a computer program product including program code means for generating a user interface, establishing point to point communications, transmitting audio data, etc. [Note that claim 1 appears to provide evidence that the combination of clam 1, including "means for establishing point to point communications," does not require the details of the subcombination (a "method for establishing point to point communications"), for patentability. See MPEP 806.05, as well as MPEP 821.03.]

Since the above-mentioned reply appears to be *bona fide*, but through an apparent oversight or inadvertence failed to provide a complete response, applicant is required to complete the response within a TIME LIMIT of ONE MONTH from the date of this letter. EXTENSIONS OF THIS TIME LIMIT MAY BE GRANTED UNDER EITHER 37 CFR 1.136(a).

2. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Glenn Gossage whose telephone number is (703) 305-3820.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 305-3900.

GLENN GOSSAGE
PRIMARY EXAMINER
ART UNIT 2751

OIPE
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PATENT & TRADEMARK OFFICE

#9/B
55t.
4-9-99

AMENDMENT	Docket No. N0003/7002

Applicant: Shane D. Mattaway, et al.
Serial No. 08/721,316
Filed: September 25, 1996
For: GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner: E. Chan
Art Unit: 2751

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Group 2700

3/9/99 gls

CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8(a)
The undersigned hereby certifies that this document is being placed in the United States mail with first-class postage attached, addressed to Assistant Commissioner for Patents, Box Non-Fee Amendment Washington, DC 20231 on March 3, 1999.

Frances M. Cunningham
Frances M. Cunningham

Assistant Commissioner for Patents
Washington, D.C. 20231
Box Non-Fee Amendment

In response to the office communication dated February 3, 1999, please amend the above-identified application as follows:

In the Claims:

Sub C1

1. (Twice Amended) A computer program product for use with a computer system having a display and an audio transducer, the computer system capable of executing [one or more processes] a first process and connecting to other processes and a server process over a computer network, the computer program product comprising a computer usable medium having computer readable code means embodied in the medium comprising:

B1

a. program code [means] for generating a user-interface enabling [through which a user may] control a first process executing on the computer system [and coupled to the computer network];

b. program code [means] for determining the currently assigned network protocol address of the first process upon connection to the computer network;

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c. program code [means,] responsive to the currently assigned network protocol address of the first process, for establishing a communication connection with the server process and for forwarding the assigned network protocol address of the first process and a unique identifier of the first process to the server process upon establishing a communication connection with the server process; and

d. program code means, responsive to user input commands, for establishing a point-to-point communications with another process over the computer network.

2. (Twice Amended) The computer program product of claim 1 wherein the program code [means] for establishing a point-to-point communication link further comprises:

d.1 program code [means], responsive to the network protocol address of a second process, for establishing a point-to-point communication link between the first process and the second process over the computer network.

3. (Twice Amended) The computer program product of claim 2 wherein the program code [means] for establishing a point-to-point communication link further comprise:

d.2 program code [means] for transmitting, from the first process to the server process, a query as to whether the second process is connected to the computer network; and

d.3 program code means for receiving a network protocol address of the second process from the server process, when the second process is connected to the computer network.

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4. (Twice Amended) The computer program product of claim 2 wherein the program code [means] for establishing a point-to-point communication link further comprises:

d.2 program code means for transmitting an E-mail message containing a network protocol address from the first process to the server process over the computer network;

d.3 program code means for receiving a second network protocol address from the second process over the computer network.

---

7. (Amended) In a computer system having a display and an audio transducer, the computer system capable of executing [one or more processes] a first process and communicating with other processes and a server process over a computer network, a method for establishing point-to-point communications with other processes comprising:

A. determining the currently assigned network protocol address of the first process upon connection to the computer network;

B. establishing a communication connection with the server process once the assigned network protocol of the first process is known;

C. forwarding the assigned network protocol address of the first process to the server process upon establishing a communication connection with the server process; and

D. establishing a point-to-point communication with another process over the computer network.

8. The method of claim 7 wherein the program step D comprises:

D.1 transmitting, from the first process to the server process, a query as to whether a second process is connected to the computer network; and

D.2 receiving a network protocol address of the second process from the server process, when the second process is connected to the computer network.

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7 5

9. The method of claim 7 wherein the program step D comprises:

D.1 transmitting an E-mail message containing a network protocol address from the first process to the server process over the computer network;

D.2 receiving a second network protocol address from a second process over the computer network.

8

10. (Amended) In a computer system having a display and capable of executing a process, a [A] method for establishing a point-to-point communication from a caller process to a callee process over a computer network, the caller process [having] capable of generating a user interface and being operatively [coupled] connected to the callee process and a server process over the computer network, the method comprising the steps of:

A. generating [an] a user-interface element representing a first communication line;

B. generating [an] a user interface element representing a first callee process;

C. querying the server process to determine if the first callee process is accessible; and

[C.] D. establishing a point-to-point communication link from the caller process to the first callee process, in response to a user associating the element representing the first callee process with the element representing the first communication line.

9 8

11. The method of claim 10 wherein step C further comprises the steps of:

C.1 querying the server process as to the on-line status of the first callee process; and

C.2 receiving a network protocol address of the first callee process over the computer network from the server process.

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Straight Path - Ex. 2025 - Page 103

10 8
12. (Amended) The method of claim 10 further comprising the step of:

[D.] E. generating [an] a user-interface element representing a second communication line.

11 8
13. (Amended) The method of claim 10 further comprising the step of:

[E.] F. terminating the point-to-point communication from the caller process to the first callee process, in response to the user disassociating the element representing the first callee process from the element representing the first communication line; and

[F.] G. establishing a different point-to-point communication from the caller process to the first callee process, in response to the user associating the element representing the first callee [processor] process with the element representing the second communication line.

12 8
82 14. (Amended) The method of claim 10 further comprising the steps of:

[D.] E. generating [an] a user interface element representing a second callee process; and

[E.] F. establishing a conference point-to-point communication between the caller process and the first and second callee processes, in response to the user associating the element representing the second callee process with the element representing the first communication line.

13 8
15. (Amended) The method of claim 10 further comprising the step of:

[F.] G. removing the second callee process from the conference point-to-point communication in response to the user disassociating the element representing the second callee process from the element representing the first communication line.

14 8
16. (Amended) The method of claim 10 further comprising the steps of:

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[D.] E. generating [an] a user interface element representing a communication line having a temporarily disabled status; and

[E.] F. temporarily disabling the point-to-point communication between the caller process and the first callee process, in response to the user associating the element representing the first callee process with the element representing the communication line having a temporarily disabled status.

15 14
17. (Amended) The method of claim ~~16~~ wherein the element generated in step [D] E represents a communication line on hold status.

B2 16 15
~~18~~. (Amended) The method of claim ~~17~~ wherein the element generated in step [D] E represents a communication line on mute status.

17 8
~~19~~. (Amended) The method of claim ~~10~~ wherein the [caller process] display further comprises a visual display [and the user interface comprises a graphic user interface].

18 17
~~20~~. (Amended) The method of claim ~~19~~ wherein the user interface is a graphic user interface and the user-interface elements generated in steps A and B are graphic elements.

Remarks

Applicants have considered carefully the Office communication dated February 3, 1999 (Paper No. 8). In response, Applicants have made minor amendments to the claims and set forth the following remarks to supplement the response submitted on October 26, 1999.

The preambles of claims 1 and 7 have been amended to provide proper antecedent basis for all terms used in the claims. In addition, claims 1-4 have been amended to eliminate the term "means" from the claim language. These amendments are offered to conform the claims to 35 U.S.C. §112 and are not

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necessitated or made in response to any rejection by the Examiner, or, in light of any reference cited by the Examiner.

Claims 1-4 were originally filed with the application and amended in the response of October 26, 1998. Remarks distinguishing claims 1-4 over the cited references are set forth in detail in the prior response of October 26, 1998.

Claims 7-9 include limitation similar to claims 1-4 and are believed patentable for the same reasons as claims 1-4, as set forth in the Remarks section of the previous response. Specifically, claim 7 recites a method for establishing a point-to-point communication comprising the step of "determining the currently assigned network protocol address of the first process upon connection to the computer network" (claim 7, lines 6-7). Claim 7 further recites the steps of "establishing a communication connection with the server process once the assigned network protocol address of the first process is know " (claim 7, lines 8-9) and " forwarding the assigned network protocol address of the first process to the server process upon establishing a communication with the server" (claim 7, lines 10-12). Claim 7, as amended, is believed neither anticipated nor made obvious in light of the IPhone by Vocal Tec. Specifically, the IPhone literature does not disclose or suggest a method comprising the steps of i) determining the currently assigned network protocol address of the first process upon connection to the computer network, ii) establishing a communication connection with the server process once the assigned network protocol address of the first process is know; and iii) forwarding the assigned network protocol address of the first process to the server process upon establishing a communication with the, as now recited in claim 7. Claims 8-9 include all the limitations of claim 7 and are likewise believed to be patentable over the IPhone literature for the same reasons as claim 7.

In addition to claims 1-4 as originally filed, the Summary of the Invention section of the specification (pages 5-6) set forth embodiments of the invention. The specification discloses a client/server system, including a client process having a user interface which is capable of interacting with a directory server process and establishing point-to-point communication connections with other

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processes over a computer network. Claims 1-4, as amended, are computer program product claims which recite program code limitations for performing the client functions as disclosed. Claims 7-9 are method limitation counterparts to the program code limitations recited in claims 1-4.

Claims 10-20 are directed to a method for establishing various point-to-point communications with a client process utilizing a graphic user interface.

The subject application discloses a client and server system and a protocol in which client processes, upon connection to an Internet Protocol based network, forward their current dynamically assigned network protocol address to a global server which acts as a repository of directory information for all other client processes. The global server associates with the network protocol address of a particular client process, a unique handle, e.g. the client's e-mail address. With this technique, the on-line status of prospective callees may be determined even though the callee is not currently connected to the network.

The subject matters of claims 10-20 are directed to a method performed by a caller process having a user interface to establishment of calls, conferencing of parties, transferring of parties among calls and disabling of calls are achieved using elements representing communication lines and parties.

Applicants respectfully assert that none of the art of record, whether considered singularly or in combination, disclose or suggest the subject matter as recited in claims 10-20. Specifically, claim 10 recites a method for establishing a point-to-point communication from a caller process to a callee process with a caller process capable of generating a user interface. Claim 10 specifically recites the method step of generating a user interface element representing a first communication line, generating a user interface element representing a first callee process, querying the server process to determine if the first callee process is accessible, and establishing a point-to-point communication link from the caller process to the callee process in response to a user associating the element representing the first callee process with the element representing the first communication line (claim 10, lines 7-12). The IPhone literature from Vocal Tec does not disclose or suggest a method including the step of querying a

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server process to determine the availability of another process and establishing a communication with the callee process by manipulating user interface elements, as now recited in claim 10.

As discussed in the previous response, the Vocal Tec Internet Phone version 2.5 as well as the NetScape Cool Talk product utilize servers executing the IRC protocol which, for the reasons set forth previously, does not provide a teaching or suggestion as to how to query a server process to determine if a first callee process is accessible, i.e. on-line and current network protocol address. None of the art of record currently are believed to recite the specific limitations of claim 10, as now amended. Claims 11-20 include all the limitations of claim 10 and are likewise believed patentable for the same reasons.

In light of the foregoing amendments to the claims, Applicants respectfully assert that all claims currently under consideration now patentably distinguish over the art of record, including the cited references, whether considered singularly or in combination. The Examiner is respectfully requested to advance this case to issuance and send a notice to that effect. In the event that outstanding issues remain following the Examiner's review of this response, Applicants' attorney requests that the Examiner contact Applicants' attorney at the number listed below to set up a telephone interview to attempt to resolve any outstanding issues with the claims and before any further Office Actions are issued.

The Commissioner is hereby authorized to charge any fees or credits under 37 C.F.R. §1.16 and 1.17 to our deposit account No. 02-3038.

Respectfully submitted

Bruce D. Jobse Date: 3/3/99

Bruce D. Jobse, Esq. Reg. No. 33,518
KUDIRKA & JOBSE, LLP
Customer Number 021127
Tel: (617) 367-4600 Fax: (617) 367-4656

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 108

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PATENT & TRADEMARK OFFICE

GAU 2751

AMENDMENT TRANSMITTAL	Docket No. N0003/7002

Applicant: Shane D. Mattaway, Et Al.
Serial No. 08/721,316
Filed: September 25, 1996
For: GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner: E. Chan
Art Unit: 2751

Assistant Commissioner for Patents
Washington, DC 20231
Box Non-Fee Amendment

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Transmitted herewith for filing is the following:

Enclosures

- ☒ Amendment
- ☐ Petition for a month Extension of Time
- ☐ Return Receipt Postcard

Small Entity

- ☐ A small entity statement under 37 C.F.R. §1.27 has already been filed.
- ☐ A small entity statement under 37 C.F.R. §1.27 is attached

Fees

Claims as Filed					
	Claims Filed	Highest Number Paid for	Number of Extra Claims	Rate	Additional Fees Due
Total Claims (37 CFR §1.16(c))	18	- 20 =	0 X	$18.00 =	$ 0.00
Independent Claims (37 CFR §1.16(b))	3	- 3 =	0 X	$78.00 =	$ 0.00
Extension Fee					$ 0.00
Reduction by 50% for filing by small entity					$ 0.00
Total Filing Fee					**$ 0.00**

LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 109

Payment

☐ Check in the amount of the total filing fee.

☐ Charge Account No. 02-3038 in the amount of the total filing fee. A duplicate of this transmittal sheet is attached.

Authorization to Charge Additional Fees

☒ The Commissioner is hereby authorized to charge any additional fees under 37 C.F.R. §1.16 and §1.17 required by the attached paper and during the entire pendency of this application to Account No. 02-3038.

Bruce D. Jobse Date: 3/3/99

Bruce D. Jobse, Esq. Reg. No. 33,518
KUDIRKA & JOBSE, LLP
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Straight Path - Ex. 2025 - Page 110

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address : COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
08/721,316	09/25/96	MATTAWAY	S

LM02/0203

BRUCE D JOBSE
BOOKSTEIN & KUDIRKA
ONE BEACON STREET
BOSTON MA 02108

EXAMINER	
CHAN, E	
ART UNIT	PAPER NUMBER
2751	8

DATE MAILED: 02/03/99

This is a communication from the examiner in charge of your application.

COMMISSIONER OF PATENTS AND TRADEMARKS

1. ☑ The communication filed 10-26-98 is informal/non-responsive for the reason(s) checked below and should be corrected. **APPLICANT IS GIVEN ONE MONTH FROM THE DATE OF THIS LETTER OR UNTIL THE EXPIRATION OF THE PERIOD FOR RESPONSE SET IN THE LAST OFFICE ACTION (WHICHEVER IS LONGER) WITHIN WHICH TO CORRECT THE INFORMALITY.**

   a. ☐ The amendment to claim(s) _____ , filed _____ , fails to comply with the provisions of 37 C.F.R. 1.121 and is accordingly held to be non-responsive. A supplemental paper correcting the informal portions and complying with the rule is required.

   b. ☐ The paper is unsigned. A duplicate paper or ratification, properly signed, is required.

   c. ☐ The paper is signed by _____ , who is not of record. A ratification or a new power of attorney with a ratification, or a duplicate paper signed by a person of record, is required.

   d. ☐ The communication is presented on paper which will not provide a permanent copy. A permanent copy, or a request that a permanent copy be made by the Office at applicant's expense, is required, see M.P.E.P. 714.07.

   e. ☑ Other See attached pages.

2. ☐ In accordance with applicant's request, **THE PERIOD FOR RESPONSE FROM THE OFFICE ACTION DATED** _____ **IS EXTENDED TO RUN** _____ **MONTH(S).**
   No further extension will be granted unless approved by the Commissioner. 37 C.F.R. 1.136 (b)

3. ☐ Receipt is acknowledged of papers submitted under 35 U.S.C. 119 which papers have been made of record in the file.

4. ☐ Other

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Straight Path - Ex. 2025 - Page 111

OIPE JC25 PATENT & TRADEMARK OFFICE OCT 26 1998

Attorney Docket No. N0003/7002

7/a
SK
10-30-98

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Shane D. Mattaway, et al.
Serial No.: 08/721,316
Filed: September 25, 1996
For: GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner: George F. Wallace
Art Unit: 2751

CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8(a)

The undersigned hereby certifies that this document is being placed in the United States mail with first-class postage attached, addressed to Assistant Commissioner for Patents, Washington, DC 20231 on the 20th day of October, 1998

Frances M. Cunningham
Frances M. Cunningham

Assistant Commissioner for Patents
Washington, D.C. 20231

AMENDMENT

In response to the Office Action dated April 20, 1998, please amend the above-identified patent application, as follows:

In the Specification

Page 2, line 8, change " XX/XXX,XXX" to -- 08/523,115 --;
line 10, change " XX/XXX,XXX" to -- 60/024,251 --;
line 16, change " XX/XXX,XXX" to -- 08/719,894 --;
line 19, change " XX/XXX,XXX" to -- 08/719,554 --;
line 22, change " XX/XXX,XXX" to -- 08/719,640 --;
Page 3, line 1, change " XX/XXX,XXX" to -- 08/719,891 --;
line 4, change " XX/XXX,XXX" to -- 08/719,898 --.
line 7, change " XX/XXX,XXX" to -- 08/718,911 --.
line 10, change " XX/XXX,XXX" to -- 08/719,639 --.
Page 8, line 5, change "a such" to --such--;

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LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 112

Page 27, line 25, change "Winsoc" to --Winsock--.

Page 28, line 11, change "XX/XXX,XXX" to --08/719,554 --.

Page 39, line 11, change"XX/XXX,XXX" to -- 08/719,891 --.

Page 46, line 23, change "XX/XXX,XXX" to -- 08/719,898 --.

In the Claims

1. (Amended) A computer program product for use with a computer system having a display and an audio transducer, the computer system capable of executing one or more processes and [operatively coupled] connecting to other [computers] processes and a server process over a computer network, the computer program product comprising a computer usable medium having computer readable code means embodied in the medium comprising:

a. program code means for generating a user-interface through which a user may control a first process executing on [coact with] the computer system and coupled to the computer network;

b. program code means for determining the currently assigned network protocol address of the first process upon connection to the computer network;

c. program code means, responsive to the currently assigned network protocol address of the first process, for establishing a communication connection with the server process and for forwarding the assigned network protocol address of the first process and a unique identifier of the first process to the server process upon establishing a communication connection with the server process; and

[b.]d. program code means, responsive to user input commands, for establishing a point-to-point communications [link] with another [computer] process over the computer network[; and].

[c. program code means, responsive to audio data from the audio transducer, for transmitting the audio data over the communication link to the other

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Straight Path - Ex. 2025 - Page 113

computer.]

2. (Amended) The computer program product of claim 1 wherein the program code means for establishing a point-to-point communication link further comprises:

[c.1] d.1 program code means, responsive to the network protocol address of a second process [the second processor], for establishing a point-to-point communication link between the first [processor] process and the second [processor] process over the computer network.

3. (Amended) The computer program product of claim 2 wherein the program code means for establishing a point-to-point communication link further comprise:

[c.2] d.2 program code means for transmitting, from the first [processor] process to the server process, a query as to whether the second [processor] process is connected to the computer network; and

[c.3] d.3 program code means for receiving a network protocol address of the second [processor] process from the server process, when the second [processor] process is connected to the computer network.

4. (Amended) The computer program product of claim 2 wherein the program code means for establishing a point-to-point communication link further comprises:

[c.2] d.2 program code means for transmitting an E-mail [signal] message containing a network protocol address from the first [processor] process to the server process over the computer network;

[c.3]d.3 program code means for receiving a second network protocol address from the second [processor] process over the computer network.

Please cancel claims 5-6 without prejudice.

Please add the following claims:

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7. In a computer system having a display and an audio transducer, the computer system capable of executing one or more processes and communicating with other processes and a server process over a computer network, a method for establishing point-to-point communications with other processes comprising:

A. determining the currently assigned network protocol address of the first process upon connection to the computer network;

B. establishing a communication connection with the server process once the assigned network protocol of the first process is known;

C. forwarding the assigned network protocol address of the first process to the server process upon establishing a communication connection with the server process; and

D. establishing a point-to-point communication with another process over the computer network.

8. The method of claim 7 wherein the program step D comprises:

D.1 transmitting, from the first process to the server process, a query as to whether a second process is connected to the computer network; and

D.2 receiving a network protocol address of the second process from the server process, when the second process is connected to the computer network.

9. The method of claim 7 wherein the program step D comprises:

D.1 transmitting an E-mail message containing a network protocol address from the first process to the server process over the computer network;

D.2 receiving a second network protocol address from a second process over the computer network.

10. A method for establishing a point-to-point communication from a caller process to a callee process over a computer network, the caller process having a user interface and being operatively coupled to the callee process and a server process over the

computer network, the method comprising the steps of:

A. generating an element representing a first communication line;

B. generating an element representing a first callee process;

C. establishing a point-to-point communication link from the caller process to the first callee process, in response to a user associating the element representing the first callee process with the element representing the first communication line.

11. The method of claim 10 wherein step C further comprises the steps of:

C.1 querying the server process as to the on-line status of the first callee process; and

C.2 receiving a network protocol address of the first callee process over the computer network from the server process.

12. The method of claim 10 further comprising the step of:

D. generating an element representing a second communication line.

13. The method of claim 10 further comprising the step of:

E. terminating the point-to-point communication from the caller process to the first callee process, in response to the user disassociating the element representing the first callee process from the element representing the first communication line; and

F. establishing a different point-to-point communication from the caller process to the first callee process, in response to the user associating the element representing the first callee processor with the element representing the second communication line.

14. The method of claim 10 further comprising the steps of:

D. generating an element representing a second callee process; and

E. establishing a conference point-to-point communication between the caller

process and the first and second callee processes, in response to the user associating the element representing the second callee process with the element representing the first communication line.

15. The method of claim 10 further comprising the step of:

F. removing the second callee process from the conference point-to-point communication in response to the user disassociating the element representing the second callee process from the element representing the first communication line.

16. The method of claim 10 further comprising the steps of:

D. generating an element representing a communication line having a temporarily disabled status; and

E. temporarily disabling the point-to-point communication between the caller process and the first callee process, in response to the user associating the element representing the first callee process with the element representing the communication line having a temporarily disabled status.

17. The method of claim 16 wherein the element generated in step D represents a communication line on hold status.

18. The method of claim 17 wherein the element generated in step D represents a communication line on mute status.

19. The method of claim 10 wherein the caller process further comprises a visual display and the user interface comprises a graphic user interface.

20. The method of claim 19 wherein the user interface is a graphic user interface and the elements generated in steps A and B are graphic elements.

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REMARKS

Applicants have carefully considered the Office Action dated April 20, 1998 and the references cited therein. In response, the specification and claims have been amended. New claims 7-20 have been added to more particularly point out and distinctly claim the subject matter which Applicants regard as their invention. Applicants respectfully request reexamination and reconsideration.

Applicants have amended the specification to supply the serial numbers of all patent applications referenced in the specification. In addition, minor grammatical errors have been corrected to over come the Examiner's objections to the specification.

Claims 1-4 have been objected to as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. In response, claims 1-4 has been amended, where appropriate, in a manner which is believed to overcome the objections of the Examiner.

Claims 1-3 and 5-6 have been rejected under 35 USC §102(a) as being anticipated by Vocal Tec Internet Phone Version 2.5 (hereafter "IPHONE"). Prior to discussing the specific amendments to the claims, Applicants would like to briefly discuss the subject invention in light of the rejections.

As stated in the Background of the Invention section of the subject specification, the locating users over a computer network has been difficult without knowing the temporary or dynamically assigned Internet Protocol address of the user. The subject application discloses a client and server system and a protocol in which client processes, upon connection to an Internet Protocol based network, forward their current dynamically assigned Internet Protocol address to a global server which acts as a repository of directory information for all other client processes. In addition, the global server associates with the Internet Protocol address of a particular client process, a unique handle, e.g. the client's e-mail address. With this technique, the on-line status of prospective callees may be determined even though the callee is not currently connected to the network. More specifically, each client process, upon receiving an Internet Protocol address after connection to an IP-based network, automatically and transparently notifies the global server that it is currently on line, its E-mail address and

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the network protocol address at which the client process may be contacted. Thereafter, the global server monitors the status of the client process and is capable of providing directory information including the Internet Protocol address of the client process to other clients processes who wish to communicate therewith. In order for a WebPhone caller to initiate a point-to-point communication connection with a callee having an unknown Internet Protocol address, the WebPhone caller merely selects either an entry representing the prospective callee from the caller's personal directory or submits a query to the global server process, the query including information identifying the prospective callee. The global server utilizes the handle, e.g. the E-mail address, or other identifier contained in the query, and determines whether the callee is currently connected to the network. If so, the current dynamically assigned Internet Protocol address of the callee is then returned to the caller's WebPhone and a point-to-point communication is initiated. The whole process occurs transparently to the WebPhone caller user.

Conversely, the Vocal Tec IPhone literature cited by the Examiner, as well as the NetScape Cool Talk product utilize servers executing the Internet Relay Chat (IRC) protocol, such protocol provides an impractical solution to the problem of locating a user's dynamically assigned Internet Protocol address. Specifically, the IRC protocol is defined in the Internet Engineer Task Force (IETF) Standard RFC 1459 available at <http://info.internet.isi.edu/in-notes/rfc/files/rfc1459.txt>. Briefly, a typical server adhering to the IRC protocol supports approximately 24 users who are "joined" on an individual "channel". To initiate communications with a callee, a caller has to manually search one or more IRC servers for the desired callee. Specifically, to locate a particular callee, a caller needs to know (1) the server which that callee is connected to and (2) the "channel" or "topic" that callee has "joined". Practically, in order to find a particular individual a prospective callee, the caller would need to know which of many IRC servers around the world the callee frequented in an attempt to connect to the proper IRC server. If the IRC server already had 24 users connected, any attempt to contact that particular IRC server would be rejected until one or more users drop off the server. If connection to the IRC server is established, the caller would need to browse

through any "channels" in which the prospective callee may be located.

According to the IRC protocol, there is no field or identifier which "uniquely" identifies an IRC server user. Each user connects to an IRC server using a "nickname" which can be any character string up to nine characters in length. Note that duplicate nicknames are possible. Accordingly, such nicknames are not unique. The IPhone Version 2.5 provides no functionality beyond that of a conventional IRC client. A user is presented with a list of "joined" IRC users from which a selection can be made. Once a nickname is selected from the IRC server, information about the user, including an Internet Protocol address are provided to the selecting party.

In contrast, the present invention provides a global server that can be queried to locate any user anywhere using a known unique identifier or handle, e.g. the user's e-mail address. A perspective caller does not have to go through the time-consuming and annoying task of hunting for the correct IRC server and sifting through all joined users and topics in search of the person to whom he or she wishes to communicate. As disclosed in the specification, a Webphone user merely selects information identifying the user from either a personal directory or the results of a query from the global server to establish a point-to-point communication connection with the desired callee.

Claim 1 has been amended to now recite the above-identified aspects of Applicants' invention. Specifically, claim 1 now recites a computer program product containing program code for "determining the currently assigned network protocol address of the first process upon connection to the computer network" (claim 1, lines 10-12). Claim 1 further recites program code for "establishing a communication connection with the server process and for forwarding the assigned network protocol address of the first process and a unique identifier of the first process to the server process upon establishing a communication with the server" (claim 1, lines 10-17). All client processes whether callers or callees "register" with the server in such a manner. Claim 1, as amended, is neither anticipated nor made obvious in light of the IPhone by Vocal Tec. Specifically, the IPhone does not disclose ore suggest program code means for forwarding to a server process the network protocol address and other

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information identifying a process once the process is coupled to the network, as now recited in claim 1. Claims 2-4 include all the limitations of claim 1 and are likewise believed to be patentable over the IPhone literature for the same reasons as claim 1.

The Examiner will note that the limitations recited in claim 4 are further refinements of limitation D of claim 1, as amended. Specifically, the subject specification discloses two techniques for establishing a point-to-point communication with another process. A first technique, as described in the specification (pp. 12-14) utilizes a query to the directory server. A second technique contemplates the caller process sending its network protocol address to the prospective callee process directly in an e-mail message, as described in the specification (pp.15-18).

Claims 5-6 have been cancelled, without prejudice.

To more particularly point out and distinctly claim the subject matter which Applicants regard as the invention, new claims 7-20 have been added to the specification. Claims 7-9 include limitation similar to claims 1-4 and are believed patentable for the same reasons. The subject matter of claims 10-20 are directed to a user interface in which establishment of calls, conferencing of parties, transferring of parties among calls and disabling of calls are achieved using elements representing communication lines and parties. Support for these claims can be found in the specification, (pp. 49-58). Applicants respectfully assert that none of the art of record, whether considered singularly or in combination, disclose or suggest the subject matter as recited in claims 10-20.

In light of the foregoing amendments and remarks, the claims are believed allowable over any of the references of record, whether considered singularly or in combination. Accordingly, Applicants believe this application is in condition for allowance and a notice to that effect is respectfully requested. If the Examiner has any questions regarding this amendment or the application in general he is invited to call the Applicants' attorney at the number listed below.

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Straight Path - Ex. 2025 - Page 121

The Commissioner is hereby authorized to charge any fees or credits under 37 C.F.R. §1.16 and 1.17 to our deposit account No. 02-3038.

Respectfully submitted,

Bruce D. Jobse, Reg. No. 33,518
KUDIRKA & JOBSE, LLP
Two Center Plaza
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LG v. Straight Path, IPR2015-00198
Straight Path - Ex. 2025 - Page 122

OIPE
OCT 26 1998
PATENT & TRADEMARK OFFICE
JC25

Attorney Docket No. N0003/7002

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Shane D. Mattaway, et al.
Serial No.: 08/721,316
Filed: September 25, 1996
For: GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner: George F. Wallace
Art Unit: 2751

CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8(a)

The undersigned hereby certifies that this document is being placed in the United States mail with first-class postage attached, addressed to Assistant Commissioner for Patents, Washington, DC 20231 on the 20th day of October, 1998

Frances M. Cunningham
Frances M. Cunningham

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Assistant Commissioner for Patents
Washington, D.C. 20231

Sir/Madam:

PETITION FOR EXTENSION OF TIME

Please extend the time for response to the Office Action dated April 20, 1998 for three months to and including October 20, 1998. Enclosed is a check in the amount of $950.00 for the extension fee.

The Commissioner is hereby authorized to charge any other fees under 37 C.F.R. §1.16 and 1.17 that may be required, or credit any overpayment, to our Deposit Account No. 02-3038.

Respectfully submitted,

10/27/1998 RMAGAT 00000126 08721316
01 FC:117 950.00 OP

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GP- 2751

OIPE JC25
OCT 26 1998
PATENT & TRADEMARK OFFICE

Attorney Docket No. N0003/7002

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Serial No.: 08/721,316
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Examiner: George F. Wallace
Art Unit: 2751

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The undersigned hereby certifies that this document is being placed in the United States mail with first-class postage attached, addressed to Assistant Commissioner for Patents, Washington, DC 20231 on the 20th day of October, 1998

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Frances M. Cunningham

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Assistant Commissioner for Patents
Washington, D.C. 20231

Sir/Madam:

Transmitted herewith for filing is the following:

X Amendment
X Three-Month Petition for Extension of Time (fee of $950.00)

The Commissioner is hereby authorized to charge any other fees under 37 C.F.R. §§1.16 and 1.17 that may be required, or credit any overpayment, to our Deposit Account No. 02-3038.

Respectfully submitted,

Bruce D. Jobse

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UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
08/721,316	09/25/96	MATTAWAY S	

LM51/0420

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EXAMINER	
WALLACE, G	

ART UNIT	PAPER NUMBER
2751	5

DATE MAILED: 04/20/98

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.	Applicant(s)
08/721,316	Mattaway et al.
Examiner	**Group Art Unit**
George F. Wallace	2751

☒ Responsive to communication(s) filed on *Sept 25, 1996, Dec 22, 1996 and Mar 30, 1998*

☐ This action is **FINAL.**

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire *3* month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claim

☒ Claim(s) *1-6* is/are pending in the applicat

Of the above, claim(s) _____ is/are withdrawn from consideration

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) *1-6* is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☒ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☒ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☒ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). *3-4*

☐ Interview Summary, PTO-413

☒ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

— SEE OFFICE ACTION ON THE FOLLOWING PAGES —

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Part III. DETAILED ACTION

Drawings

1. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required if and when the application is allowed.

Specification Objections

2. The disclosure is objected to because of the following informalities: on pages 2-3 and elsewhere within the specification, references made to patent applications must be updated to reflect their respective Serial and Patent Numbers, insofar as possible; on page 5 line 8, "a such a" appears to have been intended as "such a;" and on page 27 line 25, "Winsoc 1.1" appears to have been intended as "Winsock 1.1."

The above objections are merely illustrative and do not represent all errors contained in the specification. Applicants are required to proof read the specification and make all necessary corrections.

Claim Objections

3. Claims 1-4 are objected to because of the following informalities: Claim 1 appears to read more clearly and consistently if on line 8, applicants inserted --,-- after "means" and "commands." In Claims 2 and 3, "first processor" and "second processor" have no antecedent basis. They would read more clearly if in Claim 1 "processors" were associated with the computer systems claimed. In Claims 1, 3 and 4 "server" is unclear in light of reference to both a "global server"

and a "connection server" on page 35 of the Specification. In Claim 4, "email signal" appears to read more clearly as "email address." In Claim 5, "processing" would read more clearly if applicants specified the functions intended.

The claims have been examined insofar as clarity and reasonable certainty permits. Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless --
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

5. Claims 1-3 and 5-6 are rejected under 35 U.S.C. 102(a) as being anticipated by VocalTec Internet Phone™ Version 2.5 (hereinafter "IPHONE").

IPHONE is Internet telephony software with a graphic user interface that allows real-time Internet voice communication between two computers--having one or more speakers and at least one microphone--via a direct computer-to-computer link using TCP/IP or SLIP/PPP. IPHONE utilizes IRCs (Internet Relay Servers) as Internet Phone Directories to remedy the difficulty arising from identifying another's dynamically assigned IP address, which changes each time a user logs into his or her Internet Service Provider.

As to Claim 1, IPHONE is *a computer program product for use with a computer system having a display and an audio transducer*--it is software inherently for use with the computer

systems of two users, with each system having a display, and at least one speaker and microphone.

Moreover, each system is *operatively coupled to other computers and a server over a computer network.* Inherently the systems of each user is connected to the Internet, through which they each are coupled to a plurality of computers and an IRC (Internet Relay Server) server.

IPHONE, *a computer program product*, inherently provides *a computer usable medium* (one or more floppy disks, a CD-ROM, etc...) *having computer readable code means* (executable code) *embodied in the medium.*

Furthermore, IPHONE, *a computer program product*, provides *means, responsive to user input commands, for establishing a point-to-point communications link with another computer over the computer network.* Inherently, IPHONE contains executable code, which when executed, receives a user input (the clicking of the left button of a mouse whose pointer is above a "Quick Dial Button," see Internet Phone Help Index, Using Internet Phone (link), Setting a Quick Dial Button (link)) and establishes a direct (see Readme.txt file, which is bundled with iphone25.exe, § *About The Internet Phone and IRC*, "The actual talk is done directly between the PC's running the Internet Phone, and NOT via the IRC.") point-to-point communications link with another computer over the Internet. And as noted supra, IPHONE utilizes IRCs as Internet Phone Directories to remedy the difficulty arising from identifying another's dynamically assigned IP address, which changes each time a user logs in to his or her Internet Service Provider.

Furthermore, IPHONE, *a computer program product*, provides *means, responsive to audio data from the audio transducer, for transmitting the audio data over the communications link to the other computer*. Inherently, when one of the two users with an established point-to-point communications link speaks into his or her microphone, the analog audio signal is converted by software or hardware means to a digital signal and then sent through the Internet to the computer of the other user.

Lastly, IPHONE provides *means for generating a user-interface through which a user may coact with the computer system*. IPHONE, as *a computer program product*, inherently contains executable code. This code, when executed, generates a plurality of windows with menu bars and icons through which a user fully interacts with the software to fully effectuate Internet telephony through his or her computer system. The user, as noted *supra*, may click the left button of a mouse whose pointer is above a "Quick Dial Button," which initiates and establishes a point-to-point communications link with another computer (inherently, via its IP address) over the Internet.

As to Claim 2, which depends on Claim 1, IPHONE, *a computer program product*, provides, in conjunction with its *means for establishing a point-to-point communication link, program code means, responsive to the network protocol address of a second processor, for establishing a point-to-point communication link between a first processor and a second processor over the computer network.*

Inherently, IPHONE, *a computer program product*, provides program code, which in conjunction with its *means for establishing a point-to-point communication link*, when executed, initiates and establishes, in response to a user clicking the left button of a mouse, whose pointer is above a "Quick Dial Button" (see cite supra) a point-to-point communication link with another's computer, which is either a TCP/IP or SLIP/PPP communication link via the other's IP address over the Internet (see Internet Phone Help Index, Quick Tour (link), 4th page thereof).

As to Claim 3, which depends on Claim 2, IPHONE, *a computer program product*, provides, in conjunction with its *means for establishing a point-to-point communication link, program code means for transmitting, from a first processor to a server, a query as to whether a second processor is connected to the computer network*; and *program code means for receiving a network protocol address of the second processor from the server, when the second processor is connected to the computer network.*

IPHONE, *a computer program product*, provides program code, which in conjunction with its *means for establishing a point-to-point communication link,* when executed, inherently transmits, from a first processor to an IRC server, a query as to whether another user, whose identity (name and email address) is contained in a Quick Dial Button, is connected to the IRC network; and program code, which receives another's IP address from an IRC server, when the other is connected to the IRC network.

As to Claim 5, which depends on Claim 1, IPHONE, *a program product*, inherently provides program code means for processing audio data. The analog audio data captured by a

microphone is inherently converted to digital format before transmission across the Internet to another user, where it is converted back to analog before directed to one or more speakers.

As to Claim 6, which depends on Claim 5, IPHONE teaches the use of VOCALTEC's VC Card, a voice compression card, by its users to increase the efficiency and quality of communication (see *Internet Phone Help Index*, *Using Internet Phone* (link), *What is Internet Phone* (link), last paragraph).

Claim Rejections - 35 USC § 102/103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claim 4 is rejected under 35 U.S.C. 102(b) as anticipated by IPHONE or, in the alternative, under 35 U.S.C. 103(a) as obvious over IPHONE.

8. As to Claim 4, which depends on Claim 2, IPHONE provides, in conjunction with its means for establishing a point-to-point communication link, *program code means for receiving a second network protocol address from a second processor over the computer network,* **inherently**; and **appears** to provide *program code means for transmitting an E-mail signal containing a network protocol address from a first processor to a server over a computer network.*

IPHONE, when executed, inherently provides program code means for receiving the IP address from a second processor over the computer network, since a direct Internet connection between the second and first processors is ultimately achieved. However as to the 102/103 issue, it appears likely that IPHONE, when executed, provides program code for transmitting an E-mail signal (E-mail address) containing a network protocol address (IP address) from a first processor (a first user's computer) to a server (an IRC server) over the computer network (the Internet). Clearly, IPHONE allows a first user to query an IRC server to discover whether a particular user is "on-line." A user of IPHONE supplies the program with "user information" including his or her email address, name and other information. When the user "logs on" to an IRC server, inherently the user's IP address and some type of identifying information is sent to the server, since another user is able to locate the former user via a query containing some identifying information. An email address is sufficiently unique to be efficient search criteria for locating a specific record (user) against a list of records (users) for identification of whether a particular user is on-line, i.e.) available to receive a "call." It is highly likely that a user's E-mail address is used by IPHONE as search criteria.

Insofar as IPHONE does not use an E-mail address as search criteria, it would have been obvious to one ordinarily skilled in the art at the time the invention was made to have used an E-mail address as unique search criteria for determining whether a user associated with the E-mail address was "on-line." It would have been highly desirable to locate a specific user rather than a

plurality of users, arising from use of common search criteria, so that a correct communication link could be established in a minimal amount of time.

Conclusion

9. The following prior art made of record and not relied upon is considered pertinent to applicants' disclosure:

a. Netscape Conference and Cooltalk Meeting Room, www.q5.com. Examiner considers this website, which works in conjunction with the Internet telephony software product Netscape®Cooltalk™, as a potential 102(a)/102(b) bar to applicants' claims and as a highly probative 103(a) reference.

b. Gull, *Re: Getting IP address of PPP-connected Mac*, <jgull-0304951005350001@pm012-11.dialip.mich.net>.
Examiner considers this 103(a) reference as strong motivation to combine with prior art-Internet telephony software, such as Netscape®Cooltalk™, both a central Internet database for the storage and dissemination of dynamically assigned IP addresses of Internet telephony software users wishing to disseminate their IP addresses to others connected to the Internet, as well as program code to operatively interact with said database.

c. Gull, *Re: Internet Phone for Mac?*, <jgull-1704950116450001@pm049-28.dialip.mich.net>.
Examiner considers this 103(a) reference as strong motivation to combine with prior art Internet telephony software both software and/or hardware-based compression means, as well as a central Internet database for the storage and dissemination of the dynamically assigned IP addresses of Internet telephony software users wishing to disseminate their IP addresses to others connected to the Internet, and program code to operatively interact with said database.

10. Please address inquiries concerning this and earlier communications from the examiner to **George F. Wallace**, whose telephone number is **703/305-2277**. Examiner can be reached M-F from 9:00 a.m. to 5:00 p.m. EST.

If attempts to reach the examiner by phone fail, **Eddie P. Chan**, examiner's supervisor, can be reached at **703/305-9712**.

The **fax** number for Art Unit 2751 is **703/308-6606**.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Group receptionist** at **703/305-3900**.

George F. Wallace, J.D.
March 26, 1998

TOD R. SWANN
SUPERVISORY PATENT EXAMINER
GROUP 2700

Notice of References Cited

Application No.	Applicant(s)		
08/721,316	Mattaway et al.		
Examiner		Group Art Unit	Page 1 of 1
George F. Wallace		2751	

U.S. PATENT DOCUMENTS

		DOCUMENT NO.	DATE	NAME	CLASS	SUBCLASS
	A					
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

		DOCUMENT NO.	DATE	COUNTRY	NAME	CLASS	SUBCLASS
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	Q						
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NON-PATENT DOCUMENTS

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	U	VocalTec Internet Phone (TM) Version 2.5, www.cox.smu.edu/class/mis6386/people/stort/iphone25.exe	02/95
	V	Weinberg, Netscape Conference and Cooltalk Meeting Room, www.q5.com	2/22/96
	W	Gull, Re: Getting IP address of PPP-connected Mac, <jgull-0304951005350001@pm012-11.dialip.mich.net>	4/03/95
	X	Gull, Re: Internet Phone for Mac?, >jgull-1704950116450001@pm049-28.dialip.mich.net>	4/17/95

Form PTO-1449 INFORMATION DISCLOSURE STATEMENT	Docket No.: N0003/7002	Serial No. 08/721,316
	Applicant: Shane D. Mattaway et al.	
	Filed:September 25, 1996	Group:

MAIL ROOM DEC 23 1996 PAT. & TRADEMARK

U.S. Patent Documents

Ex.		Doc. No.	Date	Name	Class	Subcl.	Filed
DW	*	5 4 0 0 3 3 5	3/21/95	Yamada	370	524	
	*	5 3 5 7 5 7 1	10/18/94	Banwart	380	21	
	*	5 1 5 0 3 6 0	9/22/92	Perlman et al.	370	402	
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	*	5 3 2 1 8 1 3	6/14/94	McMillen et al.	714	798	
	*	5 3 0 9 4 3 3	5/3/94	Cidon et al.	370	390	
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Foreign Patent Documents

Ex.		Doc. No.	Date	Name	Class	Subcl.	

OTHER DOCUMENTS (including, Author, Title, Date, Pages, Etc.)

Examiner: George Wallace | Date considered 3/20/98

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. An * indicates references that do not require a copy to be provided under 37 C.F.R. §1.98(d) because a copy was previously cited or submitted in a prior application, which is relied upon under 35 U.S.C. §120.

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Form PTO-1449 INFORMATION DISCLOSURE STATEMENT	Docket No.: N0003/7002	Serial No. 08/721,316
	Applicant: Shane D. Mattaway, et al.	
	Filed: September 25, 1996	Group: 2751

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U.S. Patent Documents

Ex.		Doc. No.	Date	Name	Class	Subcl.	Filed
		5,425,028	06/13/95	K.H. Britton et al.	370 ~~389~~		07/16/92

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Ex.		Doc. No.	Date	Name	Class	Subcl.	Filed
EP	A2	0,445,402	06/11/91	J.C. Wu			~~23/04/91~~
EP	A2	0,556,012	18/08/93	H. Wada et al.			~~09/02/93~~
WO		92,19054	29/10/92	E. Ferdinand et al.			~~10/04/92~~

OTHER DOCUMENTS (including, Author, Title, Date, Pages, Etc.)

		Internetworking with TCP/IP, Volume I, Second Edition, Principles, Protocols, and Architecture, by Douglas E. Comer.

Examiner: George B. Wallace | Date considered 4/16/98

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. An * indicates references that do not require a copy to be provided under 37 C.F.R. §1.98(d) because a copy was previously cited or submitted in a prior application, which is relied upon under 35 U.S.C. §120.

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ATTORNEY'S DOCKET NO.:N0003/7002

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Shane D. Mattaway et al.
SERIAL NO.: 08/721,316
FILED: September 25, 1995
FOR: GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
EXAMINER: --
ART UNIT: --

CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8(a)

The undersigned hereby certifies that this document is being placed in the United States mail with first-class postage attached, addressed to Assistant Commissioner for Patents, Washington, DC 20231 on the 25th day of March, 1998.

Rivki Cohen

Rivki Cohen

Assistant Commissioner for Patents
Washington, DC 20231

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Sir:

Transmitted herewith for filing is/are the following document(s):

[X] Information Disclosure Statement
[X] PTO Form 1449 and references cited

If the enclosed papers are considered incomplete, the Mail Room and/or the Application Branch is respectfully requested to contact the undersigned collect at (617) 367-4600, Boston, Massachusetts.

No fee is being submitted. If any fee is required, the balance may be charged to the account of the undersigned, Deposit Account No. 02-3038. A duplicate of this sheet is enclosed.

Respectfully submitted,

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ATTORNEY DOCKET NO.: **N0003/7002**
DATE: March 25, 1998
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ATTORNEY'S DOCKET NO.: N0003/7002

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Shane D. Mattaway et al.
Serial No.: 08/721,316
Filed: September 25, 1996
For: GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION
Examiner:
Art Unit:

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The undersigned hereby certifies that this document is being placed in the United States mail with first-class postage attached, addressed to Assistant Commissioner for Patents, Washington, DC 20231 on the 25th day of March, 1998.

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STATEMENT FILED PURSUANT TO THE DUTY OF DISCLOSURE UNDER 37 C.F.R. §§1.56, 1.97 AND 1.98

Sir:

Pursuant to the duty of disclosure under 37 C.F.R. §§1.56, 1.97 and 1.98, the applicant requests consideration of this information disclosure statement.

Compliance with 37 C.F.R. §1.97

This information disclosure statement has been filed before the mailing date of a first office action on the merits in the above-identified application.

No fee or certification is required.

Information Cited

The applicant hereby makes of record in the above-identified application the information listed on the attached form PTO-1449 (modified). The order of presentation of the references should not be construed as an indication of the relative importance of the references.

Remarks

A copy of each of the above-identified information is enclosed unless otherwise indicated on the attached form PTO-1449 (modified). It is respectfully requested that:

- The examiner consider completely the cited information, along with any other information, in reaching a determination concerning the patentability of the present claims;
- The enclosed form PTO-1449 be signed by the examiner to evidence that the cited information has been fully considered by the Patent and Trademark Office during the examination of this application;
- The citations for the information be printed on any patent which issues from this application.

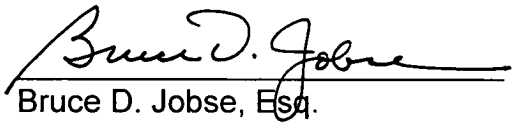
By submitting this information disclosure statement, the applicant makes no representation that a search has been performed, of the extent of any search performed, or that more relevant information does not exist.

By submitting this information disclosure statement, the applicant makes no representation that the information cited in the statement is, or is considered to be, material to patentability as defined in 37 C.F.R. §1.56(b).

By submitting this information disclosure statement, the applicant makes no representation that the information cited in the statement is, or is considered to be, in fact, prior art as defined by 35 U.S.C. §102.

It is understood by applicant that the foregoing information will be considered and, to the extent deemed appropriate by the examiner, will be reflected in the examiner's communication.

Respectfully submitted,



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Docket No.: N0003/7002

Date: March 25, 1998

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(54) Migration communication control device.

(57) Disclosed is a migration communication control device constructed to control a continuous communication between a mobile node and a node unaffected the mobile node's migration. The migration communication control device comprises a first migration control unit, a second migration control unit on the mobile node, and a third migration control unit on the partner node. The first migration control unit comprises a packet transfer unit and an address post unit. The packet transfer unit receives a packet which was destined for an outdated address of the mobile node, generates a conversion packet which holds an updated address instead of the outdated address, and then transmits the conversion packet, while an address post unit transmits an address post message which indicates the updated address to the third migration control unit. The second migration control unit comprises a migration post unit and a packet resumption unit. The migration post unit transmits to the first migration control unit a migration post message which indicates the updated address when the mobile node migrates to another network while a packet resumption unit receives the conversion packet from both the first migration control unit and the third migration control unit and resumes an original packet from the conversion packet. The third migration control unit comprises a packet conversion unit which converts a destination address of a packet into the updated address, then transmits it to the mobile node.

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BACKGROUND OF THE INVENTION

(1) Field of the Invention

The present invention relates to a migration communication control device that controls a communication between a mobile node and a corresponding node to enable them to communicate continuously when the former migrates by managing addresses assigned to the former each time it migrates across networks.

(2) Description of the Related Art

Recent progress in the field of electronic technology makes it possible to assemble smaller and lighter portable computers. These portable computers referred to as mobile nodes are designed so that they can migrate across networks: they are unplugged from a network and plugged in another and communicate with a stationary node. Thus, each of them is assigned a specific address to prove its identity. The address, in general, includes location information as to which network the mobile nodes are currently plugged in, and for this reason, a new address is assigned each time they migrate.

For example, the address composed of a network address unit for specifying a network in which the mobile node is currently plugged in and a node address unit for proving the mobile node's identity in the network, or the address used in a conventional network architecture such as Internet Protocol(details of which are in Internet Protocol, RFC791, Jon Postel, Sep., 1981), they must be changed every time the mobile nodes migrate.

However, once the mobile node migrates to another network, a communication with the stationary node will be terminated. This is because a packet is transmitted to its old address only to be wasted.

Thus, to enable the mobile node and stationary node to communicate continuously when the former migrates, it is necessary to control the communication by managing the steadily changing address.

To date, two address managing methods have been proposed: one by Sony Computer Science Laboratory Inc. and one by the Department of Computer Science at Columbia University.

Sony Computer Science Laboratory Inc. proposed a method using VIP(Virtual Internet Protocol), details of which are on "VIP : Lower Layer Internet Protocol", Fumio Teraoka, Yasuhiko Yokote, Mario Tokoro, Proceed of Data Processing Convention : Multimedia Communication and Distributed Processing.

In this method, each mobile node is assigned a VIP(Virtual Internet Protocol) address and a PIP(Physical Internet Protocol) address. The former is an unchanged address used in a communication application for packet transmission and reception; and the latter is an address changed for every migration to specify an update physical location of the mobil node. Data related to both addresses are held in a cache of a gateway. Under these conditions, the stationary node transmits a packet to the mobile node to the VIP address thereof, and the packet is converted into another packet addressed to the PIP address when it passes the gateway, thence transmitted to the mobile node via the gateways placed in a route onwards. These gateways collect data related to a correlation between the VIP and PIP addresses from the header of the packet upon the receipt thereof, thus updates data in the cache, and hence are able to convert other packets addressed to the VIP addresses into the packets addressed to the PIP addresses based on the correlation entered in the cache.

In this method, in short, the use of the address constituting with the VIP and PIP addresses enables the mobile node and the stationary node to communicate continuously when the former migrates.

The Department of Computer Science at Columbia University proposed a method using an Internet Protocol address of which network address unit does not specify the network which the mobile node is currently plugged in but declares itself to be the mobile node, hence a certain value is given as the network address unit to all the mobile nodes. As well, the method uses an MSS(Mobile Support Station) installed at each network to manage the IP addresses and control a packet route to the mobile node. The MSS is designed so that it collects data related to the update physical location of the mobile nodes by referring other MSSs.

Given these conditions, when the stationary node transmits a packet to the mobile node when it migrates, it first transmits the packet to a first MSS installed in its network; thence the first MSS transfers the packet to a second MSS installed in a network which the mobile node is currently plugged in; and finally the second MSS transfers the packet to the mobile node.

In this method, in short, the use of the MSS enables the mobile node and the stationary node to continue the communication when the former migrates.

In the first method, however, all the nodes must be constructed so that they understand both the VIP and PIP addresses, causing them to extend a scale functionally, otherwise making it impossible to apply this method to apparatuses employed in existing networks. In addition, the communication via the gateways reduces communication efficiency compared with direct packet transmission, because the gateways check whether they have received the packet addressed to the VIP address or PIP address each time they receive it, as well as whether or not to collect the data therefrom to update those in the cache.

In the second method, each network must have

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the MSS, and the communication via the MSSs makes it impossible to transmit the packet directly, thereby reducing the communication efficiency.

SUMMARY OF THE INVENTION

The present invention therefore has an object to provide a migration communication control device that is available to any apparatus employed in existing networks. Also the present invention has another object to provide a migration communication control device that enables the mobile node and stationary node to communicate continuously when the former migrates by transmitting and receiving the packet directly besides transferring the packet as has been done when the mobile node migrates across the networks.

The above objects are fulfilled by a migration communication control device constructed to control a communication between a mobile node and a partner node, the mobile node migrating across networks and obtaining an address assigned on each network while the partner node being a communication partner of the mobile node, comprising a first migration control unit, a second migration control unit, a third migration control unit, the second migration control unit being placed on the mobile node and the third migration control unit being placed on the partner node, wherein the first migration control unit comprises a packet transfer unit for receiving a packet which was destined for an outdated address of the mobile node, the outdated address assigned when the mobile node migrated to a network to which the first migration control unit is attached, generating a conversion packet which holds an updated address instead of the outdated address, and transmitting the conversion packet; and an address post unit for transmitting an address post message which indicates the updated address of the mobile node to the third migration control unit, the third migration control unit transmitting the packet received by the packet transfer unit, and the second migration control unit comprises a migration post unit for transmitting to the first migration control unit a migration post message which indicates the updated address of the mobile node when the mobile node migrates to another network; and a packet resumption unit for receiving the conversion packet from both the first migration control unit and the third migration control unit and resuming an original packet from the conversion packet, and the third migration control unit comprises a packet conversion unit for converting a destination address of a packet, the packet to be transmitted to the mobile node, into the updated address indicated by the address post message, the address post message sent by the first migration control unit, and transmitting it to the mobile node.

The migration post unit in the second migration control unit may transmit an identification key included in the migration post message, the identification key being employed to identify the mobile node.

The identification key may be an address of the mobile node assigned at one network before the network to which the mobile node is currently attached.

The identification key may be an address of the mobile node assigned before its initial migration.

The second migration control unit may be constructed to transmit to the third migration control unit the packet which has the same format as the resumed packet.

The first migration control unit may further comprise an address hold unit for holding the outdated address and the updated address by corresponding them with each other; and an address comparison unit for comparing the destination address of the received packet with the outdated address, wherein the packet transfer unit generates the conversion packet and transmits it when the address comparison unit detects that the destination address of the received packet coincides with the outdated address.

The first migration control unit may further comprise an address hold unit for holding the outdated address and the updated address by corresponding them with each other; and an address comparison unit for comparing the destination address of the packet received by the packet transfer unit with the outdated address, wherein the address post unit transmits the address post message which indicates the updated address of the mobile node to the third migration control unit, the third migration control unit transmitting the packet received by the packet transfer unit, when the address comparison unit detects that the destination address of the packet coincides with the outdated address.

The second migration control unit may further comprise an address hold unit for holding the outdated address and the updated address by corresponding them with each other; and an address comparison unit for comparing the updated address with the destination address of the packet received from one of the first migration control unit and the third migration control unit, wherein the packet resumption unit resumes the original packet from the conversion packet when the address comparison unit detects that the updated address coincides with the destination address of the packet received from one of the first migration control unit and the third migration control unit.

The third migration control unit may further comprise an address hold unit for holding the outdated address and the updated address of the mobile node by corresponding them with each other; and an address comparison unit for comparing the outdated address in the address hold unit with the destination address of the packet to be transmitted to the mobile node, wherein the packet conversion unit converts the des-

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tination address of the packet to be transmitted to the mobile node into the updated address which corresponds to the outdated address in the address hold unit when the address comparison unit detects the outdated address in the address hold unit coincides with the destination address of the packet.

There may be a plurality of the first migration control units, and the second migration control unit transmits the migration post message to at least one of the first migration control units.

The migration post unit in the second migration control unit may transmit the migration post message to the first migration control unit which is attached to the network to which the mobile node was attached before its migration, each of the first migration control units has a migration post unit for transmitting to one of the other first migration control units a migration post message to post the same address as the updated address indicated by the migration post message received from the second migration control unit, and each of the first migration control units has a migration post unit for transmitting a migration post message from one of the other first migration control units to another first migration control unit to post the same address as the updated address indicated by the received migration post message.

Each of the first migration control units and the second migration control unit may further comprise a pointer hold unit for holding pointers related to the first migration control unit to which the migration post message is transmitted, and wherein the migration post unit in each of the first migration control units and the migration post unit in the second migration control unit transmit the migration post message to each of the addresses related to each of the pointers.

Each of the pointers may be a broadcast address of the network to which one of the first migration control units is attached.

Each of the pointers may be an address which is assigned to one of the first migration control units uniquely.

Each of the pointers may be the address of the mobile node which is assigned when the mobile node is attached to the same network as is the first migration control unit, and the migration post unit in the first migration control unit and the migration post unit in the second migration control unit obtain the broadcast address of the network to which each of the first migration control units is attached with referring to the address of the mobile node, and transmits the migration post message to the obtained broadcast address.

The pointer hold unit in the second migration control unit may hold a pointer related to a first migration control unit for the latest migration, which is the first migration control unit being attached to one network before the network to which the mobile node is currently attached, and the pointer hold unit in the first migration control unit holds a pointer related to another first migration control unit attached to the same network as was the mobile node attached before migrating to the network to which the first migration control unit is attached.

The second migration control unit may further transmit to the first migration control unit the pointer by sending thereto the migration post message, the pointer to be held by the first migration control unit.

The first migration control unit may store into the pointer hold unit the pointer when it receives from the second migration control unit the migration post message by corresponding the pointer with the updated address indicated by the received migration post message.

Each of the first migration control units may further comprise an address hold unit for holding the outdated address and the updated address by corresponding them with each other, wherein a migration post message unit stores into the address hold unit the outdated address and the updated address by corresponding them with each other when it receives from the second migration control unit the migration post message, while converts the updated address in the address hold unit into the updated address indicated by the migration post message when it receives from the first migration control unit the migration post message and the outdated address indicated by the migration post message coincides with one of the updated addresses in the address hold unit.

The first migration control unit may be placed on a gateway, which connects networks.

The first migration control unit may be placed on the network as an individual node.

The migration post unit in the second migration control unit may transmit the migration post message to a home migration control unit, the home migration control unit being the first migration control unit which is attached to a network where the mobile node left for its initial migration, and the home migration control unit may further comprise a home migration post unit for transmitting a migration post message to a first migration control unit for the latest migration, the first migration control unit for the latest migration being the first migration control unit which is attached to the network where the mobile node left for the latest migration, to post the same updated address as is indicated by the migration post message received from the second migration control unit.

The first migration control unit may further comprise a migration post unit for transmitting the migration post message indicating the updated address of the mobile node to one of the other first migration control units when the conversion.packet destined for the outdated address of the mobile node was sent therefrom to the first migration control unit.

The migration post unit in the second migration control unit may transmit to the home migration control unit the migration post message where a home

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address and the updated address are corresponded with each other, the home address assigned when the mobile node is attached to the same network as is the home migration control unit, and each of the packet transfer unit and the address post unit in the home migration control unit may transmit the conversion packet and the address post message respectively with referring to the above home address and the updated address.

The second migration control unit may further comprise an outdated address post unit for transmitting to the first migration control unit for the latest migration an outdated address post message where the outdated address and the home address are corresponded with each other, the outdated address being assigned to the mobile node before the latest migration, the home migration post unit in the home migration control unit may transmit to the said first migration control unit for the latest migration the migration post message where the above home address and the updated address are corresponded with each other, and the packet transfer unit and the address post unit in the first migration control unit for the latest migration may transmit the conversion packet and the address post message respectively in accordance with the outdated address and the updated address, the outdated address and the updated address being corresponded with each other via the home address.

The outdated address post unit in the second migration control unit may transmit the above outdated address post message at a migration of the mobile node preceding the latest migration, and each of the migration post units in the second migration control unit and the home migration post unit in the home migration control unit may transmit the above migration post message at the latest migration of the mobile node.

The second migration control unit may further comprise a home migration control unit pointer hold unit for holding a pointer related to the home migration control unit, the migration post unit in the second migration control unit transmits the migration post message to the address related to the pointer, the home migration control unit may further comprise a pointer hold unit for the latest migration for holding a pointer related to the first migration control unit for the latest migration, and the home migration post unit in the home migration control unit may transmit the migration post message to the address related to the pointer.

Each of the above pointers may be the broadcast address of the network to which each of the first migration control units is attached.

Each of the above pointers may be the address assigned to each of the first migration control units uniquely.

The second migration control unit may further comprise a pointer obtainment unit for requesting to the first migration control unit for the latest migration the pointer related to the first migration control unit for the latest migration, and the migration post unit in the second migration control unit may post the obtained pointer to the home migration control unit together with the updated address by sending thereto the migration post message.

The migration post unit in the second migration control unit may post to the home migration control unit the pointer at the migration of the mobile node preceding the latest migration, while the migration post unit may post the above updated address at the latest migration of the mobile node.

The first migration control unit may further comprise an address post suppressing unit for suppressing transmission of the address post message from the address post unit to the third migration control unit, and the address post suppressing unit may suppress transmission of the address post message when none of the first migration control units is attached to the same network as is the mobile node.

The second migration control unit may further comprise a detect unit for detecting whether or not the first migration control unit is attached to the network to which the mobile node migrates, the migration post unit in the second migration control unit may transmit to the home migration control unit the migration post message which includes the detecting result of the above detect unit together with the updated address, the home migration post unit in the home migration control unit may transmit to the first migration control unit for the latest migration the migration post message which includes the detecting result of the above detect unit together with the updated address, and the address post suppressing unit in each of the home migration control unit and the first migration control unit for the latest migration may suppress the transmission of the address post message in accordance with the detecting result of the above detect unit.

The first migration control unit may further comprise a packet transfer suppressing unit for suppressing transfer of the packet conducted by the packet transfer unit.

The first migration control unit may further comprise an address post suppressing unit for suppressing transmission of the address post message from the address post unit to the third migration control unit, and the address post suppressing unit in the first migration control unit being attached to a network to which the mobile node is not attached, may suppress the transmission of the address post message when the packet transfer suppressing unit in the first migration control unit for the latest migration suppresses transfer of the packet.

The second migration control unit may further comprise a detect unit for detecting whether or not the packet transfer suppressing unit in the first migration

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control unit suppresses the transfer of the packet, the first migration control unit being attached to the network to which the mobile node migrates, and the migration post unit in the second migration control unit transmits to the home migration control unit the migration post message which includes the detecting result of the above detect unit together with the updated address, the home migration post unit in the home migration control unit may transmit to the first migration control unit for the latest migration the migration post message which includes the detecting result of the detect unit together with the updated address, and the address post suppressing unit in each of the home migration control unit and the first migration control unit for the latest migration may suppress the transmission of the address post message in accordance with the detecting result of the above detect unit.

The packet transfer suppressing unit in the first migration control unit for the latest migration may suppress the transfer of the packet conducted by the packet transfer unit, when the packet transfer suppressing unit in the first migration control unit being attached to the network to which the mobile node migrates suppresses the transfer of the packet.

The above objects may also be fulfilled by a packet transfer migration control unit in a migration communication control device, the migration communication control device being constructed to control a communication between a mobile node and a partner node, the mobile node migrating across networks and obtaining an address assigned on each network while the partner node being a communication partner of the mobile node, comprising a packet transfer unit for receiving a packet which was transmitted by the partner node to an outdated address of the mobile node, the outdated address being assigned when the mobile node migrated to a network to which the packet transfer migration control unit is attached, generating a conversion packet which holds an updated address instead of the outdated address, and transmitting the conversion packet; and an address post unit for transmitting an address post message which indicates the updated address of the mobile node to the partner node, the partner node transmitting the packet received by the packet transfer unit.

The above objects may further be fulfilled by a mobile node migration control unit in a migration communication control device, the migration communication control device being constructed to control a communication between a mobile node which migrates across networks and obtains an address assigned on each network and a partner node which is a communication partner of the mobile node, being placed on the mobile node and comprising a migration post unit for transmitting to a packet transfer migration control unit a migration post message which indicates an updated address of the mobile node when the mobile node migrates to another network, the packet transfer migration control unit for receiving a packet which was transmitted by the partner node to an outdated address of the mobile node, the outdated address assigned when the mobile node migrated to a network to which the migration control unit for packet transfer is attached, generating a conversion packet which holds the updated address instead of the outdated address, and transmitting the conversion packet; and a packet resumption unit for receiving the conversion packet from both the packet transfer migration control unit and the mobile node, and resuming an original packet from the conversion packet.

The above objects are finally fulfilled by a partner node migration control unit in a migration communication control device, the migration communication control device being constructed to control a communication between a mobile node which migrates across networks and obtains an address assigned on each network and a partner node which is a communication partner of the mobile node, being placed on the mobile node and comprising an address post message receiving unit for receiving an address post message which indicates an updated address of the mobile node from a packet transfer migration control unit, the packet transfer migration control unit transmitting an address post message which indicates the updated address of the mobile node to the partner node; and a packet conversion unit for converting a destination address of a packet, the packet to be transmitted to the mobile node, into the updated address indicated by the address post message, and transmitting it to the mobile node.

According to the above construction, the migration communication control device of the present invention transfers and converts the packet using the address assigned to the mobile node each time it migrates across networks, obviating particular addresses or devices such as the VIP address used conventionally. For this reason, the migration communication control device of the present invention can be applied to the existing partner node and mobile node so that they can communicate continuously by transferring the packet. Moreover, it is advantageous that the migration communication control device of the present invention is not necessarily applied to all the nodes to enhance communication efficiency; the present invention can be applied only to where necessary on the existing networks. More precisely, when any existing partner node communicates with the mobile node when it migrates, the packet can be transmitted directly from the mobile nodes to the existing partner node; and it can be transferred via the first migration control unit from the existing partner node to the mobile node, thereby enhancing communication efficiency.

Furthermore, when the partner node employs the migration communication control device of the

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present invention, communication efficiency is further enhanced thanks to the direct packet transmission and reception made possible by posting the update address of the mobile node from the first migration control unit to the third migration control unit.

Also, the devices such as MSS or a gateway employing the VIP are not necessarily installed at every network to which the mobile node migrates. To be precise, according to the present invention, the continuous communication is implemented even when the mobile node migrates to a network at which no special devices including above ones are installed.

BRIEF DESCRIPTION OF THE DRAWINGS

These and the other objects, advantages and features of the invention will become apparent from the following description thereof taken in conjunction with the accompanying drawings which illustrate a specific embodiment of the invention. In the drawings:

FIG. 1 is a block diagram depicting a construction of a migration communication control device in a first embodiment of the present invention;

FIG. 2 is a block diagram depicting a detailed construction of the migration communication control device employed as a mobile node in the first embodiment of the present invention;

FIG. 3 is a block diagram depicting a detailed construction of the migration communication control device employed as a gateway in the first embodiment of the present invention;

FIG. 4 is a block diagram showing a detailed construction of the migration communication control device employed as a stationary node in the first embodiment of the present invention;

FIG. 5 is a block diagram showing a detailed construction of the migration communication control device employed as an individual node in the first embodiment of the present invention;

FIG. 6 is an illustration showing a first example of a network to which the migration communication control devices in FIG. 2, 3, 4 are attached;

FIG. 7 is an illustration showing a second example of the network to which the migration communication control devices in FIG. 2, 3, 4 are attached;

FIG. 8 is an illustration showing a third example of the network to which the migration communication control devices in FIG. 2, 3, 4 are attached;

FIG. 9 is an illustration showing a fourth example of the network to which the migration communication control devices in FIG. 2, 3, 4 are attached;

FIG. 10 is an illustration showing (a) data in a data hold unit 1 in the mobile node (b) data in a data hold unit 1 in the migration communication control devices each employed as the gateway, the stationary node, and the individual node.

FIG. 11 is an illustration showing a format of a packet in the first embodiment of the present invention;

FIG. 12 is an illustration showing a format of a packet in the first embodiment of the present invention;

FIG. 13 is an illustration showing a content of the data hold unit 1 in the migration communication control device employed as the gateway;

FIG. 14 is an illustration showing a content of the data hold unit 1 in the migration communication control device employed as the individual node;

FIG. 15 is an illustration showing an example of a network to which the migration communication control device is attached in a second embodiment of the present invention;

FIG. 16 is a detailed block diagram depicting a home migration communication control device in the second embodiment of the present invention;

FIG. 17 is an illustration showing a content of a home mobile host list hold unit in the second embodiment of the present invention;

FIG. 18 is a detailed block diagram depicting the visitor migration communication control device in the second embodiment of the present invention;

FIG. 19 is an illustration showing a content of a visitor mobile host list hold unit in the second embodiment of the present invention;

FIG. 20 is a detailed block diagram depicting a migration address unit in the second embodiment of the present invention;

FIG. 21 is an illustration showing a content of an address hold unit in the migration address unit in the second embodiment of the present invention;

FIG. 22 is a detailed block diagram depicting a migration address unit in the second embodiment of the present invention;

FIG. 23 is an illustration showing a content of the address hold unit in the migration address unit in the second embodiment of the present invention;

FIG. 24 is an illustration showing a format of a data packet in the second embodiment of the present invention;

FIG. 25 is an illustration showing a format of a packet transfer message in the second embodiment of the present invention;

FIG. 26 is an illustration showing a flow of a data packet transmitted between devices in the second embodiment of the present invention;

FIG. 27 is an illustration showing a communication sequence in FIG. 26;

FIG. 28 is an illustration showing a construction of each data packet in FIG. 26;

FIG. 29 is an illustration showing a change in the content of each hold unit in FIG. 26;

FIG. 30 is an illustration showing a flow of each data packet transmitted between devices at an operation example in the second embodiment of

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the present invention;
FIG. 31 is an illustration showing a communication sequence in FIG. 30;
FIG. 32 is an illustration showing a construction of each data packet in FIG. 30;
FIG. 33 is an illustration showing a change in the address hold unit in each device in FIG. 33;
FIG. 34 is an illustration showing a flow of a data packet transmitted between devices at an operation example in the second embodiment of the present invention;
FIG. 35 is an illustration showing the communication sequence in FIG. 34;
FIG. 36 is an illustration showing a construction of each data packet in FIG. 34;
FIG. 37 is an illustration showing a change in the address hold unit in each device in FIG. 34;
FIG. 38 is an illustration showing a flow of each data packet transmitted between devices at an operation example in the second embodiment of the present invention;
FIG. 39 is an illustration showing a communication sequence in FIG. 38;
FIG. 40 is an illustration showing a construction of each data packet in FIG. 38;
FIG. 41 is an illustration showing a change in the address hold unit in each device in FIG. 38;
FIG. 42 is an illustration showing a flow of each data packet transmitted between devices in the second embodiment of the present invention;
FIG. 43 is an illustration showing a flow of each data packet transmitted between devices in the second embodiment of the present invention;
FIG. 44 is an illustration showing a flow of each data packet transmitted between devices in the second embodiment of the present invention; and
FIG. 45 is an illustration showing a flow of each data packet transmitted between devices in the second embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[Embodiment 1]

A construction of a migration communication control device in a first embodiment of the present invention is described hereunder with referring to FIGs. Hereinafter, the mobile node and partner node in the related art as well as in the summary of the invention are referred to as a mobile host and a stationary host, respectively.

FIG. 1 is an illustration showing the construction of the migration communication control device comprising a data hold unit 1, an application unit 2, a migration address unit 3, and a communication control unit 4.

The data hold unit 1 holds a couple of addresses of a mobile host by corresponding them. Each of the addresses in the data hold unit 1 is assigned before and after a migration of the mobile host.

The application unit 2 checks a connection as well as monitors a timer. The unit 2 is relevant for a higher layer in OSI model, which includes an application layer. For example, the unit 2 operates as TCP at TCP/IP (Transmission Control Protocol/Internet Protocol) or a layer which is higher than TCP.

The migration address unit 3 processes a migration address with referring to data in the data hold unit 1. The concrete operation of the migration address unit 3 varies depending on a type of the migration communication control device comprising the unit 3, and this will be described in detail later.

The communication control unit 4 controls the communication. The unit 4 is relevant for a lower layer in the OSI model. For example, the unit 4 operates as a layer which is lower than IP at TCP.

The application unit 2 and the communication control unit 4 are the same units as ones implemented on a general host. Besides the unit 2 and 4, the migration communication device in the first embodiment of the present invention includes the data hold unit 1 and the migration address unit 3; thereby implements an operation unique to this case. That is, the data hold unit 1 and the migration address processing unit 3 are attached to the mobile host which migrates across networks, or a stationary host which is attached to a network fixedly (for example, a gateway or a server); otherwise, they operate alone. Each device comprising the unit 1 and 3 supports a continuous communication unaffected by migration of the mobile host besides providing its own function.

The data hold unit 1 and the mobile address unit 3, which are included in the devices attached to the network, are described in FIGs. 2, 3, 4, 5. FIG. 2 shows a migration communication control device where the unit 1 and the unit 3 are attached to the mobile host which migrates across networks; FIG. 3 shows a migration communication control device where the unit 1 and the unit 3 are attached to a gateway which connects the networks; FIG. 4 shows a migration communication control device where the unit 1 and the unit 3 are attached to the stationary host, which is the communication partner of the mobile host; and FIG. 5 shows a migration communication control device attached to the network itself.

The migration communication control device in FIG. 2 (hereinafter referred to as a mobile host) further includes the application unit 2, the communication control unit 4, and an address obtainment unit 25, besides the data hold unit 1 and the migration address unit 3.

Each of the application unit 2 and the communication control unit 4 operates as the above; while the unit 2 together with the unit 4 operate as a conventional stationary host.

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The address obtainment unit 25 obtains an address of the mobile host assigned when it has migrated to another network. Although other options can be considered, such as employing a manual setting by an operator or communicating with a server computer which administrates addresses of the network, it is supposed here that the address is obtained in accordance with an instruction of a system administrator or the operator. The address obtainment unit 25 is also possessed by a general host and will not be described in detail.

The addresses held in the data hold unit 1 are obtained by the address obtainment unit 25.

The migration address unit 3 (enclosed with a broken line) consists of a response message transmission unit 20, a marked packet conversion unit 21, a migration address setting unit 26, a migration post transmission unit 27, a reception packet unit 28, and a marked packet resumption unit 29.

The response message transmission unit 20 transmits the packet which responds to the received packet if the response is needed.

The marked packet conversion unit 21 converts a packet received from the response message transmission unit 20 as well as the application unit 2 into a marked packet by converting the address of the received packet and marking the packet.

The migration address setting unit 26 stores the address obtained by the address obtainment unit 25 into the data hold unit 1. The address obtained by the unit 25 is the address of the mobile host assigned after the migration, and the unit 26 stores it into unit 1 by corresponding it to the address of the mobile host assigned before the migration.

The migration post transmission unit 27 posts via the communication control unit 4 that the address obtained by the unit 25 is held in the data hold unit 1 together with the correspondence between a couple addresses each of which assigned before and after the migration.

The reception packet unit 28 detects whether or not the received packet is marked, and sends the unmarked packet to the application unit 2 while sending the marked packet to the marketed packet resumption unit 29.

The marked packet resumption unit 29 resumes the marked packet.

The migration communication control device in FIG. 3 (hereinafter referred to as a gateway) further includes the application unit 2 and the communication control unit 4 besides the data hold unit 1 and the migration address unit 3 (enclosed with a broken line).

Each of the application unit 2 and the communication control unit 4 operates described the above, and the unit 2 together with the unit 4 operate as a conventional gateway.

The data hold unit 1 holds the correspondence between a couple of the addresses of the mobile host each of which assigned before and after migration.

The migration address unit 3 consists of a reception packet unit 35, a migration post information unit 36, an address comparison unit 37, an address conversion post transmission unit 38, and a marked packet conversion unit 39.

The reception packet unit 35 detects whether or not the received packet is the packet comprising a migration post message, which is transmitted by the mobile host. The unit 35 then sends the migration post message to the migration post information unit 36 while sending the other packets to the address comparison unit 37.

In accordance with the migration post message received from the reception packet unit 35, the migration post information unit 36 stores in the data hold unit 1 the correspondence between a couple of the addresses of the mobile host each of which assigned before and after the migration. The unit 36 also sends the migration post message to the address conversion post transmission unit 38.

The address comparison unit 37 detects whether or not the destination address of the packet received from the reception packet unit 35 coincides with the address of the mobile host assigned before migration, which is held in the data hold unit 1. When they coincide with each other, the unit 37 further sends to the marked packet conversion unit 39 the address assigned after the migration, which corresponds to the address which coincides with the destination address, as well as the packet received from the reception packet unit 35. On the other hand, when they do not coincided with each other, the unit 37 implements a function of a gateway by sending the packet to the application unit 2.

The address conversion post transmission unit 38 transmits to the destination address of the above packet received from the reception packet unit 35 an address conversion post message to inform that the address of the mobile host changes when the address comparison unit 37 detects a coincidence. Also the unit 38 transmits the address conversion post message to the network which satisfies the following two conditions: (1) the network where the address assigned before the migration, which is held in the data hold unit 1, is other than 0 (2) the migration communication control device employs as the gateway is not attached to the network. When the address conversion post message is transmitted to the network, which satisfies the above conditions, its destination address is a broadcast address of the network. The broadcast address consists of a network part and a host part, and every bit of the host part is 1.

The marked packet conversion unit 39 generates a marked packet when the address comparison unit 37 detects a coincidence. The unit 39 generates it by marking a general packet after converting the destination address of the packet. Then, the unit 39 trans-

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mits it.

The migration communication control device in FIG. 4 (hereinafter referred to as a stationary host) further includes the application unit 2 and the communication control unit 4 besides the data hold unit 1 and the migration address unit 3 (enclosed with a broken line).

Each of the application unit 2 and the communication control unit 4 operates as described the above, and the unit 2 together with the unit 4 operate as a conventional stationary host (not migrate).

The data hold unit 1 holds the correspondence between a couple of the addresses of the mobile host each of which assigned before and after the migration.

The migration address unit 3 consists of a reception packet unit 45, a marked packet resumption unit 46, an address conversion post information unit 47, an address comparison unit 48, and a marked packet conversion unit 49.

The reception packet unit 45 detects whether the received packet is the packet comprising the address conversion post message, the marked packet, or the other packets. The address conversion post message is transmitted by the gateway. Then the unit 45 sends the address conversion post message to the address conversion post information unit 47, the marked packet to the marked packet resumption unit 46, and the other packets to the application unit 2.

The marked packet resumption unit 46 resumes the unmarked packet from the marked packet, which is received from the reception packet unit 45.

The address conversion post information unit 47 obtains from the packet comprising the address conversions post message, which is received from the reception packet unit 45, the correspondence between the address of the mobile host assigned before the migration and the one assigned after the migration, and stores it into the data hold unit 1.

The address comparison unit 48 detects whether or not destination address of the packet received from the application unit 2 coincides with the address of the mobile host assigned before migration, which is held in the data hold unit 1. When they coincide with each other, the unit 48 further sends to the marked packet conversion unit 49 the address assigned after the migration, which corresponds to the address which coincides with the destination address, as well as the packet received from the application unit 2. On the other hand, when they do not coincided with each other, the unit 48 sends the packet to the communication control unit 4.

The marked packet conversion unit 49 generates a marked packet when the address comparison unit 37 detects a coincidence. The unit 49 generates it by marking a general packet after converting the destination address of the packet. Then, the unit 49 transmits it.

The migration communication control device in FIG. 5, which is attached to the network by itself, consists of the data hold unit 1, the migration address unit 3 (enclosed with a broken line), and the communication control unit 4.

The data hold unit 1 holds the correspondence between a couple of the addresses of the mobile host each of which assigned before and after the migration.

The migration address unit 3 consists of the reception packet unit 35, the migration post information unit 36, the address comparison unit 37, the address conversion post transmission unit 38, and the marked packet conversion unit 39. The units integrating the migration address unit 3 operate substantially same as equivalent units integrating the gateway in FIG. 3 except the following.

In FIG. 3 the address conversion post transmission unit 38 transmits the address conversion post message to the network satisfying both of the two conditions, which are described in the above; whereas, the address conversion post transmission unit 38 in FIG. 5 transmits the address conversion post message to the broadcast address of the network as long as the network satisfies the first condition, that is it transmits the address conversion post message to the network when the address assigned before the migration, which is held in the data hold unit 1, is other than 0.

FIG. 6 shows a first example of a network to which the migration communication control device as the mobile host in FIG. 2, the migration communication control device as the gateway in FIG. 3, and migration communication control device as the stationary host in FIG. 4 are attached. In the figure numeral 11 denotes a mobile host in FIG. 2, which migrates from a network A to a network B and obtains an address α assigned on the network A as well as an address β assigned on the network B.

Numeral 12 denotes a stationary host in FIG. 3, which is attached to the network B and obtains an address γ assigned thereon.

Numeral 12' denotes a stationary host in FIG. 3, which is attached to the network A and obtains an address γ' assigned thereon.

Numeral 13 denotes a gateway in FIG. 3, which has an address g. The gateway 13 is attached to both the network A and the network B.

The address on each network is assigned by a system administrator.

FIG. 7 shows a second example of a network to which the mobile host in FIG. 2, the gateway in FIG. 3, and the stationary host in FIG. 4 are attached. The stationary host is not illustrated in FIG. 7 since its location does not affect the communication with the mobile host.

In the figure the mobile host 11 migrates across network 1-4, and obtains an address m, m', m'', m'''

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assigned on each network respectively.

The network 5 as well as each of the network 1-4 (hereinafter referred to as the net 5, and the net 1-4 respectively) are connected with each other by a gateway 1-4, as shown in the figure.

A gateway 1-4 (hereinafter referred to as gw 1-gw 4) is the migration communication control device employed as the gateway in FIG. 3.

FIG. 8 shows a third example of the network to which the mobile host in FIG. 2, the gateway in FIG. 3, and the stationary host in FIG. 4 are attached. Construction of this network is substantially same as the second example of the network in FIG. 6 although operation thereof is different from the second example, which will be described later.

FIG. 9 shows a fourth example of the network to which the mobile host in FIG. 2, the migration communication control device in FIG. 5, the stationary host in FIG. 4 are attached. The migration communication control device as the stationary host will not be described here.

In the figure, numeral 11 denotes the mobile host which migrates across the network 1-4 and obtains the address m, m', m", m‴ assigned on each network respectively.

The network 5 as well as each of the network 1-4 (hereinafter referred to as the net 5, and the net 1-4 respectively) are connected with each other by a gw 1-4, as shown in the figure.

Each of the migration communication control unit 1-4 (hereinafter referred to as S1-S4) is relevant for the one in the FIG. 5.

An address used in the first embodiment of the present invention is described hereunder. Each address consists of a network part, which is assigned on each network and shared by every host attached to that network, as well as a host part, which is assigned to each host uniquely.

A broadcast address is a special kind of address, which can be divided into two types. The first one is the broadcast address used as the destination address in transmitting a packet from a network to another network, such as the broadcast address where every bit of the host part is 1. When the first type of the broadcast address is used as the destination address of the packet, the packet is transferred by the gateway to the network directed by the network part of the broadcast address. The other one is used in transmitting a packet within a network, such as the broadcast address where every bit of both the host part and the network part is 1. When the second type of the broadcast address is used as the destination address of the packet, the packet is transmitted to all the devices attached to the network, which includes the broadcast address. However, the gateway does not transfer the packet to any other network.

Operations of the migration communication control device in the first embodiment of the present invention are described hereunder with referring to drawings.

(operation example in FIG. 6)

In FIG. 6, when the mobile host migrates from the network A to the network B, the migration communication control device is operated as follows.

In a first operation, the mobile host and the gateway operate when the mobile host migrates across networks.

In a second operation, the stationary host transmits a packet to an address of the mobile host which was assigned before the migration.

In a third operation, the stationary host transmits the packet to an address of the mobile host which has been assigned after the migration.

In a fourth operation, the mobile host receives the packet which is transmitted by the stationary host.

In a fifth operation, the mobile host sends a response message to the stationary host.

(first operation in FIG. 6)

In FIG. 6 the mobile host 11 attached to the network A (enclosed with a broken line) migrates to the network B to complete ongoing communication with the stationary host 12, which is attached to the network B. When migrating to the network B, the address obtainment unit 25 in the mobile host 11 (FIG. 2) obtains the address β assigned on the network B.

Immediately after obtaining the address β, the address obtainment unit 25 gives the address β to the migration address setting unit 26 and the migration post transmission unit 27. The migration address setting unit 26 stores the address β into the data hold unit 1 by corresponding it to the address α, which is the address assigned before the migration. FIG. 10 (a) shows the content of the data hold unit 1. The migration post transmission unit 27 gives to the gateway 13 via the communication control unit 4 a packet comprising migration post message and the correspondence between the address α and the address β, so that the gateway 13 will know that the mobile host 11 has migrated to the network B. The mobile host 11 can transmit the packet both before and after the migration. In FIG. 6 a packet 51 is transmitted before the migration, and its format is shown in FIG. 11 (a). As shown in FIG. 11 (a), the packet 51 consists of a destination address 91, a source address 92, and data 93. The data 93 further comprise a message type 98, an address before migration 94, and an address after migration 95.

Receiving from the communication control unit 4 the packet 51, the gate way 13 sends it to the reception packet unit 35, the unit 4 and the unit 35 being in FIG. 3. From the message type 98 in FIG. 11 (a), the gateway 13 identifies the packet 51 with the migra-

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tion post message, and gives the packet 51 to the migration post information unit 36. The migration post information unit 36 obtains from the data 93 in the data packet 51 the address before migration α and the address after the migration β; then stores them into the data hold unit 1 by corresponding them with each other. The content of the data in the data hold unit 1 is shown in FIG. 10 (b).

Additionally, the destination address 91 of the packet in FIG. 11 (a), can be the broadcast address of the network A, where the network part names the network A and every bit of the host part is 1. When the broadcast address is employed, every stationary host attached to the network A, including the gate way 13, receives the correspondence of the addresses each of which assigned before and after the migration. In this case communication control unit 4 in the stationary host 12' receives the data packet 51, and gives it to the reception packet unit 45, the unit 4 and the unit 45 in FIG. 4. From the message type 98 in FIG. 11 (a), the reception packet unit 45 identifies the packet 51 with the migration post message, and gives the packet 51 to the address conversion post information unit 47. The unit 47 obtains from the data 93 in the data packet 51 the address before migration α and the address after the migration β and stores them into the data hold unit 1 by corresponding them with each other. Once those addresses are stored in the data hold unit 1, the stationary host 12' can transmit a packet to the address assigned after the migration instead of transmitting it to the address before the migration, the same to other stationary hosts attached to the network A.

(second operation in FIG. 6)

In the second operation, the stationary host 12 transmits a packet to the address assigned before the migration after the mobile host 11 migrates to the network B and obtains the address β assigned on the network B. It is supposed that the mobile host 11 transmits the packet 51, which comprises the migration post message, to the gateway 13 rather than to the broadcast address of the network A.

The stationary host 12, which is not notified that the mobile host 11 has migrated to the network B, transmits the packet to the address α of the mobile host, which was assigned before the migration. A packet 52 in FIG. 6 is transmitted by the stationary host 12 to the address α of the mobile host 11, and its format is shown in FIG. 11 (f). The packet 52 is received by the gateway 13. Because the gateway 13 is located between the source address of the packet 52 and the address of the mobile host α assigned before the migration, and also it is attached to the network A, to which the mobile host 11 was attached before the migration.

The gateway 13 employs its devices in FIG. 3 to implement its functions including reception of the packet. That is, the communication control unit 4 in the gateway 13 receives the packet 52, and sends it to the reception packet unit 35 in the migration address unit 3. The reception packet unit 35 identifies the packet 52 with a general packet and gives it to the address comparison unit 37. The unit 37 compares the destination address α of the packet 52 with the address before the migration, which is held in the data hold unit 1; then detects whether or not they are coincide with each other. When the destination address of the received packet does not coincide with the address assigned before the migration, the address comparison unit 37 sends the packet to the application unit 2. On the other hand, when they coincide with each other, the address comparison unit 37 obtains from the data hold unit 1 the address β of the mobile host assigned after the migration, which corresponds to the address α; then sends it both to the address conversion post transmission unit 38 and the marked packet conversion unit 39.

As is described the above, the packet 52 is transmitted to the address α of the mobile host 11 by the stationary host 12. Therefore, the address conversion post transmission unit 38 notifies the stationary host 12 that the address of the mobile host 11 has changed by transmitting thereto the packet 53. FIG. 11 (b) shows the packet 53. Simultaneously, the marked packet conversion unit 39 converts the packet 52 into the packet 53 by rewriting the destination address of the packet 52 to the address β assigned after the migration, returning thereto the previous destination address of the packet 52 as additional information, and marking to show that its destination address has changed; then sends the packet to the communication control unit 4. Thereby, the packet 52, which is converted into the marked packet 52', is transferred from the address α of the mobile host 11 assigned before the migration to the address β assigned after the migration. FIG. 12 (e) shows the packet 52'.

Receiving the packet 53 from the communication control unit 4 in the stationary host 12, it sends its packet 53 to the reception packet unit 45, the unit 4 and the unit 45 being in FIG. 4. From the message type 98 in FIG. 11 (b), the reception packet unit 45 identifies the packet 53 with the address conversion post message, and gives the packet 53 to the address conversion post information unit 47. The address conversion post information unit 47 obtains from the data 93 in the data packet 53 the address before migration α and the address after the migration β; then stores them into the data hold unit 1 by corresponding them with each other. Thereby, the stationary host 12 obtains the address of the mobile host 11 assigned after the migration, so that a direct communication between the stationary host 12 and the mobile host 11 is implemented.

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In the second operation the migration communication control device comprising the units in FIG. 4 is employed as the stationary host 12. However, a conventional stationary host, which is not constructed as the migration communication control device can also be communication partner of the mobile host if it is attached to a network. Therefore, hereunder a communication between the mobile host 11 and the convention stationary host is described.

When the conventional stationary host transmits a packet to the address of the mobile host 11 assigned before the migration after the mobile host 11 has migrated to another network, the gateway 13 transfers the packet to the address of the mobile host 11 assigned after the migration as well as sends to the stationary host the packet 53 comprising the address conversion post message in FIG. 11 (c). This operation is same as the above.

However, when receiving the packet 53, the stationary host disposes it since it does not support the address conversion post message and judges the packet 53 is not a required packet. Thus, the conventional stationary host cannot utilize the packet 53 to detect the address of the mobile host assigned after the migration nor hold the correspondence of the addresses each assigned before and after the migration.

Therefore, the stationary host gives the packet only to the address of the mobile host 11 assigned before the migration. Then, the gateway transfers the packet to the address of the mobile host 11 assigned after the migration, and the mobile host 11 receives the packet. The message from the mobile host 11, such as the response message, is transmitted to the stationary host directly, so that it is received by the stationary host without fail.

Thus, the conventional stationary host transmits a packet to the mobile host indirectly and receives a packet from the mobile host directly. Continuous communication unaffected by the mobile host's migration can be implemented, even when the conventional stationary host is employed.

(third operation in FIG. 6)

In the third operation, the stationary host 12 transmits the packet to the address β of the mobile host 11 assigned after the migration with referring to the correspondence of the addresses each assigned before and after the migration, which is held in the data hold unit 1. The third operation is described hereunder with referring to FIG. 4.

The stationary host 12 employs its devices in FIG. 4 to implement conversion of the destination address and the transmission of the packet, both of which integrate the third operation. That is, application unit 2 sends to the address comparison unit 48 the packet 54, whose destination address is the address α of the mobile host 11 assigned before the migration. FIG. 11 (f) shows a format of the packet 54. Then, the comparison unit 48 obtains the destination address of the packet 54 and detects whether or not it coincides with the address before the migration, which is held in the data hold unit 1.

The comparison unit 48 sends the packet 54 to the communication control unit 4 when the above addresses do not coincide with each other while it sends the packet 54 to the marked packet conversion unit 49 when the above addresses coincide with each other. In the third operation the coincidence is detected since the corresponded between the address α and the address β is stored in the data hold unit 1. Therefore, the packet 54 is sent to the marked packet conversion unit 49. Then the marked packet conversion unit 49 obtains from the data hold unit 1 the address β of the mobile host assigned after the migration, which corresponds to the address α as well as converts the packet 54 into the packet 54' by converting the destination address α into the address β, returning thereto the original destination address α as additional information, and marking the packet 54 to show that its destination address has changed; then sends the packet 54' to the communication control unit 4. FIG. 11 (c) shows a format of the packet 54'. Since the destination address of the packet 54' is an updated address of the mobile host 11, the packet 54' is given to the mobile host 11 without fail.

(fourth operation in FIG. 6)

In the fourth operation, the mobile host 11 receives the marked packet 54' and obtains the original unmarked packet 54 by resuming the packet 54'. This operation is described hereunder with referring to FIG. 2.

The mobile host 11 employs its devices in FIG. 2 to implement its operation. That is, the communication control unit 4 receives the packet 54' and sends it to the reception packet unit 28. The reception packet unit 28 detects that the received packet 54' is marked, and sends it to the marked packet resumption unit 29. The unit 29 obtains the original destination address α, which is held in the additional information 97, and replaces the current destination address β of the packet 54' with the address α. Then it sends the packet 54' to the application unit 2. Thus, the mobile host 11 can receive the packet destined for its outdated address.

(fifth operation in FIG. 6)

In the fifth operation, the mobile host 11 sends to the stationary host 12 a packet comprising a response message (hereinafter referred to as a response packet) or a packet excluding the response message (hereinafter referred to as a non-response

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packet). A type of the received packet determines whether or not it is responded with the response packet.

When the packet 54' is responded with a response packet, the mobile host 11 employs its devices in FIG. 2 to send the response packet. That is, the response message transmission unit 20 builds the response packet, and sends it to the marked packet conversion unit 21 together with the destination address α of the packet 54'.

The mobile host 12 also employs its devices to send the non-response packet 55. That is, the application unit 2 gives the address α assigned before the migration and the non-response packet to the marked packet conversion unit 21. The unit 21 sends the received packet to the stationary host 12 via the communication control unit 4 without marking it. FIG. 11 (e) shows the packet sent by the unit 21 to the stationary host 12.

The communication control unit 4 in the stationary host 4 receives the packet 55, and gives it to the reception packet unit 45. The unit 45 detects that the packet 55 is the non-response packet, so that it gives the packet 55 to the application unit 2. Thus, the stationary host and the mobile host implement a continuous communication unaffected by mobile host's migration. Although the migration communication control device is employed as the stationary host 12 in this embodiment, the conventional host can also be employed to transmit the non-response packet.

In the above, the unmarked response packet and the unmarked non-response packet are sent to the mobile stationary host 12. On the other hand, hereunder the operation of the mobile host 11 at conversion of the response packet and the non-response packet into the marked ones is described. This will be employed effectively in a communication between mobile hosts.

Receiving the unmarked packet from the application unit 2, the marked packet conversion unit 21 generates a packet 55' where the destination address and the source address are the address γ of the stationary host 12 and the address β assigned after the migration respectively. Also in generating the packet 55', the application unit 2 gives to the received packet the address α assigned before the migration as additional information as well as marks the received packet to indicate that the destination address has converted. FIG. 11 (d) shows a format of the packet 55'. Then the application unit 2 sends the packet 55' to the stationary host 12 via the communication control unit 4.

The communication control unit 4 in the stationary host 12 receives the packet 55', and sends it to the reception packet unit 45. Detecting the packet 55' is the marked packet, the reception packet unit 45 sends it to the marked packet resumption unit 46. The unit 46 resumes the packet 55' into the packet 55 by unmarking it and replacing the source address thereof with the address α assigned before the migration, which is held as the additional information. A format of the packet 55 is shown in FIG. 11 (e). Thus, the stationary host and the mobile host implement a continuous communication unaffected by mobile host's migration.

(operation example in FIG. 7)

In FIG. 7, when the mobile host migrates across the network 1, 2, 3, and 4, and obtains a temporary address assigned on each network, the newest address of the mobile host is transmitted to the stationary host, which operates as communication partner.

(migration from network 1 to network 2)

The address of the mobile host is m when it is attached to the network 1. When migrating from the network 1 to the network 2, the mobile host 11 replaces its address with m' assigned on the network 2. Then the mobile host 11 notifies the migration communication control device attached to the network 1 that it has migrated to the network 2 by sending thereto a packet comprising a migration post message. In FIG. 7 the migration communication control device gw 1, gw 2 attached to the network 1 receive the migration post packet 61, and store it into its own data hold unit 1. The operation in FIG. 7 is substantially same as the operation in FIG. 6 except that in FIG. 7 the packet 61 holds the address of the mobile host assigned before the last migration besides the correspondence of the addresses each assigned before and after the current migration. The address assigned before the last migration makes the gws prepare for further migration of the mobile host, which will be described later. A format of the packet 61 is shown in FIG. 12 (a). Since the migration from the network 1 to the network 2 is the first migration in FIG. 7, the packet 61 holds 0 at the address assigned before the last migration.

The gw 1 and the gw 2 store in the data hold unit 1 the correspondence of the addresses each assigned before and after the migration, as well as the address assigned before the last migration. As shown in FIG. 13 (a), m-m' and 0 are stored in the data hold unit 1 of each of the gw 1 and the gw 2.

Then, the gw 1 and the gw 2 detects from 0 at the address assigned before the last migration that no migration had been conducted before the current migration.

The broadcast address of the network 1 can be employed as the destination address of the migration post packet 61. If the packet is destined for the broadcast address, every host attached to the network 1, which includes the gw 1 and the gw 2, will hold the correspondence of the addresses each of which as-

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signed before and after the migration as well as the address assigned before the last migration. Thereby, the hosts attached to the network 1 can communicated with the mobile host directly.

(migration from network 2 to network 3)

When migrating from the network 2 to the network 3, the mobile host 11 obtains m" at the address assigned after the migration. Then the mobile host 11 notifies the gw 2 and a gw 3, both of which are attached to the network 2, that the mobile host 11 has migrated to the network 3 by transmitting thereto a packet comprising the migration post message, referred to as a packet 62 in FIG. 7. FIG. 12 (b) shows a format of the packet 62, which is transmitted to the gw 2. The broadcast address of the network 2 can be employed as the destination address of the packet 62. When the packet 62 is transmitted to the broadcast address of the network 2, every host attached to the network 2, which includes the gw 2 and the gw 3, holds the correspondence of the addresses each assigned before and after the migration.

The gw 2 employs its devices in FIG. 3 to process the packet 62. That is, receiving the packet 62, the gw 2 sends it to the migration post information unit 36 via the communication control unit 4 and the reception packet unit 35, then refers to the data hold unit 1 where m→m' and 0 are still held at the address correspondence and at the address assigned before the last migration respectively. The migration post information post unit 36 obtains from the packet 62 m'-m" as the newly assigned correspondence between the addresses each of which assigned before and after the current migration, the migration from the network 2 to the network 3. Then, it detects whether or not the address m' coincides with the address held in the data hold unit 1 as the address assigned after the last migration. Since the unit 36 detects the coincidence, it replaces the address m' in the unit 1 with the address m" as well as replaces the correspondence m-m' with the correspondence m-m".

Also the migration post information unit 36 sends to the data hold unit 1 the address m assigned before the last migration together with the address correspondence m'-m" obtained from the current migration. Now the data hold unit 1 in the gw 2 holds the address m at the address assigned before the last migration and the address correspondence m'-m" at the correspondence of the addresses each of which assigned before and after the migration as well as the address 0 at the address assigned before the last migration as well as the address correspondence m-m' at the correspondence of the addresses each of which assigned before and after the migration. After updating as well as adding the addresses in the data hold unit 1, the migration post information unit 36 sends to the address conversions post transmission unit 38 m'-m" as the newly obtained correspondence of the addresses before and after the current migration.

The address conversion post transmission unit 38 detects the network satisfying the following conditions with referring to the data hold unit 1 and then transmits the address conversion post message to the broadcast address of the detected network. That is, the address conversion post message is transmitted to the network where the address assigned before the migration, which is held in the data hold unit 1, is other than 0 as well as the migration communication control device employed as the gateway is not attached. Although in the migration from the network 2 to the network 3, the data hold unit 1 holds m at the address assigned before the last migration, the gw 2 is attached to the network 1; therefore, the unit 38 does not transmit the address conversion post to the network 1.

The packet 62 is also received by gw 3. When receiving the packet 62, the gw 3 employs its own devices in FIG. 3 to process the packet 62, which is substantially same as does the gw 2 except the following. That is, the address conversion post transmission unit 38 of the gw 3 detects that the gw 3 is not attached to the network 1. Also it is detected that the mobile host 11, attached to the network 1, has the address m as the address assigned before the last migration. Therefore, the unit 38 of the gw 3 transmits to the broadcast address of the network 1 a packet comprising the address conversion post message, which is referred to as a packet 63. FIG. 12 (c) shows the packet 63.

The packet 63 is received by the gw 2, the gw 1, both of which are attached to the network 1. Although it is also received by the stationary host 11, this will not be described here. Obtaining the current address correspondence m'-m" from the packet 63, where m' coincides with the address which has been held in the hold unit 1 at the address obtained after the migration, the gw 1 changes the m-m' in the data hold unit 1 into the m-m" by replacing m' with m" as the address assigned after migration.

On the other hand, the data hold unit 1 of the gw 2 had gained from the packet 62 the above information before receiving the packet 63. Therefore the content of the unit 1 of the gw 2 does not change across reception of the packet 63. This is because the gws of the present invention locate on a gateway, which connects a couple of networks. Due to its location, each gw receives packets from two networks. However, actually the packet 62 is destined for the network 2 and the packet 63 is destined for the network 1. Therefore, even though the gw 2, which are attached to both the network 1 and the network 2, receives both the packet 62 and 63 by the gw 2, this will not cause any problem in the communication between the stationary host 12 and the mobile host 11.

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FIG. 13 (b) shows the content of the data hold unit 1 in each of the gws.

(migration from network 3 to network 4)

When migrating from the network 3 to the network 4, the mobile host 11 obtains m''' as the address assigned after the migration. Then the mobile host 11 sends to the gw 3 and a gw 4, both of which are attached to the network 3, a packet comprising the migration post message. The packet received by the gw 3 is referred to as a packet 64. The broadcast address of the network 3 can be employed as the destination address of the packet 64. When the packet 64 is destined for the broadcast address of the network 3, every host attached to the network 2, which includes the gw 3 and the gw 4, obtains from the packet the correspondence of the addresses each of which assigned before and after the migration from the network 3 to the network 4.

The gw 3 employs its devices in FIG. 3 to process the packet 64. That is, receiving the packet 64, the gw 3 converts the content of the data hold unit 1 by replacing the address correspondence m-m'' with m-m''', newly holding m''-m''' obtained from the packet 64 as well as the address m' assigned before the last migration. Then, the address conversion post transmission unit 38 of the gw 3 transmits the address conversion post message to the network satisfying the following condition. That is, the address conversion post message is transmitted to the network where the address assigned before the migration, which is held in the data hold unit 1, is other than 0 as well as the gw 3 it self is not attached. The packet including the address conversion post message is referred to a packet 65, and the packet is transmitted to the broadcast address of the network 1. FIG. 7 (c) shows the packet 65.

The packet 64 is also received by gw 4. When receiving the packet 64, the gw 4 renews the content of the data hold unit 1 by replacing m'-m'' with m'-m''' as well as newly holding the address m' as the address assigned before the last migration. Further, the address conversion post transmission unit 38 of the gw 4 detects that the gw 4 is not attached to the network 2 which has the address other than 0 at the address assigned before the last migration; therefore, the unit 38 of the gw 4 transmits a packet comprising the address conversion post message, which is referred to as a packet 66, to the broadcast address of the network 2. FIG. 7 (c) shows the packet 66.

Receiving the packet 65, 65, the gw 2 and the gw 1 renew the content of its data hold unit 1, which is substantially the same as the above.

The gw 3 and the gw 2 receives the same information twice since the former receives the packet 64 and 65 while the latter receives the packet 65 and 66. This is because gws of the present invention locate on a gateway and receives packets from a couple of networks, which is described the above.

FIG. 13 (c) shows the content of the data hold unit 1 in each of the gws. Thus, according to the gws of the present invention, the packet transmitted to any of the addresses m, m', m'' is transferred by the gws to the updated address of the mobile host, the gws also notify the stationary host of the updated address.

For example, when the stationary host is not notified of the updated address of the mobile host and transmits a packet to the address m', the packet is received by the gw 2 and the gw 3, both of which are attached to the network 2. Then, the gw 2 and the gw 3 transfers the packet to the updated address of the mobile host as well as notifies the stationary host of the updated address. Thereby, the stationary host obtains the updated address of the mobile host, so that it will be able to communicate with the mobile host directly. The packet destined for the address m' is received by both the gw 2 and the gw 3, since they are attached to the network 2. Thus, the mobile host receives the same packet twice, once from the gw 2 and the other time from the gw 3, and the stationary host receives the same message twice; however, the repeated packet or the message can be simply ignored, so that this will not cause any problem in the communication between the stationary host and the mobile host. The repeated packet or the message is observed when the two gws are attached to each network in FIG. 7; whereas it is not observed when only one migration communication control device is attached to each network, which will be described later at the operation in FIG. 9.

(operation example in FIG. 8)

In FIG. 6, FIG. 7, the stationary host transmits the data packet to the outdated address after mobile host notifies the gws that it has migrated to another network. Then the gws transmit the address conversion post message to the stationary host. However, in FIG. 8 the gws convert the destination address of data the packet from the outdated address into the updated address assigned after the migration instead of transmitting the address conversion post message.

A packet 71, 72 in FIG. 8 are substantially same as the packet 51, 52 in FIG. 6. The operation conducted before the packet 72 is transmitted by the stationary host 12 and is received by the gateway 13 is substantially same as the first operation in FIG. 6. The operation which follows reception of the packet 72 is described hereunder with referring to FIG. 3.

The gate way 13 employs its units in FIG. 3 to process the packet 72. The communication control unit 4 receives the packet 72 and gives it to the reception packet unit 35 in the migration address unit 3. Detecting that the packet 72 is a general packet, the re-

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ception packet unit 35 sends it to the address comparison unit 37. The address comparison unit 37 detects whether or not the destination address of the packet 72 coincides with the address in the data hold unit 1 at the address assigned before the migration.

When no coincides is found, the address comparison unit 37 gives the packet 72 to the application unit 2. On the other hand, a coincidence is found, the address assigned after the migration, which corresponds with the address identical to the destination address of the packet 72, is obtained from the data hold unit 1, and is sent to the marked packet conversion unit 39 together with the packet 72. The marked packet conversion unit 39 generates a packet 72' where the destination address of the packet 72 is replaced with the address assigned after the migration, which is sent by the address comparison unit 37, the destination address of the packet 72 is added as additional address, and a mark is set to indicate that the destination address has converted. Then the packet 72' is sent to the communication control unit 4. FIG. 12 (e) shows a format of the packet 72', where identical numerals denotes the same units in FIG. 11. The packet 72' is sent to the mobile host 11 without fail since its destination address is the updated address thereof.

(operation example in FIG. 9)

In FIG. 9, the mobile host migrates across network 1, 2, 3, and 4. In FIG. 7 the gw 1-gw 4 are employed as the migration communication control devices; whereas in FIG. 9 the gw 1-gw 4 are employed simply as gateways to connect networks, and also another migration communication control device is attached to each network. The operation of the migration communication control device, which is connected to the network alone, at processing the migration post message or the address conversion post message is substantially same as one of the gw 1-gw 4 in FIG. 7. The flow of the migration post message and the address migration post message are mainly described hereunder.

(migration from network 1 to network 2)

When migrating from the network 1 to the network 2, the mobile host 11 sends a packet comprising the migration post message to the migration communication control device, which is attached to the network 1. In FIG. 9 (a) a migration post packet 81 is transmitted to a migration communication control device S1, which is attached to the network 1. The destination address of the packet 81 can be the broadcast address of the network 1.

The device S1 processes the packet 81 by employing its devices in FIG. 3. Receiving the packet 81, the device S1 stores into the data hold unit 1 the correspondence of the addresses each assigned before arid after the migration as well as the address assigned before the last migration. The migration post information unit 36 transmits the packet 81 to the address conversion post transmission unit 38; however, since the unit 38 detects that the address assigned before the last migration is 0, it does not transmit the address conversion post message to any network. The content of the data hold unit 1 in the S1-S4 are shown in FIG. 14 (a).

(migration from network 2 to network 3)

When migrating from the network 2 to the network 3, the mobile host 11 notifies the S2, which is attached to the network 2, that it has migrated to the network 3 by transmitting thereto the packet comprising the migration post message, which is referred to as a packet 82 in FIG. 9 (b).

The S2 employs its devices in FIG. 3 to process the packet 82. That is, it converts the content of the data hold unit 1 by renewing and adding new information, and finally holds in the unit 1 the address m'-m" at the correspondence of the addresses each of which assigned before and after the migration as well as the address m assigned before the last migration. Then, the migration post information unit 36 gives the newly obtained correspondence m'-m" to the address conversion post transmission unit 38.

The address conversion post transmission unit 38 detects whether or not the address assigned before the last migration, which is held in the data hold unit 1, is 0. If the address is not 0, the unit 38 transmits the address conversion post message to the broadcast address of the network which includes the detected address. In FIG. 9 (b) the address m is held at the address assigned before the last migration, so that the unit 38 transmits the packet 83 to the broadcast address of the network 1.

When receiving the packet 83, the migration communication control device S1, which is attached to the network 1, renews the content of the data hold unit 1 by newly holding the address correspondence m-m" as well as the address 0 at the address assigned before the last migration. Detecting 0 at the address assigned before the last migration, the address conversion post transmission unit 38 does not transmit the address conversion post to any network. The content of the data hold unit 1 in the S1-S4 are shown in FIG. 14 (b).

(migration from network 3 to network 4)

When migrating from the network 3 to the network 4, the mobile host 11 notifies the communication migration control device S3, which is attached to the network 3, that it has migrated to the network 4 by transmitting thereto a packet comprising the mi-

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gration post message, referred to as a packet 84 in FIG. 9 (c).

The migration communication control device S3 employs its devices in FIG. 3 to process the packet 84. That is, it newly holds into the data hold unit 1 the address correspondence m''-m''' as well as the address m' assigned before the last migration. Then, the address conversion post transmission unit 38 in the S3 transmits a packet comprising the address conversion post message, referred to a packet 85 in FIG. 9 (c), to the broadcast address of the network 2 since the address m' is held at the address assigned before the last migration in the data host unit 1.

When receiving the packet 85, the migration communication control device S2 employs its devices in FIG. 3 to process it. That is, it newly holds into the data hold unit 1 the address correspondence m'-m'' as well as the address m assigned before the last migration. Then, the address conversion post transmission unit 38 in the S2 transmits a packet comprising the address conversion post message, referred to a packet 86 in FIG. 9 (c), to the broadcast address of the network 2 since the address m is held at the address assigned before the last migration in the data hold unit 1.

When receiving the packet 86, the migration communication control device S1 employs its devices in FIG. 3 to process it. That is, it newly holds into the data hold unit 1 the address correspondence m-m''' as well as the address 0 at the address assigned before the last migration. The address conversion post transmission unit 38 in the S1 does transmit the address conversion post since 0 is detected at the address assigned before the last migration. The content of the data hold unit 1 in each of the S1-S4 are shown in FIG. 14 (c). Thus, according to the migration communication control device S1-S4 of the present invention, the S1-S4 are notified of the updated address of the mobile host at every migration, so that the packet transmitted to any of the addresses m, m', m'' is transferred thereby to the updated address of the mobile host. The S1-S4 also notify the stationary host of the updated address of the mobile host.

The operation in FIG. 9 differs from the operation in FIG. 7 in that each network has just one communication migration control device (one of the S1-S4), so that the migration post and the address conversion transmitted to S1-S4 are not duplicated.

In the format shown in FIG. 11 and 12, the mark 96 or the message type 93 indicates kind of packet. That is, mark 96 indicates whether or not the packet is marked while the message type 93 indicates whether it is the packet comprising the migration post message, the packet comprising the address conversion post message, and the general packet. Further, a protocol type can also be employed to indicate which migration communication control device is employed. For example, when TCP/IP is employed, the protocol number at the IP header thereof distinguishes the packet employed in the embodiment from other packets. That is, when the protocol number in the packet is identical with the one, which has been assigned to the protocol number field, the packet is the one employed in the embodiment.

In the first embodiment of the present invention, a nonvolatile storage can be employed as the data hold unit 1 of the mobile host. If so, the communication can be resumed even after the host or the gateway is turned off as well as after the system is reset.

Also even when the stationary host employs the nonvolatile storage as the data hold unit 1, it can resume the communication, which has interrupted by the switch off or the system reset, rather fast since it obtains from another host the updated address of the mobile host instead of receiving from the gateway the address conversion post message which shows the updated address.

For example, it is supposed in FIG. 7 that the mobile host 11 migrates from the network 1 to the network 4. The data hold unit 1 of the migration communication device holds the address correspondence m-m''' since it has communicated with the mobile host, which is attached to the network 4, at least once. According to the migration communication control device in the embodiment described the above, the packet is transferred from the outdated address to the updated address of the mobile host and the stationary host is notified of the updated address; therefore, even when the address information in the data hold unit is lost by switch off thereof, the stationary host will obtain the updated address. Restart of the communication can also be implemented by employing a specific host such as a server. That is, the server may be constructed to obtain the updated address of the mobile host at every migration, and give it to the stationary host whenever requested. In this case a packet comprising the address inquiry should be generated beforehand.

Also in the fifth operation in FIG. 6, the mobile host 11 employs the application unit 2 and sends to the marked packet conversion unit 21 the address assigned before the migration when transmitting the non-response address to the stationary host after it has migrated to another network. Instead of sending the non-response address, the application unit 2 can transmit a connection identifier to the marked packet conversion unit 21. In this case the data hold unit of the migration communication control device, employed as the mobile host, holds a correspondence between the connection identifier and the address that had been assigned when the connection was established instead of holding the correspondence between the correspondence of the addresses each assigned before and after the migration. Then, the unit 21 obtains the source address of the packet by detecting the address which corresponds to the identi-

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fier, which is held in the data hold unit 1.

As is described the above, the mobile host can employ the broadcast address of the network when transmitting the migration post to the migration communication control devices. When the broadcast address is employed, every host attached to the network, to which the migration communication control device is also attached, obtains the updated address of the mobile host. This implements a direct communication between the mobile host and the stationary host, which improves efficiency of the communication.

The address assigned before the last migration, which is held in the hold unit 1, can be replaced with the broadcast address assigned to the network to which the mobile host is attached before the last migration. If the broadcast address is employed, the gateway employed as the migration communication control device (gws) or the migration communication control device (Ss) needs to include the broadcast address in the address conversion post message. In this case both devices can obtain the broadcast address from the data hold unit; therefore, the operation thereof at requesting the broadcast address will be eliminated.

When storage capacity of the data hold unit 1 is limited, the data hold unit 1 holds only the useful data by disposing the unuseful data, which is least recently retrieved therefrom by the address comparison unit.

[Embodiment 2]

In FIG. 15 network A, B, and C are connected in a line via gateways 143 and 143', the gateway 143 placing between the network A and B while the gateway 143' placing between the network B and C.

A home migration communication control device 101 including a migration address unit 144 is attached to the network A; a visitor migration communication control device 109 including a migration address unit 145 is attached to the network B; and a visitor migration communication control device 109' including a migration address unit 145' is attached to the network C. A mobile host 146 including a migration address unit 115 is attached to the network A as its home network, and a stationary host 151 including a migration address unit 125 is also attached to the network A.

The mobile host 146 migrates across the network A, B, and C. It has a home address α assigned when it is attached to the network A, as well as other addresses assigned depending on where it migrates, such as a temporary address β on the network B and a temporary address γ on the network C.

Also each of the home migration communication control device 101, the visitor migration communication control device 109, 109' which are identical in its construction and the stationary host 151 has an address Ha, Va, Va', and Sa respectively assigned on the network.

Detailed function of the above devices 101, 109, 109', 146, and 151 is described hereunder, in which like components are labeled with like reference numerals.

[home migration communication control device 101]

When the mobile host 146 migrates from the home network to another network, it is assigned the temporary address. However if the stationary host 151 is not notified of that migration, it transmits an original data packet (hereinafter referred to as a noncapsulated data packet) to the home address α of the mobile host 146. When the noncapsulated data packet is destined for the outdated address of the home mobile host 146, the home migration communication control device 101 transfers that noncapsulated data packet from there to the updated address, that is the temporary address β or γ of the mobile host. Then, the device 101 posts to the stationary host 151 the temporary address β or γ here, so that the stationary host 151 will be able to communicate directly with the mobile host. The device 101 also posts the same information to the visitor migration communication control device 109, 109', so that the devices 109, 109' will implement the same function with the home migration communication control device 101.

As shown in FIG. 16 the home migration communication control device 101 consists of the migration address unit 144 and a communication control unit 108. The migration address unit 144 further comprises a home mobile host (MH) list hold unit 102, a packet transfer unit 103, a mobile host (MH) transfer unit 104, an address inquiry unit 105, a packet monitoring unit 106, an address post unit 107.

Next the function of each component integrating the device 101 will be described. The communication control unit 108 mainly controls the communication of protocols located in lower layers including a physical layer, such as the protocol lower than IP.

The address post unit 107 receives from the mobile host 146 an data packet including an address post message. The address post message is generated when the mobile host 146 migrates to the network B or C, and posts the temporary address β or γ of the mobile host to the device 101. The unit 107 sends the address post message to the mobile host transfer unit 104 as well as sends a response message to the mobile host 146. FIG. 28 (3) is an example of the address post message, which includes the home address α as well as the temporary address β or γ of the mobile host 146, a value of an autonomous flag F, and a broadcast address Bba, Cba on the network B, C. The autonomous flag F will be described later. FIG. 28 (4) is an example of the response message.

A mobile host transfer unit 104 stores the address post message into the home mobile host list hold unit

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102, notifies the visitor migration communication control device 109 or 109' of the migration of the mobile host 146 by sending thereto a mobile host transfer message, and receives the data packet including the response. Further, according to a direction given by the packet transfer unit 103, the unit 104 transmits the mobile host transfer message both to the stationary host 151 and the device 109 or 109'. The unit 103 gives the direction when the value of the autonomous flag F is 1.

FIG. 32 (3) and FIG. 36 (5) are examples of the mobile host transfer message including the home address α, the temporary address β or γ, and the autonomous flag F. Since the mobile host transfer message is sent to the stationary host 151 is sent only when the autonomous flag F is 1; therefore, it does not necessarily include the value of the flag F. However, the identical message is sent both to the stationary host 151 and the visitor migration communication control device 109, 109' in this embodiment to simplify the construction of the mobile host transfer unit 104. FIG 32 (4) is an example of the response message.

As shown in FIG. 17, the home mobile host list hold unit 102 holds the home address α, the temporary address β, γ, the value of the autonomous flag F, and the broadcast address Bba, Cba on the network B, C, all of which are obtained from the mobile host transfer unit 104.

The packet monitoring unit 106 receives the packet destined for the home address α of the mobile host 146, then sends it to the packet transfer unit 103 when the stationary host 151 transmits the packet to the home address α of the mobile host 146 after the mobile host 146 has migrated to another network.

The packet transfer unit 103 has a payload including the noncapsulated data packet and the packet transfer message informing the transfer of the noncapsulated data packet, generates another data packet, and sends it to the temporary address β, γ of the mobile host 146. FIG. 32 (2) is an example of the packet transfer message. As is described the above, the packet transfer unit 103 directs the mobile host transfer unit 104 to transmit the mobile host transfer message to the stationary host 151 only when the autonomous flag in the home mobile host list hold unit 102 shows the value of 1. The operation conducted when the flag F is 1 will be described later.

When the stationary host 151 has problems in communicating with the mobile host 146 such as receiving the unusual mobile host transfer message, the address inquiry unit 105 is employed to solve the problems. That is, receiving from the stationary host 151 an address inquiry message, the address inquiry unit 105 transmits to the stationary host 151 a data packet which responds to the address inquiry by showing the address to be used in the communication. The address inquiry message includes a type field 132, a flag field 133, a sequence field 134, and a home address field 138, each of which having value 5, 1, a certain number, and α respectively; while the response message includes a temporary address field 139 filled with the temporary address β, γ as well as the flag field with 2, besides the type field 132, the sequence field 134, and the home address field 138 filled with the same values in the address inquiry message.

[visitor migration communication control device 109]

The visitor migration communication control device 109 implements the same function with the home migration communication control device 101. That is, when the stationary host 151 transmits an encapsulated data packet to the temporary address β of the mobile host 146, which is the updated address thereof since the mobile host has migrated to the network C, the visitor migration communication control device 109 transfers that encapsulated data packet from the temporary address β to temporary address γ. Then, the device 109 posts to the stationary host 151 the temporary address γ, so that the stationary host 151 will be able to communicate directly with the mobile host 146. However, whether or not the device 109 provides the above packet transfer service will be determined in accordance with a processing load put on the device 109 or with a initial setting given by a system operator; thus, the packet transfer service of the device 109 is not necessarily an obligation.

As shown in FIG. 18, the visitor migration communication control device 109 consists of the migration address unit 145 and the communication control unit 108. The migration address unit 145 further comprises the packet monitoring unit 106, a visitor mobile host list hold unit 110, a packet transfer unit 111, a mobile host transfer unit 112, a mobile host visit unit 113, and an autonomous support unit 114. The unit 106 and the unit 108 function the same as those in the home migration communication control device 101.

Receiving an autonomous packet transfer support check message inquiring if the visitor migration communication control device 109 provides the packet transfer service, the autonomous support unit 114 responds to it with the response message where the autonomous flag F shows 1 when the device 109 provides that service or 0 when it does not provide that service. FIG. 28 (1) is an example of the autonomous packet transfer support check message, while FIG. 28 (2) is an example of the response message including the autonomous flag F and the broadcast address Bba.

Receiving from the mobile host 146 the mobile host visit message which informs that the mobile host 146 has migrated to the network B, the mobile host unit 113 responds it with the response message after storing the mobile host visit message into the visitor mobile host list hold unit 110. The mobile host visit

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message includes the home address α and the temporary address β of the mobile host 146. FIG. 28 (5) is the format of the mobile host visit message, while the FIG. 28 (6) is the format of the response message.

Receiving from the mobile host transfer unit 104 in the device 101 the mobile transfer message informing that the mobile host 146 has migrated to the network C, the mobile host transfer unit 112 stores in the visitor mobile host list hold unit 110 the updated temporary address γ of the mobile host 146 and the value of the autonomous flag F by corresponding them to the home address α. The unit 112 also transmits to the stationary host 151 the mobile host transfer message in accordance with the direction from the packet transfer unit 111, as does the mobile host transfer unit 104 in the device 101.

As shown in FIG. 19, the visitor mobile host list hold unit 110 holds the home address α and the temporary address β on the network B, which are obtained from the mobile host 146 via the mobile host visit unit 113, as well as the temporary address γ and value on the autonomous flag F, which are obtained from the home migration communication control device 101 via the mobile host transfer unit 112.

The packet transfer unit 111, as does the packet transfer unit 103 in the home migration communication control device 101, transmits to the temporary address γ the data packet including the transfer message as well as orders the mobile host transfer unit 112 to transmit the mobile host transfer message.

[mobile host 146]

As shown in FIG. 20, the mobile host 146 includes the migration address unit 115, an address obtainment unit 116, the communication control unit 108, and an application processing unit 124 which mainly controls the communication of protocols located in higher layers including an application layer, such as TCP or layers located higher than it.

The migration address unit 115 comprises the a packet transmission unit 117, a transfer packet reception unit 118, an address hold unit 119, a migration unit 120, an autonomous support unit 121, an address post unit 122, a mobile host visit unit 123.

The migration address unit 115 comprising the above units is employed in transfer of data to the temporary address β or γ when the mobile host 146 migrates to the network B or C. Also receiving the data packet destined for the temporary address β or γ including the packet transfer message and the noncapsulated data packet, the device 115 transmits the noncapsulated data to the application processing unit 124.

In accordance with the order given by the application processing unit 124 when the mobile host migrates to the network B, C, the migration unit 120 controls the address obtainment unit 116, the autonomous support unit 121, the address post unit 122, the mobile host visit unit 123, and the address hold unit 119.

Directed by the migration processing unit 120, the address obtainment unit 116 obtains the temporary address β, γ of the mobile host 146 assigned when it migrates to the network B, C respectively. BOOTP in "Bill Croft and John Gilmore, BOOTSTRAP PROTOCOL RFC951, Sep., 1985" is an example of obtaining the temporary address; besides employing the BOOTP, the operator may input the temporary address β, γ assigned by a system administrator of the network B, C.

Directed by the migration unit 120, the autonomous support unit 121 sends the autonomous packet transfer support check message to inquire if the visitor migration communication control device 109, 109' attached to the network B, C provides the packet transfer service and receives the response message to the inquiry. The autonomous packet transfer support check message is also sent to obtain the broadcast address Bba and Cba on the network B and C respectively.

Directed by the migration unit 120, the address post unit 122 sends the address post message to notify the home migration communication control device 101 of the temporary address β, γ. The address post message also informs whether or not the device 109, 109' provides the packet transfer service as well as the broadcast address Bba, Cba on the network B, C. If the response message from the visitor migration communication control device 109, 109' has the value 1 of the autonomous flag F, the mobile host visit unit 123 transmits to the visitor migration communication control device 109, 109' the mobile host visit message including the home address α as well as the temporary address β, γ respectively.

As shown in FIG. 21, the address hold unit 119 previously holds the home address α of the mobile host 146 and the broadcast address Aba on the network A. Now, the unit 119 newly holds the temporary address β or γ obtained from the address obtainment unit 116 via the migration unit 120 and the broadcast address Bba or Cba obtained from the autonomous support unit 121 via the migration unit 120.

When the mobile host 146 is attached to the network A and receiving a data packet destined for the home address α, the transfer packet reception unit 118 sends data etc. in the noncapsulated data packet to the application processing unit 124. On the other hand, when the mobile host 146 is attached to the network B and receiving a data packet destined for the temporary address β, the data packet including the packet transfer message and the noncapsulated data packet destined for α, the unit 118 sends to the application processing unit 124 data etc. in the noncapsulated data. Thus, the application processing

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unit 124 receives the data without being affected by the migration of the mobile across the networks.

Receiving the data to be transmitted and the instruction from the application processing unit 124, the packet transmission unit 117 generates a noncapsulated data packet whose destination address is the home address α and transmits it.

[stationary host 151]

As shown in FIG. 22, the stationary host 151 comprises the migration address unit 125 and the application processing unit 161 which mainly controls the communication of a protocol located in higher layers including application layer, such as TCP or layers located higher than the TCP and the communication control unit 108.

The migration address unit 125 comprises a transfer packet transmission unit 126, a packet reception unit 127, an address hold unit 128, an address inquiry unit 129, and the mobile host transfer unit 130.

The migration address unit 125 comprising the above units generates a noncapsulated data packet and sends it to the home address α when it is not notified that the mobile host 146 migrate to the network B or C and obtained the temporary address β or γ respectively. The unit 125 also generates an encapsulated data packet including as a payload the noncapsulated data packet and a data transfer message, which informs transfer of the noncapsulated data packet and sends it to the temporary address β, γ, when it is notified of the migration.

Receiving from the home migration communication control device 101 and the visitor migration communication control device 109, 109' the data packet including the mobile host transfer message which informs the migration of the mobile host 146, the mobile host transfer unit 130 stores into the address hold unit 128 the home address α and the temporary address β or γ of the mobile host 146 assigned on the network B or C respectively.

As shown in FIG. 23, the address hold unit 128 holds the home address α, the temporary address β or γ by corresponding them.

Directed by the application unit 161, the transfer packet transmission unit 126 generates a data packet destined for the home address α, and transmits it. However, if the address hold unit 128 holds the temporary address β or γ besides the home address α, the unit 126 generates an encapsulated data packet destined for the temporary address β or γ, which includes as a payload a noncapsulated data packet and a packet transfer message, which informs transfer of the noncapsulated data packet, and transmits it.

As is described the above, both the home migration communication control device 101 and the visitor migration communication control device 109, 109' generate the encapsulated data packet including the packet transfer message and the noncapsulated data and transmits it to the current temporary address of the mobile host 146. Owing to the device 101 or 109, 109', the stationary host 151 is able to transmit to the mobile host 146 both the noncapsulated data packet destined for the home address α and the encapsulated data packet destined for the temporary address β or γ without failure even when the address hold unit 128 fails to hold the current temporary address β or γ and the stationary host 151 transmits the data packet to the outdated address of the mobile host 146.

The packet reception unit 127 receives a data packet which is sent from the mobile host 146 and has Sa as its destination address, and sends the data etc. in it to the application unit 161.

When the address inquiry unit 129 has problems such as that it received an illegal mobile host transfer message or that it cannot communicate with the mobile host 146 successfully, it transmits a data packet including an address inquiry message in order to inquire of the host migration communication control device 101 the address which is currently used to communicate with the mobile host 146.

[construction of data packet]

As shown in FIG. 24 (a), (b), (c), there are three kinds of data packets, each data packet 210, 220, 230, includes each of header 211, 221, 231 and payload 212, 222, 232 respectively.

The header 211 of the data packet 210 includes a destination address 201, and a source address 202. Also the payload 212 consists of a transmission data 203.

The header 221 of the data packet 220 includes the destination address 201 and the source address 202. Also the payload 222 consists of a message 204.

The header 231 of the data packet 230 includes the destination address 201 and the source address 202. Also the payload 232 consists of the message 204, which is employed as the packet transfer message, and a noncapsulated data packet 210. Also each header 211, 221, 231 includes information showing presence or absence of the message 204 as a protocol number etc.

The message 204 includes some of the fields in FIG. 25 in accordance with its type.

The type of the message 204 is indicated in the message type field 132. Besides the above types, the message 204 is also employed as an echo message for examining whether or not a host employs an appropriate operation in accordance with the message.

A flag field 133 indicates whether or not the message 204 is a response. When the message 204 is not the response, the field 133 further indicates whether or not the message 204 requests a response.

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A sequence field 134 gives a single number both to the request message and its response message, thereby the request message and the response message are corresponded.

An autonomous flag field 135 contains a value of the autonomous flag F indicating whether or not the visitor migration communication control device 109,109' provide the packet transfer service.

A counter field 136 contains a counter indicating the number of the visitor migration communication control devices employed to transfer the encapsulated data packet consisting of the packet transfer message and the noncapsulated data packet. The visitor migration communication control device increments the counter in the received message packet by 1, and gives it to the message to be transmitted. When the incremented number is greater than the predetermined number, the received message packet is disposed.

A status field 137 of the response message indicates presence or absence of an error in a transmission/reception of the data packet. For example, it indicates an error in authentication information, which will be described later, or the address inquiry message which cannot or should not be responded.

A home address field 138, a temporary address field 139, and a broadcast address field 140 indicates the home address as well as the temporary address of the mobile host 146 or the broadcast address on its home network or on the network it migrates. However, what the broadcast address field 140 indicates depends on type of the message 204. Whether the message 204 is the request or the response also devices the content of the broadcast address field 140.

The authentication information field 141 indicates if a source address coincides with the sender's address.

[outline of communication operation]

The home migration communication control device 101 and the visitor migration communication control device 109,109' is basically employed to transfer the data packet transmitted by the stationary host 151 as well as post to the stationary host 151 the updated temporary address of the mobile host 146. Understanding of such operations will be helped by the following two points.

1. Transfer of the data packet and posting of the updated temporary address are conducted only when the mobile host 146 migrates from its home network to another network. The home network refers to the one to which the home migration communication control device is attached.

2. Posting of the updated temporary address is conducted only when the autonomous flag F is 1, which indicates the visitor migration communication control device 109, attached to the same network as is the mobile host 146, provides the packet transfer service. Otherwise, the data packet transmitted by the stationary host 151 to the posted temporary address will not be received by the mobile host 146 when the mobile host 146 migrates to another network.

[communication operation 1]

An example of the communication operation is described hereunder. In the communication operation 1 the visitor migration communication control device 109,109' provides the packet transfer service when the mobile host 146 migrates from the network A to the network B, further from the network B to the network C.

[migration from network A to network B]

The operation at the migration of the mobile host 146 from the network A to the network B is described with referring to FIGs. 26-29. FIG. 26 shows a flow of the data packet transmitted between the devices; FIG. 27 shows a communication sequence of the data packet; FIG. 28 shows construction of each data packet; and FIG. 29 shows the content of the address hold unit 119 etc.

When the mobile host 146 is attached to the network A, the home mobile host list hold unit 102 in the home migration communication control device 101 holds the home address α both as the home address and the temporary address of the mobile host 146. Thereby the home migration communication control device 101 detects that the mobile host 146 is attached to the network A.

The address hold unit 119 in the mobile host 146 holds the home address α and the broadcast address Aba on the network A.

When the mobile host 146 migrates to the network B, the application unit 124 orders the operation of the migration unit 120 in accordance with the instruction given by the operator. The temporary address β is assigned to the mobile host 146 on the network B, and the address obtainment unit 116 obtains it. The migration unit 120 stores into the address hold unit 119 the temporary address β together with the home address α and the broadcast address Aba.

(1) The autonomous support unit 121 transmits to the visitor migration communication control device 109, which is attached to the network B, the data packet including the autonomous packet transfer support check message 147 which holds the home address α and the temporary address β. The destination address of the data packet is the broadcast address shared by every network, such as an address where every bit is 1. The message 147 does not necessarily hold the home address α and the temporary address β although

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they can be used in checking the security of the network if it does. Also the message 147 holding the home address α and the temporary address γ can take the place of a mobile host visit message 146, which will be described later.

(2) The autonomous support unit 114 in the visitor migration communication control device 109 responds to the autonomous support unit 121 with the response message 147R where broadcast address Bba is set and the autonomous flag F in the autonomous flag field 135 indicates 1 to inform that the device 109 provides the packet transfer service.

The mobile host 146 transmits the data packet to the visitor migration communication control device 109. The broadcast address Bba is employed as the destination address of the data packet and it is set in the response message 147R; however, this is not an obligation.

That is, when the response message 147R does not hold the broadcast address Bba, the following means can be employed. First, the broadcast address shared by every network can be employed, which is described in the above. Second, the source address, which is set in the header of the data packet comprising the response message 147R, can be employed. Third, a so called name service can be employed, where a server device on the network system informs the broadcast address Bba. Finally, when the address assigned to each of the devices, which are attached to the network, consists of the network address being unique for the network and a device address being unique for the devices, and the broadcast address on each network consists of such network address and the device address where the value of every bit is 1, the network address Bba can be generated by employing the network address included in the temporary address β of the mobile host 146.

(3) The address post unit 122 transmits to the home migration communication control device 101 the address post message 148. The message 148 includes the value 1 of the autonomous flag F, which is obtained from the response message, home address α, the temporary address β on the network B, and the broadcast address Bba, and the broadcast address Aba is the destination address of the address post message 148.

When the address post unit 107 in the home migration communication control device 101 receives the address post message 148, the mobile host transfer unit 104 stores in the home mobile host list hold unit 102 the temporary address β, the value 1 of the autonomous flag 1, and the broadcast address Bba by corresponding them to the home address α. Since the home address α had been stored as the temporary address before the temporary address β was stored, the mobile host transfer unit 104 knows that the mobile host 146 has migrated from the network A to the network B; therefore, it does not transmit the mobile host transfer message to the visitor migration communication control device 109,109'. That is, the data packet transmitted by the stationary host 151 to the home address α of the mobile host 146 is received by the home migration communication control device 101 and transferred thereby to the temporary address β; therefore, the visitor migration communication control device 109,109' is not employed here.

(4) The address post unit 107 notifies the address post unit 122 that it has received the address post message 148 by sending the response message 148R.

(5) Since the visitor migration communication control device 109 provides the packet transfer service, the mobile host visit unit 123 transmits to the visitor migration communication control device 109 the mobile host visit message 149 including the home address α and the temporary address β, so that the device 109 is notified that the mobile host 146 has migrated to the network B. The mobile host visit message 149 is destined for the broadcast address Bba.

The mobile host visit unit 113 in the visitor migration communication control device 109 receives the mobile host visit message 149 and stores into the visitor mobile host list hold unit 110 the home address α as well as the temporary address β. The temporary address β is stored also as the updated temporary address of the mobile host 146, which will be assigned when the mobile host 146 migrates from the network B to another network; thereby, the visitor migration communication control device 109 detects that the mobile host is currently attached to the network B.

(6) The mobile host visit unit 113 notifies the mobile host visit unit 123 by sending the response message 149R that it has received the mobile host visit message 149.

[communication between the stationary host 151 and the mobile host 146 on the network B]

The operation at the communication between the stationary host 151 and the mobile host 146 when the mobile host is attached to the network B is described hereunder with referring to FIGs. 30-33, which are relevant for FIGs.26-29.

(1) The application unit 161 in the stationary host 151 directs the transmission of the noncapsulated data packet, whose destination is the home address α, despite the migration of the mobile host 146. Immediately after the mobile host 146

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migrates to the network B, that is, when the address hold unit 128 does not hold the home address α and the temporary address β, the transfer packet transmission unit 126 is not notified of the migration; therefore, it generates the noncapsulated data packet 152 and transmits it to the home address α in accordance with the direction from the application unit 151.

The noncapsulated data packet 152 is not received by the mobile host 146, which is not attached to the network A, but by the packet monitoring unit 106 in the home migration communication control device 101 since the home mobile host list hold unit 102 in the device 101 holds the home address α as well as the temporary address β, which coincides with the destination address of the noncapsulated data packet 152.

(2) The packet transfer unit 103 in the home migration communication control device 101 generates an encapsulated data packet including the noncapsulated data packet 152, which is received by the packet monitoring unit 106, and the packet transfer message 153, which informs the transfer of the noncapsulated data packet 152; and transmits it to the temporary address β. The packet transfer message 153 includes the value 0 in the field 133, which indicates that no response is requested, as well as the value 0 on the counter in the field 136, which indicates that the packet transfer message is the first message added to the noncapsulated data packet 152. As is described, no response is requested by the packet transfer message 153. That is, the application unit 161 of the stationary host 151 and the application unit of the mobile host 146, rather than the home migration communication control device 101 and the migration address unit 115, confirm that the mobile host 146 receives the noncapsulated data packet 152.

The transfer packet reception unit 118 in the mobile host 146 receives the encapsulated data packet including the packet transfer message 153 and the noncapsulated data packet 152, since it is destined for the temporary address β, which is held in the address hold unit 119. The unit 118 then detects that the destination address of the noncapsulated data packet 152 is the home address α, and sends the data etc. in the noncapsulated data packet 152 to the application unit 124.

Thus, the communication between the application unit 124 and the application unit 161 is not affected by the migration of the mobile host 146.

(3) The packet transfer unit 103 transmits the encapsulated data packet including the data packet transfer message. It also directs, after detecting that the autonomous flag F indicates 1, the mobile host transfer unit 104 to transmit to the stationary host 151 the data packet including the mobile host transfer message 154 where the home address α and the temporary address β are set. Finally, the unit 104 transmits the data packet to the stationary host 151.

The mobile host transfer unit 130 in the stationary host 151 receives the mobile host transfer message and stores into the address hold unit 128 the home address α and the temporary address β.

(4) The mobile host transfer unit 130 responds to the mobile host transfer unit 104 with the response message 154R.

(5) When the application unit 161 directs the transmission of the noncapsulated data packet to the home address α after the address hold unit 128 holds the home address α and the temporary address β, the transfer packet transmission unit 126 first generates a noncapsulated data packet destined for the home address α, then generates an encapsulated data packet including it and a packet transfer message 155. The encapsulated data packet is then transmitted to the temporary address β. Thus, once the home migration communication control device 101 notifies the stationary host 151 of the home address α and the temporary address β, the stationary host 151 is able to transmit the data packet to the temporary address β of the mobile host 146, and the home migration communication control device 101 is not employed.

On the other hand, when data is transmitted from the mobile host 146 to the stationary host 151, the Sa is employed as the destination address α and the home address is employed as the source address; and the noncapsulated data packet is transmitted from the address α to the address Sa.

Thus, even when all the noncapsulated data transmitted by the stationary host 151 is destined for the home address α, the home migration communication device 101 transfers the data to the updated temporary address of the mobile host; thereby, the communication between the mobile host 146 and the stationary host 151 is implemented, and the conventional device can be employed as the stationary host 151, which broadens a practicability of the network system.

Whereas, when the network system checks the original source address of the data packet or a transfer path of the data packet, the transmission unit may be built in the mobile host 146 like the transfer packet transmission unit 126 in the stationary host 151, and also the reception unit may be built in the stationary host 151 like the transfer packet reception unit 118 in the mobile host 146; and the encapsulated data packet including the packet transfer message and the noncapsulated data packet may be transmitted therebetween.

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[migration from network B to network C]

The operation at the migration of the mobile host 146 from the network B to the network C is described hereunder with referring to FIGs. 34-37, relevant for FIGs. 26-29.

(1)-(4) The operation related to transmission of an autonomous packet transfer support check message 147', a response message 147R', an address post message 148', and a response message 148' between the mobile host 146 and the visitor migration communication control device 109' is substantially same as the operation related to transmission of messages between the mobile host 146 and the visitor migration communication control device 109, which is conducted when the mobile host 146 migrates to the network B. However, the operation at the migration from the network A to the network B and the operation at the migration from the network B and the network C are different from each other in part of the operation of the home migration communication control device 101 conducted after it responds to the received address post message 148' with the response message 148R.

(5) When the address post unit 107 receives the address post message 148', the mobile host transfer unit 104 in the home migration communication control device 101 detects that the mobile host been attached to the network B before migrating to the network C since the temporary address β has been stored as the temporary address. Then, the mobile host transfer unit 104 sends to the visitor migration communication control device 109 the data packet including both the home address α and the temporary address γ, so that the device 109 transfers the data packet transmitted by the stationary host 151 from the temporary address β to the temporary address γ. The data packet received by the visitor migration communication control device is destined for the broadcast address Bba.

In accordance with the address post message 148', the mobile host transfer unit 104 stores into the home move host list hold unit 102 the temporary address γ, the value 1 of the autonomous flag F, and the broadcast address Cba by corresponding them to the home address α.

Receiving the data packet including the mobile host transfer message 150, the mobile host transfer unit 112 in the visitor migration communication control device 109 stores into the visitor mobile host list hold unit 110 the temporary address γ newly assigned to the mobile host 146 and the value 1 of the autonomous flag F by corresponding them to the home address α.

(6) The mobile host transfer unit 112 notifies the mobile host transfer unit 104 that it has received the mobile host transfer message 150 by sending thereto the response message 150R.

(7), (8) The transmission of a mobile host visit message 149' and a response message 149R' between the mobile host 146 and the visitor migration communication control device 109', which is conducted when the device 109' provides the packet transfer service, is substantially same as the transmission of messages between the mobile host 146 and the visitor migration communication control device 109, which is conducted when the mobile host 146 migrates to the network B.

[communication between mobile host 146 attached to network C and stationary host 151]

Transmission of the data packet from the stationary host 151 to the mobile host 146 when the mobile host is attached to the network C is described with referring to FIG. 38-41, which are relevant for FIG. 26-29.

The transmission is substantially same as the transmission between the stationary host 151 and the mobile host 146 when the mobile host 146 is attached to the network B, except that the visitor migration communication control device 109 instead of the home migration communication control device 101 is employed.

(1) When the stationary host 151 is not notified that the mobile host 146 has migrated from the network B to the network C, the stationary host 151 generates the encapsulated data packet including the noncapsulated data packet, which is destined for the home address α, and the packet transfer message 156; then transmits it to the temporary address β. This is substantially the same as (5) in the communication between the stationary host 151 and the mobile host 146 attached the network B.

The data packet transmitted by the stationary host is not received by the mobile host 146 since the mobile host is not attached to the network B. The data packet is received by the packet monitoring unit 106 in the visitor migration communication control device 109 since the visitor mobile host list hold list unit thereof holds the temporary address β besides the temporary address γ.

(2) The visitor migration communication control device 109 transmits to the temporary address γ of the mobile host 146 the data packet including the packet transfer message 157, which is substantially same as (2) in the communication between the stationary host 151 and the mobile host 146 on the network B except a difference described hereunder.

The home mobile host migration communi-

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cation control device 101 receives the noncapsulated data packet 152 and generates an encapsulated data packet comprising the received noncapsulated data packet 152 and the packet transfer message 153. On the other hand, the visitor migration communication control device 109 receives the encapsulated data packet comprising the packet transfer message 156 and the packet transfer unit 111 converts the data packet by changing the destination address from the temporary address β into the temporary address γ as well as converting the packet transfer message 156 into the packet transfer message 157, whose value on the counter is incremented by 1.

(3)-(5) The visitor migration communication control device 109, the stationary host 151, and the mobile host 146 on the network C operate substantially same as the home migration communication control device 101, the stationary host 151, and the mobile host 146 on the network B, which is described the above in (3)-(5); thereby the mobile host transfer message 158 and the response message 158R are transmitted, and the data packet including the packet transfer message 160 is transmitted by the stationary host 151 to the mobile host 146 attached to the network C.

If the stationary host 151 does not transmit any data packet to the mobile host 146, which is attached to the network B, the stationary host is not notified of either the temporary address β or the temporary address γ; therefore, the stationary host 151 transmits the data packet to the home address α even when the mobile host 146 has migrated from the network B to the network C. When this occurs, the home migration communication control device 101, as does the visitor migration communication device 109, transfers the data packet from the home address α to the temporary address γ; then notifies the stationary host 151 of the updated temporary address γ of the mobile host 146 so that the stationary host 151 will be able to directly transmit the data packet, which comprises the packet transfer message, to the mobile host 146 attached to the network C.

Further, when the mobile host 146 migrates to the network, to which the visitor migration communication control device is attached to provide the packet transfer service, the stationary host 151 may transmit the data packet destined for any of the addresses α, β, or γ. When the data packet is transmitted to the home address α or the temporary address γ, the home migration communication control device 101 or the visitor migration communication control device 109', which is notified of the updated temporary address of the mobile host 146, transfers the data packet to the updated temporary address; then it notifies the stationary host 151 of the updated temporary address of the mobile host.

When the data packet is transmitted to the temporary address β of the mobile host 146, the visitor migration communication control device 109 receives it. Since the device 109 is notified of only the temporary address γ, it transmits the data packet comprising the packet transfer message to the temporary address γ as well as transmits the mobile host transfer message to notify the stationary host 151 of the temporary address γ. The visitor migration communication control device 109' receives the data packet comprising the packet transfer message, which is destined for the temporary address γ, and transmits it to the updated temporary address of the mobile host 146; then transmits the mobile host transfer message to notify the stationary host 151 of the updated temporary address. Also the visitor migration communication control device 109' obtains the address of the visitor migration communication control device 109 from the source address of data packet transmitted thereby, and transmits the mobile host transfer message to the device 109. Thus, the visitor migration communication control device 109' obtains the updated temporary address of the mobile host 146, and transfers the data packet to the mobile host 146 as well as notifies stationary host 151 of the obtained updated temporary address.

[communication operation 2]

Another example of the communication operation is described hereunder. In the communication operation 2 the visitor migration communication control device 109 does not provide the packet transfer service when the mobile host 146 migrates from the network A to the network B, further from the network B to the network C.

As shown in FIG. 42, when the device 109 does not provide the packet transfer service, the autonomous packet transfer support check message 181, transmitted by the mobile host 146 which has migrated from the network A to the network B, is responded with the response message 181R where the autonomous flag F in the autonomous flag field 135 indicates 0. Thereby, the autonomous flag field 135 in the address post message 182, which is transmitted by the mobile host 146 to the home migration communication control device 101, obtains the value 0, and the value 0 is held in the home mobile host list hold unit 102 in the device 101. The mobile host 146 does not transmit the mobile host visit message to the visitor migration communication control device 109.

As shown in FIG. 43, receiving from the stationary host 151 the noncapsulated data packet 183, which is destined for the home address α, the home migration communication control device generates the encapsulated data packet comprising the received noncapsulated data packet 183 and the packet transfer message 184, and transmits it to the tem-

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porary address β, as is in the communication operation 1.

However, recognizing the value 0 on the autonomous flag F, which is held in the home mobile host list hold unit 102, the device 101 does not transmit to the stationary host 151 the mobile host transfer message including the temporary address β. Therefore, every data packet transmitted by the stationary host 151 is destined for the home address α, and it is transferred to the mobile host 146 by the home migration communication control device 101. Thus, the stationary host 151 is not notified of the temporary address β since the data packet transmitted to the address other than the home address α is not transferred by the device 109; therefore it is not received by the mobile host 146 when it departs the network B to migrate to the network C.

When the visitor migration communication control device 109', which is attached to the network, provides the packet transfer service, the home migration communication control device 101 notifies the stationary host 151 of the temporary address γ when it transmits the noncapsulated data to the home address α, so that the stationary host 151 is able to directly transmit the data packet comprising the noncapsulated data packet and the packet transfer message to the mobile host 146 on the network C.

When the visitor migration communication control device 109 does not provide the packet transfer service, the home migration communication control device 101 does not necessarily notify the device 109 of the temporary address γ of the mobile host 146 assigned when it has migrated from the network B to the network C. However, the construction of the device 101 will be simplified if it conducts the same operation either or not the packet transfer service is provided since the visitor migration communication control device 109 ignores the mobile host transfer message.

Also the device 109 may respond to the autonomous packet transfer support check message 181 only when it provides the data packet transfer service; therefore, the presence or absence of the response message 181R indicates to the mobile host 146 whether or not the data packet transfer service is provided. In the above operation the value 0 of the autonomous F also indicates that the packet transfer service is not provided, whereas absence of the response message to the message 181 can indicate the absence of the packet transfer service, which will simplify construction of mobile host 146.

[communication operation 3]

The final example of the communication operation is described hereunder. In the communication operation 3 the visitor migration communication control device 109' does not provide the packet transfer service while the visitor migration communication control device 109 does.

As shown in FIG. 44, when the packet transfer service is not provided by the visitor migration communication control device 109', the mobile host 146 transmits to the home migration communication control device 101 the address post message 182' where the value 0 is set at the autonomous flag F. Then, the home migration communication control device 101 transmits to the device 109 the mobile host transfer message 185 by setting the value 0 at the autonomous flag F.

When detecting the value 0 at the autonomous flag F, the visitor migration communication control device 109 ceases to provide the packet transfer service.

As shown in FIG. 45, even after cease of the data packet transfer service, the stationary host 151 may transmit to the temporary address the data packet comprising the noncapsulated data packet and the packet transfer message 186.

When this happens, the visitor migration communication control device 109 obtains the noncapsulated data packet 187 from the received encapsulated data packet and transmits it to its destination address, the home address α. The noncapsulated data packet 187 is then received by the home migration communication control device 101, which is attached to the network A. Finally, the home migration communication control device 101 transfers the noncapsulated data packet 187 together with the packet transfer message 188 to the temporary address γ of mobile host 146, which is attached to the network C.

The visitor migration communication control device 109 notifies the stationary host 151 that the mobile host 146 is attached to the network A instead of the network C by sending the mobile host transfer message 189 where the home address α is set in the temporary address field 139. Then, the stationary host 151 transmits the noncapsulated data packet 187 to the home address α, and it is transferred by the home migration communication control device 101, which is employed to take the place of the visitor migration communication control device 109. As another option, the device 109 may send the mobile host transfer message 189 where the invalid address is set, such as the address where every bit is 1. Then, the home migration communication control device 101 may notify the stationary host 151 of the home address α in accordance with the address inquiry obtained from the stationary host 151.

The operation described the above will be employed when the visitor migration communication control device 109 ceases to provide the packet transfer service operation regardless whether or not the device 109' provides the packet transfer service.

On the other hand, the visitor migration communication device 109 may restart the packet transfer service even when the device 109' ceases to provide

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the service.

In this case, the home migration communication control device 101 needs to provide the visitor migration communication control device 109 with the updated temporary address at every migration of the mobile host 146 unless the mobile host migrates to the network to which another visitor migration communication control device is attached and provides the packet transfer service. To realized it, for example, when the value of the autonomous flag F in the address post message is 0 to indicate that the device 109' does not provide the packet transfer service, the broadcast address Bba as the destination address of the mobile host transfer message, which is transmitted to the device 109, will not be renewed.

Additionally, the broadcast address as the destination address of the data packet, which is transmitted by the mobile host 146, can be replaced with the address Ha, Va, Va', each of which is unique to each device. The address unique to each device will be obtained by detecting the source address of the data packet received from each device, or by employing a so called name service.

Also in the second embodiment, the home migration communication control device 101 detects whether or not the mobile host 146 is attached to the same network from what is held as the temporary address in the address hold unit; to be precise, whether or not the home address α is held as the temporary address. However, this can also be detected by knowing in which table the temporary address is held. For example, when the device 101 and the mobile host 146 are attached to the same network, the first table holds the addresses, such as the home address α; whereas, the second table holds the addresses when the device 101 and the mobile host 146 are attached to the different network from each other. Value of the autonomous flag F, 0 or 1, can also be utilized in the same way.

Further, the home migration communication control device 101 and the visitor migration communication control device 109, 109' may be employed as a host such as the mobile host 146 or the stationary host 151.

Finally, the home migration communication control device 101, the visitor migration communication control device 109, the mobile host 146, and the stationary host 156 may be constructed identically and can be replaced with each other.

Although in the embodiment the application unit 124 starts its operation before being notified of updated temporary address β; therefore it always transmits the data packet to the home address α of the mobile host 146, it can transmit the data to the temporary address β if is starts its operation after obtaining the temporary address β.

Although the present invention has been fully described by way of examples with reference to the accompanying drawings, it is to be noted that various changes and modifications will be apparent to those skilled in the art. Therefore, unless otherwise such changes and modifications depart from the scope of the present invention, they should be constructed as being included therein.

Claims

1. A migration communication control device constructed to control a communication between a mobile node and a partner node, the mobile node migrating across networks and obtaining an address assigned on each network while the partner node being a communication partner of the mobile node, comprising a first migration control unit, a second migration control unit, a third migration control unit, the second migration control unit being placed on the mobile node and the third migration control unit being placed on the partner node,

   wherein the first migration control unit comprises:

   packet transfer means for receiving a packet which was destined for an outdated address of the mobile node, the outdated address assigned when the mobile node migrated to a network to which the first migration control unit is attached, generating a conversion packet which holds an updated address instead of the outdated address, and transmitting the conversion packet; and

   address post means for transmitting an address post message which indicates the updated address of the mobile node to the third migration control unit, the third migration control unit transmitting the packet received by the packet transfer means, and

   the second migration control unit comprises:

   migration post means for transmitting to the first migration control unit a migration post message which indicates the updated address of the mobile node when the mobile node migrates to another network; and

   packet resumption means for receiving the conversion packet from both the first migration control unit and the third migration control unit and resuming an original packet from the conversion packet, and

   the third migration control unit comprises:

   packet conversion means for converting a destination address of a packet, the packet to be transmitted to the mobile node, into the updated address indicated by the address post message, the address post message sent by the first migration control unit, and transmitting it to the mobile

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node.

2. The migration communication control device of Claim 1, wherein the migration post means in the second migration control unit transmits an identification key included in the migration post message, the identification key being employed to identify the mobile node.

3. The migration communication control device of Claim 2, wherein the identification key is an address of the mobile node assigned at one network before the network to which the mobile node is currently attached.

4. The migration communication control device of Claim 2, wherein the identification key is an address of the mobile node assigned before its initial migration.

5. The migration communication control device of Claim 1; wherein the second migration control unit is constructed to transmit to the third migration control unit the packet which has the same format as the resumed packet.

6. The migration communication control device of Claim 1, wherein the first migration control unit further comprises:

address hold means for holding the outdated address and the updated address by corresponding them with each other; and

address comparison means for comparing the destination address of the received packet with the outdated address, wherein

the packet transfer means generates the conversion packet and transmits it when the address comparison means detects that the destination address of the received packet coincides with the outdated address.

7. The migration communication control device of Claim 1, wherein the first migration control unit further comprises:

address hold means for holding the outdated address and the updated address by corresponding them with each other; and

address comparison means for comparing the destination address of the packet received by the packet transfer means with the outdated address, wherein

the address post means transmits the address post message which indicates the updated address of the mobile node to the third migration control unit, the third migration control unit transmitting the packet received by the packet transfer means, when the address comparison means detects that the destination address of the packet coincides with the outdated address.

8. The migration communication control device of Claim 1, wherein the second migration control unit further comprises:

address hold means for holding the outdated address and the updated address by corresponding them with each other; and

address comparison means for comparing the updated address with the destination address of the packet received from one of the first migration control unit and the third migration control unit, wherein

the packet resumption means resumes the original packet from the conversion packet when the address comparison means detects that the updated address coincides with the destination address of the packet received from one of the first migration control unit and the third migration control unit.

9. The migration communication control device of Claim 1, wherein the third migration control unit further comprises:

address hold means for holding the outdated address and the updated address of the mobile node by corresponding them with each other; and

address comparison means for comparing the outdated address in the address hold means with the destination address of the packet to be transmitted to the mobile node, wherein

the packet conversion means converts the destination address of the packet to be transmitted to the mobile node into the updated address which corresponds to the outdated address in the address hold means when the address comparison means detects the outdated address in the address hold means coincides with the destination address of the packet.

10. The migration communication control device of Claim 1, wherein there are a plurality of the first migration control units, and the second migration control unit transmits the migration post message to at least one of the first migration control units.

11. The migration communication control device of Claim 10, wherein the migration post means in the second migration control unit transmits the migration post message to the first migration control unit which is attached to the network to which the mobile node was attached before its migration,

each of the first migration control units has migration post means for transmitting to one of the other first migration control units a migration post message to post the same address as the

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updated address indicated by the migration post message received from the second migration control unit, and

each of the first migration control units has migration post means for transmitting a migration post message from one of the other first migration control units to another first migration control unit to post the same address as the updated address indicated by the received migration post message.

12. The migration communication control device of Claim 11, wherein each of the first migration control units and the second migration control unit further comprise pointer hold means for holding pointers related to the first migration control unit to which the migration post message is transmitted, and wherein

the migration post means in each of the first migration control units and the migration post means in the second migration control unit transmit the migration post message to each of the addresses related to each of the pointers.

13. The migration communication control device of Claim 12, wherein each of the pointers is a broadcast address of the network to which one of the first migration control units is attached.

14. The migration communication control device of Claim 12, wherein each of the pointers is an address which is assigned to one of the first migration control units uniquely.

15. The migration communication control device of claim 12, wherein each of the pointers is the address of the mobile node which is assigned when the mobile node is attached to the same network as is the first migration control unit, and

the migration post means in the first migration control unit and the migration post means in the second migration control unit obtain the broadcast address of the network to which each of the first migration control units is attached with referring to the address of the mobile node, and transmits the migration post message to the obtained broadcast address.

16. The migration communication control device of Claim 12, wherein the pointer hold means in the second migration control unit holds a pointer related to a first migration control unit for the latest migration, which is the first migration control unit being attached to one network before the network to which the mobile node is currently attached, and

the pointer hold means in the first migration control unit holds a pointer related to another first migration control unit attached to the same network as was the mobile node attached before migrating to the network to which the first migration control unit is attached.

17. The migration communication control device of Claim 12, wherein the second migration control unit further transmits to the first migration control unit the pointer by sending thereto the migration post message, the pointer to be held by the first migration control unit.

18. The migration communication control device of Claim 17, wherein the first migration control unit stores into the pointer hold means the pointer when it receives from the second migration control unit the migration post message by corresponding the pointer with the updated address indicated by the received migration post message.

19. The migration communication control device of Claim 11, wherein each of the first migration control units further comprises:

address hold means for holding the outdated address and the updated address by corresponding them with each other, wherein

migration post message means stores into the address hold means the outdated address and the updated address by corresponding them with each other when it receives from the second migration control unit the migration post message, while converts the updated address in the address hold means into the updated address indicated by the migration post message when it receives from the first migration control unit the migration post message and the outdated address indicated by the migration post message coincides with one of the updated addresses in the address hold means.

20. The migration communication control device of Claim 1, wherein the first migration control unit is placed on a gateway, which connects networks.

21. The migration communication control device of Claim 1, wherein the first migration control unit is placed on the network as an individual node.

22. The migration communication control device of Claim 10, wherein the migration post means in the second migration control unit transmits the migration post message to a home migration control unit, the home migration control unit being the first migration control unit which is attached to a network where the mobile node left for its initial migration, and

the home migration control unit further

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comprises home migration post means for transmitting a migration post message to a first migration control unit for the latest migration, the first migration control unit for the latest migration being the first migration control unit which is attached to the network where the mobile node left for the latest migration, to post the same updated address as is indicated by the migration post message received from the second migration control unit.

23. The migration communication control device of Claim 22, wherein the first migration control unit further comprises migration post means for transmitting the migration post message indicating the updated address of the mobile node to one of the other first migration control units when the conversion packet destined for the outdated address of the mobile node was sent therefrom to the first migration control unit.

24. The migration communication control device of Claim 22, wherein the migration post means in the second migration control unit transmits to the home migration control unit the migration post message where a home address and the updated address are corresponded with each other, the home address assigned when the mobile node is attached to the same network as is the home migration control unit,

and each of the packet transfer means and the address post means in the home migration control unit transmits the conversion packet and the address post message respectively with referring to the above home address and the updated address.

25. The migration communication control device of Claim 24, wherein the second migration control unit further comprises an outdated address post means for transmitting to the first migration control unit for the latest migration an outdated address post message where the outdated address and the home address are corresponded with each other, the outdated address being assigned to the mobile node before the latest migration,

the home migration post means in the home migration control unit transmits to the said first migration control unit for the latest migration the migration post message where the above home address and the updated address are corresponded with each other, and

the packet transfer means and the address post means in the first migration control unit for the latest migration transmit the conversion packet and the address post message respectively in accordance with the outdated address and the updated address, the outdated address and the updated address being corresponded with each other via the home address.

26. The migration communication control device of the Claim 25, wherein the outdated address post means in the second migration control unit transmits the above outdated address post message at a migration of the mobile node preceding the latest migration, and

each of the migration post means in the second migration control unit and the home migration post means in the home migration control unit transmits the above migration post message at the latest migration of the mobile node.

27. The migration communication control device of Claim 22, wherein the second migration control unit further comprises home migration control unit pointer hold means for holding a pointer related to the home migration control unit,

the migration post means in the second migration control unit transmits the migration post message to the address related to the pointer,

the home migration control unit further comprises pointer hold means for the latest migration for holding a pointer related to the first migration control unit for the latest migration, and

the home migration post means in the home migration control unit transmits the migration post message to the address related to the pointer.

28. The migration communication control device of Claim 27, wherein each of the above pointers is the broadcast address of the network to which each of the first migration control units is attached.

29. The migration communication control device of Claim 27, wherein each of the above pointers is the address assigned to each of the first migration control units uniquely.

30. The migration communication control device of Claim 27, wherein the second migration control unit further comprises pointer obtainment means for requesting to the first migration control unit for the latest migration the pointer related to the first migration control unit for the latest migration, and

the migration post means in the second migration control unit posts the obtained pointer to the home migration control unit together with the updated address by sending thereto the migration post message.

31. The migration communication control device of Claim 30, wherein the migration post means in the second migration control unit posts to the

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home migration control unit the pointer at the migration of the mobile node preceding the latest migration, while the migration post means posts the above updated address at the latest migration of the mobile node.

32. The migration communication control device of Claim 22, wherein the first migration control unit further comprises address post suppressing means for suppressing transmission of the address post message from the address post means to the third migration control unit, and

the address post suppressing means suppresses transmission of the address post message when none of the first migration control units is attached to the same network as is the mobile node.

33. The migration communication control device of Claim 32, wherein the second migration control unit further comprises detect means for detecting whether or not the first migration control unit is attached to the network to which the mobile node migrates,

the migration post means in the second migration control unit transmits to the home migration control unit the migration post message which includes the detecting result of the above detect means together with the updated address,

the home migration post means in the home migration control unit transmits to the first migration control unit for the latest migration the migration post message which includes the detecting result of the above detect means together with the updated address, and

the address post suppressing means in each of the home migration control unit and the first migration control unit for the latest migration suppress the transmission of the address post message in accordance with the detecting result of the above detect means.

34. The migration communication control device of Claim 22, wherein the first migration control unit further comprises packet transfer suppressing means for suppressing transfer of the packet conducted by the packet transfer means.

35. The migration communication control device of Claim 34, wherein the first migration control unit further comprises address post suppressing means for suppressing transmission of the address post message from the address post means to the third migration control unit, and the address post suppressing means in the first migration control unit being attached to a network to which the mobile node is not attached, suppresses the transmission of the address post message when the packet transfer suppressing means in the first migration control unit for the latest migration suppresses transfer of the packet.

36. The migration communication control device of Claim 35, wherein the second migration control unit further comprises detect means for detecting whether or not the packet transfer suppressing means in the first migration control means suppresses the transfer of the packet, the first migration control means being attached to the network to which the mobile node migrates, and

the migration post means in the second migration control unit transmits to the home migration control unit the migration post message which includes the detecting result of the above detect means together with the updated address,

the home migration post means in the home migration control unit transmits to the first migration control unit for the latest migration the migration post message which includes the detecting result of the detect means together with the updated address, and

the address post suppressing means in each of the home migration control unit and the first migration control unit for the latest migration suppresses the transmission of the address post message in accordance with the detecting result of the above detect means.

37. The communication control device of Claim 36, wherein the packet transfer suppressing means in the first migration control unit for the latest migration suppresses the transfer of the packet conducted by the packet transfer means, when the packet transfer suppressing means in the first migration control unit being attached to the network to which the mobile node migrates suppresses the transfer of the packet.

38. A packet transfer migration control unit in a migration communication control device, the migration communication control device being constructed to control a communication between a mobile node and a partner node, the mobile node migrating across networks and obtaining an address assigned on each network while the partner node being a communication partner of the mobile node, comprising:

packet transfer means for receiving a packet which was transmitted by the partner node to an outdated address of the mobile node, the outdated address being assigned when the mobile node migrated to a network to which the packet transfer migration control unit is attached, generating a conversion packet which holds an updated address instead of the outdated address, and transmitting the conversion packet;

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and

address post means for transmitting an address post message which indicates the updated address of the mobile node to the partner node, the partner node transmitting the packet received by the packet transfer means.

39. A mobile node migration control unit in a migration communication control device, the migration communication control device being constructed to control a communication between a mobile node which migrates across networks and obtains an address assigned on each network and a partner node which is a communication partner of the mobile node, being placed on the mobile node and comprising:

migration post means for transmitting to a packet transfer migration control unit a migration post message which indicates an updated address of the mobile node when the mobile node migrates to another network, the packet transfer migration control unit for receiving a packet which was transmitted by the partner node to an outdated address of the mobile node, the outdated address assigned when the mobile node migrated to a network to which the migration control unit for packet transfer is attached, generating a conversion packet which holds the updated address instead of the outdated address, and transmitting the conversion packet; and

packet resumption means for receiving the conversion packet from both the packet transfer migration control unit and the mobile node, and resuming an original packet from the conversion packet.

40. A partner node migration control unit in a migration communication control device, the migration communication control device being constructed to control a communication between a mobile node which migrates across networks and obtains an address assigned on each network and a partner node which is a communication partner of the mobile node, being placed on the mobile node and comprising:

address post message receiving means for receiving an address post message which indicates an updated address of the mobile node from a packet transfer migration control unit, the packet transfer migration control unit transmitting an address post message which indicates the updated address of the mobile node to the partner node; and

packet conversion means for converting a destination address of a packet, the packet to be transmitted to the mobile node, into the updated address indicated by the address post message, and transmitting it to the mobile node.

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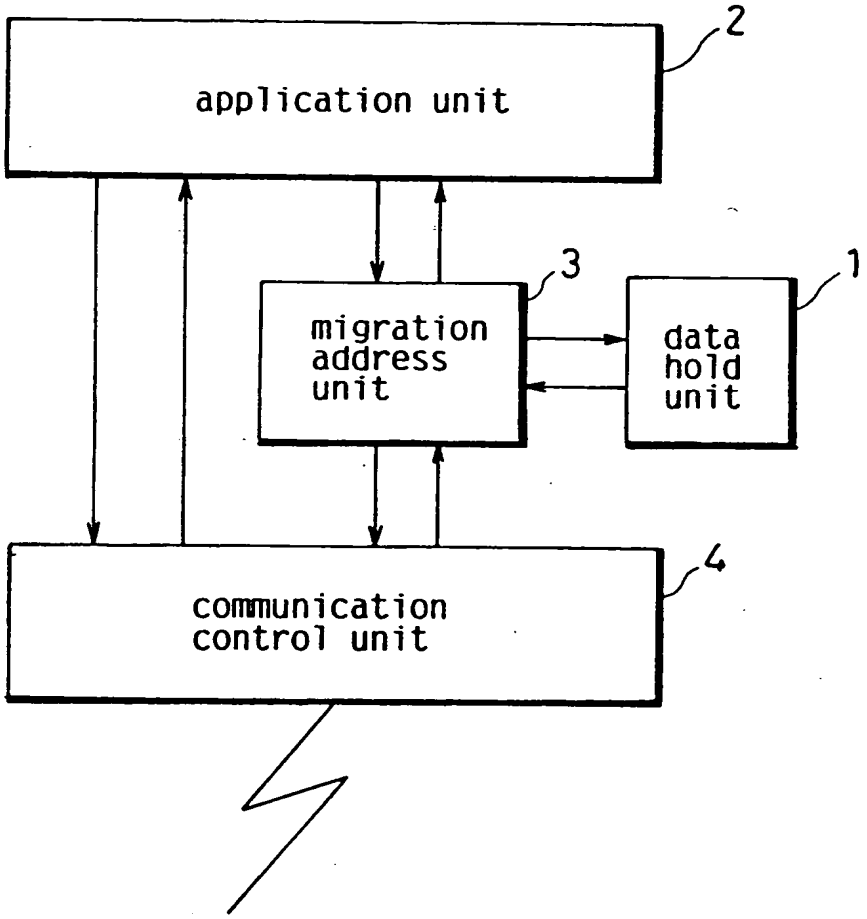
FIG. 1



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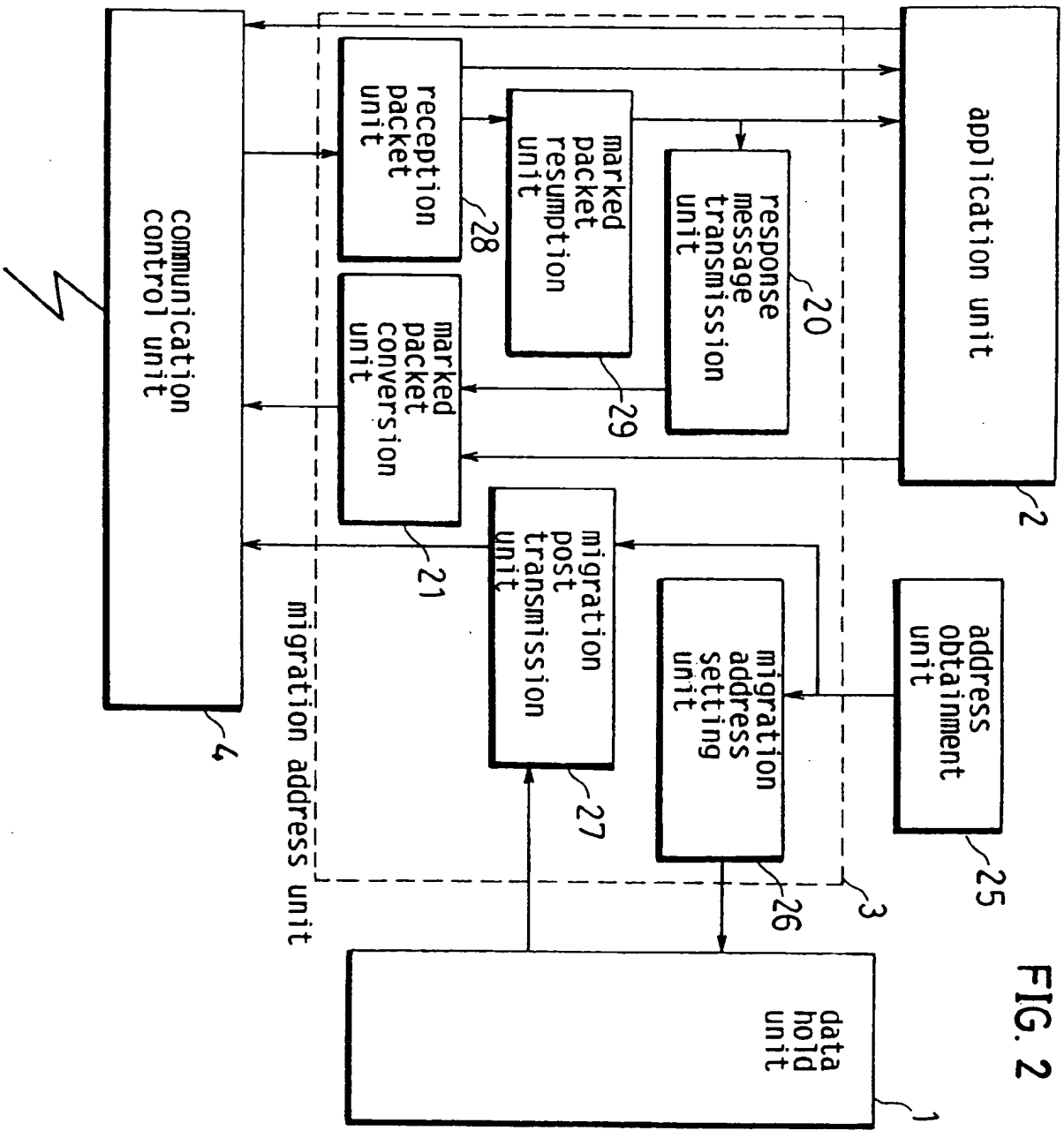

FIG. 2

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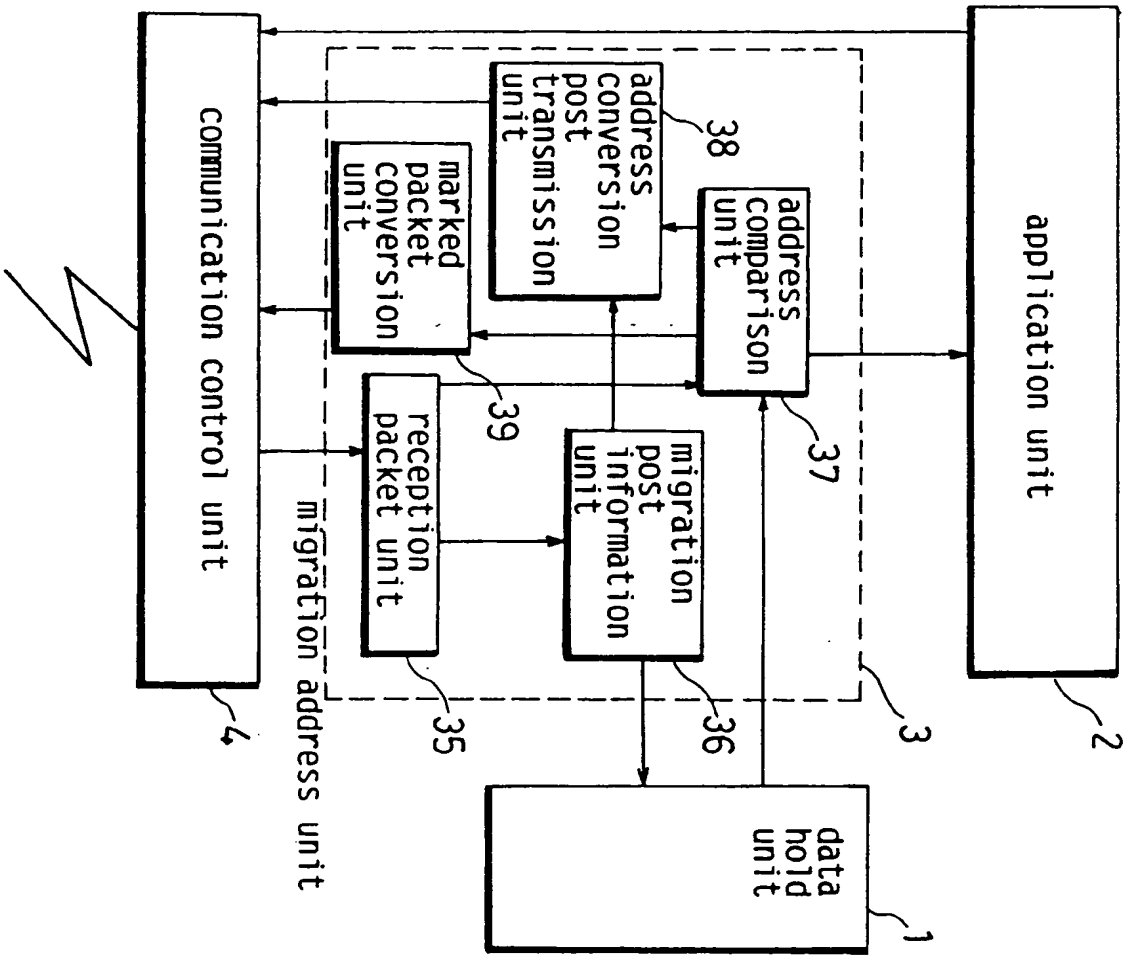

FIG. 3

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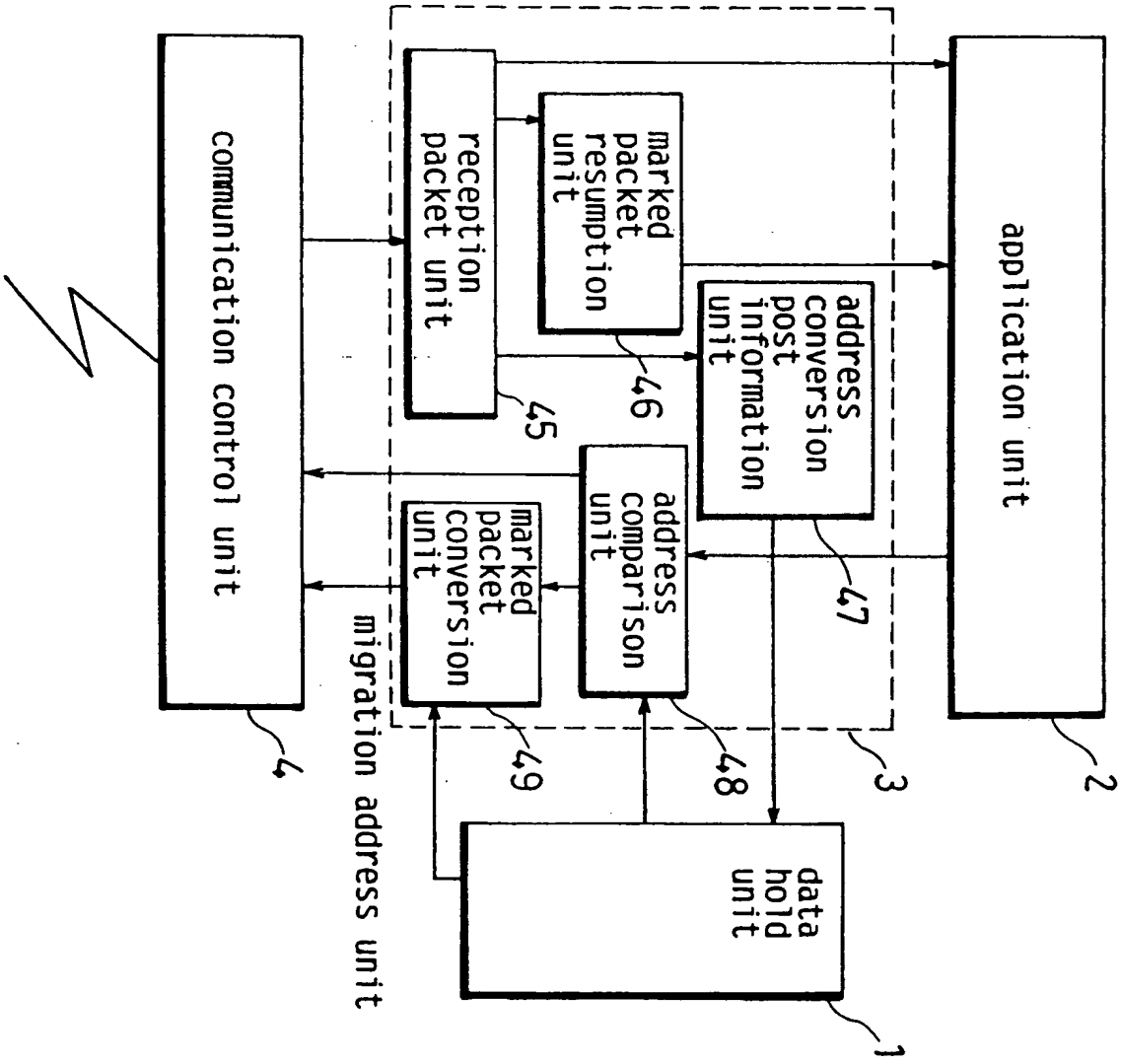

FIG. 4

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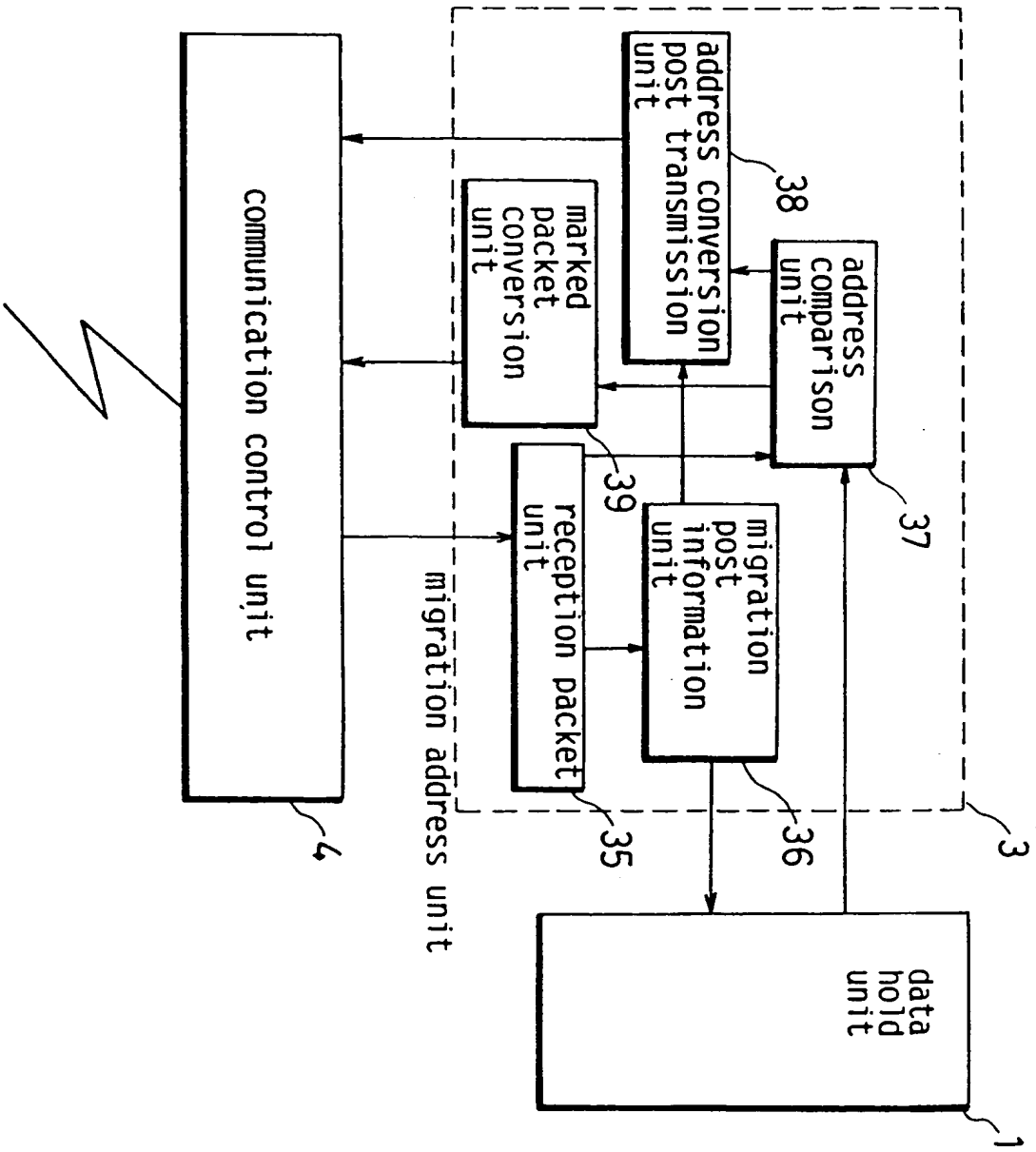

FIG. 5

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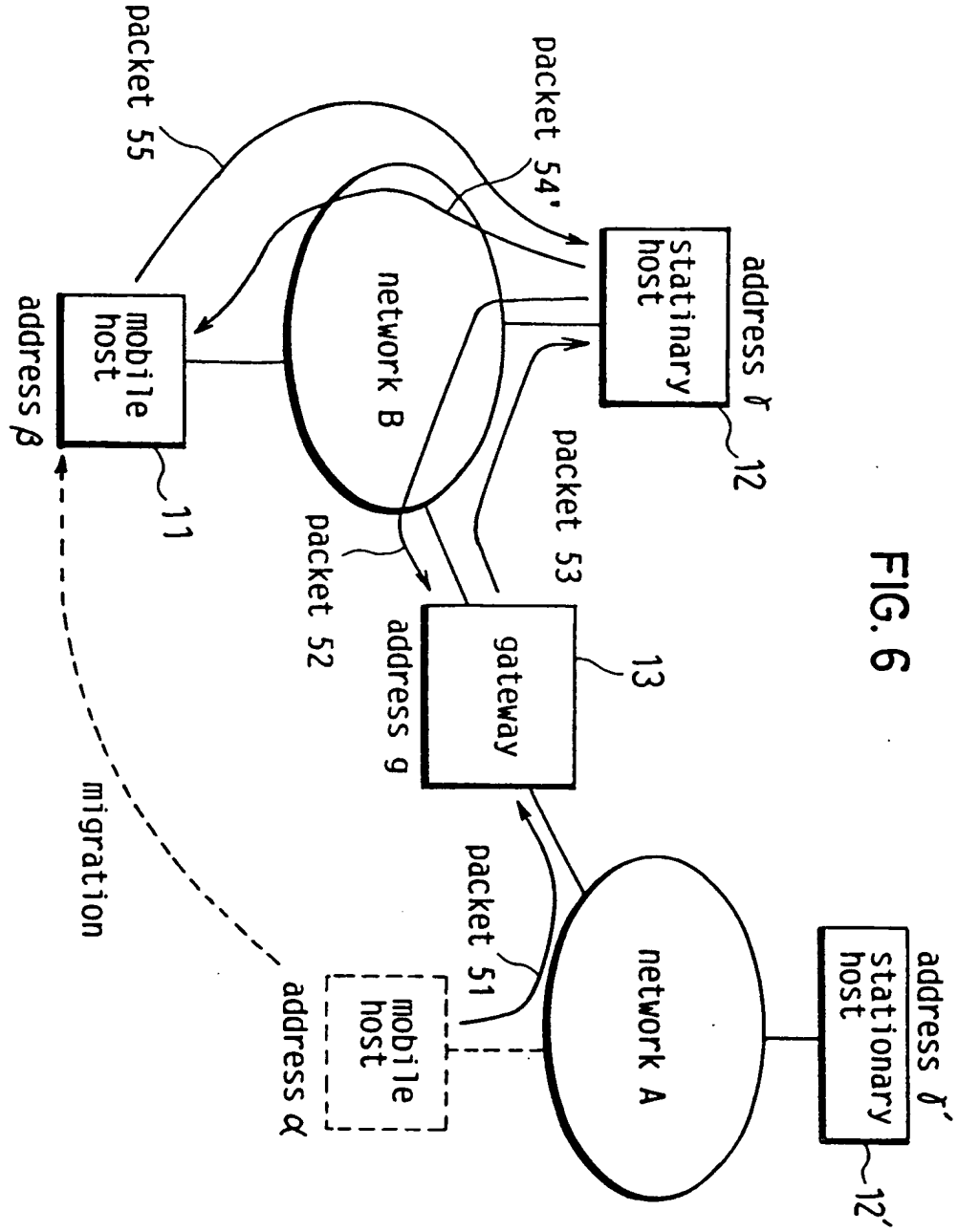

FIG. 6

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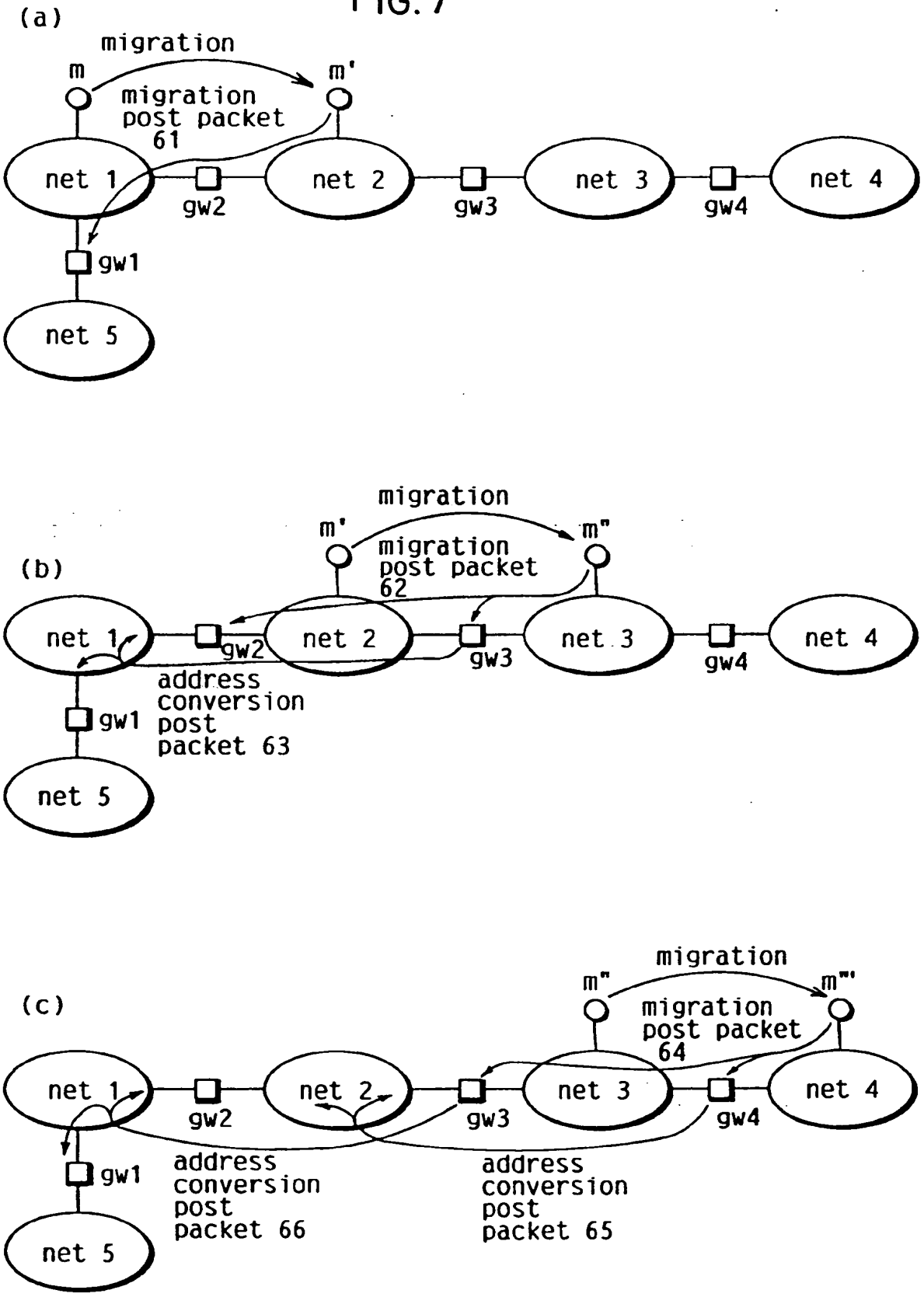
FIG. 7



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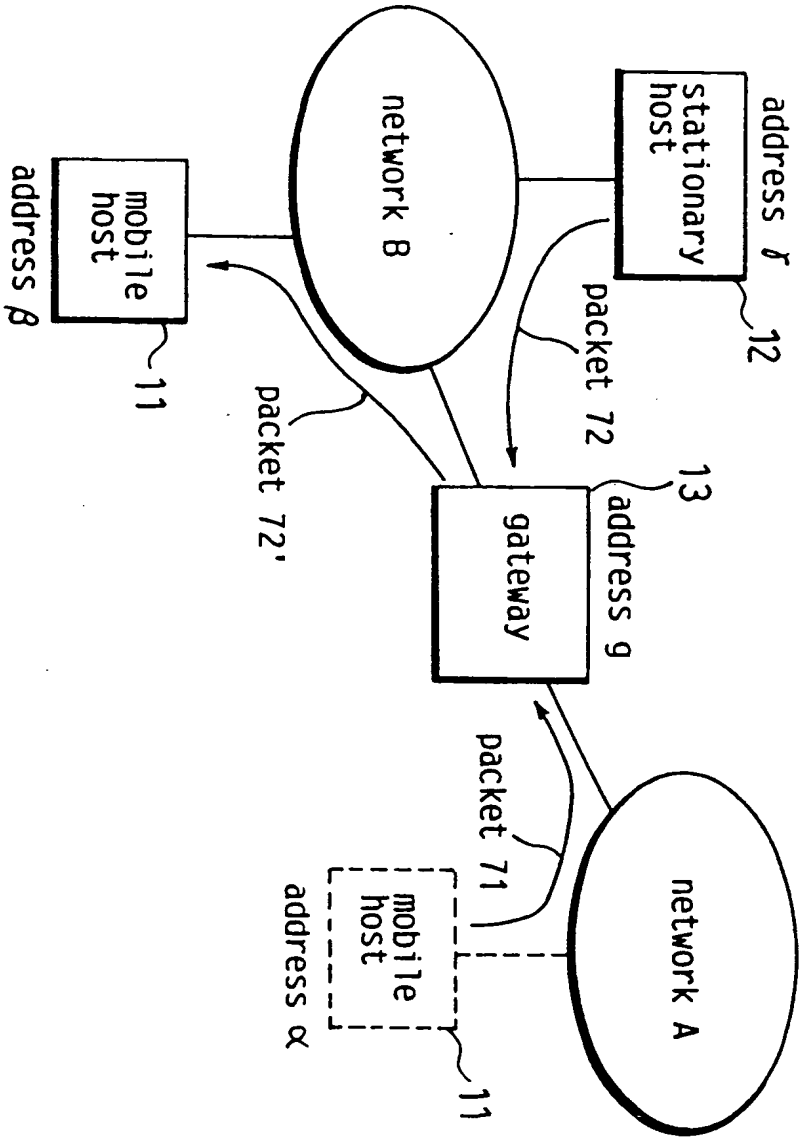

FIG. 8

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FIG. 9

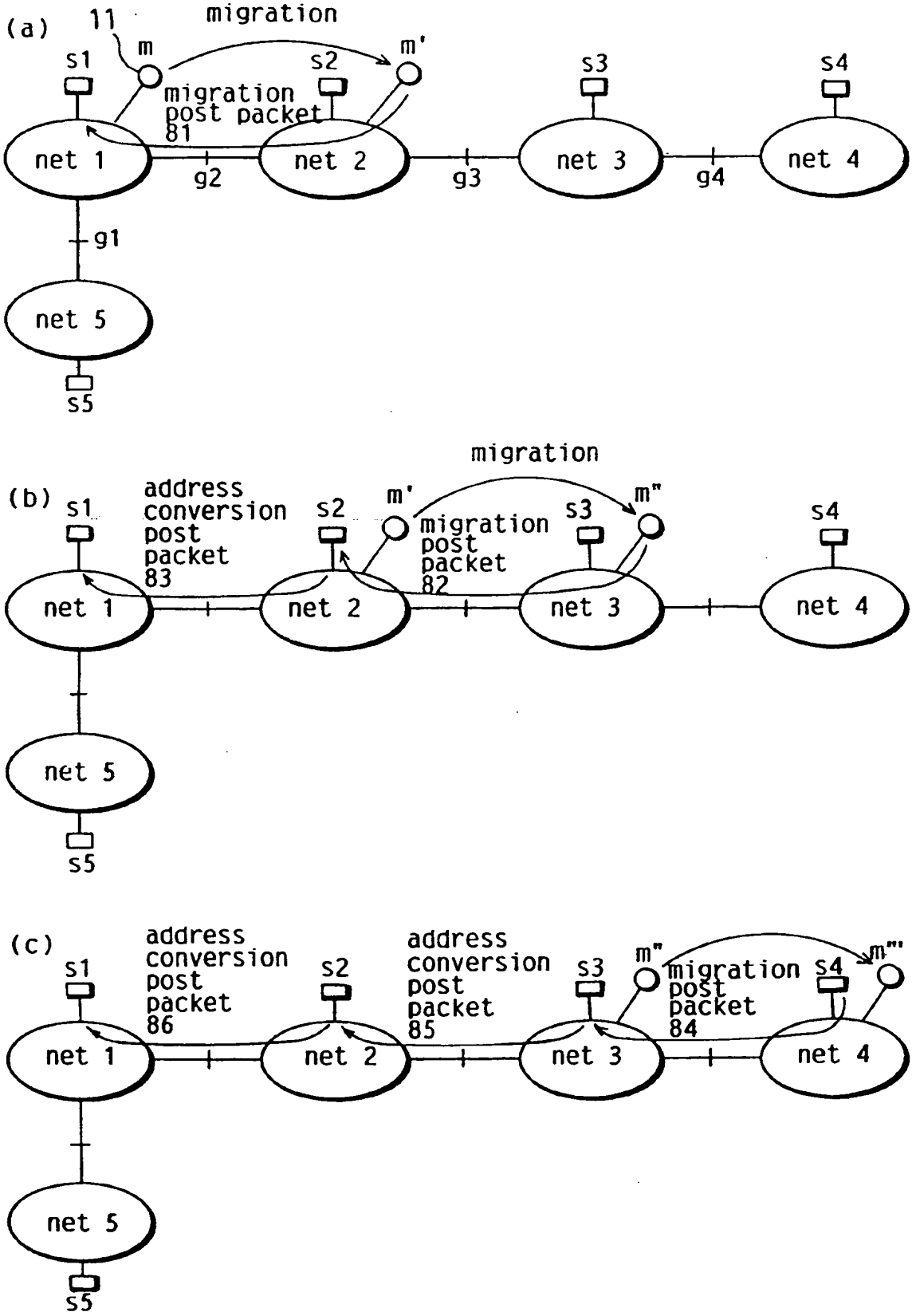

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FIG. 10

(a)

address before migration	address after migration
address α	address β

(b)

address before migration	address after migration
address α	address β
address X	address Y

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FIG. 11

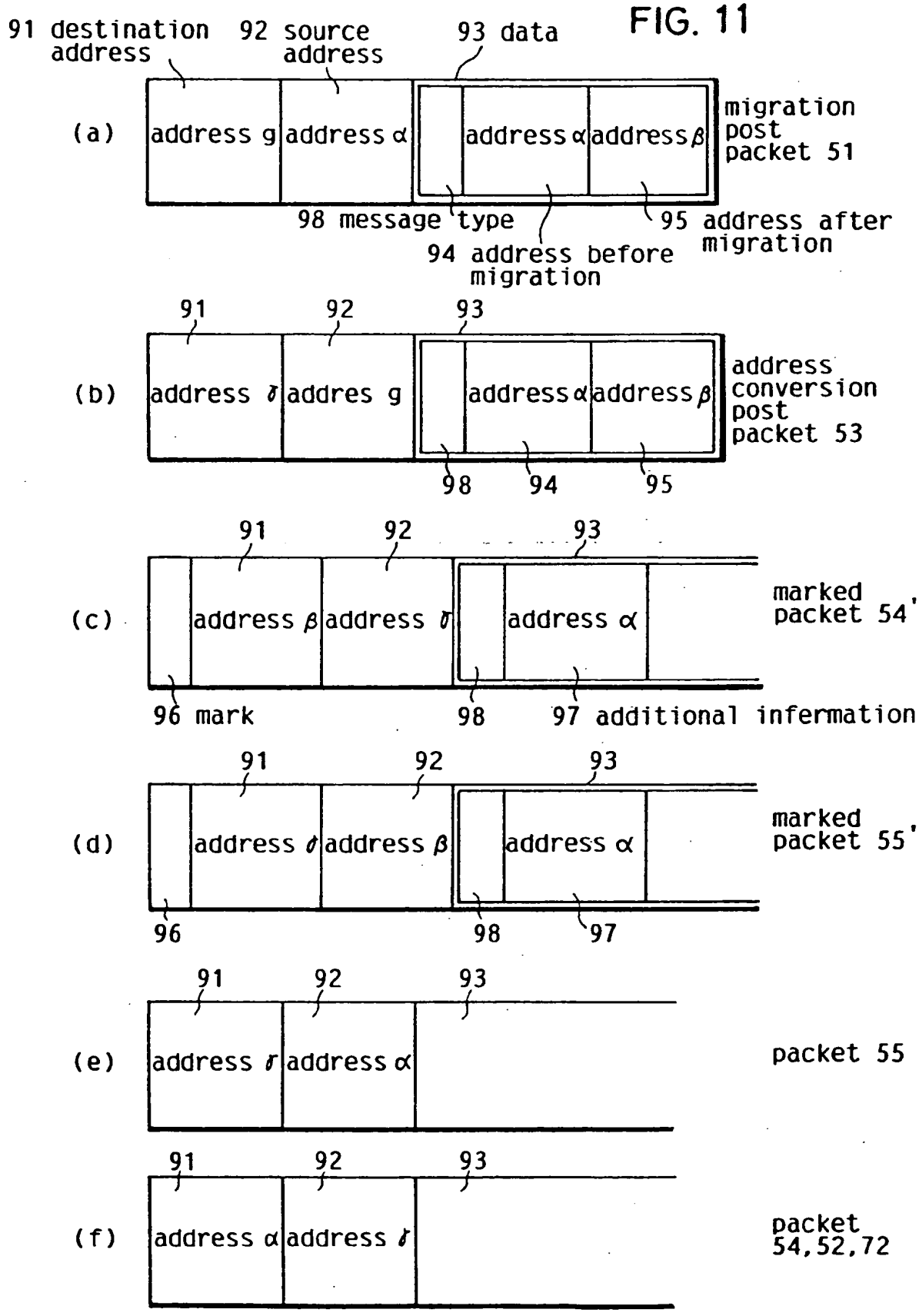

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FIG. 12

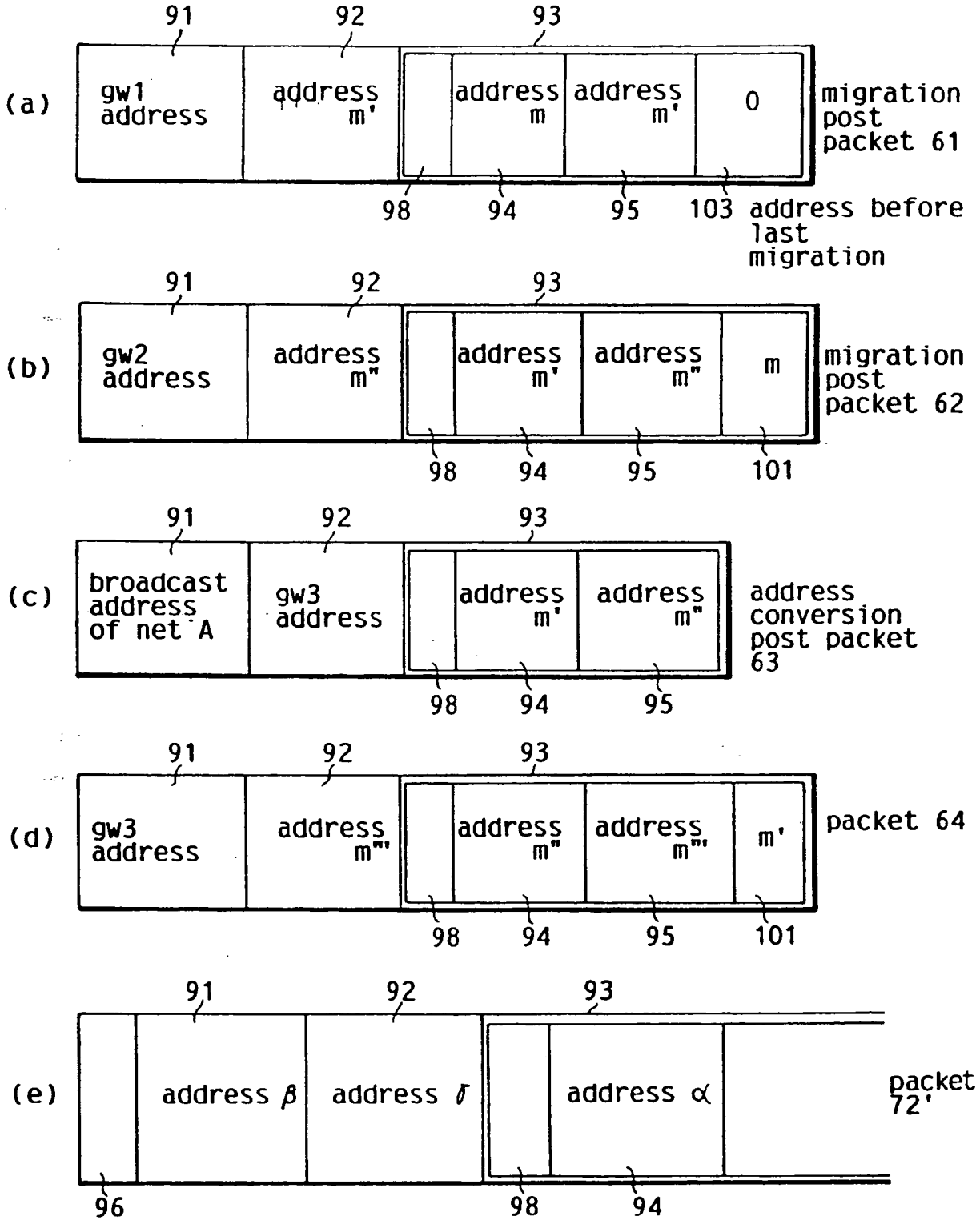

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FIG. 13

(a) migration from network A to network B

gateway	address correspon-dence	address before last migration
gw1	m → m'	0
gw2	m → m'	0
gw3	———	——
gw4	———	——

(b) migration from network B to network C

gateway	address correspon-dence	address before last migration
gw1	m → m"	0
gw2	m → m" m' → m"	0 m
gw3	m' → m"	m
gw4	———	——

(c) migration from network C to network D

gateway	address correspon-dence	address before last migration
gw1	m → m"'	0
gw2	m → m"' m' → m"'	0 m
gw3	m' → m"' m" → m"'	m m'
gw4	m" → m"'	m'

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FIG. 14

(a) migration from network A to network B

migration communication control device	content of hold unit	
	address correspon-dence	address before last migration
S1	m → m'	0
S2	——	——
S3	——	——
S4	——	——

(b) migration from network B to network C

migration communication control device	content of hold unit	
	address correspon-dence	address before last migration
S1	m → m"	0
S2	m'→ m"	m
S3	——	——
S4	——	——

(c) migration from network C to network D

migration communication control device	content of hold unit	
	address correspon-dence	address before last migration
S1	m → m"'	0
S2	m'→ m"'	m
S3	m"→ m""	m'
S4	——	——

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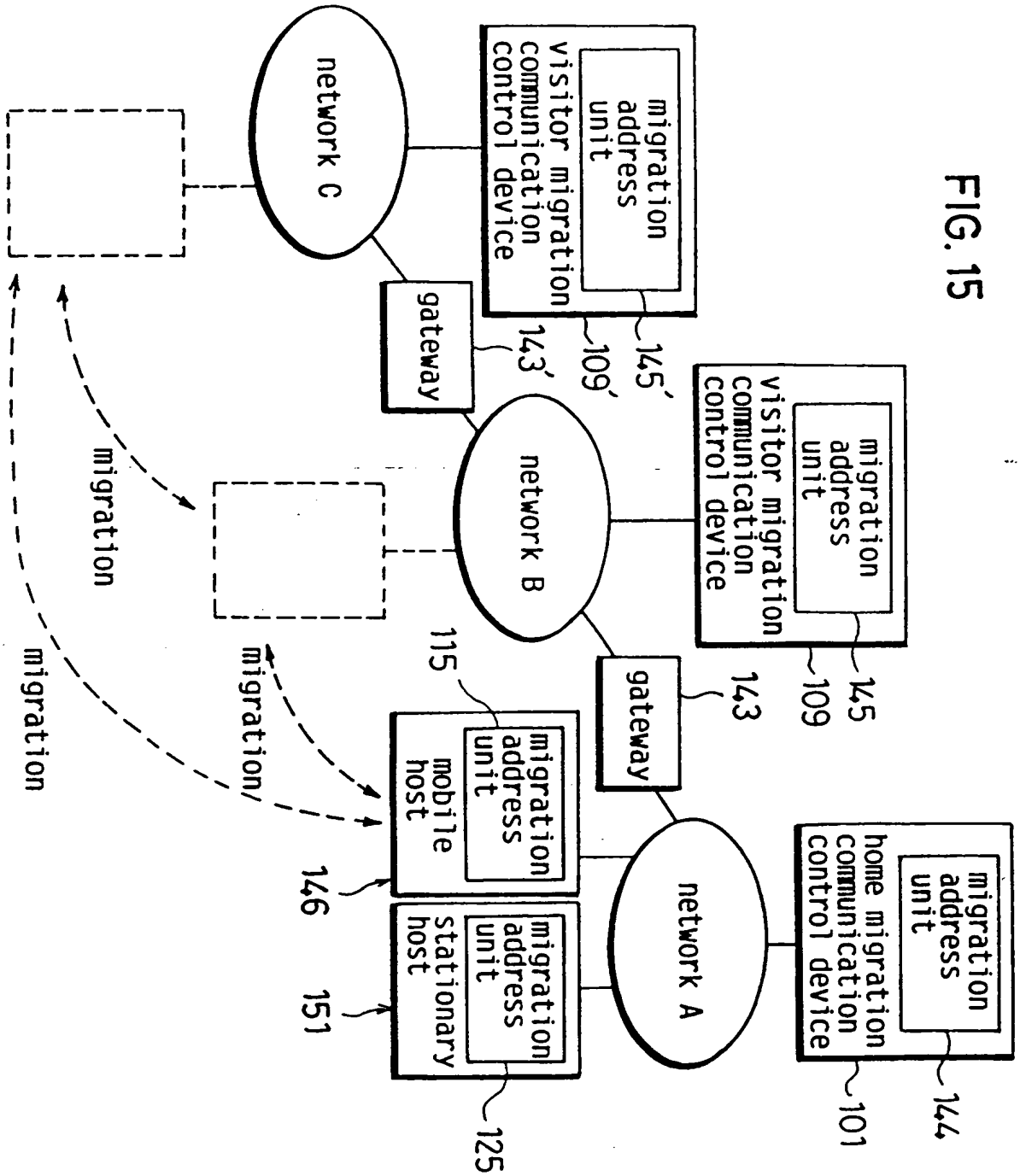

FIG. 15

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FIG. 16

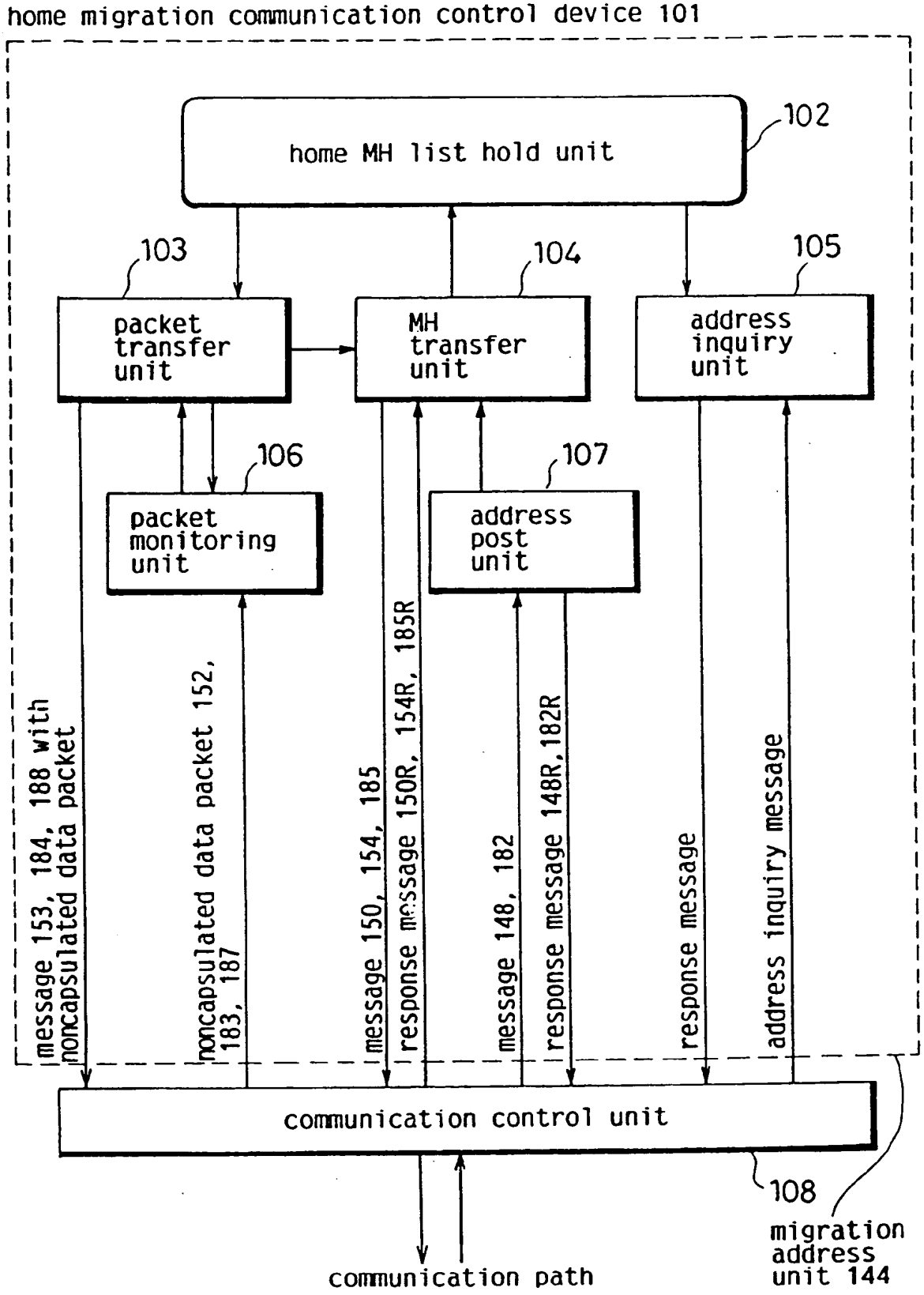

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FIG. 17

MH's home address	MH's current temporary address	autonomous flag F	current broadcast address
α	β or γ	1	Bba or Cba

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FIG. 18

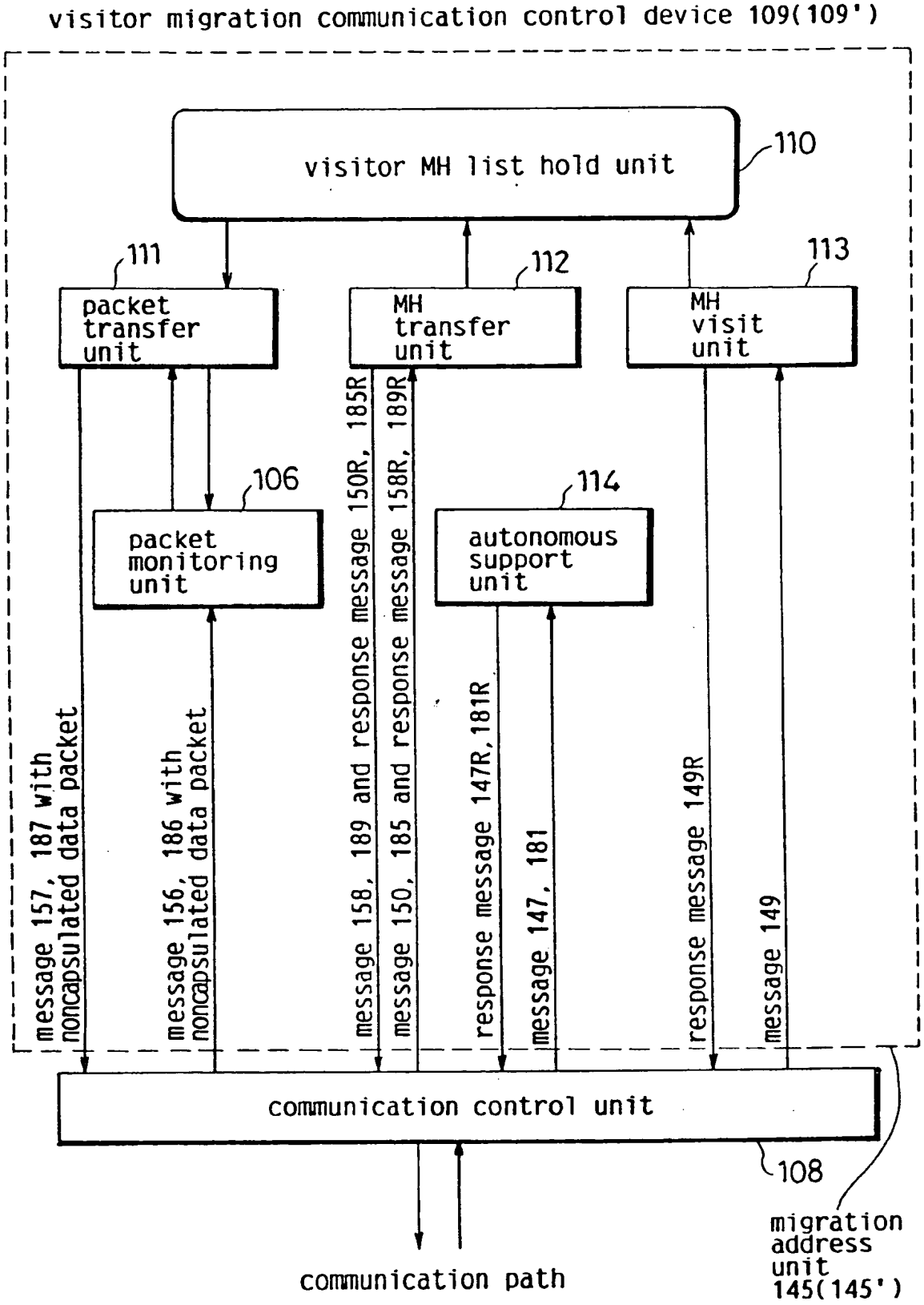

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FIG. 19

MH's home address	temporary address	temporary address after migration	autonomous flag F
α	β	γ	1

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FIG. 20

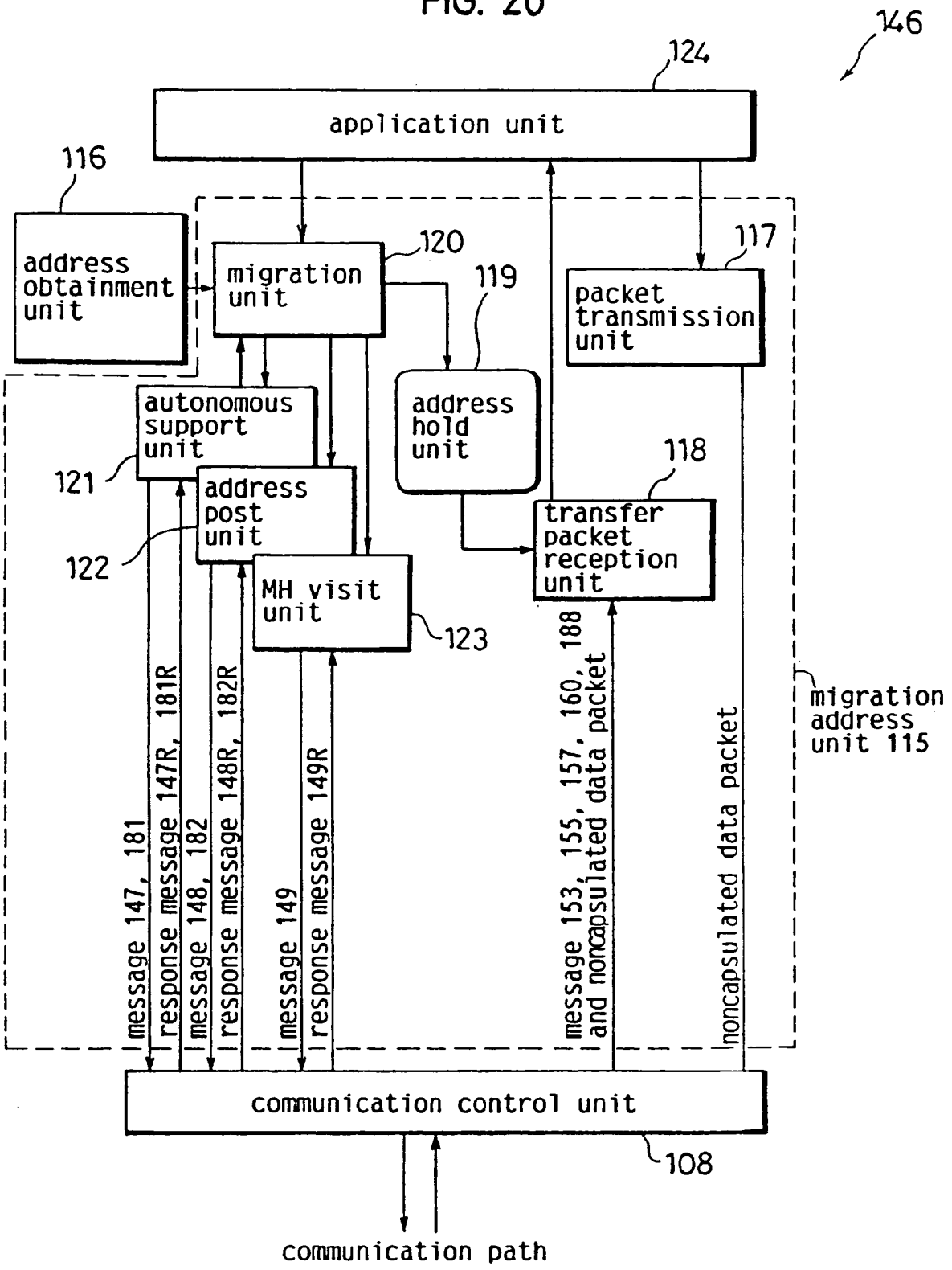

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FIG. 21

home addres	broadcast address of home network	current temporary address	broadcast address
α	Aba	β or γ	Bba or Cba

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FIG. 22

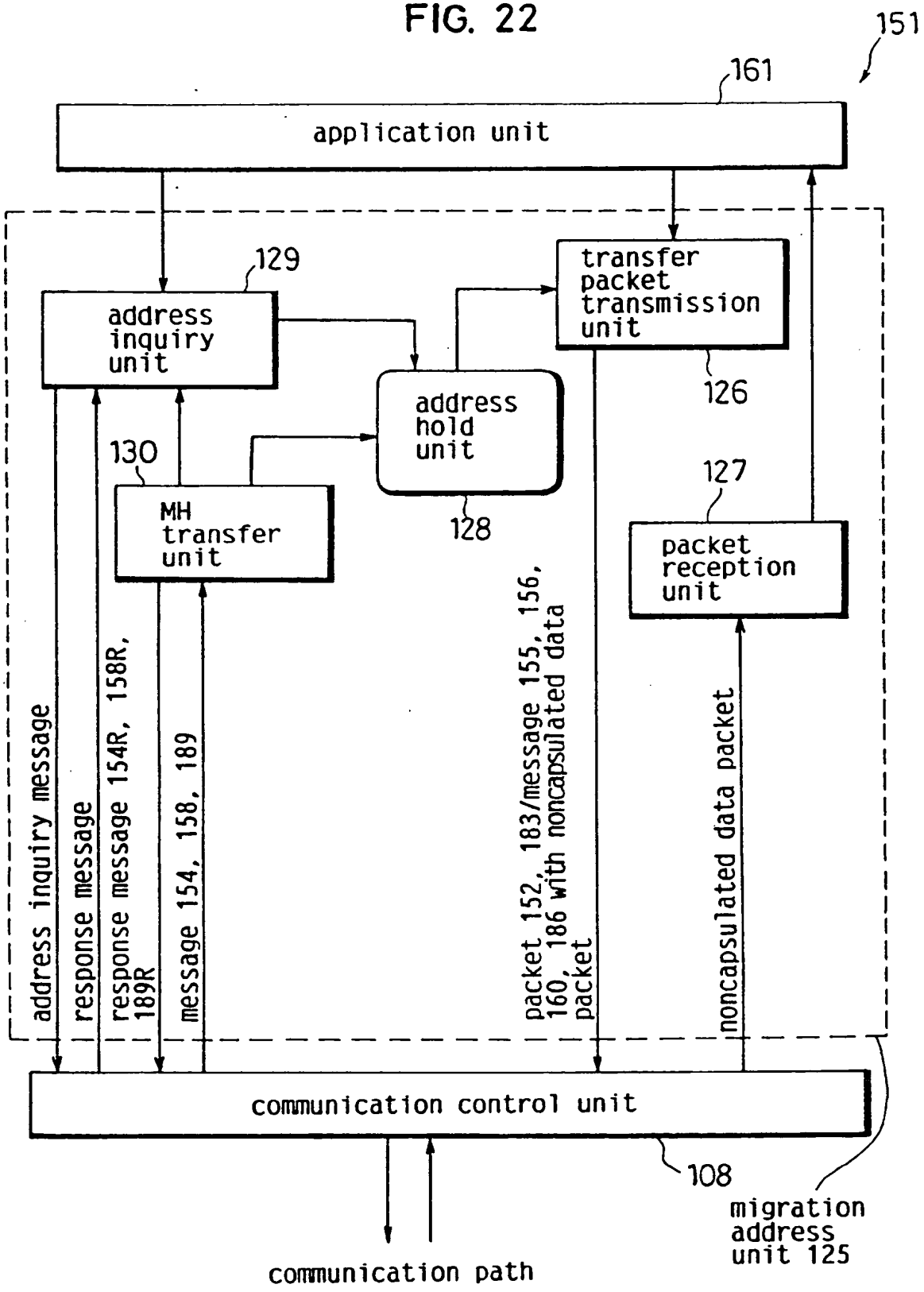

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FIG. 23

MH's home address	MH's temporary address
α	β or γ

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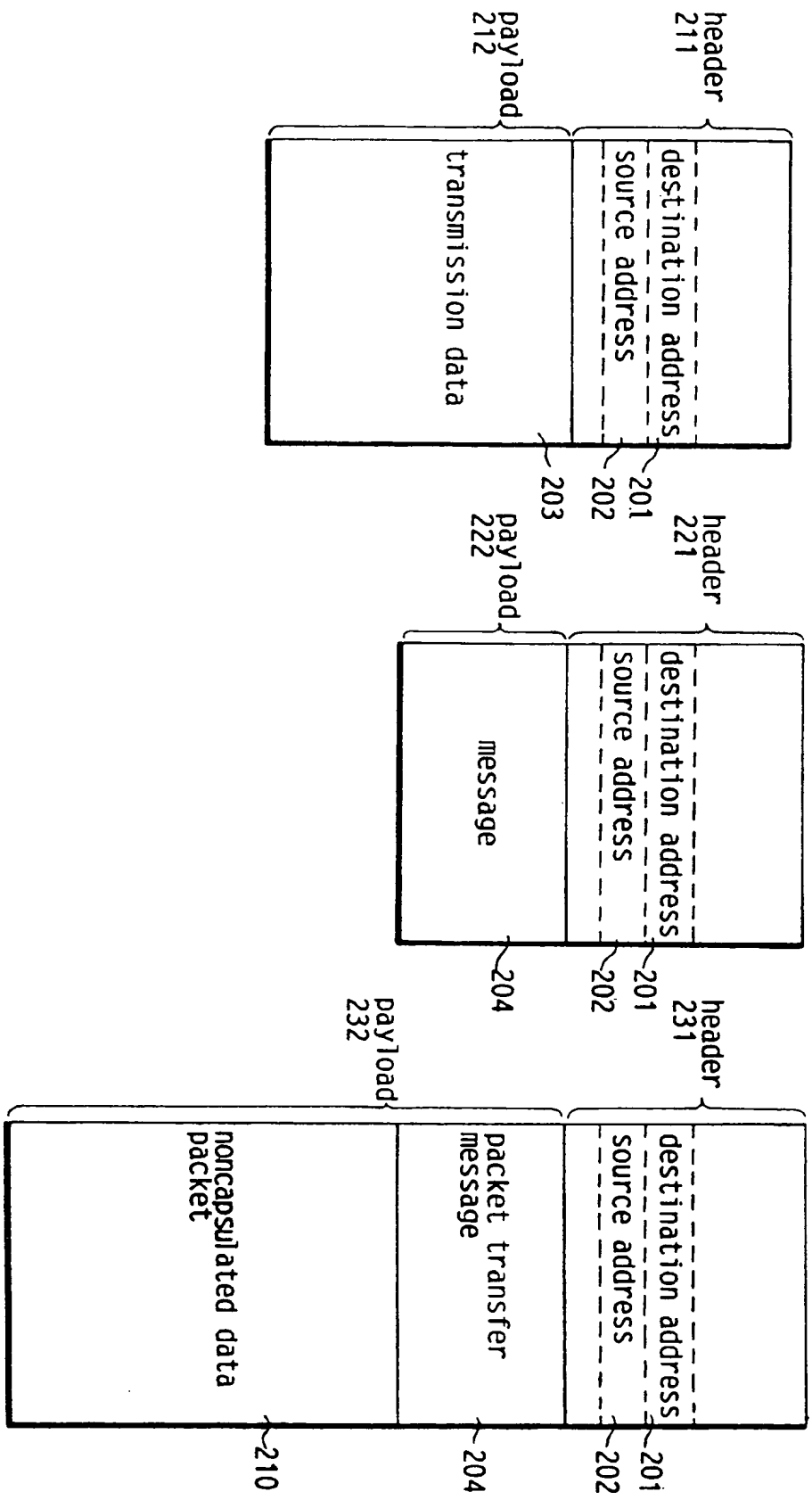

FIG. 24

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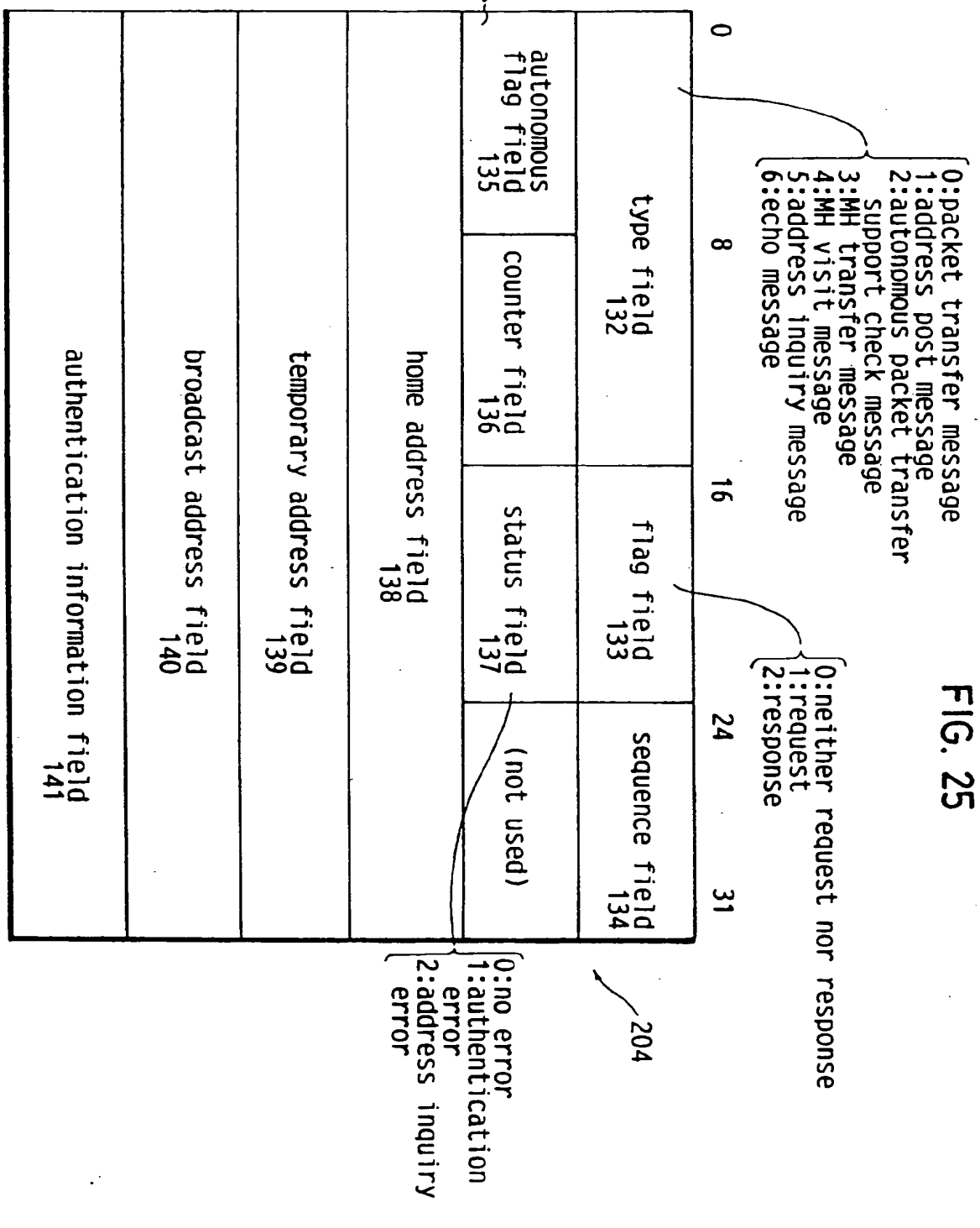

FIG. 25

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FIG. 26

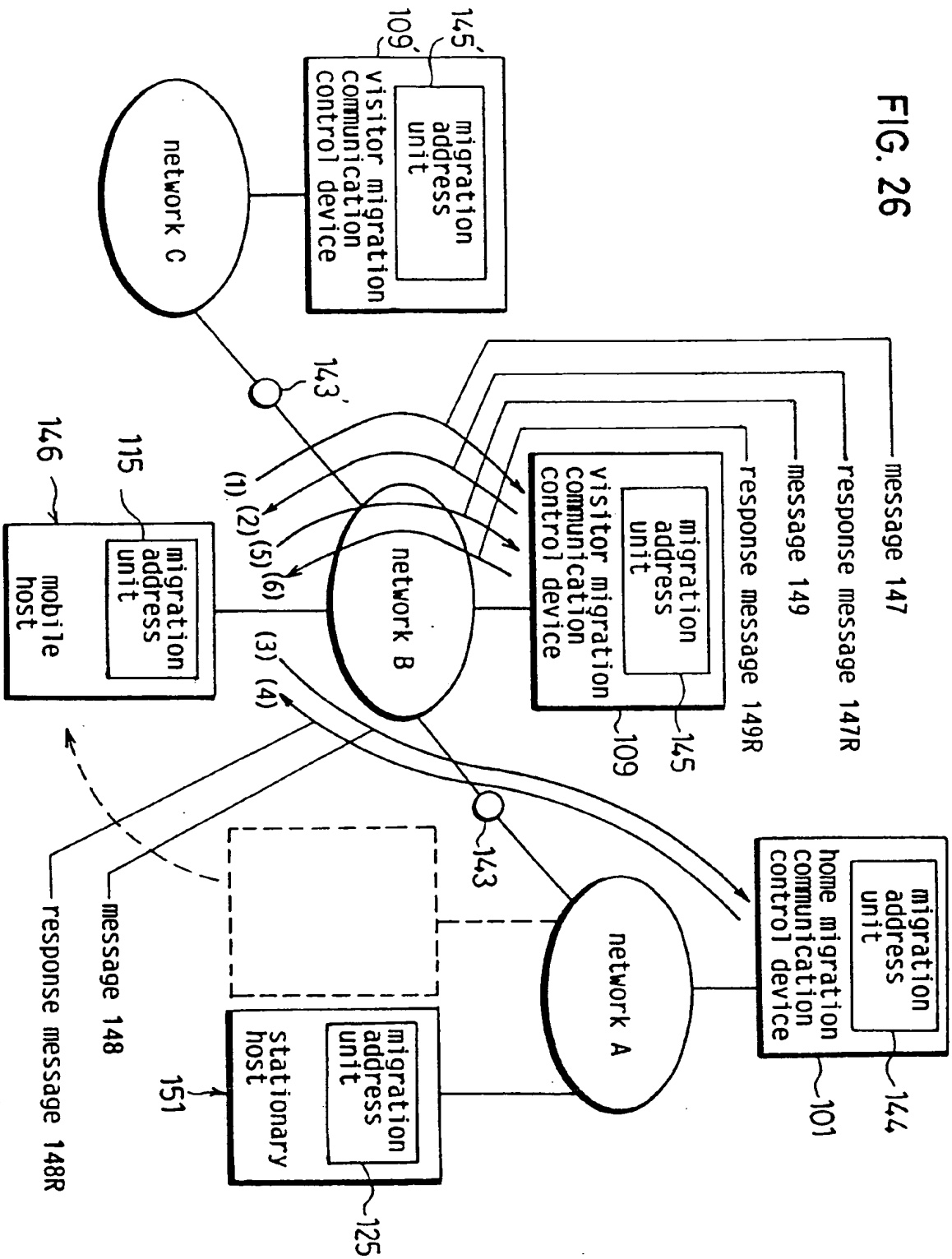

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FIG. 27 migration from network A to network B

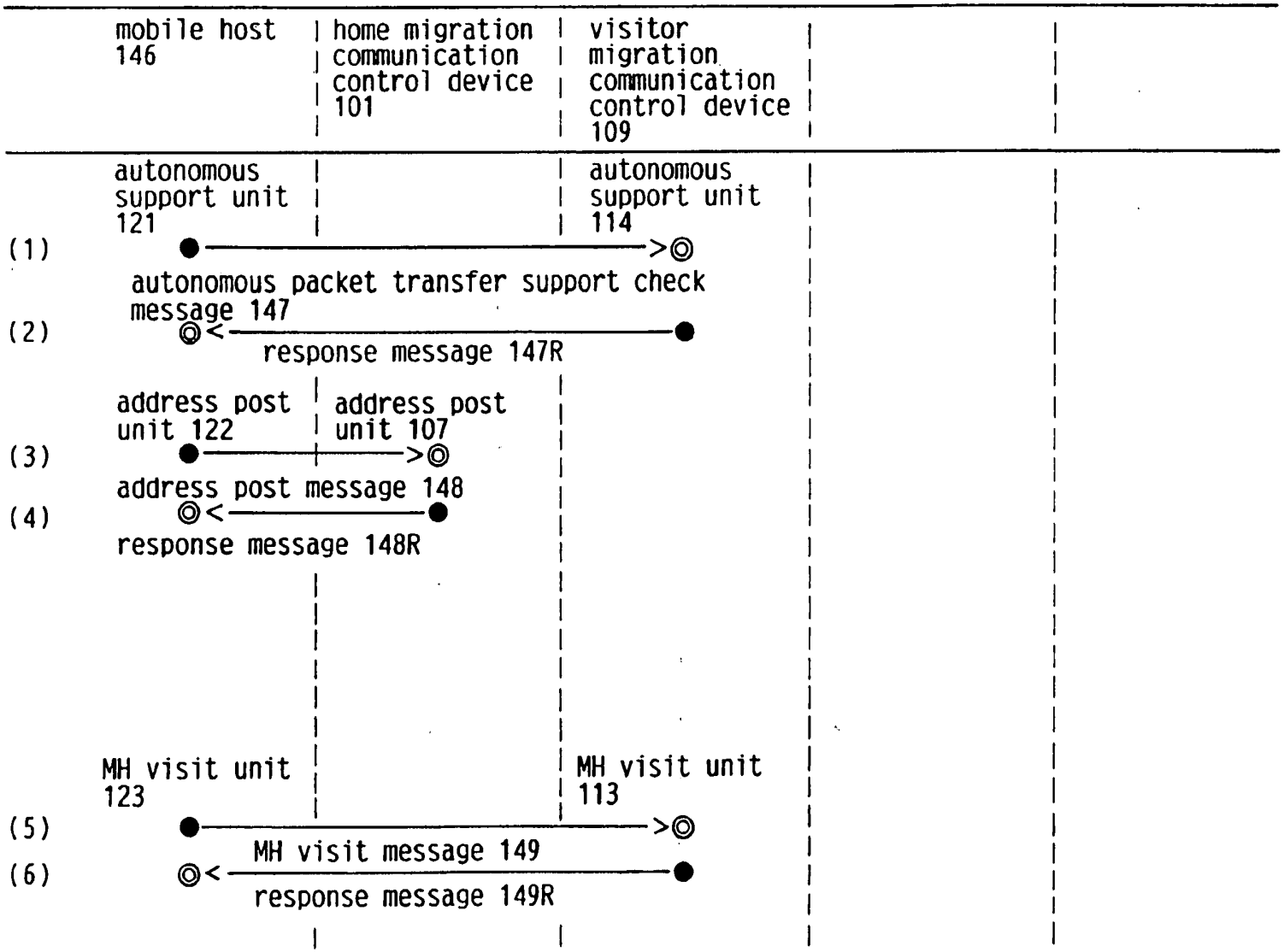

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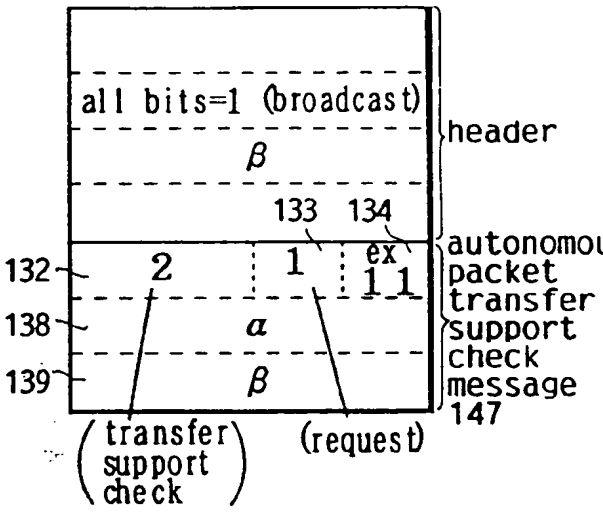
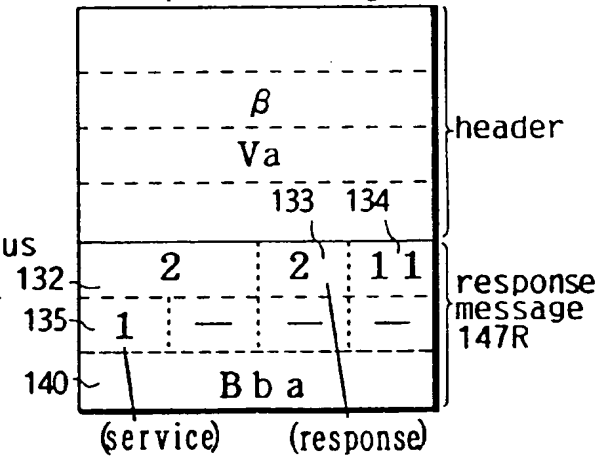
FIG.28

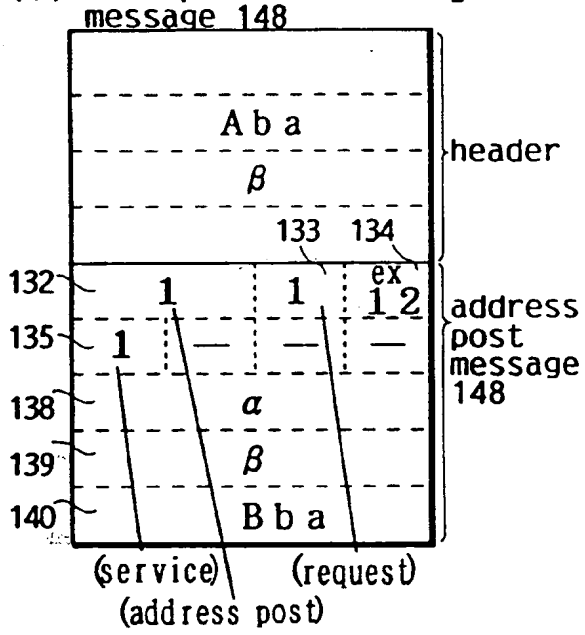
(1) data packet including message 147



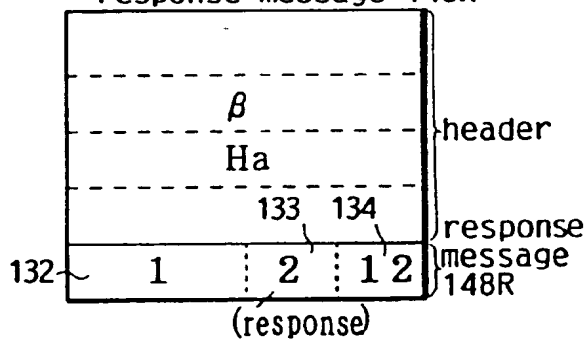
(2) data packet including response message 147R



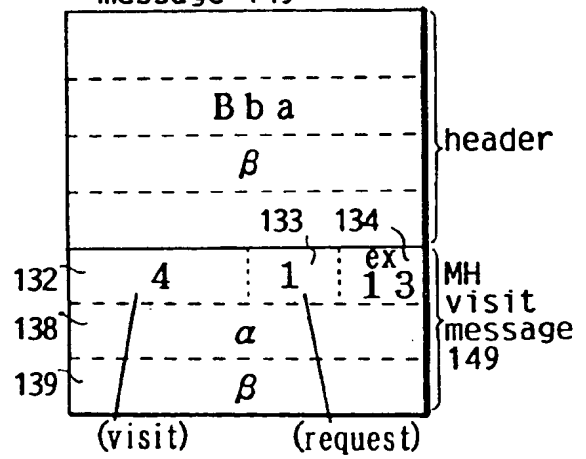
(3) data packet including message 148



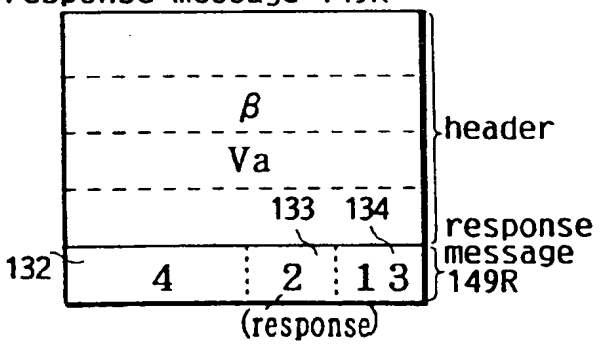
(4) data packet including response message 148R



(5) data packet including message 149



(6) data packet including response message 149R



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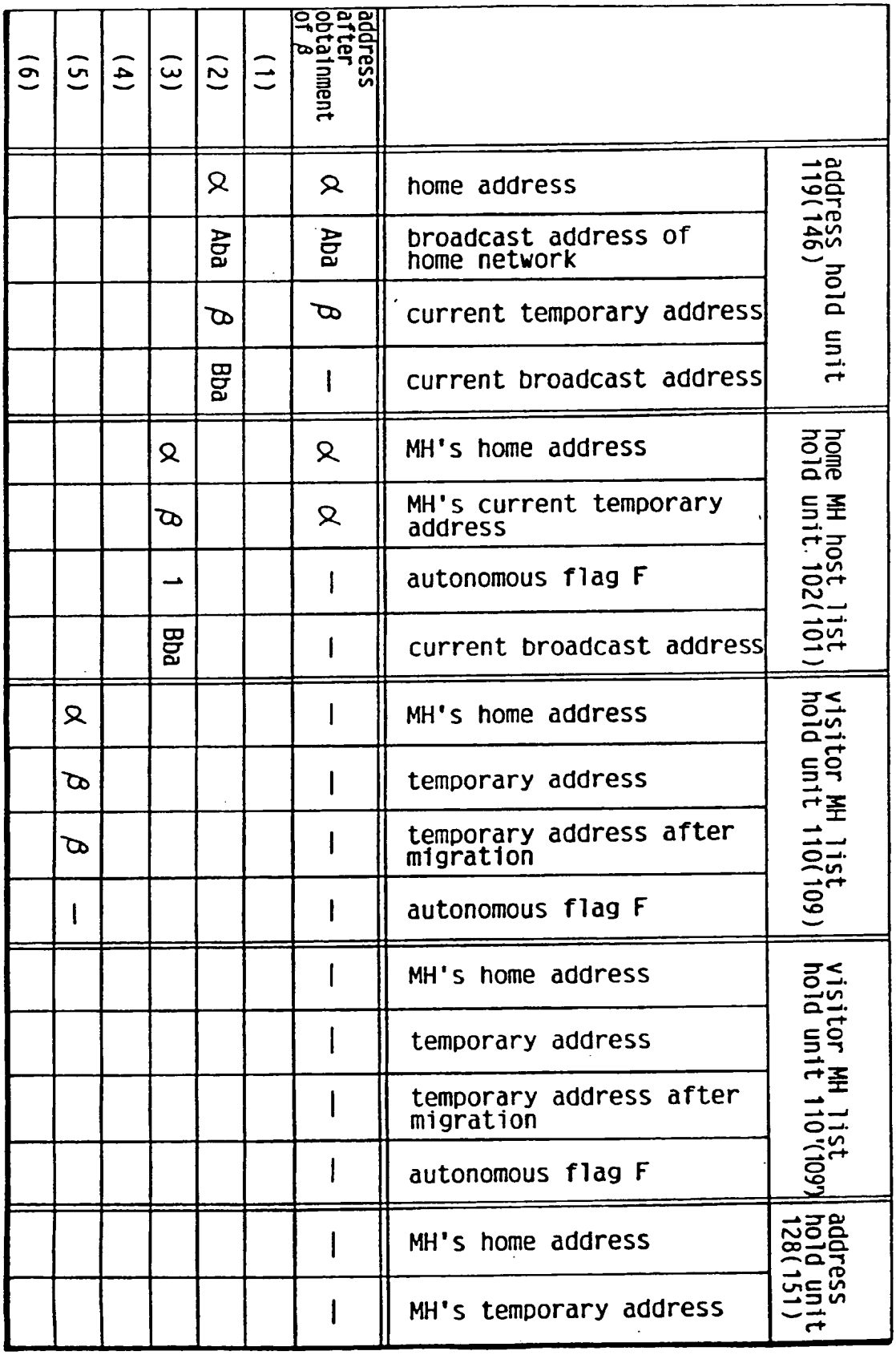

		address after obtainment of β	(1)	(2)	(3)	(4)	(5)	(6)
address hold unit 119(146)	home address	α		α				
	broadcast address of home network	Aba		Aba				
	current temporary address	β		β				
	current broadcast address	—		Bba				
home MH host list hold unit 102(101)	MH's home address	α			α			
	MH's current temporary address	α			β			
	autonomous flag F	—			1			
	current broadcast address	—			Bba			
visitor MH list hold unit 110(109)	MH's home address	—					α	
	temporary address	—					β	
	temporary address after migration	—					β	
	autonomous flag F	—					—	
visitor MH list hold unit 110'(109')	MH's home address	—						
	temporary address	—						
	temporary address after migration	—						
	autonomous flag F	—						
address hold unit 128(151)	MH's home address	—						
	MH's temporary address	—						

FIG. 29

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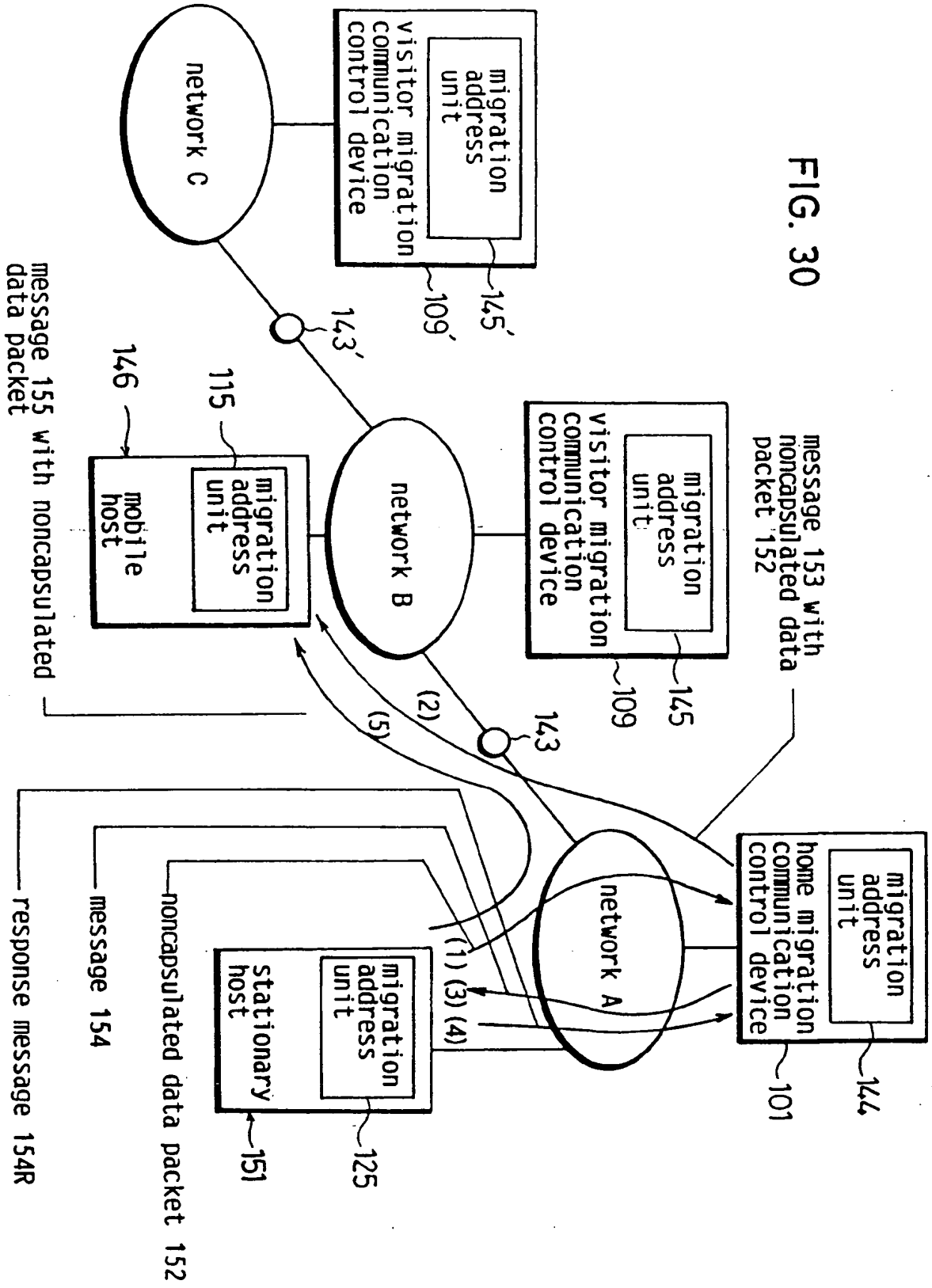

FIG. 30

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FIG. 31

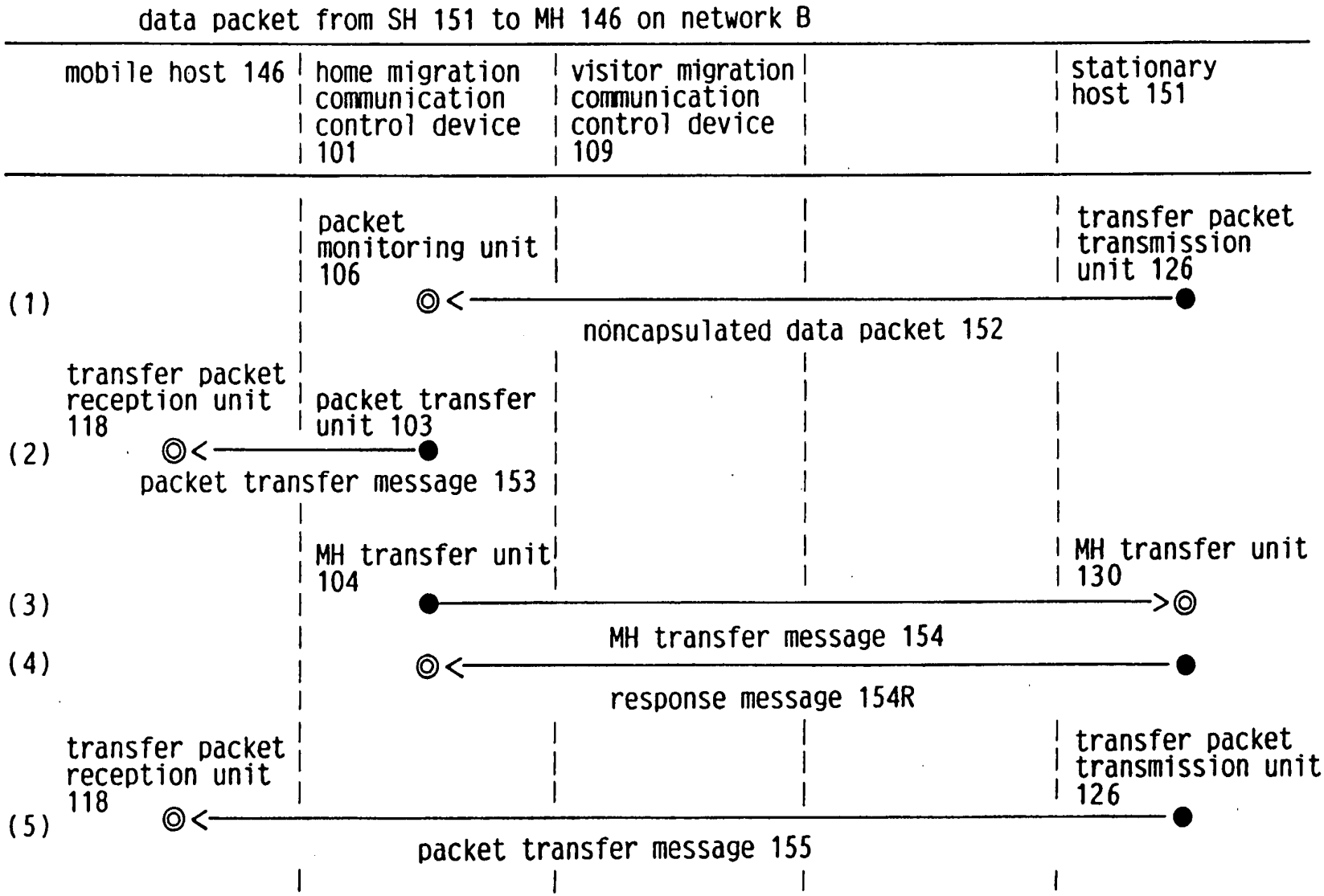

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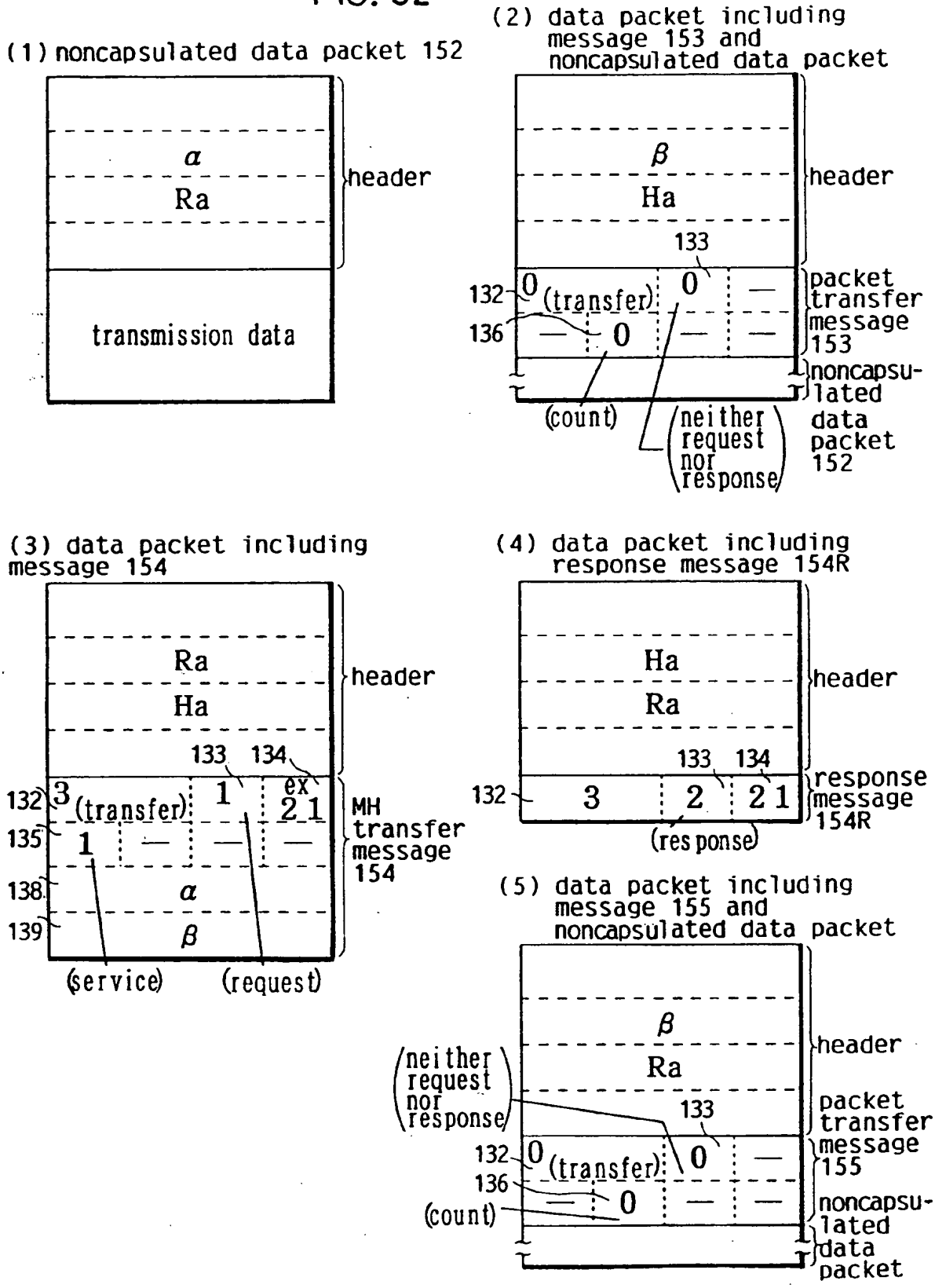
FIG. 32



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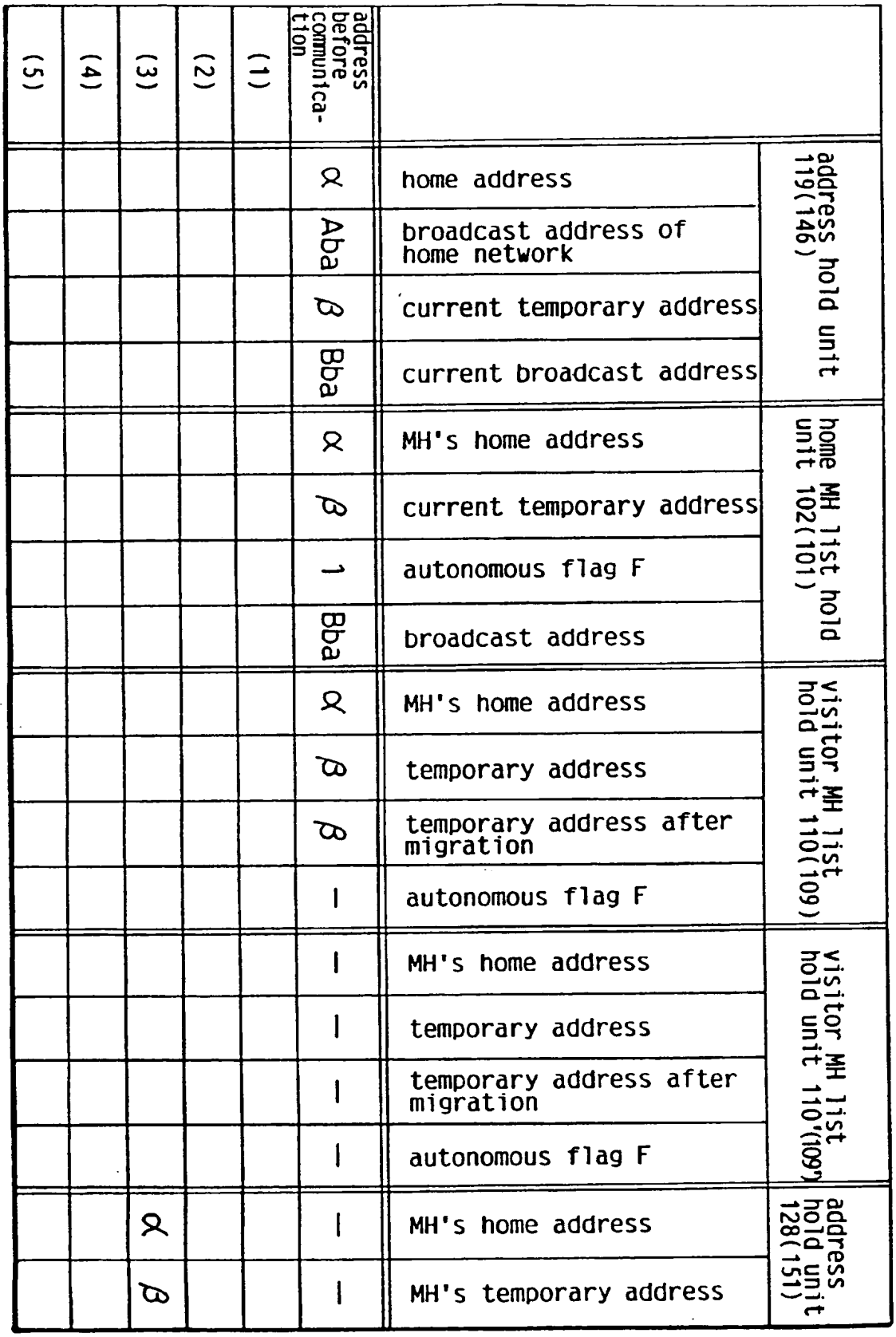

	address before communication		
address hold unit 119(146)	α	home address	(1)
	Aba	broadcast address of home network	(2)
	β	current temporary address	(3)
	Bba	current broadcast address	(4)
			(5)
home MH list hold unit 102(101)	α	MH's home address	
	β	current temporary address	
	1	autonomous flag F	
	Bba	broadcast address	
visitor MH list hold unit 110(109)	α	MH's home address	
	β	temporary address	
	β	temporary address after migration	
	1	autonomous flag F	
visitor MH list hold unit 110'(109')	1	MH's home address	
	1	temporary address	
	1	temporary address after migration	
	1	autonomous flag F	
address hold unit 128(151)	1	MH's home address	α
	1	MH's temporary address	β

FIG. 33

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FIG. 34

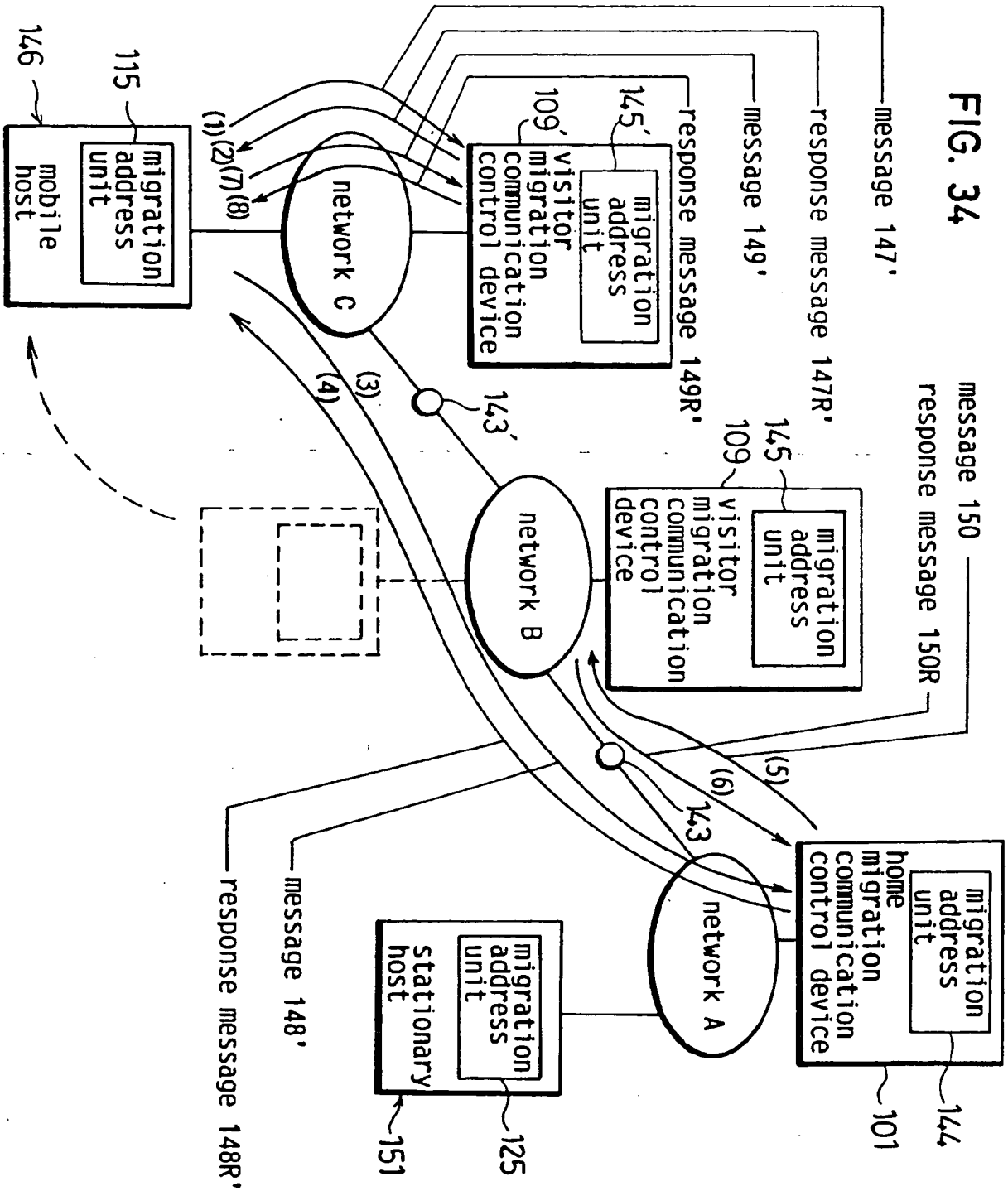

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FIG. 35 migration from network B to network C

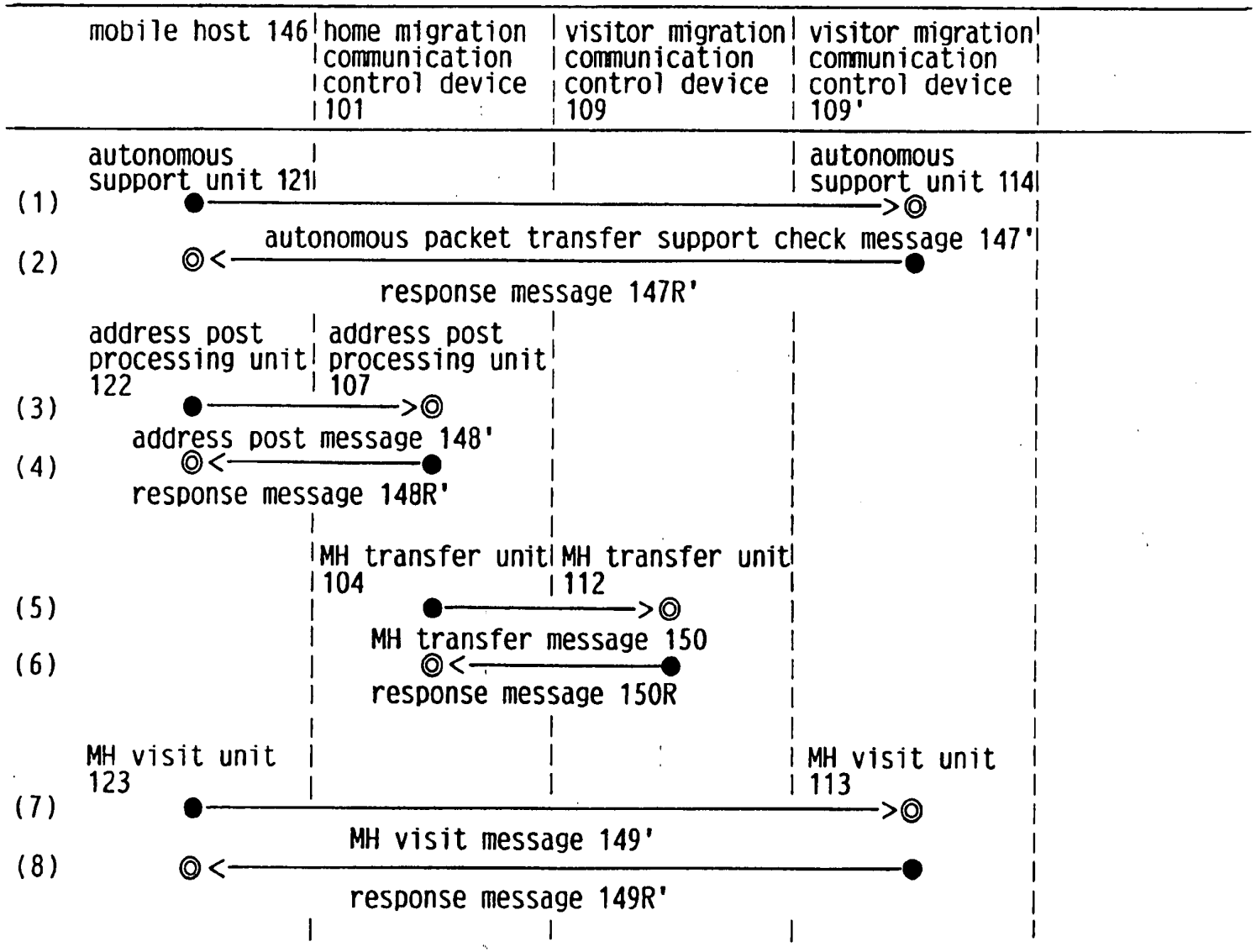

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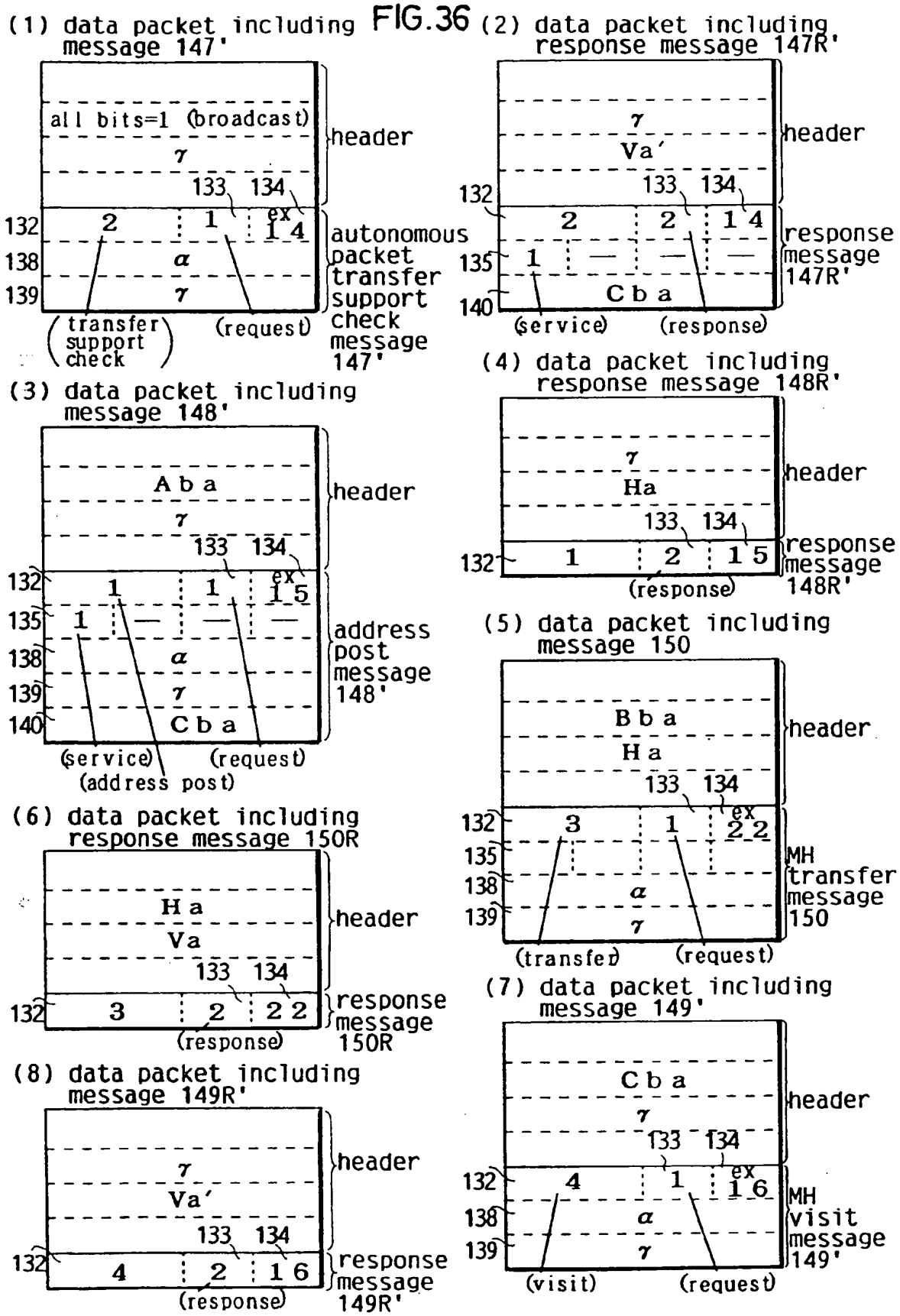
FIG.36



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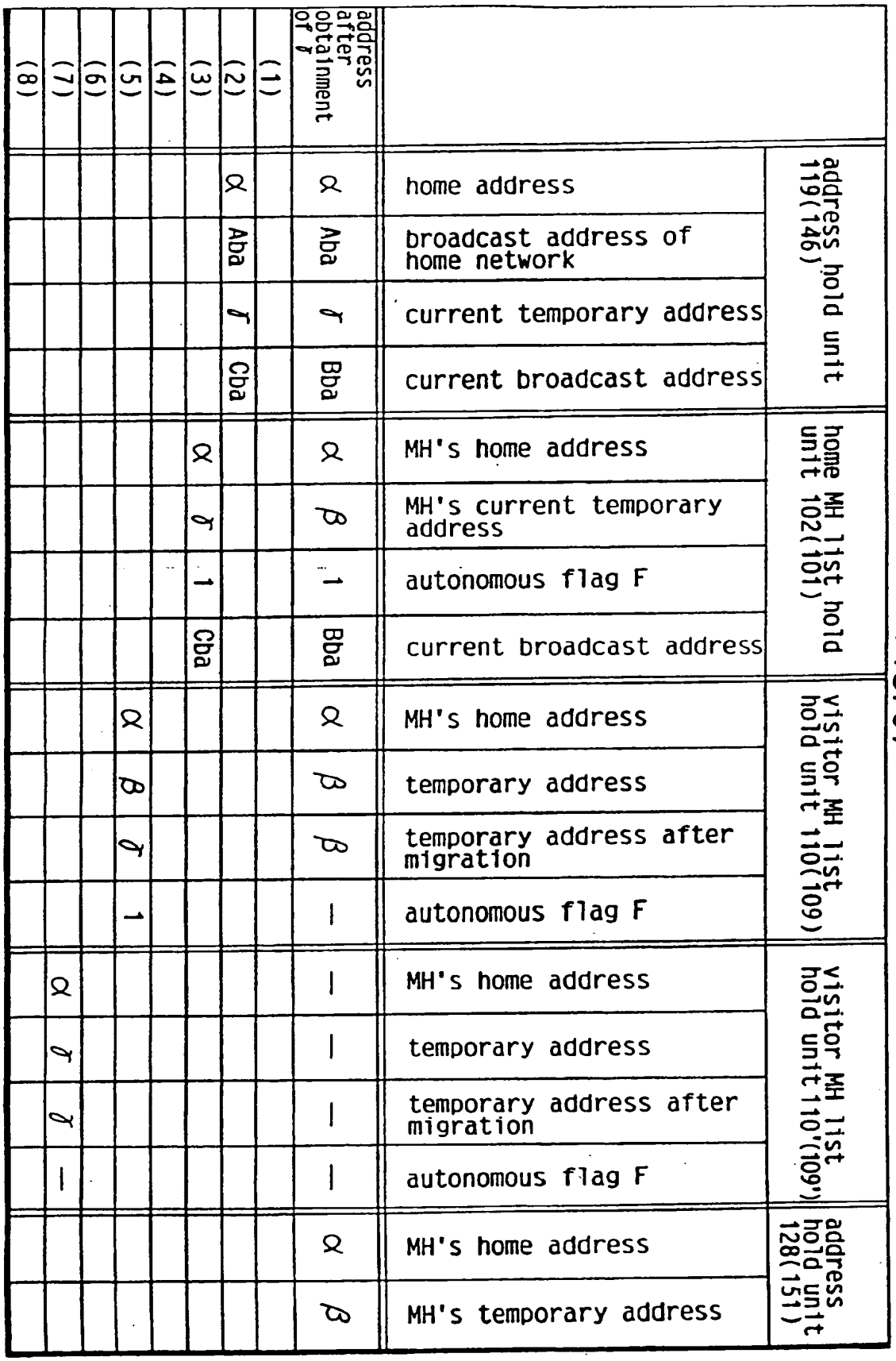

		address hold unit 119(146)	home MH list hold unit 102(101)	visitor MH list hold unit 110(109)	visitor MH list hold unit 110'(109')	address hold unit 128(151)
address after obtainment of γ						
(1)						
(2)	α	home address				
(3)	Aba	broadcast address of home network				
(4)	γ	current temporary address				
(5)	Cba	current broadcast address				
(6)	α		MH's home address			
(7)	β		MH's current temporary address			
(8)	1		autonomous flag F			
	Cba		current broadcast address			
	α			MH's home address		
	β			temporary address		
	β			temporary address after migration		
	1			autonomous flag F		
	—				MH's home address	
	γ				temporary address	
	γ				temporary address after migration	
	—				autonomous flag F	
	α					MH's home address
	β					MH's temporary address

FIG. 37

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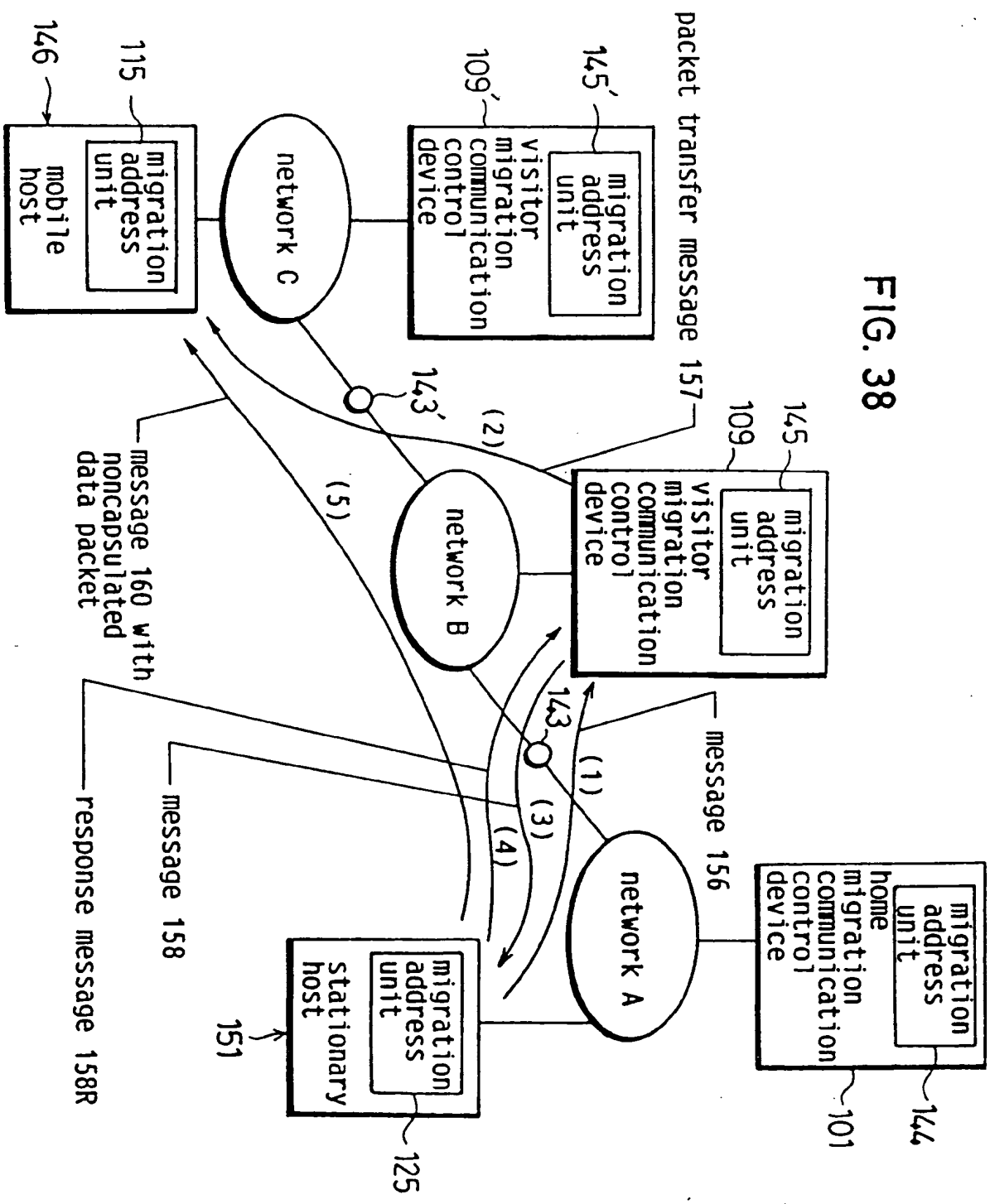

FIG. 38

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FIG. 39

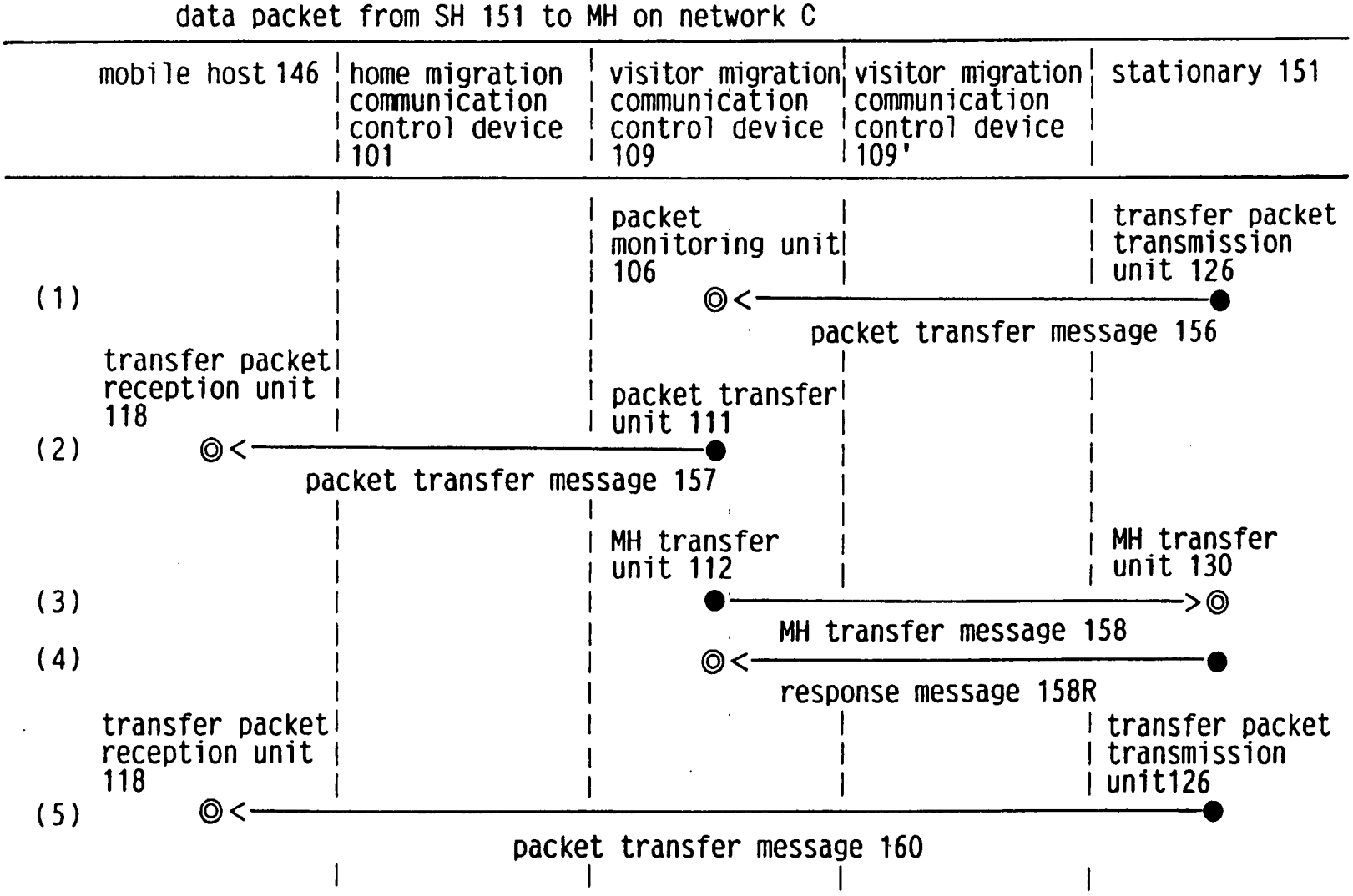

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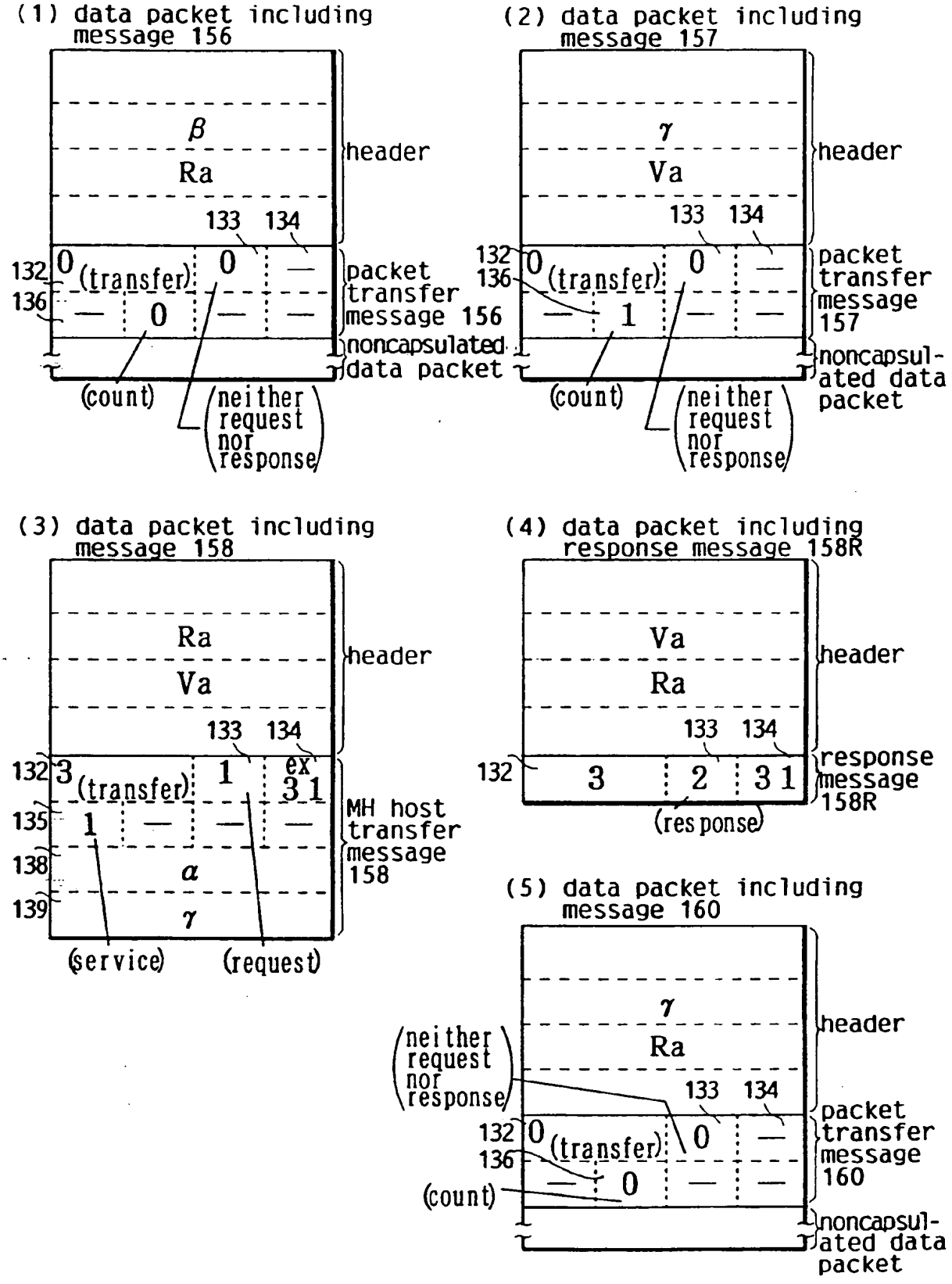
FIG. 40



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	address before communication						
						address hold unit 119	home address
					Aba		broadcast address of home network
					γ		current temporary address
					Cba		current broadcast address
					α	home MH list hold unit 102	MH's home address
					γ		MH's current temporary address
					1		autonomous flag F
					Cba		broadcast address
					α	visitor MH list hold unit 110	MH's home address
					β		temporary address
					γ		temporary address after migration
					1		autonomous flag F
					α	visitor MH list hold unit 109	MH's home address
					δ		temporary address
					δ		temporary address after migration
					-		autonomous flag F
		α			α	address hold unit 128	MH's home address
		δ			β		MH's temporary address
(5)	(4)	(3)	(2)	(1)			

FIG. 41

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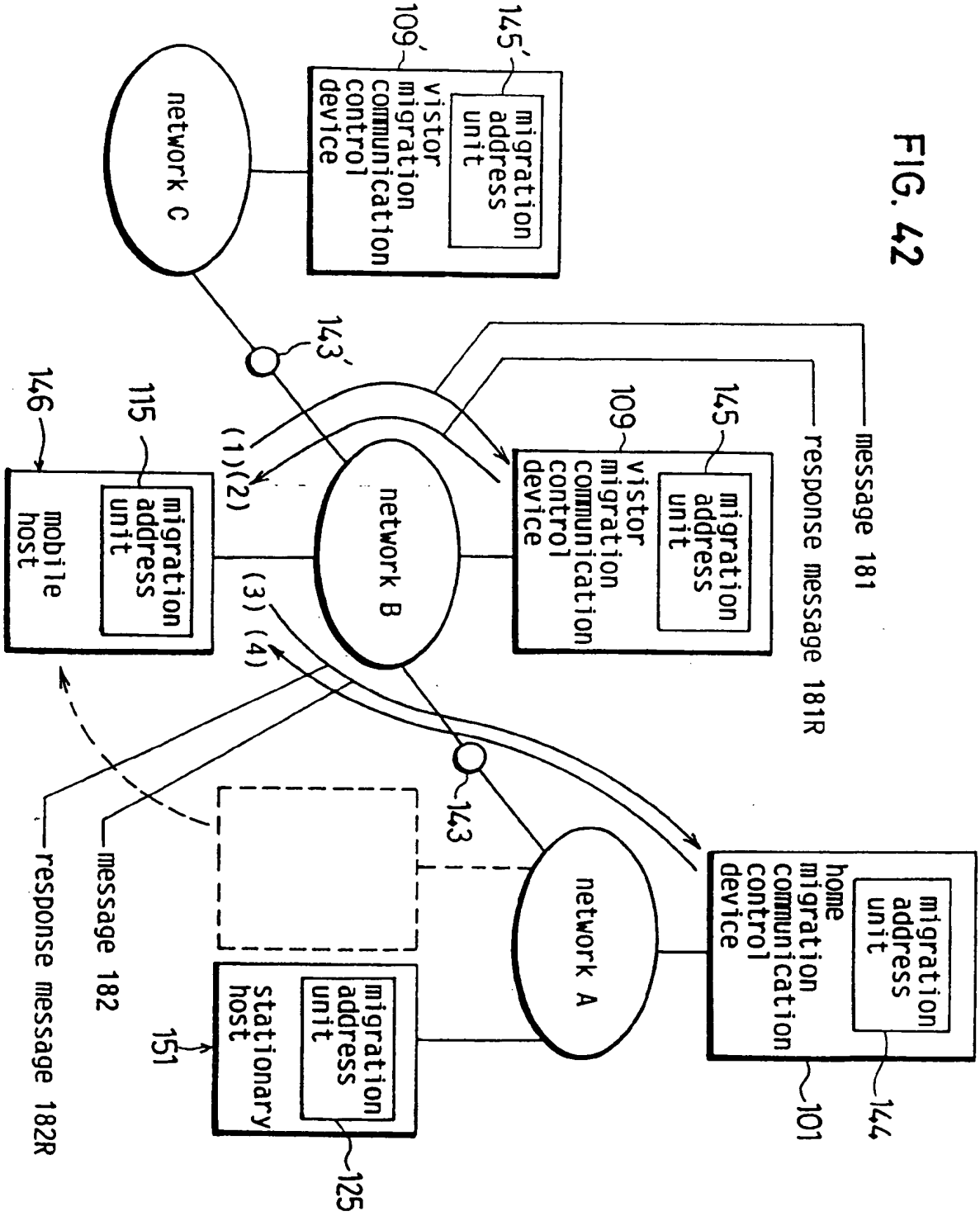
FIG. 42



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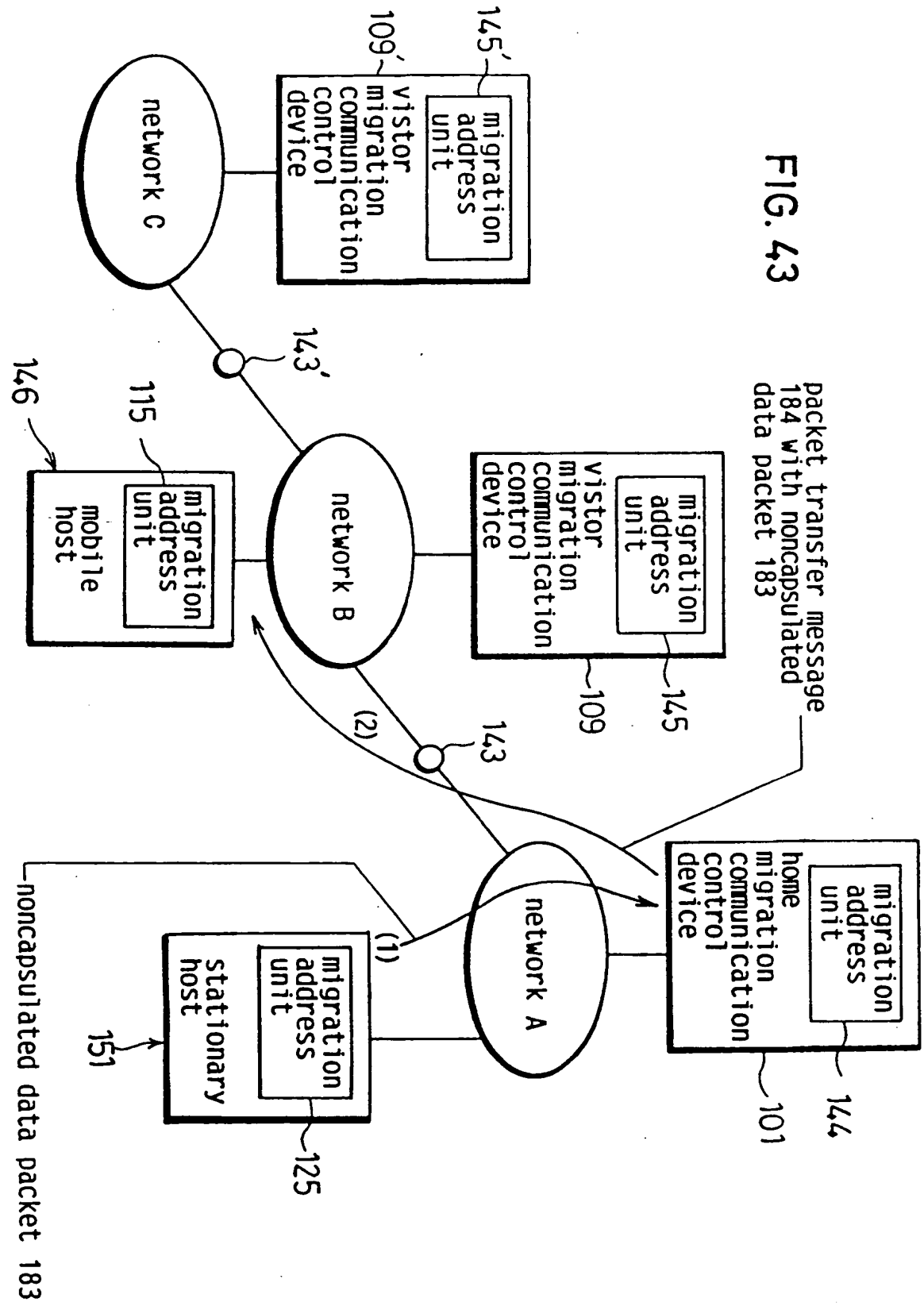

FIG. 43

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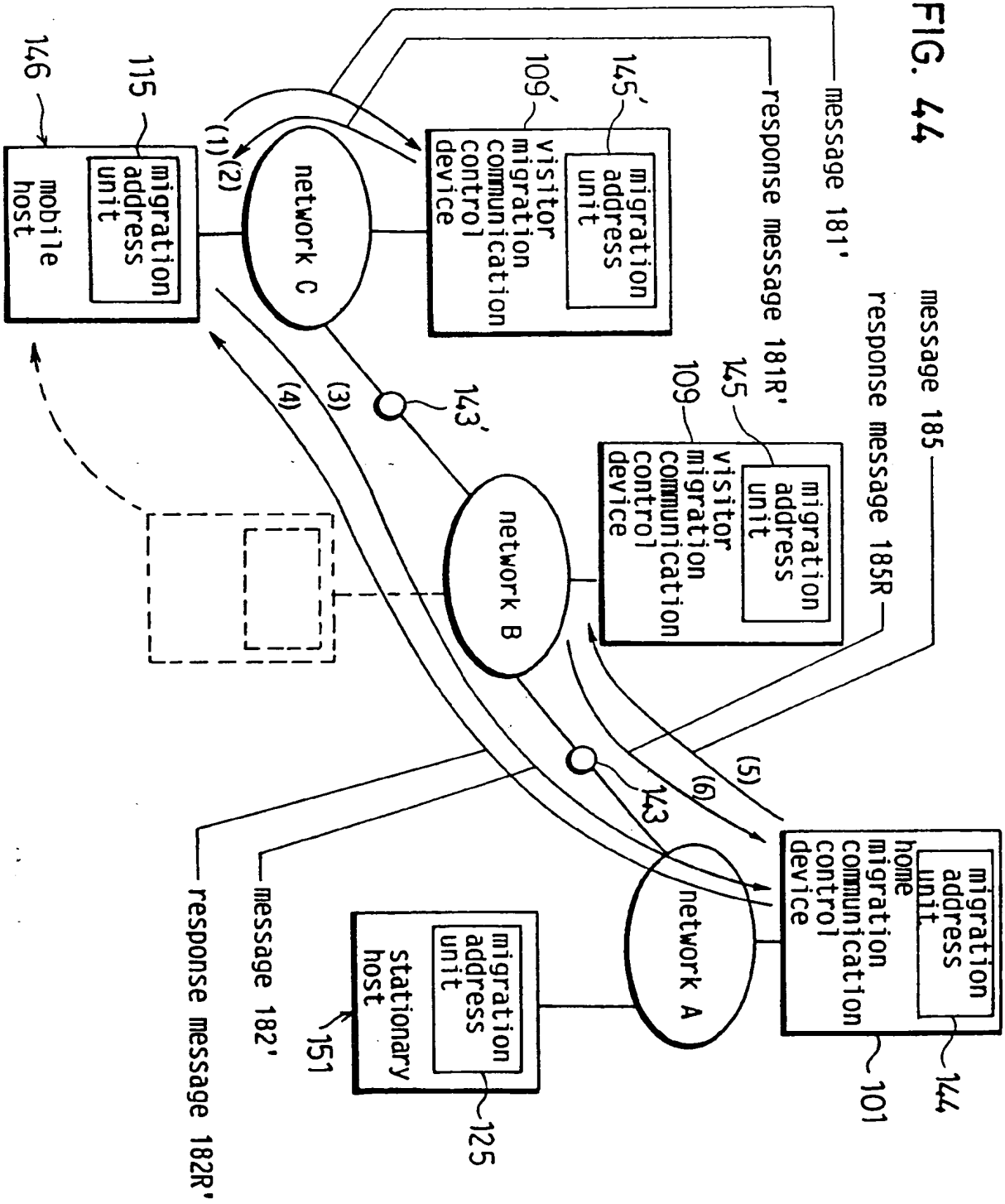
FIG. 44



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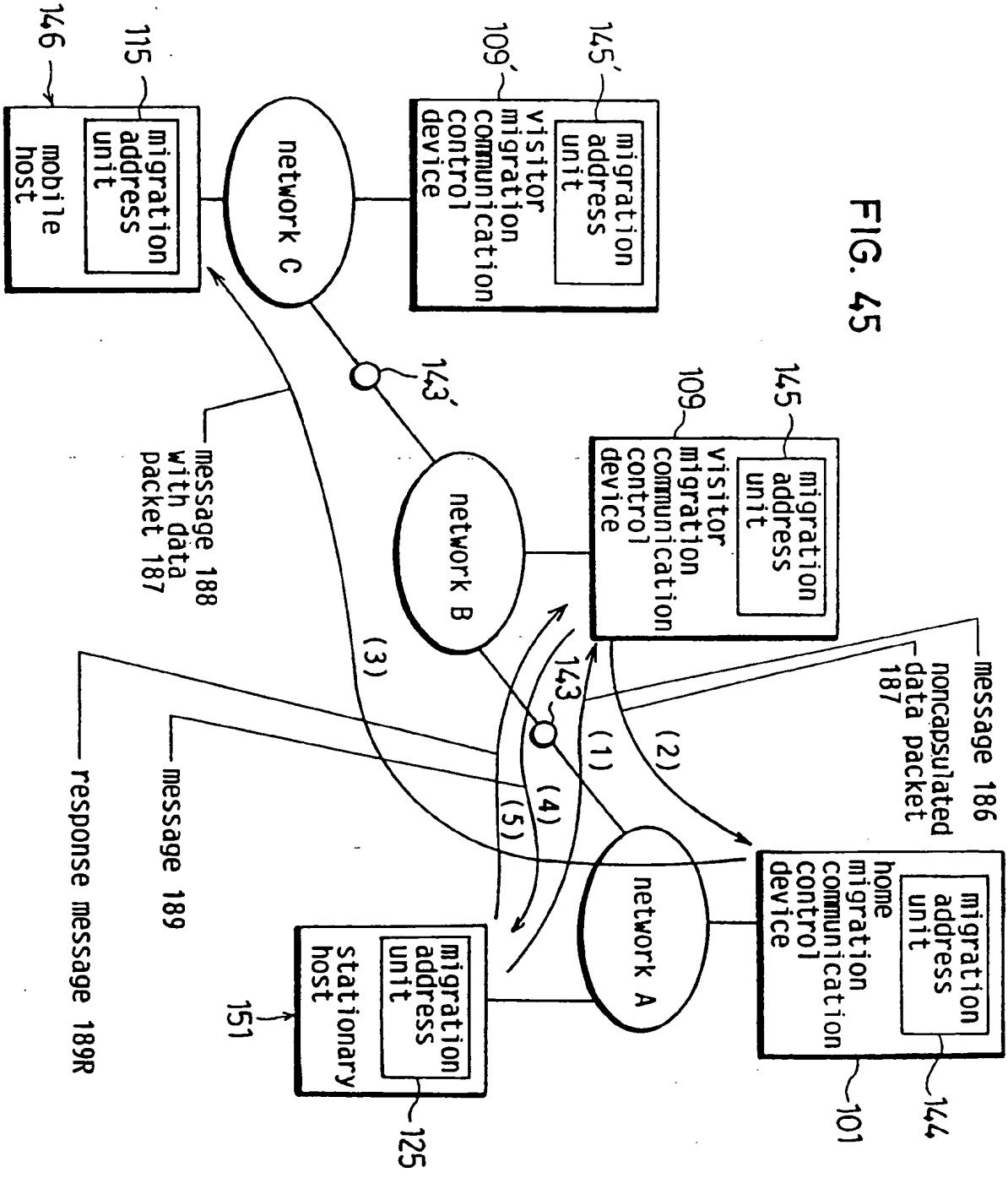

FIG. 45

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(54) Migration communication control device.

(57) Disclosed is a migration communication control device constructed to control a continuous communication between a mobile node and a node unaffected the mobile node's migration. The migration communication control device comprises a first migration control unit, a second migration control unit on the mobile node, and a third migration control unit on the partner node. The first migration control unit comprises a packet transfer unit and an address post unit. The packet transfer unit receives a packet which was destined for an outdated address of the mobile node, generates a conversion packet which holds an updated address instead of the outdated address, and then transmits the conversion packet, while an address post unit transmits an address post message which indicates the updated address to the third migration control unit. The second migration control unit comprises a migration post unit and a packet resumption unit. The migration post unit transmits to the first migration control unit a migration post message which indicates the updated address when the mobile node migrates to another network while a packet resumption unit receives the conversion packet from both the first migration control unit and the third migration control unit and resumes an original packet from the conversion packet. The third migration control unit comprises a packet conversion unit which converts a destination address of a packet into the updated address, then transmits it to the mobile node.

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European Patent Office

EUROPEAN SEARCH REPORT

Application Number EP 93300919.3

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	DATABASE WPIL, no. 90-311 754, DERWENT PUBLICATIONS LTD., London; & TP-A-99 004 (ANONYMOUS) * Abstract * --	1, 38-40	H 04 Q 7/00 H 04 L 12/56
A	GB - A - 2 236 393 (SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V.) * Fig. 2A,2B; abstract; claim 1 * --	1, 38-40	
A	WO - A - 86/01 918 (HOLBERG) * Fig. 1,2; abstract; claim 1 * ----	1, 38-40	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

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H 04 L 12/00
G 06 F 15/00
G 01 V 1/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	03-02-1995	BERGER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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(54) Automatic discovery of network elements.

(57) Disclosed is a computer network node discovery system that provides a general way of discovering network elements, or nodes, connected to a computer network, and a specific algorithm for discovering nodes connected to a TCP/IP network, using the SNMP protocol available within the TCP/IP network software. Some nodes on a network, called discovery agents, can convey knowledge of the existence of other nodes on the network. The network discovery system queries these agents and obtains the information they have about other nodes on the network. It then queries each of the nodes obtained to determine if that node is also a discovery agent. In this manner, most of the nodes on a network can be discovered. The process of querying discovery agents to obtain a list of nodes known to the discovery agents is repeated at timed intervals to obtain information about nodes that are not always active. In a TCP/IP network, discovery agents are nodes that respond to queries for an address translation table which translates internet protocol (IP) addresses to physical addresses. The data from each node's address translation table is used to obtain both the IP and the physical address of other nodes on the network. These nodes are then queried to obtain additional information. After all the nodes on a network are discovered, the list of nodes is written to a database where it can be displayed by the network manager or other users of the network.

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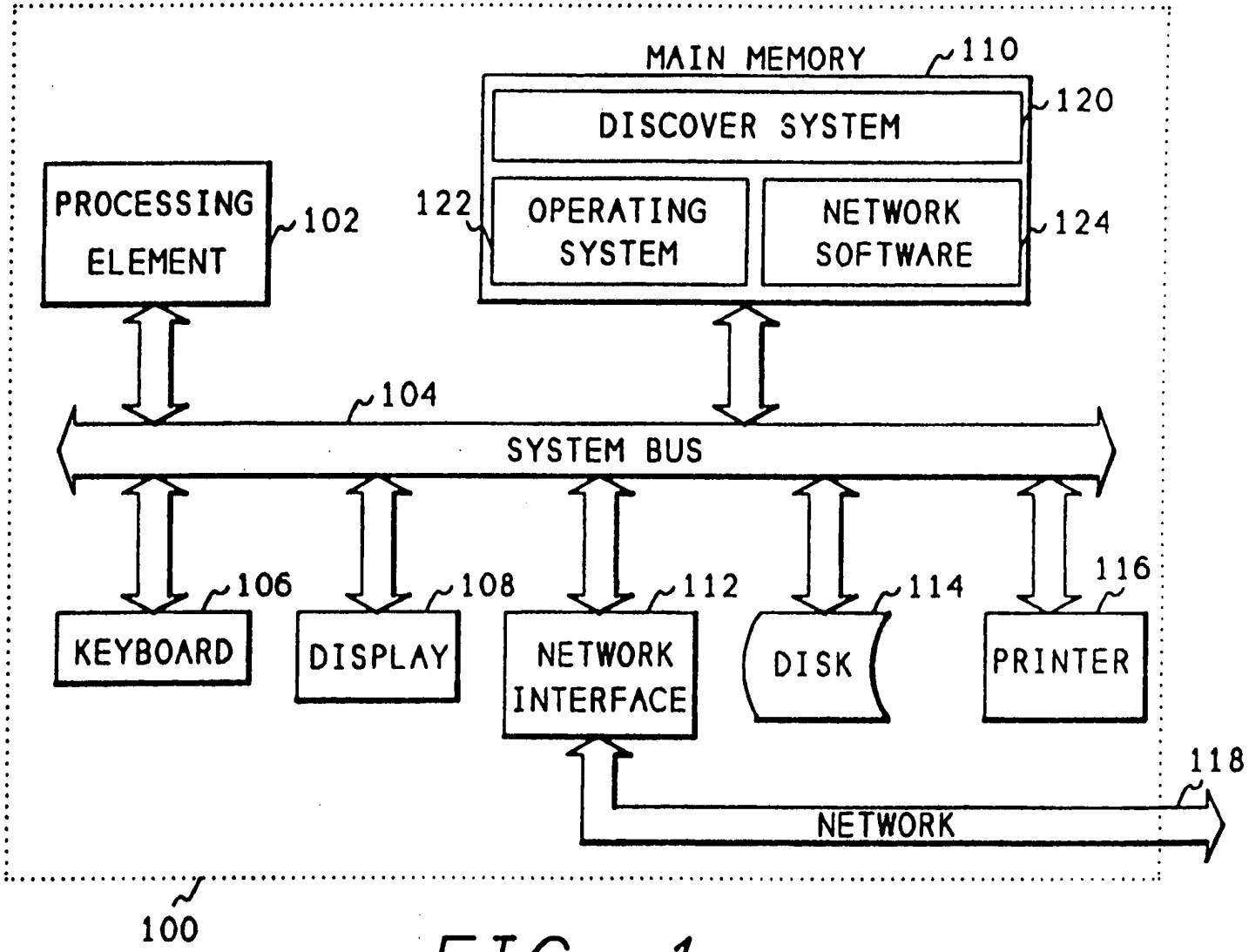

FIG. 1

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FIELD OF THE INVENTION

This invention relates to computer systems and more particularly to computer networks that interconnect computers. Even more particularly, the invention relates to determining the nodes connected to a network.

BACKGROUND OF THE INVENTION

Computer networks are collections of hardware and software that connect computers and allow them to send information from one computer to another electronically. A computer network is comprised of the physical hardware connections between the various computers, for example telephone lines or a coax cable, and the software used to send and receive data and to route the data to the selected computer on the network.

A local area network (LAN) is a network connection between computers in close proximity, typically less than one mile, and usually connected by a single cable such as coax cable. A wide area network (WAN) is a network of computers located at longer distances, often connected by telephone lines or satellite links. Network software may sometimes be used with both types of networks. For example, a popular network is the Department of Defense internetworking protocol suite, known as Transmission Control Protocol/Internet Protocol (TCP/IP). This system was originally developed by the Defense Advanced Research Projects Agency (DARPA) and has now been widely distributed to Universities and industry.

When a network is fast growing, that is, network elements or nodes are being added frequently, a network administrator may not know all of the nodes connected to the network. Also, a network administrator new to his or her job may not be familiar with the nodes on the network. Determining the nodes manually is a difficult problem. The administrator may contact all the users of the network known to the administrator, however, infrequent users may be forgotten and not contacted. Also, if a node is connected to the network, but not active because the computer is not powered up or is inoperative, that node may not be included in the list. In a very short local area network, a network administrator may physically trace the cable of the network to determine which nodes are located on the network. However, since longer local area networks can extend as far as a mile, through many floors and offices within a building, physical tracing may be impossible. In a wide area network, physical tracing is almost always impossible.

For some commonly used networks, special equipment can be purchased that will determine the nodes located on the network and the distance between them. This equipment, called a probe, is often limited by the other components of the network, however. For example, in a local area network, a repeater unit may be used to extend the effective distance of the local area network to a distance greater than is capable with a single cable. A repeater unit amplifies signals, and therefore will not allow a probe to determine the location of nodes beyond the repeater.

Other units connected to the network may obscure nodes. For example a bridge unit connects two similar networks but only passes messages that are being sent from a node on one side of the bridge to a node on the other side of the bridge. It will not pass messages between nodes on the same side, in order to reduce the traffic on the other side of the bridge. A bridge will prevent a probe from determining the nodes on the other side of the bridge. A gateway is a unit that connects dissimilar networks to pass messages. Because a gateway may have to reformat a message to accommodate a different network protocol, it will prevent a probe from finding nodes beyond the gateway.

There is need in the art then for a method of determining the nodes on a local area network. There is further need in the art for determining such nodes without the use of special equipment. A still further need is for a method that will determine which nodes are located beyond the repeater units, bridges, and gateways on a network.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a method of determining the elements or nodes connected to a network.

It is another object of the invention to provide a method of discovering network nodes on a TCP/IP network.

Another object of the invention is to determine which discovered nodes are discovery agents and can convey knowledge of the existence of other nodes on the network.

Another object is to query all discovery agents and ask for other nodes on the network

A further object is to query all TCP/IP nodes to retrieve the address translation table from the TCP/IP node.

The above and other objects of the invention are accomplished in a system which provides a general way of discovering network elements, or nodes, and a specific algorithm for discovering nodes within a TCP/IP network, using a standard Simple Network Management Protocol (SNMP), which is available within the TCP/IP network.

Some nodes on a network can convey knowledge of the existence of other nodes on a network, and are called discovery agents. When a network contains discovery agents, these agents can be queried to obtain the information they have about other nodes on the network. By obtaining a list of nodes from a single

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discovery agent, and querying each of the nodes obtained to determine if it is also a discovery agent, most of the nodes on a network can be discovered.

The process of querying discovery agents to obtain a list of nodes known to be discovery agents, must be repeated at timed intervals. At any given time on a network, one or more nodes may not be responding to the network, either because it is inoperative, or because it is not powered up. Therefore, if the discovery process is attempted during this time, these unavailable nodes will not be discovered. By repeating the discovery process over time at regular intervals, additional nodes on a network can be discovered.

In a TCP/IP network, discovery agents are nodes that respond to queries for an address translation table. Within TCP/IP network, every node will have an internet protocol (IP) address. This address is a 32 bit number and is unique to all nodes within the TCP/IP network. Although the IP address is probably unique to all nodes everywhere that use the TCP/IP protocol, the physical address of a node on a particular network will be different from the IP address. For example, some types of LANs use an 8 bit address, and can therefore use the low order 8 bits of the IP address, however, some other types of LANs use a 48 bit address and cannot use the internet address. Therefore, every node within a TCP/IP network must have an address translation table which translates the IP address to the physical address. The data from each node's address translation table can be used to obtain both the IP and the physical address of other nodes on the network. Again, as described in the above general algorithm, the queries should be repeated at timed intervals to insure that recently activated nodes are discovered. Another reason for repeating the discovery process over timed intervals in a TCP/IP network is that some of the information within a node's address translation table may be purged if the node does not use the information after a period of time. This purge is used to reduce the table size requirements within a node. By repeating the queries at timed intervals, the greatest amount of translation table information may be obtained.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features, and advantages of the invention will be better understood by reading the following more particular description of the invention, presented in conjunction with the following drawings, wherein:

Fig. 1 shows a block diagram of the hardware of the node that runs the process of the present invention;

Fig. 2 shows a diagram of a typical computer interconnection network;

Figs. 3 through 5 show a hierarchy diagram of the modules of the discovery system of the present invention;

Fig. 6 shows a flowchart of the main module of the invention;

Fig. 7 shows a flowchart of the self-seed module of the invention;

Fig. 8 shows a flowchart of the process-node module of the invention;

Fig. 9 shows a flowchart of the process-ping module of the invention;

Fig. 10 shows a flowchart of the process-IFIP module of the invention;

Fig. 11 shows a flowchart of the store-IP module of the invention;

Fig. 12 shows a flowchart of the store-IF module of the invention;

Fig. 13 shows a flowchart of the invalidnode module of the invention;

Fig. 14 shows a flowchart of the findnode module of the invention;

Fig. 15 shows a flowchart of the addnode module of the invention;

Fig. 16 shows a flowchart of the process-AT module of the invention; and

Fig. 17 shows a flowchart of the store-AT module of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The following description is of the best presently contemplated mode of carrying out the present invention. This description is not to be taken in a limiting sense but is made merely for the purpose of describing the general principles of the invention. The scope of the invention should be determined by referencing the appended claims.

Fig. 1 shows a block diagram of the computer hardware that contains the discovery system of the present invention. Referring now to Fig. 1, a computer system 100 contains a processing element 102. The processing element 102 communicates to other elements within the computer system 100 over a system bus 104. A keyboard 106 is used to input information from a user of the system, and a display 108 is used to output information to the user. A network interface 112 is used to interface the system 100 to a network 118 to allow the computer system 100 to act as a node on a network. A disk 114 is used to store the software of the discovery system of the present invention, as well as to store the data base collected by the discovery system. A printer 116 can be used to provide a hard copy output of the nodes of the network discovered by the discovery system. A main memory 110 within the system 100 contains the discovery system 120 of the present invention. The discovery system 120 communicates with in operating system 122 and network software 124 to discover the nodes on the

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network 118.

Fig. 2 shows a diagram of a network. Referring now to Fig. 2, a network 202 contains a node 206. Node 206 contains the processor 100 (Fig. 1) which contains the discovery system software of the present invention. Node 206 is attached to a first network segment 118. The network segment 118 is connected to a repeater 212 which is connected to a second network sequent 214. This second network system 214 has nodes 216 and 218 attached to it. A repeater, such as repeater 212, allows network sequents to be connected to allow a network to be extended over a longer distance. An important characteristic of a repeater is that there is no translation of data passing through it. That is, every message that is transmitted on one network segment, will pass unchanged through a repeater to the other network segment. Therefore, any messages broadcast, for example, by node 206 will be received by node 216 and node 218 after these messages pass through repeater 212.

Network segment 118 is also attached to a bridge 208 which connects it to a third network sequent 210. A bridge will only pass messages that are being transmitted from a node on one side of the bridge to a node on the other side of the bridge. It will block messages that are transmitted from a node on one side of the bridge to a node on that same side of the bridge. This characteristic reduces network traffic on various sequents of a network.

Segment 118 is also attached to a router/gateway 220 which connects is to a fourth network segment 222. Routers are devices that connect network segments which have similar characteristics. Gateways are devices which connect networks having different types of characteristics. For example, a gateway might connect a local area network to a wide area network.

Because bridges, routers, and gateways, must process the messages sent over the network, they also must contain information about which nodes are on the network. Therefore, bridges, routers, and gateways are authoritative sources of information for determining the nodes on the network. A protocol defines the format of messages that are sent across a network. One popular protocol is the Department of Defense Internetworking Protocol Suite, popularly known as TCP/IP. Because it was developed by the Department of Defense, this protocol is widely available and used extensively, particularly in a university environment. Also, this suite of protocols is very popular on the UNIX operating system and has seen wide distribution there. The internet protocol (IP) uses a single thirty-two bit address for all nodes that can be connected to the internet at any location. Physical addresses within a particular type of network, are normally different from an IP address. If a network address is very small, perhaps eight bits, it may be the same as the low order eight bits of the IP address. If a network address is large, for example, some LANs use forty-eight bit addresses, it is impossible for these addresses to correspond directly to IP addresses. Therefore, both an IP address and a physical address exist for each node on a network. Devices such as routers, gateways, and bridges, which can send messages from one network to another must be able to translate between IP addresses and physical addresses. Therefore, these devices have translation tables which allow them to translate between these two types of addresses. By accessing these translation tables, one of the nodes on a network can obtain information about the other nodes on the network. The existence of these translation tables allow the method of the present invention to perform its function.

A network probe 224 is also attached to the network 118. A network probe 224 is a device that assists in locating defective nodes and assists in repairing those nodes. Since it is a testing device, it may or may not be attached to a network at any given time. When a probe is attached to a network, the discovery system of the present invention can query the probe and use information obtained from the probe to assist in discovering other nodes on the network.

Figs. 3 through 5 show a hierarchy diagram of the modules of the software of the present invention. Referring now to Figs. 3 through 5, discovery module 302 is the main module of the system. Discovery calls self-seed block 304 to start the process of building a database about the network, and it calls process-node block 306 to process information about each node that it obtained from self-seed. Process-node block 306 calls process-ping block 308 to query a node on the network to determine if that node is active. Process-node block 306 also calls process-IFIP block 310 for each IP address that it obtains. Process-IFIP block 310 calls store-IP block 402 for each IP address, and store-IP block 402 calls invalidnode block 406, findnode block 408, and addnode block 410, for each IP address. For each IF entry (physical address) received, process-IFIP block 310 calls store-IF block 404. For each address translation table entry, process-node block 306 calls process-AT block 312 which in turn calls store-AT block 502. Store-AT block 502 calls invalidnode at block 504, findnode block 506, and addnode block 508.

Fig. 6 shows a flowchart of the discovery module block 302 (Fig. 3). Referring now to Fig. 6, after entry block 602 gets any options that the user wishes to enter. Block 604 then initializes the database used to permanently store the nodes, and loads node list from existing entries in the database. If a database for the network does not exist, the discovery system has the ability to create that database. If a database of the network already exists, the discovery system will use the node information which is already available in that database to query other nodes within the system.

Block 606 then initializes domains. A domain

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defines the limit beyond which the user of the discovery system does not wish to find nodes. That is, the domain limits the range of the discovery process. This limitation is necessary on large networks, to keep the amount of processing to reasonable level. Furthermore, a user usually is only interested in the nodes on a particular network segment, or the network segment connected by repeaters and possibly bridges.

Block 608 then calls Fig. 7 to self-seed the system. If no entries were available in the database, the discovery system can self-seed by sending a broadcast message and determine who responds to that message. After returning from self-seed, block 610 points to the first node list entry. As discussed earlier, the node list will contain a list of the nodes already known to the system. This list can be input from the database, or the list can be started from self-seed module. After pointing to the first entry, block 612 determines if there are more entries to process. If there are no more entries to process, block 612 transfers to block 614 which will wait a predetermined period of time before reprocessing the entire node list. Typically, block 614 will wait for approximately thirty seconds. By reprocessing the node list periodically, additional nodes can be discovered. This is because a node may be inactive on the system at any given time and might not be discovered by a single pass through the network. By waiting and reprocessing the node list, nodes that were inactive may now be active and additional information can be obtained.

If more entries in the node list exist, block 612 transfers to block 616 to process one of the nodes. After processing that node, block 616 transfers to block 618 which points to the next node list entry and returns to block 612 to process the next node.

Fig. 7 shows a flowchart for the self-seed block 304 (Fig. 3) which obtains initial information about nodes on the network. Referring now to Fig. 7, after entry, block 702 sends an SP broadcast request to all nodes on the network. SNMP stands for Simple Network Management Protocol, and is a part of the TCP/IP network software. After sending the broadcast request, block 702 transfers to block 704 which receives SNMP messages from the nodes. If more SNMP messages are available, block 704 transfers to block 706 which adds a node to the node list for each message received. In this manner, all nodes that are currently active on the network can be queried to obtain initial information about the node. After all SNMP messages have been received, block 704 returns to the caller.

Another way of self-seeding is to query the address translation table for the node that is executing the discovery system. This table will contain the addresses of other nodes on the network, and these addresses are then used to start the discovery process.

Fig. 8 is a flowchart of the process-node block 306 (Fig. 3). The process-node module of Fig. 8 is called from the discovery module of Fig. 6 once for each entry in the node list. Therefore, whin Fig. 8 is called, the address of a single node is passed to it. Referring now to Fig. 8, after entry, block 802 determines whether the node is within a domain. As discussed earlier, the domain defines the limits beyond which the discovery program does not wish to discover new nodes. If the node is within the domain, block 802 transfers to block 804 which calls the process-ping module of Fig. 9 to determine whether the node is active. After returning from Fig. 9, block 804 transfers to block 806 to determine whether the state of the node has changed since the last information was obtained. That is, when the process-ping module queries the node, it determines the state of the node at the present time. This state is compared, in block 806, with the state of the node as it was known previously in the database. If that state has changed, block 806 transfers to block 808 to store the new state in the database. Control then returns to block 810 which calls process-IFIP to retrieve the IF and IP tables from the node. After returning from Fig. 10, block 810 transfers to block 812 which determines whether the node responded to an SNMP request. If the node did respond to the SNMP request, block 812 transfers to block 814 which determines whether the node is currently in the database. If the node is not in the database, block 814 transfers to block 816 to add the node to the database. Control then continues at block 818 which calls Fig. 16 to retrieve the address translation table from the node. Control then returns to the caller.

Fig. 9 shows a flowchart of the process-ping module block 308 (Fig. 3). This module is called to determine whether a node is active on the network. Referring now to Fig. 9, after entry block 902 determines whether the ping interval has elapsed. The ping interval is used to prevent a node from being queried too often. If the ping interval has not elapsed, block 902 returns to the caller. If the ping interval has elapsed, block 902 transfers to block 904 which sends an ICMP-echo message to the node. The ICMP-echo protocol is defined as a part of TCP/IP and is used to cause the node to return an acknowledgement to a message. Block 904 then transfers to block 906 which determines whether a response has been received from the other node. If a response has not been received within a predetermined amount of time, typically block 906 transfers to block 910 which sets a flag to indicates that the node failed to respond. If the node does respond, block 906 transfers to block 908 which sets a flag to indicate that the node did respond and then block 912 sets a new ping interval which will prevent the node from being pinged for the period of the interval. The ping interval is typically five minutes. Block 912 then returns to the caller.

Fig. 10 shows a flowchart of the process-IFIP module block 310 (Fig. 3). The IF and IP tables are

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available in a node to define the translation of physical addresses to IP addresses. The information is available as two different tables, with an index contained in the IF table to cross-reference to the IP table within the node. By obtaining these two tables, the discovery system can determine what the other interfaces to which a node is connected, and therefore determine other networks to which the node is connected. Referring now to Fig. 10, after entry, block 1002 determines whether the IFIP interval has elapsed. The IFIP interval is similar to the ping interval described with respect to Fig. 9, and is used to keep a node from being queried too often. If the IFIP interval has not elapsed, block 1002 returns to the caller. If the IFIP has elapsed, block 1002 transfers to block 1004 which sends an SNMP message to request the node to send its next IP table entry to the discovery node. When an entry is received, block 1006 calls store-IP module of Fig. 11 to store the node within the node list. Block 1007 then transfers back to block 1004 if more IP entries are available. After all the entries are all stored in the node list, block 1007 transfers to block 1008 which sets a new IFIP interval of typically greater than 10 hours. Block 1010 then sends an SNMP message to request that the node send its next IF table entry to the discovery node. When an IF table entry is received, block 1012 calls the store-IF module of Fig. 12. Block 1014 then transfers back to block 101 if more entries are available. After receiving and storing all the IF table entries, block 1014 returns to the caller. Each IF table entry contains an index into the IP table. By using this index, physical addresses in the IF table can be matched with the IP address.

Fig. 11 shows a flowchart of the store-IP process block 402 (Fig. 4). Referring now to Fig. 11, after entry block 1102 calls Fig. 14 to find the node in the node list. The node will be found if the discovery system has already encountered this node in its process. Block 1304 then determines whether the node exists, and if the node does not exist, block 1104 transfers to block 1106 which calls Fig. 13 to determine whether the node is valid. Block 1108 then determines if the node is valid and if it is valid, block 1108 transfers to block 1110 to add the node to the node list. After adding the node, or if the node already existed, control goes to block 1112 which updates the state information about the node. After updating the node state information or if the node was not valid, Fig. 11 returns to the caller.

Fig. 12 is a flowchart of the store-IF process of block 404 (Fig. 4). This module is called for each table entry in the IF table received from a node. Referring now Fig. 12, after entry, block 1202 finds the IP index within the IF record. As described earlier, each IF table entry will have a corresponding IP table entry, and the IP entry is referenced by an index value contained in the IF entry. Block 1204 then determines whether a matching IP record exists. If a matching IP record does exist, block 1204 transfers to block 1206 which moves the physical address from the IP record to the node record in the node list. Block 1208 then updates any state information in the node record. After updating the state information, or if there were no matching IP record, Fig. 12 returns to its caller.

Fig. 13 shows a flowchart of the invalidnode module block 406 (Fig. 4). Referring now Fig. 13, after entry, block 1302 determines whether the address of the node is simply the loopback address of another node. Each node has a loopback address associated with it for use in testing the node. Because the loopback address refers to the same node, no additional information can be obtained from that node and the loopback address is never stored as a node address. If the IP address is not equal to the loopback address, block 1302 transfers to block 1304 to determine whether the node is within the domain. As described earlier, the domain is used to determine the limits beyond which the discovery system will not attempt to discover new nodes. If the node is within the domain, block 1304 transfers to block 1306 which returns an indication that the node is valid. If the node is not within the domain or if the IP address equals the loopback address, control transfers to block 1308 which returns an error indication indicating that node is not valid. Control then returns to the caller.

Fig. 14 is a flowchart of the findnode module block 408 (Fig. 4). The module is used to find a node within the node list. Referring now Fig. 14, after entry, block 1402 gets the node list entry. Block 1404 then determines whether the IP address matches the entry in the list. If a match does occur, block 1404 transfers to block 1408 which returns an indication that the node is in the node list. If the IP address does not match, block 1404 transfers to block 1406 which gets the next node list entry and block 1410 then determines whether the end of table has been reached. If the end of the list has not been reached, block 1410 transfers back to block 1404 to check the entry just found. If the end of the list has occurred, block 1410 transfers to block 1412 which returns an error indication indicating that the node is not in the node list.

Fig. 15 shows a flowchart of the process of adding a node to the node list. Referring now to Fig. 15, after entry, block 1502 performs a hash operation on the IP address to create a pointer into the node list. Block 1504 then allocates memory for a node record, and block 1506 stores the data available for the node into the node record at the location pointed to by the hashed IP address. Block 1506 then returns to the caller.

Fig. 16 shows a flowchart of the process-AT module of block 312 (Fig. 3). This module is called by the process-node module for each entry in the node list. Referring now to Fig. 16, after entry, block 1602 determines whether the AT interval has expired. The AT interval is used to prevent a node from being polled too frequently. If the AT interval has not expired, block

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1602 simply returns to the caller. If the AT interval has expired, block 1602 transfers to block 1604 which sends an SNMP message to request that the node send its next address translation table entry to the discovery node. When an entry is received, block 1606 is called to store the table entry. Block 1607 then transfers back to block 1604 if more table entries are available. After storing all the table entries, block 1607 transfers to block 1608 which updates the node's state information in the node list. Block 1610 then sets a new AT interval, typically fifteen seconds, and returns to the caller.

Fig. 17 shows a flowchart of the store-AT module of block 502 (Fig. 5). Referring now to Fig. 17, after entry, block 1702 calls the findnode module Fig. 14 to determine whether the node is already in the node list. If the node is in the node list, block 1704 transfers to block 1712. If the node is not in the node list, block 1704 transfers to block 1706 which calls Fig. 13 to determine whether the node is a valid node. If the node is not valid, block 1708 returns to the caller. If the node is valid, block 1708 transfers to block 1710 which calls Fig. 15 to add the node to the node list. After adding the node to the node list, or if the node already existed, control to transfers block 1712 which updates the state information about the node in the node list before returning to the caller.

In addition to querying nodes on the network, the discovery system can also query any network probes that may be attached to the network. Information about other nodes on the network can be obtained from these probes, and the discovery system can use this information to assist in discovering other nodes on the network.

Having thus described a presently preferred embodiment of the present invention, it will now be appreciated that the objects of the invention have been fully achieved, and it will be understood by those skilled in the art that many changes in construction and circuitry and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the present invention. The disclosures and the description herein are intended to be illustrative and are not in any sense limiting of the invention, more preferably defined in scope by the following claims.

Claims

1. A computer network node discovery process (120) for determining nodes (206, 216, 218) connected to a computer network (118), said process (120) comprising the steps of:
   (a) obtaining (306), from one node of a set of known nodes on said computer network (118), a list of addresses of one or more other nodes with which said one node communicates;
   (b) repeating step (a) for each of said other nodes obtained; and
   (c) storing said list of node addresses in a file (808); whereby said list of node addresses may be displayed to a user of said computer network.

2. The process of claim 1 further comprising the step of:
   (d) repeating steps (a) through (c) at regular time intervals.

3. The process of claim 2 further comprising the step of:
   (a1) obtaining from each bridge unit (208) connected to said network (118) a list of addresses of all nodes accessible by said bridge unit (208).

4. The process of claim 3 further comprising the step of:
   (a2) obtaining from each router unit (220) connected to said network (118) a list of addresses of all nodes accessible by said router unit (220).

5. The process of claim 4 further comprising the step of:
   (a3) obtaining from each gateway unit (220) connected to said network (118) a list of addresses of all nodes accessible by said gateway unit (220).

6. The process of claim 5 further comprising the step of:
   (a4) obtaining from any network probe device (224) connected to said network (118) a list of addresses of all nodes known to said network probe device (224).

7. A computer network node discovery process (120) for determining nodes connected to a TCP/IP computer network (118), said process comprising the steps of:
   (a) obtaining (306), from one node of a set of known nodes on said computer network, an address translation table containing a list of addresses of other nodes with which said one node communicates;
   (b) repeating step (a) for each of said other nodes in said address translation table;
   (c) storing said list of nodes in a file (808); and
   (d) repeating steps (a) through (c) at regular time intervals.

8. The process of claim 7 further comprising the steps of:
   (a1) obtaining from each bridge unit (208) con-

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nected to said network (118) an address translation table containing a list of addresses of nodes accessible from said bridge unit (208);

(a2) obtaining from each router unit (220) connected to said network (118) an address translation table containing a list of addresses of nodes accessible from said router unit (220);

(a3) obtaining from each gateway unit (220) connected to said network (118) an address translation table containing a list of addresses of nodes accessible from said gateway unit (220);

(a4) obtaining from any network probe devices (224) attached to said network (118) a list of addresses of all nodes known to said network probe (224); and

(a5) obtaining from each node in said network (118) an interface table and an internet protocol table which defines other networks and nodes to which said node is connected.

9. A computer network node discovery process (120) for determining nodes connected to a computer network (118), said process comprising the steps of:

(a) sending a general response message (307) to all nodes on said network;

(b) creating a node list (410) containing the address of each node responding to said general response message;

(c) obtaining (306), from each node in said node list, a second list of addresses of other nodes with which said node communicates;

(d) adding each node (410) in said second list to said node list;

(e) repeating steps (c) through (d) for each of said nodes in said second list;

(f) storing said node list in a file (808); and

(g) repeating steps (a) through (f) at regular time intervals.

10. The process of claim 9 further comprising the steps of:

(c1) obtaining from each bridge unit (208) connected to said network (118) a list of addresses of all nodes accessible by said bridge unit (208);

(c2) obtaining from each router unit (220) connected to said network (118) a list of addresses of all nodes accessible by said router unit (220);

(c3) obtaining from each gateway unit (220) connected to said network (118) a list of addresses of all nodes accessible by said gateway unit (220); and

(c4) obtaining from any network probe devices (224) attached to said network (118) a list of addresses of all nodes known to the network probe (224).

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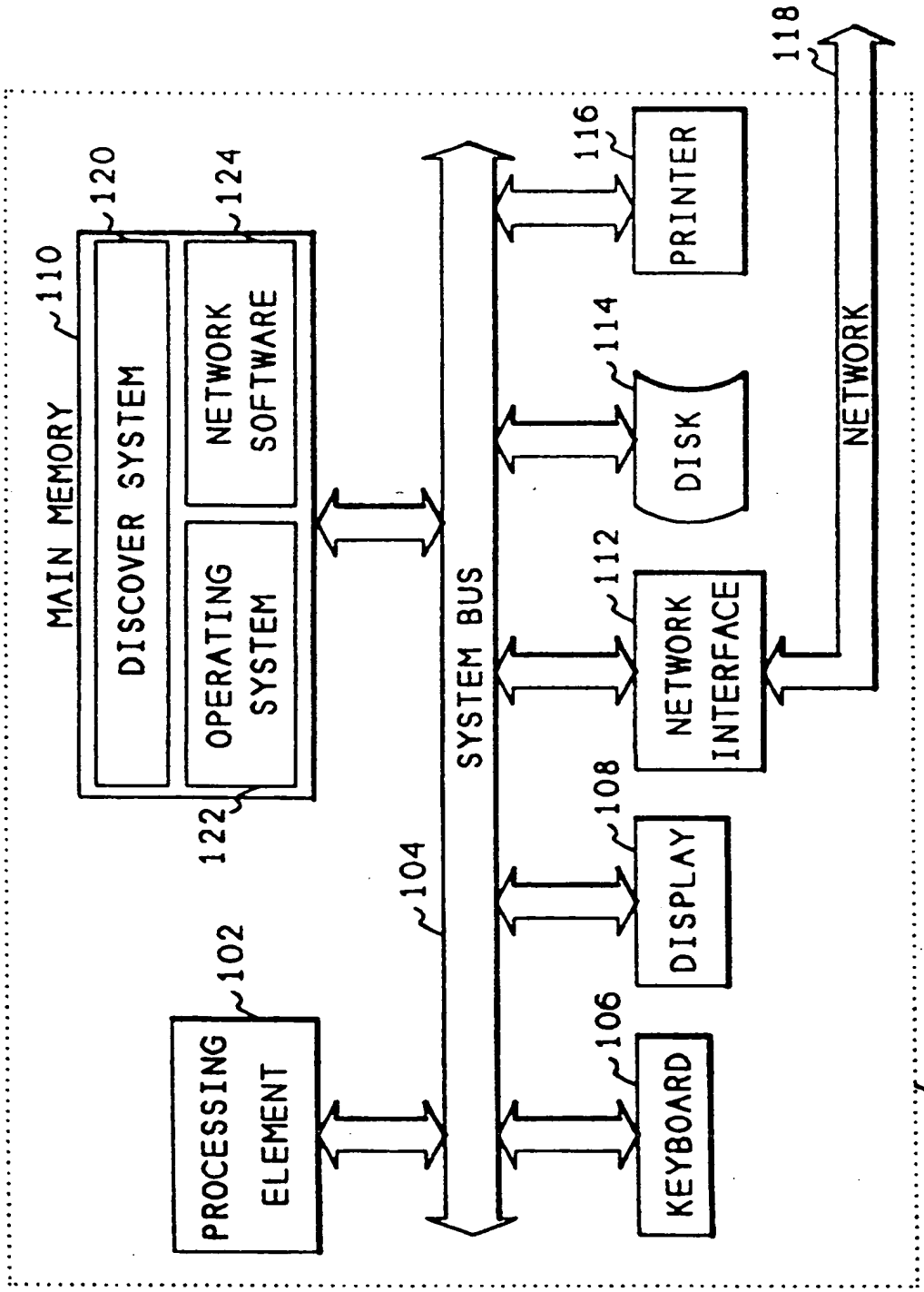

FIG. 1

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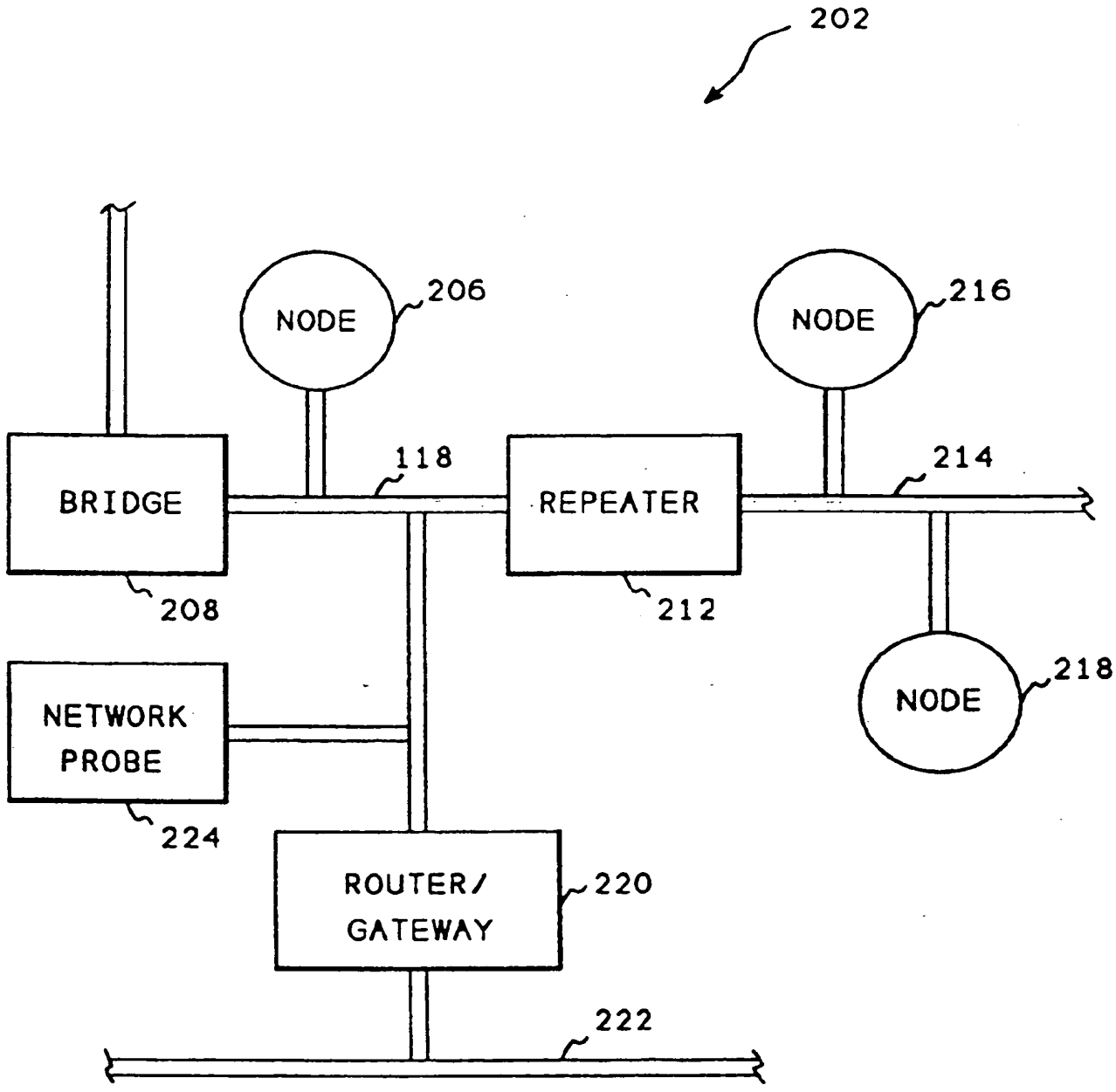

FIG. 2

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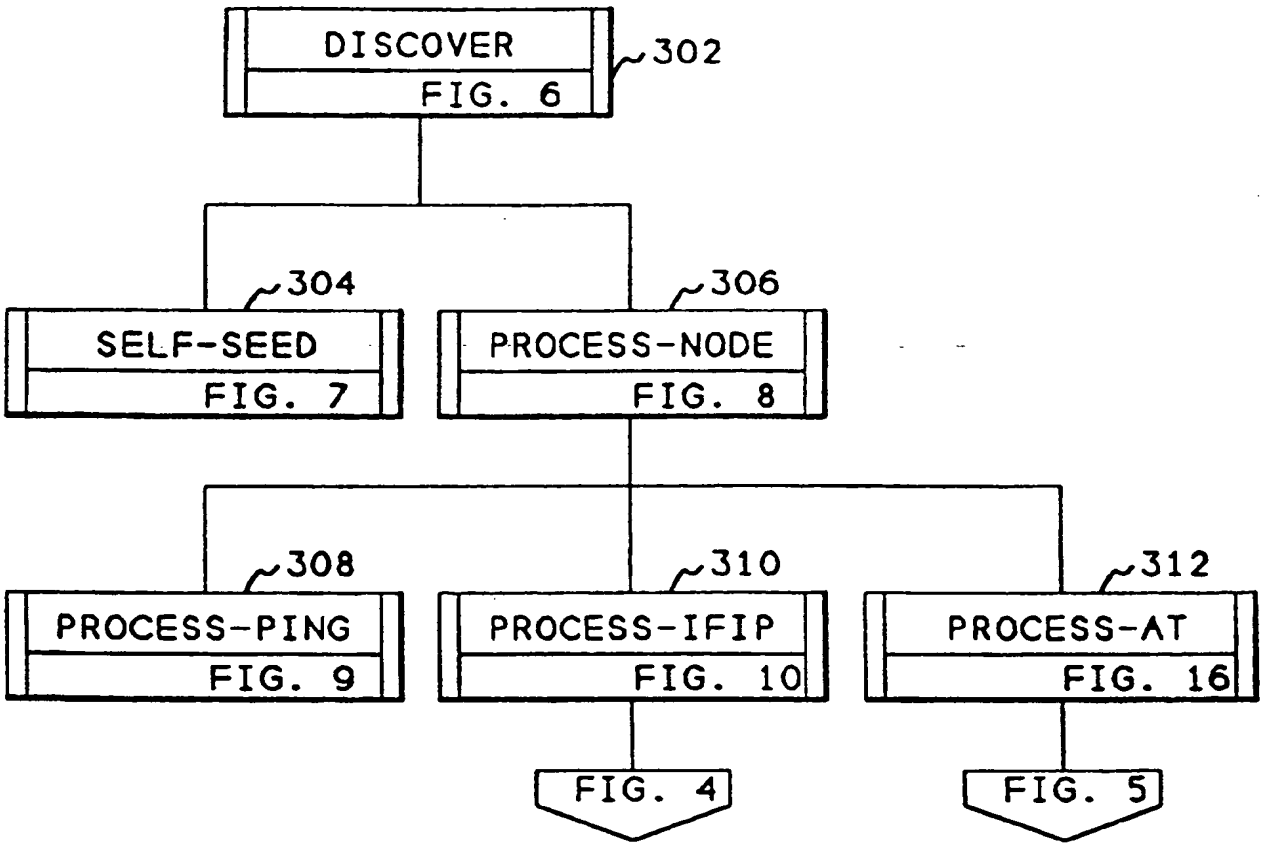

FIG. 3

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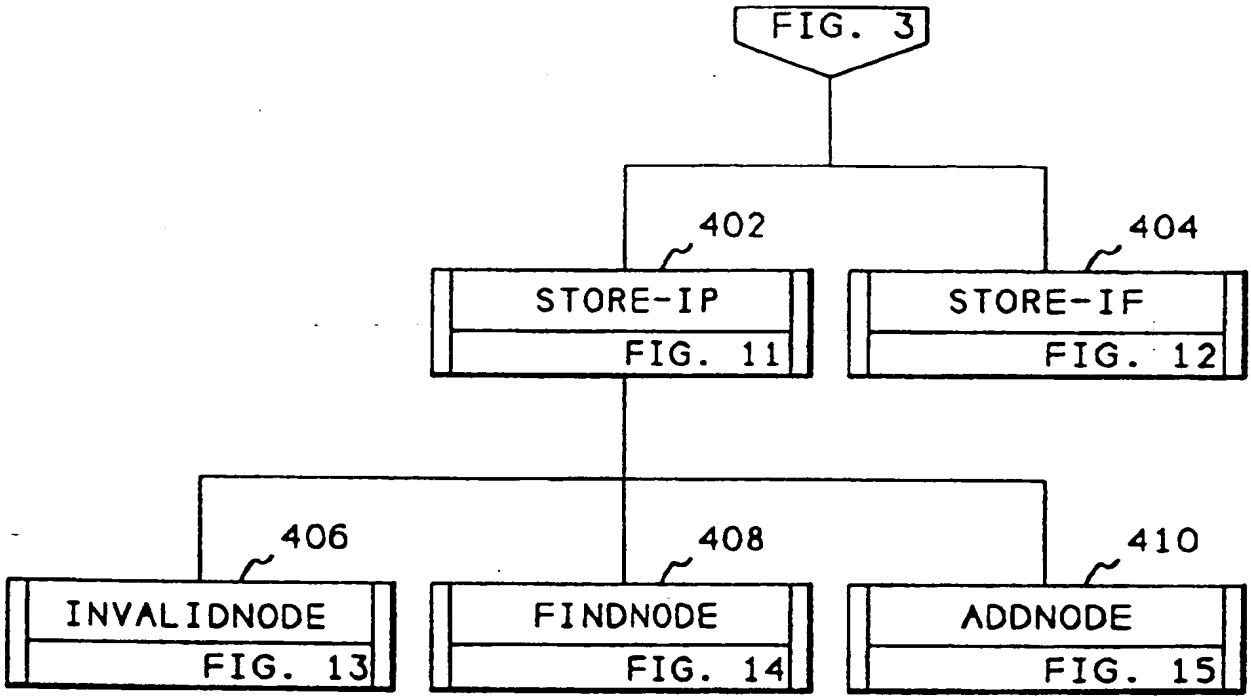

FIG. 4

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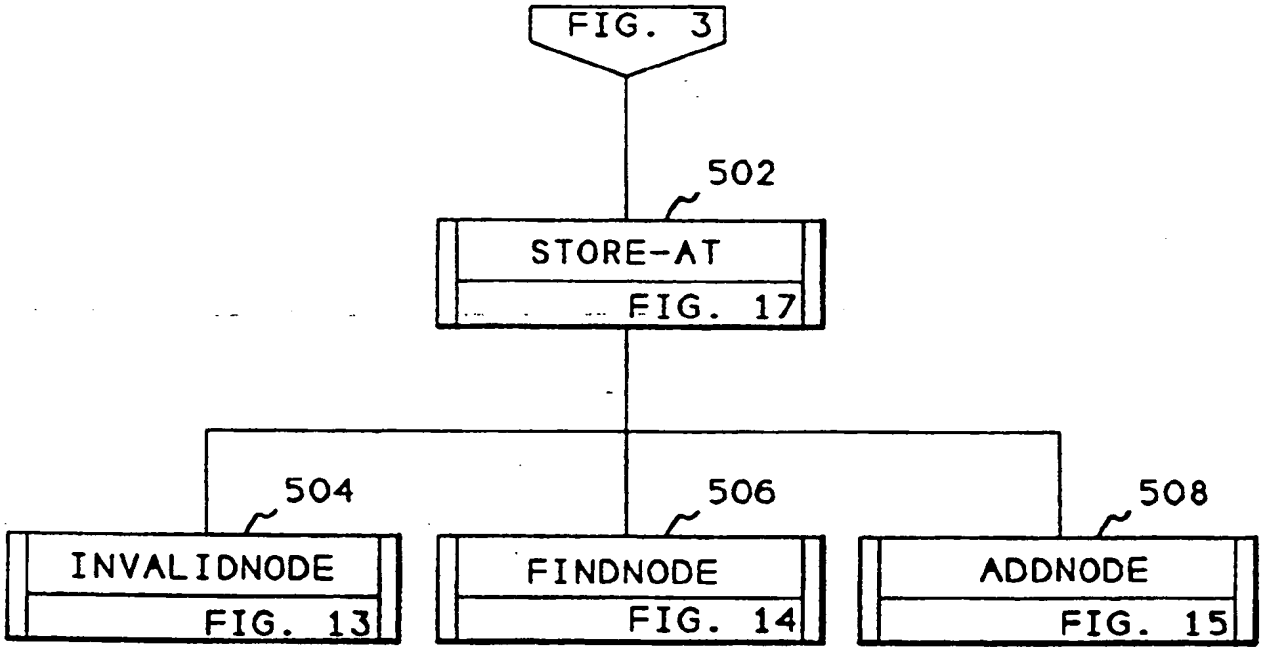

FIG. 5

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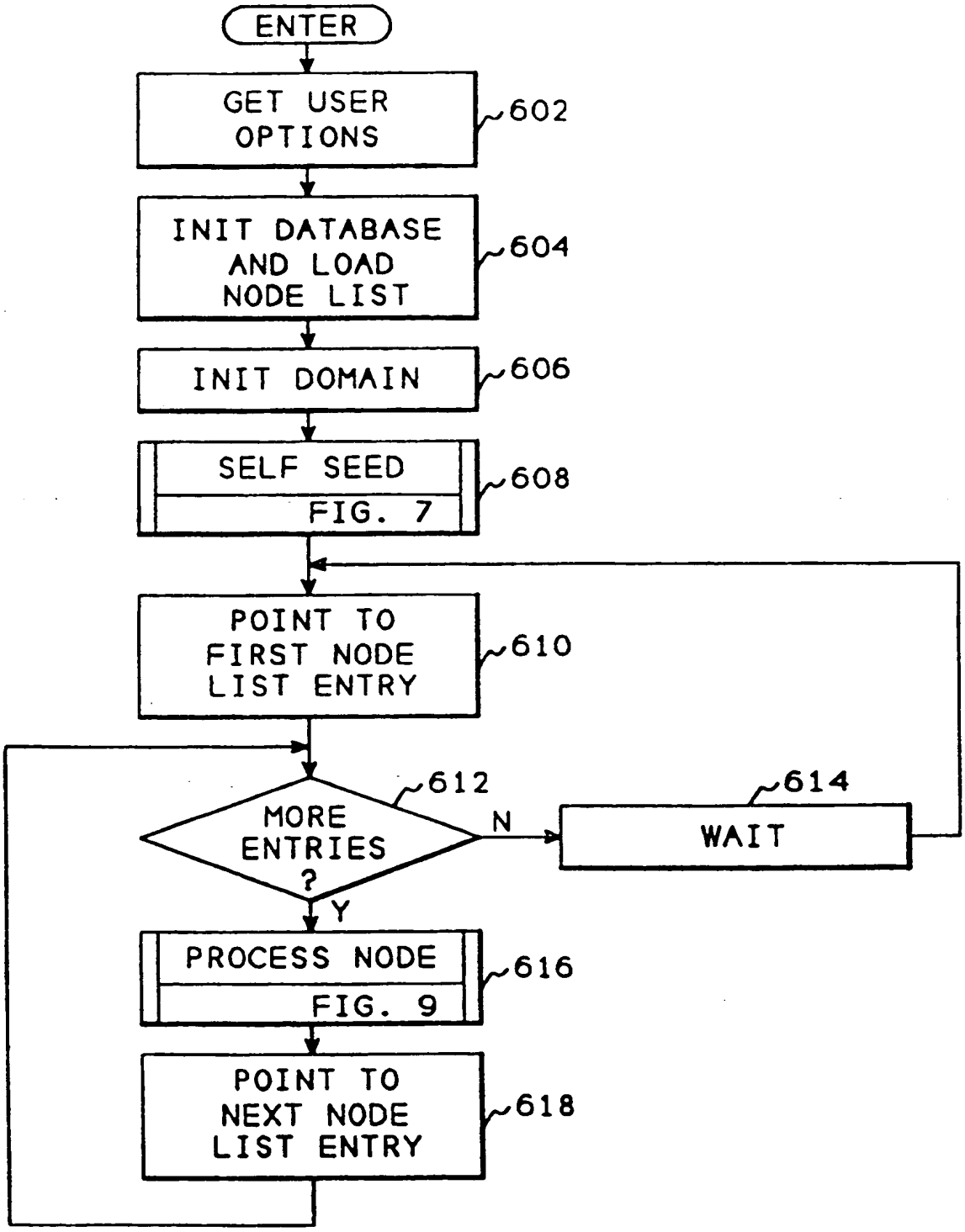

FIG. 6

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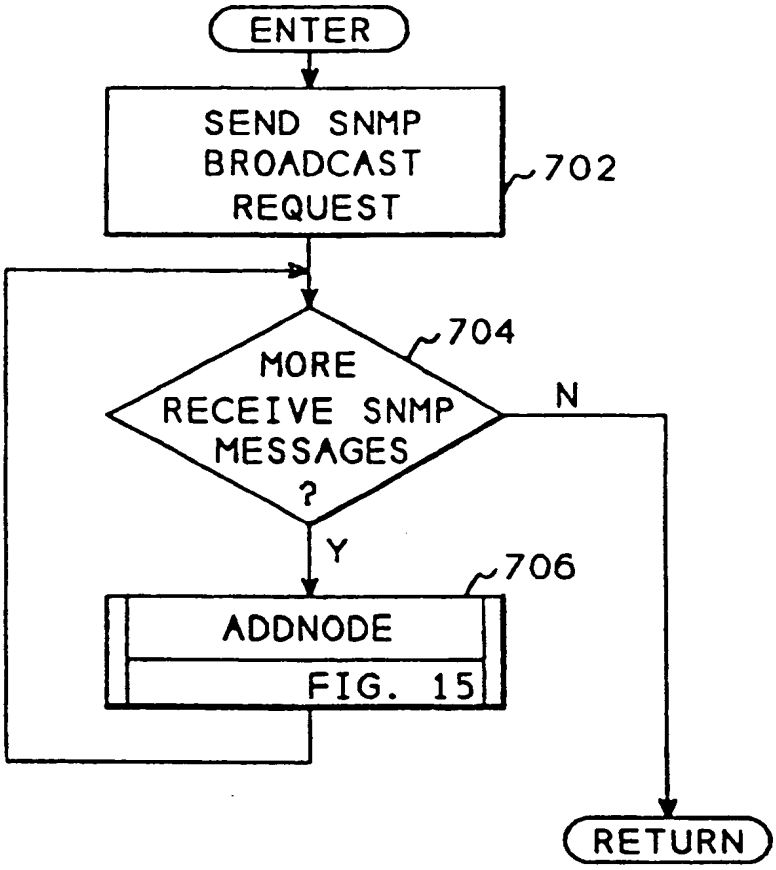

FIG. 7

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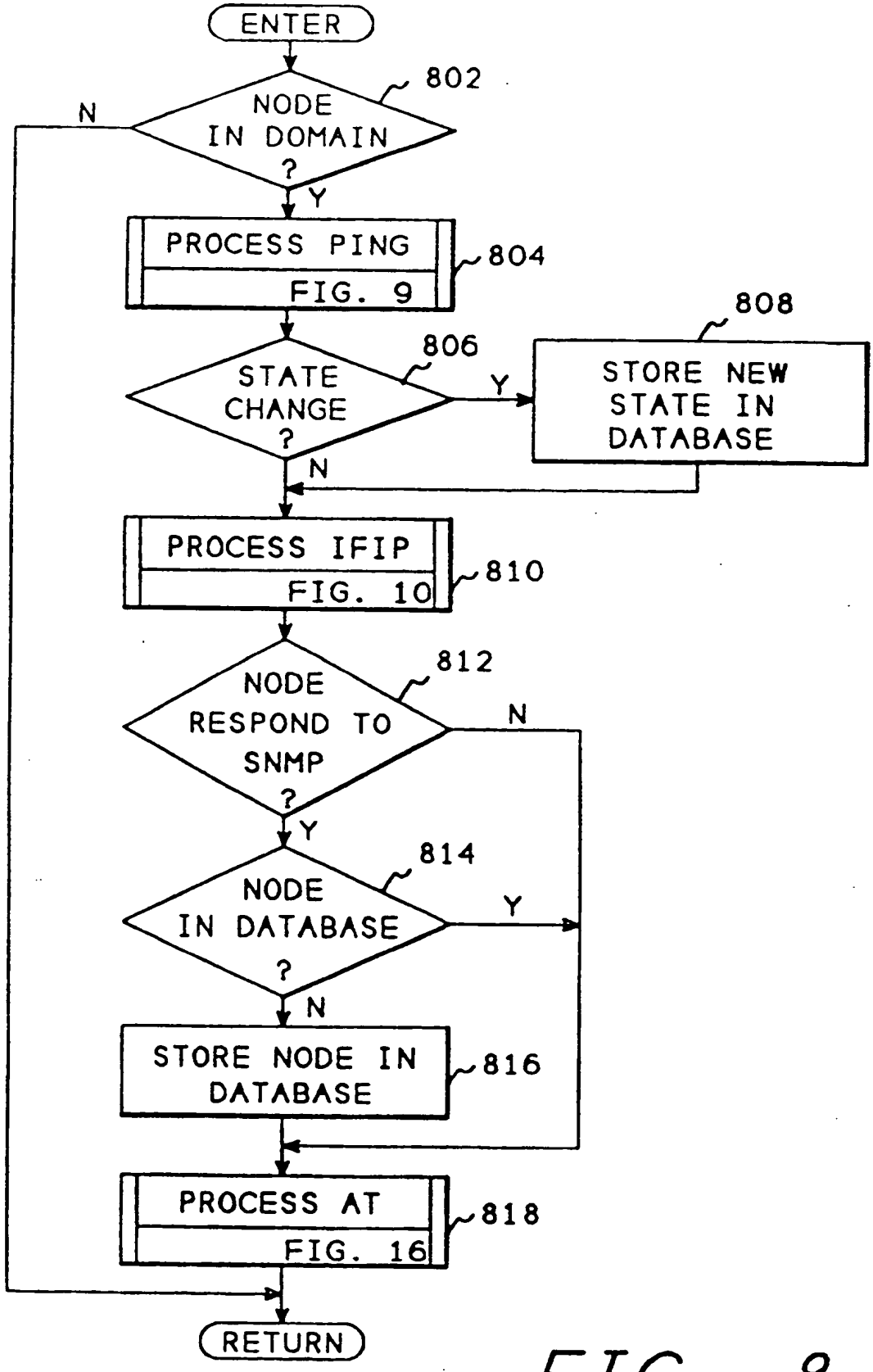

FIG. 8

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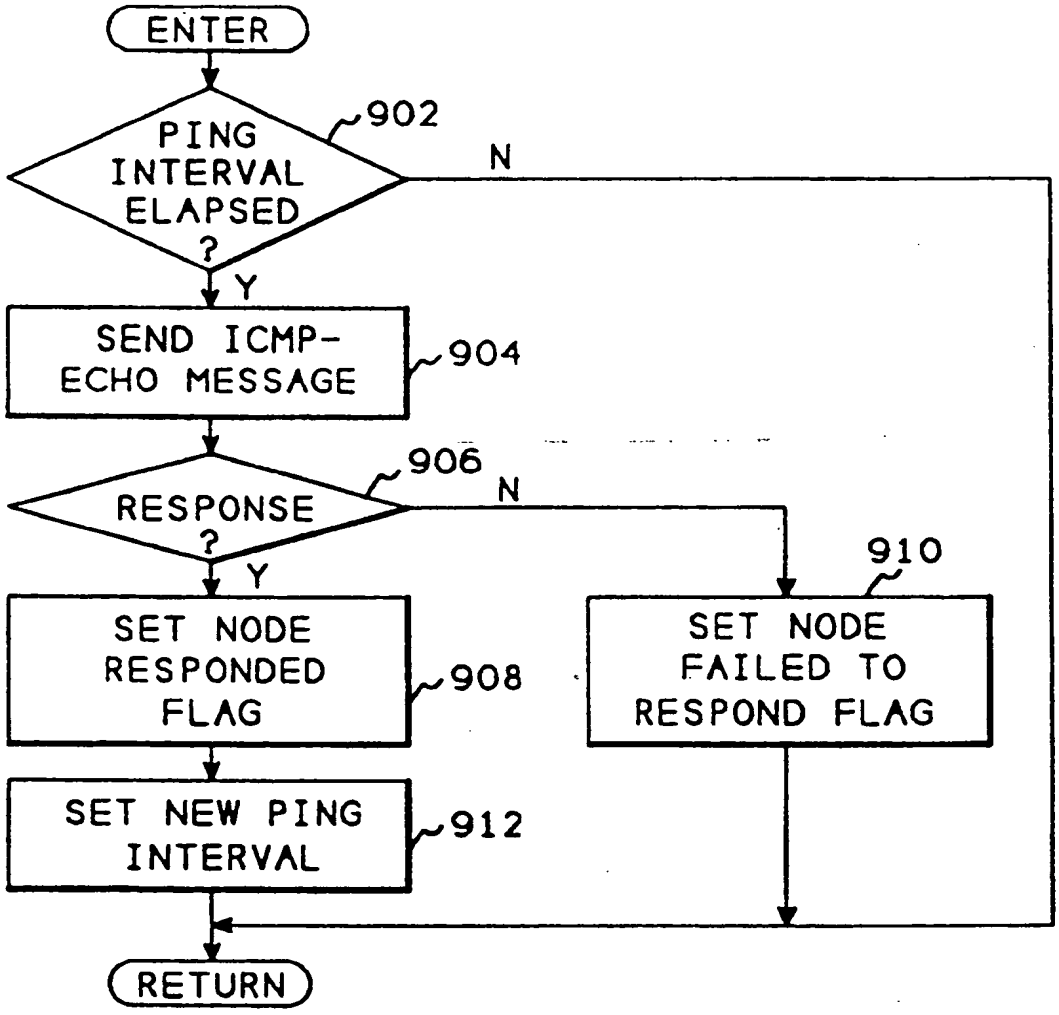

FIG. 9

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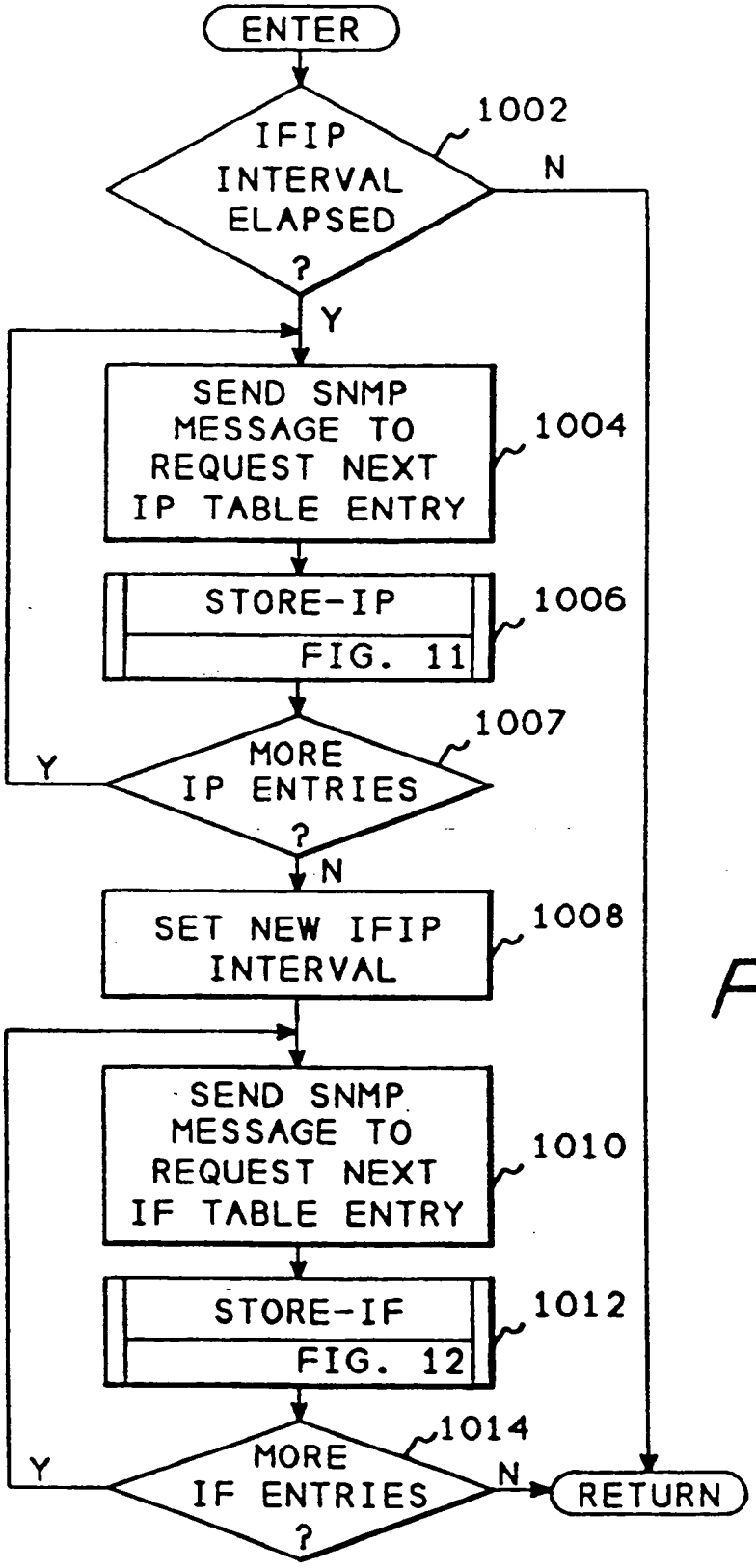

FIG. 10

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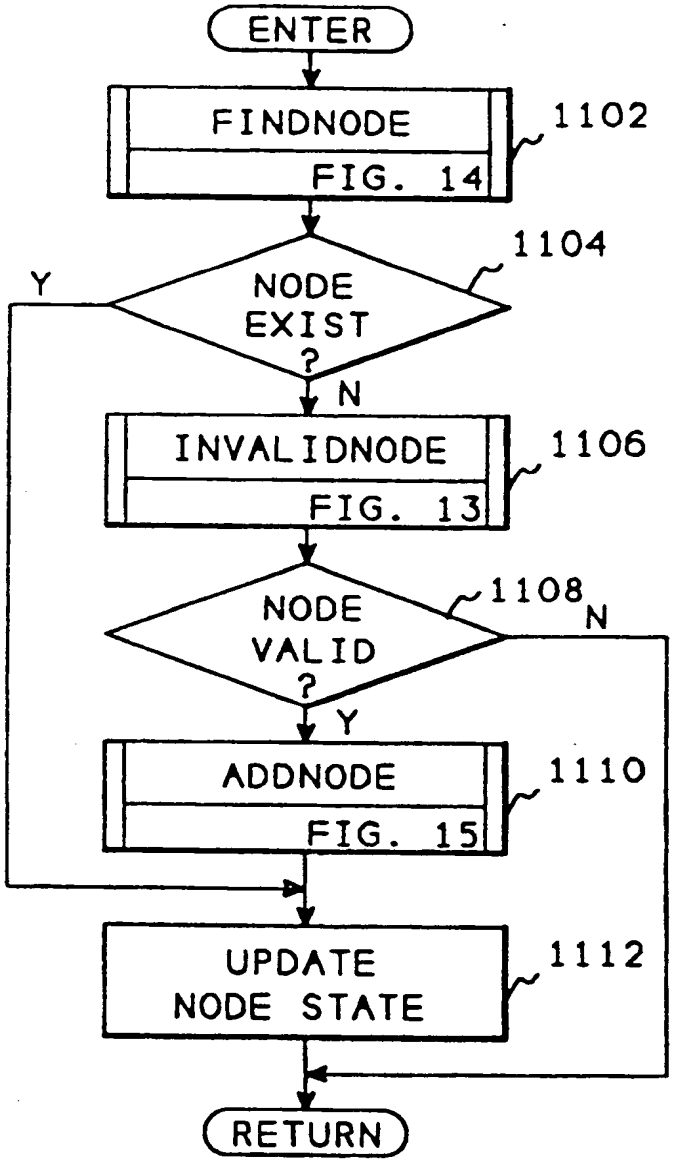

FIG. 11

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